

MICROCOPY RESOLUTION TEST CHART NATIONAL BUREAU OF STANDARDS-1963-A

# Chemical Laser Computer Code Survey

CARL M. WIGGINS AND DENNIS N. MANSELL

The BDM Corporation
Albuquerque, New Mexico 87106

and

PETER B. ULRICH AND JOHN L. WALSH

Applied Optics Branch Optical Sciences Division

December 1, 1980





NAVAL RESEARCH LABORATORY Washington, D.C.

Approved for applie release: distribution assimited.

81 1 07 035

DOC FILE COPY

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE   | READ INSTRUCTIONS BEFORE COMPLETING FORM                       |
|---|--|
| I. REPORT NUMBER    NRL/Report 8450   A A A A C C C C C C C C C C C C C C C   | . 3. RECIPIENT'S CATALOG NUMBER                                |
| a. TITLE (and Subtitle)   | 5. TYPE OF REPORT & PERIOD COVERED                             |
| CHEMICAL LASER COMPUTER CODE SURVEY   | 6. PERFORMING ORG. REPORT NUMBER                               |
| 7. AUTHOR(a)  | 8. CONTRACT OR GRANT NUMBER(4)                                 |
| Carl M. Wiggins, Dennis N. Mansell, Phys. Carb. Peter B. Ulrich, John L. Walsh, NR.   | BDM Corporation N00173-79-C-0109                               |
| S. PERFORMING ORGANIZATION NAME AND ADDRESS   | 10. PROGRAM ELEMENT, PROJECT, TASK<br>AREA & WORK UNIT NUMBERS |
| Department of the Navy Naval Research Laboratory Washington, D.C. 20375   | DARPA 62301E   |
| 11. CONTROLLING OFFICE NAME AND ADDRESS   | 12. REPORT-DATE  |
| <u>/</u>  | December 444089  |
|   | 78 text pages  |
| 14. MONITORING AGENCY NAME & ADDRESS(II different from Controlling Office)  | 15. SECURITY CLASS. (of this report)                           |
| Defense Advanced Research Projects Agency 1400 Wilson Blvd.   | UNCLASSIFIED  15. DECLASSIFICATION/DOWNGRADING SCHEDULE        |
| Arlington, Va. 22209  | SCHEDULE   |
| 16. DISTRIBUTION STATEMENT (of this Report)   | <u> </u>   |
| 17. DISTRIBUTION STATEMENT (of the abatract entered in Block 20, if different fro   | un Report)   |
| 18. SUPPLEMENTARY NOTES   |  |
|   |  |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  Chamical largers.  Chamical largers.          |  |
| Chemical lasers Gasdynamics Computer models Chemical kinetics   |  |
| Resonators  |  |
| Gain media  |  |
| 20. ABSTRACT (Continue on reverse elde if necessary and identify by block number)   |  |
| A survey of modeling capability for predicting chemical lase<br>Optics, kinetics and gasdynamics codes are included in the survey |  |
| developed at thirteen research centers are covered in this report.  |  |
| in-depth summary sheets have been prepared for each code. A su  | pplementary narrative section pro-                             |
| vides introductory material concerning code features and capabilinology used on the survey forms. This document is intended as a  |  |
| an introduction to capabilities of individual codes. Points of cont   | act at each research establishment are                         |
| PORM AUGO   | (Continues)  |
| DD 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE S/N 0102-014-6601  |  |

SECURITY CLASSIFICATION OF THIS PAGE (When Date Entered)

# CONTENTS

| I.   | INTRODUCTION I-1   |  |
|------|--|--|
| II.  | CODE SURVEY SUMMARY II-1                                 |  |
| III. | DETAILED CHEMICAL LASER CODES III-1                      |  |
| IV.  | SUPPLEMENTARY INFORMATION FOR LONG SURVEY FORM IV-1      |  |
|      | Introduction   |  |
|      | Optics   |  |
|      | Kinetics   |  |
|      | GasdynamicsIV-25   |  |
|      | References   |  |
| APF  | ENDIX A — Chemical Laser Code Capability Survey Form A-1 |  |
| APF  | ENDIX B — Researchers and Survey Mailing List B-1        |  |
| APF  | PENDIX C — Bell Aerospace Codes Response                 |  |

| Accession For    |
|------------------|
| NTIS GRA&I       |
| DUTC TIVE (II)   |
| Unspeciate od 🛄  |
| Joutification    |
|                  |
| Pro              |
| In tribution/    |
| A GARANTEN Codes |
| A. T. L /OF      |
| Dict Spoint      |
|                  |
| 112              |
|                  |

#### CHEMICAL LASER COMPUTER CODE SURVEY

#### Section I

#### INTRODUCTION

As part of its program to evaluate novel resonator concepts for high-energy laser applications, the Naval Research Laboratory (NRL) has conducted a survey sponsored by the Defense Advanced Research Projects Agency (DARPA) to determine the features and capabilities of government- and contractor-developed computer codes that model one or more features of hydrogen fluoride/deuterium fluoride chemical laser resonators. The purpose of this survey was to obtain a detailed measure of the extent of the current and near-term state-of-the-art modeling capability for predicting chemical laser performance. Because many diverse chemical laser codes exist, it was recognized that comparisons and evaluations of codes, models, and computational techniques would best be accomplished if each code architect assessed the capabilities, limitations, merits, and demerits of his own code or model for chemical laser resonator analysis and performance.

A code survey form (Appendix A) was prepared to aid in gathering information in three main areas of concern in modeling chemical lasers: optics, kinetics, and gas dynamics. It was recognized that certain codes might in some aspects be more powerful than would be required for analyzing the continuous-wave (CW), supersonic, diffusion-mixing, cold-reaction HF chemical laser. The government is interested in identifying any such extended capabilities. For this reason some generalization of the survey form in each of the three cited areas was attempted. It was also recognized that some aspects of the survey form would probably be too specific or else too general to accommodate all applicable codes and models to which they were addressed. Therefore, respondents were encouraged to cite deficiencies, make recommendations for improvements, and depart from the prescribed format when necessary to describe better the features of their codes or models.

A potential list of recipients for the chemical laser code capability survey was prepared using the following sources:

- 1. Attendees to the Novel Resonator Mid-Term Review held December 5 and 6, 1978, at NRL
- 2. Authors of papers presented at the 6th Tri-Service Chemical Laser Symposium held August 28-30, 1979, at the Air Force Weapons Laboratory
- 3. Attendees to the Intra-Cavity Adaptive Optics (ICAO)/Internal Focal Line Aperture (IFLA) Review held April 10, 1979, at the Air Force Weapons Laboratory
- 4. Distribution list for Novel Resonators for High Power Chemical Lasers Program provided by NRL.

Manuscript submitted August 6, 1980.

#### WIGGINS, MANSELL, ULRICH, AND WALSH

This list (Appendix B) includes 165 names of researchers and, in some cases, shows their current or recent areas of interest. Rather than attempt to communicate directly with this large number of potential survey recipients, it was decided instead to send several copies of the survey form to key individuals at the various companies and government agencies involved and let them make the internal distributions. This final list included 51 names and is also included in Appendix B.

A significant amount of code development, capabilities, and documentation is considered proprietary to those companies that build them. This report contains no proprietary information. The line of distinction for determining exactly which information about any code marked proprietary is vague and is best answered by the originator of the code.

The remainder of this report is a summary of the responses received from the survey. Top-level summaries and categorical distributions of chemical laser codes are presented in section II. These are intended to provide "quick-look" comparisons of code features. Detailed code capabilities and features are provided in section III.

#### Section II

### **CODE SURVEY SUMMARY**

The purpose of this chapter is twofold. First, the codes are listed in various ways to aid the reader in determining where a code fits categorically among the various combinations of optics, kinetics, and gasdynamics features. Second, a single-page summary is included for each code (alphabetically by code name). The purpose of this top-level or quick-look summary is to provide a rapid evaluation of a given code's attributes and for cross comparisons before going to the more detailed level of section III.

Table II-1 provides the complete alphabetical listing of all codes included in this survey, the company or agency that submitted them, and their proprietary/nonproprietary status (P if proprietary). An alphabetical listing of codes by company/agency, which shows also the general type or use of code (optics, kinetics, gasdynamics), is provided in Table II-2. The following rules were applied in classifying a code as O, K, or G. A code with detailed optics with up to and including a simple saturable gain model, but no detailed kinetics or gasdynamics features, was classified as an optics (O) code. A code with detailed kinetics with up to and including a simple Fabry-Perot optics model, but no detailed optics or gasdynamics, was classified as a kinetics (K) code. A code with detailed mixing or flow modeling capabilities, but without detailed optics or chemistry models, was termed a gasdynamics (G) code. In Table II-3, this categorical approach is used to divide codes into seven categories made possible by codes having different combinations of detailed optics, detailed kinetics, and detailed gasdynamics modeling capabilities. The reader will undoubtedly find many other ways to compare codes; Table II-4 provides one further example.

Some information in a very different format from that used in this survey was provided on 21 codes by Bell Aerospace Textron. Summary sheets have been included for these codes. The original Bell Aerospace inputs have been included as Appendix C.

<sup>\*</sup>Codes without names were arbitrarily given alphanumeric names for reporting consistency; such codes are indicated by a superscript asterisk following the code name.

<sup>†</sup>Most of the time, but not always, the company or agency submitting a given code was responsible for producing or building the code. Attempts have been made to properly credit the original source where known.

None of the information reported here is considered proprietary.

# WIGGINS, MANSELL, ULRICH, AND WALSH

Table II-1 — Alphabetical Listing of Chemical Laser Codes

| Code Name   | Company/Agency         | Proprietary |
|-------------|------------------------|-------------|
| ABL         | TRW                    |             |
| AEROKNS     | Rocketdyne             |             |
| AFOPTMNORO  | University of Illinois |             |
| ALCHRC*     | Rocketdyne             |             |
| ALCRRC*     | Rocketdyne             |             |
| ALFA        | AFWL/ALC               |             |
| APACHE      | AFWL/ALC               | l           |
| ARM-D       | Bell Aerospace         | P           |
| ARM-G       | Bell Aerospace         | P           |
| BAREPL      | Rocketdyne             | l           |
| BCCLC*      | AFWL/ALR               |             |
| BLAZER      | TRW                    |             |
| BLAZE I     | Bell Aerospace         | P           |
| BLAZE II    | Bell Aerospace         | P           |
| BLAZE III   | Bell Aerospace         | P           |
| BLAZE IV    | Bell Aerospace         | P           |
| BLAZE V     | Bell Aerospace         | P           |
| BLAZE VI    | Bell Aerospace         | P           |
| BLIST       | TRW                    | P           |
| CLOQ        | UTRC/P&W               | P           |
| CLOQ3D      | UTRC/P&W               | P           |
| CLSLGM*     | SAI                    |             |
| CNCDE       | Bell Aerospace         | P           |
| COMOC-SA    | Bell Aerospace         | P           |
| COMOC-TA    | Bell Aerospace         | P           |
| COMOC-2DNS  | Bell Aerospace         | P           |
| COMOC-3DPNS | Bell Aerospace         | P           |
| CROQ        | TRW                    | P           |
| DENTAL      | AFWL/ALR               |             |
| DESALE-5    | Aerospace Corporation  |             |
| DIFF-2      | Bell Aerospace         | P           |
| DIFF-3      | Bell Aerospace         | P           |
| ELNWD2      | Aerospace Corporation  |             |
| GASSER      | TRW                    |             |
| GCAL        | SAI                    |             |
| GENRING     | BDM                    |             |
| GIM         | AFWL/ALC/LOCKHEED      | P           |
| GLADV       | TRW                    | P           |
| GOAD        | Bell Aerospace         | P           |

<sup>\*</sup>Indicates alphanumeric name generated for this survey.

# NRL REPORT 8450

Table II-1 — Alphabetical Listing of Chemical Laser Codes (Continued)

| Code Name     | Company/Agency            | Proprietary |
|---------------|---------------------------|-------------|
| GOPWR         | Rocketdyne                |             |
| GURDM         | BDM                       |             |
| HFGOPWR       | Rocketdyne                |             |
| HFOX          | Sandia Laboratories       |             |
| IPAGOS        | BDM/TRW                   |             |
| KBLIMP        | Aerotherm Division ACUREX |             |
| LAPU-2        | LASL                      |             |
| LOADPL        | Rocketdyne                |             |
| LS-14RGS*     | Rocketdyne                |             |
| MCLANC        | TRW                       | P           |
| MNORO         | University of Illinois    | -           |
| MPCPAGOS      | BDM                       |             |
| MRO           | TRW                       |             |
| NCFTDPWE*     | LASL                      |             |
| NORO-I        | University of Illinois    | P           |
| NORO-II       | Bell Aerospace            | P           |
| OCELOT        | Hughes                    | P           |
| POLRES        | AFWL/ALR                  | •           |
| POLRESH       | AFWL/ALR                  |             |
| POP           | Perkin-Elmer              | P           |
| PRE-WATSON    | Rocketdyne                | •           |
| QFHT          | UTRC/P&W                  | P           |
| RASCAL        | Rocketdyne                | P           |
| ROPTICS       | University of Illinois    | P           |
| ROTKIN        | UTRC/P&W                  | P           |
| SAIC2D        | SAI                       | •           |
| SAIC2DV       | SAI                       |             |
| SAIFHT        | SAI                       |             |
| SAIGD         | SAI                       |             |
| SAIID         | SAI                       |             |
| SAI2D         | SAI                       |             |
| SOS           | Aerospace Corporation     |             |
| TDLCRC*       | Rocketdyne                | P           |
| TDWORRC*      | Rocketdyne                | P P         |
| TMRO          | TRW                       | 1           |
| TWODNOZ       | TRW                       |             |
| URINLA2       | TRW                       |             |
|               | TRW                       |             |
| VIINT<br>WAP* | TRW                       |             |

<sup>\*</sup>Indicates alphanumeric name generated for this survey.

# WIGGINS, MANSELL, ULRICH, AND WALSH

Table II-2 — Alphabetical Listing of Chemical Laser Codes by Company

| Company/Agency                        | Code Name   | Proprietary                                    | Type  |
|---------------------------------------|---|--|---|
| Aerospace Corporation                 | DESALE-5<br>ELNWD2<br>SOS   |  | K, G<br>O<br>K  |
| Air Force Weapons Laboratory          | ALFA APACHE BCCLC DENTAL GIM POLRES POLRESH   | P  | K<br>K<br>O, K<br>O, K, G<br>G<br>O                                 |
| BDM Corporation                       | GENRING<br>GURDM<br>IPAGOS<br>MPCPAGOS  |  | 0<br>0<br>0   |
| Bell Aerospace Textron                | ARM-D ARM-G BLAZE I BLAZE II BLAZE III BLAZE IV BLAZE V BLAZE VI CNDE COMOC-SA COMOC-TA COMOC-ZDNS COMOC-3DPNS DIFF-2 DIFF-3 GOAD NORO-II | P<br>P<br>P<br>P<br>P<br>P<br>P<br>P<br>P<br>P | O<br>O<br>G<br>K, G<br>K, G<br>K, G<br>K, G<br>O, G<br>O, G<br>O, G |
| Hughes Aircraft Company               | OCELOT  | P  | 0   |
| University of Illinois                | AFOPTMNORO<br>MNORO<br>NORO I<br>ROPTICS  | P<br>P   | O, K<br>K<br>K<br>O, K  |
| Los Alamos Scientific<br>Laboratories | LAPU-2<br>NCFTDPWE  |  | 0   |
| Perkin-Elmer                          | POP   |  | o   |

# NRL REPORT 8450

Table II-2 — Alphabetical Listing of Chemical Laser Codes by Company (Continued)

| Company/Agency   | Code Name  | Proprietary           | Туре   |
|--|--|-----------------------|--|
| Rocketdyne   | AEROKNS ALCHRC ALCRRC BAREPL GOPWR HFGOPWR LOADPL LS-14RGS PRE-WATSON RASCAL TDLCLRC TDWORRC | P<br>P<br>P           | K, G<br>O, K, G<br>O, K, G<br>O, K, G<br>O<br>O<br>O, K, G<br>O, K, G        |
| Sandia Laboratories                                    | нгох   |                       | K  |
| Science Applications, Inc.                             | CLSLGM GCAL SAIC2D SAIC2DV SAIFHT SAIGD SAI1D SAI2D  |                       | O<br>K<br>O<br>O<br>K, G<br>O  |
| TRW  | ABL BLAZER BLIST CROQ GASSER GLADV KBLIMP MCLANC MRO TMRO TWODNOZ URINLA2 VIINT WAP          | P<br>P<br>P<br>P<br>P | O, K, G<br>O, K, G<br>G<br>O, K, G<br>G<br>G<br>O, K, G<br>O, K, G<br>G<br>G |
| United Technologies Research<br>Center Pratt & Whitney | CLOQ<br>CLOQ3D<br>QFHT<br>ROTKIN   | P<br>P<br>P           | O, K, G<br>O, K, G<br>O<br>K, G  |

Table II-3 — Comparative Listing of Chemical Laser Codes by General Type

| - 1 | 1        | i  |  |
|-----|----------|--|--|
|     | Ŋ        | BLAZE II<br>BLAZE II<br>BLAZE V<br>BLIST<br>CNDE<br>GASSER<br>GIM<br>GLADV<br>KBLIMP<br>MCLANC<br>TWODNOZ<br>VIINT |  |
|     | К        | ALFA<br>APACHE<br>GCAL<br>HFOX<br>MNORO<br>NORO I<br>SOS   |  |
|     | 0        | ARM-D ARM-G BARE PL CLSLGM ELNWD2 GENRING GOAD GURDM IPAGOS LAPU-2 LOADPL 1S-14 RGS                                | MPCPAGOS NCFTDPWE OCELOT POLRES POLRESH POP PRE-WATSON QFHT SAIC2D SAIC2D SAIC1D SAILD SAILD SAILD TDWORRC |
|     | K, G     | AEROKNS BLAZE III BLAZE IV COMOC-SA COMOC-TA COMOC-30PNS DESALE-5 NORO-II ROTKIN SAIGD                             |  |
|     | 0, G     | DIFF-2<br>DIFF-3   |  |
|     | O, K     | AFOPTMNORO<br>BCCLC<br>ROPTICS   |  |
|     | O, K, G* | ABL ALCHRC ALCRRC BLAZER BLAZE VI CLOQ CLOQ CLOQ CROQ DENTAL GOPWR HFGOPWR MRO RASCAL                              | TMRO   |

\*0 = optics, K = kinetic, G = gasdynamic.

# NRL REPORT 8450

Table II-4 - Nonproprietary 2-D Codes as Functions of Basic Level of Detail and Geometry

|      |  | Company  | Contact   | Telephone Number   |  |  |
|------|--|--|---|--|--|--|
| I.   | 2-D Wave Optics/Kinetics/Gasdynamics Codes         |  |   |  |  |  |
| Car  | tesian   |  |   |  |  |  |
|      | Blazer<br>CLOQ 3D                                  | TRW DSSG<br>UTRC                                     | Don Bullock<br>Paul E. Fileger  | 213-535-3484<br>305-840-6643   |  |  |
| Cyl  | indrical   |  |   |  |  |  |
|      | ABL<br>CLOQ 3D                                     | TRW DSSG<br>UTRC                                     | Don Bullock   | 213-535-3484   |  |  |
| II.  | 2-D Wave Optics                                    | /Kinetics  | <del> </del>  | ·  |  |  |
| Car  | tesian   |  |   |  |  |  |
|      | BCCLC<br>SAI2D                                     | AFWL/ALR<br>SAI                                      | Capt. Ted Salvi<br>Jerry Long   | 505-264-0721<br>404-955-2663   |  |  |
| Cyl  | indrical   |  |   |  |  |  |
|      | SAIC2D<br>SAIC2DV<br>SAIFHT                        | SAI<br>SAI<br>SAI                                    | Jerry Long<br>Jerry Long<br>Jerry Long  | 404-955-2663<br>404-955-2663<br>404-955-2663                                 |  |  |
| III. | 2-D Wave Optics                                    |  |   |  |  |  |
| Car  | tesian   |  |   |  |  |  |
|      | CLSLGM   | SAI  | Robert E. Hodder  | 305-283-3380   |  |  |
| Cyl  | indrical   |  |   |  |  |  |
|      | BAREPL<br>GURDM<br>LOADPL<br>PRE-WATSON<br>URINLA2 | Rocketdyne<br>BDM<br>Rocketdyne<br>Rocketdyne<br>TRW | Alexander Simonoff<br>Tom Ferguson<br>Alexander Simonoff<br>Phil D. Briggs<br>Don Bullock | 213-884-3346<br>505-264-8568<br>213-884-3346<br>213-884-3851<br>213-535-3484 |  |  |

| CODE SUMMARY SHEET   | CODE NAME:        | ABL              |
|--|-------------------|------------------|
| ORIGINATOR/KEY CONTACT:  Name:                                     | <b></b>           | (213) 535-3484   |
| Organization: TRW DSSG   | Phone:_           | (213) 033 3404   |
| Address: R1/1162 One Space Park,                                   | Redondo Beach, Ca | lifornia 90278   |
| PRINCIPAL PURPOSE AND APPLICATION used with URINLA2. This is a URI |                   | · ·              |
|  |                   |                  |
| AVAILABLE DOCUMENTATION: Annular                                   | Laser Mode Studi  | es Final Report. |
| Program ABL User Manual, June 197                                  |                   |                  |

| CATEGORY          | OPTICS KINETICS  |  | GASDYNAMICS |   |
|-------------------|--|--|-------------|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Gain Detailed Kinetics               | •           | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical Physical   | CW Pulsed HF. DF Other                                     | •           | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular   | Annular, Radially Flowing<br>Transversely Flowing<br>Other | •           | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • 10<br>• 20<br>• 30                                       | •           | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | •           | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Miselignments     Aberrations     Deformable Mirrors     Far-Field Performance     Other | Single Line Multiline Line Broadening Other                | •           | Leminer Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other     |

| CODE | SUMI | YRAN | SHE | ET |
|------|------|------|-----|----|
|------|------|------|-----|----|

| CODE NAME: | AEROKNS |
|------------|---------|
|            |         |

The state of the state of

| ORIGINATOR/KEY CONTACT: Name: _Jim_Vieceli                                       | Phone: (213) 884-3851              |
|--|------------------------------------|
| Organization: Rockwell International-Ro  | cketdyne Division                  |
| Address: 6633 Canoga Ave., Canoga Park PRINCIPAL PURPOSE AND APPLICATION OF CO   |                                    |
| gain or loaded gain from a radially flow resonator codes. Package includes aerod | ing system for use by annular      |
| (Used in LS-14 study, see ALCHRC).   |                                    |
|  |                                    |
| AVAILABLE DOCUMENTATION: Annular Lase  |                                    |
| TR-77-117); Annular Laser Optics Study U   | ser's Manual: Loaded Cavity Codes. |

| CATEGORY          | OPTICS   |   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|---|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | • | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                            |
| ТУРЕ              | Geometrical<br>Physical  | • | CW<br>Pulsed<br>HF, DF<br>Other                            | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | • | Annular, Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 O<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | • | Cartesian<br>Cylindrical<br>Other                          | • | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | : | Single Line<br>Multiline<br>Line Broadening<br>Other       | • | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |

| CODE SUMMARY SHEET | r |
|--------------------|---|
|--------------------|---|

| CODE NAME: | <u>AFOPTMNORO</u> |
|------------|-------------------|

| ORIGINATOR/  | KEY CONTACT:  |
|--------------|---|
| Name:        | L. H. Sentman/T. Salvi (AFWL) Phone (217) 333-1834              |
| Organizatio  | on: Univ. of Illinois, Dept. of Aeronautical & Astronautical En |
| Address:     | Urbana, Illinois 61801  |
|              | RPOSE AND APPLICATION OF CODE: Predict power spectral per-      |
| formance o   | f CW chemical lasers by coupling an AFWL strip mirror optics    |
|              | rotational nonequilibrium kinetics - fluid dynamics model       |
| (MNORO).     | Combined model is called AFOPTMNORO.                            |
|              |   |
|              |   |
| AVAILABLE DO | DCUMENTATION: "An Efficient Rotational Nonequilibrium Model     |
|              | emical Laser," L. H. Sentman & W. Brandkamp, TR AAE 79-5, UILU  |
| Eng 79-050   | 5. July 1979. "Users Guide for Programs MNORO and AFOPTMNORO,"  |
|              | man AAF TR 79-7 HILLI Eng 79-0507, October 1979.                |

| CATEGORY          | OPTICS   | KINETICS                                    | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Detailed Kinetics     | Gain None Simple Flow Model Detailed Mixing             |
| TYPE              | Geometrical Physical   | CW Pulsed HF, OF Other                      | Premixed Scheduled Mixing Other                         |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Transversely Flow Other   | •   -   |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D                           | 1 D 2 D 3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                 | Cartesian Cylindrical Other                             |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other | Laminar Flow Turbulent Flow Boundary Layer Shocks Other |

| CODE | SUMM | IARY | SHEET |
|------|------|------|-------|
|------|------|------|-------|

| CODE NAME: | ALCHRC* |
|------------|---------|
|            |         |

| ORIGINATOR: KEY CONTACT:  | (010) 004 0053                        |
|---|---------------------------------------|
| Name: Phil Briggs   | Phone (213) 884-3851                  |
| Organization: Rockwell International                                      | -Rocketdyne Division                  |
| Address: 6833 Canoga Ave., Canoga   | Park, California 91304                |
| PRINCIPAL PURPOSE AND APPLICATION O selection, assess mode control, per   |                                       |
| extraction and beam quality, set/ve                                       | rify design requirements. Analysis of |
| general HSURIA with reflaxicon. Ki<br>AEROKNS developed under ALOS progra |                                       |
|   |                                       |
| AVAILABLE DOCUMENTATION: Various.   | <del></del>                           |
|   |                                       |

| CATEGORY          | OPTICS   | KINETICS  |   | GASDYNAMICS   |
|-------------------|--|---|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics              | • | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical  Physical  | CW Pulsed HF DF Other                                     | • | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical Redially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | • (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D   | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                               | • | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other               | • | Laminer Flow Turbulent Flow Boundary Laver Shocks Other               |

<sup>\*</sup>Axisymmetric Loaded Cavity HSURIA Resonator Code.

| CODE SUMMARY SHEET   | CODE NAME:                            | ALCRRC* |
|--|---------------------------------------|---------|
| ORIGINATOR/KEY CONTACT:  |                                       | (222)   |
| Name: Phil D. Briggs Organization: Rockewell Internal              |                                       |         |
| Address: 6633 Canoga Ave., Cano                                    |                                       |         |
| PRINCIPAL PURPOSE AND APPLICATIO selection, assess mode control.   | · · · · · · · · · · · · · · · · · · · |         |
| <pre>beam quality, set/verify design included - see AEROKNS.</pre> |                                       | •       |
|  |                                       |         |
| AVAILABLE DOCUMENTATION: <u>Variou</u>                             | ıs.                                   |         |
|  |                                       |         |

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics        | None Simple Flaw Model Detailed Mixing                          |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                               | Premixed Scheduled Mixing Other                                 |
| GEOMETRY          | Standing Wave Aing Compact Annular                                       | Annular Radially Flowing Transversely Flowing Other | Cylindrical Radially Flowing Rectangular Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension)     1 D     2 D                                   | • 10<br>20<br>30                                    | 1 D 2 D 3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                         | Cartesian Cylindrical Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other         | Laminar Flow Turbulent Flow Boundary Laver Shocks Other         |

<sup>\*</sup>Axisymmetric Loaded Cavity Ring Resonator Code.

| CODE SUMMARY SHEET   | CODE NAME:                    | ALFA           |
|--|-------------------------------|----------------|
| ORIGINATOR/KEY CONTACT:  Name: N. L. Rapagnani  Organization: Air Force Weapons Labor  |                               | (505) 844-9836 |
| Address: AFWL/ARAC, Kirtland AFB, New PRINCIPAL PURPOSE AND APPLICATION OF pumped mixing laser system including contains Fabry Perot optics model. | w Mexico 8711<br>CODE: Models | any chemically |
| AVAILABLE DOCUMENTATION: ALFA, AFWL-   | TR-78-19                      |                |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| rever             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                            |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                   |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing Rectangular, Linearly Flowing Other |
| GRID DIMENSION    | (Tránsverse Dimension) 1 D 2 D   | 1 D 2 D 3 D  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian Cylindrical Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other           |

| CODE SUMMARY SHEET   | CODE NAME:       | APACHE                 |
|--|------------------|------------------------|
| ORIGINATOR/KEY CONTACT:  Name: N. L. Rapagnani  Organization: Air Force Weapons La |                  | (505) 844 - 9836       |
| Address: AFWL/ARAC, Kirtland AFB, M. PRINCIPAL PURPOSE AND APPLICATION O           | New Mexico 8711  |                        |
| mixing laser system including elec<br>same as ALFA except that it is time          | tronic transitio | on type. APACHE is the |
| optics.  |                  |                        |
| AVAILABLE DOCUMENTATION: APACHE.   | LASL-LA-7427     |                        |
|  |                  |                        |

| CATEGORY          |   | OPTICS   |         | KINETICS   |         | GASDYNAMICS   |
|-------------------|---|--|---------|--|---------|---|
| LEVEL             | • | None<br>Simple Fabry Perot<br>Detailed Resonator                         | •       | None<br>Simple Saturated Gain<br>Detailed Kinetics         | •       | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | • | Geometrical<br>Physical  | ••••    | CW<br>Pulsed<br>HF DF<br>Other                             |         | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          |   | Standing Wave<br>Ring<br>Compact<br>Annular                              |         | Annular, Radially Flowing<br>Transversely Flowing<br>Other | •       | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | • | (Transverse Dimension)<br>1 D<br>2 D                                     | •       | 1 D<br>2 D<br>3 D  | •       | 1 D<br>2 D<br>3 D, Psuedo   |
| COORDINATE SYSTEM | • | Cartesian<br>Cylindrical<br>Other  | •       | Cartesian<br>Cylindrical<br>Other                          | •       | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  |   | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | • • • • | Single Line<br>Multiline<br>Line Broadening<br>Other       | • • • • | Laminar Flow Turbulent Flow Boundary Layer Shocks Other Recirculating |

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|------|---------|-------|

| CODE NAME: | ARM-D |
|------------|-------|

| DRIGINATOR/KEY CONTACT: Name: S. W. Zelazny | Phone: (716) 297-1000  |
|---|--|
| Organization: Bell Aerospace Tex            |  |
| Address: P.O. Box 1, Buffalo, N             |  |
|   | on of code: Resonator analysis codes.  ors. Uses strip propagator (r.z) in |
|   | gator in compact leg. (See appendix C.                                     |
|   |  |
| AVAILABLE DOCUMENTATION:                    |  |
| AVAILABLE DOCUMENTATION:                    |  |
|   |  |

| CATEGORY          | OPTICS   |                   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | 1 - 1             | ne<br>ople Saturated Gain<br>sailed Kinetics       | • | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical Physical   | Oth               | sed<br>DF  | • | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | 1 - 1             | nular Radially Flowing<br>nsversely Flowing<br>ler | • | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 0<br>2 0<br>3 0 |  | • | 1 D<br>2 D Quasi 2D<br>3 D  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | 1 1               | tesian<br>indrical<br>ier                          | • | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Oeformable Mirrors Far Field Performance Other | ● Mu              | gle Line<br>Itiline<br>8 Broadening<br>Ier         | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other   |

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|      |         |       |

| CODE NAME: | ARM-G |
|------------|-------|
|            |       |

| RIGINATOR/KEY CONTACT:          | (716) 007 1000                            |
|---------------------------------|---|
| Name: S. W. Zelazny             | Phone: (716) 297-1000                     |
| Organization: Bell Aerospace Te | extron                                    |
| Address: P.O. Box 1, Buffalo,   | New York 14240                            |
| INCIPAL PURPOSE AND APPLICAT    | ION OF CODE: Resonator analysis codes.    |
|                                 | SURIA (with waxicons and reflaxicons) and |
|                                 | ity as ACCOS-V except can be run          |
| interactively. (See appendix    | C, table 2).                              |
|                                 |   |
|                                 |   |
|                                 |   |
| /AILABLE DOCUMENTATION:         |   |
|                                 |   |
|                                 |   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |  |
|-------------------|--|--|---|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None<br>Simple Saturated Gain<br>Detailed Kinetics         | None<br>Simple Flow Model<br>Detailed Mixing                            |  |
| TYPE              | Geometrical     Physical   | CW Pulsed HF. DF Other                                     | Premixed<br>Scheduled Mixing<br>Other                                   |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |  |
| GRID DIMENSION    | (fransverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian<br>Cylindrical<br>Other                                       |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |  |

|  | CODE | SUMMARY | SHEET |
|--|------|---------|-------|
|--|------|---------|-------|

| CODE NAME: | BAREPL |
|------------|--------|

#N

| ORIGINATOR/KEY CONTACT:   |                                   |
|---|-----------------------------------|
| Name: Alexander M. Simonoff   | Phone: (213) 884-3346             |
| Organization: Rocketdyne Division, R                                    | ockwell International             |
| Address: 6633 Canoga Avenue, Canoga                                     | Park, California 91304            |
| PRINCIPAL PURPOSE AND APPLICATION O model a half-symmetric unstable res |                                   |
| (HSURIA). Performance predictions                                       | for beam quality and mode loss    |
| difference, set/verify design requi                                     | rements.                          |
|   |                                   |
|   | <del></del>                       |
| AVAILABLE DOCUMENTATION: 3-D Bare                                       | Cavity Resonator Code (theory and |
| user manual).   |                                   |
|   |                                   |
|   |                                   |

| CATEGORY          | OPTICS   | KINETICS   | KINETICS GASDYNAMICS  |  |
|-------------------|--|--|---|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                  |  |
| TYPE              | Geometrical Physical   | CW Pulsed HF, DF Other                                     | Premixed<br>Scheduled Mixing<br>Other                                   |  |
| GEOMETRY          | Standing Wave Ring Compact Annular   | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 O<br>3 O   |  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian Cylindrical Other   |  |
| FEATURES MODELED  | Misalignments     Aberrations     Deformable Mirrors     Far-Field Performance     Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |  |

| CODE SUMMARY SHEET  | CODE NAME:     | BCCLC*              |
|---|----------------|---------------------|
| ORIGINATOR/KEY CONTACT:  Name: Capt. Ted Salvi  Organization: Air Force Weapons Labor   |                | (505) 844 -0721     |
| Address: AFWL/ALR, Kirtland ARB, New PRINCIPAL PURPOSE AND APPLICATION OF               | Mexico 87115   |                     |
| unstable resonators with round, elli<br>Contains CO <sub>2</sub> GDL kinetics and shock | ptical, or rec | tangular apertures. |
|   |                |                     |
| AVAILABLE DOCUMENTATION: None   |                |                     |
|   |                |                     |

| CATEGORY          | <b>OPTICS</b> |  | KINETICS |  |   | GASDYNAMICS   |  |
|-------------------|---------------|--|----------|--|---|---|--|
| LEVEL             |               | None<br>Simple Fabry Perot<br>Detailed Resonator                         | •        | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                            |  |
| ТҮРЕ              | 1 . }         | Geometrical<br>Physical  | •        | CW<br>Pulsed<br>HF. DF<br>Other                            |   | Premixed<br>Scheduled Mixing<br>Other                                   |  |
| GEOMETRY          | •             | Standing Wave<br>Ring<br>Compact<br>Annular                              | •        | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |  |
| GRID DIMENSION    | _             | (Transverse Dimension)<br>1 D<br>2 D                                     | •        | 1 D<br>2 D<br>3 D  |   | 1 D<br>2 D<br>3 D   |  |
| COORDINATE SYSTEM |               | Cartesian<br>Cylindrical<br>Other  | •        | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                       |  |
| FEATURES MODELED  | •             | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | •        | Single Line<br>Multiline<br>Line Broadening<br>Other       | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other     |  |

<sup>\*</sup>Baumgardner Cartesian coordinate laser code

| CODE | SUMMAR | Y SHEET |
|------|--------|---------|
|------|--------|---------|

| CODE NAME: | <u>BLAZER</u> |
|------------|---------------|

| CODE SUMMARY SHEET                | CODE NAME:          | DEFIELK             |
|-----------------------------------|---------------------|---------------------|
|                                   | _                   |                     |
| ORIGINATOR/KEY CONTACT:           |                     |                     |
| Name: Donald L. Bullock           | Phone               | (213) 535-3484      |
| Organization: TRW DSSG            |                     |                     |
| Address: RI/1162, One Space Par   | k, Redondo Beach,   | California 90278    |
| PRINCIPAL PURPOSE AND APPLICATION | OF CODE: Models     | the optical perfor- |
| mance of linear bank CW HF and DF |                     |                     |
| model. Used as de in tools for    | BDL, NACL, MIRACL.  |                     |
|                                   |                     |                     |
|                                   |                     |                     |
|                                   |                     |                     |
| AVAILABLE DOCUMENTATION: The B    | BLAZER and MRO Code | es, TRW, June 1978  |
| (theory). BLAZER User Manual (in  |                     |                     |
|                                   |                     |                     |
|                                   |                     |                     |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Gain Detailed Kinetics         | None Simple Flow Model Detailed Mixing                            |
| TYPE              | Geometrical Physical   | CW Pulsed HF, DF Other                               | Premixed Scheduled Mixing Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular   | Annular, Radially Flowing Transversely Flowing Other | Cylindrical, Radially Flowing Rectangular, Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • 1 D 2 D 3 D  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                          | Cartesian Cylindrical Other                                       |
| FEATURES MODELED  | Misalignments     Aberrations     Deformable Mirrors     Far-Field Performance     Other | Single Line Multiline Line Broadening Other          | Laminar Flow Turbulent Flow Boundary Layer Shocks Other           |

| CODE SUMMARY SI | HEET |
|-----------------|------|
|-----------------|------|

·----

4.

| CODE NAME: | BLAZE I |
|------------|---------|

Г

| ORIGINATOR/KEY CONTACT:  |
|--|
| Name: S. W. Zelazny Phone: (716) 297-1000                              |
| Organization: Bell Aerospace Textron                                   |
| Address: P.O. Box 1, Buffalo, New York 14240                           |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: 1-0 fluid code with general |
| C, table 1).   |
|  |
| AVAILABLE DOCUMENTATION:   |
|  |
|  |
|  |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| LEVEL             | None<br>Simple Fabry Perot<br>Detailed Resonator                         | None<br>Simple Saturated Gain<br>Detailed Kinetics         |   | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF. DF Other                                     | • | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                |   | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other   |

CODE SUMMARY SHEET

CODE NAME:

BLAZE II

| ORIGINATOR/KEY CONTACT:           |   |
|-----------------------------------|---|
| · · · · · · - · · · · · · · · · · | Phone: (716) 297-1000   |
| Organization: Bell Aerosp         |   |
| Address: P.O. Box 1, But          | ffalo, New York 14240   |
| PRINCIPAL PURPOSE AND APP         | PLICATION OF CODE: Detailed mixing code with                  |
|                                   | bry-Perot optics. Combustor analysis and ppendix C. table 1). |
|                                   |   |
|                                   |   |
| AVAILABLE DOCUMENTATION:          |   |
|                                   |   |
|                                   |   |
|                                   |   |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | • | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical<br>Physical  | CW<br>Pulsed<br>HF. DF<br>Other                            | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | Annular, Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | • | Laminar Flow<br>Turbulent Flow<br>Boundary Laver<br>Shocks<br>Other     |

| CODE | SUMMAR | Y SHEET |
|------|--------|---------|
|------|--------|---------|

| CODE NAME: | BLAZE III |
|------------|-----------|

: {

| ORIGINATOR/KEY CONTACT:  |                               |
|--|-------------------------------|
| Name: S. W. Zelazny  | Phone: (716) 297-1000         |
| Organization: Bell Aerospace Textron   |                               |
| Address: P.O. Box 1, Buffalo, New York   | 14240                         |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE chemistry. Combustor nozzle, cavity, dif No optics. (See appendix C. table 1). | fuser, and ejectors analysis. |
| AVAILABLE DOCUMENTATION:   |                               |
|  |                               |
|  |                               |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| asker             | None     Simple Fabry Perot     Detailed Resonator                       | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical<br>Physical  | CW<br>Pulsed<br>HF. DF<br>Other                            | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other     |

| C | סכ | E | S | U | M | M | ΑI | RY | S | HE | ET |
|---|----|---|---|---|---|---|----|----|---|----|----|
|---|----|---|---|---|---|---|----|----|---|----|----|

|  | ME: |
|--|-----|
|  |     |
|  |     |

BLAZE IV

| ORIGINATOR/KEY CONTACT:  |                              |
|--|------------------------------|
| Name: S. W. Zelazny  | Phone: <u>(716) 297-1000</u> |
| Organization: Bell Aerospace Textron   |                              |
| Address: P.O. Box 1, Buffalo, New York   | 14240                        |
| PRINCIPAL PURPOSE AND APPLICATION OF COD chemistry. (See appendix C, table 1). | -                            |
|  |                              |
|  |                              |
|  |                              |
|  |                              |
| AVAILABLE DOCUMENTATION:   |                              |
| AVAILABLE DOCUMENTATION:   |                              |
|  |                              |
|  |                              |
|  |                              |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| LEVEL             | None<br>Simple Fabry Perot<br>Detailed Resonator                         | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF. DF Other                                     | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | • | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |

| <b>CODE SUMMAF</b> | RY SHEET |
|--------------------|----------|
|--------------------|----------|

| CODE NAME | BLAZE V |
|-----------|---------|
| l l       |         |

W.

ſ

| ORIGINATOR/KEY CONTACT:                 | 1                                 |
|---|-----------------------------------|
| Name: S. W. Zelazny                     | Phone: (716) 297-1000             |
| Organization: Bell Aerospace Textron    |                                   |
| Address: P.O. Box 1, Buffalo, New Yo    | ork: 14240                        |
| PRINCIPAL PURPOSE AND APPLICATION OF CO | ODE: 2-D mixing finite difference |
| code used for nozzle, fluid, and therm  |                                   |
| table 1).                               |                                   |
|   | <del></del>                       |
|   |                                   |
|   |                                   |
| AVAILABLE DOCUMENTATION:                |                                   |
|   |                                   |
|   |                                   |
|   |                                   |
|   |                                   |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| FENET             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | • | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical<br>Physical  | CW<br>Pulsed<br>HF, DF<br>Other                            | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian Cylindrical Other                                |   | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line<br>Multiline<br>Line Broadening<br>Other       | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other     |

| CODE SUMMARY S | HEET |
|----------------|------|
|----------------|------|

| ı          |          |
|------------|----------|
| CODE NAME: | BLAZE VI |

\*\*\*

|   |                         | _          |                     |
|---|-------------------------|------------|---------------------|
| ORIGINATOR/KEY CONT                                 |                         |            |                     |
| Name: S. W. Zela:                                   | zny                     | _ Phone:   | (716) 297-1000      |
| Organization: Bell                                  | Aerospace Textron       |            |                     |
|   | x 1, Buffalo, New York  | 14240      |                     |
| PRINCIPAL PURPOSE AN                                | D APPLICATION OF CODE   |            |                     |
| 3-D optics and mixi                                 | ng code using finite di | ifference, | FFT, and rotational |
|   | ls for optics and fluid |            |                     |
| table 1).   |                         |            |                     |
|   |                         |            |                     |
|   |                         | , <u>.</u> |                     |
| A. (A. () A. () () () () () () () () () () () () () | =                       |            |                     |
| AVAILABLE DOCUMENTA                                 | \TION:                  |            |                     |
|   |                         |            |                     |
| <del></del>   |                         |            | <del></del>         |
|   |                         |            |                     |

| CATEGORY          | OPTICS   | KINETICS  |   | GASDYNAMICS   |
|-------------------|--|---|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None<br>Simple Saturated Gain<br>Detailed Kinetics        |   | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical  Physical  | CW<br>Pulsed<br>HF, DF<br>Other                           | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D   | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                         |   | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other               | • | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |

| CODE SUMMARY SHE | ET COU |
|------------------|--------|
|                  |        |

| DE NAME: | BLIST |  |
|----------|-------|--|
|          |       |  |

| ORIGINATOR/KEY CONTACT:   |
|---|
| Name R. Hughes/D. Haflinger/H. W. Behrens Phone (213) 536-2757            |
| Organization: TRW DSSG  |
| Address: R1/1038, One Space Park, Redondo Beach, California 90278         |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: BLIST (Boundary Layer Inte-    |
| gral Solution Technique) calculates nonsimilar development of 2-D or      |
| axisymmetric compressible laminar boundary layers with wall heat transfer |
|   |
|   |
|   |
| AVAILABLE DOCUMENTATION: Internal Report: "A Description of the Lamina    |
| Integral Boundary Layer Model," TRW Report, August 1977.                  |
|   |
|   |

| CATEGORY OPTICS   |  | KINETICS   |   | GASDYNAMICS  |  |  |
|-------------------|--|--|---|--|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | • | None<br>Simple Flow Model<br>Detailed Mixing                           |  |  |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF, DF Other                                     | • | Premixed<br>Scheduled Mixing<br>Other                                  |  |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |  |  |
| GRIO DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 O  |  |  |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          | • | Cartesian<br>Cylindrical<br>Other                                      |  |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | • | Laminer Flow Turbulent Flow Boundary Layer Shocks Other                |  |  |

| CODE | SUMMAR | Y SHEET |
|------|--------|---------|
|------|--------|---------|

| CODE NAME: | CLOQ |
|------------|------|

ď.

| ORIGINATOR  | /KEY CONTACT:           |          |        |           |             |            |          |
|-------------|-------------------------|----------|--------|-----------|-------------|------------|----------|
| Name:       | Paul E. Filege          | r        |        | Pho       | ne: (305)   | 840-6643   |          |
| Organizati  | ion: <u>United Tech</u> | nologies |        |           |             |            |          |
| _           | P.O. Box 2691,          |          |        |           |             | a 33402    |          |
|             | URPOSE AND APP          |          |        |           |             |            |          |
|             | code was develo         |          |        |           |             | aser syste | ems      |
| using_ro    | tational nonequi        | librium  | kinet  | ics.      |             |            |          |
|             |                         |          |        |           |             |            |          |
|             | <del></del>             |          |        |           |             |            |          |
| AVAILABLE D | OCUMENTATION:           | R. J. H  | all, ' | 'Rotation | nal Nonequi | librium ar | nd Line- |
|             | Operation in CW         |          |        |           |             |            |          |
| (1976)      |                         |          |        |           |             |            |          |
|             |                         |          |        |           |             |            |          |

| CATEGORY          | OPTICS  |  | KINETICS |  |   | GASDYNAMICS   |  |  |
|-------------------|---------|--|----------|--|---|---|--|--|
| LEVEL             | •       | None<br>Simple Fabry Perot<br>Detailed Resonator                         | •        | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                            |  |  |
| TYPE              | •       | Geometrical<br>Physical  | •        | CW Pulsed ; HF. DF Other                                   | • | Premixed<br>Scheduled Mixing<br>Other                                   |  |  |
| GEOMETRY          | • • • • | Standing Wave<br>Ring<br>Compact<br>Annular                              | •        | Annular, Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |  |  |
| GRID DIMENSION    | •       | (Transverse Dimension)<br>1 D<br>2 D                                     | •        | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |  |  |
| COORDINATE SYSTEM |         | Cartesian<br>Cylindrical<br>Other  | •        | Cartesian<br>Cylindrical<br>Other                          | • | Cartesian<br>Cylindrical<br>Other                                       |  |  |
| FEATURES MODELED  | •       | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | •        | Single Line<br>Multiline<br>Line Broadening<br>Other       | • | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |  |  |

| CO | DE | SU | MN | AARY | SHEET |
|----|----|----|----|------|-------|
|    |    |    |    |      |       |

| CODE NAME: | CL003D |
|------------|--------|

| ORIGINATOR   | KEY CONTACT   | :                           |               |                                |               |
|--------------|---------------|-----------------------------|---------------|--------------------------------|---------------|
| Name:        | Paul E. Filed | ger                         | Phone         | (305) 84                       | 0-6643        |
|              |               | Technologies F              |               |                                |               |
| Address: _   | P.O. Box 269  | 1, MS-R-48, We              | st Palm Beac  | h, Florida                     | 33402         |
| PRINCIPAL PU | RPOSE AND AF  | PPLICATION OF chemical lase | CODE: CLC     | 0030 is an in<br>ve optics cou | put scheduled |
| tional_no    | nequilibrium  | kinetics or to              | equilibrium   | n kinetics (F                  | (F or DF).    |
| AVAILABLE DO | OCUMENTATIO   | N: <u>User's mar</u>        | nual to be pu | ublished in F                  | ebruary 1980. |
|              |               |                             |               |                                |               |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS  |
|-------------------|--|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics         | None Simple Flow Model Detailed Mixing                           |
| TYPE              | Geometrical Physical   | CW Pulsed HF, DF Other                               | Premixed Scheduled Mixing Other                                  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing Transversely Flowing Other | Cylindrical Radially Flowing Rectangular, Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D 2 D 3 D  | 1 D 2 D 3 D  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                          | Cartesian Cylindrical Other                                      |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other          | Laminar Flow Turbulent Flow Boundary Layer Shocks Other          |

| CODE | SUMM | ARY | SHEET |
|------|------|-----|-------|
|------|------|-----|-------|

| CODE NAME: | CLSLGM* |
|------------|---------|

| ORIGINATOR / KEY CONTACT:   |
|---|
| Name: Peter R. Carlson/Robert E. Hodder Phone (305) 283-3380  |
| Organization: Science Applications Inc.   |
| Address: 201 SW Monterey Rd., Suite 30, Stuart, Florida 33494   |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Assess optical performance o MIRACL device before, during, and after acceptance testing Essentially same theory/formalism developed by Sziklas |
| and Siegman for the Pratt & Whitney SOQ codes.  |
| AVAILABLE DOCUMENTATION "Chemical-Laser Scaling - Law Gain Model Analysis." P. Carlson and R. Hodder, SAI Technical Memorandum to D. Finkleman and J. Stregack (September 25, 1979).      |

| CATEGORY          | OPTICS   |       | KINETICS  |   | GASDYNAMICS  |
|-------------------|--|-------|---|---|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                             | i     | None<br>Simple Saturated Gain<br>Detailed Kinetics        | • | None<br>Simple Flow Model<br>Detailed Mixing                       |
| TYPE              | Geometrical  Physical  | •     | CW<br>Pulsed<br>HF DF<br>Other                            |   | Premixed<br>Scheduled Mixing<br>Other                              |
| GEOMETRY          | Standing Wave Ring Compact Annular                                     | •     | Annular Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radia Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | 1 D 2 D  | sioni | 1 D<br>2 O<br>3 O   |   | 1 0<br>2 0<br>3 0  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | •     | Cartesian<br>Cylindrical<br>Other                         |   | Cartesian<br>Cylindrical<br>Other                                  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performat Other | 1     | Single Line<br>Multiline<br>Line Broadening<br>Other      |   | Laminer Flow Turbulent Flow Boundary Layer Shocks Other            |

<sup>\*</sup>Chemical-Laser Scaling - Law Gain Model

| CODE SUMMARY SHEET   | CODE NAME:     | CNCDE          |
|--|----------------|----------------|
| ORIGINATOR/KEY CONTACT:  Name: S. W. Zelazny                           |                | (716) 297-1000 |
| Organization: Bell Aerospace Textron Address: P.O. Box 1, Buffalo, New | York 14240     |                |
| 1-D flow analysis code analysis of and ejectors. (See appendix C, tab  | combustor, noz |                |
|  |                |                |
| AVAILABLE DOCUMENTATION:   |                | ·              |
|  | <del></del>    |                |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| rever             | None<br>Simple Fabry Perot<br>Detailed Resonator                         | None Simple Saturated Gain Detailed Kinetics               |   | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF DF Other                                      | • | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian Cylindrical Other                                |   | Cartesian<br>Cylindrical<br>Other                                     |
| FFATURES MODELED  | Misalignments Aberrations Oeformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                |   | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |

| CODE | SUMM | ARY | SHEET |
|------|------|-----|-------|
|------|------|-----|-------|

| CODE NAME: | COMOC-SA |   |
|------------|----------|---|
|            |          | _ |

| ORIGINATOR/KEY CONTACT:                 |                                    |
|---|------------------------------------|
| Name: S. W. Zelazny                     | Phone: (716) 297-1000              |
| Organization: Bell Aerospace Textron    |                                    |
| Address: P.O. Box 1, Buffalo, New Yo    | rk 14240                           |
| PRINCIPAL PURPOSE AND APPLICATION OF CO | DDE:                               |
| 2-D finite element code for the struct  | ural analysis of combustor, nozzle |
| and optics. (See appendix C, table 1.   | )                                  |
|   |                                    |
|   |                                    |
|   |                                    |
|   |                                    |
| AVAILABLE DOCUMENTATION:                |                                    |
|   |                                    |
|   |                                    |
|   |                                    |
|   |                                    |

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None<br>Simple Fabry Perot<br>Detailed Resonator                         | None<br>Simple Saturated Gain<br>Detailed Kinetics        | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | CW<br>Pulsed<br>HF DF<br>Other                            | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D   | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                         | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other               | Laminar Flow Turbulent Flov. Boundary Layer Shocks Other              |

| CODE | SUMMAF | Y SHEET |
|------|--------|---------|
|      |        |         |

CODE NAME:

COMOC-TA

| ORIGINATOR/KEY CONTACT:   |
|---|
| Name: S. W. Zelazny Phone: (716) 297-1000                             |
| Organization: Bell Aerospace Textron                                  |
| Address: P.O. Box 1, Buffalo, New York 14240                          |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE:                            |
| 2-D thermal analysis (finite element) code used to analyze combustor, |
| nozzle, and optics. (See appendix C, table 1.)                        |
|   |
|   |
|   |
| AVAILABLE DOCUMENTATION:  |
|   |
|   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None<br>Simple Fabry Perot<br>Detailed Resonator                         | None Simple Saturated Gain Detailed Kinetics               | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical<br>Physical  | CW<br>Pulsed<br>HF. DF<br>Other                            | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 0<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |

| CODE SUMMARY S | ŝН | EET |  |
|----------------|----|-----|--|
|----------------|----|-----|--|

CODE NAME: COMOC-2DNS

| ORIGINATOR/K       | EY CONTACT: |         |            |                   |                                      |  |
|--------------------|-------------|---------|------------|-------------------|--------------------------------------|--|
|                    |             | у       |            | _ Phone _         | (716) 297-1000                       |  |
|                    | Bell Aer    |         |            |                   |                                      |  |
| Address:           | P.O. Box 1, | Buffalo | , New York | 14240             |                                      |  |
| <u>with simple</u> | chemistry u | sed for | cavity and | <u>l diffuser</u> | nite element mixing/ejector analysis |  |
| AVAILABLE DOC      | CUMENTATION | :       |            |                   |                                      |  |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics ••• •         | • | None<br>Simple Flow Model<br>" Dètailed Mixing                        |
| ТҮРЕ              | Geometrical<br>Physical  | CW Pulsed HF. DF Other                                     | • | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multilline Line Broadening Other               | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other   |

| CODE | SUM | MARY | SHEET |
|------|-----|------|-------|
|------|-----|------|-------|

| CODE NAME: | COMOC-3DPNS |
|------------|-------------|
|            |             |

| ORIGINATOR/KEY CONTACT:              |                                       |
|--------------------------------------|---------------------------------------|
| Name: S. W. Zelazny                  | Phone (716) 297-1000                  |
| Organization: Bell Aerospace Textr   |                                       |
| Address: P.O. Box 1, Buffalo, New    | York 14240                            |
| PRINCIPAL PURPOSE AND APPLICATION OF | CODE:                                 |
| 3-D mixing code, finite element wit  | h simple chemistry used for combustor |
| and cavity analysis (See appendix C  | , table 1.)                           |
|                                      |                                       |
|                                      |                                       |
|                                      |                                       |
| AVAILABLE DOCUMENTATION:             |                                       |
|                                      |                                       |
|                                      |                                       |
|                                      |                                       |
|                                      |                                       |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | • | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF. DF Other                                     | • | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other   |

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|------|---------|-------|

| CODE NAME: | CROQ |
|------------|------|

| · · · · · · · · · · · · · · · · · · ·  |                       |
|--|-----------------------|
| ORIGINATOR/KEY CONTACT:  |                       |
| Name: Donald L. Bullock Phone: (21   | 3) 535-3484           |
| Organization: TRW DSSG   |                       |
| Address: R1/1162 One Space Park, Redondo Beach, Cali   | fornia 90278          |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE:   |                       |
| Models HSURIA and ring resonator with mode rotation. resonator design code for maximizing focusability and |                       |
| beam as a function of gain generator and resonator pa  |                       |
| AVAILABLE DOCUMENTATION: Planned. Annual Laser Model   | Studies (final report |
| for axicon theory, aligned and misaligned).  |                       |
|  |                       |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS  |
|-------------------|--|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Gain Detailed Kinetics                 | None Simple Flow Model Detailed Mixing                           |
| TYPE              | Geometrical  Physical  | CW Pulsed HF. DF Other                                       | Premixed Scheduled Mixing Other                                  |
| GEOMETRY          | Standing Wave Ring Compact Annular   | Annular, Radially Flowing     Transversely Flowing     Other | Cylindrical Radially Flowing Rectangular, Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • 1 D 2 D 3 D  | 1 D 2 D 3 D  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                  | Cartesian Cylindrical Other                                      |
| FEATURES MODELED  | Misalignments     Aberrations     Deformable Mirrors     Far Field Performance     Other | Single Line Multiline Line Broadening Other                  | Laminar Flow Turbulent Flow Boundary Layer Shocks Other          |

| CODE | SU | MM | ARY | SH | EET |
|------|----|----|-----|----|-----|
|------|----|----|-----|----|-----|

| CODE NAME: | DENTAL |  |
|------------|--------|--|
|            |        |  |

| ORIGINATOR             | /KEY CONTACT:     |             |          |             |              |          |            |
|------------------------|-------------------|-------------|----------|-------------|--------------|----------|------------|
| Name:                  | Captain Ted Salv  | vi          |          | Phone:_     | (505) 844    | -0721    |            |
|                        | on: Air Force V   |             |          |             |              |          |            |
| Address: _             | AFWL/ALR, Kirt    | land AFB    | New Mex  | ico 871     | 15           |          |            |
| PRINCIPAL PL           | JRPOSE AND APPL   | LICATION    | OF CODE  | :           |              |          |            |
| Laser_kin              | etics calculation | ons with    | strip ur | istable r   | esonator.    | Can sele | <u>ect</u> |
| CO <sub>2</sub> , HF/D | F, or KrF kinet   | ics.        |          |             |              |          |            |
|                        |                   |             |          |             |              |          |            |
| AVAILABLE D            | OCUMENTATION:     | None        |          |             |              |          | _l_        |
|                        |                   | <del></del> |          |             | <del> </del> |          |            |
|                        |                   |             |          | <del></del> |              |          |            |
|                        |                   |             |          |             |              |          |            |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None /<br>Simple Flow Model<br>Detailed Mixing                    |
| TYPE              | Geometrical Physical   | CW Pulsed HF, DF Other                                     | Premixed Scheduled Mixing Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing Rectangular, Linearly Flowing Other |
| GRID DIMENSION    | • (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D 2 D 3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian Cylindrical Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other           |

| CODE SUMMARY SHEET   | CODE NAME: DESALE-5                      |
|--|--|
| ORIGINATOR/KEY CONTACT:  | Phone: (213) 648-6861                    |
|  | ratory, The Aerospace Corporation        |
| Address: P.O. Box 92957, Los Ar                                    |  |
| PRINCIPAL PURPOSE AND APPLICATION Calculation of CW and pulsed che |  |
| Carculation of the and parsed the                                  | surred raser per formance.               |
|  |  |
|  |  |
| AVAILABLE DOCUMENTATION: DESALE-                                   | -5: A Comprehensive Scheduled Mixing     |
|  | Epstein, Aerospace Corporation Report    |
|  | ser Manual, SAMSO TR-75-60, W. D. Adams, |

et al. February 20, 1975.

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS  |
|-------------------|--|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                           |
| TYPE              | Geometrical     Physical   | OW Pulsed HF. DF Other                                     | Premixed Scheduled Mixing Other                                  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing Rectangular Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian Cylindrical Other                                      |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Laver Shocks Other          |

| CODE SUMMARY SHEET   | CODE NAME: | DIFF-2         |
|--|------------|----------------|
| ORIGINATOR/KEY CONTACT: Name: S. W. Zelazny                            | Di.        | (716) 297-1000 |
| Organization: <u>Bell Aerospace Textron</u>                            | 1          |                |
| Address: P.O. Box 1, Buffalo, New PRINCIPAL PURPOSE AND APPLICATION OF | CODE:      |                |
| 2-D unstable resonator optics coup Used to analyze optics. (See appe   |            |                |
|  |            |                |
| AVAILABLE DOCUMENTATION:   |            |                |
|  |            |                |

| CATEGORY          | OPTICS   | KINETICS   |    | GASDYNAMICS   |
|-------------------|--|--|----|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               |    | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical Physical   | CW Pulsed HF. DF Other                                     | •  | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other |    | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | •  | 1 D<br>2 D<br>3 O   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          |    | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | •• | Laminar Flow<br>Turbulent Flow<br>Boundary Laver<br>Shocks<br>Other   |

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|      |         |       |

| CODE NAME: | _DIFF-3 |
|------------|---------|

ġ.,

| ORIGINATOR/KEY CONTACT:                                      |
|--|
| Name: S. W. Zelazny Phone: (716) 297-1000                    |
| Organization: Rell Aerospace Textron                         |
| Address: P.O. Box 1, Buffalo, New York 14240                 |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE:                   |
| Same as DIFF-2 except 3-D mixing. (See appendix C. table 1). |
|  |
|  |
|  |
| AVAILABLE DOCUMENTATION:                                     |
|  |
|  |
|  |

| CATEGORY          | OPTICS   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|--|---|---|
| LEVEL             | None Simple Fabry Perot Oetailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | • | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical Physical   | CW<br>Pulsed<br>HF, DF<br>Other                            | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other     |

| CODE | SUMN | MARY | SHEET |
|------|------|------|-------|
|------|------|------|-------|

ľ

| i          |        |
|------------|--------|
| CODE NAME: | ELNWD2 |

| ORIGINATOR/KEY CONTACT:   |                                 |
|---|---------------------------------|
| Name: John Ellinwood  | Phone: (213) 648-7391           |
| Organization: The Aerospace Corporation   |                                 |
| Address: P.O. Box 92957, Los Angeles,   | California 90009                |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE  Computer transverse eigenmodes of bare  model to be added. | annular resonators. Simple gain |
|   |                                 |
| AVAILABLE DOCUMENTATION: None   |                                 |
|   |                                 |

| CATEGORY          |   | OPTICS   | KINETICS |  |   | GASDYNAMICS  |  |
|-------------------|---|--|----------|--|---|--|--|
| LEVEL             | • | None<br>Simple Fabry Perot<br>Detailed Resonator                         | •        | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                           |  |
| TYPE              | • | Geometrical<br>Physical  |          | CW<br>Pulsed<br>HF DF<br>Other                             |   | Premixed<br>Scheduled Mixing<br>Other                                  |  |
| GEOMETRY          | • | Standing Wave<br>Ring<br>Compact<br>Annular                              |          | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radially Flowing<br>Rectangular: Linearly Flowing<br>Other |  |
| GRID DIMENSION    | • | (Transverse Dimension) 1 D 2 D   |          | 1 0<br>2 0<br>3 D  |   | 1 D<br>2 D<br>3 D  |  |
| COORDINATE SYSTEM | • | Cartesian<br>Cylindrical<br>Other  |          | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                      |  |
| FEATURES MODELED  |   | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other |          | Single Line<br>Multiline<br>Line Broadening<br>Other       |   | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                |  |

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|------|---------|-------|

| CODE NAME: | GASSER |
|------------|--------|

| ORIGINATOR/KEY CONTACT:   |
|---|
| Name: D. Haflinger/P. Lohn Phone: (213) 536-1624                        |
| Organization: TRW DSSG  |
| Address: R1/1038, One Space Park, Redondo Beach, California 90278       |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE:                              |
| Inviscid flow code using the method of characteristics and accounts for |
| heat release. It is used for cavity flows with heat release defining    |
| shroud contours flow conditions at end of cavity, etc.                  |
|   |
|   |
| AVAILABLE DOCUMENTATION. None   |
| AVAILABLE DOCUMENTATION: None   |
|   |
|   |
|   |

| CATEGORY          | OPTICS   |   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|---|--|---|---|
| rever             | None Simple Fabry Perot Detailed Resonator                               | • | None<br>Simple Saturated Gain<br>Detailed Kinetics         |   | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical<br>Physical  |   | CW<br>Pulsed<br>HF. DF<br>Other                            | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       |   | Annular, Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRIO DIMENSION    | (Transverse Dimension) 1 D 2 D   |   | 10<br>20<br>3D   | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  |   | Cartesian<br>Cylindrical<br>Other                          | • | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other |   | Single Line<br>Multiline<br>Line Broadening<br>Other       | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other     |

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|------|---------|-------|

|            |      | <br> |   |
|------------|------|------|---|
| CODE NAME: | GCAL |      | _ |

| ORIGINATOR/KEY CONTACT:                        |                                  |
|--|----------------------------------|
| Name: Kerry E. Patterson                       | Phone (404) 955-2663             |
| Organization: Science Applications, Inc.       |                                  |
| Address: 6600 Powers Ferry Road, Atlanta,      | Georgia 30339                    |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE:     |                                  |
| single-line gain algorithm which is anchored   | to available data base for       |
| nozzle being studied. Used with SAIGD.         |                                  |
|  |                                  |
| AVAILABLE DOCUMENTATION: HF Laser Subsystem    |                                  |
| Interim Report), Science Applications, Atlanta | a, Georgia, July 1979, Section 3 |

| CATEGORY          | OPTICS   |   | KINETICS  |   | GASDYNAMICS   |
|-------------------|--|---|---|---|---|
| rener             | None Simple Fabry Perot Detailed Resonator                               | • | None<br>Simple Saturated Gain<br>Detailed Kinetics        | • | None<br>Simple Flow Model<br>Detailed Miking                          |
| TYPE              | Geometrical<br>Physical  | • | CW<br>Pulsed<br>HF DF<br>Other                            |   | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | • | Annular Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radiaily Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • | 1 D<br>2 D<br>3 O   |   | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | • | Cartesian<br>Cylindrical<br>Other                         |   | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | • | Single Line<br>Multiline<br>Line Broadening<br>Other      |   | Laminar Flow Turbulent Flow Boundary Lawer Shocks Other               |

| CODE | SUMM | MARY | SHEET |
|------|------|------|-------|
|------|------|------|-------|

CODE NAME

GENRING

| ORIGINATOR KEY CONTACT.  |   |
|--|---|
|  | Phone (505) 848-5000  |
| Organization: The BDM Corporation  |   |
| Address: 1801 Randolph Road, S.E., Al  | buquerque, New Mexico 87106   |
| pairs of linear and nonlinear axicons  | sonator candidate trade-off studies. control. and to study concept of |
| AVAILABLE DOCUMENTATION: GENRING: cal Unstable Ring Resonators With Int. 79-152-TR. The BDM Corporation, May 1 | ernal Reflecting Axicons, BDM/TAC-                                    |

| CATEGORY          | OPTICS   | KINETICS   | GAŞDYNAMICS   |  |
|-------------------|--|--|---|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                |  |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                       |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radial / Flowing<br>Transversely Floving<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian<br>Cylindrical<br>Other                                     |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |  |

| CO | DE | SU | MM | ARY | SHE | ET |
|----|----|----|----|-----|-----|----|
|----|----|----|----|-----|-----|----|

| CODE NAME. | GIM |
|------------|-----|

| ORIGINATOR KEY CONTACT:  |
|--|
| Name:D. W. Lankford Phone (505) 844 -9836                                |
| Organization Air Force Weapons Laboratory                                |
| Address: AFWL/ARAC, Kirtland AFB, New Mexico 87117                       |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Laser cavity and nozzle       |
| analysis. Will eventually combine multidimensional viscous diffusing,    |
| time-dependent flows with the chemical kinetics capabilities of ALFA and |
| APACHE codes.  |
|  |
| AVAILABLE DOCUMENTATION: To become available.                            |
|  |
|  |

| CATEGORY          | OPTICS   |  | GASDYNAMICS   |  |
|-------------------|--|--|---|--|
| LEVEL             | None<br>Simple Fabry Perot<br>Detailed Resonator                         | None     Simple Saturated Gain     Detailed Kinetics       | None Simple Flow Model Detailed Mixing                                |  |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                       |  |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing Rectangular Linearly Flowing Other       |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 0<br>2 D<br>3 O  | 1 D<br>2 D<br>3 D   |  |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian Cylindrical Other   |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other Recirculating |  |

| CODE SUMMARY SHEET  | CODE NAME:           | _GLADV               |  |  |
|---|----------------------|----------------------|--|--|
| ORIGINATOR/KEY CONTACT:  Name: R. Hughes/D. Haflinger/H. W. | <u>Behren</u> sphone | (213) 536-2757       |  |  |
| Organization: <u>TRW_DSSG</u>                               |                      |                      |  |  |
| Address: R1/1038, One Space Park,                           | Redondo Beach        | , California 90278   |  |  |
| PRINCIPAL PURPOSE AND APPLICATION OF                        | CODE:                |                      |  |  |
| General laser analysis to calculate and in cavity.          | e average flow       | properties in nozzle |  |  |
|   |                      |                      |  |  |
|   |                      |                      |  |  |
| AVAILABLE DOCUMENTATION: None                               |                      |                      |  |  |
|   |                      |                      |  |  |

| CATEGORY          | OPTICS KINETICS  |   |   | GASDYNAMICS   |  |
|-------------------|--|---|---|---|--|
| LEVEL             | None     Simple Fabry Perot     Detailed Resonator                       | None Simple Saturated Gain Detailed Kinetics              |   | None<br>Simple Flow Model<br>Detailed Mixing                          |  |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF DF Other                                     | • | Premixed<br>Scheduled Mixing<br>Other                                 |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 0 1 D 2 D 3 D   | • | 1 D<br>2 D<br>3 D   |  |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian Cylindrical Other                               | • | Cartesian<br>Cylindrical<br>Other                                     |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other               | • | Laminar Flow<br>Turbulent Flow<br>Boundary Laver<br>Shocks<br>Other   |  |

| CO | DE | SU | MM | ARY | SH | EET |
|----|----|----|----|-----|----|-----|
|    |    |    |    |     |    |     |

| I          |      |
|------------|------|
| CODE NAME: | GOAD |

| ORIGINATO | OR/KEY CONTACT:           |                       |
|-----------|---------------------------|-----------------------|
| Name: _   | S. W. Zelazny             | Phone: (716) 297-1000 |
| Organiz   | ation: Bell Aerospace Tex | tron                  |
| Address   | P.O. Box 1, Buffalo,      | New York 14240        |
| PRINCIPAL | PURPOSE AND APPLICATIO    | N OF CODE:            |
| Resona    | itor analysis code. (See  | appendix C. table 2). |
|           |                           |                       |
|           |                           |                       |
|           |                           |                       |
|           |                           |                       |
| AVAILABLE | DOCUMENTATION:            |                       |
|           |                           |                       |
|           |                           |                       |
|           |                           |                       |

| CATEGORY          | OPTICS  | KINETICS   | GASDYNAMICS  |
|-------------------|---|--|--|
| LEVEL             | None<br>Simple Fabry Perot<br>Octailed Resonator                          | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                 |
| TYPE              | Geometrical     Physical  | CW Pulsed HF. DF Other                                     | Premixed Scheduled Mixing Other  |
| GEOMETRY          | Standing Wave Ring Compact Annular  | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D  | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other   | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                      |
| FEATURES MODELED  | Misalignments  Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Laver Shocks Other                |

| CODE | SUMMAR | Y SHEET |
|------|--------|---------|
|------|--------|---------|

| CODE NAME: | GOPWR |
|------------|-------|
|            |       |

| ORIGINATOR/KEY CONTACT:   |
|---|
| Name: Tien Tsai Yang/J. K. Hunting Phone (213) 884-3346                     |
| Organization: Rockwell International/Rocketdyne Division                    |
| Address: 6633 Canoga Avenue, Canoga Park, California 91304                  |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Predict optical performance of   |
| CW chemical lasers, identify physical parameters affecting power extraction |
| efficiency and gain saturation. (Also see HFGOPWR).                         |
|   |
|   |
| AVAILABLE DOCUMENTATION:GOPWR: A Computational Program to Calculate         |
| the Performance of CW Chemical Lasers. AFWL-TR-79-142.                      |
|   |
|   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics         | None Simple Flow Model Detailed Mixing                          |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                                | Premixed Scheduled Mixing Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular: Radially Flowing Transversely Flowing Other | Cylindrical Radially Flowing Rectangular Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • 1 D 2 D 3 D  | 1 D 2 D 3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian Cylindrical Other                          | Cartesian Cylindrical Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other          | Laminar Flow Turbulent Flow Boundary Laver Shocks Other         |

| CODE | SUMI | MARY | SHEET |
|------|------|------|-------|
|------|------|------|-------|

| CODE NAME: | GURDM |
|------------|-------|

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Gain Detailed Kinetics              | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical Physical   | CW Puised HF DF Other                                     | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave Ring Compact Annular   | Annular Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D   | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                               | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments     Aberrations     Deformable Mirrors     Far Field Performance     Other | Single Line Multiline Line Broadening Other               | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |

| CODE | SUMMA | RY SHEET |
|------|-------|----------|
|      |       |          |

| CODE NAME: | HFGOPWR |
|------------|---------|
|            |         |

| ORIGINATOR/KEY CONTACT:  |
|--|
| Name: J. K. Hunting/T. T. Yang Phone (213) 884-2370                      |
| Organization: Rockwell International - Rocketdyne Division               |
| Address: 6633 Canoga Avenue, Canoga Park, California 91304               |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Calculational tool to study   |
| the performance of CW chemical lasers and the interaction with the gain  |
| medium. Uses geometric optics and quasi-1-D aerokinetics to model HSURIA |
| resonator. Also see GOPWR.   |
|  |
| AVAILABLE DOCUMENTATION: Rocketdyne Internal Letter G-SL-77-509, Octobe  |
| 5, 1977 (theory); Rocketdyne Internal Letter G-0-78-937, January 24,     |
| 1978 (user manual).  |
|  |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS  |
|-------------------|--|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                           |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing Rectangular Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • 1 D<br>2 D<br>3 D  | 1 D 2 D 3 D  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian Cylindrical Other                                      |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other          |

| CODE SUMMARY SHEET   | CODE NAME:                                  | HF0X               |
|--|---|--------------------|
| ORIGINATOR/KEY CONTACT: Name: James B. Moreno Organization: 4212, Laser Address: Kirtland AFB, N | Projects Division, Sand<br>New Mexico 87117 | ia Laboratories    |
| performance for Sandia Labo  |   |                    |
| AVAILABLE DOCUMENTATION:   | AIAA paper 75-36. pres                      | ented at AIAA 13th |

Aerospace Sciences Meeting, Pasadena, California, January 20, 1975.

J. B. Moreno, author.

| CATEGORY          | OPTICS   |   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|---|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | • | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | • | CW<br>Pulsed<br>HF, DF<br>Other                            |   | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              |   | Annular, Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   |   | 1 D<br>2 D<br>3 D  |   | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  |   | Cartesian<br>Cylindrical<br>Other                          |   | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | • | Single Line<br>Multiline<br>Line Broadening<br>Other       |   | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |

| CODE | CLINA | 114 | DV | eы | CET |
|------|-------|-----|----|----|-----|
| CODE | SUN   | IMA | HΥ | SH | ヒヒ! |

| CODE NAME: | <u>IPAGOS</u> |  |
|------------|---------------|--|

| CODE SUMMARY SHEET                           | CODE NAME:                              |
|--|---|
| ORIGINATOR/KEY CONTACT: * Name:D. N. Mansell | Phone: (505) 848-5000                   |
| Organization: The BDM Corporation            |   |
| <del>-</del>                                 | , Albuquerque, New Mexico 87106         |
|  | OF CODE: Geometric ray trace analysis   |
| of general optical systems; can mo           |   |
| reflaxicon, waxicon, and noneverti           |   |
|  |   |
|  |   |
|  |   |
| AVAILABLE DOCUMENTATION:POLYPA               | GOS, Aerospace Report TR-0059 (6311)-1. |
| Beam Compactor Design and Fabricat           | ion Program AFWL-TR-78-77. Geometric    |
| Ray Analyses of HSURIA Prototypes,           | BDM/TAC-79-151-TR; POLYPAGOS Users'     |
| Manual, Aerospace TR-0172 (2311)-1           |   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                  |
| TYPE              | Geometrical<br>Physical  | CW<br>Pulsed<br>HF, DF<br>Other                            | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 O   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Oeformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |

\*Also: Kemp, TRW, One Space Park, Redondo Beach, California.

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|------|---------|-------|

| CODE NAME: | KBLIMP |
|------------|--------|
|            |        |

| ORIGINATOR/KEY CONTACT:   |
|---|
| Name: H. Tong/A. C. Buckingham/H. L. Morsephone (415) 964-3200  |
| Organization: Aerotherm Division of ACUREX  |
| Address: Mountain View. California  |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Boundary layer analysis.  Nonequilibrium chemistry (KINETIC) Boundary Layer Integral Matrix Pro- |
| gram (KBLIMP).  |
|   |
| AVAILABLE DOCUMENTATION: Nonequilibrium Chemistry Boundary Layer Inte-  |
| gral Matrix Procedure, Aerotherm Report, UM7367, July 1973.   |
|   |
|   |
|   |

| CATEGORY          | OPTICS   |   | KINETICS   |   | GASDYNAMICS   |
|-------------------|--|---|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | • | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | • | CW<br>Pulsed<br>HF DF<br>Other                             | • | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | • | Annular, Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRIO DIMENSION    | {Transverse Dimension} 1 D 2 D   | • | 1 D<br>2 D<br>3 D  | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | • | Cartesian<br>Cylindrical<br>Other                          | • | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other |   | Single Line<br>Multiline<br>Line Broadening<br>Other       | • | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |

| CODE SU | IMMAR | Y SHEET |
|---------|-------|---------|
|---------|-------|---------|

| CODE NAME: | LAPU-2 |
|------------|--------|

| ORIGINATO | DR/KEY CONTACT:   |
|-----------|---|
| Name:     | John C. Goldstein, D. O. Dickman Phone: (505) 667-7281          |
| Organiza  | ation: Los Alamos Scientific Laboratory                         |
| Address:  | Group X-1, MX-531, LASL, Los Alamos, New Mexico 87545           |
| PRINCIPAL | PURPOSE AND APPLICATION OF CODE:                                |
|           | ation of the propagation of a short pulse down a chain of laser |
| -         | iers and absorbers including diffraction effects: cylindrical   |
|           | ry assumed.   |
|           |   |
|           |   |
| AVAILABLE | DOCUMENTATION: LAPU2: A Laser Pulse Propagation Code with       |
|           | action, LASL Report LA-6955.                                    |
|           |   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                  |
| TYPE              | Geometrical Physical   | CW Pulsed HF, DF Other                                     | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 O  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Laver Shocks Other                 |

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|      |         |       |

| CODE NAME: | LOADPL |
|------------|--------|

| ORIGINATOR/KEY C                     | ONTACT:  |   |                                 |
|--------------------------------------|--|---|---------------------------------|
| Name: Alexan                         | der M. Simonoff  | Phone:(213                                | ) 884-3346                      |
| Organization: Ro                     | cketdyne Division. Ro  | ckwell Internationa                       | 1                               |
| Address: 66                          | <u>33 Canoga Avenue, Car</u>   | oga Park, Californi                       | a 91304                         |
| model some of th<br>Resonator with I | e AND APPLICATION OF<br>e 3-D phenomenology a<br>nternal Axicon (HSUR)<br>nce predictions for p<br>n requirements. | ssociated with Half<br>A) with a radially | Symmetric Unstable flowing gain |
| AVAILABLE DOCUM                      | ENTATION: Simplified   | 1 3-D loaded cavity                       | resonator code,                 |
| G-0-78-1123, Nov                     | ember 1978. Also see   | bare cavity code B                        | AREPL.                          |
|                                      | <del></del>  |   |                                 |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical  Physical  | CW<br>Pulsed<br>HF DF<br>Other                             | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave Ring Compact Annular   | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments     Aberrations     Deformable Mirrors     Far Field Performance     Other | Single Line<br>Multiline<br>Line Broadening<br>Other       | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |

| CODE SUMMARY SHEE | Ţ |
|-------------------|---|
|-------------------|---|

CODE NAME:

LS-14RGS\*

| ORIGINAT | OR/KEY | CONTACT: |  |
|----------|--------|----------|--|
|----------|--------|----------|--|

| Name: Victor L. Gamiz                  | Phone (213) 884-3346               |
|--|------------------------------------|
| Organization: Rocketdyne, Laser Optic  | es                                 |
| Address: 6633 Canoga Avenue, Cano      | oga Park, California 91304         |
| PRINCIPAL PURPOSE AND APPLICATION OF C | ODE: Performs an exact ray trace   |
| analysis in order to determine the geo |                                    |
| resonator with a ray redistributing re | eflaxicon beam compactor assembly. |
| Provides geometry data to wave optics  | HSURIA codes.                      |
|  |                                    |

AVAILABLE DOCUMENTATION: Resonator Geometry Synthesis Code Requirement
(V. L. Gamiz); Incorporate General Resonator into Ray Trace Code (W. H.
Southwell); Surface Optimization Algorithms and Equations (W. H. Southwell);
Equations for Wave Optics Code Parameters (V. L. Gamiz); User Manual;
Resonator Geometry Synthesis Code Development (L. R. Stidham).

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian Cylindrical Other   |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |

\*LS-14 Resonator Geometry Synthesizer

| CODE | SUMMAR | Y SHEET |
|------|--------|---------|
|------|--------|---------|

| CODE NAME: | MCLANC |  |
|------------|--------|--|
|            |        |  |

| ODICINIATOD WEN CONTACT  |
|--|
| ORIGINATOR/KEY CONTACT:  |
| Name: R. Hughes/H. W. Behrens Phone (213) 536-1624                         |
| Organization: TRW DSSG   |
| Address: R1/1038, One Space Park, Redondo Beach, California 90278          |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE:                                 |
| Direct simulation Monte Carlo laser analysis code. Models real gas         |
| flow by tracking several thousand simulated molecules. Primarily used      |
| for modeling nozzle flows with large base regions and low pressure regions |
| in hypersonic wedge wakes.   |
|  |
| AVAILABLE DOCUMENTATION:   |
|  |
| "Chemical Lazer Nozzle and Cavity Calculation by the Direct Simulation     |
| Monte Carlo Method," T. Sugimura, et. al, presented at AIAA Conference on  |
| High Power Lasers, October 31-November 2, 1978, Cambridge, Massachusetts.  |
|  |

| CATEGORY          | OPTICS   |   | KINETICS  |   | GASDYNAMICS   |
|-------------------|--|---|---|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | • | None<br>Simple Saturated Gain<br>Detailed Kinetics        | • | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | • | CW<br>Pulsed<br>HF DF<br>Other                            | • | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | • | Annular Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • | 1 D<br>2 D<br>3 D   | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | • | Cartesian<br>Cylindrical<br>Other                         | • | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other |   | Single Line<br>Multiline<br>Line Broadening<br>Other      | • | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |

| CODE | SUMMAR | Y SHEET |
|------|--------|---------|
|------|--------|---------|

| CODE NAME: | MNORO |
|------------|-------|

| ORIGINATOR/KEY CONTACT:  |                 |
|--|-----------------|
| Name: L. H. Sentman Phone (217) 333-18   | 34              |
| Organization: University of Illinois, Dept. of Aeronautical & Ast  | ronautical Eng. |
| Address: Urbana, Illinois 61801  |                 |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Rotational nonequil kinetics - fluid dynamics model. Used with AFWL strip mirror control predict power spectral performance of CW chemical lasers.  |                 |
| AVAILABLE DOCUMENTATION: "An Efficient Rotational Nonequilibri of a CW Chemical Laser." L. H. Sentman and W. Brandkamp. TR AAE  UILU Eng. 79-0505. July 1979. "Users' Guide for Programs MNORO  AFOPTMNORO." L. H. Sentman. AAE TR-79-7. UILU Eng. 79-0507. Octo | 79-5.<br>and    |

| CATEGORY          | OPTICS   |   | KINETICS   |   | GASDYNAMICS  |
|-------------------|--|---|--|---|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | • | None<br>Simple Saturated Gain<br>Detailed Kinetics         | • | None<br>Simple Flow Model<br>Detailed Mixing                           |
| TYPE              | Geometrical<br>Physical  | • | CW<br>Pulsed<br>HF, DF<br>Other                            | • | Premixed<br>Scheduled Mixing<br>Other                                  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | • | Annular, Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • | 1 D<br>2 D<br>3 D  | • | 1 0<br>2 0<br>3 D  |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | • | Cartesian<br>Cylindrical<br>Other                          | • | Cartesian<br>Cylindrical<br>Other                                      |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | • | Single Line Multiline Line Broadening Other                | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other    |

| CODE | SUMMAP | RY SHEET |
|------|--------|----------|
|------|--------|----------|

CODE NAME: MPCPAGOS

| <u> </u>  |
|---|
|   |
| ORIGINATOR/KEY CONTACT:   |
| Name: D. N. Mansell and C. C. Barnard Phone: (505) 848-5000                   |
| Organization: The BDM Corporation   |
| Address: 1801 Randolph Road, S.E., Albuquerque, New Mexico 87106              |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE:                                    |
| Calculates (misalignment) sensitivity coefficients for general optical        |
| train. Relates output ray motions to individual optical element motions       |
| <u>in six degrees of freedom. Used in conjunction with NASTRAN to predict</u> |
| beam jitter effects through a integrated optics/structures approach.          |
|   |
|   |
| AVAILABLE DOCUMENTATION:  |
| MPCPAGOS Users' Manual, BDM/TAC-78-727-TR. Final Task Report for Sensi-       |
| tivity Analyses of the ALL Optical Train, BDM/TAC-78-793-TR.                  |
|   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None     Simple Saturated Gain     Detailed Kinetics | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical Physical   | CW Pulsed HF. DF Other                               | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular   | Annular, Radially Flowing Transversely Flowing Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D                                    | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                    | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments     Aberrations     Deformable Mirrors     Far-Field Performance     Other | Single Line Multiline Line Broadening Other          | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |

| CODE SUMMARY SHEET                   | CODE NAME:      | MRO                  |
|--------------------------------------|-----------------|----------------------|
|                                      | _               |                      |
| ORIGINATOR/KEY CONTACT:              |                 |                      |
| Name: <u>Donald L. Bullock</u>       | Phone:          | (213) 535-3484       |
| Organization: TRW DSSG               | ·               |                      |
| Address: R1/1162, One Space Park     | Redondo Beach   | , California 90278   |
| PRINCIPAL PURPOSE AND APPLICATION OF | CODE: Models th | ne optical performan |
| of linear bands CW HE and DE chem    |                 |                      |

| AVAILABLE DOCUMENTATION: The BLAZER and MRO Codes, TRW, June 1978 (theory). |
|---|
| BLAZER Users Manual (includes use of MRO), TRW, November 1978.              |
|   |

except it is a 2-D model. Used as design tool for BDL, NACL, and MIRACL.

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics          | None Simple Flow Model Detailed Mixing                            |
| TYPE              | Geometrical Physical   | CW Pulsed HF, DF Other                                | Premixed Scheduled Mixing Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing  Transversely Flowing Other | Cylindrical, Radially Flowing Rectangular, Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D                                     | 1 D<br>2 D<br>3 O   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                           | Cartesian Cylindrical Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other           | Laminar Flow Turbulent Flow Boundary Laver Shocks Other           |

| С | 0 | DE | S | UN | 1M | AR | Y | SH | E | Ε | T |
|---|---|----|---|----|----|----|---|----|---|---|---|
|---|---|----|---|----|----|----|---|----|---|---|---|

| CODE NAME: | NCFTDPWE* |
|------------|-----------|

| ORIGINATOR: KEY CONTACT: **  |
|--|
| Name: F. D. Toppert/John C. Goldstein Phone: (505) 667-7281  |
| Organization: Los Alamos Scientific Laboratory   |
| Address: Group X-1, MS-531, Los Alamos, New Mexico 87545   |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Study of wavefront distortion during propagation through amplifying self-focusing materials. Code could |
| be extended to resonator calculations, but does not currently have any optical elements or saturable gain models included.                         |
| AVAILABLE DOCUMENTATION: A Numerical Code for the Three-Dimensional  |
| Parabolic Wave Equation, John C. Goldstein, LASL, LA-6833-MS.  |
|  |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None<br>Simple Fabry Perot<br>Detailed Resonator                         | None<br>Simple Saturated Gain<br>Detailed Kinetics         | None Simple Flow Model Defailed Mixing                                  |
| ТҮРЕ              | Geometrical  Physical  | CW<br>Pulsed<br>HF. DF<br>Other                            | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 O<br>3 D  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Laver Shocks Other                 |

<sup>\*</sup>Numerical Code for the Three-Dimensional Parabolic Wave Equation. \*\*Now at University of Miami, Miami, Florida.

| CODE | SUMMAP | RY SHEET |
|------|--------|----------|
|------|--------|----------|

| CODE NAME: | NORO-I |
|------------|--------|

| ORIGINATOR/KEY CONTACT:   |
|---|
| Name: L. H. Sentman/S. W. Zelazny* Phone: (217) 333-1834  |
| Organization: University of Illinois, Dept. of Aeronautical & Astronautical En                        |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Qualitative Rotational nonequi-                            |
| librium kinetics and fluid dynamics model coupled with Rell Aerospace strip optics code. See ROPTICS. |
|   |
|   |
| AVAILABLE DOCUMENTATION: Applied Optics 17, p. 2244 (1978); J. Chem.                                  |
| Phys. 62, p. 3523 (1975); Applied Optics 15, p. 744, (1976); J. Chem. Phys.                           |
| 67 p. 966 (1977).   |
|   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS  |
|-------------------|--|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics         | None Simple Flow Model Detailed Mixing                         |
| ТҮРЕ              | Geometrical<br>Physical  | CW Pulsed HF DF Other                                | Premixed Scheduled Mixing Other                                |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing Transversely Flowing Other | Cylindrical Radiatly Flowing Rectangular Linearly Flowin Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D 2 D 3 D  | • 1 D 2 D 3 D  |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian Cylindrical Other                          | Cartesian Cylindrical Other                                    |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line  Multiline Line Broadening Other         | Laminar Flow Turbulent Flow Boundary Layer Shocks Other        |

<sup>\*</sup>Bell Aerospace Textron

| CODE | SHM | MARY | SHEET |
|------|-----|------|-------|

CODE NAME:

NORO-II

| ORIGINATOR/KEY CONTACT:                  |                                |
|--|--------------------------------|
| Name: S. W. Zelazny                      | Phone (716) 297-1000           |
| Organization: Bell Aerospace Textron     |                                |
| Address: P.O. Box 1, Buffalo, New York   | 14240                          |
| PRINCIPAL PURPOSE AND APPLICATION OF COL | E: 1-D mixing model coupled to |
| rotational nonequilibrium chemistry and  |                                |
| optical cavity analysis. (See appendix   |                                |
|  |                                |
|  |                                |
|  |                                |
| AVAILABLE DOCUMENTATION:                 |                                |
|  |                                |
|  |                                |
|  |                                |
|  |                                |

| CATEGORY          | OPTICS   | KINETICS  |   | GASDYNAMICS   |
|-------------------|--|---|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics              | • | None<br>Simple Flow Model<br>Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF DF Other                                     | • | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing<br>Transversely Flowing<br>Other |   | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D   | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Carresian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                         |   | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other               | • | Laminar Frow<br>Turbulent Frow<br>Boundary Layer<br>Shocks<br>Other   |

| CODE | SUMMAR | Y SHEET |
|------|--------|---------|
|------|--------|---------|

| CODE NAME: | OCELOT |
|------------|--------|

| ORIGINATOR/KEY CONTACT:   |
|---|
| Name: <u>David Fink</u> Phone (213) 391-0711, X6925                     |
| Organization: Hughes Aircraft Company                                   |
| Address: Culver City, California 90230                                  |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Tool to assist with          |
| resonator design and mode control. Primarily models optics, but modular |
| onstructor_allows_incorporation_of_other_detailed_models.               |
|   |
|   |
| AVAILABLE DOCUMENTATION: Not available                                  |
|   |
|   |
|   |

| CATEGORY OPTICS   |  | KINETICS  | GASDYNAMICS   |  |
|-------------------|--|---|---|--|
| ' EVEL            | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Cain Detailed Kinetics              | None Simple Flow Model Detailed Mixing                                |  |
| TYPE              | Geometrical Physical   | CW Pulsed HF_DF Other                                     | Premixed<br>Scheduled Mixing<br>Other                                 |  |
| GEOMETRY          | <ul><li>Standing Wave</li><li>Ring</li><li>Compact</li><li>Annular</li></ul>   | Annular Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |  |
| GRID DIMENSION    | 1 Transverse Dimension 1 D 2 D   | 1 D<br>2 D<br>3 D   | 1 D<br>2 D<br>3 D   |  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                         | Cartesian<br>Cylindrical<br>Other                                     |  |
| FEATURES MODELED  | <ul> <li>Misalignments</li> <li>Aberrations</li> <li>Deformable Mirrors</li> <li>Far Field Performance</li> <li>Other</li> </ul> | Single Line  Multiline Line Broadening Other              | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |  |

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|------|---------|-------|

| CODE NAME: | POLRES |
|------------|--------|
|            |        |

| ORIGINATOR/K                  | EY CONTACT:   |                       |           |           |          |      |          |
|-------------------------------|---------------|-----------------------|-----------|-----------|----------|------|----------|
| Name: Wil                     | lliam P. Lath | nam                   | Pt        | none:(50  | 05) 844- | 0721 |          |
| Organization:                 | Air Force     | Weapons labor         | atory     |           |          |      |          |
| Address:                      | AFWL/ALR, Ki  | irtland AFB, M        | lew Mexic | o 87117   |          |      |          |
| PRINCIPAL PUR<br>symmetric ur |               | PLICATION OF analysis |           |           |          |      |          |
|                               |               | polarization          |           |           |          |      |          |
|                               |               |                       |           |           |          |      |          |
| AVAILABLE DOC                 | UMENTATION    | : None Relev          | ⁄ant: G.  | C. Dente  | e, App.  | Opt. | 18, 2911 |
| (1979), W. F                  | . Latham, "F  | Polarization (        | ffects o  | f Half Sy | ymmetric | Unst | able     |
| Resonators v                  | vith a Coated | Rear Cone,"           | App. Opt  | , (to be  | publish  | ed). |          |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |  |
|-------------------|--|--|---|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                  |  |
| TYPE              | Geometrical Physical   | CW Pulsed HF. DF Other                                     | Premixed<br>Scheduled Mixing<br>Other                                   |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rentangular, Linearly Flowing<br>Other |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian Cylindrical Other   |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |  |

| С | o | D | Ε | S | U | M | M | IΑ | R | Υ | S | Н | Ε | ET | • |
|---|---|---|---|---|---|---|---|----|---|---|---|---|---|----|---|
|---|---|---|---|---|---|---|---|----|---|---|---|---|---|----|---|

| CODE NAME: | POLRESH |
|------------|---------|
|            |         |

| ORIGINATOR/KEY CONTACT:                |                  |                   |
|--|------------------|-------------------|
| Name: William P. Latham                | Phone:           | (505) 844-0721    |
| Organization: Air Force Weapons Labora | tory             |                   |
| Address: AFWL/ALR, Kirtland AFB, New   | Mexico 87117     |                   |
| PRINCIPAL PURPOSE AND APPLICATION OF C | DDE: Used for a  | xisymmetric half- |
| symmetric unstable resonator with inte |                  |                   |
| contains two Fourier components for an |                  |                   |
| bare compact and annular beam resonato |                  |                   |
| and simple saturable gain models.      |                  |                   |
|  |                  |                   |
| AVAILABLE DOCUMENTATION: None relevant | : G. C. Dente,   | App. Opt 18, 2911 |
| (1979); W. P. Latham, "Polarization Ef | fects of Half Sy | mmetric Unstable  |
| Resonators with a Control Rear Cone,"  | App. Opt (to be  | published).       |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical Physical   | CW Pulsed HF, DF Other                                     | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 O<br>2 O<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |

| CODE SUMMARY SHEET |  |
|--------------------|--|
|--------------------|--|

| CODE NAME: | POP |
|------------|-----|

|             | KEY CONTACT:           |   |
|-------------|------------------------|---|
| Name: P     | eter B. Mumola         | Phone: (203) 762-4415                                 |
| Organizat   | ion: PerlKin-Elmer Cor | poration  |
| Address: .  | 50 Danbury Road, MS    | 241, Wilton, Connecticut 06897                        |
| PRINCIPAL P | URPOSE AND APPLICATIO  | N OF CODE: Physical optics analysis of                |
| _general H  | EL optical systems and | atmospheric propagation. Code can be                  |
| _coupled t  | o variety of detailed  | kinetics models including CO <sub>2</sub> EDL (pulsed |
|             | DL, and Iodine.        | <u> </u>  |
|             |                        |   |
|             |                        |   |
| AVAILABLE C | OCUMENTATION:Avai      | lable   |
|             |                        |   |
|             |                        |   |
|             |                        |   |
|             |                        |   |

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Gain Detailed Kinetics              | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                                     | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave Ring Compact Annular   | Annular Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 O   | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                         | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments     Aberrations     Deformable Mirrors     Far-Field Performance     Other | Single Line Multiline Line Broadening Other               | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |

. ...

| CODE | SUMMA | RY SHEET |
|------|-------|----------|
|------|-------|----------|

CODE NAME:

PRE-WATSON

| ORIGINATOR KEY CONTACT:   | (212) 004 2051                    |  |  |  |  |  |  |  |
|---|-----------------------------------|--|--|--|--|--|--|--|
|   | Phone: (213) 884-3851             |  |  |  |  |  |  |  |
| Organization: Rockwell Interna  | ational, Rocketdyne Division      |  |  |  |  |  |  |  |
| Address: 6633 Canoga Avenue, Canoga Park, California 91304              |                                   |  |  |  |  |  |  |  |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Evaluate impact on resonator |                                   |  |  |  |  |  |  |  |
| solution of conical element po  | olarization.                      |  |  |  |  |  |  |  |
|   |                                   |  |  |  |  |  |  |  |
|   |                                   |  |  |  |  |  |  |  |
|   |                                   |  |  |  |  |  |  |  |
|   |                                   |  |  |  |  |  |  |  |
| AVAILABLE DOCUMENTATION: None.  | . Some papers in open literature. |  |  |  |  |  |  |  |
|   |                                   |  |  |  |  |  |  |  |
|   |                                   |  |  |  |  |  |  |  |
|   |                                   |  |  |  |  |  |  |  |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None     Simple Saturated Gain     Detailed Kinetics       | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                                      | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |

| CODE SUMMARY SHEE | C | o | D | Ε | S | u | м | м | Δ | RY | s 'S | н | F | E, | r |
|-------------------|---|---|---|---|---|---|---|---|---|----|------|---|---|----|---|
|-------------------|---|---|---|---|---|---|---|---|---|----|------|---|---|----|---|

| CODE NAME: | QFHT |
|------------|------|

| ORIGINATOR/KEY CONTACT:             |   |
|-------------------------------------|---|
| Name: Paul E. Fileger               | Phone (305) 840-6643                    |
| Organization: United Technologies   | Research Center                         |
| Address: P.O. Box 2691, MS-R-48     | , West Palm Beach, Florida 33402        |
| PRINCIPAL PURPOSE AND APPLICATION C | OF CODE: The QFHT code was developed as |
| a tool for modeling high Fresnel n  | umber annular resonators (will model    |
| collimated Fresnel numbers in exce  | ss of 200).                             |
|                                     |   |
|                                     |   |
|                                     |   |
| AVAILABLE DOCUMENTATION: None. Li   | stings available.                       |
|                                     |   |
|                                     |   |
|                                     |   |
|                                     | . — — — — — —                           |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None     Simple Saturated Gain     Detailed Kinetics       | None     Simple Flow Model     Detailed Mixing                        |
| TYPE              | Geometrical  Physical  | CW<br>Puised<br>HF DF<br>Other                             | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | !Transverse Dimension) 1 D 2 C   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Detormable Mirrors Far Field Performance Other | Single Line<br>Multiline<br>Line Broadening<br>Other       | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |

| CODE | SUMMA | RY SHEET |
|------|-------|----------|
|------|-------|----------|

| İ          |        |
|------------|--------|
| CODE NAME: | RASCAL |
|            |        |

| ORIGINATOR/KEY CONTACT:     |  |
|-----------------------------|--|
| Name: Phil D. Briggs        | Phone: (213) 884-3851                            |
| Organization: Rockwell Inte | ernational - Rockedyne Division                  |
|                             | venue, Canoga Park, California 91304             |
|                             | ICATION OF CODE: Resonator parameter selection.  |
| assess mode control, perfe  | ormance predictions for power and beam quality.  |
| resonator perturbation and  | alysis, beam quality, set/verify design require- |
| ments. This is a vector of  | code. Kinetics and mixing models includedsee     |
| AEROKNS.                    |  |
|                             |  |
| AVAILABLE DOCUMENTATION:    | None   |
|                             |  |
|                             |  |
|                             |  |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics         | None Simple Flow Model Detailed Mixing                            |
| TYPE              | Geometrical Physical   | CW Pulsed FF DF Other                                | Premixed Scheduled Mixing Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing Transversely Flowing Other | Cylindrical, Radially Flowing Rectangular, Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D                                    | • 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                          | Cartesian Cylindrical Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other          | Laminar Flow Turbulent Flow Boundary Layer Shocks Other           |

| CODE SUMMARY SHE | co | MARY SHE | EΤ |
|------------------|----|----------|----|
|------------------|----|----------|----|

| CODE NAME | ROPTICS |
|-----------|---------|

| ORIGINATOR/KEY CONTACT:  |     |
|--|-----|
| Name: L. H. Sentman/S. W. Zelazny (BAT) Phone (217) 333-1834   |     |
| Organization: University of Illinois, Dept. of Aeronautical & Astronautical Ed<br>Address: Urbana, Illinois 61801  | ng. |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: Study interaction between rotational nonequilibrium kinetics and optical resonator geometry. Bell Aerospastrip optics code (BATOPT) coupled to qualitative kinetic - fluid dynamics |     |
| model (NORO-I). Combined model is called ROPTICS.  |     |
| AVAILABLE DOCUMENTATION: Applied Optics 17, p. 2244 (1978); J. Chem. Phys. 62, 3523 (1975); Applied Optics 15, p. 744 (1976); J. Chem. Phys. 67, 966 (1977).   |     |

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics        | None Simple Flow Model Detailed Mixing                          |
| TYPE              | Geometrical  Physical  | CW Pulsed HF DF Other                               | Premixed Scheduled Mixing Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing Transversely Flowing Other | Cylindrical Radially Flowing Rectangular Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D 2 D 3 D   | 1 D 2 D 3 O   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                         | Cartesian Cylindrical Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other         | Laminar Flow Turbulent Flow Boundary Layer Shocks Other         |

| CODE | SUN | MARY | SHEET |
|------|-----|------|-------|
|------|-----|------|-------|

| CODE NAME: | ROTKIN |  |
|------------|--------|--|

| ORIGINATOR/KEY CONTACT:              |                                    |
|--------------------------------------|------------------------------------|
| Name: R. J. Hall                     | Phone: (203) 727-7349              |
| Organization: United Technologies R  | esearch Center                     |
| Address: Silver Lane, E. Hartford    | , Connecticut 06108                |
| PRINCIPAL PURPOSE AND APPLICATION OF | CODE: Prediction of HF/DF chemical |
| laser performance based on coupled r | ate equation analysis of chemical. |
| vibrational, rotational, and radiati | ve transfer.                       |
|                                      |                                    |
|                                      |                                    |
|                                      |                                    |
| AVAILABLE DOCUMENTATION: Listings    | available. R. J. Hall, "Rotational |
| Nonequilibrium and Line-Selected Ope |                                    |
| IEEE JQE, Volume QE-12, p. 453 (1976 |                                    |
|                                      |                                    |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS  |  |  |
|-------------------|--|--|--|--|--|
| rever             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                           |  |  |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                  |  |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing Rectangular, Linearly Flowing Other |  |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | • 1 D 2 D 3 D  |  |  |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian Cylindrical Other                                      |  |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line  Multiline  Line Broadening  Other             | Laminar Flow Turbulent Flow Boundary Layer Shocks Other          |  |  |

| C | 01 | D | Ε | S | U | M | M | A | R | Υ | S | Н | Ε | Ε | Т |
|---|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|---|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

CODE NAME: SAIC2D

| ORIGINATOR/KEY CONTACT: Name: Jerry Long                                    | Phone: (404) 955-2663                                     |
|---|---|
| Organization: Science Applications, In                                      |   |
| Address: 6600 Powers Ferry Road, Su   | ite 220, Atlanta, Georgia 30339                           |
| PRINCIPAL PURPOSE AND APPLICATION OF high order modes in cylindrical/annula | CODE: Provide capability of modeling roptical resonators. |
|   |   |
| AVAILABLE DOCUMENTATION: None   |   |
|   |   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |  |  |
|-------------------|--|--|---|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                  |  |  |
| TYPE              | Geometrical Physical   | CW Puised HF. DF Other                                     | Premixed<br>Scheduled Mixing<br>Other                                   |  |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |  |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |  |  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                       |  |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |  |  |

| C | OD | Ε | SI | UN | IM | AR | Y | SH | EET |
|---|----|---|----|----|----|----|---|----|-----|
|---|----|---|----|----|----|----|---|----|-----|

| CODE NAME: | SAIC2DV |  |
|------------|---------|--|
|            |         |  |

| ORIGINATOR / Name: Je |            | <del>-</del>      | Phone: (404) 955-2663   |
|-----------------------|------------|-------------------|---|
| Organizatio           | n: Science | Applications, Inc |   |
| PRINCIPAL PU          | RPOSE AND  | APPLICATION OF CO | ODE: Provide accurate, cost effective sonator mode and power extraction |
| analysis and          | determine  | the effect of var | ious design perturbations on these                                      |
| parameters.           | This code  | is a vectorized v | ersion of SAIC2D.   |
| AVAILABLE DO          | CUMENTAT   | ION: None         |   |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |  |  |
|-------------------|--|--|---|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                |  |  |
| ТҮРЕ              | Geometrical  Physical  | CW<br>Pulsed<br>HF. DF<br>Other                            | Premixed<br>Scheduled Mixing<br>Other                                 |  |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |  |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D  | 1 D<br>2 D<br>3 D   |  |  |
| COCRDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                     |  |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line<br>Multiline<br>Line Broadening<br>Other       | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |  |  |

| COD | FS  | UM    | МΔ     | RY   | SH  | FFT |
|-----|-----|-------|--------|------|-----|-----|
| ~~~ | L J | U 141 | ** . ~ | ra 1 | 311 |     |

| CODE NAME. | SAIFHT |
|------------|--------|
|            |        |

| ORIGINATOR/KEY CONTACT:  |                                     |
|--|-------------------------------------|
| Name: Jerry Long   | Phone (404) 955-2663                |
| Organization: Science Applications, Inc.   |                                     |
| Address: 6600 Powers Ferry Road, Atlan   |                                     |
| PRINCIPAL PURPOSE AND APPLICATION OF COU<br>method of cylindrical/annular optical reso | DE: Provide accurate, cost effectiv |
| power extraction for use in overall system   |                                     |
|  |                                     |
| AVAILABLE DOCUMENTATION: HF Laser Substitute Report), Science Applications, Inc.       |                                     |
| (CONFIDENTIAL)   |                                     |
|  |                                     |

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics        | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                               | Premixed<br>Scheduled Mixing<br>Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing Transversely Flowing Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | • Transverse Dimension) • 1 D • 2 D                                      | 1 0<br>2 D<br>3 O                                   | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                   | Cartesian<br>Cylingrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors For Field Performance Other | Single Line Multiline Line Broadening Other         | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |

| CODE SUMMARY | SHEET |
|--------------|-------|
|--------------|-------|

| CODE NAME | SAIGD |  |
|-----------|-------|--|
|           |       |  |

| ORIGINATOR KEY CONTACT:  |                               |
|--|-------------------------------|
| Name: Kerry E. Patterson   | Phone (404) 955-2663          |
| Organization: Science Applications., Inc   |                               |
| Address: 6600 Powers Ferry Road, Suite   | 220, Atlanta, Georgia 30339   |
| PRINCIPAL PURPOSE AND APPLICATION OF COL<br>closed cavity data. (2) Optimize operati |                               |
| configurations. (3) Generate gain algori   | thm for wave optics analyses. |
| Lasing and chemical kinetics models are in kinetic profiles for gain algorithim (see |                               |
| AVAILABLE DOCUMENTATION: HF Laser Subs<br>Interim Report), Science Applications, In  |                               |
|  |                               |

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics        | None Simple Flow Model Detailed Mixing                          |
| TYPE              | Geometrical<br>Physical  | O CW Pulsed HF DF Other                             | Premixed Scheduled Mixing Other                                 |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | Annular Radially Flowing Transversely Flowing Other | Cylindrical Radially Flowing Rectangular Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • 10<br>20<br>30                                    | 1 D<br>2 D<br>3 D Psuedo  |
| COORDINATE SYSTEM | Cartesian<br>Gylindrical<br>Other  | Cartesian Cylindrical Other                         | Cartesian Cylindrical Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other         | Laminat Finw Turbulent Flow Boundary Layer Shocks Other         |

| CODE SUMMARY SHEET   | CODE NAME: _                                  | SAIID          |
|--|---|----------------|
|  | Phone(  | 404) 955-2663  |
| Organization: Science Applications, Address: 6600 Powers Ferry Road, PRINCIPAL PURPOSE AND APPLICATION O | Suite 220, Atlanta<br>FCODE: <u>Provide a</u> | accurate, cost |
| analysis and the effect of various de  |   |                |
| AVAILABLE DOCUMENTATION: None  |   |                |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator   | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical Physical   | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | <ul><li>Standing Wave</li><li>Ring</li><li>Compact</li><li>Annular</li></ul>             | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | • Transverse Dimension: 1 D 2 D  | 1 D<br>2 D<br>3 O  | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments     Aberrations     Deformable Mirrors     Far Field Performance     Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |

| CODE SUMMARY SHEE |
|-------------------|
|-------------------|

| CODE NAME: | SAI2D |
|------------|-------|

| Organization: Science Applications, Inc.                                    | Phone (404) 955-2663            |
|---|---------------------------------|
| Address: 6600 Powers Ferry Road, Atlanta,                                   |                                 |
| PRINCIPAL PURPOSE AND APPLICATION OF CODE: _ resonators and optical trains. | moderning of rectangular timear |
|   |                                 |
|   |                                 |
|   |                                 |
| AVAILABLE DOCUMENTATION: None   |                                 |
|   | ·····                           |
|   |                                 |
|   |                                 |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                                   | None Simple Saturated Gain  Detailed Kinetics              | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical  Physical  | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | <ul><li>Standing Wave</li><li>Ring</li><li>Compact</li><li>Annular</li></ul> | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 O  | 1 D<br>2 D<br>3 O   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                          | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other     | Single Line Multiline Line Broadening Other                | Lamina: Cow<br>Turbulent Frow<br>Boundary Laver<br>Shocks<br>Other    |

| CODE SUMMARY SHEET | ET |
|--------------------|----|
|--------------------|----|

A STATE OF THE REAL PROPERTY.

| CODE NAME: | SOS |
|------------|-----|

| ORIGINATO          | R/KEY CON          | ITACT:                          |                   |                    |              |               |
|--------------------|--------------------|---------------------------------|-------------------|--------------------|--------------|---------------|
| Name: _            | J. Hough/          | M. Epstein                      |                   | _ Phone:           | (213) 648-68 | 361           |
| Organiza           | ation: <u>Aero</u> | physics Labora                  | tory, The         | Aerospace          | Corporation  |               |
| Address            | P.O. B             | ox 92957, Los                   | <u>Angeles, C</u> | alifornia          | 90009        |               |
|                    |                    | ND APPLICATION performance by   |                   |                    |              |               |
| _kinetic.          | , and radia        | tion transport                  | equations         | . Ut <u>iliz</u> e | s comprehens | sive chemical |
| kinetics<br>model. | s model (in        | cluding rotation                | onal noneq        | uilibrium)         | and simple   | Fabry-Perot   |
|                    |                    | ration: Effic<br>J.T. Hough, Ae |                   |                    |              |               |
|                    |                    | SAMSO-TR-78-84,                 |                   |                    |              |               |

| CATEGORY          | OPTICS   | KINETICS  | GASDYNAMICS   |
|-------------------|--|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics              | None Simple Flow Model Detailed Mixing                                |
| TYPE              | Geometrical     Physical   | CW Pulsed HF. DF Other                                    | Premixed Scheduled Mixing Other                                       |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Annular                              | Annular Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | ITransverse Dimension <br>  1 D<br>  2 D                                 | 1 D<br>2 D<br>3 D   | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                               | Cartesian<br>Cylindrical<br>Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line  Multiline Line Broadening Other              | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |

| CODE | SUMMAI | RY SHEET |
|------|--------|----------|
|------|--------|----------|

| CODE NAME: | TDLCLRC* |  |
|------------|----------|--|
| CODE NAME. |          |  |

| 0.510.11.4.50.               |  |
|------------------------------|--|
| ORIGINATOR/KEY CONTACT:      |  |
| Name: Victor L. Gamiz        | Phone: (213) 884-3346                          |
|                              | ernational, Rocketdyne Division                |
| Address: 6633 Conoga /       | Avenue, Canoga Park, California 91304          |
| PRINCIPAL PURPOSE AND APPLIC | CATION OF CODE:                                |
| Performs 3-D wave optics re  | esonator analysis of a positive branch con-    |
|                              | ith rectangular spherical mirrors. Has off     |
| axis geometry capability.    | Kinetics and mixing models included - see      |
| AEROKNS.                     |  |
|                              |  |
| AVAILABLE DOCUMENTATION: H   | igh Power Testing of Optical Components        |
|                              | 1 Part III, Appendix B (V. L. Gamiz) (theory). |
|                              |  |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |
|-------------------|--|--|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None Simple Flow Model Detailed Mixing                          |
| TYPE              | Geometrical  Physical  | CW Pulsed HF DF Other                                      | Premixed Scheduled Mixing Other                                 |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical Radially Flowing Rectangular Linearly Flowing Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | • 1 D 2 D 3 D  | 1 D 2 D 3 D   |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian Cylindrical Other                                     |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other         |

<sup>\*3-</sup>D Loaded Cavity Linear Resonator Code.

| CODE | SUMMARY | SHEET |
|------|---------|-------|
|      |         |       |

| CODE NAME: | TDWORRC* |
|------------|----------|
|            |          |

| ORIGINATOR/KEY CONTACT:                 |                            |
|---|----------------------------|
| Name: Victor L. Gamiz                   | Phone: (213) 884-3346      |
| Organization: Rocketdyne, Laser Optic   |                            |
| Address: 6633 Canoga Avenue, Can        | oga Park, California 91304 |
| PRINCIPAL PURPOSE AND APPLICATION OF CO | DDE:                       |
| Performs 3-D wave optics resonator ana  |                            |
| laser resonator using either a two ref  |                            |
| pactor assembly.                        |                            |
|   |                            |
|   |                            |
| AVAILABLE DOCUMENTATION:                |                            |
| See manuals for LS-14 3-D base and loa  | ded HSURIA codes.          |
|   |                            |
|   |                            |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS  |
|-------------------|--|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics               | None     Simple Flow Model     Detailed Mixing                         |
| TYPE              | Geometrical Physical   | CW<br>Pulsed<br>HF DF<br>Other                             | Premixed Scheduled Mixing Other  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing<br>Transversely Flowing<br>Other | Cylindrical, Radially Flowing<br>Rectangular Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 O  | 1 D<br>2 D<br>3 D  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                | Cartesian<br>Cylindrical<br>Other                                      |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other                | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                |

<sup>\* 3-</sup>D Wave Optics Ring Resonator Code.

| С | 0 | D | Ε | S | U | M | M | Α | R | Υ | S | Н | E | E. | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|---|
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|---|

| CODE NAME: | TMRO |
|------------|------|

| ORIGINATOR         | /KEY CON  | TACT:  |      |       |         |       |        |      |        |       |          |
|--------------------|-----------|--------|------|-------|---------|-------|--------|------|--------|-------|----------|
| Name:              | Donald L. | Bullo  | ck   |       |         | Pt    | none:_ | (213 | 3) 535 | -3484 |          |
| Organizati         | on: TRV   | DSSG   |      |       |         |       |        |      |        |       | <u> </u> |
|                    | R1/       |        |      | pace  | Park,   | Redor | ndo Be | ach, | Calif  | ornia | 90278    |
| Version o          |           |        |      |       |         |       |        |      |        |       |          |
| AVAILABLE D        | OCUMENI   | ration | No t | heory | / manua | al as | such,  | but  | (TRW)  | BLAZE | R and    |
| MRO code Manual. N |           |        |      |       |         |       |        |      | See    |       | User     |
|                    |           |        |      |       |         |       |        |      |        |       |          |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |  |  |
|-------------------|--|--|---|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics                 | None Simple Flow Model Detailed Mixing                                  |  |  |
| TYPE              | Geometrical Physical   | CW Pulsed HF. DF Other                                       | Premixed Scheduled Mixing Other   |  |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular, Radially Flowing     Transversely Flowing     Other | Cylindricat, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |  |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D 2 D 3 D  | 1 D 2 D 3 D   |  |  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian Cylindrical Other                                  | Cartesian Cylindrical Other   |  |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other                  | Laminar Flow Turbulent Flow Boundary Layer Shocks Other                 |  |  |

| $\sim$ | DE | CHI | ММА    | PV | CHI | CET |
|--------|----|-----|--------|----|-----|-----|
| υU     | UΕ | 201 | VIIVIA | HY | 371 | ヒヒリ |

Ì

ł

| CODE NAME: | TWODNOZ |
|------------|---------|

| ORIGINATOR/K   | EY CONTACT:       |            |                                       |                  |             |
|----------------|-------------------|------------|---------------------------------------|------------------|-------------|
| Name: D.       | Haflinger/P. Lohr | 1          | Phone:                                | (213) 536-162    | 24          |
| Organization:  | TRW DSSG          |            | <del> </del>                          |                  |             |
|                | R1/1038, One Sp   | oace Park, | Redondo Be                            | each, California | a 90278     |
| PRINCIPAL PURI | POSE AND APPLICA  | TION OF CO | DE:                                   |                  |             |
| Calculate no   | zzle flow includi | ing bounda | ry layer ar                           | nd inviscid cor  | e analysis. |
|                |                   |            |                                       |                  |             |
|                |                   |            |                                       |                  |             |
|                |                   |            | <del></del>                           |                  |             |
|                |                   |            |                                       |                  |             |
| AVAILABLE DOC  | UMENTATION: None  |            |                                       |                  |             |
|                |                   |            |                                       |                  |             |
|                |                   |            | · · · · · · · · · · · · · · · · · · · |                  |             |
|                |                   |            | <del></del>                           |                  |             |
|                |                   |            |                                       |                  |             |

| CATEGORY          | OPTICS   | KINETICS  |   | GASDYNAMICS   |  |  |
|-------------------|--|---|---|---|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics        |   | None<br>Simple Flow Model<br>Detailed Mixing                          |  |  |
| TYPE              | Geometrical<br>Physical  | CW<br>Pulsed<br>HF DF<br>Other                      | • | Premixed<br>Scheduled Mixing<br>Other                                 |  |  |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing iransversely Flowing Other | • | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |  |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D                                   | • | 1 D<br>2 D<br>3 D   |  |  |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                   | • | Cartesian<br>Cylindrical<br>Other                                     |  |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line Multiline Line Broadening Other         | • | Laminar Flow Turbulent Flow Boundary Layer Shocks Other               |  |  |

| CODE SUMMARY SHEET  | CODE NAME:                    | URINLAZ                   |
|---|-------------------------------|---------------------------|
| ORIGINATOR/KEY CONTACT:  Name:  | Phone:_                       | (213) 535-4384            |
| Address: R1/1162, One Space Park PRINCIPAL PURPOSE AND APPLICATION OF arbitrary axicon (except noneverting determines mode control and beam que | GODE: Model<br>q waxicon). Ba | ls cylindrical laser with |
| AVAILABLE DOCUMENTATION: Annular March 1980. Program URINLA2 User   |                               |                           |

| CATEGORY          | OPTICS   | KINETICS   | GASDYNAMICS   |  |  |
|-------------------|--|--|---|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None Simple Saturated Gain Detailed Kinetics         | None     Simple Flow Model     Detailed Mixing                        |  |  |
| TYPE              | Geometrical  Physical  | CW<br>Pulsed<br>HF. DF<br>Other                      | Premixed Scheduled Mixing Other                                       |  |  |
| GEOMETRY          | GEOMETRY  Standing Wave Annular, F Ring Transverse Compact Annular Other |  | Cylindrical Radially Flowing<br>Rectangular Linearly Flowing<br>Other |  |  |
| GRID DIMENSION    | GRID DIMENSION  (Transverse Dimension)  1 D  2 D                         |  | 1 D<br>2 D<br>3 O   |  |  |
| COORDINATE SYSTEM | Cartesian Cylindrical Other  | Cartesian<br>Cylindrical<br>Other                    | Cartesian<br>Cylindrical<br>Other                                     |  |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far-Field Performance Other | Single Line<br>Multiline<br>Line Broadening<br>Other | Laminar Flow Turbulent Flow Boundary Laver Shocks Other               |  |  |

Market - Alexander

| CODE SUMMARY SHEET                 | CODE NAME:       | VIINT                   |
|------------------------------------|------------------|-------------------------|
| ORIGINATOR: KEY CONTACT:           |                  |                         |
| Name: J. Ohrenberger               | Phone:_          | (213) 536-4024          |
| Organization: TRW DSSG             |                  |                         |
| Address: 88/1012, One Space Pa     | rk, Redondo Beac | h, California 90278     |
| PRINCIPAL PURPOSE AND APPLICATION  |                  |                         |
| program; calculates flow between u |                  |                         |
|                                    |                  |                         |
|                                    |                  |                         |
| <del></del>                        |                  |                         |
|                                    |                  | <del></del>             |
| AVAILABLE DOCUMENTATION:Ohrenb     | erger, BMDATC, D | ASG60-76-C-0043, April  |
| 1977 (theory). Computer Program D  |                  |                         |
| and Far Wake Modeling Analysis for | Reentry under T  | urbulent Boundary Laver |

Conditions, Ohrenberger, for BMDSC, DASG60-76-C-0043, March 1979. Others.

| CATEGORY          | OPTICS   | KINETICS                            |  |   | GASDYNAMICS   |  |  |
|-------------------|--|-------------------------------------|--|---|---|--|--|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | 1                                   | le Saturated Gain<br>led Kinetics        | • | None<br>Simple Flow Model<br>Detailed Mixing                            |  |  |
| TYPE              | Geometrical<br>Physical  | CW<br>Pulse<br>HF, D                | F  | • | Premixed<br>Scheduled Mixing<br>Other                                   |  |  |
| GEOMETRY          | Standing Wave<br>Ring<br>Compact<br>Arnular                              | 1 1                                 | lar, Radially Flowing<br>versely Flowing | • | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |  |  |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D                   |  | • | 1 D<br>2 D<br>3 D   |  |  |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Carte<br>Cylind<br>Other            | drical                                   | • | Cartesian<br>Cylindrical<br>Other                                       |  |  |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single<br>Multil<br>Line E<br>Other | line<br>Broadening                       | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other     |  |  |

| CODE | SUMMAR | Y SHEET |
|------|--------|---------|
|------|--------|---------|

| CODE NAME: | WAP* |
|------------|------|

| ORIGINATOR/KEY CONTACT:  |   |
|--|---|
| Name: J. Ohrenberger   | Phone (213) 536-4024  |
| Organization: TRW DSSG   |   |
| Address: 88/1012, One Space par  | k, Redondo Beach, California 90278  |
|  | FCODE: To determine base flow between base flows, recirculation, and embed- |
| ded subsonic zone; boundary remnant included.                          | lip and wake shocks formation are   |
| AVAILABLE DOCUMENTATION: Computer of a Near and Far Wake Modeling Ana  |   |
| Turbulent Boundary Layer Conditions (DASG60-76-C-0043) April 1977. Oth | , J. T. Ohrenberger, for BMDATC   |
|  |   |

| CATEGORY          | OPTICS   | KINETICS  |   | GASDYNAMICS   |
|-------------------|--|---|---|---|
| LEVEL             | None Simple Fabry Perot Detailed Resonator                               | None     Simple Saturated Gain     Detailed Kinetics      | • | None<br>Simple Flow Model<br>Detailed Mixing                            |
| TYPE              | Geometrical<br>Physical  | CW Pulsed HF. DF Other                                    | • | Premixed<br>Scheduled Mixing<br>Other                                   |
| GEOMETRY          | Standing Wave Ring Compact Annular                                       | Annular Radially Flowing<br>Transversely Flowing<br>Other | • | Cylindrical, Radially Flowing<br>Rectangular, Linearly Flowing<br>Other |
| GRID DIMENSION    | (Transverse Dimension) 1 D 2 D   | 1 D<br>2 D<br>3 D   | • | 1 D<br>2 D<br>3 D   |
| COORDINATE SYSTEM | Cartesian<br>Cylindrical<br>Other  | Cartesian<br>Cylindrical<br>Other                         | • | Cartesian<br>Cylindrical<br>Other                                       |
| FEATURES MODELED  | Misalignments Aberrations Deformable Mirrors Far Field Performance Other | Single Line Multiline Line Broadening Other               | • | Laminar Flow<br>Turbulent Flow<br>Boundary Layer<br>Shocks<br>Other     |

<sup>\*</sup>Wake Analysis Program

## Section III DETAILED CHEMICAL LASER CODES

This chapter contains, in alphabetical order, the received detailed responses to the survey form (Appendix A). The material has been reformatted somewhat for economy of presentation and ease of comparison. It was not possible to include the 28 codes submitted by Bell Aerospace in this detailed format; for these, the reader should see Appendix C. See Section IV for an explanation of the forms.

| CODE NAME | ABL* |
|-----------|------|
|           |      |

| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE: Models cylindric model with gain.  | al lasers used with URINLA2. This is a URINLA2   |
|---|--|
| 1000 111 111 111 111 111 111 111 111 11   |  |
|   |  |
| ASSESSMENT OF CAPARILITIES See URINLA2.   |  |
| ASSESSMENT OF CAPABILITIES: See UKINLAZ.  |  |
|   |  |
|   |  |
| ASSESSMENT OF LIMITATIONS: See URINLA2.   |  |
|   |  |
|   |  |
|   |  |
| OTHER UNIQUE FEATURES: Resonator geometries modeled:  | HSURIA; "HSURIA" with toric back mirror, TURIA.  |
|   |  |
|   |  |
| ORIGINATOR/KEY CONTACT:  Name Donald L. Bullock   | hone (213) 535-3484                              |
| Name: DOTATO L. BUTTOCK PROFILE TRW DSSG  | hone: (213) 535-3484                             |
| Address: R1/1162, One Space Park, Redondo Beach   | n, California 90278                              |
| AVAILABLE DOCUMENTATION (1 Theory, U User, RP Relevant Publication (U) Program ABL User Manual, June 1978; listings av  | n): (T) Annular Laser Mode Studies Final Report; |
| (II) Program ARI User Manual June 1978: listings as   |  |
| TOT I LOSE MILE COSE MANUAL S DUME 1970, LISCHINGS AV   | vailable.  |
| 107 Hoge will more open manual, outle 1970, 115thigs av   | vailable.  |
| 107 . Togram Rot Oser manual, oune 1970, 113tilligs av  | vailable.  |
| 107 . Togram one oser mender, oune 1970, 115things av   | vailable.  |
| 107 Trougram one oser manual, varie 1970, 115things av  | vailable.  |
| 107 Trougram Aug Oser manual, owne 1970, 115things av   | vailable.  |
| STATUS:   | vailable.  |
| STATUS Operational Currently?: Yes  | vailable.  |
| STATUS:  Operational Currently?: Yes  Under Modification?. No   | vailable.  |
| STATUS Operational Currently?: Yes  | vailable.  |
| STATUS  Operational Currently?: Yes  Under Modification?. No  Purpose(s): —   | vailable.  |
| STATUS:  Operational Currently?: Yes  Under Modification? No  Purpose(s):  Ownership?: Government   | vailable.  |
| STATUS:  Operational Currently?: Yes Under Modification?. No Purpose(s):  Ownership?: Government Proprietary?: No   |  |
| STATUS:  Operational Currently?: Yes Under Modification?. No Purpose(s):  Ownership?: Government Proprietary?: No   |  |
| STATUS:  Operational Currently?: Yes Under Modification?. NO  Purpose(s):  Ownership?: Government Proprietary?: No  MACHINE/OPERATING SYSTEM (on which installed): AFWL CYBER 176,  |  |
| STATUS:  Operational Currently?: Yes Under Modification?. NO  Purpose(s):  Ownership?: Government Proprietary?: No  MACHINE/OPERATING SYSTEM (on which installed): AFWL CYBER 176,  |  |
| STATUS:  Operational Currently?: Yes Under Modification?. NO Purpose(s):  Ownership?: Government Proprietary?: NO MACHINE/OPERATING SYSTEM (on which installed): AFWL CYBER 176,  TRANSPORTABLE?: Machine Dependent Restrictions:   |  |
| STATUS:  Operational Currently?: Yes Under Modification?. No Purpose(s):  Ownership?: Government Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed)  AFWL CYBER 176,  TRANSPORTABLE?: Machine Dependent Restrictions:  SELF-CONTAINED?: See MRO/BLAZER  |  |
| STATUS:  Operational Currently?: Yes Under Modification?. NO Purpose(s):  Ownership?: Government Proprietary?: NO MACHINE/OPERATING SYSTEM (on which installed): AFWL CYBER 176,  TRANSPORTABLE?: Machine Dependent Restrictions:   |  |
| STATUS:  Operational Currently?: Yes Under Modification?. NO  Purpose(s):  Ownership?: Government Proprietary?: No  MACHINE/OPERATING SYSTEM (on which installed): AFWL CYBER 176,  TRANSPORTABLE?: Machine Dependent Restrictions:  SELF-CONTAINED?: See MRO/BLAZER Other Codes Required (name, purpose):  |  |
| STATUS:  Operational Currently?: Yes Under Modification?. NO  Purpose(s):  Ownership?: Government Proprietary?: No  MACHINE/OPERATING SYSTEM (on which installed): AFWL CYBER 176,  TRANSPORTABLE?: Machine Dependent Restrictions:  SELF-CONTAINED?: See MRO/BLAZER Other Codes Required (name, purpose):  |  |
| STATUS:  Operational Currently?: Yes Under Modification?. NO Purpose(s):  Ownership?: Government Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): AFWL CYBER 176,  TRANSPORTABLE?: Machine Dependent Restrictions:  SELF-CONTAINED?: See MRO/BLAZER Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:   | NOS/BE.  |
| STATUS:  Operational Currently?: Yes Under Modification? NO  Purpose(s):  Ownership?: Government Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed)  AFWL CYBER 176,  TRANSPORTABLE?: Machine Dependent Restrictions:  SELF-CONTAINED?: See MRO/BLAZER Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Small Job: Typical Job. | NOS/BE.  Execution Time (Sec. CDC 7600)          |
| STATUS  Operational Currently?: YeS Under Modification?. NO Purpose(s):  Ownership?: Government Proprietary?: NO MACHINE/OPERATING SYSTEM (on which installed): AFWL CYBER 176,  TRANSPORTABLE?: Machine Dependent Restrictions: SELF-CONTAINED?: See MRO/BLAZER Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words) Small Job:                   | NOS/BE.  |

<sup>\*</sup> Annular BLAZER

| ODE NAME.                                     |                                    |
|---|------------------------------------|
|   |                                    |
| OPTICS  | ICS                                |
| BASIC TYPE (\$)                               | RESONATOR TYPE (V) Standing Wave   |
| Physical Optics ** Geometrical                | Traveling Wave (Ring) Revelve FW   |
| FIELD (POLARIZATION) REPRESENTATION (\$)      | BRANCH (1) Positive " Nexative     |
| Scalar 7 Vector                               | OPTICAL ELEMENT MODELS INCLUDED () |
| COORDINATE SYSTEM (Canesian cylindrical etc.) | Flat Mirrors V Spherical Mirrors   |
| Compact Region GV Annular Region CV           | Cylindrical Mirrors Telescopes     |
| TRANSVERSE GRID DIMENSIONALITY (V) 10 20      | Scraper Mirrors                    |
| Compact Region                                | Arcons                             |
| Annular Region                                | Arbiter                            |
| FIELD SYMMETRY RESTRICTIONS! Half plane       |                                    |
| MIRROR SHAPE(S) ALLOWED (V)                   | 1                                  |
| Square Circular Strip                         | Parabola-Parabola                  |
| Rectangular Eliptic at Arbitrary              | Vanable Cone Offset                |
| CONFIGURATION FLEXIBILITY (V)                 | Other (specify)                    |
| Fried Single Resunator Geometry               | Deformable Mirrors                 |

MODELS INCLUDED ()) NA) Reverse 14

COORDINATE SYSTEM (Cartesian cylindrica: etc.)

KINETICS GRID DIMENSIONALITY (V) \*

Compact Region Annulas Region Compact Region CV

GAIN REGION MODELED (V)

KINETICS

GAS DYNAMICS

| Authorized Marrora (Compact Region Symmetrics) and Date of Dat |
|--|
|--|

Modular Multiple Resonator Geometries Fixed Multiple Resonator Geometries

PROPAGATION TECHNIQUE

Freshel Integral Algorithms With Kernel Averaging Garissian Quadrature

| N REGION MODELED (\$)   | NOZZIE GEOMETRY MODELED (and type) (1)  |
|---|---|
| mpact Region Annulas Region   | Cylindrical Radially Flowing  |
| ORDINATE SYSTEM (Cartesian cylindrica: etc.)                              | Rectangular Linearly Flowing  |
| ompact Region Annular Region CV   | Other   |
| (V)   | COORDINATE SYSTEM CY  |
| 10 20 30  | FLUID GRID DIMENSION (V) 10 1 20 10 10 10 10 10 10 10 10 10 10 10 10 10       |
| mular Region  | Laminar Turbulent   |
| YMMETRY RESTRICTION   | oner Scheduled mixing   |
| sin Vary Along Optic Axes? Y Flow Direction?                              | BASIC MODELING APPROACH ()  |
| SED CW KINETICS MODELED   | Premised Minns  |
| MICAL PUMPING REACTIONS MODELED (V)                                       | Other (specify) SCHEGUIEC III A 1119  |
| H   | Retenences for Appendix Used See MRO/ BLAZER                                  |
| 0 , 0   |   |
| of (H · F <sub>2</sub> ) Chain (F · H <sub>2</sub> & H · F <sub>2</sub> ) |   |
| her (specify)   | THERMAL DRIVER MODELED (1)  |
| TRANSFER  | Arc Heater Combustor  |
| T See MKU/BLAZEK  | Shock Tube Resistance Healer  |
| See MRO/RI A7FR   | Other   |
| 1   |   |
| her ,   | 1   |
| ngle Line Model (N)   | Other (specify) NF 3  |
| Ultime Moder (V)  | F ATOM CONCENTRATION DETERMINED FROM MODEL? 306                               |
| Assumed Rotational Population Distribution State (V)                      | DILUENTS MODELED HE. No. Lt   |
| Equilibrium Nonequilibrium  | MODELS EFFECTS ON MIXING MATE DUE TO (1.) Morale Boundary Langua Chock Manage |
| umber of Laser Lines Modeled 23   | 1   |
| nuce of Rate Coefficients Used in Code N. Cohen                           | 1 =   |
|   |   |
| E PROFILE MODELS $\langle V'  angle$                                      |   |
| Oppler Broadening   |   |
| Missional Broadening  | MODELS FITEL'S ON OTHER MODES OF TOTAL  |
| ner specify Operation at line center                                      | Media index Variations  |

\*See SRINAS USER Sanual

Ghr

Mui tiple eigenvalue/vector extraction algorithm  $(rac{1}{V})$ 

hou ğ.

9

ACCELERATION ALGORITHMS USED?

Power Comparison L Field Comparison

CONVERGENCE TECHNIQUE (V)

Gardener Fresner Kirchhoff (GFK)

Other (specify)

Sast Hanker Transform (FHT) Fast Fourier Transform (FEE)

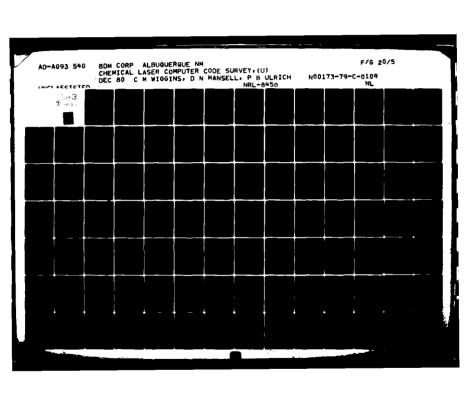
| CODE NAME | At ROLN' |
|-----------|----------|
|-----------|----------|

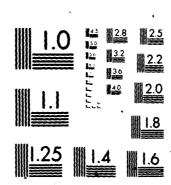
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE COMPUTA  | ation of small signal or loaded gains from a radially loans  |
|--|--|
|  | s. Package includes aerodynamics for madial tipw field.  |
|  |  |
|  |  |
|  |  |
|  | n of gain sheet through a radial wear through the sire .   |
|  | are v = 1 · 10, j × 1 · 20; uses latest . · · · · · · · · · ·  |
| available.   |  |
|  |  |
| ASSESSMENT OF LIMITATIONS Model does not incl  | lude rotational nonequilibrium.  |
| ASSESSMENT OF CHATATIONS   |  |
|  |  |
|  |  |
|  |  |
| OTHER UNIQUE FEATURES  |  |
|  | ·  |
|  |  |
|  |  |
| ORIGINATOR/KEY CONTACT   | Phone (213) 884-3851   |
| Deligation 11 International Dec  | Phone (213) 884-3851   |
| 6633.0   |  |
| Address. <u>bb33 Lanoga Ave., Lanoga Par</u>   | . K3 Carriornia 31304  |
|  | (7) Annular Laser Optics Study Final Report  |
| AVAILABLE DOCUMENTATION (T Theory U User RP Rel<br>APRIL - THE 17-117') (U) Annular Laser Optic  | Nevant Publication, (T) Annular Laser Optics Study Final Report<br>Cs Study Psers Manual, Loaded Cavity Codes.                   |
| AVAILABLE DOCUMENTATION (T Theory U User RP Rel  | levant Publication) (T) Annular Lasen Optics Study Final Pepant<br>CS Study Usens Manual, Loaded Cavity Codes.                   |
| Transfer to the sense to the se | levant Publication) (T) Annular Lasen Optics Study Final Pepart<br>CS Study Users Manual Loaded Caylty Codes.                    |
| Transfer to the sense to the se | levant Publication) (T) Annular Lasen Optics Study Final Pepart<br>CS Study Users Manual Loaded Cavity Codes.                    |
| STATUS   | levant Publication) (T) Annular Lasen Optics Study Final Pepart<br>CS Study Users Manual Loaded Cavity Codes                     |
| STATUS  Operational Currently'  'es  | levant Publication) (T) Annular Lasen Optics Study Final Report CS Study Users Manual, Loaded Cavity Codes.                      |
| STATUS  Operational Currently'  Under Modification'  | levant Publication) (1) Annular Laser Optics Study Final Pepart<br>(2 Study Jeens Manual, Loaded Cavity Codes.                   |
| STATUS Operational Currently? VES Under Modification? Purpose(s)   | levant Publication) (1) Annular Laser Optics Study Final Pepart<br>(2 Study, Users Manual, Loaded Cavity Codes,                  |
| STATUS Operational Currently) Under Modification? Purpose(s)  Ownership)  AFML   | (evant Publication) (1) Annular Laser Optics Study Final Pepart (2) Study Users Manual Loaded Cavity Codes                       |
| STATUS  Operational Currently?    Under Modification?    Purpose(s)  Ownership?    AFWL    Proprietary?    NO  | 12 Study Indexs Hamilain Loading Havity Lodes.   |
| STATUS  Operational Currently?   Under Modification?  Purpose(s)  Ownership?  Proprietary?   NO  | devant Publication) (1) Annular Laser Optics Study Final Pepart (2) Study Users Manual Loaded Cavity Codes  bor 176              |
| Operational Currently?  Under Modification?  Purpose(s)  Ownership?  Proprietary?  NO  MACHINE/OPERATING SYSTEM (on which installed)   | 12 Study Indexs Hamilain Loading Havity Lodes.   |
| Operational Currently?  Operational Currently?  Under Modification?  Purpose(s)  Ownership?  AFWL Proprietary?  NO  MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE? dith modification.   | ber 176  |
| Operational Currently?  Operational Currently?  Under Modrication?  Purpose(s)  Ownership?  Proprietary?  NO  MACHINE/OPERATING SYSTEM (on which installed)  | ber 176  |
| Operational Currently)  Operational Currently)  Under Modification?  Purpose(s)  Ownership)  AFWL Proprietary)  NO  MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE?  Alth modification.  Machine Dependent Restrictions  1565 CDC extensi  | ber 176  |
| Operational Currently?   | ber 176  |
| Operational Currently?  Under Modification?  Purpose(s)  Ownership?  AFWL Proprietary?  NO  MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE? Ath modification.  Machine Dependent Restrictions  SELF CONTAINED?  NO 15 a Subroutine packar  | ber 176.  Sed fore (LCM).  |
| STATUS  Operational Currently? VES  Under Modification?  Purpose(s)  Ownership! AFWL Proprietary? NO  MACHINE/OPERATING SYSTEM (on which installed) AFWL  TRANSPORTABLE? Alth modification.  Machine Dependent Restrictions SEEF CONTAINED? NO - 15 a subroutine pucka   | ber 176.  Sed fore (LCM).  |
| Operational Currently, VES Under Modification? Purpose(s)  Ownership, AFWL Proprietary, NO MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE, with modification. Machine Dependent Restrictions 1005 CDC externs  SELF CONTAINED, NO - 15 a submoutine puckation of the Codes Required (name, purpose)  Requires the codes Required (name, purpose)   | ber 176.  Sed fore (LCM).  |
| STATUS  Operational Currently?  Under Modification?  Purpose(s)  Ownership?  AFML  Proprietary?  NO  MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE?  With modification.  Machine Dependent Restrictions  SELF CONTAINED?  Other Codes Required (name, purpose)  Requires the Stimmart of RESOURCES REQUIRED FOR RUNS  | ber 176.  Sed Core (LCM).  |
| STATUS  Operational Currently?  Under Modification?  Purpose(s)  Ownership?  AFML  Proprietary?  NO  MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE?  With modification.  Machine Dependent Restrictions  SELF CONTAINED?  Other Codes Required (name, purpose)  Requires the Stimmare Of RESOURCES REQUIRED FOR RUNS  | ted (ore (LEV)).  1996.  That a driver code provide intensity-transition rathin.  (Ortal Words)   Execution Time (Sec. CDC 7600) |
| STATUS  Operational Currently? VES  Under Modification?  Purpose(s)  Ownership? AFWL Proprietary? NO  MACHINE/OPERATING SYSTEM (on which installed) IND  TRANSPORTABLE? With modification.  Machine Dependent Restrictions INDES COLE Extension  Other Codes Required (name, purpose) Requires the ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size  | ben 176  Sed core (LCM).  Age. hat a driver code provide intensity-transition rathis.  |

The same of

| S31140   | None   | KINETICS   | GAS DYNAMICS   |
|--|--|--|--|
| BASIC TYPE (V) None  | RESONATOR TYPE () Standing Wave              | GAIN REGION MODELED (V)  | NOZZLE GEOMETRY MODELED (and type) (V)   |
| Preparati Optica Geometrical   | Traveling Wave (Ring) Reverse 1W             | Compact Region Annular Region .  | Cylindrical Redually Flowing   |
| FIELD (POLARIZATION) REPRESENTATION (V)  | BRANCH (V) POSITIVE NEGATIVE                 | COORDINATE SYSTEM (Cartesian cylindrical etc.)   | Rectangular Linearly Flowing   |
| Stater Wester  |  | Compact Region Annular Region CY   | Other  |
| COORDINATE SYSTEM (Cartesian cylindrical etc.)   | Flat Mirrors Spherical Mirrors               | KINETICS GRID DIMENSIONALITY $\langle V  angle$  | COORDINATE SYSTEM CY   |
| Compact Region Annular Region  | Cylindrical Mirors Telescopes                | 10 20 30   | FLUID GRID DIMENSION (1) 10 V 20 30  |
| TRANSVERSE GRID DIMENSIONALITY (V) 1D 2D   | Scraper Mirrors                              | Compact Region   |  |
| Compact Region   | Asicons Melasicons                           | Annular Region   | (aminar Turbulent  |
| Annular Region   | Arbitary                                     | GAIN REGION SYMMETRY RESTRICTIONS  | Other Scheduled mixing   |
| FIELD SYMMETRY RESTRICTIONS?   | Linear                                       | Gain Yary Along Optic Axes? Flow Direction?  | BASIC MODELING APPROACH ()   |
| MIRROR SHAPE(5) ALLOWED (1)  | Parabola Parabola                            | PULSED CW KINETICS MODELED   | Premised Mising V  |
| Square Circular Sino   | Company Communication                        | CHEMICAL PUMPING REACTIONS MODELED (V)   | Other (specify)  |
| Rectangular Elliptical A citrary   | Variable Core Core                           | X - Y <sub>2</sub> - YX - Y   Y   F   C1   B1   1  |  |
| CONFIGURATION FLEXIBILITY (V)  | Comment (shorting)                           | Y - K2 - YX - X  | References for Approach Used ALOS Final Report   |
| fixed Single Resonator Geometry  | Deformable Mirrors                           | Cold (f · H <sub>2</sub> )   |  |
| Fixed Multiple Resonator Geometries  | Spattal Filters Gratings                     | Hot (H • F <sub>2</sub> ) V. Chain (F · H <sub>2</sub> & H · F <sub>2</sub> )  |  |
| Modular Multiple Reson for Geometries  | Other Elements                               | Other (specify)  | A A STANCE OF THE STANCE OF TH |
| PROPAGATION TECHNIQUE  |  | AND STORY OF THE PROPERTY OF T | At these Collects would be a   |
| Fresnel Integral Algorithms  | GAIN MODELS (V) Bare Cavity Only             | vr v' Cohen  |  |
| Milt Kerin: Avetaging  | Simple Saturated Gain                        |  | Shock Tube Resistance Rester   |
| Canadian Dunftature  | BARE CAVITY FIELD MODIFIER MODELS (V)        | 7040   | Other Model Tool Tool Tool   |
|  | Mirror Tilt Decentration                     | Landy 4 V  | F ATOM DISSOCIATION FROM (V)   |
| Fast Fourier Transform (FFT)   | Aberrations / Thermal Distortions            | Other  | f <sub>2</sub> Sf <sub>6</sub>   |
| Fast Hankel Transform (FHT)  |  | Single Line Model (V)  | Other (specify) NF3  |
| Gardener Fresnel Kirchhoff (GFK)   |  | Multitine Model (V)  | F.ATOM CONCENTRATION DETERMINED FROM MODEL'  |
| Other (specify)  |  | Assumed Rotational Population Distribution State (V)   | DILUENTS MODELED He, No  |
|  | 4601 6501 9510                               | Equilibrium Y Nonequilibrium   | MODELS EFFECTS ON MIXING RATE DUE TO (1)   |
| CONVERGENCE TECHNIQUE (1)  | Ę  | Number of Laser Lines Modeled  | Nozzle Boundary Layers Shock Wayes   |
| Power Companion Field Companion  | Serrated Other                               | Source of Rate Coefficients Used in Code Handbook  | Presentions (thermal blockage)Turbylence   |
| : 5  | LOADED CAVITY FIELD MODIFIER MODELS (V.)     | of Chemical Lasers   | Other (specify) TTID   |
| ALCELERATION ALGORITHMS USED?  | Medium Indea Vanahan                         | LINE PROFILE MODELS (V.)   |  |
| رها يسام المارية   | Gav Absorption                               | Donole Broadening  |  |
| . P. F. FLILFNYALLE VEFTOREXTRACTION ALGORITHM (\$1)   | Overlapped Beams                             | Collection Broadware V   | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)   |
|  | Other  | Constitute and   | Media Index Variations   |
|  | FAR FIELD MODELS (V.) Hearn Steering Removal | (Nher (specify)  | Other (apecity)  |
|  | Optimal Focal Search Beam Quality            |  |  |
|  | Other  |  |  |
| and a second sec |  |  |  |
|  |  |  |  |

\* Equilibrium thermochemistry





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

CODE NAME:

AFOPTMNORO

| CODE TYPE: Optics and Kinetics  |  |
|---|--|
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE: Predict power specially for more detailed kinetics description.  | ctral performance of CW chemical laser. Also see   |
|   |  |
| ASSESSMENT OF CAPABILITIES: Predict power spectral distri-<br>optics code was provided by Capt. T. Salvi, AFWL/ALI<br>will predict which lines lase.  | bution for unstable and stable resonators. Strip<br>R. With rotational Nonequilibrium kinetics, code   |
|   |  |
| ASSESSMENT OF LIMITATIONS: <u>Need to include rotational no</u><br>Study.   | on-equalibrium on 1-0 band.  |
| OTHER UNIQUE FEATURES: Besides power comparison techni-<br>I(x) on all lines; it also calculates Po/Pc, where<br>available from chemistry.  | que to establish convergence, this code compares<br>Po = total optics power loss and Pc = power  |
| ORIGINATOR/KEY CONTACT:  Name: L. H. Sentman Organization: Aeronautical and Astronautical Enginee Address: Urbana, Illinois 61801   | nome:(217) 333-1834<br>ring Dept., University of Illinois  |
|   |  |
| (U) "Users Guide for Program MNORO and AFOPTMNORO,"   | ). (1) "An Efficient Rotational Monequilibrium Moc<br>kamp, TR AAE 79-5, UILU Eng 79-0505 (July 1979);<br>L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507 |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).   | ). (1) "An Efficient Rotational Monequilibrium Moc<br>kamp, TR AAE 79-5, UILU Eng 79-0505 (July 1979);<br>L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507 |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS:  | ). (1) "An Efficient Rotational Nonequilibrium Moc<br>kamp, TR AAE 79-5, UILU Eng 79-0505 (July 1979);<br>L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507 |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).   | k (T) "An Efficient Rotational Monequilibrium Moc<br>kamp, TR AAE 79-5, UILU Eng 79-0505 (July 1979);<br>L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507  |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS: Operational Currently?: Yes Under Modification?: Purpose(a):   | ). (T) "An Efficient Rotational Nonequilibrium Moc<br>kamp, TR AAE 79-5, ULLU Eng 79-0505 (July 1979);<br>L. H. Sentman, AAE TR 79-7, ULLU Eng 79-0507 |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS: Operational Currently?: YES Under Modification?: Purpose(s):  Ownership?: AFOSR Proprietary?: NO   | kamp, TR AAE 79-5, UILU Eng 79-0505 (July 1979); L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507  |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS: Operational Currently?: Yes Under Modification?: Purpose(a):  Ownership?: AFOSR Proprietary?: NO MACHINE/OPERATING SYSTEM (on which instaffed): CDC Cyber 175  | h. (T) "An Efficient Rotational Monequilibrium Moc<br>kamp, TR AAE 79-5, UILU Eng 79-0505 (July 1979);<br>L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507 |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS: Operational Currently?: Yes Under Modification?: Purpose(a):  Ownership?: AFOSR Proprietary?: NO MACHINE/OPERATING SYSTEM (on which instaffed): CDC Cyber 175  | ATT "An Efficient Rotational Monequilibrium Moc<br>kamp, TR AAE 79-5, UILU Eng 79-0505 (July 1979);<br>L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507    |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS: Operational Currently?: Yes Under Modification?: Purpose(s):  Ownership?: AFOSR Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 175  TRANSPORTABLE?: Yes Machine Dependent Restrictions:   | ATT "An Efficient Rotational Monequilibrium Moc<br>kamp, TR AAE 79-5, UILU Eng 79-0505 (July 1979);<br>L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507    |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS:  Operational Currently?: Yes Under Modification?: Purpose(a):  Ownership?: AFOSR Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 175  TRANSPORTABLE?: Yes Machine Dependent Restrictions: SELF-CONTAINED?: Yes Other Cedes Required (name, purpose):   | L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507   |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS:  Operational Currently?: Yes Under Modification?: Purpose(a):  Ownership?: AFOSR Proprietary?: NO MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 175  TRANSPORTABLET: Yes Mechine Dependent Restrictions:  SELF-CONTAINED: Yes Other Codes Required (name, purpose):   |  |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS:  Operational Currently?: Yes Under Modification?: Purpose(a):  Ownership?: AFOSR Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 175  TRANSPORTABLET: Yes Mechine Dependent Restrictions:  SELF-CONTAINED: Yes Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Small Job: 100K | L. H. Sentman, AAE TR 79-7, UILU Eng 79-0507   |
| (U) "Users Guide for Program MNORO and AFOPTMNORO," (October 1979).  STATUS: Operational Currently?: Yes Under Modification?: Purpose(s):  Ownership?: AFOSR Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 175  TRANSPORTABLE: Yes Machine Dependent Restrictions:  SELF-CONTAINED: Yes Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)                    | Execution Time (Sec. CDc 7600)   |

|     | Į |
|-----|---|
|     | j |
|     | ۱ |
| 0   | ۱ |
| ≆   | ı |
| ¥   | ı |
| 3   | l |
| ~   | ١ |
| 5   | ۱ |
| ويا | ı |
| _   | l |
|     | ł |
|     | ì |
|     |   |

| отпся  | SOL   | KINETICS   | GAS DYNAMICS                                      |
|--|---|--|---|
| BASIC TYPE (V)   | **  | GAIN REGION MODELED (V):   | NOZZLE GEOMETRY MODELED (and type) (V): NO.RE     |
| Pyrical OpticsCoornelines.   | Traveling Wave (Ning): Raverse TW:                                    | Compact Region: Y Annuisr Region:  | Cylindrical, Radiolly Flowing:                    |
| Scaler - L vector - V | BRANCH (V): Pourine: V Negative: OPTICAL ELEMENT MADELS INCLUDED (V): | COORDINATE SYSTEM (Centesian, cylindrical, etc.) Compact Resion: Cd. Annular Resion:   | Rectangular, Unearly Flowing: 4                   |
| COORDINATE SYSTEM (Cartesian, cylindrical, etc.):-   | Flat Mirrors. Spherical Mirrors:                                      | KINETICS GRID DIMENSIONALITY (V):  | Cartesian every                                   |
|  | Cylindrical Mirrors:Telescopes:                                       | 10 02 0T   | FLUID GRID DIMENSION (V): 10: 10: 10: 30: 30      |
| TRANSVERSE GRID DIMENSIONALITY (V): 10 20  | Straper Minora:   | Compact Region:  | FLOW FIELD MODELED $(V)$ :                        |
| Compact Nation   | Assemp Wations Refusions  | Annular Region:  | Laminar:Turbulant:                                |
| Annual Tagon:  | Arbitrary:  | GAIN REGION SYMMETRY RESTRICTIONS:   | Other   |
| MIRROR SHAPE(S) ALLOWED (V):   | · Parent  | Gain Very Mont Optic Asset: from Direction?  | BASIC MODELING APPROACH (V):                      |
| Square Crouler.  | Peratolo Parabolo   | CHEMICAL PUMPING REACTIONS WODELED (V):  | Other (specify).                                  |
| Nectarquiar Eliptical  | Verlable Care Offset  | 11.42 - 11.14 X F G W !  |   |
| CONFIGURATION FLEXIBILITY (V):   | Deformable Mirrors:   | <u></u>  | References for Appreach Used:                     |
| Fined. Multiple Reconstic Geometries:  | Special Physics.  |  |   |
| Modular, Multiple Resonator Geometries:  | Other Elements:   | Carrier (2) - 1 - 2 -  | ,   |
| PROPAGATION TECHNIQUE (Val mar appy); COMPACT ANNULAR  |   | ENERGY TRANSFER MODES MODELED (V): Reference   | INEMMAL ONIVER WOOGLED (V): Are Hauter:Combustor: |
| Freshel Integral Algorithms:   | GAM MODELS (V): Bare Centy Only:                                      | v.s. /   |   |
| With Karnel Averaging  | MARE CAVITY PIST D MODIFIER MODELS (A):                               |  | Other   |
| Gaussian Quadrature:   | Merce TR:   | 4.4  | FATOM DISSOCIATION FROM (V):                      |
| Fast Fearther Transform (FFT):   | Aberrations/Thermal Distortions:                                      | one Multiquentum V-1, F-atom wall recombination.   | · · · · · · · · · · · · · · · · · · ·             |
| Candente franch Lirchboth (CFI):   | Arthrey   | A STATE OF THE STA | Other (specify)                                   |
| Other (specify):   | Selected (specify):   | , V.   | ONLUENTS MODELED:                                 |
|  | Refreshing Lose:  | in Month.  | MODELS EFFECTS ON MIXING NATE DUE TO $()$ :       |
| CONVERGENCE TECHNIQUE (V):   | Output Coupler Edges: Bolled:   | Mumber of Lear Lives Medical Predicts which  | Nozzie Boundary Layers: V Shock Waves             |
| Programment / Prob Comparison:   | 5   | Junes Tase. Service fine Code. Cuben's HE/ The mate materials Hinchen's  | Provestions (Premis Bockage).                     |
| ACCELERATION ALCORTHUS USED  | Medium Index Variation:   | rotational, * ,  |   |
| Technique  | Ges Abserption:   | LIME PROPILE WODELS (V):   |   |
| multiple eigenvalue/vector extraction algorithm:( $V$ ):   | Destroyad Beants:   | Cultivas Bradaning.  | MODELS EFFECTS ON OFTICAL MODES DUE TO $(V)$ :    |
| 900  | FAR-FTELD MODELS (V): Down Specing formoral                           | Other (appendy). Voight profile  | Media Index Variations:                           |
|  | Optimal Focal Search: Beam Quality:                                   |  |   |
|  | Other   |  |   |
|  |   |  |   |

\*Relaxation data, Polanyi's pumping distribution

| ODE NAME: | ALCHRC* |
|-----------|---------|

|   |  | onator parameter selection, assess mode control.   |
|---|--|--|
| performance   | <u>oredictions for power extraction</u>  | and beam quality, set/verify design requirements.  |
|   | <del></del>  |  |
| SSESSMENT OF CA   | canable of evaluating  | any general HSURIA with reflaxicon.  |
| ISSESSMENT OF CA  | PABILITIES: VALUE III LEUTIMETTI   |  |
|   |  |  |
| SSESSMENT OF LIN  |  | symmetric model precludes resonator azimuthal  |
| perturbation  | analysis.  |  |
|   |  |  |
| THER UNIQUE FEA   |  | eled; HSURIA with reflaxicon. Axisymmetric mode  |
| competition.  | Twelve fields (combination of  | transitions and modes).  |
| RIGINATOR/KEY C   | ONTACT.  |  |
| Name:   | Phil Briggs  | Phone: (213) 884-3581  |
|   | Rockwell International-Rocketdyn   | e Division   |
|   | 6033 Canoga Ave., Canoga Park, C   |  |
|   |  | alifornia 91304  |
|   |  | /T\  |
|   | ENTATION: (T = Theory, U = User, RP = Relevant   | /T\  |
|   |  | /T\  |
| AVAILABLE DOCUMI  |  | /T\  |
| AVAILABLE DOCUMI  | ENTATION: (T = Theory, U = User, RP < Relevant   | /T\  |
| AVAILABLE DOCUMI  | ENTATION: (T = Theory, U = User, RP = Relevant   | /T\  |
| STATUS:   | ENTATION: (T = Theory, U = User, RP < Relevant    Theory   Theory   Theory   Theory    Theory   Theory   Theory   Theory   Theory    Theory   Theory   Theory   Theory   Theory    Theory   Theory   Theory   Theory    Theory   Theory   Theory   Theory    Theory   Theory   Theory    Theory   Theory   Theory    Theory   Theory   Theory    Theory   Theory   Theory    Theory    Theory   Theory  | /T\  |
| VAILABLE DOCUMI   | ENTATION: (T = Theory, U = User, RP = Relevant    Pentity: Yes  No   | /T\  |
| IVAILABLE DOCUMI  | ENTATION: (T = Theory, U = User, RP = Relevant    Pentity: Yes  No   | /T\  |
| STATUS: Operational Curr Under Modificati Purpose(s):   | ENTATION: (T = Theory, U = User, RP = Relevant    Pentity: Yes  No   | /T\  |
| VAILABLE DOCUMI  VAITUS: Operational Curr Under Modificati Purpose(s): Ownership?:  | ENTATION: (T = Theory, U = User, RP < Relevant    Theory of the second o | /T\  |
| TATUS: Operational Curr Under Modificati Purpose(a): Oumership?: Proprietary?:  | ENTATION: (T = Theory, U = User, RP = Relevant    Pently?: Yes  NO  AFWL   | PubMication): (T) various.   |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: IRCHINE/OPERATH   | ENTATION: (T = Theory, U = User, RP = Relevant    entity?: Yes ion?: No  AFWL No NG SYSTEM (on which installed): CDC Cyber  With mofification.   | PubMication): (T) various.   |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: IRCHINE/OPERATH   | entity?: Yes  ontity?: NO  AFWL  NO  NG SYSTEM (on which installed): CDC Cyber   | PubMication): (T) various.   |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: IRACHINE/OPERATH TRANSPORTABLE?: Machine Depen  | ently?: Yes  ently?: Yes  No  AFWL  No  No System (on which installed): CDC Cyber  With mofification.  dent Restrictions: Uses CDC extended co   | PubMication): (T) various.   |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATH FRANSPORTABLE?: Machine Depen   | ently?: Yes  ently?: Yes  ion?:No  AFWL  No  NG SYSTEM (on which installed): _CDC Cyber  _With mofification.  dent Restrictions: _Uses CDC extended co   | PubMication): (T) various.   |
| IVAILABLE DOCUMI  ITATUS: Operational Curr Under Modificati Purpose(e): Ownership?: Proprietary?: IACHINE/OPERATH IRANSPORTABLE?: Machine Depen ELF-CONTAINED?: Other Codes Rec | ently?: Yes  ently?: Yes  No  AFWL  No  No System (on which installed): CDC Cyber  With mofification.  dent Restrictions: Uses CDC extended co   | PubMication): (T) various.   |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: IACHINE/OPERATH (RANSPORTABLE?: Machine Depen   | ently? Yes  ently? Yes  ion? No  | PubMication): (T) various.  176  are.  try systems code (for other than P-P reflaxicon),   |
| TATUS: Operational Curr Under Modificati Purpose(s): Ownership7: Proprietary7: IACHINE/OPERATH RANSPORTABLE7: Machine Depen ELF-CONTAINED7: Other Codes Rec ax i symmetric      | ently?: Yes  ently?: Yes  ion?: No  AFWL  No  NG SYSTEM (on which installed): CDC Cyber  With mofification.  dent Restrictions: Uses CDC extended comparison of the comparison | PubMication): (T) various.  176  are.  try systems code (for other than P-P reflaxicon),   |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATH IRANSPORTABLE?: Machine Depen   | entig?: Yes  entig?: Yes  ion?: No  AFWL  No  No System (on which installed): CDC Cyber  With mofification.  dent Restrictions: Uses CDC extended compared (name, purpose): Resonator geome  far-field code.  URCES REQUIRED FOR RUNS:  Core Size (Octal   | PubMication): (T) various.  176  176  try systems code (for other than P-P reflaxicon),  Words)   Execution Time (Sec. CDC 7500) |

<sup>\*</sup> Axisymmetric Loaded Cavity HSURIA Resonator Code

| - | - | 2 |
|---|---|---|
| - | = | П |
|   | 8 | ч |
|   |   | ľ |
|   |   | ı |
|   |   | 1 |
|   |   | 1 |
|   |   | ı |
|   |   | ı |
|   |   | ı |
|   |   | 1 |
|   |   | 1 |
|   |   | • |
|   |   |   |
|   |   |   |
|   |   |   |
|   |   |   |
|   |   |   |
|   | : | : |
|   | • |   |
| • | ٠ | 2 |
|   |   | E |
|   |   |   |

| SOLIAO  | S0.  | KINETICS   | GAS DYNAMICS   |
|---|--|--|--|
| BASIC TYPE (V): Prosest OpticsGeometrical                       | RESONATOR TYPE (V): Standing Wave: Transling Wove (Ring):Raverse TW: | GAIN REGION MODELED (\$\sqrt{\psi}\$):  Compact flagion: | MOZZLE GEOMETRY MODELED (and type) (V):<br>Cylindrical Radially Flowing: |
| FIELD (POLARIZATION) REPRESENTATION (V):                        | BRANCH (V): Positive:Negative:                                       | COORDINATE SYSTEM (Canasian, cylindrical, etc.)          | Reclargatar, Linearly Flowing:   |
| Scaler Ver've   | OPTICAL ELEMENT MODELS INCLUDED (V):                                 | Compact Ragion: Annular Ragion: CV                       | Other  |
|   | Cylendrical Mirrors: Telescopes:                                     | NINE ILCS GRID DIMENSIONALITY (V.):                      | COORDINATE SYSTEM: FLUID GRID DIMENSION (V): 10: - 20: 30:               |
| TRANSVERSE GRID DIMENSIONALITY (V): 10 20                       |  | Compact Region:  | FLOW FIELD MODELED (V):  |
|   | Anienes Nefericone Nefericone  | Annater Region: ( )                                      | One: Scheduled mixing  |
| FIELD SYMMETRY RESTRICTIONS? AXISYMMETRIC                       |  | Gain Yary Along Optic Asset: Flow Direction?             | BASIC MODELING APPROACH (V):   |
| Square CrouterCrouterStrp                                       | Parabelle, Parabold:   | PULSED: CW: V KINETICS MODELED                           | Premised:  |
| Rectangater Eliphost Arbitrary:                                 | Variable Cone Office:  | X x y 2 - x x - y X E G   6e   1                         | Office (appear)  |
| CONFIGURATION FLEXIBILITY (V): Fuest, Single Resolute Germetry. | Defermeble Mirrors   | ~  | References for Approach Used: ALOS Final Report                          |
| Fixed, Bullyte Beconster Geometries.                            | Special Fibers:  | Het (N + F.s): X Chain (F + N - & H + F.s): Y            |  |
|   | Other Sements:   | Other (specify):   | THERMAL DRIVER MODELED (V):  |
| PROPAGATION TECHNIQUE CONTINUE ADDIVI, COMPACT ANNULAN          | GAIN MODELS (V): Base Centro cort:                                   |  | Arc Heater:Combustor:  |
| With Stored foresping   | Simple Schurched Gain:   | 11.  | Shock Tube: Resistance Heater:   |
| Gaussian Quedrature   | Æ  | vv. / Cohen  | over No. modeled   |
| Fact Faurier Transform (FFT)                                    | Mirror Tilt: Decembration:   |  | FACTOR DISSOCIATION FROM (V):  |
| Fast Handel Transform (PMT):                                    | Mercen, Therm Both (radial only)                                     | Single Line Model (V):                                   | Other (specify): NE  |
| Continue franct Historia (CFI):                                 | Selected (specify):  | Mutation Model (V):                                      | F-ATOM CONCENTRATION DETERMINED FROM MODEL: *                            |
| Annatar   | Reflectivity Loss:   | Assumed Rotational Population Distribution State (V):    | MODELS EFFECTS ON MIXING RATE DUE TO (V):                                |
| CONVERGENCE TECHNIQUE (V):                                      | 3  | Number of Lear Unes Modeled: < 12                        | Hozde Boundern Leyers:Sheck Words:                                       |
| Power Companious:   | LOADED CAVITY FIELD MODFIER MODELS (V):                              | Source of Rate Coefficients Used in Code. Handbook       | Presections (thermal blockage):Turbulence:<br>Other (seecity):Trip       |
| ACCELERATION ALGORITHMS USED?:                                  | Medium Index Variation: / Radial only                                | of Chemical Lasers                                       |  |
| Technique   |  | Doppler Bradening:                                       |  |
| multiple eigenvalue/vector extraction algorithm:{V}: Pure:      | Other:   | Californal Broadening:                                   | MODELS EFFECTS ON OPTICAL MODES DUE TO (V):                              |
|   | MODELS (V):  | Other (specify):   | Other (specify)  |
|   | Optimal Focal Search: Beam Quality:                                  |  |  |
|   | Other  |  |  |
|   |  |  |  |

\*Equilibrium thermochemistry

| CODE NAME: | ALCRRC* |  |
|------------|---------|--|
|            |         |  |

|  | Optics, Kinetics, and Gasdynamics   |  |
|--|---|--|
| PRINCIPAL PURPOSE  | S)/APPLICATION(S) OF CODE: Resonator  | parameter selection, assess mode control, performance  |
|  | or power and beam quality, set/ve   | erify design requirements.   |
|  |   |  |
|  |   |  |
| ASSESSMENT OF CAP  | ADIENTIES.  | general ring geometries with independently specified   |
| <u>reflaxicons.</u>  |   |  |
|  |   |  |
| ASSESSMENT OF LIMI   | TATIONS: Axisymmetric model pro   | ecludes resonator azimuthal perturbation analysis.   |
|  |   |  |
| other unique feati<br>branch. Axis   | unes: Resonator geometries mode<br>ymmetric mode competition, 5 gain  | eled: ring resonator with reflaxicon positive/negiting sheets. Twelve fields (combination of transitions |
| and modes).  |   |  |
| ORIGINATOR/KEY COI   | NTACT:  | (010) 004 0053   |
| Name:  | Phil D. Briggs  | Phone: (213) 884-3851  |
| Organization:  | Rockwell International, Rocketo   |  |
| Addrees:   | 6633 Canoga Ave., Canoga Park,  | California 91304   |
|  |   | Heation): (1) various.   |
|  |   |  |
|  |   |  |
|  | No  |  |
| Operational Currer   | D - 2 42 4  |  |
| Operational Currer<br>Under Modification   | Being developed.  |  |
| Operational Currer   | Being developed.  |  |
| Operational Currer<br>Under Medification<br>Purpose(s):  | Being developed.  |  |
| Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?:   | Being developed.  AFML No   |  |
| Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING   | AFML No. a SYSTEM (on which installed):CDC_Cyber_   |  |
| Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING   | AFML No. a system (on which installed):CDC Cyber With modification.   | 176  |
| Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING   | AFML No. a SYSTEM (on which installed): CDC Cyber With modification.  | 176  |
| Operational Currer Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depends                                    | APML No. a system (on which installed):CDC Cyber With modification. and Restrictions:Uses CDC extended con  | 176<br>re.   |
| Operational Currer Under Modification Purpose(s):  | AFML No. a SYSTEM (on which installed): CDC Cyber With modification.  | 176<br>re.   |
| Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depends BELF-CONTAINED?: Other Codes Requ | AFML No a system (on which installed):CDC Cyber With modification.  on Restrictions:Uses CDC extended con   | 176<br>re.   |
| Operational Currer Under Modification Purpose(s):  | AFML NO.  a system (on which installed): CDC Cyber With modification. and Restrictions: Uses CDC extended con fired (name, purpose): Axisymmetric fail  | 176  re.  r-field code.  |
| Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Requ                    | AFML No. a system (on which installed):CDC_Cyber_ With modification.  we Restrictions:Uses_CDC_extended_con  fired (name, purpose):Axisymmetric_falled  RCES_REQUIRED FOR RUNS:                                 | re. refield code. refield code. refield code. refield code. refield code.                                |
| Operational Currer Under Modification Purpose(s):  | AFML No. a system (on which installed):CDC_Cyber With modification. and Restrictions:Uses_CDC_extended_con fred (name, purpose):Axisymmetric_fal  NCES REQUIRED FOR RUNS: Core Size (Octat We 200K_SCM-200K_LCM | 176  re.  r-field code.  |

<sup>\*</sup> Axisymmetric Loaded Cavity Ring Resonator Code

| Oddy 18 | MANAGER |
|---------|---------|
| DA PAGE |         |

| OPTICS   | SOI  | KINETICS  | GAS DYNAMICS   |
|--|--|---|--|
| `  | RESONATOR TYPE (V): Standing Wave:                               | GAIN REGION MODELED (V):  | NOZZLE GEOMETRY MODELED (and type) (V):                      |
| Physical Optics V Geometrical                            | Traveling Wave (Ming): -X_Reverse TW:                            | Compact Region:Annular Region:  | Cylindrical Radially Flowing:                                |
| Scalar / Worter  | DITION (V): POLITY:NOGETHE:                                      | COORDINATE SYSTEM (Carlesian, cylindrical, stc.) Compact Region: Annular Region: CV | Reclanguler, Linearly Flowing.                               |
| COORDINATE SYSTEM (Carressen, cylindrical, etc.):-       | Flat Mirrors: Y Spherical Mirrors:                               | KINETICS GRID DIMENSIONALITY (V):   | COMMUNICATION CV   |
| Compact Region CV Annater Region: CV                     | Cylindrical Mirrors:Telescopes:                                  | 10 20 30  | FLUID GRID DIMENSION (V): 10. 120. 30.                       |
| TRANSVERSE GRID DIMENSIONALITY (V): 1D 2D                | Scraper Mirrors:   | Compact Region:   | FLOW FIELD MODELED $\langle V \rangle$ :                     |
| Compact Region   | Azicons Reflaxicons  | Annular Region:   | Leminar:Turbulent:   |
|  | Arbitrary:   | GAIN REGION SYMMETRY RESTRICTIONS:  | ower Scheduled mixing  |
| FILLD SYMMETRY RESTRICTIONS? AXISYMBELL'I.C.             | Linear   | Gain Vary Along Optic Aues?: Flow Direction?  | BASIC MODELING APPROACH (V):                                 |
| Square Coroller Strip:                                   | Parabola-Parabola:   | PULSED: CW: Y KINETICS MODELED  | Promised.  |
|  | Variable Cone Offset:  | (x · y = · x · v · v)   | Other (specify):   |
| CONFIGURATION FLEXIBILITY (V):                           | Other (specify): P-P tanh  | =   | References for Appendix Hand ALOS Final Report               |
| Frank, Single Resonator Geometry                         | ۱ <u>۰</u>   | Cond (f · H <sub>2</sub> ).   |  |
| Fraed, Multiple Resonator Germetries                     | Special Filters: Greings:  | Hot (H + F2): V Chain (F + H2 & H + F2):  |  |
| Medular, Multiple Recordor Geometries                    | Other Elements:  | Other (specify):  | THERMAL DRIVER MODELED (V):                                  |
| PROPAGATION TECHNIQUE IN STREET COMPACT ANNULAN          |  | 5   | Arc Haster:Combustor:  |
| French Hanges Agenthems.                                 | Strate Strates Gain: Outside Gain:                               | v.t. V Cohen  | Shock Tube: Resistance Henter:                               |
| Purity Service Average Services                          | 1 7  |   | one: Not modeled   |
| Gaussian Quadrature                                      | Mrror Tit:   | ww. Z Cohen   | F-ATOM DISSOCIATION FROM (V):                                |
| Fact Squrar Transform (FFT):                             | Aberrations/Thermal Distortions:                                 | Other   | 12 / 36 - / 1  |
| Fact Number Transform (FHT)                              | Arthur: / - Axisymmetric   | Single Line Model (V):  | Other (apacity): NF 3  |
| Gardener-Freenst Krichhelf (GFR):                        | Selected (specify):  | Multiline Model (V):  | F.ATOM CONCENTRATION DETERMINED FROM MODEL?                  |
| Other (specify) MIGDOINE TUIE:                           | Reflectivity Loss:   | Assumed Rotational Population Distribution State (V):                               | MODELS EFFECTS ON MINING RATE DUE TO (V):                    |
| Commerce Commerce  | Output Coupler Edges: Rolled:                                    | Equilibrium: 1 Nonequilibrium:  | Nozzła Boundary Layers: Y Shock Waves                        |
| CONVENIENCE TECHNIQUE (V):                               | Serrated: Other:   | Number of Laser Lines Modeled: < 12   | Presections (thermal blockage): Turbulence:                  |
|  | LOADED CAVITY FIELD MODIFIER MODELS ( $oldsymbol{V}$ ):          | Source of Rate Coefficients Used in Code: Handbook                                  | i  |
| ACCELERATION ALCORITHMS USED: NODE                       | Medium Index Variation: V - Axisympletric                        | or chemical Lasers  |  |
| Technique  | Gas Absorption: / - Axisymmetric                                 | LINE PROFILE MODELS (V):  |  |
| multiple eigenvalue/vector extraction algorithm ( $V$ ): | Overtapped Beems:  | Dopper Bradening:   | models effects on oftical modes due to $\langle V \rangle$ : |
| Premy  | Other  | China (see the )  | Medie Index Variations:                                      |
| Office .   | FAR-FIELD MODELS (V): Been Searing Remoral: Omitmel Focal Search |   | Other (specify):   |
|  |  |   |  |
|  |  |   |  |
|  |  |   |  |

\*Equilibrium thermochemistry

The Paris

|   | E(s)/APPLICATION(s) OF COD<br>Type. (See also GIM  |  | cally pumped mixing laser system, even electroni  |
|---|--|--|---|
| SSESSMENT OF C  | APABILITIES: 2-D parat   | polic reactive, visc   | ous flow code. TKE turbulence (2-equation).   |
| (Similar to   | APACHE, except not   | time-dependent).   |   |
| ASSESSMENT OF LI<br>Optics packa  | miinique   | odel dP/dY in subson   | ic flows. Contains only Fabry-Perot (geometric)   |
| THER UNIQUE FEA   | 110000   | t and cold HF and DF   | kinetics, it also models 3 body recombination   |
| Organization:   |  | Laboratory   | hone: (505) 844-9836  |
| Address: .  | AFWL/ARAC, Kirtlar   | nd AFB, New Mexico 8   |   |
| AVAILABLE DOCUM   |  |  | /11/<br>n): (T)(U) AFWL-TR-78-19  |
|   |  |  |   |
| STATUS:   | ENTATION: (T = Theory, U =   |  |   |
| STATUS:<br>Operational Cur  | ENTATION: (T = Theory, U =   |  |   |
| STATUS:   | rently?: Yes   |  |   |
| Operational Cur<br>Under Modifical<br>Purpose(s):<br>Ownership?:<br>Produktare?.  | rently?: Yes tion?: No  U.S. Government  | User, RP = Relevant Publication  | n): (T)(U) AFWL-TR-78-19  |
| Operational Cur<br>Under Modifical<br>Purpose(s):<br>Ownership?:<br>Produktare?.  | rently?: Yes tion?: No  U.S. Government No  NG SYSTEM (on which installed  | User, RP = Relevant Publication  |   |
| Operational Cur Under Modifical Purpose(a):  Ownership?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?:  | rently?: Yes tion?: No  U.S. Government No  NG SYSTEM (on which installe   | User, RP = Relevant Publication  d): CRAY Cyber-176 .                      | n): (T)(U) AFWL-TR-78-19  |
| Operational Cur Under Modifical Purpose(s):  Demorship?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?: Machine Deper                                | rently?: Yes  U.S. Government No  Wes  Yes  which installe  Yes  whent Restrictions: None  | User, RP = Relevant Publication  CRAY Cyber-176                            | CDC-7600, CDC-6600, IBM-370   |
| Operational Cur<br>Under Modifical<br>Purpose(s):<br>Demorship?:<br>Proprietary?:<br>MACHINE/OPERATI<br>TRANSPORTABLE?:<br>Machine Deport           | rently?: Yes  U.S. Government No  Wes  Yes  which installe  Yes  whent Restrictions: None  | User, RP = Relevant Publication  d): CRAY Cyber-176 .                      | CDC-7600, CDC-6600, IBM-370   |
| Department Cur Under Modificat Purpose(s):  Department Proprietary?:  Proprietary?:  MACHINE/OPERATI TRANSPORTABLE?:  Machine Depart Other Codes Re | rently?: Yes tion?: No  U.S. Government No  No  No  Yes tionRestrictions: None   | User, RP = Relevant Publication  dy:CRAY . Cyber-176 ,  DYNDIM for dynamic | CDC-7600, CDC-6600, IBM-370   |
| STATUS: Operational Cur Under Modifical Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?: Machine Deper                         | rentby?: Yes tion?: No  U.S. Government No  NG SYSTEM (on which installe Yes ndent Restrictions: None No quired (name, purpose):  URCES REQUIRED FOR RUNS: 65K | User, RP = Relevant Publication  d):CRAY . Cyber-176 .  DYNDIM for dynamic | CDC-7600, CDC-6600, IBM-370  dimensioning. Not necessary on CRAY  Execution Time (Sec. CDC 7600)  15 sec. |
| STATUS: Operational Cur Under Modifical Purpose(s):  Ownership?:  | rently?: Yes tion?: No  U.S. Government No  No SYSTEM (on which installe Yes ndent Restrictions: None No Quired (name, purpose):                               | User, RP = Relevant Publication  d):CRAY . Cyber-176 .  DYNDIM for dynamic | CDC-7600, CDC-6600, IBM-370  dimensioning. Not necessary on CRAY  Execution Time (Sec. CDC 7600)          |

CODE NAME:

|   | <b>OPTICS</b> None   | KINETICS   | GAS DYNAMICS   |
|---|--|--|--|
| BASIC TYPE (V) Physical OpicsGeometrical  | RESONATOR TYPE (V): Standing Wave: Traveling Wave (Ming): Reverse TW:            | GAIN REGION MODELED (V): Compact Ragion: / Annular Ragion: /                         | NOZZLE GEOMETRY MODELED (and type) (V): Cylindrical, Radially Flowing: |
| FIELD (POLAMIZATION) REPRESENTATION (V):  | BRANCH (V): Pusitive: Negative: OPTICAL ELEMENT MODELS INCLUDED (V):             | COORDINATE SYSTEM (Cartesian, cylindrical, etc.) Compact Region: V Annular Region: V | Rectangular, Linearly Flowing: /                                       |
| COORDINATE SYSTEM (Cartesian, cylindrical, etc.);:<br>Compact Regon Arnular Region      | Flat Mirrors: Spherical Mirrors: Cylindrical Mirrors: Telescopes:                | KINETICS GRID DIMENSIONALITY (V):  | 1.21   |
| TRANSVERSE GRID DIMENSIONALITY (V): 1D 2D Compact Repon.                                | ·  |  | FLUID GRID DIMENSION (V): 10:  |
| Annuar Ingion:  | Authors Arbitrary:   | Annular Ragion: 7 GAIN REGION SYMMETRY RESTRICTIONS:                                 | Other:   |
| PIELD STWINE NY RESTRICTIONSS:  MIRROR SHAPE(S) ALLOWED (V):  Square — Gredder — Steip: | Unear:<br>Parabola-Parabola:   | Gain Vary Along Optic Asset: Flow Direction?   | BASIC MODELING APPROACH (V): Premised:Mining:                          |
| 1 2   | Variable Cone Office:<br>Other (specify):  |  | Other (specify): V   |
| Fixed. Single Resonator Geometry:   | Defermable Mirrors: Spetial Filters: Grabings:                                   | Cald (F + H <sub>2</sub> )   | References for Approach Used:  |
| Modular. Multiple Resonator Geometries:   | Other Bements:   | one (nestly): 3-body recombination   | THERMAL DRIVER MODELED (V):  |
| French Prograf Agorithms.   |  | ENERGY TRANSFER MODES MODELED (V): Reference v.t. / Keber and Hough                  | Are Master: Contbustor:  |
| With Kennel Averaging<br>Gaussian Quadrature  | Simple Selected Gahr   | , , , , , , , , , , , , , , , , , , ,  | Other  |
| Past Fourier Transform (FFT):   | Mirror TR:   |  | F-ATOM DISSOCIATION FROM (V):  |
| Gardener French Kirchhoff (GFI):  | Arbking:   | Single Line Model (V):   | Other (specify):  F.ATOM CONCENTRATION DETERMINED FROM BOT             |
| Other (specity):  | Serviced (appoint):  | Assumed Rotational Population Distribution State ( $V_i$ :                           | DILUENTS MODELED: MODELS EFFECTS ON MITTING BATE DIE TO (V)            |
| CONVERGENCE TECHNIQUE (V):  | Output Coupler Edges: Rolled:  | Equilibrium:Nemequilibrium:Number of Leser Lines Nodesed:                            | Nozzle Boundary Layers: Y Shock Weres: Y                               |
|   | LOADED CAVITY FIELD MODIFIER MODELS (V):   | Source of Rate Coefficients Used in Code: COhen                                      | Other (specify):   |
| ACCELERATION ALGORITHMS USED?   | Medium Index Variation:  | LINE PROFILE MODELS (V):   |  |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM: (V):                                   | Overlapped Bearns:   | Doppier Broadening:  | MODELS EFFECTS ON OPTICAL MODES DUE TO (V):                            |
| Oher.   | FAR-FIELD MODELS (V): Beam Steering Remores: Optimel Focal Search: Beam Quality: | Other (upacify): Voight  | Other (specify):   |
|   | Other  |  |  |
|   |  |  |  |

At MODES DUE TO (V):

rtesian & cylindrica

APACHE\_\_\_\_

| CODE TYPE: Kine   | LICS   |   |  |      |
|---|--|---|--|------|
| PRINCIPAL PURPOSE(S)//<br>transition type   | APPLICATION(S) OF (  | CODE: Models any chemic   | ally pumped mixing laser system, even electr                         | onic |
|   |  |   |  |      |
| <del></del>   |  |   |  | _    |
| ASSESSMENT OF CAPABIL<br>Similar to ALFA,   |  |   | scous flow code. TKE turbulence (2-equation                          | ).   |
| ASSESSMENT OF LIMITAT   | nons: Conta  | ins only Fabry-Perot  | qeometric) optics packages.  |      |
|   | . Besides h  | ot and cold HF and DF   | reactions, it also models 3-body recombinati                         | on   |
| THER UNIQUE FEATURE  H + F + M → H  | ~  |   |  |      |
| RIGINATOR/KEY CONTAI  | ct:  |   | 1505) 844-9836   |      |
| Organization: Af  | r Force Weapo  | ns Laboratory   |  |      |
|   |  | land AFB, New Mexico 8  |  |      |
| VAILABLE DOCUMENTAT   | NON- /T Theory II  |   | (T)(II) 1 ACL - I A 7A27   |      |
|   | 1011. (1 - 11 <b>1601)</b> , O   | = User, RP = Relevant Publicatio  | (T)(U) LASL-LA 7427  |      |
|   |  | = User, RP = Relevant Publicatio  | n: (T)(U) LASL-LA 7427   |      |
|   | 1100.(1 - 1110.19; 0   | = User, RP = Relevant Publicatio  | 1): (T)(U) LASL-LA 7427  | _    |
|   |  | = User, RP = Relevant Publicatio  | 1): (T)(U) LASL-LA 7427  |      |
|   | Total (1 - Thous, o  | = User, RP = Relevant Publicatio  | n: (T)(U) LASL-LA 7427   |      |
|   | The state of the s | = User, RP = Relevant Publicatio  | n): (T)(U) LASL-LA 7427  |      |
|   |  | = User, RP = Relevant Publicatio  | n): (T)(U) LASL-LA 7427  |      |
|   |  | = User, RP = Relevant Publicatio  | 1): (T)(U) LASL-LA 7427  |      |
|   | Yes  | = User, RP = Relevant Publicatio  | 1): (T)(U) LASL-LA 7427  |      |
| TATUS:  | Yes  | = User, RP = Relevant Publicatio  | 1): (T)(U) LASL-LA 7427  |      |
| TATUS:<br>Operational Currently?  | Yes  | = User, RP = Relevant Publicatio  | n): (T)(U) LASL-LA 7427  |      |
| TATUS:<br>Operational Currently?<br>Under Madification?: _  | Yes  | = User, RP = Relevant Publicatio  | n): (T)(U) LASL-LA 7427  |      |
| TATUS:<br>Operational Currently?<br>Under Modification?:<br>Purpose(s):   | Yes No   | = User, RP = Relevant Publicatio  | n): (T)(U) LASL-LA 7427  |      |
| Operational Currently? Under Modification? _ Purpose(s):  Comerchip?:   | Yes  | = User, RP = Relevant Publicatio  | n): (T)(U) LASL-LA 7427  |      |
| Operational Currently? Under Modification?:  Purpose(s):  Ownership?:  V. S.  Proprietary?:  No.  | Yes<br>No  |   |  |      |
| Operational Currently? Under Modification?:  Purpose(s):  Ownership?:  V. S.  Proprietary?:  No.  | Yes<br>No  |   | ; (T)(U) LASL-LA 7427  |      |
| Operational Currently? Under Modification?: Purpose(s):  Ownership?: Proprietary?:NO  IACHINE/OPERATING SY  | Yes No Government  |   |  |      |
| Operational Currently? Under Modification?: Purpose(s):  Ownership?: Proprietary?:NO  IACHINE/OPERATING SY  | Yes No Government STEM (on which insta   |   |  |      |
| Operational Currently? Under Modification?: Purpose(s): Ownership?: U.S. Proprietary?: NO. RACHINE/OPERATING SY TRANSPORTABLE: Mechine Dependent R  | Yes No Government STEM (on which insta   | olled):CRAY, Cyber-17   |  |      |
| Operational Currently? Under Modification?: Purpose(s): Ownership?: Proprietary?: NO NACHINE/OPERATING SY TRANSPORTABLE: Machine Dependent R  | Yes No  Government  STEM (on which instatives Yes Lestrictions: No   | one   |  |      |
| Operational Currently? Under Modification?: Purpose(s):  Demorphip?: NO IACHINE/OPERATING SY TRANSPORTABLE?: Mechine Dependent R  ELF-CONTAINED?: Other Cedes Required  | Yes No Government STEM (on which insta Yes lestrictions: No (name, purpose):   | One  DYNDIM for dynamic of the state of the | S, CDC-7600, CDC-6600, IBM-370  Simensioning. Not necessary on CRAY. |      |
| Operational Currently? Under Modification?: Purpose(s): Ownership?: Proprietary?: NO RACHINE/OPERATING SY TRANSPORTABLE: Mechine Dependent R ELF-CONTAINED?: Other Cedes Required   | Yes No Government STEM (on which insta Yes lestrictions: No (name, purpose):   | ONDIM for dynamic of  | 5, CDC-7600, CDC-6600, IBM-370                                       |      |
| Operational Currently? Under Modification?: Purpose(s):  Oemership?: U.S. Proprietary?: NO.  RACHINE/OPERATING SY  TRANSPORTABLE: Mechine Dependent R  ELF-CONTAINED?: Other Codes Required  STIMATE OF RESOURCES  Small Job: | Yes No Government STEM (on which insta Yes lestrictions: No (name, purpose):   | One  DYNDIM for dynamic of the state of the | inensioning. Not necessary on CRAY.  Execution Time (Sec. CDC 7600)  |      |
| DIATUS: Operational Currently? Under Modification?: Purpose(s):  Ownership?: NO AACHINE/OPERATING SY TRANSPORTABLET: Mechine Dependent R SELF-CONTAINEDT: Other Cedes Required  | Yes No No Government STEM (on which insta Yes lestrictions: No (name, purpose):  | One  DYNDIM for dynamic of the state of the | S, CDC-7600, CDC-6600, IBM-370  Simensioning. Not necessary on CRAY. |      |

|  | Ī |  |
|--|---|--|
|  |   |  |
|  | į |  |

| OPTICS   | lcs None                                    | KINETICS  | GAS DYNAMICS  |
|--|---|---|---|
| BASIC TYPE (V)   | RESONATOR TYPE (V): Standing Wave:          | GAIN REGION MODELED (V):                              | NOZZLE GEOMETRY MODELED (and type) ( $ar{m{V}}$ ):  |
| Physical OpticsGeometrical                                 | Traveling Wave (Ring): Reverse TW:          | Compact Region: Annular Region:                       | Cylindrical, Radiatly Flowing V   |
| FIELD (POLARIZATION) REPRESENTATION (V):                   | BRANCH (V): Positive: Negative:             | COORDINATE SYSTEM (Cartesian, cylindrical, etc.)      | Rectangular, Linearly Flowing   |
| Scalar Vactor  | z   | Compact Region. Y Annular Region.                     | Other   |
| COORDINATE SYSTEM (Cartesian, cylindrical, etc.);          | <u>.</u>                                    | ⋖₽  | COORDINATE SYSTEM Cartesian & Cylindrical   |
|  | Cytindrical Whitons:Telescopes:             | 10 20 30  | FLUID GRID DIMENSION (V): 10. 20: 7 30 7  |
| TRANSVERSE GRID DIMENSIONALITY (V): 10 20                  | Scraper Mirrora:                            | Compact Region:                                       | FLOW FIELD MODELED (V):   |
| Compact region.  | Axicons Nathanicons                         | Annular Region:                                       | Doring Jahino   |
| Annular Region:  | Arbitrary                                   | GAIN REGION SYMMETRY RESTRICTIONS:                    | Oher The County of the County |
| FIELD SYMMETRY RESTRICTIONS:                               | Linear:                                     | Gain Vary Along Optic Ares? Y Flow Direction?         | BASIC MODELING APPROACH (V)   |
| Square Credit Strip  | Parabola-Parabola:                          | PULSED: V CW: V KINETICS MODELED                      | Premised:Mitung:  |
| Elliptical   | Variable Cone Offset:                       | (x · y = xx · y)                                      | Onet (abecas)   |
| ʹ;;  | Other (specify):                            | 1 2   | Defendences for Ambriach Used   |
| Fixed. Single Resonator Geometry.                          | Deformable Mirrora:                         | 2 3 200   |   |
| Fixed, Multiple Resonator Geometries:                      | Spatial Filters: Gratings.                  | Chain (f · )  |   |
| Modular, Multiple Resonator Geometries.                    | Other Elements:                             | Other (apacity): 3-body recombination                 | THERMAL DRIVER MODELED (V)  |
| PROPAGATION FECHNIQUE IN AN INTER SERVICE COMPACT ANNUITAR |   | ENERGY TRANSFER MODES MODELED (V): Reference          | Arc Heater Combustor  |
| Fresnet Integral Agorithms.                                | -   | V. V Kerber and Hough                                 |   |
| With Kernel Averaging                                      | Simple Saturated Gain: Detailed Gain:       | * # *   | Other   |
| Gaussian Quadrature:                                       | BARE CAVITY FIELD MODIFIER MODELS (V):      | V.V /   | F-ATOM DISSOCIATION FROM (V):   |
| Fast Fourier Transform (FFT):                              | Mirror Tiff:Decentration:                   | Other   | F25f6   |
| Fast Hankel Transform (FHT):                               | Aberrations/Thermal Distortions:            | Single Line Model (V)                                 | Other (specify):  |
| Gerdener Franck Kirchhoff (GFK)                            | Montely                                     | Multiline Model (V):                                  | F.ATOM CONCENTRATION DETERMINED FROM MODEL?   |
| Other (specify):   | Consiste (epicons):                         | Assumed Rotational Population Distribution State (V): | DILUENTS MODELED:   |
|  | Reflectivity Loss:                          | Equitibrium: V Nonequilibrium:                        | MODELS EFFECTS ON MIXING RATE DUE TO (V)  |
| CONVERGENCE TECHNIQUE (V):                                 | Output Coupler Edges: Rolled:               | Number of Leser Lines Modeled: ARV                    | Nozzie Boundary Layers: Shock Waves.  |
| Power Comparison:fletd Comparison:                         | Serieted:                                   | Source of Rate Coefficients Used in Code: ConP.       | Presections (thermal blockage)Turbulence  |
| Other  | LOADED CAVITY FIELD MUDIFIER MODELS (V)     |   | Other (specify)   |
| ACCELERATION ALGORITHMS USED?                              | Medium Index Variation                      | LINE PROFILE MODELS (V)                               |   |
| Technique  | Gas Absorption:                             | Doppler Broadening                                    |   |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM:(V):       | Overlapped Beams                            | Collectoral Broadening                                | MODELS EFFECTS ON OPTICAL MODES DUE TO (V):   |
| Profit   | FAR-FIELD MODELS (V): Beam Steering Removal | other (specify) Voight                                | Other (specify)   |
|  | Optimal Focal Search: Beam Quality:         |   |   |
|  | Other                                       |   |   |
|  |   |   |   |

| CODE NAME: | BAREPL |
|------------|--------|
|            |        |

|   | Optics  |  |  |          |                            |                                |                               |                           |
|---|---|--|--|----------|----------------------------|--------------------------------|-------------------------------|---------------------------|
| Half-Symme  | tric Unstai   | ble Resona   | tor with an                            | Interna  | Resonator (<br>1 Axicon (H | ode. The code<br>URIA). Perfor | was designed<br>mance predict | to model a<br>ion for bea |
| 3   |   |  |  |          |                            |                                |                               |                           |
| ASSESSMENT OF O   | CAPABILITIES:   | General  | field modif                            | iers. M  | tirror misal               | gnment, misfig                 | ure, struts,                  | deformable                |
| ASSESSMENT OF   | LIMITATIONS   | Half-pla   | ne symmetry                            | restric  | ted to HSUR                | A, axisymmetri                 | c or 3-D calc                 | ulation.                  |
| OTHER UNIQUE FI<br>General fi   |   |  |  |          |                            | table P-P waxi                 |                               | ing).                     |
| DRIGINATOR/KEY<br>Name:<br>Organization:<br>Address:<br>RVAILABLE DOCU  | Rocketdy<br>6633 Can  |  |  | , Califo | /= \ /                     |                                | resonator co                  | ode.                      |
|   |   |  |  |          |                            | Dule cavicy                    |                               |                           |
|   |   |  |  |          |                            | - D date cuvicy                |                               |                           |
| STATUS:<br>Operational Co   |   | s  |  |          |                            | - D date curry                 |                               |                           |
|   | ation?: No  | S  |  |          |                            | - buile cavily                 |                               |                           |
| Operational Co<br>Under Modific<br>Purpose(s<br>Ownership?:<br>Proprietary?:  | AFWL  |  | i);CDC Cybe                            | er 176   |                            | - buile cavity                 |                               |                           |
| Operational Ci Under Modific Purpose(s  Ownership): Proprietary): MACHINE/OPERA   | AFWL NO   | n which installe   | .,                                     |          |                            | - buile cavity                 |                               |                           |
| Operational Ci Under Modific Purpose(s  Ownership?: Proprietary?: MACHINE/OPERA  TRANSPORTABLE Machine Dep              | AFWL NO TING SYSTEM (o 7: Yes (w                              | n which installe<br>ith modifi<br>ns: Uses C<br>onator geo | cation)<br>DC extended                 | core.    |                            | han P-P reflax                 |                               | r-field code              |
| Operational Ci Under Modific Purpose(s  Ownership?: Proprietary?: MACHINE/OPERA TRANSPORTABLE Machine Dep Other Codes R | AFWL NO TING SYSTEM (o 7: Yes (w endent Restrictio 7: No, res | n which installed ith modifies. Uses Conator geo           | cation)<br>DC extended<br>metry system | core.    | (for other                 | han P-P reflax                 |                               | r-field code              |
| Under Modific Purpose(s  Ownership): Proprietary): MACHINE/OPERA TRANSPORTABLE Machine Dep                              | AFWL NO TING SYSTEM (o 7: Yes (w endent Restrictio 7: No, res | n which installed ith modifies. Uses Conator geo           | cation)<br>DC extended                 | core.    | (for other                 |                                |                               | r-field code              |

| 1    |
|------|
| 긺    |
| BARE |
| -    |

| OPTICS   | cs   | KINETICS  | GAS DYNAMICS   |
|--|--|---|--|
| BASIC TYPE (V)   | RESONATOR TYPE (V): Standing Wave  | GAIN REGION MODELED (V): None   | NOZZLE GEOMETRY MODELED (and type) (V) NONE  |
| Physical Oplics V Geometrical  | Traveling Wave (Ring): Reverse TW  | Compact Region: Annular Region  | Cylindrical, Redually Flowing  |
| FIELD (POLARIZATION) REPRESENTATION (V):   | BRANCH (V): Positive: / Negative   | COORDINATE SYSTEM (Centesian, cylindrical, etc.)                            | Rectangular Linearly Flowing   |
| Scalar V Vector  | OPTICAL ELEMENT MODELS INCLUDED $(f V)$ :  | Compact Region Annular Region   | Parties of the second s |
| COORDINATE SYSTEM (Cartesian cylindrical etc.)   | Flat Mirrors Spherical Mirrors   | KINETICS GRID DIMENSIONALITY ( $oldsymbol{V}$ ):                            | COORDINATE SYSTEM  |
|  | Cylindrical Mirrors  | 1D 2D 3D  | FLUID GRID DIMENSION (V): 10 20 30   |
| TRANSVERSE GRID DIMENSIONALITY (V): 1D 2D  | Scraper Mirrors:   | Compact Ragion:   |  |
| Compact Region.  | Axicons Reflaxicons  | Annular Region:   | Laminar:Turbulant:   |
| Annular Region   | Arbitrary /*   | GAIN REGION SYMMETRY RESTRICTIONS:  | Other  |
| FIELD SYMMETRY RESTRICTIONS?   | Linear   | Gain Vary Along Optic Axes? Flow Direction?                                 | BASIC MODELING APPROACH $(V)$ :  |
| ŝ.   | Parabola-Parabola:   | PULSED: CW: KINETICS MODELED  | PremisedMixing   |
| Square Circles Strip.  | Variable Core Offset:  | IG REACTIONS MODELED ()   | Other (specify):   |
|  | Other (specify):   |   |  |
| Fired Strate Resource Geometry   | Deformable Mirrors:  | <u>~</u>  | References for Approach Used   |
| Fixed Multimie Beconside Geometries  | Spetial Filters: Gratings:   | 1   |  |
|  | oner Bennens: Corner cube by using   | Hat (H · F <sub>2</sub> ): Chain (F · H <sub>2</sub> & H · F <sub>2</sub> ) |  |
| שמעותה בפסטיים הפסטיים האווחסיים האו | general field modifier to model.   | Other (specify):  | THERMAL DRIVER MODELED (V):  |
| PROPAGATION TECHNIQUE AND THE PROPAGATION AND  | CAIN MODELS (V). Bree Carbon Carlos  | ENERGY TRANSFER MODES MODELED (V): Reference                                | Arc Heater Combustor   |
| August Saland August Saland  | Simple Saturated Gain  | 4.1   | Shock Tube Repistance Heater   |
| With Kernel Averaging  | DABE CAVITY FIELD MADIETER MADEL CA.   | 4.×   | Other  |
| Gaussian Quadrature  | Mirror Th:   | **·   | F-ATOM DISSOCIATION FROM (V):  |
| Fast Fourier Transform (FFT).  |  | Other.  | 12 — 5t 6 — — — — — — — — — — — — — — — — — —  |
| Fast Hankel Transform (FMT)  | Between account of the control of th | Single Line Model (V):  | Other (specify)  |
| Gardener Fresnel-Kirchhoff (GFK)   |  | Multiline Model (V)   | F.ATOM CONCENTRATION DETERMINED FROM MODEL?  |
| Other (specify)  |  | Assumed Rotational Population Distribution State (V)                        | DILUENTS MODELED:  |
|  | Reflectivity Loss.   | Equilibrium Nonequilibrium  | MODELS EFFECTS ON MIXING RATE DUE TO (V).  |
| CONVERGENCE TECHNIQUE $()$ :   | -  | Number of Laser Lines Modeled   | Nozzle Boundery Layers Shock Waves   |
| Power Comparison Field Comparison  | Serrated: Other  | Course of Base Confidence Head or Course                                    | Prereactions (thermal blockage) Turbulence   |
| oner Prony method  | LOADED CAVITY FIELD MODIFIER MODELS (V):   |   | Other (specify)  |
| ACCELERATION ALGORITHMS USED?  | Medium Index Variation   | INC DESCRIPTION OF THE PROPERTY.  |  |
| Technique  | Gas Absorption   | Doppler Broadening  |  |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V):   | Overlapped Beams   | Collisional Broadening  | MODELS EFFECTS ON OPTICAL MODES DUE TO $(oldsymbol{V})$ .  |
| Prony Y  | 1  | Other (specify)   | Media Index Variations   |
| Other  | FAR-FIELD MODELS (V): Beam Steering Removal Optimal Focal Search   |   | Other (apacify)  |
|  | Other  |   |  |
|  |  |   |  |

\*With update

| CODE NAME: | BCCLC* |
|------------|--------|
|            |        |

| CODE TYPE: Optics and Kinetics.  |   |
|--|---|
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE Modeling lasers will elliptical, or rectangular apertures.   | th conventional unstable resonators with round, |
|  |   |
| ASSESSMENT OF CAPABILITIES:  |   |
|  |   |
|  |   |
| ASSESSMENT OF LIMITATIONS:   |   |
|  |   |
| OTHER UNIQUE FEATURES: <u>CO. GDL kinetics and shock wave</u><br>resonators. Contains amplifier pass.  | phase sheets. Models conventional unstable      |
| esultators. Concams ampriliter pass.   |   |
| ORIGINATOR/KEY CONTACT:  Name: Capt. Ted Salvi or Al Paxton  | (505) 844 -0721                                 |
| Name: Capt. 1ed Salvi or Al Paxton Processing Processin | None: (505) 844 - 0721                          |
| Address: AFWL/ALR Kirtland AFB, New Mexico 871   | 17  |
| AVAILABLE DOCUMENTATION: (T = Theory, U = User, RP = Relevant Publication  | (T) (II) Name: lighting in name and             |
| TANDED DOCUMENTATION, (1 - THEORY, 0 - USER, RF - REPORTED FOR COLUMN  |   |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |
| v .  |   |
| Operational Currently?: Yes  |   |
| Operational Currently?: Yes Under Modification?: No  |   |
| Operational Currently?: Yes  |   |
| Operational Currently?: Yes Under Modification?: No  |   |
| Operational Currentity?: Yes Under Modification?: NO Purpose(s):   |   |
| Operational Currentity?: Yes Under Modification?: No Purpose(s):  Ownership?: Government (AFWL)  |   |
| Operational Currentity: Yes Under Modification?: No Purpose(s): Ownership?: Government (AFWL) Proprietary: No  |   |
| Operational Currently?: Yes Under Modification?: No Purpose(s): Ownership?: Government (AFWL) Proprietary?: No   |   |
| Operational Currently?: Yes Under Modification?: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176   |   |
| Operational Currently?: Yes Under Modification?: No Purpose(s): No Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176 TRANSPORTABLE?: Diet voutsions: comp. 1/0. 5  |   |
| Operational Currently?: Yes Under Modification?: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176   |   |
| Operational Currentity?: Yes Under Modification?: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176  TRANSPORTABLE?: Plot routines; some 1/0; E  |   |
| Operational Currently?: Yes Under Modification1: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176  TRANSPORTABLE?: Plot routines; some 1/0; E SELF-CONTAINED?:  |   |
| Operational Currentity?: Yes Under Modification?: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176  TRANSPORTABLE?: Plot routines; some 1/0; E  |   |
| Operational Currently?: Yes Under Modification1: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176  TRANSPORTABLE?: Plot routines; some 1/0; E SELF-CONTAINED?:  |   |
| Operational Currently?: Yes Under Modification?: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176  TRANSPORTABLE?: Machine Dependent Restrictions: Plot routines; some 1/0; E  BELF-CONTAINED?: Other Codes Required (name, purpose):   | CS.   |
| Operational Currently?: Yes Under Modification?: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176  TRANSPORTABLE?: Plot routines; some 1/0; E SELF-CONTAINED?: Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words)  | CS.   |
| Under Modification?: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176  TRANSPORTABLE?: Machine Dependent Restrictions: Plot routines; some 1/0; E  SELF-CONTAINED?: Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words)   | CS.   |
| Operational Currently?: Yes Under Modification?: No Purpose(s):  Ownership?: Government (AFWL) Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 176  TRANSPORTABLE?: Plot routines; some 1/0; E  SELF-CONTAINED?: Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  | CS.   |

<sup>\*</sup> Baumgardner Cylindrical Coordinate Laser Code

| GAS DYNAMICS | NOZZLE GEOMETRY MODELED (and type) (V): NOTIE |  |                                      | COORDINATE SYSTEM                                 | FLUID GRID DIMENSION (V): 10: 20 30  | FLOW FIELD MODELED (V):                   | Laminar:Turbulent:  | Other                              | RASIC MODELING APPROACH (V):                        | Premixed: Mixing:              | Other (specify):      | -                                 | References for Approach Used:  |                            |  | THERMAL DRIVER MODELED (V): | Herence Arc Heater: Combustor:                      | Shock Tube: Resistance Heater: | Other                 | F.ATOM DISSOCIATION FROM (V): | f <sub>2</sub> — s <sub>f</sub> s | Other (specify).                  | F-ATOM CONCENTRATION DETERMINED FROM MOD | _  | <b>Æ</b>                     | Nozzłe Boundary Layeri         | Trengerions (mermal processies)          | Other (specify).                          |                                    |                    | MODELS EFFECTS ON OPTICAL MODES DUE TO (V):          | The state of the s |                                     |       |  |
|--------------|---|--|--------------------------------------|---|--------------------------------------|---|---------------------|------------------------------------|---|--------------------------------|-----------------------|-----------------------------------|--------------------------------|----------------------------|--|-----------------------------|---|--------------------------------|-----------------------|-------------------------------|-----------------------------------|-----------------------------------|--|--|------------------------------|--------------------------------|--|---|------------------------------------|--------------------|--|--|-------------------------------------|-------|--|
| KINETICS     | GAIN REGION MODELED (V):                      | WEST SACRETURE OF THE PROPERTY | Compact Region: Ca. Annular Region:  | KINETICS GRID DIMENSIONALITY (V):                 | 10 20 3D                             | Compact Region:                           | Annular Bagion      | GAIN REGION SYMMETRY RESTRICTIONS: | Gain Vary Along Optic Axes? Yes Flow Direction? Yes | PULSED: CW: V KINETICS MODELED | G REACTIONS MODE      |                                   |                                | Cold (F · H <sub>2</sub> ) | Hot (H · F <sub>2</sub> ): Chain (F · H <sub>2</sub> & H · F <sub>2</sub> ): | Other (specify): CU2        | ENERGY TRANSFER MODES MODELED (V): Reference        | **:                            | , i.e.                | 4.v.                          | Other:                            | Single Line Model (V):            | Multiline Model (V):                     | Assumed Rotational Population Distribution State ( $oldsymbol{V}$ ): | Equilibrium: Nonequilibrium: | Number of Laser Unes Modeled:  | Source of Rate Coefficients Used in Code |   | LINE PROFILE MODELS (V):           | Doppler Broadening | Collisional Broadening:                              | Other (apecify):   |                                     |       |  |
| OPTICS       | RESONATOR TYPE (V): Standing Wave             | Opposite A. Stranger   | OPTICAL ELEMENT MODELS INCLUDED (V): | Flat Mirrors: * Spherical Mirrors                 | Cylindrical Mirrors: Telescopes      | Scraper Mirrors:                          | Azicons Reflaxicons | Arbitrary:                         | Linear  | Parabola-Parabola:             | Variable Cone Offset: | Other (spacify):                  | Deformable Mirrore:            | Spatial Filters: Gratings: |  |                             | Calle MORES & CA'. Bare Control Only                |                                |                       | -                             | Mittor IIII.                      | Aberrations/ Thermal Distortions: | Arbitrary:                               | Secretary (specify):   |                              | Output Coupers togges: Rolled: |  | LUADED CAVITY FIELD MODIFIER MODELS (V.): |                                    | ( two beans)       |  | CAR FIELD MANDELS (V). Beautiful Branches  | Optimal Focal Search: Beam Quality: | Other |  |
| do           | BASIC TYPE (V):                               | FIELD (BOI ABIZATION) BEDBESENTATION (V)   | Scalar V Vector                      | COORDINATE SYSTEM (Cartesian, cylindrical, etc.); | Compact Region. C.B. Annular Region: | TRANSVERSE GRID DIMENSIONALITY (V): 1D 2D | Compact Region      | Annular Region:                    | FIELD SYMMETRY RESTRICTIONS?                        | MARROR SHAPE(S) ALLOWED (V):   | <b>5</b> .            | Rectangular Elliptical Arbitrary: | CONFIGURATION FLEXIBILITY (V): |                            | Fined, museum secondary transfers.   | ١,                          | PROPAGATION TECHNIQUE IN IT ABOTTLE COMPACT ANNULAR | Treated Integral Agoretimes    | With Kernel Averaging | Gaussian Quadrature:          | Fast Fourier Transform (FFT):     | East Hankal Transform (FMT).      | Gardenar-France Kirchhoff (GFK):         | Other (specify):   |                              | CONVERGENCE TECHNIQUE (V):     | Power Cemperison: Field Cemperison:      | None                                      | ACCELERATION ALGORITHMS USED?: NO. | Technique:         | MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM:(V): | Trans.   | 000                                 |       |  |

\*Limited

|            | D. 435D |
|------------|---------|
| CODE NAME: | BLAZER  |

S. Carlotte

| CODE TYPE:   | cs. Kinetics, and (   |  |  |   |      |
|--|---|--|--|---|------|
| MINCIPAL DI IDROSE/S//   | BRI ICATIONIS) OF CODE:   | Models the optical   | l performance of                             | linear bank CW HF and DF  |      |
| chemical lasers.   | MRO is 2D model;  | BLAZER is 3D mod   | iel. Used as des                             | ign tools for BDL, NACL, MIR  | ICL. |
|  |   |  |  |   |      |
|  |   |  |  |   |      |
|  |   |  |  |   |      |
| ASSESSMENT OF CAPABIL  | HHES: <u>Kesonator: Po</u> rical toric or su  | ositive or negat<br>Therical mirrors   | Gain medium:                                 | <u>al unstable; arbitrary optic</u><br>CW flowing HF* or DF*, strut | wa k |
|  | n, thermal distorti   |  |  | on 1100111g 112 01 01 1 3 01 00                                     |      |
|  | .,  | ,  | iune mack or o                               |   |      |
| MRO does stable  | Fabry Perot with ge   | eometrical optic   | i  |   |      |
| ASSESSMENT OF LIMITAT  | ions: Lacks transve   | erse pressure gr   | dient modeling c                             | apability, lacks FFT propaga  | 100  |
| algorithm, uses  | only single gain st   | neet, uses only  | rotational equili                            | brium description.  |      |
|  |   |  |  | <del></del>   | _    |
|  |   |  |  |   |      |
| THER UNIQUE FEATURE  | : Confocal unstab   | le resonator mod   | eled.  |   |      |
|  | <del></del>   |  |  |   |      |
|  |   |  |  |   |      |
|  |   |  |  |   |      |
| PRIGINATOR/KEY CONTACT DO  | nald L. Bullock   |  | (213) 535-                                   | 3484  |      |
|  | W DSSG  |  |  |   |      |
| Address: RI  | /1162, One Space Pa   | ark, Redondo Bea   | ch, California 90                            | 278   |      |
| VAII ARI S DOCUMENTAT  |   |  |  |   |      |
| (U): BLAZER Use  | non: (T = Theory, U = User,<br>r Manual, November   | RP = Relevant Publicatio<br>1978 (includes   | n) <u>(T): The BLAZ</u><br>MRO); Listings av | ER and MRO Codes, June 1978;<br>ailable.                            |      |
| (U): BLAZER Use  | iiON: (T = Theory, U = User,<br>r Manual, November  | RP = Relevant Publicatio<br>1978 (1nc Ludes  | n) (T): The BLAZ<br>MRO); Listings av        | ER and MRO Codes, June 1978;<br>ailable.                            |      |
|  | iON: (T = Theory, U = User,<br>r Manual, November   | RP = Relevant Publicatio<br>1978 (includes   | n) (T): The BLAZ<br>MRO); Listings av        | ER and MRO Codes, June 1978;<br>ailable.                            |      |
| STATUS:  | Voc   | RP - Relevant Publicatio<br>1978 (includes   | n) (T): The BLAZ<br>MRO); Listings av        | ER and MRO Codes, June 1978;<br>ailable.                            |      |
| STATUS: Operational Currently?   | Yes<br>Planned  |  |  |   |      |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  R   | Yes<br>Planned<br>otational nonequil  | ibrium, FFT prop   |  | ER and MRO Codes, June 1978;<br>ailable.<br>I, multiple gain skins, |      |
| STATUS:  Operational Currently?: Under Modification?: Purpose(s):  R   | Yes<br>Planned  | ibrium, FFT prop   |  |   |      |
| STATUS: Operational Currently?: Under Modification?: Purpose(s): Etransverse press   | Yes<br>Planned<br>otational nonequil<br>ure gradient descr  | ibrium, FFT prop   |  |   |      |
| STATUS:  Operational Currently?  Under Modification?:  | Yes<br>Planned<br>otational nonequil  | ibrium, FFT prop   |  |   |      |
| Operational Currently? Under Modification?: Purpose(s): R transverse press Ownership?: Gove  | Yes<br>Planned<br>otational nonequil<br>ure gradient descr  | ibrium, FFT prop<br>iption.  | agation algorithm                            |   |      |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  R transverse press  Ownership?:  Gove Proprietary?:  No   | Yes<br>Planned<br>otational nonequil<br>ure gradient descr  | ibrium, FFT prop<br>iption.  | agation algorithm                            |   |      |
| Operational Currently?: Under Modification?: Purpose(s): Etransverse press Ownership?: Proprietary?: No MACHINE/OPERATING SY   | Yes Planned otational nonequil ure gradient descr rnment STEM (on which installed):   | ibrium, FFT prop<br>iption.<br>Cyber 174-TRW/TS  | agation algorithm                            |   |      |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  Etransverse press  Ownership?:  Proprietary?:  MACHINE/OPERATING SY   | Yes Planned otational nonequiliure gradient descripment STEM (on which installed):  | ibrium, FFT prop<br>iption.<br>Cyber 174-TRW/TS  | agation algorithm                            |   |      |
| Operational Currently? Under Modification?: Purpose(s): Etransverse press Ownership?: Proprietary?: No MACHINE/OPERATING SY FRANSPORTABLE?: Machine Dependent R  | Yes Planned otational nonequiliure gradient descripment STEM (on which installed):  | ibrium, FFT prop<br>iption.<br>Cyber 174-TRW/TS  | agation algorithm                            |   |      |
| Operational Currently? Under Modification?: Purpose(s): Etransverse press Ownership?: Proprietary?: No MACHINE/OPERATING SY FRANSPORTABLE?: Machine Dependent R  | Yes Planned otational nonequil ure gradient description rnment STEM (on which installed): Needs mods for expressivitions:CDC  | ibrium, FFT prop<br>iption.<br>Cyber 174-TRW/TS  | agation algorithm                            | , multiple gain skins,  |      |
| Operational Currently? Under Modification?: Purpose(s): transverse press Ownership?: Proprietary?: MACHINE/OPERATING SY  TRANSPORTABLE?: Machine Dependent R  SELF-CONTAINED?:   | Yes Planned otational nonequil ure gradient description rnment STEM (on which installed): Needs mods for expressivitions:CDC  | ibrium, FFT prop<br>iption.<br>Cyber 174-TRW/TS  | agation algorithm                            | , multiple gain skins,  |      |
| Operational Currently?: Under Modification?: Purpose(s): Etransverse press Ownership?: Proprietary?: MACHINE/OPERATING SY FRANSPORTABLE?: Machine Dependent R SELF-CONTAINED?: Other Codes Required                                  | Yes Planned otational nonequil ure gradient description rnment  STEM (on which installed): Needs mods for expensestrictions: CDC  (name, purpose): VIINT  REQUIRED FOR RUNS:        | ibrium, FFT propiption.  Cyber 174-TRW/TS  ort  , KBLIMP, ALFA f                                   | agation algorithm                            | n, multiple gain skins,   |      |
| STATUS:  Operational Currently? Under Modification?: Purpose(s):  transverse press  Ownership?: Proprietary?: No MACHINE/OPERATING SY  TRANSPORTABLE?: Machine Dependent R  SELF-CONTAINED?: Other Codes Required                    | Yes Planned otational nonequil ure gradient descripment  STEM (on which installed):   | ibrium, FFT prop<br>iption.<br>Cyber 174-TRW/TS  | agation algorithm                            | n, multiple gain skins,   |      |
| STATUS:  Operational Currently? Under Modification?:   | Yes Planned otational nonequili ure gradient descr rnment  STEM (on which installed):   | ibrium, FFT propiption.  Cyber 174-TRW/TS  Ort  , KBLIMP, ALFA f                                   | agation algorithm  S  or nozzle exit co      | n, multiple gain skins,   |      |
| STATUS: Operational Currently?: Under Modification?: Purpose(s): Etransverse press Ownership?: Operational Covership?: Proprietary?: Machine Dependent R SELF-CONTAINED?: Other Codes Required ESTIMATE OF RESOURCES Small Job: MRO: | Yes Planned otational nonequil ure gradient description rnment  STEM (on which installed):  Needs mods for expensestrictions:CDC  (name, purpose):VIINT  REQUIRED FOR RUNS:BL. KBL. | ibrium, FFT propiption.  Cyber 174-TRW/TS  ort  , KBLIMP, ALFA f  Core Size (Octal Words)  AZER: - | agation algorithm                            | n, multiple gain skins,  multiple gain skins,  multiple gain skins, |      |

BLAZER

| GAS DYNAMICS  NOZZIE GEOMETRY MODELED (and typo) (V): Cylindrical Radialy Formed.  **Rectangular: Lonsofy Formed.  **COORDINATE SYSTEM: Cartesian FLUIO GRID DIMENSION (V): 10 — 20 — 30 FLUIN FIELD MODELED (V): Laminat.  **Laminat. Turbami  **Description of the Cartesian Onne (specify) — SCheduled mixing.  **Printing onne (specify) — Scheduled mixing.  **Printing onne (specify) — Scheduled mixing.  **Printing onne (specify) — Scheduled mixing.  **TATOM DISSOCIATION FROM (V):  **2 — ** 50 — Maintance Header  **OTHER MODELED (V):  **ATOM DISSOCIATION FROM (V):  **2 — ** 50 — Maintance Header  **OTHER MODELE (V):  **ATOM DISSOCIATION FROM (V):  ***********************************   |
|--|
| COMPLETICS  GAIN REGION WODELED (V): Compact Region. COMPLIATE SYSTEM (Careaus, chadrical, etc.) Compact Region. KINETICS GRID DIMENSIONALITY (V).  Annuals Pragion: Annuals Pra |
| RESONATOR TYPE (V): Standing Wave  Transing Wave (Ring)  OPTICAL ELEMENT WODELS INCLUDED (V): File Mirrors  Childrical Mirrors  Scrapes Mirrors  Childrical Mirrors  Social Filter  Childrical Mirrors  Childrical Childrical  Mirrors  Childrical Childrical  Mirrors  Childrical Childrical  Childrical Childrical  Mirrors  Childrical Childrical  Childrical Childrical  Mirrors  Childrical Childrical  Childr |
| PRESICTYPE (\)  Prince I Open - Connenical - Connect Import - Connect - Connect - Connect Import - Connect Import - Connect Import - Connect Import - Connect - Connect Import - Connect Im |

| CODE NAME  | BLIST   |
|------------|---------|
| CODE NAME. | <u></u> |

| <del></del>  | <del> </del>  |  |
|--|---|--|
| PRINCIPAL PURPOSE(S)/APPLICA   | 211014(8) 41 44427  | milar development of 2-D or axisymmetric   |
|  | ir boundary layers with wall he   |  |
| (BLIST: Boundary L   | ayer Integral Solution Techniq  | ue)  |
| ASSESSMENT OF CAPABILITIES:  | Yields reliable solutions o   | of boundary layer properties including skin frict  |
| heat transfer rate,  | and velocity profiles up to s   | eparation.   |
| ASSESSMENT OF LIMITATIONS:   | Will analyze only nonreacti   | ing flow.  |
|  |   |  |
| OTHER UNIQUE FEATURES:   |   |  |
|  | es/D. Haflinger/H. Behrens  | hene: (213) 536-2757   |
| Organization: TRW DSSG   |   | . California 90278   |
| Address: R1, 1038,   | , One Space Park, Redondo Beach   |  |
|  |   | (2) 1 4 4 4 5 6 4 4 4 6 6 4 6 4 6 6 6 6 6 6 6  |
| AVAILABLE DOCUMENTATION O<br>Laminar Integral Bo   | T - Theory, U = User, RP = Referent Publication<br>oundary Layer Model, TRW Repor   | (T) Internal Report: "A Description of the t. August 1977; (U) same; listing proprietary.  |
| AVAILABLE DOCUMENTATION: (1<br>Laminar Integral Bo   | r - Theory, U = Veer RF = Repress Publication<br>nundary Layer Model, TRW Repor   | (2) 1 4 4 4 5 6 4 4 5 6 4 6 4 6 6 6 6 6 6 6 6  |
|  | f = Theory, U = User, RF = Selprent Publication<br>bundary Layer Model, TRW Repor   | (2) 1 4 4 4 5 6 4 4 5 6 4 6 4 6 6 6 6 6 6 6 6  |
| STATUS:  |   | (2) 1 4 4 4 5 6 4 4 4 6 6 4 6 4 6 6 6 6 6 6 6  |
| STATUS: Operational Currently?:  | (es   | (2) 1 4 4 4 5 6 4 4 4 6 6 4 6 4 6 6 6 6 6 6 6  |
| STATUS:  Operational Currently?:  Under Modification?:  N  |   | (T) 1 A  |
| STATUS:<br>Operational Currently?Y   | (es   | (2) 1 4 4 4 5 6 4 4 4 6 6 4 6 4 6 6 6 6 6 6 6  |
| STATUS:  Operational Currently?  Under Modification?:  Purpose(s):  Ownership?:  TRW   | (es   | (2) 1 4 4 4 5 6 4 4 4 6 6 4 6 4 6 6 6 6 6 6 6  |
| STATUS:  Operational Currently? Under Modification?  Purpose(s):  Ownership: Proprietary: Yes  | (es   | (2) 1 4 4 4 5 6 4 4 4 6 6 4 6 4 6 6 6 6 6 6 6  |
| STATUS:  Operational Currently?:Y  Under Modification?:N  Purpose(s):TRW  Operatory?:Ye5  MACHINE/OPERATING SYSTEM (   | (es<br>to<br>(on which installed):CDC_Cyber_174   | (T) Internal Report: "A Description of the t. August 1977; (U) same: listing proprietary.  |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  TRW  Proprietary?:  Yes  MACHINE/OPERATING SYSTEM (  TRANSPORTABLE?:  No  Machine Dependent Restrict  | (es No CDC Cyber 174  | (T) Internal Report: "A Description of the t. August 1977; (U) same: listing proprietary.  |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  Oemeratip?:  TRM Preprietary?:  Yes  MACHINE/OPERATING SYSTEM (  TRANSPORTABLE?:  No  Machine Dependent Restricts   | (es No. CDC Cyber 174  TRW numerical subroutine   | (T) Internal Report: "A Description of the t. August 1977; (U) same: listing proprietary.  |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  TRM  Proprietary?:  YES  MACHINE/OPERATING SYSTEM (  TRANSPORTABLE?:  NO  Machine Dependent Restrict  SELF-CONTAINED?:  NO  Other Codes Required (name  | (on which installed):CDC_Cyber_174  Ions:TRW numerical subroutine .purpose):TRW subroutines.  | (T) Internal Report: "A Description of the t. August 1977; (U) same: listing proprietary.  |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  Oumership?:  TRM Preprietary?:  Yes  MACHINE/OPERATING SYSTEM (  TRANSPORTABLE?:  NO  Machine Dependent Restrict  SELF-CONTAINED?:  Other Codes Required (name.                               | (es  (on which installed):CDC_Cyber 174  lond:TRW numerical subroutine .purpose):TRW subroutines.  (RED FOR RUNS:Core Size (Octal Words)                                    | (T) Internal Report: "A Description of the t. August 1977; (U) same: listing proprietary.  Es are used in BLIST.                                 |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  Ouverable?:  TRM  Proprietary?:  Yes  MACHINE/OPERATING SYSTEM (  TRANSPORTABLE?:  NO  Machine Dependent Restrict  SELF-CONTAINED?:  Other Codes Required (name)  ESTIMATE OF RESOURCES REQUI | (es No CDC Cyber 174  fon which installed):CDC Cyber 174  fons:TRW numerical subroutine  TRW subroutines.  TRW subroutines.  TRW Subroutines.  Core Size (Octal Words)  53K | (T) Internal Report: "A Description of the t. August 1977; (U) same; listing proprietary.  Es are used in BLIST.  Esscution Time (Sec. CDC 7600) |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  Oumership?:  TRM Preprietary?:  Yes  MACHINE/OPERATING SYSTEM (  TRANSPORTABLE?:  NO  Machine Dependent Restrict  SELF-CONTAINED?:  Other Codes Required (name.                               | (es  (on which installed):CDC_Cyber 174  lond:TRW numerical subroutine .purpose):TRW subroutines.  (RED FOR RUNS:Core Size (Octal Words)                                    | (T) Internal Report: "A Description of the t. August 1977; (U) same: listing proprietary.  Es are used in BLIST.                                 |

BLIST

| OPTICS   | ics None  | KINETICS  | GAS DYNAMICS  |
|--|---|---|---|
| BASIC TYPE (V) Yone  | RESONATOR TYPE (V) Blanding House   | GAIN REGION MODELED (V) None  | MOZZLE GEOMETRY MODELED (and 1980) (V)  |
| FIELD (POLARIZATION) REPRESENTATION (V)  | WHO WAS   | COMBANIE SYSTEM OF  | Cylinderical Medically Florence T   |
| Kaler Trees  | OPTICAL ELEMENT MODELS INCLUDED (V.)  | Compect Report  | Other Control of the |
| COORDINATE SYSTEM (Carteuan crimitical esc.)   | Flat Marrors Sphiercal Marrors  | KINETICS GRID DIMENSIONALITY (V.)   | COORDINATE SYSTEM Streamline  |
| Competi Region Annular Region  | Cyhadrus Merun  | GR GR 01  | FLUID GRID DIMENSION (V) 10 20 20 30  |
|  | Among Malacons Inflancons   | Armaniae Bagger   | Library Turbulent   |
| Annuales Region  |   | GAIN REGION SYMMETRY RESTRICTIONS   | Other   |
| FIELD SYMMETRY RESTRICTIONS?   | - Property of the Property of | Girn Vary Mong Opic Ases? Flow Direction?                                 | BASIC MODELING APPROACH (V.)  |
| MARROR SHAFE(S) ALLOWED (V)  | Personal Personal   | PULSED CW KINETICS MODELED  | Promised beautiful and a second   |
|  | Variable Core Office  | CHEMICAL PUMPING REACTIONS MODELED (V)                                    | Other (specify)   |
|  | Other (specify)   | : =   | References for Approach Used K1 ineberg-Lees  |
| Final Single Resonator Geometry  | Control of | Code (f · Ny)   | procedure   |
| Fisad McRobie Recondor Geometras   |   | Hat (H · F <sub>2</sub> ) Chem (f · H <sub>2</sub> & H · F <sub>2</sub> ) |   |
| The state of the s |   | Other (specify)   | THERMAL DRIVER MODELED (V)  |
|  | GAIN MODELS (V) Bore Conty Out  | ENERGY TRANSFER MODES MODELED (V) Internice                               | Arc Heater Combustor  |
| Subtrant Journal of  | Simple Saturated Guin Detailed Gum  |   | Shock TubeReestance Heater  |
| Garagean Quedrahre   | 9   |   | Other   |
| Fast Fourse Transform (FT)   | Miner Tile  | 1   | F. ATOM DISSOCIATION PROM (V)   |
| Famil Hambari Transform (FMT)  | Aberrations/Thermal Distantions   | Single Line Hodel (V)   | Other (apacrty)   |
| Gardener Fragues Eursthadt (GFE)   |   | Multithre Model (V)   | F.ATOM CONCENTRATION DETERMINED FROM MODEL?   |
| Other (specify)  | Reflectivity Loss   | Assumed Rotational Population Distribution State $\langle V \rangle$      | DILUENTS MODELED  |
|  | Output Coupler Edges Rolled   | Equilibrium Nonequilibrium  | MODEL'S EFFECTS ON MIXING MATE DUE TO (V) Notife Boundary Levers  |
| CONVERGENCE VECHNIQUE (V)  | Serrated  | Number of Least Lines Modeled   | Persections (thermal blocksee) Turbulence   |
| l  | LOADED CANTY FIELD MODIFIER MODELS ( $V_i$  | Seurce of Rate Coefficients Used in Cody                                  | Other (specify)   |
| ACCELERATION ALGORITHMS USED?  | Medium Index Vanabon  | /*  |   |
| Technique  | Gas Absorption  | LINE PROPILE MODELS (V)   |   |
| multiple engenyalue/vector extraction algorithm (V)  | Overlapped Stems  | Catheinna Broadening  | MODELS EFFECTS ON OFTICAL MODES DUE TO $(V)$  |
|  | FAR PIELD MODELS (V) Bean Steamed   | Other (apacity)   | Media index Veristions  |
|  | Ophmal Focal Search Beam Quality  |   |   |
|  | Other   |   |   |
|  |   |   |   |

| CLOQ |  |  |
|------|--|--|
|      |  |  |

| _  | ics, Kinetics, and Gas   |  |  |          |
|--|--|--|--|----------|
| PRINCIPAL PURPOSE  | (S)/APPLICATION(S) OF CODE: .  | The CLOQ code wa   | s developed to analyze linear chemical l   | asers    |
| systems using  | rotational nonequili   | ibrium kinetics.   |  |          |
|  |  |  |  |          |
|  |  |  |  |          |
|  |  |  | <del></del>  |          |
|  |  |  | esonators with collimated Fresnel number   |          |
|  |  |  | one transverse dimension. This indepen   |          |
|  | be expressed either a  | as a Cartesian coo   | rdinate or as a cylindrical coordinate -   |          |
| apparently.)   |  |  |  |          |
|  | Normal limi  | itations of a 2-N  | analysis. For detailed analysis of spec  | ific     |
| ASSESSMENT OF LIN  |  |  | om a code (such as ALFA) having sophisti   |          |
| gas dynamic c  |  | TON POTAMETERS IT  | on a code (Sach as Activ) having sophiser  | 00000    |
| gas ayriaiia   |  |  |  |          |
|  |  |  |  |          |
| OTHER LINIOUS SEA  | numse. Models beam/mc  | ode rotation. Cod  | e employs a schedule mixing model with d   | ifferent |
| mixing length  | s for primary and sec  | condary mixing zon   | es. Allows use of linear, exponential,   | or tabu  |
| mixing rates.  |  | <del>_</del>   |  |          |
|  |  |  |  |          |
| ORIGINATOR/KEY CO  | NTACT:   |  | <del></del>  |          |
| Name:  | Paul E. Fileger  | PI   | (305)840-6643  |          |
| Organization:  | United Technologies  |  |  |          |
|  |  |  |  |          |
| Address:   | P. O. Box 2691, MS-F   |  | ch, Florida 33402  |          |
|  | P. O. Box 2691, MS-F   |  |  | ibrium   |
|  | P. O. Box 2691, MS-F   |  | ch, Florida 33402  | ibrium   |
|  | P. O. Box 2691, MS-F   |  | ch, Florida 33402  | ibrium   |
| AVAHABLE DOCUME<br>and Line-Sele   | P. O. Box 2691, MS-F NTATION:(T - Theory, U use cted Operation in CW   |  | ch, Florida 33402  | ibrium   |
| AVAHABLE DOCUME<br>and Line-Sele   | P. O. Box 2691, MS-F NTATION: (T = Theory, U use cted Operation in CW  |  | ch, Florida 33402  | ibrium   |
| AVAILABLE DOCUME<br>and Line-Sele  | P. O. Box 2691, MS-F NTATION: (T - Theory, U use cted Operation in CW  |  | ch, Florida 33402  | ibrium   |
| AVAILABLE DOCUME  and Line-Sele  STATUS:  Operational Curre  | P. O. Box 2691, MS-F NTATION: (T - Theory, U use cted Operation in CW  |  | ch, Florida 33402  | ibrium   |
| AVAILABLE DOCUME  and Line-Sele  STATUS:  Operational Curre  Under Modificatic  Purpose(s) -   | P. O. Box 2691, MS-F NTATION: (T = Theory, U use cted Operation in CW  mmty? Yes No  |  | ch, Florida 33402  | ibrium   |
| AVAILABLE DOCUME and Line-Sele  STATUS: Operational Curre Under Modificatic Purpose(s): Ownership?   | P. O. Box 2691, MS-F NTATION: (T = Theory, U use cted Operation in CW  white the control of the  |  | ch, Florida 33402  | ibrium   |
| AVAILABLE DOCUME and Line-Sele  STATUS:  Operational Curre Under Modificatic Purpose(s)  Ounership?  Proprietary?  | P. O. Box 2691, MS-F NTATION: (T = Theory, U used cted Operation in CW  white the control of the | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| AVAILABLE DOCUME and Line-Sele  STATUS:  Operational Curre Under Modificatic Purpose(s)  Ounership?  Proprietary?  | P. O. Box 2691, MS-F NTATION: (T = Theory, U use cted Operation in CW  white the control of the  | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| AVAILABLE DOCUME AND LINE-Sele  STATUS: Operational Curro Under Modification Purpose(s):  Ownership? Proprietary? MACHINE/OPERATIA   | P. O. Box 2691, MS-F NTATION: (T - Theory, U use cted Operation in CW  | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| SYATUS: Operational Curre Under Modification Purpose(s): Proprietary? MACHINE/OPERATIN TRANSPORTABLE?  | P. O. Box 2691, MS-F NTATION: (T - Theory, U use cted Operation in CW  | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| AVAILABLE DOCUME AND LINE-Sele  STATUS: Operational Curre Under Modification Purpose(s): Proprietary? MACHINE/OPERATIA  TRANSPORTABLE?: Machine Depend                                 | P. O. Box 2691, MS-F NTATION: (T = Theory, U use cted Operation in CW  which is the company of t | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| AVAILABLE DOCUME  and Line-Sele  STATUS: Operational Curre Under Modification Purpose(s): Proprietary? MACHINE/OPERATIN TRANSPORTABLE?: Machine Depend                                 | P. O. Box 2691, MS-F NTATION: (T = Theory, U use cted Operation in CW  mity? Yes No  UTRC Yes IG SYSTEM (on which installed) Yes Ves Ves   | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| AVAILABLE DOCUME  and Line-Sele  STATUS:  Operational Curre Under Modificatic Purpose(s):  Proprietary?  MACHINE/OPERATIR  TRANSPORTABLE?: Machine Depend                              | P. O. Box 2691, MS-F NTATION: (T = Theory, U use cted Operation in CW  which is the company of t | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| AVAILABLE DOCUME  and Line-Sele  STATUS: Operational Curre Under Modificatic Purpose(s) Proprietary? MACHINE/OPERATIA  TRANSPORTABLE? Machine Depend  SELF-CONTAINED? Other Codes Req  | P. O. Box 2691, MS-F NTATION: (T - Theory, U use cted Operation in CW  whith the control of the control of the control  TYES  UTRC YES  G SYSTEM (on which installed)  Yes  lent Restrictions!lone  Yes  uired (name, purpose):  | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| AVAILABLE DOCUME  and Line-Sele  STATUS: Operational Curre Under Modificatic Purpose(s) Proprietary? MACHINE/OPERATIA  TRANSPORTABLE? Machine Depend  SELF-CONTAINED? Other Codes Req  | P. O. Box 2691, MS-F NTATION: (T = Theory, U use cted Operation in CW  mity? Yes No  UTRC Yes IG SYSTEM (on which installed) Yes Ves Ves   | v. RP - Roisvant Publication<br>DF Chemical Laser              | ch, Florida 33402<br>p: (RP) R. J. Hall. "Rotational Nonequil<br>s," IEEE JQE, QE-12, 453 (1976).                                | ibrium   |
| AVAILABLE DOCUME AND LINE-Sele  STATUS: Operational Curre Under Modificatic Purpose(s) Proprietary? MACHINE/OPERATIA  TRANSPORTABLE? Machine Depend  SELF-CONTAINED? Other Codes Req   | P. O. Box 2691, MS-F NTATION: (T - Theory, U use cted Operation in CW  Denty? Yes NO  UTRC Yes  G SYSTEM (on which installed) Yes Sent Restrictions _!lone Yes uired (name, purpose)   | w. RP Resevant Publication DF Chemical Laser  CDC 176, IBM 370 | ch, Florida 33402  p: (RP) R. J. Hall. "Rotational Nonequil's," IEEE JQE, QE-12, 453 (1976).  Execution Time (Sec. CDC 7600)  60 | ibrium   |
| AVAILABLE DOCUME  and Ling-Sele  STATUS: Operational Curre Under Modificatic Purpose(s): Proprietary? MACHINE/OPERATIN  TRANSPORTABLE? Machine Depend  SELF-CONTAINED? Other Codes Req | P. O. Box 2691, MS-F NTATION: (T - Theory, U use cted Operation in CW  whith the control of the control of the control  TYES  UTRC YES  G SYSTEM (on which installed)  Yes  lent Restrictions!lone  Yes  uired (name, purpose):  | w. RP Resevant Publication DF Chemical Laser  CDC 176, IBM 370 | ch, Florida 33402  (RP) R. J. Hall. "Rotational Nonequil's," IEEE JQE, QE-12, 453 (1976).  Execution Time (Sec. CDC 7600)        | ibrium   |

i

| ú | i |
|---|---|
| ₹ | į |
| 2 | 5 |
| 7 | ŧ |
| 4 | • |
|   |   |

8

| 140  | OPTICS   | KINETICS   | GAS DYNAMICS  |
|--|--|--|---|
| BASIC TYPE (V)                                     | RESONATOR TYPE (V) Sanding Wiles   | GAIN REGION MODELED (V):   | MOZZLE GEOMETRY MODELED (and type) (V)                                  |
| FIELD (POLARIZATION) REPRESENTATION (V)            | BRACH (V) Protein V Magners  | COORDINATE SYSTEM CENTERING CHIMPICAL SEC.)                                    | Cylendrical Reduilly Flowing  |
| Scalar 1 Vector                                    | OPTICAL ELEMENT MODELS INCLUDED (V)  | Compact Region 80th Annula Region Both   | Other   |
| COORDINATE SYSTEM (Consum cylindrical sec.)        | Part Marrors   | KINETICS GRID DIMENSIONALITY (V)   | -   |
| TRANSVERSE GRID DIMENSIONALITY (V) 10 20           | Scriper Mirrors  |  | FLOW FIELD MODELED (V)  |
| Compact Region Cart. Or Cy*                        | Asicons Metazicons   | Annular Region   | Lemmas / Turbulent /  |
| FIELD SYMMETRY RESTRICTIONS? YAS                   | Artistery  | GAIN REGION SYMMETRY RESTRICTIONS Can't Var Anne Date Asset 7 From Dispersion? | ONNY SCHEDULED BISSING ANTIGERIE LEIGHEN<br>BASH: MODELING APPROACH (V) |
|  | Personal Personal  | PULSED CW / KINETICS MODELED   | Premied thung   |
| Square   | Variable Cone Offert   | CHEMICAL PUMPING REACTIONS MODELED (V):  | one (each) riow properties specified by anchoring to device data using  |
| CONFIGURATION FLEXIBILITY (V)                      | Other (specify) Deformable Mirrers   | <u>~</u>   | ALFA, References for Approach Used                                      |
| Fixed Single Resonance Geometries                  | Spetial Filters Craings  | Code (F - Mg) O - J  |   |
| Mediular Multiple Resonator Geometrias             | Other Bements  |  | THE BARA DRIVER BODGLED (1)   |
| PROPAGATION TECHNIQUE TO THE RELEASE AND ASSESSED. | Annual Control of the | ENERGY TRANSFER MODES MODELED (V) Reference                                    | Arc Heater Combustor  |
| White Spirits Averages                             | Simple Serumon Gerr Detailed Gerr  | / 14   | Shock Tube Residence Haster   |
| Gaussian Quadrature                                | <u> </u>   | 7 ***  | Other   |
| Sass Faurner Transdorm (FFT)                       | Mirror Tit. Decembration   | Other  | r 2 — 86 — — — — — — — — — — — — — — — — —                              |
| Fast Hanbui Transform (FMT)                        | ( (one dimensional)  | Sungle Line Model (V)  | Other (specify)   |
| Contains Franch Errchfolf (GFE)                    | Selected (specify)   | Multithrie Model (V)   | F-ATOM CONCENTRATION DETERMINED FROM MODELY                             |
| Omer (Necret)                                      | Suffectivity Loss  | Assumed floreinant Population Distribution State (V)                           | MODELS EFFECTS ON MARING RATE DUE TO (V)                                |
| CONVERGENCE TECHNIQUE (V)                          | Output Countrie Edges Buildes  | Number of Least Lines Mediates Up to 20 of 68                                  | Pozzie Boundary Layers Bhack Wares                                      |
| Press Companionfraid Companion                     | LOADED CAVITY FIELD MODIFIER MODELS (V)  | Source of Rese Conflicterits Used in Code                                      | Office (seeding) Specified by ALFA code.                                |
| ACCELERATION ALGORITHMS USED? YES                  | Mothern Index Vanction   | LINE PROFILE MODELS (V)  |   |
| SCHEULTEN SON ALGORITHM (V).                       | Overtopees Bears / (arbitrary number)  | Departer Brandening  | MODELS EFFECTS ON OPTICAL MODES BUE TO (V)                              |
|  | Other  | Other (specify) Voight   | Medie Index Verations   |
| ONE  | Ophmel focal Search * Beam Quanty  |  | Other (specify)   |
|  | Other  |  |   |
|  |  |  |   |

\*This is a strip code

| CODE NAME: | CL0Q3D |
|------------|--------|
|            |        |

\$ 4

| CODE TYPE Optics, Kinetics, and Ga   | sdynamics   |  |
|--|---|--|
| using wave optics coupled to rotatio   | <u>nal nonequilibr</u>  | it scheduled code for analyzing HEL chemical lasers<br>rium kinetics or to equilibrium kinetics HF or DF   |
| Gasdynamics capabilities include: l<br>and radial flow.  | -D, scheduled a   | rea, scheduled pressure, all aerodynamics scheduled  |
| ASSESSMENT OF CAPABILITIES The code is ca  | pable of analyz   | ing a large number of annular or linear, unstable  |
| or ring resonator systems having ove   | rall collimated   | Fresnel numbers generally 30 (single step  |
| resonators, rings, and rings with in   | jection locking   | positive and negative compact unstable confocal inter-focal line aperture, and inter-focal point   |
| agerture. Limited to res   | onators with Fr   | resnel numbers less than 250. Gasdynamics are  |
| "generally" provided by ALFA analysi   | s although 1-D,   | , 3 stream scheduled mixing G/D are included in  |
| this code.   |   |  |
| OTHER UNIQUE FEATURES Models beam/mode   | rotation, inti  | ra and extra cavity phase correction, and mirror   |
| strut supports. Scheduled mixing mo  | <u>del used differ</u>  | rent mixing lengths for primary and secondary  |
| mixing zones. Linear, exponential,   | or tabular mix  | ing rates are available to the flow field model.   |
| ORIGINATOR/KEY CONTACT   |   | (200) 242 5542   |
| Name: Paul E. Fileger  |   | hone: (305) 840-6643   |
| Organization United Technologies Re  |   |  |
| (RP) SOQ user's manual.  | P Relevant Publication  | n) User's manual publication date is February 1980.  |
| (RP) SOQ user's manual.  | P Relevent Publication  | n) User's manual publication date is February 1980.  |
| (RF) SUQ user's manual.  | P Relevant Publication  | n) User's manual publication date is February 1980.  |
| STATUS:  Operational Currently? Yes  | P Relevant Publication  | n) User's manual publication date is February 1980.  |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pg   |   | eld. incorporate more sophisticated (geometric   |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (po   |   |  |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pomapping) axicon model.  Operational Currently? Yes Purpose(s): Incorporate vector (pomapping) axicon model.  | nlarization) fig  | eld. incorporate more sophisticated (geometric   |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pomapping) axicon model.  Operational Currently? Yes Purpose(s): Incorporate vector (pomapping) axicon model.  | nlarization) fig  | eld. incorporate more sophisticated (geometric   |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pc mapping) axicon model.  Ournership? USAF/UTRC Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE? Yes  | plarization) fil  | eld. incorporate more sophisticated (geometric   |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pomapping) axicon model.  Operational Currently? Yes Proprietary?: NO MACHINE/OPERATING SYSTEM (on which installed)  | plarization) fil  | eld. incorporate more sophisticated (geometric   |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pomapping) axicon model.  Oumarship? USAF/UTRC Proprietary? No MACHINE/OPERATING SYSTEM (on which installed) C TRANSPORTABLE? Yes Mechine Dependent Restrictions The FFT role SELF-CONTAINED? Yes  | DC-176; kinetic   | eld. incorporate more sophisticated (geometric  cs also available on IBM-370.  CDC system dependent.   |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pomapping) axicon model.  Oumarship? USAF/UTRC Proprietary? No MACHINE/OPERATING SYSTEM (on which installed) C TRANSPORTABLE? Yes Mechine Dependent Restrictions The FFT role SELF-CONTAINED? Yes  | DC-176; kinetic   | eld. incorporate more sophisticated (geometric   |
| STATUS:  Operational Currently? Yes Unider Modification? Yes Unider Modification? Yes Purpose(s): Incorporate vector (pormapping) axicon model.  Ournership? USAF/UTRC Proprietary? No MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE? Yes Machine Dependent Restrictions Ine FFI roll  SELF-CONTAINED? Yes. Other Codes Required (name, purpose) None 1             | DC-176; kinetic   | eld. incorporate more sophisticated (geometric cs also available on IBM-370.  CDC system dependent.  A code is used for gasdynamics inputs.  |
| STATUS:  Operational Currently? Yes Under Modification? Yes Under Modification? Yes Purpose(s): Incorporate vector (pormapping) axicon model.  Oumarship? USAF/UTRC Proprietary? NO MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE? Yes Mechine Dependent Restrictions Ihe FFI roll  SELF-CONTAINED? Yes. Other Cades Required (name, purpose) None 1                | DC-176; kinetic   | eld. incorporate more sophisticated (geometric  cs also available on IBM-370.  CDC system dependent.   |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pomapping) axicon model.  Ownership? USAF/UTRC Proprietary?: NO MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE? Yes Mechine Dependent RestrictionsIhe_FFI_rol SELF-CONTAINED?Yes Other Codes Required (name, purpose) None 1  ESTIMATE OF RESOURCES REQUIRED FOR RUNS Co | DC-176; kinetic   | eld. incorporate more sophisticated (geometric  cs also available on IBM-370.  CDC system dependent.  A code is used for gasdynamics inputs.  Execution Time (Sec. CDC 7600)  15 sec/iteration 410 sec/iteration |
| STATUS:  Operational Currently? Yes Under Modification? Yes Purpose(s): Incorporate vector (pomanning) axicon model.  Ownership? USAF/UTRC Propristary? No MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE? Yes Mechine Dependent Restrictions The FFT roll  SELF-CONTAINED? Yes Other Cades Required (name, purpose) None 1  | plarization) fix  DC-176; kinetic  utine (CPFT) is  for optics; ALF | eld. incorporate more sophisticated (geometric  cs also available on IBM-370.  CDC system dependent.  A code is used for gasdynamics inputs.  Esecution Time (Sec. CDC 7600)  15 sec/iteration                   |

|  |  | KINETICS   | GAS DYNAMICS  |
|--|--|--|---|
|  | RESONATOR TYPE (V): Sanding New Transling Ways (Ring): REMANCH (V): Positive: Measing OFTICAL ELEMENT MODELS INCLUDED (V): The Mirror: Spherical Mirror: (QeOMETT'S) Scraper Mirror: (Tobecoper: (QeOMETT'S) Scraper Mirror: (Tobecoper: (Topecoper: Maxicon Anticon   | ELED (V): Annular Region: Annular Region: Oth Annular Region: D 20 30 T 30 T 30 30 T 3 | MOZZIE GEOMETRY MODELED (and type) (V):  Cytindrical, Endaily Flowing  Mechangular, Liman's Flowing  Other  COORDINATE SYSTEM. CA OF CY  FLUID GRID DIMENSION (V): 10 20 30  FLOW FIELD MODELED (V):  Laminer:  |
| mptotic Commercy Annual | Other (spacify):  Deformable painton:  Cand S.  Cond S.  Cand Same Cand Offset  Cond S.  Same Cantry Field Moderican:  Admirery  Same Cantry Field Moderican:  Admirery  Same Cantry Field Moderican:  Can Absorption  Convertigated (A):  Bean Seeme Remove I  Can Absorption  Convertigated Beans  Cand Absorption  Convertigated Beans  Control Congress  Congr | 1 × 12 × 12 × 12 × 12 × 12 × 12 × 12 ×   | ALFA CODE.  THERMAL DRIVER MODELED (V):  ACT HASTER—Combusto:  Shoral Tube—Resistance Haster:  Other  F.ATOM DISSOCIATION FROM (V):  F.ATOM CONCENTRATION DETERMINED FROM MODEL?  DILUENTS MODELED—He, N <sub>2</sub> MODELS EFFECTS ON MIXING RATE DUE TO (V):  Hozze Boundary Layers—Shock Weres  Presections (thermal blockage) — Turtudence  Other (specify). SDECIFIED by ALFA CODE.  MODELS EFFECTS ON OFFICIAL MODES DUE TO (V)  Media Index Veriations.  Other (specify): |

\*cylindrical in progress

| CODE NAME: | CLSLGM* |
|------------|---------|
|            |         |

| CODE TYPE: Optics  |  |
|--|--|
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE: Assess optical pe   | erformance of MIRACL device before, during, and  |
| after acceptance testing without "breaking the bank  | ( "  |
|  |  |
|  |  |
| ASSESSMENT OF CAPABILITIES: Very flexible because of modu  | lar programming approach; faster run time due to   |
| empirical gain modeling approach. Gain is modeled  | via empirical "fit" to BLAZER predictions.   |
|  |  |
|  | · · · · · · · · · · · · · · · · · · ·  |
| ASSESSMENT OF LIMITATIONS: Not suitable for cylindrical  | problems; gain medium device specific (i.e., not   |
| a design code). Detailed kinetic/gas dynamics are  | not calculated from first principals, but instea   |
| are empirically modeled.   |  |
|  |  |
| other unique Features: <u>Currently configured for MIRACL</u> but easily adaptable to other geometries due to mod  |  |
| but easily adaptable to other geometries due to mot  | dular code prillosophy.  |
|  |  |
| Peter R. Carlson/Robert E. Hodder  | none: (305) 283-3380   |
| Organization: Science Applications, Inc.   | 1016   |
| Address:201 S.W. Monterey Rd., Suite 30, Stuar   | rt. Florida 33494  |
| VAILABLE DOCUMENTATION: (T = Theory, U = User, RP = Relevant Publication   |  |
|  |  |
| Sziklas and Siegman at Pratt and Whitney for their   | SOO codes): (RP) P. Carlson and R. Hodder.   |
| <u>Sziklas and Siegman at Pratt and Whitney for their</u>  | SUU codes); (RP) P. Carlson and K. Hodder,   |
| Sziklas and Siegman at Pratt and Whitney for their<br>"Chemical-Laser Scaling-Law Gain Model Analysis," S  | SUU codes); (RP) P. Carlson and K. Hodder,   |
| Sziklas and Siegman at Pratt and Whitney for their<br>"Chemical-Laser Scaling-Law Gain Model Analysis," S  | SUU codes); (RP) P. Carlson and K. Hodder,   |
| Sziklas and Siegman at Pratt and Whitney for their<br>"Chemical-Laser Scaling-Law Gain Model Analysis," S  | SUU codes); (RP) P. Carlson and K. Hodder,   |
| Sziklas and Siegman at Pratt and Whitney for their<br>"Chemical-Laser Scaling-Law Gain Model Analysis," S  | SUU codes); (RP) P. Carlson and K. Hodder,   |
| Sziklas and Siegman at Pratt and Whitney for their<br>"Chemical-Laser Scaling-Law Gain Model Analysis," S<br>J. Stregack dated September 25, 1979.   | SUU codes); (RP) P. Carlson and K. Hodder,   |
| Sziklas and Siegman at Pratt and Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.   | SUU codes); (RP) P. Carlson and R. Hodder,   |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Linder Modification? Yes  | SOU codes; (RP) P. Carison and R. Hodder, SAI technical memorandum to D. Finkleman and                       |
| SZIKIAS and Siegman at Pratt and Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Linder Modification? Yes  | SOU codes; (RP) P. Carison and R. Hodder, SAI technical memorandum to D. Finkleman and                       |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to m   | SAI technical memorandum to D. Finkleman and   |
| SZIKIAS and Siegman at Pratt and Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to m at CTS (including aerowindow and beam path conditions).   | SAI technical memorandum to D. Finkleman and   |
| SZIKIAS and Siegman at Pratt and Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to m at CTS (including aerowindow and beam path condition  Ownership: Government  | SAI technical memorandum to D. Finkleman and   |
| SZIKIAS and Siegman at Pratt and Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently: Yes - but limited.  Under Modification: Yes  Purpose(s): Under development. The intent is to m at CTS (including aerowindow and beam path condition  Ownership: Government  Proprietary: No  | SAI technical memorandum to D. Finkleman and   |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S  J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to material of the conditional Currently?: Yes - but limited.  Ownership?: Government  Proprietary?: No  MACHINE/OPERATING SYSTEM (on which installed): CDC 175/NOS   | SAI technical memorandum to D. Finkleman and   |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S  J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to material of the condition | SAI technical memorandum to D. Finkleman and  model the entire optical path to the calorimeter oning ducts). |
| SZIKIAS AND SIEGMAN AT Pratt and Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to n at CTS (including aerowindow and beam path condition  Ownership?: Government  Proprietary?: No  MACHINE/OPERATING SYSTEM (on which installed): CDC 175/NOS  TRANSPORTABLE?: Probably  Machine Dependent Restrictions: Line printer, disc storage  | SAI technical memorandum to D. Finkleman and  model the entire optical path to the calorimeter oning ducts). |
| SZIKIAS AND Siegman at Pratt and Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to n at CTS (including aerowindow and beam path condition  Ownership: Government  Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC 175/NOS  TRANSPORTABLE?: Probably Machine Dependent Restrictions: Line printer, disc storage   | SAI technical memorandum to D. Finkleman and  model the entire optical path to the calorimeter oning ducts). |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to m at CTS (including aerowindow and beam path condition  Ownership?: Government Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC 175/NOS  TRANSPORTABLE?: Probably Machine Dependent Restrictions: Line printer, disc storage SELF-CONTAINED?: Yes Other Codes Required (name, purpose):  | SAI technical memorandum to D. Finkleman and  model the entire optical path to the calorimeter oning ducts). |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S  J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to material to the condition of the condition | SAI technical memorandum to D. Finkleman and  model the entire optical path to the calorimeter oning ducts). |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS: Operational Currently?: Yes - but limited. Under Modification?: Yes Purpose(s): Under development. The intent is to n at CTS (including aerowindow and beam path condition  Ownership?: Government Proprietary?: No MACHINE/OPERATING SYSTEM (on which installed): CDC 175/NOS  TRANSPORTABLE?: Probably Machine Dependent Restrictions: Line printer, disc storage  SELF-CONTAINED?: Yes Other Codes Required (name, purpose):  | model the entire optical path to the calorimeter oning ducts).   |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to n at CTS (including aerowindow and beam path condition  Ownership?: Government  Proprietary?: No  MACHINE/OPERATING SYSTEM (on which installed): CDC 175/NOS  TRANSPORTABLE?: Probably  Machine Dependent Restrictions: Line printer, disc storage  SELF-CONTAINED?: Yes  Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  | model the entire optical path to the calorimeter oning ducts).   |
| SZIKIAS AND SIEGMAN AT PrATE AND Whitney for their "Chemical-Laser Scaling-Law Gain Model Analysis," S  J. Stregack dated September 25, 1979.  STATUS:  Operational Currently?: Yes - but limited.  Under Modification?: Yes  Purpose(s): Under development. The intent is to m at CTS (including aerowindow and beam path condition  Ownership?: Government  Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): CDC 175/NOS  TRANSPORTABLET: Probably  Machine Dependent Restrictions: Line Drinter, disc storage  SELF-CONTAINED?: Yes  Other Codes Required (name, purpose):  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Small Job:   | model the entire optical path to the calorimeter oning ducts).   |

<sup>\*</sup> Chemical Laser Scaling-Law Gain Model

| CLSLGM |  |
|--------|--|
|        |  |

| OPTICS  | \$31  | KINETICS  | GAS DYNAMICS   |
|---|---|---|--|
| BASIC TYPE (V) Physical Opics / Geometrical                               | RESONATOR TYPE (V): Standing Wave /                                   | GAIN REGION MODELED (V): None Compact Region.                                 | NOZZLE GEOMETRY MODELED (and type) (V) NORE Chindrical, Redusly Floring        |
| FIELD (POLARIZATION) REPRESENTATION (V):                                  | BRANCH (V): Positive: V Negative OPTICAL ELEMENT MODELS INCLUDED (V): |   | Rectangular, Linearly Flowing  |
| COORDINATE SYSTEM (Caregian, cylindrical, etc.).                          | Flat Mirrors Spherical Mirrors  | KINETICS GRID DIMENSIONALITY (V):   | Other COORDINATE SYSTEM  |
| TRANSVERSE GRID DIMENSIONALITY (V): 10 20                                 | Cylindrical MirrorsTelescopes:Scraper Mirrors:                        | Compact Region.   | FLUID GRID DIMENSION (V). 10 20 30 FLOW FIELD MODELED (V):                     |
| Compact Negron 128 X 128  | Axicons Reflaxicons   | Annular Region:   | Laminar  |
| Annular Region FIELD SYMMETRY RESTRICTIONS?                               | Arbitrary:  | GAIN REGION SYMMETRY RESTRICTIONS: Gain Van Alone Optic Asset From Bisaction? | Other  MASIC MODELING APPROACH (V)   |
| MIRROR SHAPE(S) ALLOWED (V):  | Linear<br>Perabole:   | PULSED: CW: KINETICS MODELED  | Premised Mining:   |
| Square Circular Strip   | Variable Cone Offset:   | CHEMICAL PUMPING REACTIONS MODELED (V):                                       | Other (specify)  |
|   | Other (specify):  | 3<br>* =  | References for Approach Used   |
| Fixad. Single Resonator Geometry  | Deformable Mirors: Scalin Fibers                                      | Cold (F · H <sub>2</sub> )  |  |
| Fixed. Multiple Resonator Geometines                                      | Tran  | Hot (H + F <sub>2</sub> ): Chain (F + H <sub>2</sub> & H + F <sub>2</sub> )   |  |
|   | only developed for DM and grating.*                                   | Other (specify)   | THERMAL DRIVER MODELED $\langle V  angle$ :                                    |
| Francisco Control Registrations of the Asset Control Asset Asset Street   | Cavity Only:  | ENERGY TRANSFER MODES MODELED (V): Reference                                  |  |
| With Kernel Averaging   | Simple Saturated Gain: ++   |   | Shock Tube   |
| Geussian Quadrature   | ₩.  | 2.2   | Catom Dissociation FROM (V)  |
| Fast Fourner Transform (FFT):   | Mirror VIII: Decentration   | Other   | ra on Dissociation room (v).   |
| Fest Hankel Transform (FHT)   | Aberrations / Thermal Distortions:                                    | Single Line Model (V)   | Other (specify)  |
| Gardener Fresnel Kirchhoff (GFK)  | Selected (appacity):  | Multiline Model (V).  | F.ATOM CONCENTRATION DETERMINED FROM MODEL?                                    |
| Other (specify)   | Reflectivity Loss   | Assumed Rotational Population Distribution State (V)                          | DILUENTS MODELED   |
| CONVERGENCE TECHNIQUE (V):  | Output Coupier Edges: Rolled  | Equilibrium Nonequilibrium  | MODELS EFFECTS ON MINING AND E DUE 10 1 9 / Nozzle Boundary Layers Shock Waves |
| Companison _  |   | Number of Laser Lines Modeled   | Presections (thermal blockage)Turbulence                                       |
| one Monitor rms change over crosshain                                     | 3   | action of rate construction used in code.                                     | Other (specify)  |
| ACCELERATION ALGORITHMS USED: Yes Technology Field and/or gain averaging. | Gas Absorption in "gain" model.                                       | LINE PROFILE MODELS $\langle V \rangle$                                       |  |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V):                      | Overlapped Beams  | Doppier Broadening  | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)                                     |
| Prom  | Other   | Collisional Broadening  | Model Index Variations   |
| Other   |   | Other (specify)   | Other (specify)  |
|   | Optimal focal Search Beam Quality.                                    |   |  |
|   | Other   |   |  |
|   |   |   |  |
| *on optic axis  | *Not presently in code. +Empirical fit to BLAZER predictions.         | it to BLAZER predictions.   |  |

\*Not presently in code. +Empirical fit to BLAZER predictions.

| CODE NAME: | CR00* |
|------------|-------|

| CODE TYPE:Optics   | , Kinetics, and Gasdynamics   |  |
|--|---|--|
| Daniel Disposer  | Models HSIRIA and   | d Ring Resonator with mode rotation. Is intended   |
| to be a resonator  | design code for maximizing focus  | ability and power of output beam as a function of  |
|  | resonator parameters.   | sorring and poner or output beam of a remove of  |
| <del></del>  |   | ·  |
|  |   |  |
| ASSESSMENT OF CAPABILIT  | Constant or variable magnific   | cation non-everting waxicon with arbitrary offset  |
|  |   | pading capability. Spherically diverging, converg  |
| ing, or collimated   | compact leg beam with capability  | y to adjust ID/OD ratio (bifocal property of   |
| axicon) of output  | beam independent of resonator mag   | gnification. Models arbitrary tilt, decentation,   |
| misfigure, and the   | rmal distortion of all elements.  | Models arbitrary number of struts.   |
| ASSESSMENT OF LIMITATIO  | ns: Planned additions: reflaxico  | on option, sparse OPD matrix calculation with inte   |
| <u>polation, decompos</u>  | ition of OPD matrix into componer   | nts amenable to convolution, integral annular leg  |
|  | roduction of FFT annular leg prop   | pagation, two or more gain sheets, polarization  |
| (vector) code.   |   |  |
| or AFWL; resonator   | geometrics modeled - HSURIA and   | mented listings (proprietary), available from TRW ring resonator with mode rotation and axicon tip   |
| flux unloading; ex   | p. gain, CL11, or HWN modeling.   |  |
| ORIGINATOR/KEY CONTACT   |   |  |
| Name: Dona?  | d L. Bullock P  | hone: (213) 535-3484   |
| Organization: TRW [  | <del></del>   |  |
| Address: RI/11   | 62, One Space Park Redondo Beach  | , California 90278   |
|  | igned and misaligned); other doct   | umentation planned.  |
|  | igned and misaligned); other doc  | umentation planned.  |
| STATUS:  |   | umentation planned.  |
| STATUS:<br>Operational Currently?:!  | Bare cavity yersion.  | umentation planned.  |
| STATUS:<br>Operational Currently?: J   | Bare cavity version.  |  |
| STATUS:  Operational Currently?: J Under Modification?:  Purpose(s): Add   | Bare cavity version.  | implemented at AF:/L). Thermal aberrations being   |
| STATUS: Operational Currently?: J Under Modification?: Purpose(s): Add Coded.  | Bare cavity version.<br>(es<br>SLIM gain model (currently being   |  |
| STATUS:  Operational Currently?: J Under Modification?:  Purpose(s): Add coded.  Ownership?: GOVE  | Bare cavity version.  |  |
| STATUS: Operational Currently?: Under Modification?: Purpose(s):Add Coded.  Ownership?:Gove! Proprietary?:Yes  | Bare cavity version.<br>les<br>SLIM gain model (currently being   |  |
| STATUS:  Operational Currently?:   | Sare cavity version.  es SLIM gain model (currently being comment for ALPHA competition.  EM (on which installed): Cyber 176 (CDC)  | implemented at AFIL). Thermal aberrations being  |
| Operational Currently?: J Under Modification?: — Purpose(s): — Add COded.  Ownership?: — GOVE Proprietary?: — Yes 1 MACHINE/OPERATING SYST FRANSPORTABLE?: _ CDC Machine Depandent Res   | Sare cavity version.  les SLIM gain model (currently being  mment for ALPHA competition.  EM (on which installed): Cyber 176 (CDC)  Only  Inclines CDC only (may have to reco   | implemented at AF./L). Thermal aberrations being   |
| STATUS: Operational Currently?:  | Care cavity version.  (es SLIM gain model (currently being roment  for ALPHA competition.  EM (on which installed): Cyber 176 (CDC)  Only  Inclines: CDC only (may have to reconstructions for installation other   | implemented at AF./L). Thermal aberrations being  de permanent disk file management and core size than AFWL.)  |
| STATUS: Operational Currently?:  | Care cavity version.  (es SLIM gain model (currently being roment  for ALPHA competition.  EM (on which installed): Cyber 176 (CDC)  Only  Inclines: CDC only (may have to reconstructions for installation other   | implemented at AF./L). Thermal aberrations being  de permanent disk file management and core size than AFWL.)  |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):Add  Coded.  Ownership?:Gove!  Proprietary?:Yes  MACHINE/OPERATING SYST  FRANSPORTABLE?:CDC  Machine Dependent Res adjustment compas:  adjustment compas:  ELF-CONTAINED?:NO  Other Codes Required (n | Care cavity version.  (es SLIM gain model (currently being roment  for ALPHA competition.  EM (on which installed): Cyber 176 (CDC)  Only  Inclines: CDC only (may have to reconstructions for installation other   | implemented at AF./L). Thermal aberrations being de permanent disk file management and core size than AFWL.)   |
| STATUS:  Operational Currently?:   | Gare cavity version.  Ses SLIM gain model (currently being comment correction.  EM (on which installed): Cyber 176 (CDC)  Only trictions: CDC only (may have to reconstructions for installation other corrections.  EMBLIB routines for elint, KBLIMP, ALFA for nozzle exit  | implemented at AF./L.). Thermal aberrations being  de permanent disk file management and core size than AFWL.)  igenvalue calculation; DISSPLA for 2D, 3D, and/or conditions.                                |
| STATUS:  Operational Currently?: J Under Modification?: Purpose(s): Add coded.  Ownership?: Gove Proprietary?: Yes ! MACHINE/OPERATING SYST TRANSPORTABLE?: CDC Machine Dependent Res adjustment compass SELF-CONTAINED?: NO Other Codes Required (in Contour Diots, VI. | Bare cavity version.  Tes SLIM gain model (currently being comment for ALPHA competition.  EM (on which installed): Cyber 176 (CDC)  Only trictions: CDC only (may have to reconstructions for installation other continues for installation other continues for installation other continues for entity | implemented at AF./L). Thermal aberrations being de permanent disk file management and core size than AFWL.)  igenvalue calculation; DISSPLA for 2D, 3D, and/or conditions.                                  |
| STATUS:  Operational Currently?:   | Gare cavity version.  Ses SLIM gain model (currently being comment correction.  EM (on which installed): Cyber 176 (CDC)  Only trictions: CDC only (may have to reconstructions for installation other corrections.  EMBLIB routines for elint, KBLIMP, ALFA for nozzle exit  | de permanent disk file management and core size than AFWL.)  igenvalue calculation; DISSPLA for 2D, 3D, and/or conditions.   |
| STATUS:  Operational Currently?:   | Core Size (Octal Words)  Sare cavity version.  Sare cavity version.  Sare cavity version.  Sare cavity version.  Core size (Octal Words)  Sare cavity version.  Sare cavity version.  Cyber 176 (CDC)  Saroutines for installation other  Same, purpose): IMSLIB routines for element of the same purpose | implemented at AF./L). Thermal aberrations being  de permanent disk file management and core size than AFWL.)  igenvalue calculation; DISSPLA for 2D, 3D, and/or conditions.  Execution Time (Sec. CDc 7500) |

<sup>\*</sup>Cylindrical Resonator Optical Quality

| CRO |
|-----|
| ·   |

| OPTICS  | SOI  | KINETICS   | GAS DYNAMICS  |
|---|--|--|---|
| JASIC TYPE (V)  Presental Opics   | RESONATOR TYPE (V): Standing Wave Traveling Wave (Ring)                      | GAIN REGION MODELED (V):                             | NOZZLE GEOMETRY MODELED (and type) (V).                     |
| IELD (POLARIZATION) REPRESENTATION (V):                                     |  | COORDINATE SYSTEM (Cartasum, cytropical, etc.)       | Cymarka: nadany rowing -<br>Rectangular Librarity Flowing   |
| Scalar Vector   | OPTICAL ELEMENT MODELS INCLUDED $\langle V  angle_{ m c}$                    | Compact Region CY Annular Region CY                  | Other   |
| COORDINATE SYSTEM (Carressan cylindrical, etc.).  CV - CV - CV              | 3-   | ~^ <b>-</b>  | COORDINATE SYSTEM CY  |
| PRANSVERSE GRID DIMENSIONALITY (V): 1D 2D                                   | Scraper Mirrora  | Compact Region                                       | FLUID GRID DIMENSION (V), 10 × 20 30                        |
|   | Asions Retlaucons  | Annular Region                                       | Laminar Turbulent   |
| Annular Region  | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS                    | one Scheduled mixing.                                       |
| JELD SYMMETRY RESTRICTIONS? NOTICE  | Linear   | Gain Vary Nong Optic Ases? Yes* Flow Direction? Yes  | BASIC MODELING APPROACH (V)                                 |
| Square Circular Snp   | Parabola Parabola  | PULSED. CW V KINETICS MODELED                        | Premised Mixing 1   |
|   | Veriable Cone Offset:  | (x · y · vx · v)                                     | Other (specify)   |
| ONFIGURATION FLEXIBILITY (V)  | Other (specify)  | ~~   | References for Approach Used                                |
| Fixed. Single Resonator Geometry  | Scattal filters Continue   | Cold (F · H <sub>2</sub> ) / D                       |   |
| Pired: Multiple Medonator Cetometrees Machina Multiple Becomitte Connection | Bifo   | Hot (H · F2) Chain (F · H2 & H · F2)                 |   |
| PROPAGATION TECHNIQUE   | or corner reflector back elements.   | Other (specify)                                      | ē   |
| Freshal Integral Algorithms   | GAIN MODELS (V): Bare Cavity Only  | V.T. V   | Arc Meater Combustor  |
| With Kernel Averaging   | Simple Saturated Gain Detailed Cain  | ác ×   | Chiase  |
| Geussian Quadrature   | BARE CAVITY FIELD MODIFIER MODELS (V)  | V. V.  | FATOM DISSOCIATION FROM (V)                                 |
| Fast Fourier Transform (FFT)  | 1 1  | one, RR (ACLOS rot. noneq. to come)                  | f <sub>2</sub> V SF <sub>6</sub>                            |
| Fast Hankel Transform (FHT)   | Arbitrary  | Single Line Model (V)                                | Other (apecity) NF  |
| Gardener Freenet Kirchhoff (GFK)  | Selected (apporty)   | Multime Model (V)                                    | F.ATOM CONCENTRATION DETERMINED FROM MODELY YES             |
| Office (specify)  | Reflectivity Loss  | Assumed Rotational Population Distribution State (V) | MODELS EFFECTS ON MIXING RATE DUE TO (1)                    |
| CONVERGENCE TECHNIQUE (V):  | Output Coupler Edges Rolled  | Equitibrium Nonequilibrium   19111EU                 | Nozzle Boundary Layers Shock Waves                          |
| Power Comparison V Field Companson:   | Serated Other Control of Serated Other                                       | Source of Rate Coefficients Used in Code N. COhen    | Presentions (therma) blockage)Turbulence                    |
| Other   | Medium index Variation   |  | fuel, oxidant, mixed.                                       |
| ACCELERATION ALCOMISTMES USED!  | Gas Absorption   | LINE PROFILE MODELS (V)                              |   |
| MULTIPLE EIGENVALISZ/VECTOR EXTRACTION ALGORITHM (V):                       | Overlapped Beams   | Doppler Broadening V                                 | MODELS EFFECTS ON OPTICAL MODES DUE TO (1)                  |
| Prony V   | oner Single skin at rear element.*   | ones (specify) Operation at line center              | Media Index Variations                                      |
| Other   | FAR-FIELD MODELS (V) Beam Steeming Removal Optimal Focal Search Beam Quality |  | one (epects) Nonresonant and wake UPE index effects olamped |
| , ,   | Other  |  |   |
|   |  |  |   |

\*Upgrading to two skins, \*With 2

\*With 2 + skin upgrad.

| CODE NAME: | DENTAL |
|------------|--------|
|            |        |

| l com literation  | alculations with strip unstable vecesator  |
|---|--|
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE: Laser kinetics ca  | arculations with strip unstable resonator. |
|   |  |
|   |  |
| ASSESSMENT OF CAPABILITIES: Kinetics which can be select  | ted are CO., HF/DF, and KRF.               |
| ASSESSMENT OF CAPABILITIES: Kinetics which can be select  |  |
|   |  |
|   |  |
| ASSESSMENT OF LIMITATIONS: One transverse dimension.  |  |
|   |  |
|   |  |
|   |  |
| OTHER UNIQUE FEATURES:  |  |
|   |  |
|   |  |
| ORIGINATOR/KEY CONTACT:   |  |
|   | tione: (505) 844 - 0721                    |
| Organization: AFWL/ALR  |  |
| Address: Kirtland AFB, New Mexico 87115   | T, U, RP: none                             |
| AVAILABLE DOCUMENTATION: (T = Theory, U = User, RP = Relevant Publication   | . L. U. KP: NOBE                           |
|   | n):  |
|   | n):  |
|   | n):  |
|   | 1):  |
|   | 1)   |
|   |  |
|   |  |
|   |  |
|   |  |
| STATUS:   |  |
| STATUS:  Operational Currently?: Yes  |  |
| STATUS:  Operational Currently?: Yes  Under Modification?:  |  |
| STATUS:  Operational Currently?: Yes  |  |
| STATUS:  Operational Currently?: Yes  Under Modification?:  |  |
| STATUS:  Operational Currently?: Yes  Under Modification?: Purpose(s):  |  |
| STATUS:  Operational Currently?: Yes  Under Modification?: Purpose(s):  |  |
| STATUS:  Operational Currently?: Yes  Under Modification?: Purpose(s):  Ownership?: Government (AFWL)   |  |
| STATUS:  Operational Currently?: Yes  Under Modification?: Purpose(s):  Ownership?: Government (AFWL)  Proprietary?: No   |  |
| STATUS:  Operational Currently?: Yes  Under Modification?: Purpose(s):  Ownership?: Government (AFWL)  Proprietary?: No   |  |
| STATUS:  Operational Currently?: Yes  Under Modification?: Purpose(s):  Ownership?: Government (AFWL)  Proprietary?: No   |  |
| STATUS:  Operational Currently?: Yes Under Modification?:  Purpose(s):  Ownership?: GOVETITIENT (AFWL)  Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): CDC  TRANSPORTABLE?:   |  |
| STATUS:  Operational Currently?: Yes Under Modification?:  Purpose(s):  Ownership?: GOVETITIENT (AFWL)  Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): CDC  TRANSPORTABLE?:   |  |
| STATUS:  Operational Currently?: Yes  Under Modification?: Purpose(s): Ownership?: GOVETriment (AFWL)  Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): CDC   |  |
| STATUS:  Operational Currently?:Yes  Under Modification?: Purpose(s):  Ownership?:GOVET riment (AFWL) Proprietary?:No  MACHINE/OPERATING SYSTEM (on which installed):CDC  TRANSPORTABLE?: Machine Dependent RestrictionsFFT_is_machine_language.  |  |
| STATUS:  Operational Currently?: Yes Under Modification?:  Purpose(s):  Ownership?: GOVETITIENT (AFWL)  Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): CDC  TRANSPORTABLE?:   |  |
| STATUS:  Operational Currently?:Yes  Under Modification?: Purpose(s):  Ownership?:GOVETITEENT (AFWL) Proprietary?:NO  MACHINE/OPERATING SYSTEM (on which installed):CDC  TRANSPORTABLE?: Machine Dependent RestrictionsFFT_is_machine_language.   |  |
| STATUS:  Operational Currently?:Yes   |  |
| STATUS:  Operational Currently?: Yes  Under Modification?:  Purpose(s):  Ownership?: GOVETHMENT (AFWL)  Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): CDC  TRANSPORTABLE?:  Machine Dependent Restrictions FFT is machine language.  SELF-CONTAINED?:  Other Codes Required (name, purpose):   |  |
| STATUS:  Operational Currently?:Yes   |  |
| STATUS:  Operational Currently?:Yes   |  |
| STATUS:  Operational Currently?:Yes  Under Modification?:   |  |
| STATUS:  Operational Currently?: Yes Under Modification?:  Purpose(s):  Ownership?: GOVETIMENT (AFWL)  Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): CDC  TRANSPORTABLE?:  Machine Dependent Restrictions FFT is machine language.  SELF-CONTAINED?:  Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) |  |

| GAS DYNAMICS | NOZZE GEOMETRY MODELED (and type) (V) Cylindirea Radaily Floance Recursquia Linearly Floance One FILUD GRID DIMENSION (V) 10 — 20 One (appect)  THERMAL DRIVER MODELED (V) Act Hazir FATOM DISSOCIATION FROM (V) FATOM DISSOCIATION FROM (V) FATOM CONCENTRATION DETERMINED FROM MODEL) FOR GONEY (appect)  FATOM CONCENTRATION DETERMINED FROM MODEL) FATOM CONCENTRATION DETERMINED FROM MODEL) FATOM CONCENTRATION DETERMINED FROM MODELS FEFECTS ON MIXING RATE DUE TO (V) NOTHER (appect)  MODELS EFFECTS ON MIXING RATE DUE TO (V) MARGIN FORMINE  MODELS EFFECTS ON MIXING RATE DUE TO (V) MARGIN FORMINE  MARGIN FATOM PARISHOR  OTHER (APPECT)  OTHER (APPECT)  OTHER (APPECT)  OTHER (APPECT)  |  |
|--------------|--|--|
| KINETICS     | GAIN REGION MODELED (V)  Compact Region  CONDINATE SYSTEM (Cartesian cylindrical etc.)  Compact Region  Compact Region  Compact Region  Annutar Region  Compact Region  Compac |  |
| OPTICS       | RESONATOR TYPE (V) Standing Wave  Traveling Wave (Ming) — Reveise TW  BRANCH (V) Positive — Negative  OPTICAL ELEMENT MODELS INCLUDED (V):  Full Minors — Sphenical Minors — Scrape Minors  Scrape Minors — Sphenical Minors  Astrons  Astron |  |
| 40           | FIELD (POLARIZATION) REPRESENTATION (V): Scalar — Vector COORDINATE SYSTEM (Cartesian, cylindrical art) COORDINATE SYSTEM (Cartesian, cylindrical art) TRANSVERSE CRID DIMENSIONALLY (V) COMPACT REPORT Annular Region A |  |

| CODE | MAME: |
|------|-------|

DESALE-5

| PRINCIPAL PILEBORS/EL/  | APPRICATION(S) OF CODE Calculation   | of CW and Pulsed Chemical Laser Performance.  |
|---|--|---|
|   | AFFEIGN (TOTALS) OF CODE   |   |
|   |  |   |
| ASSESSMENT OF CAPABIL   | Calculates solutions to  | coupled fluid dynamic, chemical kinetic and radiati   |
| transport equati  | ons for CW and pulsed chemical   | lasers. Utilizes comprehensive model of chemical  |
| kinetics and inc  | ludes treatment of base relief   | and nozzle boundary layer effects.  |
| ASSESSMENT OF LIMITAT   | nons: Restricted to Fabry-Pero   | t cavity (although ad hoc technique for first order ). Uses scheduled mixing model to treat mixing  |
|   |  |   |
|   |  | ocally at each downstream station according to  |
| local flow prope  | rties). Restricted to rotation   | al equilibrium.   |
| OTHER UNIQUE FEATURE  | s: Individual vibration levels   | treated as separate species; models effect of   |
| blockage (base r  | relief).   |   |
|   |  |   |
| ORIGINATOR/KEY CONTA  |  | (213) 640 6963  |
| Any   | Epstein  | Phone: (213) 648-6861   |
| O-20-112011011  | ophysics Laboratory, The Aerosp  | ace corporation   |
|   |  | 4- 00000  |
|   | ). Box 92957, Los Angeles, Calif   |   |
|   |  |   |
| AVAILABLE DOCUMENTA<br>Mixing Model for   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac  | cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.  |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)  | TION:(T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac   | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)  | TION:(T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac   |   |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)  | TION:(T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac   | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)  | TION:(T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac   | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)  | TION:(T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac   | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)<br>75-60, W.D. Adan  | TION:(T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac   | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)<br>75-60, W.D. Adan  | TION:(T = Theory U = User RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Comp ns, E.B. Turner, J.F. Holt, D.G.  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)<br>75-60, W.D. Adan<br>STATUS:<br>Operational Currentlyi   | TION:(T = Theory U = User RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Comp ns, E.B. Turner, J.F. Holt, D.G.  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)<br>75-60, W.D. Adan<br>STATUS:<br>Operational Currently!<br>Under Modification?:   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Compis, E.B. Turner, J.F. Holt, D.G.  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AYAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)<br>75-60, W.D. Adan<br>STATUS:<br>Operational Currentlyi   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Compis, E.B. Turner, J.F. Holt, D.G.  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA<br>Mixing Model for<br>M. Epstein; (U)<br>75-60, W.D. Adan<br>STATUS:<br>Operational Currently!<br>Under Modification?:   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Compis, E.B. Turner, J.F. Holt, D.G.  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently Under Modification? Purpose(s):  | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Comp ns, E.B. Turner, J.F. Holt, D.G.  Yes  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently! Under Modification?: Purpose(s): Ouncership?: ARTS  | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Compis, E.B. Turner, J.F. Holt, D.G.  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently! Under Modification?: Purpose(s): Proprietary: No  | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospace "The Resale Chemical Laser Compiss, E.B. Turner, J.F. Holt, D.G.  Presson   | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently! Under Modification?: Purpose(s): Proprietary: No  | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Comp ns, E.B. Turner, J.F. Holt, D.G.  Yes  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently! Under Modification? Purpose(s):  Ownership?: Aero Proprietary?: No MACHINE/OPERATING SY   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Compins, E.B. Turner, J.F. Holt, D.G.  P. Yes No  Dispace Corporation  (STEM (on which installed): CDC 7500   | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently! Under Modification?: Purpose(s):  Ownership: Aero Proprietary?: No MACHINE/OPERATING SY  TRANSPORTABLE?: YS   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Lasers."  The Resale Chemical Lasers."  Aerospace Compassion Compas | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently! Under Modification?: Purpose(s):  Ownership: Aero Proprietary?: No MACHINE/OPERATING SY  TRANSPORTABLE?: YS   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Compins, E.B. Turner, J.F. Holt, D.G.  P. Yes No  Dispace Corporation  (STEM (on which installed): CDC 7500   | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently Under Modification?: Purpose(s): Proprietary?: NO MACHINE/OPERATING SI  TRANSPORTABLE?: YE Machine Dependent   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospace "The Resale Chemical Laser Compins, E.B. Turner, J.F. Holt, D.G.  P. Yes  No  P. Yes  No  P. Yes  No  P. Yes  No  Restrictions: None  | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently Under Modification?: Purpose(s): Proprietary?: NO MACHINE/OPERATING SI  TRANSPORTABLE?: YE Machine Dependent I   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospace "The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  P. Yes  No  P. Y | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently Under Modification?: Purpose(s): Proprietary?: No MACHINE/OPERATING SI  TRANSPORTABLE?: YE Machine Dependent I   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospace "The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  P. Yes  No  P. Y | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently! Under Modification?: Purpose(s): Proprietary?: NO MACHINE/OPERATING SY  TRANSPORTABLE?: YE Machine Dependent I  SELF-CONTAINED?: YE Other Codes Required  | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospac "The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Lasers."  The Researt Public Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Lasers."  The Researt Public Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Lasers."  The Resale Chemical Lasers."  The Researt Public Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Holt, D.G.  The Resale Chemical Laser Compas, E.B. Turner, J.F. Turner, J.F. Turner, J.F. Turner, J.F. Tu | (cation): (T) "Desale-5: A Comprehensive Scheduled<br>e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979.<br>uter Program." Aerospace Corporation Rpt. SAMSO-T                                      |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently Under Modification?: Purpose(s): Purpose(s): Proprietary?: No MACHINE/OPERATING SI  TRANSPORTABLE?: YE Other Codes Required  ESTIMATE OF RESOURCE:   | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospace "The Resale Chemical Laser Compins, E.B. Turner, J.F. Holt, D.G.  P. Yes  No  Dispace Corporation  (STEM (on which installed): CDC 7600  P. COR STEM (On Which installed): CDC 7600   | castion): (T) "Desale-5: A Comprehensive Scheduled e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979. uter Program." Aerospace Corporation Rpt. SAMSO-TI Sutton, and H. Mirels, February 20, 1975. |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently Under Modification?: Purpose(s):  Ounership?: Aerc Proprietary?: No MACHINE/OPERATING ST  TRANSPORTABLE?: YS Machine Dependent I SELF-CONTAINED?: YS Other Codes Required  ESTIMATE OF RESOURCE: | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospace "The Resale Chemical Laser Compins, E.B. Turner, J.F. Holt, D.G.  P. Yes  No  Dispace Corporation  (STEM (on which installed): CDC 7500  25  Restrictions: None  25  15 (name, purpose): Core Size (Octal World 146K)   | cation): (T) "Desale-5: A Comprehensive Scheduled e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979. uter Program." Aerospace Corporation Rpt. SAMSO-TI Sutton, and H. Mirels, February 20, 1975.  |
| AVAILABLE DOCUMENTA Mixing Model for M. Epstein; (U) 75-60, W.D. Adan  STATUS: Operational Currently Under Modification?: Purpose(s):  Ownership?: Aero Proprietary?: No MACHINE/OPERATING SI  TRANSPORTABLE?: YG Machine Dependent I  SELF-CONTAINED?: YG Other Codes Required                       | TION: (T = Theory, U = User, RP = Relevant Public CW Chemical Lasers." Aerospace "The Resale Chemical Laser Compins, E.B. Turner, J.F. Holt, D.G.  P. Yes  No  Dispace Corporation  (STEM (on which installed): CDC 7600  P. COR STEM (On Which installed): CDC 7600   | castion): (T) "Desale-5: A Comprehensive Scheduled e Corporation Rpt. SAMSO-TR-79-31, May 1, 1979. uter Program." Aerospace Corporation Rpt. SAMSO-TI Sutton, and H. Mirels, February 20, 1975. |

|   | 2 |   |   |  |
|---|---|---|---|--|
|   | į |   | j |  |
|   |   |   |   |  |
| - | - |   |   |  |
|   |   | ı |   |  |
|   |   | - | 1 |  |

| OPTICS   | ICS None   | KINETICS   | GAS DYNAMICS                                    |
|--|--|--|---|
| BASIC TVPE (V)   | A Section of the sect | 767 44 34 44 44 44 44 44 44 44 44 44 44 44           |   |
|  | RESOURTION TITLE (V): Standing Wave  | GAIN REGION MODELED (V):                             | MOZZLE GEOMETRY MODELED (and type) (V):         |
| There of the state | Traveling Wave (Ring.) Reverse TW  | Compact Region: Annular Region:                      | Cylindrical, Radially Flowing                   |
| FIELD (POLARIZATION) REPRESENTATION (V):   | BRANCH (V): Positive: Negative:  | COORDINATE SYSTEM (Cartesian, cylindrical, etc.)     | Rectangular, Linearly Flowing                   |
| Scalar Vector  | OPTICAL ELEMENT MODELS INCLUDED (V):   | Compact Region. Cd. Annular Region:                  | one Rectangular + varging area due              |
| COORDINATE SYSTEM (Cartesian, cylindrical, etc.);  | Flat Mirrors: Spherical Mirrors.   | KINETICS GRID DIMENSIONALITY (V):                    | COORDINATE SYSTEM CARTESTAN TO SHITOUGS         |
| Compact Region Annular Region  | Cylindrical Minora:Telescopes:   | 00 OZ 01   | FLUID GRID DIMENSION (V): 10: 1/20 30           |
| TRANSVERSE GRID DIMENSIONALITY (V): 1D 20  | Scraper Mirrors:   | Compact Region:                                      | FLOW FIELD MODELED (V):                         |
| Compact Region   | Asicons Reflasicons  | Annular Region:                                      | Laminar: Turbulent:                             |
| Annuter Region   | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS:                   | Other   |
| FIELD SYMMETRY RESTRICTIONS?   | Linger   | Gain Vary Along Optic Asas? Flow Direction?          | BASIC MODELING APPROACH (V):                    |
| mirror shape(s) allowed (V)  | Parabole: Parabole:  | PULSED: V CW: V KINETICS MODELED                     | Premused Maine V (Scheduled mass addit          |
| ž.   | Variable Core Offer:   | G REACTIONS MODELED (                                | Other (specify)                                 |
| Rectangular Elliptical Arbitrary   | Other (see city)   | - 18 C   |   |
| COMPIGURATION FLEXIBILITY (V)  | Deformable Mirrors   | (Y - X <sub>2</sub> - YX - X) H /                    | References for Approach Used                    |
|  | Section 5 December 1   | Code (F. H2)   |   |
| Fixed, Multiple Resonator Geometries   |  | Hat (H - F2): 1 Chain (F - H2 & H - F2) 1            |   |
| Moduler Multiple Recourtor Geometries  | Unite Compute  | Other (specify):                                     | THERMAL DRIVER MODELED (V.)                     |
| PROPAGATION TECHNIQUE LA CALCACATIONNAL ANNICAN  |  | ENERGY TRANSFER MODES MODELED (V): Reference         | Arc Heater Combustor                            |
| Freshel Integral Algorithms  | GAIN MODELS (V): Bere Cevity Only  | v. / See rate coefficient reference                  |   |
| With Kernel Averaging  | Skripte Seturated Gain Detailed Gain:  | Y.R.   | ı   |
| Gaussian Quadrature  | 1  | ww / See rate coefficient reference                  | E ATOM DICEOCIATION CROM (V.                    |
| Faul Fourner Transform (FFT)   | December of the contraction of t | Other  | 62 4 St. V                                      |
| Fast Nankol Transform (FMT)  | AND THE PROPERTY OF THE PROPER | Single Line Model (V) - V *                          | Other (specify) NF <sub>2</sub>                 |
| Gardense Freens-Kerchheff (GFR)  |  | Muthikm Model (V)                                    | F-ATOM CONCENTRATION DETERMINED FROM MODEL? YES |
| Other (specify)  |  | Assumed Rotational Population Distribution State (V) | DILUENTS MODELED He, Ar, No, others pos-        |
|  |  | Equilibrium / Nonequilibrium                         | S   |
| CONVERGENCE TECHNIQUE (V):   |  | Number of Leser Lines Modeled 9                      | Nozzłe Boundery Layers Shock Weres              |
| Power Comparison Field Comparison  | LOADED CAVITY FIELD MODIFIER MODELS (V)  | Source of Rate Coefficients Used in Code             | remestions (Mermal blockage) - Intruductor      |
|  | Mechum Index Variation   |  | mixing zone calculated as part of               |
| ACCELERATION ALCORITHMS USED?  | Gas Abacrotton   | LINE PROFILE MODELS (V)                              | solution using local values of var-             |
|  | Overlapped Bearry  | Doppler Broadening                                   | 7.  |
| MULTIPLE ENGENYALUE/VELTUM EXTRACTION ALLUMITATION (V.).   | Other  | Coffisional Broadening                               | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)      |
| Other  | FAR FIELD MODELS (V) Boam Secong Removal   | oner (specing) Voight function (includes             | Other (specify)                                 |
|  | Optimal focal Search Beam Quality  | Doppler and collisional broadening).                 |   |
|  | Other  |  |   |
|  |  |  |   |

\*Lasing on only one transition between prs of vibrational levels.

| CODE NAME: | ELNWD2 |
|------------|--------|
|            | L      |

| Compute transve  | erse eigenmodes of bare annular resonators and     |
|--|--|
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE: COMPUTE transverlater add simple gain.  |  |
|  |  |
|  |  |
| ASSESSMENT OF CAPABILITIES: Mode loss frequency mode   | shape, and optical quality versus equivalent Fresi |
| number, magnification, and fractional length that  |  |
|  |  |
|  |  |
| ASSESSMENT OF LIMITATIONS: Linear mirrors; low azimutha  | 1 modes; geometry. Extensions are difficult NEQ >  |
| due to asymptotic Fresnel approximation.   |  |
|  |  |
|  |  |
| OTHER UNIQUE FEATURES:Can model HSURIA and compact   | unstable confocal resonator.                       |
| NIMER UNIQUE PEATURES:   |  |
|  |  |
|  | <del></del>  |
| PRIGINATOR/KEY CONTACT:  | (213) 648-7391                                     |
| Name: John Ellinwood P Organization: Aerospace Corporation   | hone: (213) 040-7391                               |
| Address: Box 92957, Los Angeles, California 900  | 009  |
| VAILABLE DOCUMENTATION: (T = Theory, U = User, RP = Relevant Publication   | (T) To be extended to 2000 (II)                    |
| (listings) custom available; (RP) see literature   | on asymptotic methods.                             |
| (listings) custom available; (RP) see literature   | on asymptotic methods.                             |
| (listings) custom available; (RP) see literature   | on asymptotic methods.                             |
| (11stings) custom available; (RP) see interature   | on asymptotic methods.                             |
| (  Stings  custom available; (RP) see Interature   | on asymptotic methods.                             |
| (  Stings  custom available; (KP) see Interature   | on asymptotic methods.                             |
| STATUS:  Operational Currently:NO  | on asymptotic methods.                             |
| STATUS:  Operational Currently?  Under Modification?:  Under development   | on asymptotic methods.                             |
| STATUS:  Operational Currently: Under Modification:  Purpose(s):  A account of the content of th | on asymptotic methods.                             |
| STATUS:  Operational Currently?  Under Modification?:  Purpose(s):  Aerospace Corporation  Ownership?:  Aerospace Corporation  | on asymptotic methods.                             |
| STATUS:  Operational Currently?  | on asymptotic methods.                             |
| STATUS:  Operational Currently? Under Modification? Purpose(s):  Ownership? Aerospace Corporation Proprietary?: Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 76/1  | on asymptotic methods.                             |
| STATUS:  Operational Currently? Under Modification?:  Purpose(s):  Ownership?:  Aerospace Corporation Proprietary?:  Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed):  CDC Cyber 76/1  TRANSPORTABLE?:  No quarantee   | on asymptotic methods.                             |
| STATUS:  Operational Currently? Under Modification? Purpose(s):  Ownership? Aerospace Corporation Proprietary?: Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 76/1  | on asymptotic methods.                             |
| STATUS:  Operational Currently: Under Modification: Purpose(s):  Ownership: Aerospace Corporation Proprietary: Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 76/1  TRANSPORTABLE: No quarantee Machine Dependent Restrictions: Plot routine   | on asymptotic methods.                             |
| STATUS:  Operational Currently? Under development Purpose(s):  Ownership? Aerospace Corporation Proprietary?: Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 76/1  TRANSPORTABLE: No quarantee   | on asymptotic methods.                             |
| STATUS:  Operational Currently?  Under Modification?:  Ownership?:  Purpose(s):  Ownership?:  Aerospace Corporation  Proprietary?:  Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed):  TRANSPORTABLE?:  No quarantee  Machine Dependent Restrictions:  Plot routine  SELF-CONTAINED?:  No   | on asymptotic methods.                             |
| STATUS:  Operational Currently?  Under Modification?:  Ownership?:  Purpose(s):  Ownership?:  Aerospace Corporation  Proprietary?:  Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed):  TRANSPORTABLE?:  No quarantee  Machine Dependent Restrictions:  Plot routine  SELF-CONTAINED?:  No   | on asymptotic methods.                             |
| STATUS:  Operational Currently?  Under Modification?:  Distribution controlled by USAF.  Purpose(s):  Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed):  CDC Cyber 76/1  TRANSPORTABLE:  No quarantee  Machine Dependent Restrictions:  Plot routine  SELF-CONTAINED?:  No Other Codes Required (name, purpose):  Special functions,  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)   | TMSL  Execution Time (Sec. CDC 7600)               |
| STATUS:  Operational Currently? Under Modification? Purpose(s):  Ownership?: Aerospace Corporation Proprietary?: Distribution controlled by USAF. MACHINE/OPERATING SYSTEM (on which installed): CDC Cyber 76/1: TRANSPORTABLE?: No quarantee Machine Dependent Restrictions: Plot routine  SELF-CONTAINED?: No Other Codes Required (name, purpose): SPECIAL functions,  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words) 40K   | IMSL  Execution Time (Sec. CDC 7600)  5            |
| STATUS:  Operational Currently?  Under Modification?:  Distribution controlled by USAF.  Purpose(s):  Distribution controlled by USAF.  MACHINE/OPERATING SYSTEM (on which installed):  CDC Cyber 76/1  TRANSPORTABLE:  No quarantee  Machine Dependent Restrictions:  Plot routine  SELF-CONTAINED?:  No Other Codes Required (name, purpose):  Special functions,  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)   | TMSL  Execution Time (Sec. CDC 7600)               |

. ...

ELNWD2

| OPTICS  | cs   | KINETICS  | GAS DYNAMICS  |
|---|--|---|---|
| BASIC TYPE (V) Physical Opins — Geometrical —   | RESONATOR TYPE (V): Standing Wave Traveling Wave (Ring) Reverse TW   | GAIN REGION MODELED (V) NONE Compet Region Annula Region                        | NOZZLE GEOMETRY MODELED (and type) ( $V_i$ ). None Cylindrical Roddily Flound |
| FIELD (POLARIZATION) REPRESENTATION (V):  | BRANCH (V): Positive V Negative. OPTICAL ELEMENT MODELS INCLUDED (V) | COORDINATE SYSTEM (Cartesuan, cylindrical etc.) Compact Region Annular Region   | Rectangular, Lansarty Florence  |
| COORDINATE SYSTEM (Cartesian, cylindineal, etc.). Compact Region CY Annulas Region CY | Flat Mirrors Spherical Mirrors Chindres Mirrors Talescone            | KINETICS GRID DIMENSIONALITY (V)  |   |
| TRANSVERSE GRID DIMENSIONALITY (V): 1D 20   |  |   | FLUID GRID DIMENSION (V) 10 20 30<br>FLOW FIELD MODELED (V)                   |
| Compact Region Annutar Region   | Asscora  | Annukar Region:   | LerninarTurbulent   |
| FIELD SYMMETRY RESTRICTIONS? None   | (Tuest   | GAIN REGION STAMME BY NEST RIC HONS: Gain Vary Mong Optic Ases? Flow Direction? | BASIC MODELING APPROACH (V)   |
| Square Circular Strip   | Parabola Parabola  | PULSED: CW KINETICS MODELED   | Premised Misme  |
| Rectangular Elliptical Arbdrary   | Variable Core Offset:  | (x · v2 · vx · v)   | Other (specify)   |
| CONFIGURATION FLEXIBILITY (V): Fixed: Single Resonator Geometry                       | Deformable Minors  | <u>~</u>  | References for Approach Used  |
| Fraed. Multiple Masonator Geometries  | Special Filters. Gratings  | Het (H · F.3) Chain (F · M · B.4)   |   |
|   | Other Elements   |   | THE BREAT DRIVE B. ACRES CO. A.   |
| PROPAGATION TECHNIQUE AT THE REPORT OF ANNUAL FRANKLING                               | GAIN MODELS (V): Base Coults Only                                    | ENERGY TRANSFER MODES MODELED (V) Paterence                                     | Are Heater Combuston  |
| Buth Kernel Averagen  | Simple Saturated Gan SOOD Detailed Gen:                              | V-T   | Shock Tube Resistance Heater  |
| Soussien Quadrature   | BARE CAVITY FIELD MODIFIER MODELS $(f V)$ :                          |   | Other   |
| Fast Faurer Transform (FFT)   | Mirror Titt:   | Other   | F-ATOM DISSOCIATION FROM (V)  |
| Fast Nambal Transform (PHT)   | Apert anors / Thermal Discortors:                                    | Single Line Model (V)   |   |
| Gardener Fresnet-Kirchhoff (GFK)  | Selected (specify):  | Multiline Model (V)   | F.ATOM CONCENTRATION DETERMINED FROM MODEL!                                   |
| integral equation, Fresnel integrals  | Reflectivity Lova:   | Assumed Rotational Population Distribution State (V)                            | DALUENTS MODELED MODELS FFFETS ON MITTING BATE DIJE TO (V)                    |
| CONVENCENCE TECHNIQUE (V)   | Output Coupler Edges: Rolled:  | Equitibrium Nonequilibrium  | Nozife Boundary Layers Shock Wares  |
| Power Comparison  | Serrated:Other   | Source of Res Coefficients Used in Code   | Prenections (thermal blockage)  |
| More High to Convergence as per<br>Horwitz  | LUADED LAVITY FIELD MUDIFIER MODELS (V) Medium Index Variation:      |   | Other (apacety)   |
| ACCELERATION ALGORITHMS USEDS TRUTTE. Technique                                       | Ges Absorption   | LINE PROFILE MODELS (V)   |   |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V):                                  | Overlapped Beams   | Doppier Broadening  | MODELS EFFECTS ON OFTICAL MODES DUE TO $\langle V \rangle$                    |
| Other   | Other FAR-FIELD MODELS (V): Ream Secure Removal                      | Other (spacify)   | Media Index Variations  |
|   | Optimal Focal Search Beam Quality SOON                               |   | Other (specify)   |
|   | Other  |   |   |
|   |  |   |   |

| CODE TYPE: Gasdynamics                   |   |  |
|--|---|--|
| PRINCIPAL PLIRPOSE(S)/APPLICATIONS       | norcone Inviscid flow co                                | ode using the method of characteristics and                              |
| accounts for heat release                | . It is used for cavity                                 | flows with heat release defining shroud contours                         |
| flow conditions at end of                |   |  |
|  |   |  |
| <del></del>                              |   |  |
|  | can calculate mean flow c<br>s, resulting in optical pa | parameters in the laser cavity and the variations ath difference fields. |
| ASSESSMENT OF LIBERTATIONS. IT           | does not do the laser mi:                               | king problem and the heat release is an input.                           |
| nosessment of emitations.                |   |  |
|  |   |  |
| OTHER UNIQUE FEATURES:                   |   |  |
| ORIGINATOR/KEY CONTACT:                  | r and P. Lohr   | (2)3) 536-1624   |
| Name: D. HaT11nge Organization: TRW DSSG | : wind 1 ; EVIII P                                      | hone: (213) 536-1624   |
| O'SDINGSHIOIT.                           | e Space Park, Redondo Bead                              | ch. California 90278   |
|  |   |  |
| AVAILABLE DOCUMENTATION: (1 = 1%         | ory, U = User, RP = Relevant Publication                | n):  |
|  |   | <del></del>  |
| <del></del>                              |   |  |
|  |   |  |
|  |   |  |
|  |   |  |
|  |   |  |
| STATUS:                                  |   | · · · · · · · · · · · · · · · · · · ·                                    |
|  |   |  |
| Operational Currently?: Yes              | <del></del>   | <del></del>  |
| Under Modification?:                     |   | <del></del>  |
| Purpose(s):                              |   |  |
|  |   |  |
| Ownership? TRW                           |   | <del></del>  |
| Content strips.                          | <del></del>   | <del></del>  |
| Proprietary?:                            |   |  |
| MACHINE/OPERATING SYSTEM (on whic        | h installed):CUC_6600                                   |  |
| TRANSPORTABLE?: Yes                      | <del></del>   |  |
| Machine Dependent Restrictions:          | None  |  |
| SELF-CONTAINED: NO                       |   |  |
| Other Codes Required (name, purpor       | Combustor (GLAD) gene                                   | erates inputs to GASSER at the cavity entrance.                          |
| Other Codes Required (name, purpo)       | (8)   |  |
| ESTIMATE OF RESOURCES REQUIRED FO        |   | I Francision Time (Box CBV 7000)   |
| Small Job:                               | Core Size (Octal Words)                                 | Execution Time (Sec. CDU 7600)   |
| Typical Job:                             | 50K   | 25   |
| Large Job:                               |   |  |
| Approximate Number of FORTRAN Lines:     | 1000  | <del></del>  |
| PURITAR NUMBER OF FURITAR LINES:         |   |  |

| CACCED | 2002 |  |
|--------|------|--|
|        | 3    |  |
|        |      |  |

| OPTICS   | None   | KINETICS  | GAS DYNAMICS   |
|--|--|---|--|
| BASIC TYPE (V) NONE Physical OpticsGeometrical                                 | RESONATOR TYPE (V): Standing Wave Traveling Wave (Ring)            | GAIN REGION MODELED (V): None Compact Region                    | NOZZLE GEOMETRY MODELED (and type) (V) Cylindrical, Radially Flowing |
| FIELD (POLARIZATION) REPRESENTATION (V):                                       | BRANCH (V): Positive Negative OPTICAL ELEMENT MODELS INCLUDED (V): | COORDINATE SYSTEM (Certesian, cyfindrical etc.) Compact Region. | Rectangular Linearly Flowing 1                                       |
| COORDINATE SYSTEM (Carinsian, cylindrical, etc.): Compact Repon Annular Region | Flat Mirrors. Spherical Mirrors Cylindrical Mirrors. Telescopes    | KINETICS GRID DIMENSIONALITY (V):                               | TE SYSTEM: Ca  |
| TRANSVERSE GRID DIMENSIONALITY (V): 1D 2D                                      | Mirrors  |   | FLOW FIELD MODELED (V)   |
| Annular Region   | Asicons Reflasicons Reflasicons Arbitrary:                         | Annular Ragion. GAIN REGION SYMMETRY RESTRICTIONS:              | Other Inviscid with scheduled heat                                   |
| FIELD SYMMETRY RESTRICTIONS? MIRROR SHAPE(S) ALLOWED (V)                       | Linear   | Gain Vary Along Optic Aset? Flow Direction?                     | BASIC MODELING APPROACH (V):   |
| Square Creuka Strip  | Variable Cone Offset:  |   | Other (epecity)  |
| CONFIGURATION FLEXIBILITY (V):   | Other (specify): Deformable Mirrori:                               | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\                          | Reterences for Approach Used Leipman and Roshko                      |
| Fixed. Multiple Resonator Geometries   | Sparial Filters:   | Cold (F · H <sub>2</sub> ):                                     | ics and Thermo of Compressible Flow"                                 |
| Modular, Multiple Resonator Geometries   | Other Elements:  | Other (specify):  | THERMAL DRIVER MODELED $(ar{V})$                                     |
| French Integral Algorithms   | GAIN MODELS (V): Bere Cavity Only:                                 | ENERGY TRANSFER MODES MODELED (V): Beforence                    | Arc Heater Combustor   |
| With Kernel Averaging  | Emple Sehrand Cain:Detailed Gen                                    | A.E.  | Other  |
| Gaussian Quadrature.   | Mirror TM:   | V.V.  | F.ATOM DISSOCIATION FROM (V)   |
| Fest Henkel Transform (FHT)  | Aberrations/Therrost Distortions.                                  | Other<br>Single Line Model (V)                                  | f <sub>2</sub> — Sf <sub>6</sub> — Other (descrit)                   |
| Gardener Fresnel Kirchhoff (GFK)   | Arbitrary Selected (searcity)                                      | Muthiline Model (V)   | F. ATOM CONCENTRATION DETERMINED FROM MODEL! NO.                     |
| Other (specify)  | Reflectivity Loss.   | Assumed Rotational Population Distribution State (V)            | DILUENTS MODELED MODELS EFFECTS ON MIXING RATE DUE TO (1)            |
| 1 2  | Output Coupler Edges Rolled Serrated                               | Roumber of Laser Lines Modeled                                  | ğ  |
| Power Comparison Field Comparison Other  | LOADED CAVITY FIELD MODIFIER MODELS ( $V_i$                        | Source of Rate Coefficients Used in Code                        | Other (specify)  |
| ACCELERATION ALGORITHMS USED?  | Medium Index Variation<br>Gas Absorption                           | LINE PROFILE MODELS (V)   |  |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V).                           | Overlapped Bearns  | Depoter Broadening Celtisonal Broadening                        | MODELS EFFECTS ON OPTICAL MODES DUE TO (\$)                          |
| Other  | •  | Other (specify)   | Broke koecht   |
|  | Other  |   |  |
|  |  |   |  |

| CODE NAME | GCAL |
|-----------|------|
|           |      |

| ODE TYPE                           | Kinetics   |
|------------------------------------|--|
|                                    | (s)/APPLICATION(S) OF CODE TO provide extremely efficient single-line gain algorithm anchored to available data base for nozzle being studied. Used with SAIGD.  |
|                                    |  |
| ssessment of car<br>to convent     | PABILITIES Principally designed to analyze source flow nozzles but can also be applied ional 2-D slit nozzles.   |
| SSESSMENT OF LIN                   | NTATIONS   |
| THER UNIQUE FEA                    |  |
| algorithm                          | f gasdynamic and kinetic parameter profiles are passed from the full code to the gain in the form of a data file. The gain algorithm then solves the lasing specie equation asdynamic/kinetic field with an imposed intensity profile (see SAIGD). |
| RIGINATOR/KEY CO                   |  |
| Name                               | Kerry E. Patterson (494) 955-2663  |
| Organization                       | Science Applications, Inc. 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339   |
|                                    |  |
| TATUS                              | Voc  |
| Operational Curre Under Modificate | <b>Vρ</b> ς  |
| Purpose(s)                         | Extend to multi-line capability.   |
|                                    | J.S. Government  |
| Proprietary?                       | NO NG SYSTEM (on which installed) <u>Cyber 175</u>   |
| TRANSPORTABLE? Machine Depend      | Yes None None  |
|                                    | No   |
|                                    | ured (name purpose)SAIGD - SAI gasdynamics code generates gasdynamic field<br>as input to this code.   |
| ESTIMATE OF RESOU                  | RCES REQUIRED FOR RUNS  Core Size (Octal Words)   Execution Time (Sec. CDL. 7600)  |
| Small Job                          |  |
| Typical Job                        |  |
| Approximate Number                 | of FORTRAN Lines 75  |

| J. A. |   |  |
|-------|---|--|
| 4     | į |  |

| 140   | OPTICS   | KINETICS  | GAS DYNAMICS                                |
|---|--|---|---|
| BASIC TYPE ( )  | RESONATOR TYPE (V) Standing Wave   | GAIN REGION MODELED (V)                                   | NOZZLE GEOMETRY MODELED (and typa) (V):     |
| Physical Optics Geometrical                           | Traveling Mave (Ming) Moverue TW   | Compact Region 1/ Annular Ragion 1/                       | Cylindrical Radiatly Flowing                |
| FIELD (POLARIZATION) REPRESENTATION (V)               | BRANCH (V) Positive  | COORDINATE SYSTEM (Cartassan, cylindrical etc.)           | Reclangular, Linearly Flowing               |
| States Werter   | OPTICAL ELEMENT MODELS INCLUDED (V)  | Compact Region Cd Annular Region CY                       | Other                                       |
| COORDINATE SYSTEM (Certexian cylindrical etc.)        | Flat Merrors Spherical Merrors   | KINETICS GRID DIMENSIONALITY (V).                         | COORDINATE EVETEM                           |
| Compact Region Annular Region                         | Cylindrical Murors Telescopes  | QK QZ Q1  | FLUID GRID DIMENSION (V) 10 20 30           |
| TRANSVERSE GRID DIMENSIONALITY (V) 10 20              | Scraper Merors   | Compact Begion  |   |
| Compact Repon   | Aucons Waxons Melasicons   | Annular Region  | Lemmar Turbulent                            |
| Annulae Region  | - Control of the Cont | CAIN BEGION SYMMETRY RESTRICTIONS                         | Other                                       |
| FIELD SYMMETRY RESTRICTIONS?                          |  | Gan Vary Mong Optic Auss? Yes Thou Direction? Yes         | BASIC MODELING APPROACH (V)                 |
| MIRROR SHAPE(S) ALLOWED (V)                           |  | Call Soft and All And | Premised Maing                              |
| Square CurcularStrup                                  | Parabola Parabola  | CHEMICAL PRINCIPLE OF ACTIONS ADDRESS (V)                 | Other teachers                              |
| Rectengular Elliptical Arbitrary                      | Variable Core Offeet   |   |   |
| 1   | Other (specify)  | 3   |   |
| Freed Severe Resonator Georgetra                      | Deformable Mirrors   | _   | References for Approach Used                |
|   | Control of the contro | Cons (F - H <sub>2</sub> )                                |   |
| Services resources (securement)                       |  | Hot (H - F2) - Chem (F - H2 & H - F2) - Y                 |   |
| Moduler Multiple Resonator Geometries                 |  | Other (specify)   | THERMAL DRIVER MODELED (V)                  |
| PROPAGATION TECHNIQUE NO TOTAL TOTAL TANKEN           |  | ENERGY TRANSFER MODES MODELED (V): Authoritie             | Arc Heater Combuston                        |
| Freend Indep at Algorithms                            | GAIN MODELS (V): Bare Cavity Only  | vr / Cohen & Bott (1976)                                  | Short Tube Beastance Master                 |
| State Meruel Australia                                | Simple Saturated Gain Detailed Gain  | # 2 P   | <br>  |
| Laurenan Quadrature                                   | BARE CAVITY FIELD MODIFIER MODELS (V):   | 3   |   |
| Fast Fourier Transform (FFT)                          | Mirror Tith Decentration   |   | FATOM DISSOCIATION FROM (V)                 |
| Fact Hanker Transform (FMT)                           | Aberrations / Thermal Distortions  | one [ -i+line 4+in]                                       | 2,  |
|   | Arbitrary  | Single time model (V) (VN1 c) into City (VN1 c)           | Other (specify)                             |
| Considerate Property Recommend (GPR)                  | Salacted (specify)   | Multiline Model (V)                                       | F.ATOM CONCENTRATION DETERMINED FROM MODEL" |
| Other (specify)                                       | Martin Case  | Assumed Rotational Population Distribution State $(f V)$  | DILUENTS MODELED                            |
|   |  | Equilibrium Nonequilibrium                                | MODELS EFFECTS ON MIXING RATE DUE TO (V)    |
| CONVERGENCE TECHNIQUE (V)                             | Deline sales andro reduce  | Number of Leser Lines Modeled                             | Nozzłe Boundary Layers. Shock Waves         |
| Perer Cempenson Field Compensor                       | Serviced Other   | Source of Rate Coefficients Used in Code                  | Prenactions (thermal blockage)Turbulence    |
| Other   | LOADED CAVITY FIELD MODIFIER MODELS (V)  | & Bott (1976)   | Other (specify)                             |
| ACCELERATION ALGORITHMS USED?                         | Medium Index Variation   |   |   |
| Technique   | Ges Absorption   | LINE PROFILE MODELS (V)                                   |   |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHIR (V). | Overtapped Baims   | Dopper Broadening   | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)  |
| Presty  | Other  | Collesonal Broadening                                     | Medie Index Variations.                     |
| Other   | FAR FIELD MODELS (V) Beam Steaming Removat   | Other (apacity)   | Other (specify)                             |
|   | Optimel focal Search Beam Quelity  |   |   |
|   | Other  |   |   |
|   |  |   |   |
|   |  |   |   |

\* with multiple gain sheets

;

| CODE NAME: | GENRING |
|------------|---------|
|            |         |

| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE: To mode? chemic  | cal laser ring resonators utilizing linear and nor           |
|---|--|
| linear reflecting axicons to produce an annular ga  | ain region; to study and trade off ring resonator            |
| candidates; to study effects of spatial filtering   | on mode control; to study the concept of (scraper            |
| aperture self-imaging.  |  |
|   |  |
| ASSESSMENT OF CAPABILITIES: Models bare and loaded unst   | table ring resonators of aligned circulary-shaped            |
| optics which employ a pair of similar reflecting a  | axicons. Models positive and negative branch                 |
| resonators. Models simple gain. Uses Fresnel-Kir  | rchhoff propagation. Models far-field performance            |
| 2-D plots.  |  |
|   |  |
| ASSESSMENT OF LIMITATIONS: Cavity fields are assumed to   | o be circularly symmetric; this is a 2-D code.               |
|   |  |
| OTHER UNIQUE FEATURES. Models positive and negative to  | branch P-P waxicon (reflaxicon)/P-P waxicon                  |
| (reflaxicon) ring with or without offset. Bare or   |  |
| combinations. Easily modified to model ring resor   |  |
| 200-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-  |  |
| DRIGINATOR/KEY CONTACT  |  |
| Caul M. Winning   | Phone: (505) 848-5000  |
| Organization The BDM Corporation  |  |
| Address: 1801 Randolph Road S.E., Albuquerque,  | New Mexico 87106   |
|   | (T) and (U) "GENRING: A Computer Code for                    |
| AVAILABLE DOCUMENTATION: (T. Theory, U. User, RP. Relevant Publicati<br>Modeling Cylindrical Unstable Ring Resonators With  | h Internal Reflecting Axicons" BDM/TAC-79-152-TR             |
| The BDM Corporation, May 1, 1979; listings availab  | 1 - 6 851h (3) D   |
|   | DIE Trom AFWL/ALK.   |
|   | DIE Trom AFWL/ALK.   |
|   | DIE TYOM AFWL/ALK.   |
|   | ole from AFWL/ALK.   |
|   | ole from ArwL/ALK.   |
|   | ole from ArwL/ALK.   |
| V   | ole from AFWL/ALK.   |
| Operational Currently? Yes  | ole from AFWL/ALK.   |
| Operational Currently? Yes. Under Modification? NO  | ole from AFWL/ALK.   |
| Operational Currently?: Yes   | ole from AFWL/ALK.   |
| Operational Currently? Yes. Under Modification? NO  | ole from AFWL/ALK.   |
| Operational Currently? Yes. Under Modification? NO Purpose(s):  | ole from AFWL/ALK.   |
| Operational Currently? Yes  Under Modification? NO  Purpose(s):  Ownership? Government (AFWL/ALR)   | ole from ArwL/ALK.   |
| Operational Currently? Yes Under Modification? No Purpose(e):  Ownership? Government (AFWL/ALR) Proprietary? No   | ole from AFWL/ALK.   |
| Operational Currently? Yes Under Modification? NO Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No   | ole from AFWL/ALK.   |
| Operational Currently? Yes Under Modification? No  Purpose(s):  Ownership? Government (AFWL/ALR)  Proprietary? No  MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600   | ole from AFWL/ALK.   |
| Operational Currently? Yes Under Modification? NO Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600 TRANSPORTABLE?: Yes, except for plot routines  |  |
| Operational Currently? Yes Under Modification?: NO Purpose(s):  Ownership?: Government (AFWL/ALR) Proprietary?: NO  MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  |  |
| Operational Currently? Yes Under Modification? No Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE? Yes, except for plot routines Machine Dependent Restrictions: Uses AFWL plot library N   |  |
| Operational Currently? Yes Under Modification? NO Purpose(e):  Ownership? Government (AFWL/ALR) Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE?: Yes, except for plot routines Machine Dependent Restrictions: Uses AFWL plot library N  SELF-CONTAINED?: No   | METALIB.   |
| Operational Currently? Yes Under Modification? NO Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE? Yes, except for plot routines Machine Dependent Restrictions: Uses AFWL plot library M   | METALIB.   |
| Operational Currently? Yes Under Modification? NO Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE?: Yes, except for plot routines Machine Dependent Restrictions: Uses AFWL plot library No SELF-CONTAINED?: No   | METALIB.   |
| Operational Currently? Yes Under Modification? NO  Purpose(s):  Ownership? Government (AFWL/ALR)  Proprietary? No  MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE? Yes, except for plot routines  Machine Dependent Restrictions: Uses AFWL plot library No Other Codes Required (name, purpose): Uses AFWL plot library   | METALIB.   |
| Operational Currently? Yes Under Modification? NO Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE?: Yes. except for plot routines Machine Dependent Restrictions: Uses AFWL plot library N  SELF-CONTAINED?: No Other Codes Required (name, purpose): Uses AFWL plot library  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  | METALIB.   |
| Operational Currently? Yes Under Modification? NO Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE?: Yes. except for plot routines Machine Dependent Restrictions: Uses AFWL plot library N  SELF-CONTAINED?: No Other Codes Required (name, purpose): Uses AFWL plot library  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words)                | METALIB.  ary METALIB.  Execution Time (Sec. CDC 7600)       |
| Operational Currently? Yes Under Modification? NO Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE?: Yes, except for plot routines Machine Dependent Restrictions: Uses AFWL plot library N  SELF-CONTAINED?: No Other Codes Required (name, purpose): Uses AFWL plot library  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words) 200K           | METALIB.  Execution Time (Sec. CDC 7600)  5                  |
| Operational Currently? Yes Under Modification? NO  Purpose(s):  Ownership? Government (AFWL/ALR)  Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE? Yes, except for plot routines Machine Dependent Restrictions: Uses AFWL plot library No Other Codes Required (name, purpose): Uses AFWL plot library  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words)  Smell Job 200K Typical Job: 200K | METALIB.  ary METALIB.  Execution Time (Sec. CDC 7600)  5 15 |
| Under Modification? NO Purpose(s):  Ownership? Government (AFWL/ALR) Proprietary? No  MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  TRANSPORTABLE? Yes, except for plot routines Machine Dependent Restrictions: Uses AFWL plot library N  Other Codes Required (name, purpose): Uses AFWL plot library  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  200K  | METALIB.  Execution Time (Sec. CDC 7600)  5                  |

i

...

1

GENRING

| GAS DYNAMICS | NOZZE GEOMETRY MODELEO (und type) (V) NONE<br>Cylindrical Radally Flowing | Other Contract of | FLUID GRID DIMENSION (V): 1D 20 30 70 10 30                                   | Laminar Turbulent<br>Other                         | BASIC MODELING APPROACH (V): PremusedMining                              | Other (specrft).                        |   | <u> </u>   | Shock Tube Resistance Healter Chhe                         | F-ATOM DISSOCIATION FROM (V):                            | F-ATOM CONCENTRATION DETERMINED FROM MODEL?  DILLERYS MODELED  MODELS EFFECTS ON MINING DATE DIET OF A. | Mozie Boundary Lypes - Shock Wares Presentions (thermal blockage) - Turbulence Other (specify)        |  | MODELS EFFECTS ON OPTICAL MODES DUE TO (V.) Media Index Variations | Office (specify)     |  |
|--------------|---|---|---|--|--|---|---|--|--|--|---|---|--|--|----------------------|--|
| KINETICS     | GAIN REGION MODELED (V): NOne Compact RegionAnnula: Region                | Compact Region Annular Region: KINETICS GRID DIMENSIONALITY (V):  | Compact Region  | Annular Region. GAIN REGION SYMMETRY RESTRICTIONS: | Gain Vary Along Optic Ases? Flow Direction? PULSED: CW: KINETICS WODELED | CHEMICAL PUMPING REACTIONS MODELED (V): | Cold (F · H <sub>2</sub> ) 0 0 Hor (F · H <sub>2</sub> & H · F <sub>2</sub> ) | Other (specify)  ENERGY TRANSFER MODES MODELED (V): Reference  | 4 3  | Other<br>Contact on the day of                           | Mustime Model (V) Assumed Rotational Population Grave (V)   | Equilibrum Nonequilibrum<br>Number of Leset Lines Modeled<br>Source of Rase Coefficients Used in Code | LINE PROFILE MODELS (V):               | Dopbler Broadening Collisional Broadening Other (apacity)          |                      |  |
| OPTICS       | RESONATOR TYPE (V): Standing Wave transing Wave freeing Wave (fing)       | OPTICAL ELEMENT MODELS INCLUDED (V): Flat Mirrors Sphancal Mirrors  | Cykindrical MirrorsTolescopes   | Azicons Wasicons Reflaxedns<br>Arbitrary           | Linear: Parabote-Parabote:   | Variable Cone Offset:                   | Deformable Minors:  | GAIN MODELS (V): Bare Centy Only:  | Simple Serviced Gain. ———————————————————————————————————— | Mirror TM:   | Ambienty Can mod for circular Selected (specify) Symmetric distortions.                                 | Output Couper Edges Roled.  Serrated Other  LOADED CAVITY FIELD MODELS (V):                           | Medium Index Vanishon<br>Gas Abearphon | Overlapped Beams Other Other CAR FIELD MODELS 1V, Ream Seame Beams | Optimal focal Search |  |
| ido          | BASIC TYPE (1) PHYSICAL OPICS (2) FIELD (POLARIZATION) REPRESENTATION (1) | Scalar Vector Vector COORDINATE SYSTEM (Certeban cyandrical etc.)   | Compact Region CV Annular Region CV TRANSVERSE GRID DIMENSIONALITY (V): 10 20 | Compact Region Annular Region                      | ETRY RESTRICTION<br>PE(S) ALLOWED ()                                     | Square Action of Existency (V):         | Fraed, Single Resonator Geometry  | Modular, Multiple Resonator Geometres: PROPAGATION TECHNIQUE NETER ABSOLUTIONALE FARMALIAN FRANCIA MODITION. | With Kernel Averaging<br>Genesum Quadrature                | Fast Fourier Transform (FFT) Fast Hankel Transform (FHT) | Gardene Freshest Kirchhaft (GFK) Other (specify) Midpoint rule  | CONVERGENCE TECHNIQUE (V): Preser Companion   | ACCELERATION ALGORITHMS USED? NOTE     | MULTIME EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V). Prott          |                      |  |

| CODE NAME: | GIM |
|------------|-----|
|            |     |

| CODE TYPE: Las  | sdynamics Code   |  |
|---|--|--|
| PRINCIPAL PURPOSE(S   | )/APPLICATION(S) OF CODE General Interp  | olation Method (GIM) is used for laser cavity and  |
| nozzle analysi:   | s. Used for external and internal  | flows.   |
|   |  |  |
|   |  |  |
| ASSESSMENT OF CAPA  | Multidimensional 2-D, 3-   | D viscous, diffusing flows; time-dependent. Will   |
|   | bine this capability with the chemi  |  |
|   |  |  |
|   |  |  |
|   | Cimplified diffusion   |  |
| ASSESSMENT OF LIMIT   | ATIONSSimplified diffusion.  |  |
|   |  |  |
|   |  |  |
|   | <del></del>  |  |
| OTHER UNIQUE FEATU  | RES:   |  |
|   |  |  |
|   |  |  |
| DRIGINATOR/KEY CON  | TACT:  | /FOE\ 044 0026   |
| Name:   | D. W. Lankford   | Phone: (505) 844-9836  |
| Organization:   | Air Force Weapons Laboratory   | 0 97117  |
| Address:  | AFWL/ARAC, Kirtland AFB, New Mexic   | (T) (U) T. 1   |
| AVAILABLE DOCUMENT  | TATION: (T Theory, U = User, RP Relevant Publica   | .:   |
| CATIONS ARE COM   | moleted  | 110n/  |
| cations are co  | mpleted.   | (101)  |
| cations are co  | mpleted.   |  |
| cations are con   |  |  |
| STATUS:<br>Operational Current  | lly?: Yes  |  |
| STATUS:<br>Operational Current<br>Under Modification  | nyr. Yes<br>r. Yes, from December 1979 until   | January 1981.  |
| STATUS:<br>Operational Current  | lly?: Yes  | January 1981.  |
| STATUS:<br>Operational Current<br>Under Modification  | Yes r. Yes, from December 1979 until Add all chemistry and laser p   | January 1981.<br>Physics capabilities of ALFA.   |
| STATUS: Operational Current Under Modification Purpose(s): Ownership?:  | Yes Yes, from December 1979 until Add all chemistry and laser p  | January 1981.  Shysics capabilities of ALFA.  after modifications complete.  |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?:  | Yes Yes, from December 1979 until Add all chemistry and laser g Lockheed Space and Missiles; USAF Yes, while under development by Lockheed Space and Missiles;   | January 1981.  Physics capabilities of ALFA.  after modifications complete.  ockheed.  |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?:  | Yes Yes, from December 1979 until Add all chemistry and laser p  | January 1981.  Physics capabilities of ALFA.  after modifications complete.  ockheed.  |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING  | Yes, from December 1979 until Add all chemistry and laser publications of the Add all chemistry and laser publications. USAF Yes, while under development by Losystem (on which installed):CDC 176, Star,  | January 1981.  Physics capabilities of ALFA.  after modifications complete.  ockheed.  |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING  | Yes, from December 1979 until Add all chemistry and laser publications. Lockheed Space and Missiles; USAF Yes, while under development by Lockheed System (on which installed); CDC 176, Stary   | January 1981.  Physics capabilities of ALFA.  after modifications complete.  ockheed.  |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?:  | Yes Yes, from December 1979 until Add all chemistry and laser p  Lockheed Space and Missiles; USAF Yes, while under development by Lo  SYSTEM (on which installed): CDC 176, Star, Yes  At Restrictions: None  | January 1981.  Physics capabilities of ALFA.  after modifications complete.  ockheed.  |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?:  | Yes, Yes, from December 1979 until Add all chemistry and laser place.  Lockheed Space and Missiles; USAF Yes, while under development by Lockheed (on which installed): CDC 176, Star, Yes.  | January 1981.  Physics capabilities of ALFA.  after modifications complete.  sckheed.  Cray.   |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depender                                     | Yes, Yes, from December 1979 until Add all chemistry and laser place.  Lockheed Space and Missiles; USAF Yes, while under development by Lockheed (on which installed): CDC 176, Star, Yes.  | January 1981.  Physics capabilities of ALFA.  after modifications complete.  ockheed.  |
| STATUS: Operational Current Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depender                                       | Yes, from December 1979 until Add all chemistry and laser public Lockheed Space and Missiles; USAF Yes, while under development by Lockheed (on which installed): CDC 176, Star, Yes at Restrictions: None   | January 1981.  Physics capabilities of ALFA.  after modifications complete.  sckheed.  Cray.   |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depender SELF-CONTAINED?: Other Codes Requir | Yes, from December 1979 until Add all chemistry and laser public Lockheed Space and Missiles; USAF Yes, while under development by Lockheed (on which installed): CDC 176, Star, Yes at Restrictions: None   | January 1981.  Shysics capabilities of ALFA.  after modifications complete.  ckheed.  Cray.  Ometry mesh, code assembly, operational assembly.                                 |
| STATUS:  Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depender SELF-CONTAINED?: Other Codes Requir | Yes, from December 1979 until Add all chemistry and laser proceed to the Add all chemistry and laser proceed to | January 1981.  shysics capabilities of ALFA.  after modifications complete.  sckheed.  Cray.  metry mesh, code assembly, operational assembly.  Execution Time (Sec. CDC 7600) |
| STATUS: Operational Current Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depender SELF-CONTAINED?: Other Codes Requir  | Yes, from December 1979 until Add all chemistry and laser public Lockheed Space and Missiles; USAF Yes, while under development by Cosystem (on which installed): CDC 176, Star, Yes at Restrictions: None  No red (name, purpose): Three modules: geometric geometric constants and constants are purposed.   | January 1981.  Shysics capabilities of ALFA.  after modifications complete.  ckheed.  Cray.  Ometry mesh, code assembly, operational assembly.                                 |

. . . .

•

\_

| OPTICS   | ICS None   | KINETICS   | GAS DYNAMICS                                 |
|--|--|--|--|
| BASIC TYPE (V) None  | RESONATOR TYPE (V) Standing Wave   | GAIN REGION MODELED (V): None  | NOZZI E GEOMETRY MODELED (and 1ype) (V)      |
| Physical Optics Geometrical  | Traveling Wave (Ring) Reverse TW   | Compact RegionAnnular Region   | Cylindr al, Radially Flowing                 |
| HELD (POLARIZATION) REPRESENTATION (V)                             | BRANCH (V): PositiveNegative   | COORDINATE SYST( M (Cartesian, cylindrical, etc.)                          | Rectangular, Linearly Flowing V              |
| Scalar Vector  | OPTICAL ELEMENT MODELS INCLUDED (V)  | Compact Region Annula: Region  | Other  |
| COORDINATE SYSTEM (Cartesian cylindrical atc.):                    | Flat Mirrors Spherical Mirrors   | KINETICS GRID DIMENSIONALITY (V)   | COORDINATE SYSTEM Ca and Cy                  |
| •  | Cylindrical MirrorsTelescopris   | 10 20 30   | FLUID GRID DIMENSION (V): 10 7 20 V 30       |
| FRANSVERSE GRID DIMENSIONALITY (V): 10 20                          | Scraper Mirrors  | Compact Region   | FLOW FIELD MODELED (V)                       |
| Compact Region   | Axicons Retlasicons  | Annular Reg: n   | Laminar Y Turbulent Y                        |
| Annular Region   | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS  | one Recirculating                            |
| FIELD SYMMETRY RESTRICTIONS  | Linear   | Gain Vary Along Optic Axes? "Flow Direction?"                              | BASIC MODELING APPROACH $(V)$                |
| APE(S) ALLOWED (V  | Parabola Parabola  | PULSED CW. KINETICS MODELED  | Premised Mining Y                            |
| Circular   | Vanable Core Offset  | G REACTIONS MODEL  | Other (specify)                              |
| Rectangular Elliptical /   | Other (specify)  | X - Y2 - YX - Y  |  |
| CONFIGURATION FLEXIBILITY (V)                                      | Deformable Mirror  | Y - X2 YX - X  | References for Approach Used                 |
| Fraed. Single Resonator Geometry                                   | }  | Cold (f · H <sub>2</sub> )   |  |
| Fixed. Multiple Resonator Geometries                               | Signification of the state of t | Hot (H · F <sub>2</sub> ) Chain (F · H <sub>2</sub> & H · F <sub>2</sub> ) |  |
| Modular Muhiple Resonator Geometries                               | Other Elements   | Other (specify)  | THE DAINED MODELED (1)                       |
| PROPAGATION TECHNIQUE  |  | ENERGY TRANSFER MODES MODELED (V) Reference                                | Arc Heater Combustor -*                      |
| Freshel Integral Algorithms  | GAIN MODELS (V) Bare Cavity Only   | ¥.1  | Short Tube                                   |
| With Kernel Averaging  | Simple Saturated Gem Detailed Gam  | 8.7  | STOCK TOLK                                   |
| Gaussian Ocadeature  | BARE CAVITY FIELD MODIFIER MODELS (V):   | ×.×  | Other  |
| Fast Fourier Transform (FFT)                                       | Marror Tilt Decentration   | Sher   | F. A. CON DISSOCIATION FROM (V)              |
| Fast Hankel Transform (FMT)  | Aberrations / Thermal Districtions   | Single time Model (V)  | Other Jennethy NF 2                          |
| Gardener Frysnal Kirchhoff (GFK)                                   | Arbeitary  | Mobilize Model A   | Service and Confession of Teaming Foundation |
| Giber (specify)  | Selected (specify)   | ,  | DILIENTS MODELED HE                          |
|  | Reflectivity Loss  | Assumed Witational Population (Mistrobution State (V)                      | MODELS EFFECTS ON MIXING RATE DUE TO (V)     |
| CONVERGENCE TECHNIQUE (V)  | Output Coupler Edges Rolled  | Equilibrium  | Nozzie Boundary Layers 3 Shock Waves 3       |
| Power Companson Field Companson                                    | Serrated Other   | Despite Sales to Sales   | Prereactions (thermal blockage) Turbulence   |
| Other  | LOADED CAVITY FIELD MODIFIER MODELS (V)  | Source of Rate Coefficients Used in Code                                   | Other (specify)                              |
| ACCES FRATION ALGORITHMS USED?                                     | Medium Index Variation   |  |  |
| Technique  | Gas Absorption   | LINE PROFILE MODELS (V)  |  |
| multiple eigenvalue/vector extraction algorithm ( $oldsymbol{V}$ ) | Overlapped Beams   | Doppler Broadening   | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)   |
| Prorry   | Other  | Colissonal Broadening  | Medis Index Variations                       |
| Other  | FAR FIELD MODELS (V) Beam Steering Removal   | Other (specify)  | Other (specify)                              |
|  | Optimal Focal Search Beam Quality  |  |  |
|  | Other  |  |  |
|  |  |  |  |

| CODE NAME: | GLADY |
|------------|-------|
|            |       |

|   | Sener Gener  | al laser analysis to calculate average flow properties   |
|---|--|--|
| PRINCIPAL PURPOSE(S)/APPLI<br>nozzles and in cavi   |  | at laser analysis to calculate average flow properties   |
| HOZZIES GNG IN CUVI   | <u> </u>   |  |
|   |  |  |
|   |  |  |
| SSESSMENT OF CAPABILITIES   | <u>With general in</u>   | put quantities such as bulk heat loss and flow condition |
|   |  | occurately. Two nozzle flow options are included, for h  |
| and moderate Reynol   | d's numbers.   |  |
|   |  |  |
| ASSESSMENT OF LIMITATIONS   | . Detailed flow c  | conditions cannot be predicted. Cavity chemistry is also |
| done by bulk proced   |  |  |
|   |  |  |
|   |  |  |
|   | <del></del>  |  |
| OTHER UNIQUE FEATURES -   |  |  |
| <del></del>   | <del></del>  |  |
| <del></del>   |  |  |
| ORIGINATOR/KEY CONTACT:   |  |  |
| Name: R. H  | ughes/D. Haflinger/H.  | Behrens Phone: (213) 536-2757                            |
| Organization.   | DSSG   |  |
| Address: R1/1   | 038, One Space Park,   | Redondo Beach, California 90278                          |
|   |  |  |
| AVAILABLE DOCUMENTATION:  | (T - Theory, U - User, RP - Rel                                  | levant Publication): (T) None; listings proprietary.     |
| AVAILABLE DOCUMENTATION   | (T - Theory, U - User, RP - Rel                                  | Hevant Publication): (T) None; listings proprietary.     |
| AVAILABLE DOCUMENTATION   | (T - Theory, U - User, RP - Rel                                  | Hevant Publication): (T) None; listings proprietary.     |
| AVAILABLE DOCUMENTATION   | (T - Theory, U - User, RP - Rei                                  | Hevant Publication): (T) None; listings proprietary.     |
| VAILABLE DOCUMENTATION  | (T - Theory, U - User, RP - Rel                                  | Hevant Publication): (T) None; listings proprietary.     |
|   |  | Hevant Publication): (T) None; listings proprietary.     |
|   | Yes  | Hevant Publication): (T) None; listings proprietary.     |
| STATUS:   |  | Hevant Publication): (T) None; listings proprietary.     |
| STATUS: Operational Currently?:   | Yes  | Hevant Publication): (T) None; listings proprietary.     |
| STATUS:  Operational Currently?:  Under Modification?:  | Yes  | Hevant Publication): (T) None; listings proprietary.     |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):   | Yes  | levant Publication): (T) None; listings proprietary.     |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  Ownership?:  IEW   | Yes  | None; listings proprietary.                              |
| Operational Currently?:   | Yes<br>No  |  |
| STATUS:  Operational Currently?: Under Modification?: Purpose(s):  Ownership?:TKW Proprietary?:Yes.   | Yes<br>No  |  |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  Ownership?:  This  Proprietary?:  Yes  MACHINE/OPERATING SYSTER  | Yes<br>No  |  |
| Operational Currently?:  Operational Currently?:  Under Modification?:  Purpose(s):  Ownership?:  Yes  MACHINE/OPERATING SYSTER   | Yes No I (on which installed):CDC 1                              |  |
| Operational Currently?:   | Yes No I (on which installed):CDC 1                              |  |
| STATUS:  Operational Currently?:  Under Modification?:  Purpose(s):  Ownership?:  TEM  Proprietary?:  Yes  MACHINE/OPERATING SYSTER  TRANSPORTABLE:  Yes  Machine Dependent Restri  | Yes No I (on which installed):CDC 1                              |  |
| Operational Currently?:  Under Modification?:  Purpose(s):  Ownership?:  TEM  Proprietary?:  Yes  MACHINE/OPERATING SYSTER  TRANSPORTABLE:  Yes  Machine Dependent Restri   | Yes No  I (on which installed):CDC 1                             |  |
| Operational Currently?:   | Yes No  I (on which installed):CDC 1                             |  |
| Operational Currently?:  Under Modification?:  Purpose(s):  Ownership?:  Third  Proprietary?:  Yes  MACHINE/OPERATING SYSTER  FRANSPORTABLE?:  Machine Dependent Restrict  SELF-CONTAINED?:  Yes  Other Codes Required (nan | Yes No I (on which installed):CDC 1 ctions:None                  | 74   |
| Operational Currently?:  Under Modification?:  Purpose(s):  Ownership?:  Proprietary?:  Yes  MACHINE/OPERATING SYSTER  TRANSPORTABLE?:  Yes  Machine Dependent Restri  SELF-CONTAINED?:  Other Codes Required (nan          | Yes No  I (on which installed):CDC 1  ctions:None  ie. purpose): | .74  |
| Operational Currently?:   | Yes No I (on which installed):CDC 1 ctions: _None le. purpose):  | 74  I (Octel Words)   Execution Time (Sec. CDC 7600)  15 |
| Operational Currently?:  Under Modification?:  Purpose(s):  Ownership?:  Proprietary?:  Yes  MACHINE/OPERATING SYSTER  TRANSPORTABLE?:  Yes  Machine Dependent Restri  SELF-CONTAINED?:  Other Codes Required (nan          | Yes No  I (on which installed):CDC 1  ctions:None  ie. purpose): | .74  |

V.

....

| $\geq$ |  |
|--------|--|
| ₹      |  |
| ᇰ      |  |
| ľ      |  |
| - 1    |  |
| -      |  |
| ı      |  |

| OPTICS   | lone None  | KINETICS  | GAS DYNAMICS                                |
|--|--|---|---|
| BASIC TYPE (V) None  | RESONATOR TYPE (V): Standing Wave  | GAIN REGION MODELED (V): None   | NOZZLE GEOMETRY MODELED (and type) ( $V$ )  |
| Physical Optics Geometrical  | Traveling Wave (Ring) Reverse TW   | Compact Region Annular Region.  | Cytindrical, Radially Flowing               |
| ⋖  | BRANCH (V): Positive: Negative   | ₩.  | Rectangular Linearly Flowing                |
| Scalar Vector  | EZ.  | Compact Region Annular Region.  | Other                                       |
| COORDINATE SYSTEM (Cartesian cylindrical atc.)   | S  | Š   | - 1   |
| 2  | Cylindrical Mirrors  | 16 22 30  | FLUID GRID DIMENSION (V) 10 20 30           |
| TRANSPERSE GRID DIMENSIONALITY (V)   | Mirrors  | Compact Region  | Lambas * Turbulent                          |
|  | Axicons Waxicons Netlaxicons   | Annular Region:   |   |
| ANTICAL TO THE PROPERTY OF THE | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS.  | BACC MODELING ADDROVED (2)                  |
| MIRROR SHAPE(S) ALLOWED (V):   | Linear<br>Despite Despite  | PULSED: CW: KINETICS MODELED  | Premixed Mixing (bulk)                      |
| Square Cricular Ship   |  | UMPING REA  | Other (specify)                             |
| Rectangular Elliptical Arbitrary   | Variable Cone Umani:   | (X - Y2 - YX - Y   F   C1   Br   1  |   |
| CONFIGURATION FLEXIBILITY (V):   | Other (Specify):   | (Y - X <sub>2</sub> - YX - X)   | References for Approach Used                |
| Fraed, Single Resonator Geometry   | Panalal Elisano  | Code (F · H2):  |   |
| Fraed, Multiple Resonator Geometries   |  | Hot (H + F <sub>2</sub> ): Chain (F + H <sub>2</sub> & H · F <sub>2</sub> ) |   |
| Modular, Multiple Resonator Geometries   | Other Elements   | Other (specify):  | THERMAL DRIVER MODELED (V)                  |
| PROPAGATION TECHNIQUE NOT THE PROPERTY ANNUAL  |  | ENERGY TRANSFER MODES MODELED (V). Reference                                | Arc Heater Combustor                        |
| Fresnel Integral Algorithms  | GAIN MODELS (V): Bare Cavity Only:   | V.1   | Shock TubeResistance Heater                 |
| With Kernet Averaging  | 1 8  | V.P.  | Other                                       |
| Gaussian Quadrature  | Mirror Tile Decembation  | ۷.۷   | F.ATOM DISSOCIATION FROM (V)                |
| Fast Fourier Transform (FFT)   | 1 4  | Other.  | r <sub>2</sub>                              |
| Fast Hankel Transform (FHT)  | Aberrations / Thermal Descriptions   | Single Line Model (V)   | Other (apacity)                             |
| Gardener Freshell Kirchhoff (GFK)  | Salartad (smeth)   | Authiline Model (V)   | ž   |
| Other (specify)  | Deflactivity free  | Assumed Rotational Population Distribution State (V):                       | DILUENTS MODELED He, No                     |
|  | Control of the Bullet  | Equilibrium Nonequilibrium:   | MODELS EFFECTS ON MIXING RATE DUE TO (V)    |
| CONVERGENCE TECHNIQUE (V):   | Carrella Couper, Coupe | Number of Laser Lines Modeled   | Section 1                                   |
| Power Comparison Field Comparison  | "  | Source of Rate Coefficients Used in Code                                    | Other (specify)                             |
|  | Medium Index Variation   |   |   |
| ACCELERATION ALGORITHMS USED?:   | Gas Absorption   | LINE PROFILE MODELS (V):  |   |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM.(V):   | Overlapped Beams:  | Doppler Broadening  | MODELS EFFECTS ON OPTICAL MODES DUE TO (\$) |
| Promy  | Other  | Other famoustics  | Media Index Variations                      |
| one.   |  |   | Other (specify)                             |
|  | Optimal Focal Selecti.   |   |   |
|  | Other  |   |   |
|  |  |   |   |

| CODE NAME |  |
|-----------|--|
|-----------|--|

| GOPWR       |
|-------------|
| <del></del> |

| <del></del>   | tics, and Gasdynamics   |                   |
|---|---|-------------------|
|   | ion(s) or cope: Calculational tool to study the performance of  | CW chemical laser |
| and the interaction wi  | th the gain medium.   |                   |
|   |   |                   |
|   | Uses geometric action and quari are dimensional condition   | ice Ucoful for    |
| ASSESSMENT OF CAPABILITIES: —<br>parameter studies to i   | <u>Uses qeometric optics and quasi-one-dimensional aerokinet</u><br>ndicate the importance of design parameters on laser perform  |                   |
|   |   |                   |
|   |   |                   |
| ASSESSMENT OF LIMITATIONS:  | Limited to HSURIA geometry only unless modified.  |                   |
|   |   |                   |
|   |   |                   |
| Re  | sonator geometries modeled: HSURIA, reflaxicon beam compact   | ors.              |
| OTHER UNIQUE FEATURES:KE  | Sonator geometries modered. Insorting retrainment beam compass  |                   |
|   |   |                   |
| DRIGINATOR/KEY CONTACT:   |   |                   |
| Name: J. K. H   | lunting/T. T. Yang Phone: (213)884-2370   |                   |
| Organization: Rocketd   |   |                   |
|   | noga Avenue, Canoga Park, California  | t C C) 77 F00     |
| AVAILABLE DOCUMENTATION: (T   | Theory, U User, RP Relevant Publication): (T) Rocketdyne Internal Let   | ter 6-3L-//-509,  |
| <u>Uctober 5, 1977; (U) R</u>   | ocketdyne Internal Letter G-0-78-937, January 24, 1978.   |                   |
|   |   |                   |
|   |   |                   |
|   |   |                   |
|   |   |                   |
|   |   |                   |
|   |   |                   |
|   |   |                   |
| STATUS:   |   |                   |
|   | ış  |                   |
| Operational Currently?:Ye   | ış  |                   |
| Operational Currently?:Ye Under Modification?:  | 15  |                   |
| Operational Currently?:Ye   | is .  |                   |
| Operational Currently?:Ye Under Modification?:  | ıs  |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s):  Ownership?: Rocketd  |   |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?:Rocketd Proprietary?:No  | lyne opc 176 Mos pr   |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?:Rocketd Proprietary?:No  | lyne opc 176 Mos pr   |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?:Rocketd Proprietary?:NO MACHINE/OPERATING SYSTEM (on   | lyne which installed):CDC 176 NOS BE  |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?:Rocketd Proprietary?:NO MACHINE/OPERATING SYSTEM (on   | lyne opc 176 Mos pr   |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s):  Ownership?: Rocketd Proprietary?: No MACHINE/OPERATING SYSTEM (on TRANSPORTABLE?: No Machine Dependent Restriction   | lyne which installed):CDC 176 NOS BE  |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?: Rocketd Proprietary?: NO MACHINE/OPERATING SYSTEM (on TRANSPORTABLE?: NO Machine Dependent Restriction SELF-CONTAINED?                                | lyne which installed):CDC 176 NOS BE  |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?: Rocketd Proprietary?: NO MACHINE/OPERATING SYSTEM (on TRANSPORTABLE?: NO Machine Dependent Restriction SELF-CONTAINED?                                | dyne  which installed):CDC 176 NOS BE  Uses CDC Fortran extended features, uses CDC LCM.  |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s):   | lyne  which installed):CDC 176 NOS BE  USes CDC Fortran extended features, uses CDC LCM.  purpose):DISSPLA Plot library.  |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?: Rocketd Proprietary?: No MACHINE/OPERATING SYSTEM (on TRANSPORTABLE?: NO Machine Dependent Restriction SELF-CONTAINED?: Other Codes Required (name, p | lyne  n which installed): CDC 176 NOS BE  ns Uses CDC Fortran extended features, uses CDC LCM.  purpose): DISSPLA Plot library.  ED FOR RUNS: Core Size (Octal Words)   Execution Time (Sec. CDC 7600)  |                   |
| Under Modification?:  Purpose(s):  Qwnership?:  Rocketd Proprietary?:  NO  MACHINE/OPERATING SYSTEM (on  TRANSPORTABLE?:  NO  Machine Dependent Restriction  SELF-CONTAINED?  Other Codes Required (name, p                   | CDC 176 NOS BE  To which installed): CDC 176 NOS BE  TO SEE CDC Fortran extended features, uses CDC LCM.  TO FOR RUNS: Core Size (Octal Words)   Execution Time (Sec. CDC 7600)   16K/15K LCM   10 sec/iteration  |                   |
| Operational Currently?: Ye Under Modification?: Purpose(s):   | tyne  which installed):CDC 176 NOS BE  TheUses CDC Fortran extended features, uses CDC LCM.                     |
| Operational Currently?: Ye Under Modification?: Purpose(s):  Ownership?: Rocketd Proprietary?: No MACHINE/OPERATING SYSTEM (on TRANSPORTABLE?: No Machine Dependent Restriction SELF-CONTAINED? Other Codes Required (name, p | ED FOR RUNS:  Core Size (Octal Words)  16K/15K LCM  16K/15K LCM  16K/15K LCM  10 sec/iteration  16K/15K LCM  10 sec/iteration   |                   |

| GOPWR |  |
|-------|--|
|       |  |

| 140  | OPTICS   | KINETICS  | GAS DYNAMICS   |
|--|--|---|--|
| BASIC TYPE ( )   | RESONATOR TYPE (V) Standing Wave   | GAIN REGION MODELED (V):                                | NOZZLE GEOMETRY MODELED (and type) (V)   |
| Physical Optics Geometrical  | Traveling Wave (Ring) Reverse TW   | Compact Region Annular Region                           | Cylindrical Radially Flowing   |
| FIELD (POLARIZATION) REPRESENTATION (V)  | BRANCH (V) Positive V Negative   | COORDINATE SYSTEM (Cartesian, cylindrical, etc.)        | Rectangular, Linearly Flowing  |
| Scalar Vector  | OPTICAL ELEMENT MODELS INCLUDED (V).   | Compact Region CY Annular Region: CY                    | o de la composición della comp |
| COORDINATE SYSTEM (Cartesian cylindrical etc.)   | Flat Mirrors Sphencal Mirrors  | KINETICS GRID DIMENSIONALITY (V):                       | COMPANDE EXETEN CV   indrica   |
| Cumpact Region CY Annular Region CY  | Cylindrical Mirrors Telescopes   | 10 20 30  | FLUID GRID DIMENSION (V) 10 V 20 30  |
| TRANSVERSE GRID DIMENSIONALITY (V) 1D 2D   | Scraper Mirrors.   | Compact Region:   |  |
| Compact Region   | Aucons Reflaxicons   | Annular Region  | Leminar Turbulent  |
| Annufar Region   | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS                       | one, Scheduled mixing.   |
| FIELD SYMMETRY RESTRICTIONS! AXISYMMETRY   | 1000   | Gain Vary Along Optic Axes? Flow Direction?             | BASIC MODELING APPROACH (V):   |
| MIRROR SHAPE(S) ALLOWED $(V)$  | Parabota Parabota  | PULSED: CW: KINETICS MODELED                            | Premixed Mixing  |
| Square Circular Y Strip  | À  | - 3   | Other (specify)  |
| Rectangular Eliptical Arbitrary  | Variable Cone Offset:  | (x·x² xx·x)   |  |
| CONFIGURATION FLEXIBILITY (V):   | Other (specify)  | V · X2 VX · X   | References for Apparagn 1840 ALOS Final Report   |
| Fixed Single Resonator Geometry  | Deformable Mirrors   | Cond (F : H.2)  |  |
| Fred. Multiple Resonator Geometries  | Spatial Fifters: Gratings.   | پارلو   |  |
| Modular Multiple Resonator Geometres   | Other Elements:  | 2   |  |
|  |  | Other (specify):  | THERMAL DRIVER MODELED ( $oldsymbol{V}$ ):   |
| MOPAGATION TECHNIQUE   | CAIN MODELS (V). Good Control Control  | ENERGY TRANSFER MODES MODELED (V): Reference            | Arc Heater Combustor   |
| Freshel Integral Algorithms  | Complete Columna Colum | v.r. / Conen  | Shock Tube Resistance Heater   |
| With Kernel Averaging  | The second of th |   | Only Not modeled   |
| Gaussian Quadrature  | -  | v.v. / Cohen  | F. ATOM DISSOCIATION FROM (V)  |
| Fast Fourier Transform (FFT)   | Mirror IIII  | Other   | 12 y St. y   |
| Fast Hankel Transform (FHT)  | Aberrations/ Thermal Distortions.  | Single Line Model (V).                                  | Other (specify)  |
| Cardener Fresnet Kirchhoff (GFR)   | Arbitrary  | Multiline Model (V)                                     | F. ATOM CONCENTRATION DETERMINED FROM MODEL?   |
| Other (specify) Geometric optics   | Selected (specify):  | Assumed Destroy at Board about Action (Action (Action)) | DILUENTS MODELED. HE. No.  |
|  | Reflectivity Loss  |   | MODELS EFFECTS ON MIXING RATE DUE TO (1)   |
| CONVERGENCE TECHNIQUE (V)  | Output Coupler Edges. Rolled:  | × 12  | Nozzle Boundary Layers 'Shock Waves  |
| Power Comparison   | Serrated Other   | Number of Laser Lines Modeled                           | Prereactions (thermal blockage)Turbulence  |
| Other  | LOADED CAVITY FIELD MODIFIER MODELS ( $oldsymbol{V}$ ):  | Source of Rate Coefficients Used in Code 1751 US DOUCE  | Other (specify) Trip   |
| ON SERVICE AND SERVICE ON SERVICE | Medium Index Variation   | , collect   |  |
| Technique  | Gas Absorption   | LINE PROFILE MODELS (V):                                |  |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V):   | Overlapped Beams   | Doppler Broadening                                      | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)   |
| Prosp  | Other  | Collisional Broadaning V                                | Media Index Variations   |
| Oher   | FAR-FIELD MODELS (V): Beam Steering Removal  | Other (specify)   | Other (specify)  |
|  | Optimal Focal Search Beam Quality  |   |  |
|  | Other  |   |  |
|  |  |   |  |
|  |  |   |  |

\*Uses equilibrium thermochemistry.

| ODE NAME | GURDM |
|----------|-------|
| J        |       |

| CODE TYPE: Optics  |   |
|--|---|
| PRINCIPAL PURPOSE(S)//   | APPLICATION(S) OF CODE: Originally designed to model Pratt's Intracavity Adaptive Optics  |
|  | dels bare cavity compact beam resonators with circular end mirrors and one or two   |
|  | ble mirrors. A far-field code includes external deformable mirror, tilt removal,  |
| optimum focus, e   |   |
| operman rocus; c   |   |
| ASSESSMENT OF CAPABIL  | ITIES: Full 3-D tilt and decentrations of all mirrors; arbitrary deformations on  |
| all mirrors; arb   | itrary turning angles at internal deformable mirrors. 2-D and 3-D plots.  |
|  |   |
|  |   |
|  |   |
| ASSESSMENT OF LIMITAT  | ions: Usual paraxial requirements; restrictions on peak deformations of turning   |
| mirrors, machine   | and cost limitations for large problems.  |
|  |   |
|  |   |
|  |   |
| OTHER UNIQUE FEATURE   |   |
| <u>deformable turni</u>  | ng mirrors intracavity, one deformable turning mirror extracavity.  |
|  |   |
|  |   |
| DRIGINATOR/KEY CONTA   |   |
| Name: Thom   | as R. Ferguson or Guy T. Worth Phone: (505) 848-5000  |
| Organization: The  | BDM Corporation   |
| Address: 1801  | Randolph Road S.E., Albuquerque, New Mexico 87106   |
|  | (=) (+) (-) (+) (-)   |
| Deferment Decoments  |   |
| Deromiable Mirro   | (Program GURDM). T. R. Ferguson et al. The BDM Corporation, BDM/TAC-79-193-TR.  |
|  | rion: (T. Theory, U. User, RP. Relevant Publication): (I) (U) General Unstable Resonator with rs (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR, |
|  | (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  |
|  | (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  |
|  | (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  |
|  | (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  |
|  | (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  |
| March 31, 1979.  | (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  |
| March 31, 1979.  | rs (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,   |
| March 31, 1979.  STATUS:  Operational Currently?   | rs (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,   |
| March 31, 1979.  STATUS.  Operational Currently?  Under Modification?:   | rs (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  Yes  |
| March 31, 1979.  STATUS:  Operational Currently?   | rs (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  Yes  |
| March 31, 1979.  STATUS.  Operational Currently?  Under Modification?:   | rs (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  Yes  |
| March 31, 1979.  STATUS: Operational Currently? Under Modification?:   | rs (Program GURDM), T. R. Ferguson et al, The BDM Corporation, BDM/TAC-79-193-TR,  Yes No   |
| March 31, 1979.  STATUS: Operational Currently? Under Modification?: Purpose(s): Ownership?:   | Yes No  Overnment (AFWL/ALR).   |
| STATUS:  Operational Currently? Under Modification?: Purpose(s):  Ownership?:  G Proorletary?  | Yes No  Overnment (AFWL/ALR).   |
| STATUS:  Operational Currently? Under Modification?: Purpose(s):  Ownership?:  G Proorletary?  | Yes No  Overnment (AFWL/ALR).   |
| March 31, 1979.  STATUS:  Operational Currently?  Under Modification?:  Purpose(s):  Ownership?:  G Proprietary?:  N MACHINE/OPERATING SY  | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  |
| March 31, 1979.  STATUS.  Operational Currently? Under Modification?:  Purpose(s):  Oemership?:  G Proprietary?:  N MACHINE/OPERATING SY   | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  |
| March 31, 1979.  STATUS.  Operational Currently? Under Modification?:  Purpose(s):  Oemership?:  G Proprietary?:  N MACHINE/OPERATING SY   | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  |
| March 31, 1979.  STATUS.  Operational Currently? Under Modification?:  Purpose(s):  Ownership?:  G Proprietary?:  N MACHINE/OPERATING SY  TRANSPORTABLE?  Y Machine Dependent F                                      | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  |
| March 31, 1979.  STATUS.  Operational Currently? Under Modification?: Purpose(s):  Ownershipt: Q Proprietary?: N MACHINE/OPERATING SY TRANSPORTABLE? Y Machine Dependent F   | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  es  Restrictions:CDC 1/0, size restrictions.  |
| March 31, 1979.  STATUS.  Operational Currently? Under Modification?: Purpose(s):  Ownershipt: Q Proprietary?: N MACHINE/OPERATING SY TRANSPORTABLE? Y Machine Dependent F   | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  |
| March 31, 1979.  STATUS.  Operational Currently? Under Modification?: Purpose(s):  Ownershipt: Q Proprietary?: N MACHINE/OPERATING SY TRANSPORTABLE? Y Machine Dependent F   | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  es  Restrictions:CDC 1/0, size restrictions.  |
| STATUS:  Operational Currently? Under Modification?: Purpose(s):  Ownership?:  GProprietary?:  NACHINE/OPERATING SY  TRANSPORTABLE?  Machine Dependent F  SELF-CONTAINED?:  Other Codes Required                     | Yes No  Overnment (AFML/ALR).  O STEM (on which installed): CDC 6000, 7000, 176.  es Restrictions CDC 1/0, size restrictions.   |
| STATUS:  Operational Currently? Under Modification?: Purpose(s):  Ownership?:  GProprietary?:  NACHINE/OPERATING SY  TRANSPORTABLE?  Machine Dependent F  SELF-CONTAINED?:  Other Codes Required                     | Yes No  Overnment (AFML/ALR).  O STEM (on which installed): CDC 6000, 7000, 176.  es Restrictions CDC 1/0, size restrictions.   |
| STATUS:  Operational Currently? Under Modification?: Purpose(s):  Ownership?:  GProprietary?:  NACHINE/OPERATING SY  TRANSPORTABLE?  Machine Dependent F  SELF-CONTAINED?:  Other Codes Required                     | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  EstrictionsCDC 1/0, size restrictions.  (name, purpose)NOne                                   |
| March 31, 1979.  STATUS.  Operational Currently? Under Modification?: Purpose(s):  Ownership?: GProprietary?: NMACHINE/OPERATING SY  TRANSPORTABLE? YMachine Dependent F  SELF-CONTAINED?: Other Codes Required      | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  EstrictionsCDC 1/0, size restrictions.  (name, purpose)NOne                                   |
| March 31, 1979.  STATUS.  Operational Currently? Under Modification?: Purpose(s):  Oemership?: QProprietary?: NMACHINE/OPERATING SY Machine Dependent F SELF-CONTAINED?: Other Codes Required  ESTIMATE OF RESOURCES | Yes No  Overnment (AFWL/ALR).  O  STEM (on which installed):CDC 6000, 7000, 176.  Estrictions:CDC 1/0, size restrictions.  (name, purpose)None                                  |

| - |   |
|---|---|
|   |   |
| ü | d |
| 3 | Ē |
| 3 | Ş |
| • | , |
| č | 5 |
| ς | 2 |

| OPTICS   | sol   | KINETICS   | GAS DYNAMICS                                 |
|--|---|--|--|
| BASIC TYPE (V)                                       | RESONATOR TYPE (V) Standing Wave            | GAIN REGION MODELED (V) None                         | NOZZLE GEOMETRY MODELED (and type) (V) NOTIE |
| Physical Optics Coometrical                          | Traveling Weve (Ring) Reverse TW            | Compact Region Annula: Region                        | Cylindrical Radially Flowing                 |
| FIELD (POLARIZATION) REPRESENTATION (V):             | BRANCH (V): Positive Negative               | COORDINATE SYSTEM (Canassan, cylindrical, etc.)      | Reclangular Linearly Flowing                 |
| Scatar Vector  | OPTICAL ELEMENT MODELS INCLUDED $(V)$       | Compact Region Annular Region                        | Other  |
| COORDHNATE SYSTEM (Cartesian, cylindrical, etc.):    | Flat Mirrors V Sphencel Mirrors             | KINETICS GRID DIMENSIONALITY (V)                     | COORDINATE SYSTEM                            |
|  | Cylindrical Mirrora Telescopes              | 10 20 30   | FLUID GRID DIMENSION (V) 1D 20 3D            |
| TRANSVERSE GRID DIMENSIONALITY (V): 10 20            | Scraper Merces                              | Complet Region                                       | FLOW FIELD MODELED $(V)$                     |
| Compact Repon  | Asicons Reflasicons                         | Annular Region                                       | Laminar Turbulant                            |
| Annular Repon  | Arbitasy                                    | GAIN REGION SYMMETRY RESTRICTIONS                    | Other  |
| FIELD SYMMETRY RESTRICTIONS?                         | Linear                                      | Gain Vary Along Optic Asse? Flow Direction?          | BASIC MODELING APPROACH $\langle V \rangle$  |
| MIRROR SHAPE(S) ALLOWED (V).                         | Parabola Parabola                           | PULSED CW KINETICS MODELED                           | Premised Misself.                            |
| Reclamation Efficient Arbitrary                      | Variable Core Offert                        | (I.V. V. VI.V)                                       | Other (specify)                              |
| -\$  | Other (specify)                             | * *  |  |
| Fixed. Single Resonator Geometry                     | Deformable Mirrors                          |  | Restricts for Approach Used                  |
| Fixed, thutliple Resonator Geometries                | Spatial Filters Gratings                    | 1 ; j) wants   |  |
| Moduler Multiple Resonator Geometines                | Other Elements                              | Other (specify)                                      | TAREBUSE DESCRIPTION AND                     |
| PROPAGATION TECHNIQUE AT CONTROL OF ANALYSIS         |   | ENERGY TRANSFER MODES MODELED (V) Reference          | Arc Healer Combustor                         |
| Freenal Integral Algorithms                          | GAIN MODELS (V): Bere Carris Drily          | W.T.   | i  |
| Weth Kernel Averaging                                | Simple Seburated Gain Paraded Gain          | & >  |  |
| Gaussian Quadrature                                  | ₹.  | * A A  | F. ATOM DISSOCIATION FROM (V)                |
| Fast Fourier Transform (FFT)                         | Merce 18.                                   | Other  | F2 SF6                                       |
| Fast Mankel Transform (FMT)                          | Apertations/ Intermet Desperations          | Single Line Model (V)                                | Other (specify)                              |
| Gardener Freenet Rechild (GFK)                       | Shape set by Zernike                        | Multiture Model (V)                                  | F.ATOM CONCENTRATION DETERMINED FROM MODEL?  |
| Other (specify)                                      | coefficients input.                         | Assumed Roterbonal Population Distribution State (V) | DILUENTS MODELED                             |
|  | Cartain Counties Educate Robbert            | Equalibrium Nonequalibrium                           | MODELS EFFECTS ON MIXING RATE DUE TO (1)     |
| CONVENCE TECHNIQUE (V)                               | Serrated                                    | Number of Later Lines Modeled                        | Presentions (thermal blockers)               |
| Other  | 7   | Source of Rate Coefficients Used in Code             | Other (specify)                              |
| ACCELERATION ALGORITHMS USED? NONE                   | Medium Index Verlation                      | LINE PROFILE MODELS (V)                              |  |
| Technique  | Ges Absorption                              | Donote Bradenine                                     |  |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V): | Overlapped Baarrs                           | Collisional Broadening.                              | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)   |
| Other  | FAR.FIELD MODELS (V). Beem Steaming Removal | Other (specify):                                     | Other (specify)                              |
|  | Optimel focal Search Beam Quelity           |  |  |
|  | omer External deformable mirror.            |  |  |
|  |   |  |  |

<sup>\*</sup>Azimuthal Fourier expansion.

| CODE NAME: | HFGOPWK |
|------------|---------|
|            |         |

| CODE TYPE:  | Optics, Kinetics, and  | d Gasdynamics                                       |   |
|---|--|---|---|
| PRINCIPAL PURPOS  | E(S)/APPLICATION(S) OF CODE:   | Calculational t                                     | ool to study the performance of CW chemical laser                               |
|   | raction with the gair  |   |   |
|   |  |   |   |
|   |  |   |   |
| ASSESSMENT OF CA  | DARILITIES USES GEO  | ometric optics and                                  | quasi-one-dimensional aerokinetics. Useful for                                  |
|   |  | importance of de                                    | sign parameters on laser performance.   |
|   |  |   |   |
|   |  |   |   |
| ASSESSMENT OF LI  | MITATIONS:Limited  | to HSURIA geometr                                   | y only unless modified.   |
|   | <del></del>  |   |   |
|   |  |   |   |
|   |  |   |   |
| OTHER UNIQUE FEA  | TURES: Resonator   | <u>aeometries modeled</u>                           | : HSURIA, reflaxicon beam compactors.   |
|   |  |   |   |
|   |  |   |   |
| ORIGINATOR/KEY C  | ONTACT:  | [ Yang  | (213)884-2370   |
| Name:   | Cooketduse   | i ignig   | Phone:(213)884-2370   |
| Organization:   | 6633 Canoga Ave.,  | Canoga Park. Cali                                   | fornia  |
|   |  |   |   |
|   | FNTATION (T = Theory II = IIs  | ar 89 = Balavant Publicatio                         | (T) Rocketdyne Internal Letter G-SL-77-509,                                     |
| October 5, 1  | ENTATION: (T = Theory, U = Us<br>977; (U) Rocketdyne :   | er, RP = Relevant Publicatio<br>[nterna] Letter G-  | on): (T) Rocketdyne Internal Letter G-SL-77-509, 0-78-937, January 24, 1978.    |
| October 5, 1  | ENTATION: (T = Theory, U = Us<br>977; (U) Rocketdyne   | er, RP = Relevant Publication<br>[nternal Letter G- | on). (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| October 5, 1  | ENTATION: (T = Theory, U = Us<br>977; (U) Rocketdyne   | er, RP = Relevant Publication<br>Internal Letter G- | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| October 5, 1  | ENTATION: (T = Theory, U = Us<br>977; (U) Rocketdyne   | er, RP = Relevant Publicatio<br>Internal Letter G-  | on): (I) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| October 5, 1  | ENTATION: (T = Theory, U = Us<br>977; (U) Rocketdyne   | er, RP = Relevant Publication                       | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| October 5, 1  | EMTATIQN:(T = Theory, U = Us<br>977; (U) Rocketdyne  | er RP = Relevant Publication                        | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
|   |  | er RP = Relevant Publicati<br>Internal Letter G-    | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
|   | V  | er RP = Relevant Publicati<br>Internal Letter G-    | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| STATUS:   | rently?. Yes   | er RP = Relevant Publicati<br>Internal Letter G-    | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| STATUS:<br>Operational Cun  | rently?: Yes   | er RP = Relevant Publicati<br>Internal Letter G-    | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| STATUS:<br>Operational Cun<br>Under Modifical   | rently? Yes  | er RP = Relevant Publicati<br>Internal Letter G-    | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| STATUS:<br>Operational Cun<br>Under Modifical   | rently?: Yes   | er RP = Relevant Publicati<br>Internal Letter G-    | on): (T) Rocketdyne Internal Letter G-SL-77-509,<br>0-78-937, January 24, 1978. |
| STATUS: Operational Cur Under Modifical Purpose(s): Ownership?: Proprietary?:   | rently?: Yes ion?:  Racketdyne No  | CDC LTC MOC DE                                      | 0-78-937, January 24, 1978.   |
| STATUS: Operational Cur Under Modifical Purpose(s): Ownership?: Proprietary?:   | rently?: Yes   | CDC LTC MOC DE                                      | 0-78-937, January 24, 1978.   |
| STATUS: Operational Cur Under Modificat Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI   | rently?: Yes ion?:  Racketdyne No NG SYSTEM (on which installed):  | CDC LTC MOC DE                                      | 0-78-937, January 24, 1978.   |
| STATUS: Operational Cur Under Modificat Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI   | rently?: Yes ion?:  Rocketdyne No NG SYSTEM (on which installed):  | CDC 176 NOS BE.                                     | 0-78-937, January 24, 1978.   |
| STATUS: Operational Cur Under Modificat Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI   | Racketdyne No NG SYSTEM (on which installed):  | CDC 176 NOS BE.                                     | 0-78-937, January 24, 1978.   |
| STATUS: Operational Cun Under Modifical Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?: Machine Deper                                 | Rocketdyne No No System (on which installed): No Indent Restrictions: USES (                                       | CDC 176 NOS BE.                                     | 0-78-937, January 24, 1978.  led features, uses CDC LCM.                        |
| STATUS: Operational Cun Under Modifical Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?: Machine Deper                                 | Racketdyne No No SySTEM (on which installed): No ndent Restrictions: USES  | CDC 176 NOS BE.                                     | 0-78-937, January 24, 1978.  led features, uses CDC LCM.                        |
| STATUS: Operational Cur Under Modificat Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?: Machine Deper Other Codes Re                  | Racketdyne No NG SYSTEM (on which installed): No Ident Restrictions: USES (  | CDC 176 NOS BE.                                     | 0-78-937, January 24, 1978.  led features, uses CDC LCM.                        |
| STATUS: Operational Cur Under Modificat Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?: Machine Deper Other Codes Re                  | Rocketdyne No No System (on which installed): No Indent Restrictions: USES (                                       | CDC 176 NOS BE.                                     | 0-78-937, January 24, 1978.  led features, uses CDC LCM.                        |
| STATUS: Operational Cur Under Modificat Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?: Machine Deper Other Codes Re                  | Racketdyne No NG SYSTEM (on which installed): NO udent Restrictions: USES (  URCES REQUIRED FOR RUNS:  16K/15K LCM | CDC 176 NOS BE.                                     | 0-78-937, January 24, 1978.  led features, uses CDC LCM.                        |
| STATUS: Operational Cun Under Modifical Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI TRANSPORTABLE?: Machine Deper SELF-CONTAINEO?: Other Codes Re | Racketdyne No NG SYSTEM (on which installed): No Ident Restrictions: USES (  | CDC 176 NOS BE.                                     | 0-78-937, January 24, 1978.  led features, uses CDC LCM.                        |

| OPTICS   | ccs   | KINETICS  | GAS DYNAMICS  |
|--|---|---|---|
| BASIC TYPE (\$)  | RESONATOR TYPE (V): Standing Wave           | GAIN REGION MODELED (V)   | NOZZLE GEOMETRY MODELED (and type) (V)  |
| ≩  | ROBNEH (V. Poeting)                         | COMPET REGION   | Cylindrical Regionly Flowring F   |
| Scalar Vector  | OPTICAL ELEMENT MODELS INCLUDED (V):        | Compact Region CV Annular Region CV                                 | Other   |
| COORDINATE SYSTEM (Carlesian cylindrical etc.)   | Flat Mirrors Spherical Mirrors              | KINETICS GRID DIMENSIONALITY (V):                                   | COORDINATE SYSTEM CYTINGRICAL   |
|  | Cylindrical Mirrors. Telescopes             | 10 20 30  | FLUID GRID DIMENSION (V) 10 20 30   |
| TRANSVERSE GRID DIMENSIONALITY (V) 10 2D Compact Negoon  | Mirrors.                                    | <b>.</b>  | FLOW FIELD MODELED (V)  |
| Annular Region   | Asicons Matricons Matricons Matricons       | Annular Region  | اۃ، ا   |
| FIELD SYMMETRY RESTRICTIONS! AXISYMMETRIC  | Linear                                      | Gan Vary Along Optic Axes? Flow Direction?                          | BASIC MODELING APPROACH ( $V$ ).  |
| APE(S) ALLOWED (V)   | Parabola-Parabola:                          | PULSED: CW. KINETICS MODELED  | Premisedbusing  |
| Square Curcular Strip  | Variable Cone Offset:                       | CHEMICAL PUMPING REACTIONS MODELED (V).                             | Other (specify)   |
| N FLEXIBILITY (V)  | Other (specify):                            | ;<br>;<br>;<br>;  | ALOS Final Report   |
| Fried Single Resonator Geometry  | <b>1</b>                                    |   |   |
| Fired Multiple Resonator Geometries  | Spatial filters: Gratings                   | Hot (H - F2) V Chain (F - H2 & H - F2)                              |   |
| Įι   | Und Elements                                | Other (specify)   | THERMAL DRIVER MODELED (V).   |
| PROPAGATION TECHNIQUE  | CAIN MODEL CAV. Band County Coult           |   | Arc HeaterCombustor   |
| The state of the s | Simple Seturated GainDetailed Gain          | v.t V Cohen   | Shock Tube Residence Heater   |
| Gaussian Quadrature  | BARE CAVITY FIELD MODIFIER MODELS (V)       | 2040J   | Other Not modeled.  |
| Fast Fourner Transform (FFT)   | Mirror TiftDecentration                     | ı   | F.ATOM DISSOCIATION FROM (V)  |
| Feel Hankel Transform (FMT)  | Aberrations/Thermal Distortions             | Single Line Model (V)   | 72  |
| Gardener Fragnel Kirchhoff (GFR)   | Arbitrary                                   | Multitine Model (V)   | F. ATOM CONCENTRATION DETERMINED FROM MODEL!                                    |
| Other (specify) Geometric optics.  | Reflectivity Loss                           | Assumed Rotational Population Distribution State $\langle V  angle$ | DILUENTS MODELED He, N2   |
|  | Output Coupler Edges Rolled                 | Equilibrium Nonequilibrium  | MODELS EFFECTS ON MIXING RATE DUE TO (V.) Nezzle Boundary Laters V. Shock Waves |
| CONVERSENCE TECHNIQUE (V)  | Serrated Other                              | Number of Laser Lines Modeled - 12                                  | Prereactions (thermal blochage)   |
| 4 1  | LOADED CAVITY FIELD MODIFIER MODELS (V)     | Source of Rate Coefficients Used in Code ACTOSDACE -                | Other (specify) Trip  |
| ACCELERATION ALGORITHMS USED! NO.  | Medium Index Variation                      | LINE PROFILE MODELS (V)   |   |
| Tachnique  | Contract Bases                              | Doppler Broadening  |   |
| MULTIPLE ENGENVALUE/VECTOR EXTRACTION ALGORITHM (V)  | Other                                       | Cothsional Broademng V  | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)                                      |
| Other  | FAR-FIELD MODELS (V): Beam Steering Removel | Other (specify)   | Other (specify)   |
|  | Optimal Focal Search Beam Quality           |   |   |
|  | Other                                       |   |   |
|  |   |   |   |

\*Uses equilibrium thermochemistry.

| CODE TYPE Kinetics   | <del></del>   |
|--|---|
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODEPredict_oscillathydrogen flouride fusion laser program.   | tor and amplifier performance for Sandia Lab's  |
| ASSESSMENT OF CAPABILITIES <u>Can do HF pulsed oscillator</u> nonuniformities, plus volume-averaged oscillator ca  |   |
| atom enhancement of hot and cold reaction rates, ch  | nain-terminating O <sub>2</sub> kinetics, amplified spon-   |
| taneous emission, and transverse parasitic oscillat  | tions are allowed.  |
| ASSESSMENT OF LIMITATIONS <u>Initiation rate must be sign</u>  | pecified. Calculations which allow longitudinal er time as pulse length increases. No optics in                       |
| this code. Rotational relaxation limited to R-I.   | Difficult to add reactions to existing scheme.  |
| orther unique featuresHot-atom_hot_and_cold_rate optical_axis_included_in_amplifier_calculations; an description_allowed; transverse_parasitic_oscillati calculations.   |   |
| DRIGINATOR/KEY CONTACT   |   |
|  | hone (505) 264-4259   |
| Organization Sandia Laboratories  Address 4212, Laser Projects Division, Kirtle  |   |
| AVAILABLE DOCUMENTATION (1 Theory, U User RP Relevant Publication Aerospace Sciences Meeting, Pasadena, California,  | and AFB, New Mexico 87117<br>n) <u>(RP) A1AA paper 75-36 presented at A1AA 13t</u><br>January 20, 1975, J. B. Moreno. |
| AVAILABLE DOCUMENTATION (1 Theory, U User RP Relevant Publication<br>Aerospace Sciences Meeting, Pasadena, California,   | and AFB, New Mexico 87117  n) (RP) A1AA paper 75-36 presented at A1AA 13ti January 20, 1975, J. B. Moreno.            |
| AVAILABLE DOCUMENTATION (* Theory & User RP Relevant Publication Aerospace Sciences Meeting, Pasadena, California,   STATUS  | and AFB, New Mexico 87117  n) (RP) AlAA paper 75-36 presented at AlAA lati January 20, 1975, J. B. Moreno.            |
| AVAILABLE DOCUMENTATION († Theory U User RP Relevant Publicatio<br>Aerospace Sciences Meeting, Pasadena, California, (   | and AFB, New Mexico 87117  (RP) A1AA paper 75-36 presented at A1AA 13ti January 20, 1975, J. B. Moreno.               |
| AVAILABLE DOCUMENTATION (* Theory, U User, RP Relevant Publication Aerospace Sciences Meeting, Pasadena, California,  STATUS  Operational Currently?  Yes  Not at present  | and AFB, New Mexico 87117  n) (RP) AlAA paper 75-36 presented at AlAA 13t  January 20, 1975, J. B. Moreno.            |
| AVAILABLE DOCUMENTATION (T Theory, U User, RP Relevant Publication Aerospace Sciences Meeting, Pasadena, California, Californi | and AFB, New Mexico 87117  (RP) A1AA paper 75-36 presented at A1AA 13ti January 20, 1975, J. B. Moreno.               |
| AVAILABLE DOCUMENTATION (T Theory, U User, RP Relevant Publication Aerospace Sciences Meeting, Pasadena, California,  STATUS  Operational Currently?  Under Modification?  Not at present  | and AFB, New Mexico 87117  n) (RP) A1AA paper 75-36 presented at A1AA 13ti January 20, 1975, J. B. Moreno.            |
| AVAILABLE DOCUMENTATION (T. Theory, U. User, RP. Relevant Publication Aerospace Sciences Meeting, Pasadena, California,  STATUS  Operational Currently?  Under Modification?  Purpose(s)  Ownership?  Sandia Laboratories/D.O.E.  Proprietary?  NO   | and AFB, New Mexico 87117  (RP) AlAA paper 75-36 presented at AlAA lati January 20, 1975, J. B. Moreno.               |
| AVAILABLE DOCUMENTATION (T. Theory, U. User, RP. Relevant Publication Aerospace Sciences Meeting, Pasadena, California, Califo | and AFB, New Mexico 87117  n) (RP) AlAA paper 75-36 presented at AlAA lati January 20, 1975, J. B. Moreno.            |
| AVAILABLE DOCUMENTATION (T Theory, U User, RP Relevant Publication Agrospace Sciences Meeting, Pasadena, California, Californi | and AFB, New Mexico 87117  n) (RP) AlAA paper 75-36 presented at AlAA 13ti January 20, 1975, J. B. Moreno.            |
| AVAILABLE DOCUMENTATION (T Theory, U User, RP Relevant Publication Agrospace Sciences Meeting, Pasadena, California, Californi | and AFB, New Mexico 87117  n) (RP) AlAA paper 75-36 presented at AlAA 13t)  January 20, 1975, J. B. Moreno.           |
| AVAILABLE DOCUMENTATION (T. Theory, U. User, RP. Relevant Publication Agrospace Sciences Meeting, Pasadena, California,  STATUS  Operational Currently?  Under Modification?  Purpose(s)  Ownership?  Sandia Laboratories/D.O.E.  Proprietary?  NO  MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE?  Not very, since not documented.  Machine Dependent Restrictions  SELF CONTAINED?  Yes  Other Codes Required (name, purpose)   | n) (RP) AlAA paper 75-36 presented at AlAA little<br>January 20, 1975, J. B. Moreno.                                  |
| AVAILABLE DOCUMENTATION (T Theory, U User, RP Relevant Publication Aerospace Sciences Meeting, Pasadena, California, Californi | RP) AlAA paper 75-36 presented at AlAA 13th January 20, 1975, J. B. Moreno.  Execution Time (Sec. CDL 7600)           |
| AVAILABLE DOCUMENTATION (T Theory, U User, RP Relevant Publication Agerospace Sciences Meeting, Pasadena, California, Californ | n) (RP) AlAA paper 75-36 presented at AlAA 13th January 20, 1975, J. B. Moreno.                                       |

| HFOX |   |
|------|---|
| AME  | E |

| OPTICS   | ICS None                                   | KINETICS   | GAS DYNAMICS                                |
|--|--|--|---|
| BASIC TYPE (V) None  | RESONATOR TYPE (V) Standing Wave           | GAIN REGION MODELED (V)                              | NOZZLE GEOMETRY MODELED (and type) (1) None |
| Physical Optics Geometrical  | Traveling Wave (Ring) Reverse TW           | Compact Region Annular Region                        | Cylindrical Radially Flowing                |
| FIELD (POLARIZATION) REPRESENTATION (V)  | BRANCH (V): Positive Negative              | COORDINATE SYSTEM (Caringian cylindrical etc.)       | Rectangular Linearly Flowing                |
| Scalar Vector  | OPTICAL ELEMENT MODELS INCLUDED (V)        | Compact Region Annula Region                         | Other                                       |
| COORDINATE SYSTEM (Cartesian cylindrical, etc.)  | Flat Mirrors Spherical Mirrors             | KINETICS GRID DIMENSIONALITY (\$)                    | COORDINATE SYSTEM                           |
|  | Cylindrical Mirrors Telescopes             | 10 20 30   | FLUID GRID DIMENSION (\$ + 10 20 30         |
| TRANSVERSE GRID DIMENSIONALITY ( $V$ ). 1D 2D  | Scraper Mirrors                            | Compact Region                                       | FLOW FIELD MODELED (A.)                     |
| Compact Region   | Asicons Masicons Refisitions               | Annular Region                                       | Laminar Turbulent                           |
| Annular Region   | Arbitary                                   | GAIN REGION SYMMETRY RESTRICTIONS                    | Other                                       |
| FIELD SYMMETRY RESTRICTIONS?   | Linear                                     | Gain Vary Along Optic Ases? ' Flow Direction'        | BASIC MODELING APPROACH (\$)                |
| PE(S) ALLOWED (V)  | Parabola Parabola                          | PULSED V CW KINETICS MODELED                         | Principle Described                         |
| Square Circular Sinp   |  | CHEMICAL PUMPING REACTIONS MODELED (V)               | Other (specify)                             |
| Rectangular Elliptical Arbdiary  | Variable Cons office                       | (x·y2 yx·y)  |   |
| CONFIGURATION FLEXIBILITY (V)  | Curae (Specing)                            | Y - X2 W - X   H   1/                                | References for Asserbach Used               |
| Fired. Single Resonator Geometry   | Deformable Mirrors                         | Cond (f - H <sub>2</sub> ) ,                         |   |
| Fixed. Multiple Resonator Geometries   | Spatial Fishers Gratings                   | Hot (H - F - ) Chan (F - H - E H - F - )             |   |
| Moduler Multiple Reconstor Geometries  | Other Elements                             | Other innertal                                       |   |
| PROPAGATION TECHNIQUE  |  |  | ~   |
| Fresnel Integral Algorithms  | GAIN MODELS (V) Bere Centy Only            | ENERGY INANSER MODES WODELED (1) Mercence            | Arc Heater Combuston                        |
| With Karnet Averaging  | Simple Seturated Garn Detailed Garn        | Π  | Shock Tube Resistance Master                |
| Gaussian Ouadrature  | BARE CAVITY FIELD MODIFIER MODELS (V)      |  | Other                                       |
|  | Mirror Titl Decentration                   | * * LAETOSDACE COTD. COMPLIACIONS.                   | F ATOM DISSOCIATION FROM (V)                |
| The state of the s | Aberrations/Thermal Distortions            | Other  | 1,2 51,6                                    |
| Fast Mankel Transform (FMT)  | Andrews .                                  | Single Line Model (V)                                | Other (specify)                             |
| Gardenar Fresnet Kirchhof (GFK)  | Calculation (Calculation)                  | Multiline Model (V.)                                 | F ATOM CONCENTRATION DETERMINED FROM MODEL' |
| Other (specify)  | The firsts has                             | Assumed Rotational Population Distribution State (V) | DILUENTS MODELED                            |
|  |  | Equilibrium Nonequilibrium 1                         | MODELS EFFECTS ON MIXING RATE DUE TO (\$)   |
| CONVERGENCE TECHNIQUE (V)  | Curpur Coupses Rolled South                | Number of Leser Lines Modeled                        | Nozzie Boundary Layers Shock Waves          |
| Power Companson Field Companson  | Sertined                                   | Source of Rate Conflictents Used in Code AerrOSpace  | Presections (thermal blockage)Turbulence    |
| Other  | LUADED LAVIST FIELD MUDIFIER MODELS (V)    | Corp.  | Other (apacify)                             |
| ACCELERATION ALGORITHMS USED?  | Medium Index Variation                     | LINE PROFILE MODELS (V)                              |   |
| Technique  | Gas Absorption                             | Donoler Broadenine                                   |   |
| multiple eigenvalue/vector extraction algorithm ( $V_{\rm L}$  | Overlapped Bearris                         | Collisional Broadening                               | MODELS EFFECTS ON OPTICAL MODES DUE TO (\$) |
| Prom   | Other                                      |  | Media Index Variations                      |
| Other  | FAR FIELD MODELS (V) Beam Steering Removal | Other (specify)                                      | Other (specify)                             |
|  | Optimal Focal Search                       |  |   |
|  | Other                                      |  |   |
|  |  |  |   |
|  |  |  |   |

\*Variable dimension code.

| CODE NAME | IPAGOS |
|-----------|--------|
|           |        |

| code type: <u>Opti</u>   | cs  |   |  |   |   |                     |
|--|---|---|--|---|---|---------------------|
|  | S)/APPLICATION(S) OF CODE   | Interactive ver   | sion of POLYPAG  | GOS: conduct der                                      | ometric ray trace                                       | e                   |
| PRINCIPAL PURPOSE(S  | neral optical system  | ns: code subrouti   | nes can design   | nonlinear beam  | compactors of   | <u> </u>            |
|  | xicon, and nonevert   |   |  | Horricas Deam   | compactor's or  |                     |
| TETTAXICON, WO   | ATCOM: MINE HOME VET C  | This wax reon design  |  |   |   |                     |
| ASSESSMENT OF CAPA   | Code can  | produce OPD and   | spot diagrams  | through systems                                       | containing sphe   | res,                |
| conics, torics   | , diffraction gratin  | ngs, axicons, and   | corner cubes.  | Code can take   | Fourier transfo   | rm of               |
| field at outpu   | t plane and generate  | e far-field energ   | y distributions  | . Can handle i  | up to two deform  | able                |
|  | map movement of a i   |   |  |   |   |                     |
|  | Has no ni   | hysical optics ca   | mahility inter   | nal to ontical  | train: does not   |                     |
| ASSESSMENT OF LIMI<br>model resonato   | rations <u>nas no pr</u><br>ers by iterative solu   |   |  | iai to opticai  | cram, does not  |                     |
|  |   |   |  |   |   |                     |
|  |   |   |  |   |   |                     |
| THER UNIQUE FEATL  | RES Resonator geor  | metries modeled:  | HSURIA, compac   | ct unstable con                                       | focal, unstable   | P-P                 |
| waxicon/linear   | waxicon negative be   | ranch ring with s   | spatial ritter.  |   |   |                     |
|  |   |   |  |   |   |                     |
| RIGINATOR/KEY CON  | Mansell/C. Barnard  | /Kemp*  | Phone(505  | 848-5000  |   |                     |
|  | e BDM Corporation   |   | Phone  | 7010 3000   |   |                     |
| 100  | Ol Randolph Road, S.  |   |  | 100   |   |                     |
| Address 180  |   |   | Now Movico XI  |   |   |                     |
|  |   |   | New Mexico 8/  | PAGOS" Aprosnaci                                      | e Report TR-0059  | 76311               |
| VAILABLE DOCUMEN   | TATION (T Theory, U Use   | r. RP Relevant Publication  | New Mexico 8/<br>(T) "POLY   | PAGOS" Aerospaci                                      | e Report TR-0059  | (6311               |
| (T) "Beam Comp   | TATION (T Theory, U Use<br>pactor Design and Fal  | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059  | (6311)<br>of        |
| HSURIA Prototy   | TATION (T Theory U Use<br>pactor Design and Fal<br>ypes," BDM/TAC-79-15   | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | (6311<br>of<br>U)   |
| HSURIA Prototy   | TATION (T Theory U Use<br>pactor Design and Fal<br>ypes," BDM/TAC-79-15   | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | (6311<br>of<br>U)   |
| HSURIA Prototy   | TATION (T Theory U Use<br>pactor Design and Fal<br>ypes," BDM/TAC-79-15   | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy   | TATION (T Theory U Use<br>pactor Design and Fal<br>ypes," BDM/TAC-79-15   | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy<br>AFWL-TR-78-77.   | TATION (T Theory U Use<br>pactor Design and Fal<br>ypes," BDM/TAC-79-15   | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | (6311)<br>of<br>U)  |
| HSURIA Prototy<br>AFWL-TR-78-77.   | TATION (T Theory. U Use<br>actor Design and Fal<br>ppes," BDM/TAC-79-15   | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | (6311)<br>of<br>U)  |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Curren   | TATION (T Theory, U Use<br>eactor Design and Fal<br>ppes," BDM/TAC-79-15  | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Curren Under Modification  | TATION (T Theory, U Use<br>eactor Design and Fal<br>ppes," BDM/TAC-79-15  | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | (6311<br>of<br>U)   |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Curren   | TATION (T Theory, U Use<br>eactor Design and Fal<br>ppes," BDM/TAC-79-15  | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)   | TATION (T Theory. U Use<br>Nactor Design and Fal<br>Appes," BDM/TAC-79-15<br>BDM/TAC-79-15<br>Ally? Yes   | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership?   | TATION (T Theory, U Use<br>Dector Design and Fal<br>Pipes," BDM/TAC-79-15  Types," Yes No  AEWL   | r. RP Relevant Publicated   | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary?  | TATION (T Theory, U Use<br>Dector Design and Fal<br>Pipes," BDM/TAC-79-15  Theory, Yes No  AFWL No  | r. RP Relevant Publication Program 1-TR; (U) POLYPAC                          | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | (6311<br>of<br>u)   |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary?  MACHINE/OPERATING   | TATION (T Theory, U Use actor Design and Fall Pipes," BDM/TAC-79-15  THIP Yes No  AFML NO  SYSTEM (on which installed)  | r. RP Relevant Publication Program 1-TR; (U) POLYPAC                          | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary?  MACHINE/OPERATING   | TATION (T Theory, U Use actor Design and Fall pess," BDM/TAC-79-15  Table Pess," BDM/TAC-79-15  Table Pess," Yes  No  AFWL No SYSTEM (on which installed)   | r. RP Relevant Publication Program 1-TR; (U) POLYPAC                          | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary?  MACHINE/OPERATING   | TATION (T Theory, U Use actor Design and Fall Pipes, "BDM/TAC-79-15  Mby, Yes No  AFWL No  SYSTEM (on which installed)  | r. RP Relevant Publication Program 1-TR; (U) POLYPAC                          | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of<br>U)            |
| HSURIA Prototy AFWL-TR-78-77  STATUS  Operational Currer Under Modification Purpose(s)  Ownership? Proprietery?  Proprietery?  MACHINE/OPERATING  TRANSPORTABLE?  Machine Depende                    | TATION (T Theory, U Use actor Design and Fall Pipes, "BDM/TAC-79-15  Mby, Yes No  AFWL No  SYSTEM (on which installed)  | r. RP Relevant Publication Program 1-TR; (U) POLYPAC                          | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of U)               |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary? MACHINE/OPERATING TRANSPORTABLE? Machine Depende                                     | TATION (T Theory, U Use actor Design and Fall pes, "BDM/TAC-79-15  May Yes No  AF WL No  SYSTEM (on which installed)  Yes Restrictions Requires   | r. RP Relevant Publication Program 1-TR; (U) POLYPAC                          | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | of U)               |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary? MACHINE/OPERATING TRANSPORTABLE? Machine Depende                                     | TATION (T Theory, U Use actor Design and Fall Pages, "BDM/TAC-79-15  May Yes No  AFML No  SYSTEM (on which installed)  Yes Requires   | r. RP Relevant Publication Program 1-TR; (U) POLYPAC                          | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet                    | e Report TR-0059 ry Ray Analyses -0172(2311)-1; (       | of U)               |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary? MACHINE/OPERATING TRANSPORTABLE? Machine Depende SELF-CONTAINED? Other Codes Requi   | TATION (T Theory, U Use actor Design and Fall pes, "BDM/TAC-79-15  May Yes No  AF WL No  SYSTEM (on which installed)  Yes Restrictions Requires   | RP Relevant Publication Program 1-TR; (U) POLYPAC  CDC 6600/7600  overlaying. | on) (T) "POLY" n," AFWL-TR-78- GOS Users Manua                     | PAGOS" Aerospac<br>77; (T) "Geomet<br>1, Aerospace TR | e Report TR-0059<br>ry Ray Analyses<br>-0172(2311)-1; ( | 0(6311)<br>of<br>U) |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary? MACHINE/OPERATING TRANSPORTABLE? Machine Depende SELF-CONTAINED? Other Codes Requi   | TATION (T Theory, U Use actor Design and Fail pess," BDM/TAC-79-15  TATION (T Theory, U Use actor Design and Fail pess," BDM/TAC-79-15  TATION (T Theory, U Use actor Design and Fail pess," No  AFWL No SYSTEM (on which installed) Yes Int Restrictions Requires Yes Interest (name purpose)  | r. RP Relevant Publication Program 1-TR; (U) POLYPAC                          | (T) "POLY<br>n," AFWL-TR-78-                                       | PAGOS" Aerospac<br>77; (T) "Geomet<br>1, Aerospace TR | e Report TR-0059 ry Ray Analyses -0172(2311)-1; (       | of (6311)           |
| HSURIA Prototy AFWL-TR-78-77.  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary?  MACHINE/OPERATING TRANSPORTABLE?  Machine Depende SELF-CONTAINED? Other Codes Requi | TATION (T Theory, U Use actor Design and Fail pess," BDM/TAC-79-15  TATION (T Theory, U Use actor Design and Fail pess," BDM/TAC-79-15  TATION (T Theory, U Use actor Design and Fail pess," No  AFWL No SYSTEM (on which installed) Yes Int Restrictions Requires Yes Interest (name purpose)  | RP Relevant Publication Program 1-TR; (U) POLYPAC  CDC 6600/7600  overlaying. | on) (T) "POLYI n." AFWL-TR-78- GOS Users Manua  Execution Time (Se | PAGOS" Aerospac<br>77; (T) "Geomet<br>1, Aerospace TR | e Report TR-0059 ry Ray Analyses -0172(2311)-1; (       | 0(63)1<br>of<br>U)  |
| HSURIA Prototy AFWL-TR-78-77  STATUS Operational Currer Under Modification Purpose(s)  Ownership? Proprietary?  MACHINE/OPERATING TRANSPORTABLE?  Machine Depende SELF-CONTAINED? Other Codes Requi  | TATION (T Theory, U Use actor Design and Failpes, "BDM/TAC-79-15  TATION YES, "BDM/TAC-79-15  TATION YES  NO  AFWL NO SYSTEM (on which installed) Yes Int Restrictions Requires Yes Interestrictions Requires Yes Interestrictions Requires  Yes Interestrictions Requires  Yes Interestrictions Requires  Yes Interestrictions Requires  Yes Interestrictions Requires | RP Relevant Publication Program 1-TR; (U) POLYPAC  CDC 6600/7600  overlaying. | on) (T) "POLY" n," AFWL-TR-78- GOS Users Manua                     | PAGOS" Aerospac<br>77; (T) "Geomet<br>1, Aerospace TR | e Report TR-0059 ry Ray Analyses -0172(2311)-1; (       | of U)               |

<sup>\*</sup> TRW/DSSG, 1 Space Park, Redondo Beach, California

| OPTICS   | SOI  | KINETICS   | GAS DYNAMICS   |
|--|--|--|--|
| And the state of t | A STATE OF THE STA | COON VV DE 1900 MOI DE MIND  | COOK ALL PROPERTY MODEL OF THE PROPERTY OF THE |
| d to the control of t | ARSONAL OR LITTER W. C.  | CALLA REGION MODELEO (V) NOTICE  | NOZZEE GEOMETRY WODELED (AND 1990) ( V.) (COTO   |
|  |  |  | Thursday Legisla   |
| FIELD (POLARIZATION) REPRESENTATION (L)  | BRANCH (1) Positive Negative   | COORDINATE SYSTEM (Canesian, cylindrical, etc.)                            | Rectangular, Linearly Flowing  |
| re-in-   | =  | Compact Region Annular Region  | Other  |
| COORDINATE SYSTEM (Certexan cylindrical etc.)  | Flat Mirrors Spherical Mirrors   | Š  | COORDINATE SYSTEM  |
| •  | Cylindrical Mirrors Telescopes   | 10 20 30   | FLUID GRID DIMENSION (V) 10 20 20 30   |
| TRANSVERSE GRID DIMENSIONALITY (V) 10 2D   | Scraper Mirrors  | Compact Region   | FLOW FIELD MODELED ( $V$ ).  |
| angert Region  | Azicons Religacons   | Annular Region   | Laminar Turbulent  |
| Annular Region   | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS.   | Other  |
| FIELD SYMMETRY RESTRICTIONS?   | Linear   | Gain Yary Along Optic Axes? Flow Direction?                                | BASIC MODELING APPROACH $(V)$  |
| MIRROR SMAPE(S) ALLOWED (V)  | Parabola Parabola  | PULSED CW KINETICS MODELED   | Premised Mising  |
| Square Crecular One  | Vanable Core Offset  | G REACTIONS MODELED ()   | Other (specify)  |
| i i i i i i i i i i i i i i i i i i i  | Other (specify) Noneverting ,  |  |  |
| CONFIGURATION FLEXIBILITY (V)  | Deformable Mirrors   | Y - X2 YX - X) H   | References for Approach Used   |
| Fired Smills Reconstor Geometry  | Section 2  | Cold (f · H <sub>2</sub> )   |  |
| Frank Multiple Resonator Geometries  | Ļ  | Hot (H · F <sub>2</sub> ) Chain (F · H <sub>2</sub> & H · F <sub>2</sub> ) |  |
| Woduler Multiple Reconstor Geometres   | Other tements 101.00   | Other (specify)  | THERMAL DRIVER MODELED (1)   |
| PROPAGATION TECHNIQUE  | יייין דיייין   | ENERGY TRANSFER MODES MODELED (V) Reference                                | Arc Heater Combustor   |
| Freshal Integral Algorithms  | Š  | 1 >  | Shork Lube Resistance Assier   |
| With Kernel Averaging  | Simple Saturated Gain Detailed Gain  | 22.  |  |
| Geussian Quadrature  | BARE CAVITY FIELD MODIFIER MODELS (V)  | ^^   | F ATOM DISCOCIATION FROM (A)   |
| Fast Fourier Transform (FFT)   | Merce Tell Decentration  | Special  | Facility and the second second (4)   |
| Fast Hankel Transform (FHT)  | Aberrations / Thermal Distortions  | Single Line Model (V)  | Other (specify)  |
| Gardener Freshell Kirchhoff (GFK)  | Arbitrary  | Muttiline Model (V)  | F-ATOM CONCENTRATION DETERMINED FROM MODEL?  |
| Other (specify)  | Selected (specify)   | Assumed Rolational Population Distribution State (V)                       | DILUENTS MODELED   |
|  | Reflectivity Loss  | Equitibrium Nonequilibrium   | MODELS EFFECTS ON MIXING RATE DUE TO (V)   |
| CONVERGENCE TECHNIQUE (V)  | Output Coupler Edges Rolled  | Number of Laser Lines Modeled  | Nozzłe Boundary Layers Shock Waves   |
| Power Companison Field Companison  | Serrated Other   | Course of Date Coefficients Head to Code                                   | Presections (thermal blockage)Turbulence   |
| Other  | LOADED CAVITY FIELD MODIFIER MODELS (V)  |  | Other (specify)  |
| ACCELERATION ALGORITHMS USED?  | Medium Index Vanation  | INE PROFILE MODELS (V)   |  |
| Technique  | Gas Absorption   | Donale Bendaning   |  |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V)  | Overlapped Beams   | Collectoral Broadanna  | MODELS EFFECTS ON OPTICAL MODES DUE TO $(oldsymbol{V})$  |
| Prony  | Other  |  | Media Index Variations   |
| Other  | FAR-FIELD MODELS (V) Beam Steering Removal   | Other (specify)  | Other (apecity)  |
|  | Optimal Focal Search Beam Quality ,  |  |  |
|  | one Isometric platting.  |  |  |
|  |  |  |  |

| CODE TYPE: _   | Gasdynamics   |  |  |                      |                     |
|--|---|--|--|----------------------|---------------------|
| PRINCIPAL PURP   | OSE(S)/APPLICATION(S) OF CODE   | Boundary layer   | analysis. No                             | onequilibrium Chemi  | stry (KINETIC)      |
| Boundary La  | yer Integral Matrix Pr  | rogram (KBLIMP).   |  |                      |                     |
|  |   |  |  |                      |                     |
|  | <del></del>   |  |  |                      |                     |
| <del></del>  | CAPABILITIES Treats   | laminar and turbul   | ent flows h                              | fulticomponent and   | chemically reacting |
| ASSESSMENT OF  | uding wall recombinati  | ion) are analyzed.   | Circ Fromp.                              | id to teemponent and | <u> </u>            |
| LIOWS (INC.  | daring warr recombination   | ion, are unaryzeur   |  |                      |                     |
|  |   |  |  |                      |                     |
|  |   |  |  |                      |                     |
| ASSESSMENT OF  | LIMITATIONS Must prede  | etermine pressure q  | radient.                                 |                      |                     |
|  |   |  |  |                      |                     |
|  |   |  |  |                      |                     |
|  |   |  |  |                      |                     |
|  |   |  |  |                      |                     |
| OTHER UNIQUE   | FEATURES  |  |  |                      |                     |
|  |   |  |  |                      |                     |
|  |   | <del></del>  |  |                      |                     |
|  |   |  |  |                      | <del></del>         |
| ORIGINATOR/KE  | Y CONTACT   | and and the Manager  | (415)                                    | 964-3200             |                     |
| Name   | H. Tong/ A.C. Buckir  |  | hone: (415)                              | 964-3200             |                     |
| -  | Aerotherm Division  |  |  | <del></del>          |                     |
| Address  | <u>Mountain View, Cali</u>  | fornia   |  |                      |                     |
| Integral Ma  | UMENTATION († Theory U U<br>atrix Procedure, Aerot  | ser RP Relevant Publication<br>herm Report, UM7367         | n) <u>(T) None</u><br>7. July 1973.      | quilibrium Chemist   | ry Boundary Layer   |
| AVAILABLE DOCI<br>Integral Ma  | UMENTATION († Theory U u<br>atrix Procedure, Aeroti   | ser RP Relevant Publication<br>herm Report, <u>UM</u> 7367 | n) <u>(T) None</u><br>7. July 1973.      | quilibrium Chemist   | ry Boundary Layer   |
| AVAILABLE DOCI<br>Integral Mi  | JMENTATION (T. Theory U. U.<br>atrix Procedure, Aeroti  | ser RP Relevant Publication<br>hermi Report, UM7367        | n) <u>(T) None</u><br>7. July 1973.      | quilibrium Chemist   | ry Boundary Layer   |
|  | JMENTATION (T Theory U U<br>strix Procedure, Aeroti   | ser RP Relevant Publication<br>herm Report, UM7367         | n). <u>(T) None</u><br>7. July 1973.     | guilibrium Chemist   | ry Boundary Layer   |
| STATUS   |   |  | 7. July 1973.                            | guilibrium Chemist   | ry Boundary Layer   |
| STATUS:  | Surrently? Yes  |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS:<br>Operational (<br>Under Modifi   | Surrently? Yes  |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS:  | Surrently? Yes  |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS:<br>Operational (<br>Under Modifi<br>Purposet   | Surrently?: Yes cation?:  |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS:<br>Operational (<br>Under Modifi<br>Purposet   | Surrently? Yes  |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose(  Ownership?: Proprietary?  | Currently? Yes cation?  |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose(  Ownership?: Proprietary?  | Currently? Yes cation?  |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose) Ownership?: Proprietary? MACHINE/OPER.   | Currently?: Yes cation?   |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose) Ownership?: Proprietary? MACHINE/OPER.   | Currently?: Yes cation?   |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER.   | Currently?: Yes cation?   |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER: TRANSPORTABL Machine De   | Currently?: Yes cation?:  |  | 7. July 1973.                            | quilibrium Chemist   | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER: TRANSPORTABL Machine Del  | Currently? Yes cation?  is):  Industry-wide code.  No ATING SYSTEM (on which installed)  F? Yes pendent Restrictions:   | :CDC_6600/7600   | 7. July 1973.                            |                      | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER. TRANSPORTABL Machine Del  | Currently?: Yes cation?:  | :CDC_6600/7600   | 7. July 1973.                            |                      | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER: TRANSPORTABL Machine Del  | Currently? Yes cation?  is):  Industry-wide code.  No ATING SYSTEM (on which installed)  F? Yes pendent Restrictions:   | :CDC_6600/7600   | 7. July 1973.                            |                      | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purposet  Ownership?: Proprietary? MACHINE/OPER.  TRANSPORTABL Machine Del SELF-CONTAINEI Other Codes                             | Currently?  | :CDC_6600/7600   | 7. July 1973.                            |                      | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purposet  Ownership?: Proprietary? MACHINE/OPER.  TRANSPORTABL Machine Del SELF-CONTAINEI Other Codes                             | Currently? Yes cation?  is):  Industry-wide code.  No ATING SYSTEM (on which installed)  F? Yes pendent Restrictions:   | cDC 6600/7600  | 7. July 1973.                            | re distribution.     | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER: TRANSPORTABL Machine De; SELF-CONTAINE( Other Codes                               | Currently?: Yes cation?:  | :CDC_6600/7600   | 7. July 1973.                            | re distribution.     | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER. TRANSPORTABL Machine De; SELF-CONTAINE( Other Codes                               | Currently?: Yes cation?:  | cDC 6600/7600  | nerate pressu                            | re distribution.     | ry Boundary Layer   |
| STATUS: Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER: TRANSPORTABL Machine De; SELF-CONTAINE( Other Codes                               | Currently? Yes cation? Industry-wide code. No ATING SYSTEM (on which installed) EP: Yes pendent Restrictions: Co Required (name, purpose): Co SQUECES REQUIRED FOR RUNS 120K 120K | cDC 6600/7600  | nerate pressu  Execution Time  300  1000 | re distribution.     | ry Boundary Layer   |
| Operational ( Under Modifi Purpose( Ownership?: Proprietary? MACHINE/OPER.  TRANSPORTABL Machine De; Other Codes  ESTIMATE OF RE  Small Job: Typical Job: Large Job: | Currently?: Yes cation?:  | cDC 6600/7600  | nerate pressu                            | re distribution.     | ry Boundary Layer   |

|         | Į |
|---------|---|
|         | ı |
| KBL 1MP |   |
|         | Į |

| \$31140  | CS  | KINETICS  | GAS DYNAMICS  |
|--|---|---|---|
| Z  | RESONATOR TYPE (V) Standing Wave  |   | NOZZLE GEOMETRY MODELED (and 1994) (V)                            |
|  | Targing Mare (Ring)   | Compact Region Annular Region                                     | Cylindrical Radially Flowing V                                    |
| FIELD (POLARIZATION) REPRESENTATION (V.)                           | BRANCH (V) Pounte Negative  | COORDINATE SYSTEM (Cartesian, cylindrical, etc.)                  | Rectangular Linearly Flowing V                                    |
|  | CHARLE ELEMENT MODELS INCLUDED (V.).  | Compact Region Annular Region                                     | Other   |
| CONDUCTRE STSTEM (Language Symposical etc.)                        | Celindrical Merces  | KINETICS GRID DIMENSIONALITY (V).                                 | neral   |
| TRANSVERSE GRID DIMENSIONALITY (1) 10 2D                           | , ,   |   | FLUID GRID DIMENSION (V) 10 20 20 30 FLUID FLOW FIELD MODELED (V) |
| Compact Region   | Axicons Rellaxicons   | Annular Region  | Laminar Turbuleni   |
| Annular Region   | Arbitery  | GAIN REGION SYMMETRY RESTRICTIONS.                                | Other   |
| FIELD SYMMETRY RESTRICTIONS?                                       | Linear  | Gain Vary Along Optic Axes? Flow Direction?                       | BASIC MODELING APPROACH (V)                                       |
| MIRROR SHAPE(S) ALLOWED (V)  | Parabola-Parabola   | PULSED CW. KINETICS MODELED                                       | Premised Mising V   |
| Elimpical  | Vanable Cone Offset   | CHEMICAL PUMPING REACTIONS MODELED (V):                           | Other (specify)   |
| N FLEXIBILITY (V)  | Other (specify)   | 3 2   |   |
| Fixed Single Resonator Geometry                                    | Deformable Mirrors:   |   | References for Approach Used                                      |
| Fixed Multiple Resonator Geometries                                | Spatial Fitters Gratings  |   |   |
| Modular Multiple Resonator Geometries                              | Other Elements  | l   |   |
| PROPAGATION TECHNIQUE  |   | ENERGY TOANGED MODES MODES EN A                                   |   |
| Freshet integral Algorithms  | GAIN MODELS (V): Bare Canty Only  | V-1   | ı   |
| With Kernel Averaging  | Simple Saturated Gain Detailed Gain   | - C   | Shock Tube Resistance Heater                                      |
| Gaussian Quadrature  | BARE CAVITY FIELD MODIFIER MODELS $\langle oldsymbol{}  angle :$  |   | Other   |
| Fast Fourier Transform (FFT)                                       | Mirror Tift Decentration  |   | FATOM DISSOCIATION FROM (V)                                       |
| Fast Hankel Transform (FHT)  | Aberrations/Thermal Distortions   | Single line Model (V.)  | 72 316  |
| Gardener-Fresnet Krichhoff (GFK)                                   | Arbitrary   | Multime Model (V)   | FATOM CONCENTRATION DETERMINED FROM MODEL? YES                    |
| Other (specify)  | Selected (specify)  | Assumed Rotational Population Distribution State $(oldsymbol{V})$ | DILUENTS MODELED He, N2, etc.                                     |
|  | National Property and Property | Equilibrium Nonequilibrium  | MODELS EFFECTS ON MIXING RATE DUE TO (V)                          |
| ž  | Volyat Copies roges Roled   | Number of Laser Lines Modeled                                     | ×   |
| Power Lompansonrietd Lompanson                                     | _ <u>-</u>  | Source of Rafe Coefficients Used in Code                          | Other (specify) Laminar   |
| ACCELEBATION ALGORITHMS USED?                                      | Medium Index Variation  |   |   |
| Technique  | Gas Abtorption  | LINE PROFILE MODELS (V)   |   |
| multiple eigenvalue/vector extraction algorithm $\langle V  angle$ | Overlapped Beams  | Doppler Broadening  | MODELS EFFECTS ON OPTICAL MODES DUE TO (\$)                       |
| Prony  | Other   | Coliteional Broadening  | Media Index Vanations   |
| Other  | FAR FIELD MODELS (V) Beam Steening Removal  | Other (specify)   | Other (specify)   |
|  | Optimal Focal Search Beam Quality   |   |   |
|  | Wher  |   |   |
|  |   |   |   |

| CODE NAME | LAPU-2 |
|-----------|--------|
| _         |        |

| Operational currently?: Yes Under Modification? No Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? No MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE? No Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.   |   |  | <del> </del>  |
|--|---|--|---|
| ASSESSMENT OF CAPABILITIES Calculates the temporal and spatial evolution of a short pulse due to nonline amplification and diffraction from circular apertures and lenses; includes laser kinetics appropria for modeling of CO <sub>2</sub> and Nd: glass laser systems.  ASSESSMENT OF LIMITATIONS CYLINDRICAL geometry assumed; is not designed for oscillator calculations.  ASSESSMENT OF LIMITATIONS CYLINDRICAL geometry assumed; is not designed for oscillator calculations.  DEFICIENT OF LIMITATIONS CYLINDRICAL geometry assumed; is not designed for oscillator calculations.  DEFICIENT OF LIMITATIONS CYLINDRICAL geometry assumed; is not designed for oscillator calculations.  DEFICIENT OF LIMITATIONS CYLINDRICAL geometry assumed; is not designed for oscillator calculations.  DEFICIENT OF LOS Alamos Scientific Laboratory, Group X-1, MS-531 Address Los Alamos Scientific Laboratory, Group X-1, MS-531 Address Los Alamos New Mexico 87545 Whith Diffraction, Los Alamos report LA-6955.  STATUS  Operational Currently: Yes Under Modification: No Purpose(6)  Operational Currently: Yes Operational Currently: Yes Operational Currently: Los Alamos Scientific Laboratory Proprietry No MACHINE OPERATING SYSTEM (on which installed) CDC 7600/LTSS  TRANSPORTABLE: No Machine Operations Los Alamos Scientific Laboratory Proprietry: No MACHINE OPERATING SYSTEM (on which installed) CDC 7600/LTSS  TRANSPORTABLE: No Machine Operations Los Alamos Scientific Laboratory Proprietry Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job Typical Job | PRINCIPAL PURPOSE(S)  | APPLICATION(S) OF CODECalculation of t   | he propagation of a short pulse down a chain of   |
| amplification and diffraction from circular apertures and lenses; includes laser kinetics appropria for modeling of CO <sub>2</sub> and Nd: glass laser systems.  ASSESSMENT OF LIMITATIONS: _Cylindrical geometry assumed; is not designed for oscillator calculations.  DOTHER UNIQUE FEATURES:Models unstable and hole-coupled stable confocal resonators.  DORIGINATOR/KEY CONTACT   | laser amplifier   | s and absorbers including diffracti  | on effects; cylindrical symmetry assumed.   |
| amplification and diffraction from circular apertures and lenses; includes laser kinetics appropria for modeling of CO <sub>2</sub> and Nd: glass laser systems.  ASSESSMENT OF LIMITATIONS: _Cylindrical geometry assumed; is not designed for oscillator calculations.  DOTHER UNIQUE FEATURES:Models unstable and hole-coupled stable confocal resonators.  DORIGINATOR/KEY CONTACT   | <del></del>   |  |   |
| amplification and diffraction from circular apertures and lenses; includes laser kinetics appropria for modeling of CO <sub>2</sub> and Nd: glass laser systems.  ASSESSMENT OF LIMITATIONS: _Cylindrical geometry assumed; is not designed for oscillator calculations.  DOTHER UNIQUE FEATURES:Models unstable and hole-coupled stable confocal resonators.  DORIGINATOR/KEY CONTACT   |   |  |   |
| ASSESSMENT OF LIMITATIONS: Cylindrical geometry assumed: is not designed for oscillator calculations.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER UNIQUE FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER Unique FEATURES: Models unstable and hole-coupled stable confocal resonators.  DITHER Unique FEATURES: Models unstable and hole-co           | amplification a   | and diffraction from circular apertu   | spatial evolution of a short pulse due to nonline<br>res and lenses; includes laser kinetics appropria  |
| DRIGINATOR/KEY CONTACT:  Name:  JOHN C:  Coldstein and D.O. Dickman Phone:  Models unstable and hole-coupled stable confocal resonators.  DRIGINATOR/KEY CONTACT:  Name:  JOHN C:  Coldstein and D.O. Dickman Phone:  JOS Alamos Scientific Laboratory, Group X-1, MS-531  Address:  LOS Alamos New Mexico 8/545  AVAILABLE DOCUMENTATION: (** Theory, U Juer, RP Relevant Publication). (T) (U) LAPU-2: A Laser Pulse Propagation Coc With Diffraction, LOS Alamos report LA-6955  STATUS  Operational Currently?  Yes Under Modification?  NO Purpose(6):  Ownership?  LOS Alamos Scientific Laboratory Propietary?  NO  MACHINE/OPERATING SYSTEM (on which installed)  CDC 7600/LTSS  TRANSPORTABLE?  NO Machine Operadem Restrictions.  USES Storage Scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED?  Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Small Job Typical Job  58K (decimal)  10 minutes   | for modeling of   | f CO <sub>2</sub> and Nd: glass laser systems.   |   |
| DRIGINATOR/MEY CONTACT.  Name. John C. Coldstein and D.O. Dickman Phone: (505) 667-728]  Organization: Los Alamos Scientific Laboratory, Group X-1, MS-531  Address: Los Alamos, New Mexico 87545  AVAILABLE DOCUMENTATION: (7 Theory, U User, RP Relevant Publication). (T) (U) LAPU-2: A Laser Pulse Propagation Coc With Diffraction, Los Alamos report LA-6955.  STATUS:  Operational Currently: Yes  Under Modification: No  Purpose(s)  Ownership: Los Alamos Scientific Laboratory  Proprietary: No  MACHINE/OPERATING SYSTEM (on which installed). CDC 7600/LTSS  TRANSPORTABLE: No  Machine Dependent Restrictions. Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED: Yes  Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Typical Job. 58K (decimal) 10 minutes   | ASSESSMENT OF LIMIT   | ations: <u>Cylindrical geometry assumed</u>  | ; is not designed for oscillator calculations.  |
| DRIGINATOR/MEY CONTACT.  Name. John C. Coldstein and D.O. Dickman Phone: (505) 667-728]  Organization: Los Alamos Scientific Laboratory, Group X-1, MS-531  Address: Los Alamos, New Mexico 87545  AVAILABLE DOCUMENTATION: (7 Theory, U User, RP Relevant Publication). (T) (U) LAPU-2: A Laser Pulse Propagation Coc With Diffraction, Los Alamos report LA-6955.  STATUS:  Operational Currently: Yes  Under Modification: No  Purpose(s)  Ownership: Los Alamos Scientific Laboratory  Proprietary: No  MACHINE/OPERATING SYSTEM (on which installed). CDC 7600/LTSS  TRANSPORTABLE: No  Machine Dependent Restrictions. Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED: Yes  Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Typical Job. 58K (decimal) 10 minutes   |   |  |   |
| DRIGINATOR/MEY CONTACT.  Name. John C. Coldstein and D.O. Dickman Phone: (505) 667-728]  Organization: Los Alamos Scientific Laboratory, Group X-1, MS-531  Address: Los Alamos, New Mexico 87545  AVAILABLE DOCUMENTATION: (7 Theory, U User, RP Relevant Publication). (T) (U) LAPU-2: A Laser Pulse Propagation Coc With Diffraction, Los Alamos report LA-6955.  STATUS:  Operational Currently: Yes  Under Modification: No  Purpose(s)  Ownership: Los Alamos Scientific Laboratory  Proprietary: No  MACHINE/OPERATING SYSTEM (on which installed). CDC 7600/LTSS  TRANSPORTABLE: No  Machine Dependent Restrictions. Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED: Yes  Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Typical Job. 58K (decimal) 10 minutes   | OTHER LINIOUS SEATUR  | Models unstable and hole-coup  | led stable confocal resonators.   |
| Name: John C. Coldstein and D. O. Dickman Phone: (505) 667-7281 Organization: Los Alamos Scientific Laboratory, Group X-1, MS-531 Address: Los Alamos, New Mexico 87545 AVAILABLE DOCUMENTATION: (T Theory, U User, RP Relevant Publication). (T) (U) LAPU-2: A Laser Pulse Propagation Coc With Diffraction, Los Alamos report LA-6955.  STATUS: Operational Currently?: Yes Under Modification?: No Purpose(s):  Ownership?: Los Alamos Scientific Laboratory Proprietary? No MACHINE/OPERATING SYSTEM (on which installed) CDC 7600/LTSS  TRANSPORTABLE?: No Machine Dependent Restrictions: Uses Storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED?: Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS Core Size (Octal Words)   Execution Time (Sec. CDC 7600)  Typical Job 58K (decimal) 10 minutes  | JINER UNIQUE PERIUN   | ES   |   |
| Name: John C. Coldstein and D. O. Dickman Phone: (505) 667-7281 Organization: Los Alamos Scientific Laboratory, Group X-1, MS-531 Address: Los Alamos, New Mexico 87545 AVAILABLE DOCUMENTATION: (T Theory, U User, RP Relevant Publication). (T) (U) LAPU-2: A Laser Pulse Propagation Coc With Diffraction, Los Alamos report LA-6955.  STATUS: Operational Currently?: Yes Under Modification?: No Purpose(s):  Ownership?: Los Alamos Scientific Laboratory Proprietary? No MACHINE/OPERATING SYSTEM (on which installed) CDC 7600/LTSS  TRANSPORTABLE?: No Machine Dependent Restrictions: Uses Storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED?: Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS Core Size (Octal Words)   Execution Time (Sec. CDC 7600)  Typical Job 58K (decimal) 10 minutes  | ORIGINATOR/KEY CONT   | ACT.   |   |
| Address: Los Alamos, New Mexico 87545  AVAILABLE DOCUMENTATION: (T Theory, U User, RP Relevant Publication)(T) (U) LAPU-2: A Laser Pulse Propagation Coc With Diffraction, Los Alamos report LA-6955.  STATUS: Operational Currently?:YES  | John  | n C. Coldstein and D.O. Dickman 🙀  | hone: (505) 667-7281  |
| AVAILABLE DOCUMENTATION: (T Theory, U User, RP Relevant Publication). (T) (U) LAPU-2: A Laser Pulse Propagation Coc With Diffraction, Los Alamos report LA-6955.  STATUS:  Operational Currently: Yes Under Modification: No Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? No MACHINE/OPERATING SYSTEM (on which installed) CDC 7600/LTSS  TRANSPORTABLE? No Machine Dependent Restrictions: Uses Storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job. Typical Job 58K (decimal) 10 minutes  | Organization: LOS   | Alamos Scientific Laboratory, Group  | X-1, MS-531   |
| With Diffraction, Los Alamos report LA-6955.  STATUS  Operational Currently?: Yes Under Modification? No Purpose(s):  Ownership?: Los Alamos Scientific Laboratory Proprietary? No MACHINE/OPERATING SYSTEM (on which installed) CDC 7500/LTSS  TRANSPORTABLE? No Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job. Typical Job 58K (decimal) 10 minutes   | Address: LOS  | Alamos, New Mexico 87545   | (7) (1) (2) (7)   |
| STATUS:  Operational Currently?: Yes Under Modification?: NO  Purpose(s):  Ownership?: Los Alamos Scientific Laboratory Proprietary? No  MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE?: No  Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words)  Execution Time (Sec. CDC 7600)  Small Job. Typical Job.  Typical Job.  10 minutes   | AVAILABLE DOCUMENT  | ATION: (T. Theory, U. User, RP - Relevant Publication  | . IT I III I APPL-2: A Laser Pulse Propagation Log  |
| Operational Currently?: Yes Under Modification?: NO Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? NO MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE?: NO Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Typical Job 58K (decimal) 10 minutes  | Iliah Diffmanti.  | am los diamos usasut la EGEE   | n): Til tol Enio E. H Easel False Fropagation oca   |
| Operational Currently?: Yes Under Modification?: NO Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? NO MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE?: NO Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Typical Job 58K (decimal) 10 minutes  | With Diffraction  | on, Los Alamos report LA-6955.   | 1)  |
| Operational Currently?: Yes Under Modification?: NO Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? NO MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE?: NO Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Typical Job 58K (decimal) 10 minutes  | With Diffracti  | on, Los Alamos report LA-6955.   | n)  |
| Operational Currently?: Yes Under Modification?: NO Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? NO MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE?: NO Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Typical Job 58K (decimal) 10 minutes  | With Diffracti  | on, Los Alamos report LA-6955.   | 1) (1) (2) [2] (3)  |
| Operational Currently?: Yes Under Modification?: NO Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? NO MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE?: NO Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Typical Job 58K (decimal) 10 minutes  | With Diffracti  | on, Los Alamos report LA-6955.   | 1) (1) (2) [2] (2)  |
| Operational Currently?: Yes Under Modification?: NO Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? NO MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE?: NO Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Typical Job 58K (decimal) 10 minutes  | With Diffracti  | on, Los Alamos report LA-6955.   | 1) (1) (2) [2] (2)  |
| Under Modification? No Purpose(s):  Ownership? Los Alamos Scientific Laboratory Proprietary? No MACHINE/OPERATING SYSTEM (on which installed):  CDC 7600/LTSS  TRANSPORTABLE? NO Machine Dependent Restrictions. Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Typical Job. 58K (decimal)  10 minutes   |   | on, Los Alamos report LA-6955.   | 1) (1) (2) [2] (2)  |
| Ownership? Los Alamos Scientific Laboratory Proprietary? NO  MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE? NO Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job. Typical Job 58K (decimal) 10 minutes  | STATUS:   |  | 1) (1) (2) [2] (2)  |
| Proprietary? NO  MACHINE/OPERATING SYSTEM (on which installed) CDC 7600/LTSS  TRANSPORTABLE? NO  Machine Dependent Restrictions. Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job. Typical Job 58K (decimal) 10 minutes  | STATUS: Operational Currentl  | yr. Yes  | 1) (1) (2) [2] (2)  |
| Proprietary? NO  MACHINE/OPERATING SYSTEM (on which installed)  TRANSPORTABLE? NO  Machine Dependent Restrictions. Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job. Typical Job 58K (decimal) 10 minutes   | STATUS:<br>Operational Currentl<br>Under Modification?  | yr. Yes  | 1) (1) (0) [27] (0) (0) [27] (0) [27] (0) [27] (0) [27] (0) [27] (0) [27] (0) [27] (0 |
| Proprietary? NO  MACHINE/OPERATING SYSTEM (on which installed) CDC 7600/LTSS  TRANSPORTABLE? NO  Machine Dependent Restrictions. Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job. Typical Job 58K (decimal) 10 minutes  | STATUS:<br>Operational Currentl<br>Under Modification?  | yr. Yes  |   |
| MACHINE/OPERATING SYSTEM (on which installed): CDC 7600/LTSS  TRANSPORTABLE?: NO Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED?: Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS: Core Size (Octal Words)   Execution Time (Sec. CDC 7600)  Small Job.   10 minutes   | STATUS:  Operational Current!  Under Modification?  Purpose(s):   | y?. Yes<br>No  |   |
| TRANSPORTABLE?: NO  Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED?: Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Small Job.  Typical Job.  10 minutes   | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  | y? Yes<br>No<br>os Alamos Scientific Laboratory  |   |
| Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job. 10 minutes   | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?: Proprietary?  N  | yr. Yes No os Alamos Scientific Laboratory   |   |
| Machine Dependent Restrictions: Uses storage scheme of 7600 and relies on some aspects of LTSS operating system.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job. 10 minutes   | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?: Proprietary?  N  | yr. Yes No os Alamos Scientific Laboratory   |   |
| SYSTEM.  SELF-CONTAINED? Yes Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words)  Small Job.  Typical Job 58K (decimal) 10 minutes  | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  Proprietary?  MACHINE/OPERATING:  | y? Yes No  os Alamos Scientific Laboratory os SYSTEM (on which installed) CDC 7600/LTSS  |   |
| Other Codes Required (name, purpose)  ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words)   Execution Time (Sec. CDC 7600)  Small Job   58K (decimal)   10 minutes  | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  Proprietary?  MACHINE/OPERATING:  | y? Yes No  os Alamos Scientific Laboratory os SYSTEM (on which installed) CDC 7600/LTSS  |   |
| ESTIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words)  Small Job.  Typical Job 58K (decimal)  10 minutes  | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  Proprietary?  MACHINE/OPERATING:  TRANSPORTABLE?:  Machine Dependen   | y? Yes No  os Alamos Scientific Laboratory os SYSTEM (on which installed) CDC 7600/LTSS  |   |
| Core Size (Octal Words)   Execution Time (Sec. CDC 7600)   | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  Proprietary?  MACHINE/OPERATING:  TRANSPORTABLE?:  Machine Dependen   | y? Yes No  os Alamos Scientific Laboratory os SYSTEM (on which installed) CDC 7600/LTSS o  |   |
| Core Size (Octal Words)   Execution Time (Sec. CDC 7600)   | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  Proprietary?  MACHINE/OPERATING: TRANSPORTABLE?: Machine Dependen SYSTEM.   | y? Yes No  os Alamos Scientific Laboratory o  SYSTEM (on which installed) CDC 7600/LTSS  o  I Restrictions: Uses storage scheme of 76  Yes   |   |
| Typical Job 58K (decimal) 10 minutes   | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  Proprietary?  MACHINE/OPERATING: TRANSPORTABLE?: Machine Dependen SYSTEM.   | y? Yes No  os Alamos Scientific Laboratory o  SYSTEM (on which installed) CDC 7600/LTSS  o  I Restrictions: Uses storage scheme of 76  Yes   |   |
| Typical Job 58K (decimal) 10 minutes   | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  Proprietary?  MACHINE/OPERATING:  TRANSPORTABLE?:  Machine Dependen SYSTEM: Other Codes Require   | y? Yes No  OS Alamos Scientific Laboratory  OSYSTEM (on which installed) CDC 7600/LTSS  O Restrictions Uses Storage Scheme of 76  Yes ed (name, purpose)  ES REQUIRED FOR RUNS                           | 500 and relies on some aspects of LTSS operating  |
|  | STATUS:  Operational Currentl Under Modification? Purpose(s):  Ownership?:  Proprietary?  MACHINE/OPERATING: TRANSPORTABLE?: Machine Dependen SYSTEM.  SELF-CONTAINED?: Other Codes Require                               | y? Yes No  OS Alamos Scientific Laboratory  OSYSTEM (on which installed) CDC 7600/LTSS  O Restrictions Uses Storage Scheme of 76  Yes ed (name, purpose)  ES REQUIRED FOR RUNS                           | 500 and relies on some aspects of LTSS operating  |
|  | STATUS: Operational Currentl Under Modification? Purpose(s):  Ownership?: Proprietary?N MACHINE/OPERATING: TRANSPORTABLE?:N Machine Dependen SYSTEM.  SELF-CONTAINED?: Other Codes Require  ESTIMATE OF RESOURC Small Job | y?: Yes No  OS Alamos Scientific Laboratory OSYSTEM (on which installed) CDC 7600/LTSS OCIRESTRICTIONS: USES Storage scheme of 76  Yes ad (name, purpose)  ES REQUIRED FOR RUNS  Core Size (Octal Words) | 500 and relies on some aspects of LTSS operating  Execution Time (Sec. CDC 7600)  |

CODE NAME:

LAPU-2

| OPTICS  | soi  | KINETICS   | GAS DYNAMICS                                |
|---|--|--|---|
| BASIC TYPE (%)                                      | RESONATOR TYPE (V) Standing Wave           | GAIN REGION MODELED (V). None                        | NOZZLE GEOMETRY MODELED (and type) (V) NONE |
| Physican Opto strenshelmen                          | Traveling Wave (Ring) " Reverse TW         | Compact Region Annular Region                        | Cylindrical Radially Flowing                |
| FIELD (POLARIZATION) REPRESENTATION (V)             | BRANCH (V) Positive Negative               | COORDINATE SYSTEM (Canesian cylindrical etc.)        | Rectangular Linearly Flowing                |
| Scalar Vector                                       | OPTICAL ELEMENT MODELS INCLUDED (V)        | Compact Region Annutar Region                        | Other                                       |
| COORDINATE SYSTEM (Cartesian Lylindrical etc.)      | Flat Mirrors Spherical Mirrors             | KINETICS GRID DIMENSIONALITY (V)                     | COORDINATE SYSTEM                           |
| Compact Region Annular Region CV                    | Cylindrical Mirrors (Felescopes )          | 10 20 30   | FLUID GRID DIMENSION (V) 10 20 30           |
| TRANSVERSE GRID DIMENSIONALITY (V) 1D 2D            | Scraper Merons                             | Compact Region                                       |   |
| Lumpart Region                                      | Asicons Reflasions                         | Annular Region                                       | Laminar Turbulent                           |
| Annular Region                                      | Arbitery                                   | GAIN REGION SYMMETRY RESTRICTIONS.                   | Other                                       |
| FIELD SYMMETRY RESTRICTIONS! CYTINGTICAL            | Linear                                     | Gain Vary Along Optic Axes? Flow Direction?          | BASIC MODELING APPROACH (1)                 |
| IPE(S) ALLOWED IV                                   | Parabola Parabola                          | PULSED: CW KINETICS MODELED                          | Premized Mixing                             |
| Square Circular Strop                               | Vanable Core Offer                         | CHEMICAL PUMPING REACTIONS MODELED (V)               | Other (apecify)                             |
|   | Other (specify)                            | -  |   |
| Frued Single Resunator Geometry                     | Deformable Mirrors                         |  | References for Approach Used                |
| Fixed Multiple Resonator Geometries                 | Spatial Fitters Cratings                   | <u>.</u><br>ا  |   |
| Modular Muriple Resonator Geometres                 | Other Elements                             | Street, 27   |   |
| PROPAGATION TECHNIQUE                               |  |  | THERMAL DRIVER MODELED (V)                  |
|   | GAIN MODELS (V) Bare Cavity Only           | ENERGY INANSER MUDES MODELED (V) Reference           | Arc Heater Combusion                        |
| With Ker tet Averaging                              | Simple Saturated Gain Detailed Gain        |  | Shock Tube Resistance Heater                |
| Gaussian Quadrature                                 | BARE CAVITY FIELD MODIFIER MODELS (V)      | 2  | Other                                       |
| Fast Fourier Transform (FFT)                        | Mirror TillDecentration                    | Other  | F. ATOM DISSOCIATION PROM (V)               |
| Fast Hankel Transform (FMT)                         | Aberrations/Thermal Distortions            | Single Line Model (V.)                               | Other (searcite)                            |
| Gardener Fresner Archhoff (GFR)                     | Arbitrary                                  | Multitine Model (V)                                  | F ATOM CONCENTRATION DETERMINED FROM MODEL? |
| one works, Numerical scheme devised                 | Selected (specify)                         | Assumed Rotational Population Distribution State (V) | DILUENTS MODELED                            |
| by B. R. Suydam, LASL.                              | Reflectivity Loss                          | Equitibrium Nonequilibrium                           | MODELS EFFECTS ON MIXING RATE DUE TO (V)    |
| CONVERGENCE TECHNIQUE (V)                           | £  | Number of Laser Lines Modeled                        | Nozzle Boundary Layers Shock Waves          |
| Power Comparison Field Comparison                   | Seriated Other                             | Source of Rate Coefficients Used in Code             | Prereactions (thermal blockage) Turbulence  |
| Other   | LOADED CAVITY FIELD MODIFIER MODELS (V)    |  | Other (specify)                             |
| ACCELERATION ALGORITHMS USED?                       | Medium Index Variation Gas Absorption      | LINE PROFILE MODELS (V')                             |   |
| MULTIPLE FICENCELLE VECTOR ETTRACTION ALGORITHM (V) | Overlapped Beams                           | Doppler Braedening                                   | MONE E EFFECT ON ADTICAL MODES DIJE TO (1)  |
| Prony   | Other                                      | Collisional Broadening                               | Media Index Variations                      |
| Other   | FAR-FIELD MODELS (V) Beam Steering Removal | Other (specify)                                      | Other (apecity)                             |
|   | Optimal Focal Search Beam Quality          |  |   |
|   | Other                                      |  |   |
|   |  |  |   |

| CODE NAME: | LOADPL |
|------------|--------|
|            |        |

|  | Optics   |   |
|--|--|---|
| DOINGIBA: TITLE  | E(S)/APPLICATION(S) OF CODE(3-D_Loaded   | Cavity Code with Analytical Gain) The purpose is to   |
|  |  | with half symmetric unstable resonator with internal  |
|  |  | edium; performance predictions for power extraction   |
|  | ility; set/verify design requirement   |   |
|  | ,,,,   | <del></del>   |
|  | Canable of evaluating an   | ny general HSURIA w/reflaxicon. Analytical gain mode  |
| ASSESSMENT OF CA   |  | isfigure, thermal distortion, struts.   |
| delierat riel  | a mourifers mirror misarisments m  | istiguicy offermar around for a solution  |
|  |  | <del></del>   |
|  | <del></del>  | <del></del>   |
| ASSESSMENT OF LIF  | Half plane symmetry, rest  | tricted to HSURIA axisymmetric or 3-dimensional   |
| calculations   |  |   |
|  |  |   |
|  | <del></del>  |   |
|  |  |   |
| OTHER UNIQUE FEA   | Tuese General field modifier with  | n deformable mirrors to correct for any aberration.   |
| THER ORIGOR TER  | TORES.   |   |
|  |  |   |
|  |  |   |
| ORIGINATOR/KEY C   | ONTACT   |   |
| Name _   | Alexander M. Simonoff  | Phone:(213) 884-3346  |
| Organization: _  | Rocketdyne, Laser Optics   |   |
| Address:   | 6633 Canoga Ave., Canoga Park, Ca  | alifornia   |
| _  | ENTATION: (T - Theory, U - User, RP - Relevant Public  | (7) (1) 71 71 71 71 71 71 71 71 71 71 71 71 71  |
|  |  |   |
|  |  |   |
|  | r 1978, G-0-78-1123; see also bare   |   |
|  |  |   |
|  |  |   |
|  |  |   |
|  |  |   |
|  |  |   |
|  |  |   |
| STATUS   | er 1978, G-0-78-1123; see also bare  |   |
|  | ertly? Yes   |   |
| STATUS:<br>Operational Curr<br>Under Modificati  | ently? Yes   |   |
| STATUS<br>Operational Curr   | ently? Yes   |   |
| STATUS:<br>Operational Curr<br>Under Modificati  | ently? Yes   |   |
| STATUS:<br>Operational Curr<br>Under Modificati  | ently? Yes   |   |
| STATUS:<br>Operational Curr<br>Under Modificate<br>Purpose(s): .   | ently? Yes   |   |
| STATUS: Operational Curr Under Modificat Purpose(s): Ownership? Proprietary?:  | ently? Yes No  AFWL  | cavity code.  |
| STATUS: Operational Curr Under Modificat Purpose(s): Ownership? Proprietary?:  | ently? Yes  AFWL No  | cavity code.  |
| STATUS: Operational Curr Under Modificate Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATI  | ently? Yes on? No  AFWL No NG SYSTEM (on which installed): CDC Cyber 1:  | cavity code.  |
| STATUS: Operational Curr Under Modificate Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII   | ently: Yes on? No  AFML No NG SYSTEM (on which installed): CDC Cyber 1: Yes (with modification)  | Cavity code.  |
| STATUS: Operational Curr Under Modificate Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII   | ently? Yes on? No  AFWL NG SYSTEM (on which installed). CDC Cyber 1: Yes (with modification)   | Cavity code.  |
| STATUS:  Operational Curr Under Modificate Purpose(s):  Ownership? Proprietary?:  MACHINE/OPERATII  TRANSPORTABLE?: Machine Depender   | ently? Yes  AFWL  No  MG SYSTEM (on which installed): CDC Cyber 1:  Yes (with modification)  dent Restrictions. USSS COC extended core   | cavity code.  |
| STATUS:  Operational Curr Under Modificat Purpose(s):  Ownership? Proprietary?:  MACHINE/OPERATII  TRANSPORTABLE?  Machine Depend  | ently? Yes on? No  AFWL No NG SYSTEM (on which installed): CDC Cyber 1: Yes (with modification) dent Restrictions Uses CDC extended corre No. resonator geometry systems (   | cavity code.  |
| STATUS:  Operational Curr Under Modificat Purpose(s):  Ownership? Proprietary?:  MACHINE/OPERATII  TRANSPORTABLE?  Machine Depend  | ently? Yes  AFWL  No  MG SYSTEM (on which installed): CDC Cyber 1:  Yes (with modification)  dent Restrictions. USSS COC extended core   | cavity code.  |
| STATUS: Operational Curr Under Modificat Purpose(s): Ownership? Proprietary?: MACHINE/OPERATII TRANSPORTABLE? Machine Depend   | ently? Yes on? No  AFWL No NG SYSTEM (on which installed): CDC Cyber 1: Yes (with modification) dent Restrictions Uses CDC extended corre No. resonator geometry systems (   | cavity code.  |
| STATUS: Operational Curr Under Modificate Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII TRANSPORTABLE?: Machine Depending Contact Codes Recommended Codes Recommended Current Codes Recommended | ently? Yes on? No  AFWL NG SYSTEM (on which installed): CDC Cyber 1: Yes (with modification) dent Restrictions. Uses CDC extended core No. resonator geometry systems (  | cavity code.  |
| STATUS: Operational Curr Under Modificate Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII TRANSPORTABLE?: Machine Depending Contact Codes Recommended Codes Recommended Current Codes Recommended | ently? Yes on? No  AFWL No NG SYSTEM (on which installed): CDC Cyber 1: Yes (with modification) dent Restrictions. Uses CDC extended correlation of the correlation o | cavity code.  76  e.  code (for other than PP reflaxicon) 3-D fairfield cod   |
| STATUS:  Operational Curr Under Modificat Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATII TRANSPORTABLE? Machine Depender SELF-CONTAINED? Other Codes Red   | ently? Yes  AFWL No  NG SYSTEM (on which installed): CDC Cyber 1:  Yes (with modification)  dent Restrictions. Uses CDC extended corr  No. resonator geometry systems ( uured (name, purpose):  JRCES REQUIRED FOR RUNS.  Core Size (Octal Word  | cavity code.  76  e.  code (for other than PP reflaxicon) 3-D fairfield codes  (so)   Execution Time (Sec. CD: 7600)        |
| STATUS: Operational Curr Under Modificate Purpose(s): Ownership? Proprietary?: MACHINE/OPERATII TRANSPORTABLE? Machine Depender Codes Red ESTIMATE OF RESOL  | emity? Yes on? No  AFWL No NG SYSTEM (on which installed): CDC Cyber 1: Yes (with modification) dent Restrictions. Uses CDC extended corre No. resonator geometry systems ( uured (name, purpose):  JRCES REQUIRED FOR RUNS Core Size (Octal Word  < 250K  | cavity code.  76  e.  code (for other than PP reflaxicon) 3-D fairfield cod  (so)   Execution Time (Sec. CDC 7600)  300-600 |
| STATUS:  Operational Curr Under Modificat Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATII TRANSPORTABLE? Machine Depender SELF-CONTAINED? Other Codes Red   | ently? Yes  AFWL No  NG SYSTEM (on which installed): CDC Cyber 1:  Yes (with modification)  dent Restrictions. Uses CDC extended corr  No. resonator geometry systems ( uured (name, purpose):  JRCES REQUIRED FOR RUNS.  Core Size (Octal Word  | cavity code.  76  e.  code (for other than PP reflaxicon) 3-D fairfield cod  (so)   Execution Time (Sec. CD: 7600)          |

,

\_\_\_\_\_

CODE NAME:

|   |   | ı |
|---|---|---|
|   |   | ı |
|   |   | ı |
|   |   | ı |
| - | _ | ľ |
| _ | L |   |
| _ | 3 | ı |
| æ | r | ١ |
| 7 | 3 | 1 |
| • | 7 | 1 |
| - | ٠ | 1 |
|   |   | ı |
|   |   | ı |
|   |   | ı |
|   |   | Ų |
|   |   | ı |
|   |   | ١ |

| 140  | OPTICS   | KINETICS   | GAS DYNAMICS  |
|--|--|--|---|
| BASIC TYPE (V) Physical Optics Cometrical  | RESONATOR TYPE (V). Standing Wave Traveling Wave (Ring)  | GAIN REGION MODELED (V): None Compact Region   | NOZZLE GEOMETRY MODELED (and type) (V) NOTIE<br>Coindrical Radially Flowing |
| FIELD (POLARIZATION) REPRESENTATION ( $oldsymbol{V}$ ):                              | BRANCH (V): Positive V Negative  | COORDINATE SYSTEM (Cartesian, cylindrical etc.)  | Rectangular Linearly Flowing  |
| Scalar V Vector  | OPTICAL ELEMENT MODELS INCLUDED (V)  | Compact Region Annular Region  | Other   |
| COORDINATE SYSTEM (Cartesian cylindrical etc.): Compact Region CY_Annular Region CY_ | Flat Mirrors V Sphencal Mirrors V  | KINETICS GRID DIMENSIONALITY (V):  |   |
| TRANSVERSE GRID DIMENSIONALITY (V). 10 2D  |  |  | FLUID GRID DIMENSION (V): 10 20 30 FLOW FIELD MODELED (V)                   |
| Compact Region   | Axicons Reflaxicons  | Annular Region:  | Laminar Turbulent   |
| Annular Region   | Arbitrary.   | GAIN REGION SYMMETRY RESTRICTIONS:   | Other   |
| FIELD SYMMETRY RESTRICTIONS: MIRROR SHAPE(S) ALLOWED (V)                             | Fruest.  | Ŷ.   | BASIC MODELING APPROACH (V)   |
| Square Circular Strip  | Parabola Parabola  | CHEMICAL DIMENS BEACTIONS MODELED  | Premised  |
| Rectangular Elliptical Arbitrary   | Variable Cone Offset:  | (x·y² xx·y)  |   |
| CONFIGURATION FLEXIBILITY (V).   | Deformable Mirrors:  | ×  | References for Approach Used  |
| Fixed Multiple Resonator Geometries  | Spatial Filters. Gratings  | Cold (F · H <sub>2</sub> ):  |   |
| Modular Multiple Resonator Geometries  | Other Elements Corner Cube (by using   | Other (country)  | 7   |
| PROPAGATION TECHNIQUE NO PROSESSION CONTRACT ANNOTAGE                                | general fleid modifier to model).  | ENERGY TRANSFER MODES MODELED (V): Reference   | THERMAL DRIVER MODELED (V) Arc HeaterCombustor                              |
| Freshal Integral Algorithms  | Simple Seturated Gain V Detailed Gain  | V.T.   | Shock Tube. Resistance Heater   |
| With Kernel Averaging  | BARE CAVITY FIELD MODIFIER MODELS (V):   | V.R  | Other   |
| Gaussian Quadrature  | Mirror Titt: V Decentration:   | **   | F-ATOM DISSOCIATION FROM $\langle V  angle$                                 |
| Fast Hankel Transform (FHT)  | Aberrations/Thermal Distortions.   | Other Control of Contr | F2 SF6  |
| Gardenar Fresnat-Kirchhoff (GFK)   | Arbitrary Township of the Control of | Multipline Model (V)   | FATOM CONCENTRATION DETERMINED FROM MODEL?                                  |
| Other (specify)  | selected (specify) ALL autaine mapping, bow-   | Assumed Rotational Population Distribution State (V).  | DILUENTS MODELED  |
|  | Reflectivity Loss: 2. Chetenst Counties Felena Bottont   | Equilibrium. Nonequilibrium  | MODELS EFFECTS ON MIXING RATE DUE TO (1)                                    |
| CONVERGENCE TECHNIQUE (V):   | Serated Other  | Number of Laser Lines Modeled  | Nozzie Boundary Layers Shock Waves Persactions (therms) Morkees             |
|  | LOADED CAVITY FIELD MODIFIER MODELS (V)  | Source of Rate Coefficients Used in Code   | Other (specify)   |
| ACCELERATION ALGORITHMS USED? Yes  | Medium Index Variation   | I'ME DONEILE MONEIC (V)  |   |
| Technous Gain convergence algorithm.   | Gas Absorption   | Doppler Broadening:  |   |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V): Proft                           | oner Apertures   | Collisional Broadening   | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)  Martin Inches Variations        |
| Other  |  | Other (specify):   | Other (specity)   |
|  | Optimal Focal Search Beam Quality  |  |   |
|  | Other  |  |   |
|  |  |  |   |

| CODE NAME: | LS-14RGS* |
|------------|-----------|
|            |           |

| CODE TYPE:   | Optics   |
|--|--|
|  |  |
| PRINCIPAL PURPO  | se(s)/APPLICATION(s) OF CODE: Performs an exact ray trace analysis in order to determine the   |
| geometric  | <u>configuration of a HSURIA type laser optical resonator with a ray distributing reflaxico</u>  |
| beam compa   | ctor assembly. Provides geometry data to wave optics HSURIA codes.   |
|  |  |
|  |  |
| SSESSMENT OF   | APABILITIES:Capable of synthesizing HSURIA resonators with: (1) parabolic-parabolic:   |
|  | m-Gaussian; (3) Uniform-Lorenzian; (4) P-P TANH redistributing reflaxicon beam compactor   |
|  | PDs introduced by the beam compactor. Determines optimum feedback mirror configuration.  |
| computes o   | 33 THE OLDER ST. CHE Dean Compactor? Descripting Openium recorder will of contriguitions.  |
|  | Desired to the second s |
| ASSESSMENT OF  |  |
| compactors   | · <del></del>  |
|  |  |
| THER UNIQUE F  | Resonator Geometries Modeled: HSURIA, reflaxicon beam compactors.  |
|  | aberration due to beam compactor and transfers data to wave optics codes.  |
|  |  |
| ORIGINATOR/KEY   | CONTACT  |
| Name:  | Victor L. Gamiz Phone: (213) 884-3346  |
| Organization:  | 0-1-1-1  |
| Address:   | 6633 Canoga Ave., Canoga Park, California (91304)  |
|  |  |
| AVAILABLE DOCII  |  |
| monte (V   | MENTATION: (T = Theory, U = User, RP = Relevant Publication): (1) RESUMBLUT SEQUENTLY SYNTHESTS CODE = COUNTY CONTROL OF COUNTY COUNT |
|  | . Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface   |
| Optimizati   | . Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters  |
| Optimizati   | . Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface   |
| Optimizati   | . Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters  |
| Optimizati   | . Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters  |
| Optimizati   | . Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters  |
| Optimizati<br>(V. L. Gam   | . Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters  |
| Optimizati<br>(V. L. Gam   | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  |
| Optimizati (V. L. Gam  STATUS: Operational Co  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  |
| Optimizati (V. L. Gam  STATUS: Operational Cu  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).    Yes   No   No   No   No   No   No   No   N  |
| Optimizati (V. L. Gam  STATUS: Operational Co  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).    Yes   No   No   No   No   No   No   No   N  |
| Optimizati (V. L. Gam  STATUS: Operational Cu  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).    Yes   No   No   No   No   No   No   No   N  |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).    Yes   No   No   No   No   No   No   No   N  |
| Optimizati (V. L. Gam  STATUS: Operational Co Under Modific Purpose(s  Ownership?:   | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).    Yes   No  |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Ownership?: Proprietary?  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  Transly: Yes No   |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Ownership?: Proprietary? MACHINE/OPERA  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Ownership?: Proprietary? MACHINE/OPERA  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters (iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).   |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Ownership?: Proprietary? MACHINE/OPERA TRANSPORTABLE  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters (iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).   |
| Optimizati (V. L. Gam  STATUS: Operational Co Under Modific Purpose(s  Proprietary? - PRACHINE/OPERA  TRANSPORTABLE Machine Dep  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Proprietary: MACHINE/OPERA  TRANSPORTABLE Machine DeposeLF-CONTAINED                              | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  Transly: Yes No  AFML No  TING SYSTEM (on which installed): CDC Cyber 176. 6600  Yes Indent Restrictions: None  |
| Optimizati (V. L. Gam  STATUS: Operational Cu Under Modific Purpose(s  Proprietary: ARCHINE/OPERA  TRANSPORTABLE Machine Depo  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters (iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).   |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Proprietary? Proprietary? AACHINE/OPERA  TRANSPORTABLE Machine Depo Dielf-CONTAINED Other Codes R | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters (z); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Proprietary?: MACHINE/OPERA  FRANSPORTABLE Machine Dep Other Codes R                              | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  Trently?: Yes stion? No  AFWL No  TING SYSTEM (on which installed): CDC Cyber 176, 6600  Yes ondent Restrictions: None  equired (name, purpose): None  DURCES REQUIRED FOR RUNS  Core Size (Octal Words)   Execution Time (Sec. CDc 7600)   |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Proprietary? Proprietary? AACHINE/OPERA  TRANSPORTABLE Machine Depo Dielf-CONTAINED Other Codes R | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  **Transly?** Yes *** No ***  **AFML No ***  **AFML No ***  **TING SYSTEM (on which installed): CDC Cyber 176. 6600 ***  **Yes ***  **Indent Restrictions: None ***  **Applications None **  **Applications None ***  **Appli     |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Ownership?: Proprietary?: MACHINE/OPERA  TRANSPORTABLE Machine Dep SELF-CONTAINED Other Codes R   | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  Trently?: Yes stion? No  AFWL No  TING SYSTEM (on which installed): CDC Cyber 176, 6600  Yes ondent Restrictions: None  equired (name, purpose): None  DURCES REQUIRED FOR RUNS  Core Size (Octal Words)   Execution Time (Sec. CDc 7600)   |
| Optimizati (V. L. Gam  STATUS: Operational Ct Under Modific Purpose(s  Ownership?: Proprietary?: MACHINE/OPERA  FRANSPORTABLE Machine Dep  SELF-CONTAINED Other Codes R  | Gamiz); Incorporate General Resonator into Ray Trace Code (W. H. Southwell); Surface on Algorithms and Equations (W. H. Southwell); Equations for Wave Optics Code Parameters iz); (U) Resonator Geometry Synthesis Code Development (L. R. Stidham).  Trently?: Yes stion? No  AFWL No  TING SYSTEM (on which installed): CDC Cyber 176, 6600  Yes ondent Restrictions: None  equired (name, purpose): None  DURCES REQUIRED FOR RUNS  Core Size (Octal Words)   Execution Time (Sec. CDc 7600)   |

<sup>\*</sup>LS-14 Resonator Geometry Synthesizer

| - 1 |  |
|-----|--|
| 2   |  |
| ଞା  |  |
| 4   |  |
|     |  |
| 11  |  |
| 2   |  |
| 7   |  |
| - 1 |  |
|     |  |

| GAS DYNAMICS | NOZZLE GEOMETRY MODELED (and type) (V) None Cylindrical Redaily Flowing | Reclangular Linearly Flowing                    | COORDINATE SYSTEM   | FLUID GRID DIMENSION (1) 10 20 30   | riow rietu modereŭ (*)               | Other                             | Perited Fire Perited        | Other (specify)      | References for Annotation Used |                                 |  | ***                                   | Arc Hester Combustor                         |                                   | F ATOM DISSOCIATION FROM (V)               | <sup>1</sup> 2 St 6         | Other (specify)             | F. ATOM CONCENTRATION DETERMINED FROM MODEL! | MODELS EFFECTS ON MIXING BATE DUE TO A               | Nozzie Boundary Layers Shock Waves | Presections (thermal blochage) furbulence | Other (specify)                             |   |                    | Model's Effects on Offical Modes Doe 10 (1) | Other (specify)                                |                                   |       |  |
|--------------|---|---|---|-------------------------------------|--------------------------------------|-----------------------------------|-----------------------------|----------------------|--------------------------------|---------------------------------|--|---------------------------------------|--|-----------------------------------|--|-----------------------------|-----------------------------|--|--|------------------------------------|---|---|---|--------------------|---|--|-----------------------------------|-------|--|
| KINETICS     | GAIN REGION MODELED (V): None Compact RegionAnnular Region              | COORDINATE SYSTEM (Canessan, cylindrical, etc.) | Compact Region Annular Region KINETICS GRID DIMENSIONALITY (V): | 10 20 30                            | Compare region Annular Region        | GAIN REGION SYMMETRY RESTRICTIONS | PULSED CW KINETICS MODELED  | VIMPING REACTION     | 3                              | Cold (F · H <sub>2</sub> ) D    | Hot (H·F <sub>2</sub> ) Cham (F·H <sub>2</sub> &H·F <sub>2</sub> ) | Other (specify)                       | ENERGY TRANSFER MODES MODELED (V.) Reference | <i>x</i> >                        | **   | Other                       | Single Line Model (V)       | Muhitine Model (V.)                          | Assumed Rotalional Population Distribution State (V) | Equitibrium Nonequilibrium         | Number of Laser Lines Modeled             | Source of Rate Coefficients Used in Code    | LINE PROFILE MODELS (V.)                  | Doppler Broadening | Coftworal Broadening                        | Other (specify)                                |                                   |       |  |
| OPTICS       | RESONATOR TYPE (V) Standing Wave N/A                                    | BRANCH (V) Positive 1 Negative                  | Grical Element Models Include U(V)                              | Cylindrical Mirrors Talescopes      | Assemble Marions Assemble Reflexions | Arbitrary                         | Linear<br>Parabola Parabola | Variable Cone Offset | Other (apacity) PPTANH         | Determable Mirrors              |  |                                       | GAIN MODELS (V) Bare Centy Only N/A          | Simple Seturated Gen Detailed Gen | MARRE CAVITY FIELD MODIFIER MODELS (V) N/A | 1                           | Arbitary                    | Selected (specify)                           | Reflectivity Loss                                    | Output Coupler Edges Rolled        | Serrated Other                            | LOADED CAVITY FIELD MODIFIER MODELS (V) N/A | Medium Index Veriation<br>Gas Arternation | Overtapped Beams   | Other                                       | FAR FIELD MODELS (V) Beam Steering Removal N/A | Optimel Focal Search Beam Quality | Other |  |
| 140          | BASIC TYPE (\) Physical Optics Geometrical                              | FIELD (POLARIZATION) REPRESENTATION (V)         | COORDINATE SYSTEM (Cartesian cylindrical etc.)                  | Compact Region CY Annuise Ragion CY |                                      | Annuar Region                     |                             | Square Crouler V Smp | FLEXIBILITY (V)                | Fired Single Resonator Geometry | Fixed Multiple Resonator Geometries                                | Modular Multiple Resonator Geometries |  | With Kernel Awaraging             | Gaussian Quadrature                        | Fast Fourier Transform (FT) | Fast Hankel Transform (FHT) | Ŧ.   | Other (specify) Kdy Lidie                            | CONVERGENCE TECHNIQUE (V. N.A.     | Power Comparison Field Comparison         | Giver                                       | ACCELERATION ALGORITMMS USED!             | Technique          | Proce N/A                                   |  |                                   |       |  |

| CODE NAME | MCLANC |
|-----------|--------|
|           |        |

|   | <del></del>  |   |
|---|--|---|
| PRINCIPAL PURPOSE(S).   | APPLICATION(S) OF CODEModeling   | of a real gas flow by tracking several thousand simula  |
|   |  | zle flows with large base regions, and low pressure   |
| regions in hype   | rsonic wedge wakes.  |   |
| SSESSMENT OF CAPAB  |  | on a wide variety of problems has shown no sign of  |
| instability in  | operation.   |   |
| A CETTE DE LIMITA   | arge array sizes   | for flowfield cell network and molecular information  |
| imposes limits<br>action not incl   | on size of flowfield which c   | an be analyzed in one run. Cavity radiation inter-  |
| OTHER UNIQUE FEATUR   | nes Developed cavity initia  | l conditions for a large number of cavity injector  |
| systems. Inclu<br>transverse pres   | des nonequilibrium chemical  | reactions, models shock waves, recirculating flows, and   |
| ORIGINATOR/KEY CONT   | ACT<br>Hughes and H. W. Behrens  | Phone. (213) 536-1624   |
| Organization: TRW   | DSSG   | Phone: (213) 535-1524   |
|   | 1030 One Cases Dank Bedond   |   |
|   | 1030, the space rark, Reduit   | o Beach, California 90278   |
| VAILABLE DOCUMENTA  |  |   |
| Calculations by   | ATION: (T - Theory, U = User, RP = Relevan<br>the Direct Simulation Monte  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| AVAILABLE DOCUMENTS Calculations by presented at AI   | ATION: (T - Theory, U = User, RP = Relevan<br>the Direct Simulation Monte  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| AVAILABLE DOCUMENTS<br>Calculations by<br>presented at AI   | ATION: (T - Theory, U = User, RP = Relevan<br>the Direct Simulation Monte  |   |
| AVAILABLE DOCUMENTS<br>Calculations by<br>presented at AI   | ATION: (T - Theory, U = User, RP = Relevan<br>the Direct Simulation Monte  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| AVAILABLE DOCUMENTS<br>Calculations by<br>presented at AI   | ATION: (T - Theory, U = User, RP = Relevan<br>the Direct Simulation Monte  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| NAMILABLE DOCUMENT<br>Calculations by<br>presented at AI  | ATION: (T - Theory, U = User, RP = Relevan<br>the Direct Simulation Monte  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI   | ATION: (T - Theory, U = User, RP = Relevan<br>the Direct Simulation Monte  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI   | ATION (T - Theor, U - User, RP = Reieven<br>the Direct Simulation Monte<br>AA Conference on High Power   | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI STATUS: Operational Currently   | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power  yr. Yes   | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI   | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power  yr. Yes   | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI  STATUS: Operational Currently  | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power  yr. Yes   | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI  STATUS: Operational Currently Under Modification?:   | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power  yr. Yes   | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI  STATUS: Operational Currently Under Modification?: Purpose(s):   | ATION (T - Theory, U - User, RP - Relevan<br>the Direct Simulation Monte<br>AA Conference on High Power<br>APPROVED THE THE POWER OF T  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI  STATUS: Operational Currently Under Modification?: Purpose(s): Ownership?:   | ATION: (T - Theory, U - User, RP = Relevant the Direct Simulation Monte AA Conference on High Power  YP: Yes No  IRW   | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI  STATUS: Operational Currently Under Modification?: Purpose(s): Ownership?:   | ATION (T - Theory, U - User, RP - Relevan<br>the Direct Simulation Monte<br>AA Conference on High Power<br>APPROVED THE THE POWER OF T  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr   |
| presented at AI  STATUS: Operational Currently Under Modification?: Purpose(s):  Ownership?: Proprietary?:  | ATION: (T - Theory, U - User, RP = Relevante   | M Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts.  |
| presented at AI  STATUS:  Operational Currently Under Modification?: Purpose(s):  Ownership?: Proprietary?:  WACHINE/OPERATING S  | ATION: (T - Theory, U - User, RP - Relevante   | M Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts.  |
| presented at AI  STATUS: Operational Currently Under Modification?: Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING S   | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power  AY: Yes No  TRW Yes SYSTEM (on which installed): CDC 7600   | M Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts.  |
| STATUS: Operational Currently Under Modification?: Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING S TRANSPORTABLE?: Machine Dependent  | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power AA Conference  | M Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts.  |
| presented at AI  STATUS: Operational Currently Under Modification?: Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING S  TRANSPORTABLE?: Machine Dependent SELF-CONTAINED?:  | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power AA Conference  | M Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts.  |
| STATUS: Operational Currently Under Modification?: Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING S TRANSPORTABLE?: Machine Dependent  | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power AA Conference  | M Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts.  |
| STATUS:  Operational Currently Under Modification?: Purpose(s): Proprietary?:  MACHINE/OPERATING S  FRANSPORTABLE?: Machine Dependent  SELF-CONTAINED?: Other Codes Require   | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power AA Conference  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts. |
| STATUS:  Operational Currently Under Modification?: Purpose(s):  Proprietary?:  MACHINE/OPERATING S  (RANSPORTABLE?: Machine Dependent SELF-CONTAINED?: Other Codes Require   | ATION: (T - Theory, U = User, RP = Relevanted the Direct Simulation Monte AA Conference on High Power AA Conference on High Power AR Conferenc | M Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts.  |
| presented at AI  STATUS: Operational Currently Under Modification?: Purpose(s): Proprietary?: MACHINE/OPERATING S  TRANSPORTABLE?: Mechine Dependent SELF-CONTAINED?: Other Codes Require  ESTIMATE OF RESOURCE  Small Job: | ATION: (T - Theory, U - User, RP - Relevant the Direct Simulation Monte AA Conference on High Power AA Conference  | M. Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts. |
| presented at AI  STATUS: Operational Currently Under Modification?: Purpose(a): Proprietary?: MACHINE/OPERATING S  TRANSPORTABLE?: Machine Dependent SELF-CONTAINED?: Other Codes Require                                   | ATION. (T. Theory, U User, RP - Relevant the Direct Simulation Monte AA Conference on High Power AA Conference     | M Publication): (RP): "Chemical Laser Nozzle and Cavity Carlo Method," T. Sugimura, G. A. Bird, and H. W. Behr Lasers, Oct. 31-Nov. 2, 1978, Cambridge, Massachusetts.  |

| AME |
|-----|

MCLANC

A. C.

| OPTICS   | ICS None   | KINETICS   | GAS DYNAMICS   |
|--|--|--|--|
| BASIC TYPE (V) None                                  | RESONATOR TYPE (V) Standing Wave                                 | GAIN REGION MODELED (V) NONE   | NOZZLE GEOMETRY MODELED (and 1754) (\$)                                  |
| FIELD (POLARIZATION) REPRESENTATION (V)              | BRANCH (V) POLITIVE  | COORDINATE SYSTEM CENTERS CUINCESS ME                                      | Chindred Nacional Founds   |
| Scaler Wester  | OPTICAL ELEMENT MODELS INCLUDED (V)                              | Compact Region Annular Region  | Other  |
| COORDINATE SYSTEM (Cartesian cylindrical etc.)       | Flat Mirrors   | KINETICS GRID DIMENSIONALITY (V)   | COORDINATE SYSTEM CALLESIAN  |
| ŀ  | Cytradrical Mirrors  | 20 20  | FLUID GRID DIMENSION (V) 10 20 1 30                                      |
| THANSVERSE GRID DIMENSIONALITY (V) ID ZD             |  | Compact Region   | FLOW FIELD MODELED (%)   |
| Annual Region  | Arbitary   | GAIN REGION SYMMETRY PEXTRETIONS   |  |
| FIELD SYMMETRY RESTRICTIONS?                         | Linear   | Gein Yary Mong Optic Ases? Flow Direction?                                 | BASIC MODELING APPROACH (V)  |
| <u>ج</u>   | Parabole Parabole  | PULSED CW KINETICS MODELED   | Premised Mixing  |
| Rectampular Elliptical Andreay                       | Variable Come Offices  | CHEMICAL PUMPING REACTIONS MODELED (V)                                     | one (epech)Kinetic theory, which does the mixing on the molecular scale. |
| CONFIGURATION FLEXIBILITY (V)                        | Other (specify)  | ^-   | References for Approach Used "Molecular Gas Dyn".                        |
| Freed Single Resonator Geometry                      | Spottal Fifters  | Codd (f · M2)  | 6. A. Bird, Oxford, 1976.  |
| Machine Multiple Reconstruction                      |  | Mat (M - F <sub>2</sub> ) Chain (f · M <sub>2</sub> & M · F <sub>2</sub> ) |  |
| PROPAGATION TECHNIQUE                                |  | Other (specify)  | THERMAL DRIVER MODELED (1)   |
|  | GAIN MODELS (V) Bere Carrity Onty                                | ENERGY INANSPER MODES MODELED (§) Reference                                | Arc Healer Combuston   |
| Which Kernel Avecuating                              | Sumple Saturated Gam Detailed Gam                                | # >  | Christ   |
| Gautanan Quadrature                                  | MARTE CAVITY FIELD MODBIER MODELS (V)                            | *  | F. ATOM DISSOCIATION FROM (%)  |
| Fast Fourier Transform (FFT)                         | Aberrations / Thermal Districture                                | Other  | f <sub>2</sub>   |
| Fact Hembel Transform (FHT)                          | Montan   | Smalle Line Model (V)  | Other (specify)  |
| Gardenar Freend Krithhaff (GFK)                      | Selected (specify)   | Mutitime Model (V)   | F-ATOM CONCENTRATION DETERMINED FROM MODEL! IES                          |
| Other (specify)                                      | Melectrity Loss  | Assumed Rotational Population Distribution State (V)                       | DILUENTS MODELED MODELS EFFECTS ON MIXING RATE DUE TO (1)                |
| CONVERGENCE TECHNIQUE (V)                            | Output Coupler Edges Rolled                                      | Equation   Nonequitions  | Norze Bounder, Layers  |
| Power Companion Field Companion                      | Served Other   | Source of Rate Coefficients Used in Code                                   | Presections (Phermal Mochage)  |
| Other  | Medium Index Variation   |  | One (specify)  |
| ACCELERATION ALGORITHMS USED?                        | Ges Absorption   | LINE PROFILE MODELS $(f V)$  |  |
| MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V): | Overlapped Basima  | Orapies Broads ung   | MODELS EFFECTS ON OPTICAL MODES DUE TO (\$)                              |
| Prort  | Other  | Superiores proportion  | Media Indes Variations   |
| Other  | FAR FIELD MODELS (V). Been Searing Removal Optimis For al Search |  | Other (specify)  |
|  | 1  |  |  |
|  |  |  |  |

| CODE NAME | MNORO |  |
|-----------|-------|--|
| _         |       |  |

|   | Dradict no   | wer and power spectral distribution of CW chemical   |
|---|--|--|
| RINCIPAL PURPOSE(S)/APPLICATIO<br>lasers. Also see AFOP   |  | WELL STILL STATE S |
|   |  |  |
| <del></del>   |  |  |
| SSESSMENT OF CAPABILITIES:  | Can predict power and  | d power spectral distribution on 2.1 band for CW   |
| chemical lasers, typic  | al case takes 100-200 s  | econds on Cyber 175. Contains Fabry-Perot resonator.   |
| With the rotational no  | nequilibrium kinetics,   | code will predict which lines lase.  |
| ASSESSMENT OF LIMITATIONS:  | Need to include rota   | tional nonequilibrium on 1+0 band.   |
|   |  |  |
| OTHER UNIQUE FEATURES:Th  | e following quantities   | are input as polynomials: $T(x)$ , $P(x)$ , $U(x)$ , $m_p(x)$  |
| (flow rate remaining i  | n primary), m (x) (flow  | rate remaining in secondary), primary nozzle F atom  |
| boundary layer profile  | , and Le/Lg(x) (thickne  | ss of mixed flow). Coefficients of the polynomials   |
|   | o these profiles (profi  | les come from BLAZE II, LAMP, etc.)  |
| DRIGINATOR/KEY CONTACT:   | man  | Phone (217) 333-1834   |
| Name: <u>L. H. Sent</u>   | al and Astronautical En  | gineering Dept., University of Illinois  |
|   | linois 61801   | Street ing population of or arrival  |
| Address: UI Dalla, 11   | 1111015 01001  | blication): (T) "An Efficient Rotational Nonequilibrium nd W. Brandkamp, AAE TR 79-5. UILU Eng 79-0505   |
| World of CW Chemical 1  | asers." I. H. Sentman a  | blication):  |
| INVECTOR OF CHEMICAL E  | asers, Et ill contained  | na W. Brandkamp, AAE IR 79-5. DILU ENG 79-0505   |
| (July 1979); (U) "User<br>Eng 79-0507 (October 1  | s Guide for Programs MN  | ORO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILU  |
| <u>(July 1979); (U) "User</u>   | s Guide for Programs MN  | INGO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILL   |
| (July 1979); (U) "User<br>Eng 79-0507 (October 1  | s Guide for Programs MN  | INGO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILL   |
| (July 1979); (U) "User<br>Eng 79-0507 (October 1  | s Guide for Programs MN<br>979).   | INGO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILU   |
| (July 1979); (U) "Usen Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye   | s Guide for Programs MN<br>979).   | ing w. Brandkamp, AAE TR 79-5. SILO Eng 79-0505  |
| (July 1979); (U) "User Eng 79-0507 (October 1 )  STATUS: Operational Currently?: Ye Under Modification?:  | s Guide for Programs MN<br>979).   | ing w. Brandkamp, AAE TR 79-5. SILO Eng 79-0505  |
| (July 1979); (U) "Usen Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye   | s Guide for Programs MN<br>979).   | ing w. Brandkamp, AAE TR 79-5. SILO Eng 79-0505 IORO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILL   |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye Under Modification?: Purpose(s):  | s Guide for Programs MN<br>979).   | INGO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILL   |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye Under Modification?:  | s Guide for Programs MN<br>979).   | INGRO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILU  |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye Under Modification?: Purpose(s):  Ownership?: AFOSR Proprietary?: No  | s Guide for Programs MN<br>979).   | ORO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILU  |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS:  Operational Currently?: Ye Under Modification?: Purpose(s):  Ownership?: AFOSR Proprietary?: NO  MACHINE/OPERATING SYSTEM (on second  | rs Guide for Programs MN<br>979).  | ORO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILU  |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?:AFOSR Proprietary?:NO   | es Guide for Programs MN 979).   | ORO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILU  |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?:AFOSR Proprietary?:No MACHINE/OPERATING SYSTEM (on a standard proprietary):Yes Machine Dependent Restrictions   | es Guide for Programs MN 979).   | ORO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILL  |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS: Operational Currently?:Ye Under Modification?: Purpose(s): Ownership?:AFOSR Proprietary?:No MACHINE/OPERATING SYSTEM (on v   | es Guide for Programs MN 979).   | ORO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILU  |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye Under Modification?: Ye Under Modification?: No  Ownership?: AFOSR Proprietary?: No MACHINE/OPERATING SYSTEM (on v  TRANSPORTABLE?: Yes Machine Dependent Restrictions  SELF-CONTAINED?: Yes  | es Guide for Programs MN 979).   | ORO and AFOPTMNORO," L. H. Sentman, AAE TR 79-7, UILU  |
| (July 1979); (U) "User Eng 79-0507 (October 1  STATUS: Operational Currently?: Ye Under Modification?: Purpose(s): Ownership?:AFOSR Proprietary?:NO MACHINE/OPERATING SYSTEM (on various) TRANSPORTABLE?:Yes Machine Dependent Restrictions SELF-CONTAINED?:Yes Other Codes Required (name, pu  | es Guide for Programs MN 979).  Ses CDC Cyber CDC CDC CDC CDC CDC CDC CDC CDC CDC CD | 175  |
| Eng 79-0507 (October 1  STATUS:  Operational Currently?: Ye Under Modification?: Purpose(s):  Ownership?:AFOSR Proprietary?:NO  MACHINE/OPERATING SYSTEM (on v  TRANSPORTABLE?: Yes Machine Dependent Restrictions  SELF-CONTAINED?: Yes Other Codes Required (name, pu   | which installed):CDC_Cyber   | 175  Execution Time (Sec. CDc 7600)  |
| CJuly 1979); (U) "User Eng 79-0507 (October 1 Purpose (s):  Operational Currently?: Ye Under Modification?: Purpose (s):  Ownership?: AFOSR Proprietary?: NO MACHINE/OPERATING SYSTEM (on v TRANSPORTABLE?: Yes Machine Dependent Restrictions SELF-CONTAINED?: Yes Other Codes Required (name, pu ESTIMATE OF RESOURCES REQUIRE Small Job: | which installed):CDC_Cyber_  CDC_Cyber_  CDC_Cyber_  CDC_Cyber_  CDC_Cyber_  | 175  |

| MNORO |  |
|-------|--|
| ME    |  |

| OPTICS   | SOI  | KINETICS  | GAS DYNAMICS                                |
|--|--|---|---|
| BASIC TYPE (V)                                   | RESONATOR TYPE (V): Standing Wave  | GAIN REGION MODELED ( $oldsymbol{V}$ ):                 | NOZZLE GEOMETRY MODELED (and type) $(V)$    |
| Physical Optics Geometrical K                    | Traveling Wave (Ring)  | Compact Region: V Annular Region:                       | Cylindrical, Radially Flowing               |
| FIELD (POLARIZATION) REPRESENTATION (V):         | BRANCH (V): Positive Negative -  | COORDINATE SYSTEM (Cartesian, cylindrical, etc.)        | Rectangular, Unearly Flowing                |
| Scalar Vector                                    | OPTICAL ELEMENT MODELS INCLUDED $(f V)$ :  | Compact Region Cd Annular Region:                       | Other                                       |
| COORDINATE SYSTEM (Cartesian, cylindrical, etc.) | Flat Mirrors Spherical Mirrors   | KINETICS GRID DIMENSIONALITY (V).                       | COORDINATE SYSTEM. Cartesian                |
|  | Cylindrical Mirrors:Telescopes.  | 10 20 30  | FLUID GRID DIMENSION (V): 10 20 30          |
| TRANSVERSE GRID DIMENSIONALITY (V): 1D 2D        | Scraper Mirrors  | Compact Region:   | FLOW FIELD MODELED $(V)$ .                  |
| Compact Region                                   | Axicons Reflaxicons  | Annular Region:   | Laminar Turbulent                           |
| Annular Region                                   | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS:                      | Other                                       |
| FIELD SYMMETRY RESTRICTIONS?                     | Linear   | Gain Vary Along Optic Axee?Flow Direction?              | BASIC MODELING APPROACH $(V)$ :             |
| Ŝ  | Parabola-Parabola  | PULSED: CW: KINETICS MODELED                            | PremisedMixing                              |
| <u></u>  | Variable Cone Offset:  | G REACTIONS MODELED ()                                  | Other (specify)                             |
| COMEGUIDATION STEXENITY (V.                      | Other (specify):   |   |   |
| Fixed. Single Resonator Geometry                 | Deformable Mirrors:  | ( , , , , , , , , , , , , , , , , , , ,                 | References for Approach Used                |
| Fixed. Multiple Resonator Geometries             | Spatial Fithers  | ر<br>ا  |   |
| Modular Multiple Resonator Geometnes             | Other Elements:  | Other femority  | ,   |
| PROPAGATION TECHNIQUE SAL ME SERVICEMENT ANNUAN  |  | ENERGY TRANSECT MODES MODELED (V) Beleened              | THERMAL DRIVER MODELED (V):                 |
| Fresnet Integral Algorithms                      | GAIN MODELS (V): Bare Cavity Only  | vr/   | Chart Tithe                                 |
| With Kernel Averaging                            | Simple Saturated Gain:Detailed Gain  | V-R: 4  |   |
| Gaussian Quadrature                              | BARE CAVITY FIELD MODIFIER MODELS (V):   | A-A   | E ATOM DISCOCIATION FROM (V)                |
| Fast Founer Transform (FFT)                      | Mirror Tift: Decentration.   | Multiquantum V-   | f. Sf.                                      |
| Fast Hankel Transform (FMT)                      | Aberrations/Thermal Distortions.   | Single Line Model (V)                                   | Other (specify)                             |
| Gardenes Fresnet Ruchhoff (GFR)                  | Arbitrary  | Mutiline Model (V)                                      | F-ATOM CONCENTRATION DETERMINED FROM MODEL? |
| Other (specify)                                  |  | Assumed Rotational Population Distribution State (V)    | DILUENTS MODELED                            |
|  | Management of the state of the  | Equilibrium Nonequilibrium                              |   |
| CONVERGENCE TECHNIQUE (V)                        | <u> </u>   | Predicts which  | Nozzłe Boundery Layers Shock Waves          |
| Power Comparison Field Comparison                | ) A state of the s | Source of Rate Coefficients Used in Code, Cohen's HE/DF | Prereactions (thermal blockage) Turbulence  |
| Other  | MACHINE THE CONTRACT MODELS (V)  | rate package, Hinchen's rotational*                     | Other (specify)                             |
| ACCELERATION ALGORITHMS USED?                    | Ges Absorption   | LINE PROFILE MODELS $\langle oldsymbol{V}  angle$ :     |   |
| Technique  Technique                             | Overlapped Beams   | Doppler Broadening                                      | MANAGE EFFECTE ON OBTICAL MODES DUE TO (1)  |
| Provy  | Other  | Collisional Broadening                                  | MODELS EFFECTS ON OFTICAL MODES DOE 10 (V)  |
| Other  | FAR-FIELD MODELS (V): Beem Steering Removal  | Other (specify)   | Other (specify)                             |
|  | Optimal Focal Search Beam Quality  |   |   |
|  | Other  |   |   |
|  |  |   |   |

Relaxation data, Polanyi's pumping distribution.

| l          |          |
|------------|----------|
| CODE NAME: | MPCPAGOS |

| coefficients for general optical train; relates o<br>motions in six degrees of freedom; used in conjun-   |   |
|---|---|
| coefficients for general optical train; relates o<br>motions in six degrees of freedom; used in conjun-   | IPAGOS and POLYPAGOS); calculates sensitivity       |
| motions in six degrees of freedom; used in conjun-  |   |
|   |   |
| an integrated optics/structures approach.   | ceron with invarious to predice beam greece en ough |
| an integraced operes) sor actual est approach   |   |
| ASSESSMENT OF CAPABILITIES: <u>Can handle all elements</u> modeling capability.   | of IPAGOS, but also includes an unstable resonator  |
| ASSESSMENT OF LIMITATIONS: Meant to be used to gene NASTRAN; output format is rough and difficult for   | rate multipoint constraint (MPC) cards for          |
| THAT TOWN AND THE TOWN AND THE TOWN   | novice to interpret.                                |
| DTHER UNIQUE FEATURES: Resonator Geometries Modeled:  | Unstable, Linear, with up to 4 folding flats.       |
| The DDM Componentian  | Phone:(505) 848-5000                                |
| Organization: The BDM Corporation   |   |
| Address: 1801 Randolph Road, S.E., Albuquerque  |   |
| AVAILABLE DOCUMENTATION: (T Theory, U User, RP = Relevant Publication Analyses of the All Optical Train, BDM/TAC-78-79  | (T) "Final Task Report for Sensitivity              |
| Analyses of the All Optical Irain," BUM/IAC-/8-/9   | 3-TR; (U) "MPCPAGOS Users Manual," BDM/TAC-78-727-  |
|   |   |
| STATUS:   |   |
| Operational Currently?: Yes   |   |
| Under Modification?: No   |   |
|   |   |
| Purpose(s):   |   |
| Purpose(s):   |   |
| Purpose(s):  AEWL/LRO_BDM   |   |
| Purpose(s):  Ownership?:  AEWL/LRO, BDM  Proprietary?:  NO  |   |
| Purpose(s):  AEWL/LRO_BDM   |   |
| Purpose(s):  Ownership?:  AEWL/LRO, BDM  Proprietary?:  NO  |   |
| Purpose(s):  Ownership?:  AFWL/LRO, BDM  Proprietary?:  NO  MACHINE/OPERATING SYSTEM (on which installed):  CDC 6600/7600   |   |
| Purpose(s):  Ownership?:  NO  MACHINE/OPERATING SYSTEM (on which installed):  CDC 6600/7600  TRANSPORTABLE?:  Yes  Machine Dependent Restrictions:  |   |
| Purpose(s):  Ownership?:AFWL/LROBDM  Proprietary?:NO  MACHINE/OPERATING SYSTEM (on which installed):CDC6600/7600  TRANSPORTABLE?YES   | S output  |
| Purpose(s):  Ownership?:AEWL/LROBDM Proprietary?:NO  MACHINE/OPERATING SYSTEM (on which installed):CDC_6600/7600  TRANSPORTABLE?:YES  Machine Dependent Restrictions:SELF-CONTAINED?:YES  | S output  |
| Purpose(s):  Ownership?:AFWL/LROBDM   | S output  Execution Time (Sec. COC 7600)            |
| Purpose(s):  Ownership?:AEWL/LROBDM Proprietary?:NO  MACHINE/OPERATING SYSTEM (on which installed):CDC6600/7600  TRANSPORTABLE?:YES  Machine Dependent Restrictions:  SELF-CONTAINED?:YES  Other Codes Required (name, purpose):NASTRAN_USESMCPAGO  ESTIMATE OF RESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)  Small Job:1204 | Execution Time (Sec. CDC 7600)                      |
| Purpose(s):  Ownership?:AEWL/LROBDM_ Proprietary?:NONO  |   |

----

| GAS DYNAMICS | NOZZLE GEOMETRY MODELED Land types (V) Spirit | Cylindrical Radially Flowing Rectangular Linearly Flowing | Other  | COGROINATE SYSTEM FLUID GRID DIMENSION (V) 10 20 30 | FLOW FIELD MODELED (V.)                                | Other                             | BASIC MODELING APPROACH ()                  | Premised Mising   |  | References for Approach Used                 |                                      | THERMAL DRIVER MODELED (\$) | Arc HesterCombustor  | Shock Tube Resistance Heater        | Green Green Control of the Control o | ration dissociation ration (4)    | -                           | F ATOM CONCENTRATION DETERMINED FROM MODEL? | MODELS EFFECTS ON MINING RATE DUE TO ( )             | Nozze Boundary Layers Shock Water | Prenactions (therms) blockage)  | Other (apacify)                         |                               |                    | MODELS EFFECTS ON OPTICAL MODES DUE TO (\$)         | Other (specify)                            |                                   |                                     |  |
|--------------|---|---|--|---|--|-----------------------------------|---|---|--|--|--------------------------------------|-----------------------------|--|-------------------------------------|--|-----------------------------------|-----------------------------|---|--|-----------------------------------|---------------------------------|---|-------------------------------|--------------------|---|--|-----------------------------------|-------------------------------------|--|
| KINETICS     | GAIN REGION MODELED (V) None                  | COORDINATE SYSTEM (Cartesian cylindrical etc.)            | Compact Region Annular Region                                      | 10 20 30  | Compact Region Annular Region                          | GAIN REGION SYMMETRY RESTRICTIONS | Gain Vary Along Optic Asas? Flow Direction? | PULSED CW KINETICS MODELED CHEMICAL PUMPING REACTIONS MODELED (V) | (x-42 4x-y)                                      | Cod (F. H.)                                  |                                      | Other (specify)             | ENERGY TRANSFER MODES MODELED (V.) Reference   |                                     |  | Other                             | Single Line Model (V)       | Muthine Model (V)                           | Assumed Rotational Population Distribution State (V) | Equitibrium Monequilibrium        | Number of Laser Lines Modeled   |   | LINE PROFILE MODELS (V)       | Doppler Broadening | Collisional Broadening                              | Other (spacify)                            |                                   |                                     |  |
| OPTICS       | RESONATOR TYPE (V) Standing Wave              | BRANCH (V). Positive / Negative                           | OPTICAL ELEMENT MODELS INCLUDED (V) Flat Mirrors Spherical Mirrors |   | Scraper Mirrors.                                       | Arbitary                          | Linear                                      | Parabota-Parabota   | Variable Cone Offset Other (specify) Noneverting | Deformable Mirrors                           | Spatial Filters                      | Other Elements              | GAIN MODELS (V) Bare Carrix Onty   | Simple Saturated Gain Detailed Gain | BARE CAVITY FIELD MODIFIER MODELS (V)  | Aberration / Theresa Decembration | Arbitrary                   | Selected (specify)                          | Reflectivity Loss                                    | Output Coupler Edges Rolled       | Serviced Other                  | LOADED CAVITY FIELD MODIFIER MODELS (V) | Gas Absorption                | Overtapped Bearns  | Other   | FAR-FIELD MODELS (V) Beem Steering Removal | Optimal Focal Search Been Quality | ome Z-dimensional kourier transform |  |
| .dO          | BASIC TYPE (V)                                | FIELD (POLARIZATION) REPRESENTATION (V)                   | COORDINATE SYSTEM (Cartesian cylindrical etc.)                     | Compact Region Y Annular Region                     | TRANSVERSE GRID DIMENSIONALITY (V) LO 20 Compet Region | Annutar Region                    | FIELD SYMMETRY RESTRICTIONS? 110            | Square Circular Sarip   | Rectangular Elliptical Arbitrary                 | Fired Single Resonator Geometry (V): Branch, | Fired. Multiple Resonator Geometries | - 11                        | PROPAGATION TECHNIQUE CONTRACTOR STATE AND STA | With Kernel Averaging               | Gaussian Quadrature  | Fast Fourser Transform (FET)      | Fast Hankel Transform (FMT) | Gardener fragnal Kirchhoff (GFK)            | Other (specify)                                      | CONVERGENCE TECHNIQUE (V)         | Power Companson Field Companson | Other                                   | ACCELERATION ALGORITHMS USED? |                    | MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V) | Other                                      |                                   |                                     |  |

| CODE NAME | MRO |
|-----------|-----|

| PRINCIPAL PURI   | POSE(S)/APPLICATION(S)   | or copeModels_the   | optical performance of linear bank CW HF and DF   |
|--|--|---|---|
| chemical   | lasers. MkO is   | <u>2D_model; BLAZER is_</u>   | 3D model. Used as design tools for BDL, NACL, MIRACL.   |
|  |  |   |   |
|  |  | · · · · · · · · · · · · · · · · · · ·   |   |
|  | 9010   | nator: Positive or  | negative branch confocal unstable; arbitrary optical a  |
| ASSESSMENT OF  | CAPABILITIES RESU  | ric or spherical mi   | rrors. Gain medium: CW flowing HF* or DF*, strut wal  |
|  |  |   | presonant index OPD's   |
| million db   | erraerong enerma   | , disconcion, and no  | Micolane mock of b  |
| MRO does   | stable Fabry Per   | ot with geometrical   | optics.   |
| ASSESSMENT O   | FLIMITATIONS Lac   | ks transverse pressu  | re gradient modeling capability, lacks FFT propagation  |
| algorithm  | , uses only sing   | le gain sheet, uses   | only rotational equilibrium description.  |
|  |  |   |   |
|  |  |   |   |
|  |  |   |   |
| OTHER UNIQUE   | FEATURES CONTOC  | al unstable resonato  | or modeled.   |
|  |  | <del></del>   |   |
|  |  |   | · · · · · · · · · · · · · · · · · · ·   |
| ORIGINATOR/KE  | TV CONTACT   |   | ····  |
| Name   | Donald L. B  | ullock  | Phone: (213) 535-3484   |
| Organizatio  | TRW_DSSG   |   |   |
| Address.   |  | e Space Park, Redond  | do Beach, California 90278  |
| AUAU AGI E DOC   |  |   |   |
|  | IIMENTATION (T . Theo  | ev II Liser RP Relevant Pu  |   |
| (U): BLA   | UMENTATION (T - Theo<br>ZER User Manual,   | ory, U. User, RP. Relevant Pu<br>November 1978 (inc)  | blication) (T): The BLAZER and MRO Codes, June 1978;<br>udes MRO); Listings available.  |
| (U): BLA   | UMENTATION (T - Theo   | ory, U. User, RP. Relevant Pu<br>November 1978 (inc)  | blication) (T): The BLAZER and MRO Codes, June 1978;  |
| (U): BLA   | umentation (f - Theo<br>ZER User Manual.   | ny, U User RP Relevant Pu<br>November 1978 (incl  | blication) (T): The BLAZER and MRO Codes, June 1978;  |
| STATUS. Operational  | Currently? Yes   | .November 19/8 (inc)  | blication) (T): The BLAZER and MRO Codes, June 1978;  |
| STATUS. Operational Under Modifi   | Currently? Yes   | November 19/8 (inc)   | blication) (T): The BLAZER and MRO Codes, June 1978;<br>udes MRO); Listings available.  |
| STATUS.  Operational Under Modit   | Currently? Yes lication? Pla (s) Rotational  |   | blication) (T): The BLAZER and MRO Codes, June 1978;  |
| STATUS.  Operational Under Modifi Purpose  | Currently? Yes lication? Pla (s) Rotational  | November 19/8 (inc)   | blication) (T): The BLAZER and MRO Codes, June 1978;<br>udes MRO); Listings available.  |
| STATUS. Operational Under Modit Purpose transvers  | Currently? Yes lication? Pla (6) Rotational e pressure gradi   |   | blication) (T): The BLAZER and MRO Codes, June 1978;<br>udes MRO); Listings available.  |
| STATUS.  Operational Under Modit Purpose transyers Ownership?  | Currently? Yes loation? Pla (s) Rotational e pressure gradi Government   |   | blication) (T): The BLAZER and MRO Codes, June 1978;<br>udes MRO); Listings available.  |
| STATUS.  Operational Under Modit Purpose transvers  Ownership? Proprietary!  | Currently? Yes loation? Pla (s) Rotational e pressure gradi Government No  | nned<br>nonequilibrium, FF1<br>ent description.   | Discassion) (T): The BLAZER and MRO Codes, June 1978; Ludes MRO); Listings available.  F propagation algorithm, multiple gain skins,  |
| STATUS.  Operational Under Modit Purpose transvers  Ownership? Proprietary!  | Currently? Yes loation? Pla (s) Rotational e pressure gradi Government No  |   | Discassion) (T): The BLAZER and MRO Codes, June 1978; Ludes MRO); Listings available.  F propagation algorithm, multiple gain skins,  |
| STATUS Operational Under Modit Purpose transvers Ownership* Proprietary:   | Currently? Yes loation? Pla (s) Rotational e pressure gradi Government No  | nned nonequilibrium, FF1 ent description.  nustalled)Cyber 174-1  | Discassion) (T): The BLAZER and MRO Codes, June 1978; Ludes MRO); Listings available.  F propagation algorithm, multiple gain skins,  |
| STATUS Operational Under Modit Purpose transvers Ownership* Proprietary! MACHINE/OPER  | Currently? Yes location? Pla (s) Rotational e pressure gradi Government No   | nned nonequilibrium, FF1 ent description.   | Discassion) (T): The BLAZER and MRO Codes, June 1978; Ludes MRO); Listings available.  F propagation algorithm, multiple gain skins,  |
| STATUS Operational Under Modit Purpose transvers Ownership* Proprietary! MACHINE/OPER  | Currently? Yes location? Pla (s) Rotational e pressure gradi Government No IATING SYSTEM (on which   | nned nonequilibrium, FF1 ent description.  nustalled)Cyber 174-1  | Discassion) (T): The BLAZER and MRO Codes, June 1978;  Ludes MRO); Listings available.  F propagation algorithm, multiple gain skins,   |
| STATUS.  Operational Under Modit Purpose <u>transvers</u> Ownership? Proprietary! MACHINE/OPER TRANSPORTABL  | Currently? Yes Placation? Placation? Placation | nned nonequilibrium, FF1 ent description.  nussalled)Cyber 174-1 Is for export CDC  | Direction) (T): The BLAZER and MRO Codes, June 1978; udes MRO); Listings available.  T propagation algorithm, multiple gain skins,  |
| STATUS.  Operational Under Modifi Purpose transvers  Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De  | Currently? Yes Placation? Placation? Placation | nned nonequilibrium, Ff1 ent description.  Junstalled)Cyber 174-1 Is for export CDC   | Discassion) (T): The BLAZER and MRO Codes, June 1978;  Ludes MRO); Listings available.  F propagation algorithm, multiple gain skins,   |
| STATUS.  Operational Under Modifi Purpose transvers  Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De  | Currently? Yes  Currently? Yes  Pla  (s) Rotational  e pressure gradi  Government  No  IATING SYSTEM (on which  E? Needs mod  ppendent Restrictions  D?  | nned nonequilibrium, Ff1 ent description.  Junstalled)Cyber 174-1 Is for export CDC   | Direction) (T): The BLAZER and MRO Codes, June 1978; udes MRO); Listings available.  T propagation algorithm, multiple gain skins,  |
| STATUS Operational Under Modit Purpose transvers Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De SELF-CONTAINE  | Currently? Yes lication? Pla (s) Rotational e pressure gradi   | nned nonequilibrium, FF1 ent description.  nustalled)Cyber 174-1 ls for export CDC  | Direction) (T): The BLAZER and MRO Codes, June 1978; udes MRO); Listings available.  T propagation algorithm, multiple gain skins,  |
| STATUS Operational Under Modit Purpose transvers Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De SELF-CONTAINE  | Currently? Yes  Currently? Yes  Pla  (s) Rotational  e pressure gradi  Government  No  IATING SYSTEM (on which  E? Needs mod  ppendent Restrictions  D?  | nned nonequilibrium, FF1 ent description.  nustalled)Cyber 174-1 ls for export CDC  | Thication (T): The BLAZER and MRO Codes, June 1978; udes MRO); Listings available.  The propagation algorithm, multiple gain skins,  TRW/TSS  ALFA for nozzle exit condition. |
| STATUS Operational Under Modit Purpose transvers Ownership? MACHINE/OPER TRANSPORTABL Machine De SELF-CONTAINE   | Currently? Yes lication? Pla (s) Rotational e pressure gradi   | nned nonequilibrium, FFI ent description.  nunstalled)Cyber 174-1 ls for exportCDC  | Thication; (T): The BLAZER and MRO Codes, June 1978;  udes MRO); Listings available.  F propagation algorithm, multiple gain skins,  IRW/TSS  ALFA for nozzle exit condition. |
| STATUS.  Operational Under Modit Purpose <u>transvers</u> Ownership? Proprietary! MACHINE/OPER TRANSPORTABL Machine De SELF-CONTAINE Other Codes                       | Currently? Yes  Currently? Yes  Pla  (s) Potational  e pressure gradi  Government  No  IATING SYSTEM (on which  E? Needs mod  ppendent Restrictions  D?  Required (name, purpose  ESOURCES REQUIRED FOI  | nned nonequilibrium, FF1 ent description.  nustalled)Cyber 174-1 ls for export CDC  P)VIINT, KBLIMP, A  RRUNS Core Size (Octal W BLAZER: 165K | Thication; (T): The BLAZER and MRO Codes, June 1978; udes MRO); Listings available.  T propagation algorithm, multiple gain skins,  TRW/TSS  ALFA for nozzle exit condition.  |
| STATUS.  Operational Under Modif Purpose transvers Ownership? Proprietary MACHINE/OPER TRANSPORTABL Machine De SELF-CONTAINE Other Codes Small Job Large Job Large Job | Currently? Yes location? Pla (s) Rotational e pressure gradi  Government No ATING SYSTEM (on which E? Needs mod spendent Restrictions D? Required (name, purpose ESOURCES REQUIRED FOI MRQ: 151K   | nned nonequilibrium, FF1 ent description.  nustalled)Cyber 174-1 ls for exportCpc  RRUNSCore Size (Octal W                                    | Thication; (T): The BLAZER and MRO Codes, June 1978; udes MRO); Listings available.  F propagation algorithm, multiple gain skins,  IRW/TSS  ALFA for nozzle exit condition.  |

The second second second

W

| MRO     |
|---------|
| E NAME: |

| OPTICS   | SOI  | KINETICS  | GAS DYNAMICS   |
|--|--|---|--|
| BASIC TYPE ( )                                       | RESONATOR TYPE (V) Standing Wave   | GAIN REGION MODELED (V)                               | NOZZLE GEOMETRY MODELED (and 17PE) (1)   |
| Prysical Optics   Geometrical                        | Traveling Wave (Ring) , Reverse TW   | Compact Region Annular Region                         | Cylindrical Radially Flowing   |
| FIELD (POLARIZATION) REPRESENTATION (V)              | BRANCH (V): Positive Negative  |   | Rectangular Linearly flowing   |
| Kalar Vertor   | OPTICAL ELEMENT MODELS INCLUDED $(f V)$  | Compact Region Cd Annula' Region                      | Other  |
| COORDINATE SYSTEM (Cartesian cylindrical etc.)       | Flat Mirrors Spherical Mirrors   | KINETICS GRID DIMENSIONALITY (\$ )                    | COORDINATE SYSTEM CARTESIAN  |
| Compact Region Ca Annual Region                      | Cylindrical Mirrors V Telescopes   | 10 20 30  | FLUID GRID DIMENSION (V) 10 , 20 30  |
| TRANSVERSE GRID DIMENSIONALITY (V) 1D 2D             | Scraper Mirrors  | Compact Region  | FLOW FIELD MODELED $(V)$   |
| Compact Region                                       | Axicons Refigurons   | Annular Region  | Le at Turbulent  |
| Annylar Region                                       | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS                     | oher Scheduled mixing.   |
| FIELD SYMMETRY RESTRICTIONS! 1008                    | Linear   | Gain Vary Along Optic Axes? Flow Direction?           | BASIC MODELING APPROACH (1)  |
| MIRROR SHAPE(S, ALLOWED (V)                          | Parabola-Parabola  | PULSED CW KINETICS MODELED                            | PremixedMinng  |
| ١.   | Variable Cone Offset   | G REACTIONS MODELED (V                                | Other (specify) Oction (1)   |
| A CLEVIBRITY (A.)                                    | Other (specify)  |   | bas 374 (F) ant  |
| Freed Single Retainator Lecorretry                   | Deformable Mirro   | (*****  | References for Approach Used III. TELLING MRC COCKS (TRW).   |
| Fred Multiple Resonator Geometries                   | Spatial Filters Gralings   | ا<br>آ  |  |
| Modular Multiple Resonator Geometries                | Other Elements   | ı   | Treeses of the second of the s |
| PROPAGATION TECHNIQUE                                |  | ENERGY TRANSFER MODES MODELED (V) Reference           | Arc Meater Combustor   |
| fresnel Integral Algorithms                          | Ş  | vr · The BLAZER and MRO Codes                         |  |
| With Kernel Averaging                                | Simple Saturated Gain Detailed Gain  | *>  |  |
| Gaussian Quadrature (Modiffed)                       | BARE CAVITY FIELD MODIFIER MODELS (V)  | vv . The BLAZER and MRO Codes                         | FATOM DISSOCIATION FROM (V)  |
| Fast fourier Transform (FFT)                         | About the second of the second | oner RR with rot, nonequil.                           | f <sub>2</sub>   |
| East Hankel Transform (EMT)                          | Abelitary  | Single Line Model (V)                                 | Other (specify)  |
| Gardener Freite Kurhhoff (SFK)                       | Selected (specify)   | Multipre Model (V)                                    | F. ATOM CONCENTRATION DETERMINED FROM MODELY 165   |
| Other (specify)                                      | Reflectivity Loss  | Assumed Rotational Population Distribution State (V.) | DILUENTS MODELED (20, 12, 1)   |
|  | Output Coupler Edges Rolled  | Equilibrium 1 Nonequilibrium                          | Models creecis on married and control of the Mares   |
| CONVERGENCE TECHNIQUE (V)                            | SerratedOther  | Number of Laser Lines Modeled 24                      | Presea from othermal Mockeys   |
| 1  | LOADED CAVITY FIELD MODIFIER MODELS (V)  | Source of Rate Coefficients, Used in Code N. COTIET   | Ower Goedy Scheduled three stream;   |
| ACCELEBATION ALGORITHMS USED: "(O                    | Medic-minder Variation   |   | fuel, oxidant, mixed.  |
| Technique  | Gas Absorption   | LINE PROFILE MODELS ()                                |  |
| MULTIPLE EIGENVALUE-VECTOR EXTRACTION ALGORITHM (\$) | Overdabled Beams   | Colheinal Broadening                                  | MODELS EFFECTS ON OPTICAL MODES DUE ${ m TC}(\Lambda)$   |
| Printy   | Cher  Cher  FAR FIELD MODELS (V.) Beam Steering Removal  | Onecopedy Operation at line center.                   | Media Indea Variations   |
|  | Optimal Tirral Search Ream Quality 1   |   |  |
|  | OTHE, EMBLAZON   |   |  |
|  |  |   |  |

| CODE NAME | NCFTDPWE* | <br> |
|-----------|-----------|------|

|  | ics  |
|--|--|
|  | s)/APPLICATION(s) OF CODE <u>Study of wavefront distortions during propagation through</u><br>If-focusing media.   |
|  |  |
|  |  |
|  |  |
| ASSESSMENT OF CAP  | ABILITIES This code propagates a two (transverse) dimensional wavefront through  |
|  | constant small signal gain and with a nonlinear index of refraction which induces  |
|  | . The code was written by F.D. Tappert, now at the University of Miami in Miami,   |
| Florida. A de  | escription is in Los Alamos report LA-6833-MS by John C. Goldstein.  |
|  | MATIONS. Although this code could be extended to be used in resonator calculations, does not have any optical elements or saturable gain models included. Therefore,           |
| other than no  | ting that the fast Fourier transform is the basic numerical method employed and that   |
| other details  | can be found in the report cited, no other data for this code will be given.   |
| <del></del>  |  |
| OTHER UNIQUE FEAT  | URES   |
|  |  |
|  |  |
| ORIGINATOR/KEY CO  | NYACY.   |
|  | D. Tappert/John C. Goldstein Phone (505) 667-7281  |
|  | os Alamos Scientific Laboratory, Group X-1, MS-531   |
| -  | os Alamos, New Mexico 87545  |
|  | (T) A M  |
|  | KTATION: (T. Theory, U. User, RP. Relevant Publication): (1) A Numerical Code for the inree Dimensional<br>e Equation, John C. Goldstein, Los Alamos report number LA-6833-MS. |
| raraboric may  | E Equacion, bonni C. dordstein, Los Aramos report number Ex-boss-ns.   |
|  | ··   |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| STATUS.  |  |
| STATUS.  Operational Curre   |  |
|  | ntly'  |
| Operational Curre  | ntly'  |
| Operational Curre<br>Under Modificatio   | ntly'  |
| Operational Curre<br>Under Modificatio<br>Purpose(s): —  | ntly'  |
| Operational Curre Under Modificatio Purpose(s):  Ownership?  | ntly'  |
| Operational Curre Under Modificatio Purpose(s): —  Ownership? — Proprietary?: ——   | ntly?  |
| Operational Curre Under Modificatio Purpose(s): —  Ownership? — Proprietary?: ——   | ntly'  |
| Operational Curre Under Modificatio Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATINI  | ntly?  n?  G SYSTEM (on which installed):  |
| Operational Curre Under Modificatio Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATINI TRANSPORTABLE?.  | ntly?  n?  G SYSTEM (on which installed):  |
| Operational Curre Under Modificatio Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATINI  | ntly?  n?  G SYSTEM (on which installed):  |
| Operational Curre Under Modificatio Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATINI TRANSPORTABLE? Machine Dispendi  | ntly? n?  G SYSTEM (on which installed):  ant Restrictions   |
| Operational Curre Under Modificatio Purpose(s): —  Ownership? — Proprietary?: — MACHINE/OPERATINI TRANSPORTABLE?. — Machine Dapendi  | ntiy? n2-  G SYSTEM (on which installed):  ant Restrictions  |
| Operational Curre Under Modificatio Purpose(s): —  Ownership? — Proprietary?: — MACHINE/OPERATINI TRANSPORTABLE?. — Machine Dapendi  | ntly? n?  G SYSTEM (on which installed):  ant Restrictions   |
| Operational Curre Under Modificatio Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATINI TRANSPORTABLE? Machine Dapendi SELF-CONTAINED?: Other Codes Requ   | antiy?  G SYSTEM (on which installed):  ent Restrictions  ent Restrictions  ented (name, purpose)  RCES REQUIRED FOR RUNS:   |
| Operational Curre Under Modificatio Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATINI TRANSPORTABLE? Machine Dapendi SELF-CONTAINED?: Other Codes Requ   | activations  G SYSTEM (on which installed):  ent Restrictions  irred (name, purpose)   |
| Under Modification Purpose(s):  Ownership? Proprietary?:  MACHINE/OPERATINI  TRANSPORTABLE? Machine Dapendi  SELF-CONTAINED?: Other Codes Requ   | antiy?  G SYSTEM (on which installed):  ent Restrictions  ent Restrictions  ented (name, purpose)  RCES REQUIRED FOR RUNS:   |
| Operational Curre Under Modificatio Purpose(s): —  Ownership? — Proprietary?: — MACHINE/OPERATINI TRANSPORTABLE?. — Machine Dapend SELF-CONTAINED?: — Other Codes Requ   | antiy?  G SYSTEM (on which installed):  ent Restrictions  ent Restrictions  ented (name, purpose)  RCES REQUIRED FOR RUNS:   |
| Operational Curre Under Modificatio Purpose(s):  Ownership? Proprietary?: MACHINE/OPERATINI TRANSPORTABLE? Machine Dapendi SELF-CONTAINED?: Other Codes Requ ESTIMATE OF RESOUL Small Job Typical Job Large Job              | ant Restrictions.  ant Restrictions.  Brited (name purpose)  Core Size (Octal Words)  Execution Time (Sec. CDt. 7600)  |
| Operational Curre Under Modificatio Purpose(s): —  Ownership? — Proprietary?: —  MACHINE/OPERATIN:  TRANSPORTABLE? — Machine Dapend:  SELF-CONTAINED?: — Other Codes Requires  ESTIMATE OF RESOUL  Small Job — Typical Job — | ant Restrictions.  ant Restrictions.  Brited (name, purpose)  Core Size (Octal Words)  Execution Time (Sec. CDC 7600)  |

<sup>\*</sup>Numerical Code for the Three Dimensional Parabolic Wave Equation

| GAS DYNAMICS       | NOZZLE GEOMETRY MODELED (and type) (V) NONE Crinducal Radialis Flowing | Rectangular Linearly Flowing  | Other COORDINATE SYSTEM                        | FLUID GRID DIMENSION ( $V$ ): 10 20 30                                 | Laminar Turbuleni   | Gher Gabering Approach (V)   | Premiadd Mixing                             | Other (specify)                        | References for Approach Used                                   |                                      | THERMAL DRIVER MODELED (V). | Arc Healer Combustor                        | Shock Tube Resistance Heater        | FATOM DISCOCIATION FROM (V)            | f <sub>2</sub> Sf <sub>6</sub> | 3                           | F.ATOM CONCENTRATION DETERMINED FROM MODEL? | MODELS EFFECTS ON MIXING RATE DUE TO (1)             | Nozzle Boundary Layers Shock Waves | Prereactions (thermal blockage)Turbulence | Other (specify)        |                               | MODELS EFFECTS ON OPTICAL MODES DUE TO $(V)$        | Media Index Variations | Other (specify)   |     |  |
|--------------------|--|---|--|--|---------------------|--|---|--|--|--------------------------------------|-----------------------------|---|-------------------------------------|--|--------------------------------|-----------------------------|---|--|------------------------------------|---|------------------------|-------------------------------|---|------------------------|---|-----|--|
| KINETICS           | GAIN REGION MODELED (V) None Compact Region Annulai Region             | COORDINATE SYSTEM (Cartesian cylindrical, etc.) Command Beason Annulas Basson |  | Lompact Region   | Annular Region      | GAIN REGION SYMMETRY RESTRICTIONS.  Gain Vary Along Optic Ares?flow Direction? | PULSED: CW. KINETICS MODELED                | CHEMICAL PUMPING REACTIONS MODELED (V) | (Y · X <sub>2</sub> · YX · X)                                  | Change C                             | Other (specify)             | ENERGY TRANSFER MODES MODELED (V) Reference | **                                  | > >                                    | Other                          | Single Line Model (V)       | Multitine Model (V)                         | Assumed Rotational Population Distribution State (V) | Equilibrium Nonequitbrium          | Source of Rate Coefficients Used in Code  |                        | LINE PROFILE MODELS $(f V)$   | Dopple: Groadening                                  | Consider (specify)     |   |     |  |
| <b>OPTICS</b> None | RESONATOR TYPE (V) Standing Wave Traveling Wave (Ring) Reverse TW      | BRANCH (V) POSTING NEGATIVE OPTICAL ELEMENT MODELS INCLUDED (V)               | Flat Mirrors Spherical Mirrors                 | Cylindrical Mirrors Telescopes   | Asicons Reflasicons | Arbitrary  | Parabola: Parabola:                         | Variable Core Offset:                  | Orner (specity) Deformable Mirrors                             | Spatial Filters Gratings             | Other Elements:             | GAIN MODELS (V): Bare Cavity Only           | Simple Saturated Gain Detailed Gain | BARE CAVITY FIELD MODIFIER MODELS (V): | Mirror IIIDecentration         | Arbitrary                   | Selected (specify)                          | Reflectivity Loss                                    | Output Coupler Edges Rolled        | ServatedOther                             | Medium Index Variation | Gas Absorption                | Overlapped Beams                                    | Other                  | FAR FIELD MODELS (V.) Beam Steering Removal Optimal First Search Beam Quality | - 1 |  |
| 140                | BASIC TYPE (V) NONE Physical Opics Geometrical                         | FIELD (POLAR)ZATION) REPRESENTATION (V)                                       | COORDINATE SYSTEM (Canesian cylindrical, etc.) | Compact Region Annular Region TRANSVERSE GRID DIMENSIONALITY (V) 1D 2D | Compact Region      | Annular Kerpon<br>FIELD SYMMETRY RESTRICTIONS?                                 | MIRROR SHAPE(S) ALLOWED (V) Square Circular | Rectangular Eliptical Arbitrary        | CONFIGURATION FLEXIBILITY (V) Fixed. Single Resonator Geometry | Fixed. Multiple Resonator Geometries | - 11                        | PROPAGATION TECHNIQUE                       | With Kernel Averaging               | Gaussian Quadrature                    | Fast Fourier Transform (FFT)   | Fast Hankel Transform (FHT) | Gardener Fresnel Kirchhoff (GFK)            | Other (specify)                                      | CONVERGENCE TECHNIQUE (V)          | Power Comparison Freid Comparison         | Other                  | ACCELERATION ALGORITHMS USED? | MULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V) | Prony                  | Chler   |     |  |

| CODE NAME | NORO-1 |
|-----------|--------|
| 1         |        |

|   | inetics   |
|---|---|
| PRINCIPAL PURPO   | E(S)/APPLICATION(S) OF CODEModels rotational nonequilibrium effects in CW chemical laser  |
| (Combined w   | th other optics models, e.g., see ROPTICS).   |
|   |   |
|   | <del></del>   |
|   | PARKUTHES Predicts power spectral distribution, effect of rotational nonequilibris  |
| A <b>ssessment o</b> f c<br>on laser pe   |   |
| on tuser pe   | TOTALICE.   |
|   |   |
|   |   |
| ASSESSMENT OF L   |   |
| lines, Fabr   | -Perot cavity, fluid dynamic variables p, p, T, u input as constants, premixed.   |
|   |   |
|   |   |
|   | TURESThis model was used to demonstrate the importance of rotational nonequilibrium   |
|   | CW chemical lasers. To ascertain the role of the resonator, it was coupled to the   |
|   | ace strip resonator code and run with a confocal unstable resonator. In this form   |
|   | known as ROPTICS.   |
| ORIGINATOR/KEY  | (017) 000 1004  |
|   | Aeronautical and Astronautical Engineering Dept., University of Illinois  |
|   | Urbana, Illingis 61801  |
| Address:  | 970dila, 11111015 01001 (T) 1 Chemical Physics 62 3523 (1975): (  |
| Annlied Ont   |   |
| ADDITED ODE   | ics 15, 744 (1976); (RP) J. Chemical Physics 67, 966 (1977); (RP) Applied Optics 17,  |
|   | ENTATION (T. Theory, U. User RP. Relevant Publication) (T. J. Chemical Physics 62, 3523 (1975); (ics 15, 744 (1976); (RP) J. Chemical Physics 67, 966 (1977); (RP) Applied Optics 17,   |
| 2244 (1978)   |   |
|   |   |
|   |   |
|   |   |
| 2244 (1978)   |   |
| 2244 (1978)   |   |
| 2244 (1978)   | ently?:Yes  |
| 2244 (1978) STATUS: Operational Cu  | ently?:Yes.   |
| 2244 (1978) STATUS: Operational Cu  | ently?:Yes.   |
| 2244 (1978)  STATUS:  Operational Cu Under Modifica Purpose(s)  | ently?:Yes  |
| STATUS: Operational Cu Under Modifica Purpose(s) Ownership?:  | ently?:Yes  |
| 2244 (1978)  STATUS:  Operational Cu Under Modifica Purpose(s)  Ownership? Proprietary?:  | Bell Aerospace TEXTRON Yes  |
| 2244 (1978)  STATUS:  Operational Cu Under Modifica Purpose(s)  Ownership? Proprietary?:  | ently?:Yes  |
| 2244 (1978)  STATUS:  Operational Cu Under Modifica Purpose(s)  Ownership? Proprietary?:  | Bell Aerospace TEXTRON Yes  NG SYSTEM (on which installed): IBM. CDC  |
| 2244 (1978)  STATUS: Operational Cu Under Modifica Purpose(s)  Ownership?: Proprietary?: MACHINE/OPERAT  TRANSPORTABLE?   | Bell Aerospace TEXTRON Yes  NG SYSTEM (on which installed): IBM. CDC  |
| STATUS.  Operational Cu Under Modifica Purpose(s)  Ownership?: Proprietary?: MACHINE/OPERAT  TRANSPORTABLE? Machine Depe  | ently?:Yes_ ion?:  Bell Aerospace TEXTRON Yes  NG SYSTEM (on which installed):IBM. CDC  Yes  dent Restrictions:   |
| STATUS:  Operational Cu Under Modifica Purpose(s)  Ownership?: Proprietary?: MACHINE/OPERAT TRANSPORTABLE? Machine Depe   | ently?:Yes_ ion?:  Bell Aerospace TEXTRON Yes  NG SYSTEM (on which installed):IBM. CDC  Yes  dent Restrictions:   |
| STATUS: Operational Cu Under Modifica Purpose(s) Ownership?: Proprietary?: MACHINE/OPERAT TRANSPORTABLE? Machine Depe   | ently?:Yes_ ion?:  Bell Aerospace TEXTRON Yes  NG SYSTEM (on which installed):IBM. CDC  Yes  dent Restrictions:   |
| STATUS.  Operational Cu Under Modifica Purpose(s)  Ownership? Proprietary?: MACHINE/OPERAT  TRANSPORTABLE? Machine Depe   | ently?:Yes  |
| 2244 (1978) STATUS: Operational Cu Under Modifica Purpose(s) Ownership?: Proprietary?: MACHINE/OPERAT TRANSPORTABLE? Machine Depe                                       | Bell Aerospace TEXTRON Yes  NG SYSTEM (on which installed): IBM. CDC Yes dent Restrictions: Yes  Quired (name, purpose):  |
| 2244 (1978)  STATUS: Operational Cu Under Modifica Purpose(s)  Ownership?: Proprietary?: MACHINE/OPERAT  TRANSPORTABLE? Machine Depe                                    | ently?:Yes  |
| STATUS: Operational Cu Under Modifica Purpose(s) Ownership?: Proprietary?: MACHINE/OPERAT TRANSPORTABLE? Machine Depe   | ently?:Yes_ ion?:   |
| STATUS.  Operational Cu Under Modifica Purpose(s)  Ownership?: _ Proprietary?: _ MACHINE/OPERAT  TRANSPORTABLE? Machine Depe SELF-CONTAINED?: Other Codes R:  Small Job | ently?:Yes_ ion?:   |
| STATUS.  Operational Cu Under Modifica Purpose(s)  Ownership? Proprietary?  MACHINE/OPERAT  TRANSPORTABLE? Machine Depe  SELF-CONTAINED? Other Codes Ri  Small Job.     | ently?: Yes.  Bell Aerospace TEXTRON Yes  NG SYSTEM (on which installed): IBM. CDC  Yes  dent Restrictions: —  Yes  Quired (name, purpose):  URCES REQUIRED FOR RUNS.  Core Size (Octal Words)   Execution Time (Sec. CDC 7600) |

....

ſ

NORO-I

| OPTICS   | sol   | KINETICS   | GAS DYNAMICS                                |
|--|---|--|---|
|  | RESONATOR TYPE (1) Standing Wave            | GAIN REGION MODELED ();  | NOZZLE GEOMETRY MODELED (and type) (V)      |
| Property of Optics   |   | Lompect Regrun Annula: Regron  | Cylindrical fieds of flowing                |
| FIELD (POLARIZATION) REPRESENTATION (V)                          | BRANCH (1) Positive Negative                | COURDINATE SYSTEM (Cartesian critical at Compact Region Cd. Annular Region | Rectanguiar Linearly Froming *              |
| COORDINATE SYSTEM (Cartesian cylindrical atc.)                   | Flat Mirrors Spherical Mirrors              | KINETICS GRID DIMENSIONALITY (V.)  | Cartecian Cartecian                         |
| Compact Region Annular Region                                    | Cylindric al MirroraTelesc opes             | 10 20 10   | FLUID GRID DIMENSION (N) 10 20 30           |
| TRANSVERSE GRID DIMENSIONALITY (V) 1D 2D                         | Scraper Mirrors                             | Compact Region   | FLOW THELD MODELED (V.)                     |
| Compact Region   | Aurons Reflancons                           | Annula: Region   | Laminar Turbulent                           |
| Annular Region   | Arbitrary                                   | GAIN REGION SYMMETRY RESTRICTIONS  | Other                                       |
| FIELD SYMMETRY RESTRICTIONS?                                     | Linear                                      | Gain Yary Along Optic Ases? Flow Direction?                                | BASIC MODELING APPROACH (V)                 |
| MIRROR SHAPE(S) ALLOWED (V)                                      | Parabola Parabola                           | PULSED CW . KINETICS MODELED   | Premised t build                            |
| Eliptical  | Variable Cone Offset                        | CHEMICAL PUMPING REACTIONS MODELED (V)                                     | Other (specify)                             |
| ON FLEXIBILITY (V)   | Other (specify)                             | ]<br>  |   |
| Fised Single Resonator Geometry                                  | Deformable Mirrors                          |  | Mererances for Approach Used                |
| Fred Multiple Resonator Geometries                               | Spatial Filters Gratings                    | Cham (f.   |   |
| Modular Multiple Resonator Geometries                            | Other Elements                              | ŀ  | THEREAL ORIVER MODELED (1)                  |
| PROPAGATION TECHNIQUE  |   | ENERGY TRANSFER MODES MODELED (\$) Reference                               | Arc Heater Combustor                        |
| Freshes integral Migorithms                                      | GAIN MODELS (V) Bara Carrity Only           |  |   |
| With Karnel Averaging  | Simple Saturated Gain Detailed Gain         |  | 200   |
| Gaussian Quadrature  | 쁜   | * *  | F ATOM DISSOCIATION FROM (1)                |
| Fast Fourier Transform (FFT)                                     | Mirror 1ft Decentration                     | Other  | f <sub>2</sub>                              |
| Fast Hankel Transform (FMT)                                      | Aberrations / Thermal Distortions           | Single Line Model (V.)   | Other (specify)                             |
| Gardenar Freshell Kirchhoff (GFK)                                | Arbitery                                    | Multitine Model (V)  | F-ATOM CONCENTRATION DETERMINED FROM MODEL? |
| Other (specify)  | Selected (specify)                          | Assumed Rotational Population Distribution State ()                        | DILUENTS MODELED                            |
|  | Output Coupler Edges Rolled                 | Equilibrium Nonequilibrium (Continue)                                      | MODELS EFFECTS ON MIXING RATE DUE TO (V.)   |
| Ž  | Serrated                                    | Number of Laser Lines Modeled 11065 Tase.                                  | Presentation (Phenesis Machines)            |
| Power Comparison Treat Comparison Comparison Comparison Contract | 4   | Source of Rate Coefficients Used in Code CORED S HE                        | Other (specify)                             |
|  | Medium Index Vanation                       | rate package, Hinchen's rotational   |   |
| ACCELERATION ALGORITHMS USED:                                    | Gas Absorption                              | LINE PROFILE MODELS (V)  |   |
| MULTIPLE ELGENYALUE -VECTOR ENTRACTION ALCORITHM (V)             | Overlapped Beams                            | Doppler Broadening   | MODELS FFECTS ON OPTICAL MODES DUE TO (V)   |
| Prony  | Other                                       | Collisional Broadening   | Media Index Variations                      |
| Other  | FAR FIELD MODELS (V.) Beam Steering Removal | Other (specify) VOIGIL PTUILE.   | Other (specify)                             |
|  | Optimal fix at Search Beam Quality          | # Dolarion data Dolary's Dimning   |   |
|  | (Alber                                      | distribution.  |   |
|  |   |  |   |

| CODE NAME: | OCELOT |
|------------|--------|

| CODE TYPE <u>001</u>  | tics   |   |   |   |                    |
|---|--|---|---|---|--------------------|
|   |  | T. 1 1  |   | (-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-         |                    |
| RINCIPAL PURPOS   | E(S)/APPLICATION(S) OF CODE  | 1001 to assist w  | ith resonator o   | lesign and mode control.                          |                    |
|   |  |   |   |   |                    |
|   |  |   |   |   |                    |
|   |  |   |   |   |                    |
|   |  |   |   | any resonator we have b                           |                    |
|   |  |   |   | l coordinate systems ar                           |                    |
|   | more elements available with coupled trans   |   |   | present. Simultaneous                             | multiple           |
| spectral line   | s with coupled trais   | icions used in sim  | re garri moder.   |   |                    |
| ASSESSMENT OF LIF   | MITATIONS Limited  | almost exclusively  | by lack of mod  | lels for those elements                           | we                 |
|   | time to write models   |   | CO TACK OF THE  | <u> </u>  |                    |
|   |  |   |   |   |                    |
|   |  |   |   |   |                    |
|   |  | <del> </del>  |   |   |                    |
| THER UNIQUE FEA   | TURES _Modeled HSURI   | A. unstable P-P ax  | con negative t  | ranch ring; many compac                           | t. folded          |
| resonator/amp   | c can specify any num  | bon of field static   | ns located who  | fier beams to overlap r<br>rever desired. Utilize | esonator<br>s both |
|   | can specify any num  |   | ons rocated wife  | Tever desired. Otilize                            | S DOCTI            |
|   |  | ace systems.  |   |   |                    |
| DRIGINATOR/KEY C  | David Fink 6/C 129   | Pho   | (213)   | 391-0711, Ext. 6925                               |                    |
|   | lughes Aircraft Compa  |   | one:  |   |                    |
|   | Culver City, Californ  |   |   |   |                    |
|   |  |   |   |   |                    |
| VAILABLE DOCUM  | ENTATION: (T = Theory, U = Use   |   | Not available   |   |                    |
| AVAILABLE DOCUM   |  |   | Not available   |   |                    |
| AVAILABLE DOCUMI  |  |   | Not available   |   |                    |
|   |  |   | Not available   |   |                    |
| STATUS  | ENTATION: (T · Theory, U = Use   |   | Not available   |   |                    |
| STATUS:<br>Operational Curr   | ENTATION: (T : Theory, U = Use   |   | Not available   |   |                    |
| STATUS:<br>Operational Curr<br>Under Modificati   | ENTATION: (T : Theory, U = Use   | r. RP Relevant Publication)                                   |   |   |                    |
| STATUS:<br>Operational Curr   | ENTATION: (T : Theory, U = Use   | r. RP Relevant Publication)                                   |   |   |                    |
| STATUS:  Operational Curr  Under Modificati  Purpose(s):  | ently?: Yes Increase number of   | models in cylindr   |   |   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?:   | ently? Yes Increase number of Hughes Aircraft Co   | models in cylindr   |   |   |                    |
| STATUS:  Operational Curr Under Modificati Purpose(s):  Ownership?: Proprietary?:   | ently? Yes ion? Yes Increase number of Hughes Aircraft Coi   | models in cylindr   | ical coordinate   |   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?:   | ently? Yes Increase number of Hughes Aircraft Co   | models in cylindr   | ical coordinate   |   |                    |
| STATUS:  Operational Curr Under Modificati Purpose(s):  Ownership?:  Proprietary?:  MACHINE/OPERATI   | ently? Yes ion? Yes Increase number of Hughes Aircraft Cor Yes   | models in cylindr   | ical coordinate   | 5.  |                    |
| STATUS:  Operational Curr Under Modificati Purpose(s):  Ownership?:  Proprietary?:  MACHINE/OPERATIE TRANSPORTABLE?   | ently?: Yes ion?: Yes Increase number of Hughes Aircraft Col Yes NG SYSTEM (on which installed). Almost, previous v.   | models in cylindr mpany  CDC 7600 CDC 176 ersions have been 6 | ical coordinate   | 25.<br>   |                    |
| STATUS:  Operational Curr Under Modificati Purpose(s):  Ownership?:  Proprietary?:  MACHINE/OPERATIE TRANSPORTABLE?   | ently? Yes ion? Yes Increase number of Hughes Aircraft Cor Yes   | models in cylindr mpany  CDC 7600 CDC 176 ersions have been 6 | ical coordinate   | 25.<br>   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: WACHINE/OPERATII TRANSPORTABLE?: Machine Depen                                  | ently?: Yes  fon? Yes  Increase number of  Hughes Aircraft Con Yes  NG SYSTEM (on which installed).  Almost, previous V.  dent Restrictions Control  | models in cylindr mpany  CDC 7600 CDC 176 ersions have been 6 | ical coordinate   | 25.<br>   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII TRANSPORTABLE?: Machine Depen                                  | ently? Yes  lon? Yes  Increase number of  Hughes Aircraft Col Yes  NG SYSTEM (on which installed).  Almost, previous v. dent Restrictions Control Yes  | models in cylindr mpany  CDC 7600 CDC 176 ersions have been 6 | ical coordinate   | 25.<br>   |                    |
| STATUS:  Operational Curr Under Modificati Purpose(s):  Ownership?:  Proprietary?:  MACHINE/OPERATII  TRANSPORTABLE?:  Machine Depen                            | ently?: Yes  fon? Yes  Increase number of  Hughes Aircraft Con Yes  NG SYSTEM (on which installed).  Almost, previous V.  dent Restrictions Control  | models in cylindr mpany  CDC 7600 CDC 176 ersions have been 6 | ical coordinate   | 25.<br>   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII TRANSPORTABLE?: Machine Depen                                  | ently? Yes  ion? Yes  Increase number of  Hughes Aircraft Cor  Yes  NG SYSTEM (on which installed).  Almost, previous volum Restrictions: Control  Yes  quired (name, purpose):                              | models in cylindr mpany  CDC 7600 CDC 176 ersions have been 6 | ical coordinate   | 25.<br>   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII TRANSPORTABLE?: Machine Depen                                  | ently? Yes  lon? Yes  Increase number of  Hughes Aircraft Col Yes  NG SYSTEM (on which installed).  Almost, previous v. dent Restrictions Control Yes  | models in cylindr mpany  CDC 7600 CDC 170 ersions have been o | ical coordinate  Sonverted to Its d external file                     | M. usage.   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII TRANSPORTABLE?: Machine Depen SELF-CONTAINED?: Other Codes Rec | ently? Yes  ion? Yes  Increase number of  Hughes Aircraft Cor  Yes  NG SYSTEM (on which installed).  Almost, previous volum Restrictions: Control  Yes  quired (name, purpose):                              | models in cylindr mpany  CDC 7600 CDC 176 ersions have been 6 | ical Coordinate  converted to It dexternal file                       | M. usage.   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII TRANSPORTABLE?: Machine Depen SELF-CONTAINED?: Other Codes Rec | ently?: Yes  lon?: Yes  Increase number of  Hughes Aircraft Col Yes  NG SYSTEM (on which installed).  Almost, previous v. dent Restrictions Control Yes  quired (name, purpose):                             | models in cylindr mpany  CDC 7600 CDC 170 ersions have been o | ical coordinate  Sonverted to Its d external file                     | M. usage.   |                    |
| STATUS: Operational Curr Under Modificati Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATII TRANSPORTABLE?: Machine Depen SELF-CONTAINED?: Other Codes Rec | ently? Yes  font: Yes  Increase number of  Hughes Aircraft Cor  Yes  NG SYSTEM (on which installed).  Almost, previous v.  dent Restrictions Control  Yes  quired (name, purpose):  URCES REQUIRED FOR RUNS: | models in cylindr mpany  CDC 7600 CDC 170 ersions have been o | ical coordinate  converted to It d external file  Execution Time (Sec | M. usage.   |                    |

CODE NAME:

| 3   |
|-----|
| - [ |

| 0PTICS   | SOI   | KINETICS  | GAS DYNAMICS   |
|--|---|---|--|
| BASIC TYPE (1) Physical Optics Geometrical   | RESONATOR TYPE (V): Standing Wave   | GAIN REGION MODELED (V): None Compact Resign                              | NOZZLE GEOMETRY MODELED (and type) (V) None  |
| FIELD (POLARIZATION) REPRESENTATION (V):   | BRANCH (V): Positive / Negalive / OPTICAL FI EMENY MODELS INC. 116-1116-110-110-110-110-110-110-110-110 | COORDINATE SYSTEM (Cartesian, cylindrical, etc.)                          | Rectangular, Linearly Flowing  |
| ical etc)  | Flat Merces Spherical Mirrors.  | KINETICS GRID DIMENSIONALITY (V):   | COORDINATE SYSTEM  |
| Compact Region Annular Region T  | Cylindrical Mirrors: V Telescopes:  | Compact Region  | FLUID GRID DIMENSION ( $V$ ) 10  |
| Compact Region Ca , C.;  | Azicons Reflaxicons   | Annular Region  | Laminat Turbulani  |
| Annular Region Cy FIELD SYMMETRY RESTRICTIONS? 1eft-right*   | Arbitrary   | GAIN REGION SYMMETRY RESTRICTIONS:  | Other BACKLING SEGENCE IV  |
| MIRROR SHAPE(S) ALLOWED (V) for Cartesian:   | Parabola Parabola   | PULSED CW. KINETICS MODELED   | Premised Transfer of the Premised  |
| Square Circular Strip Rectangular / Eliphical * Arbitrary  | Variable Cone Offset:   | CHEMICAL PUMPING REACTIONS MODELED (V):                                   | Other (specify)  |
| CONFIGURATION FLEXIBILITY (V)  | Other (specify): Deformable skirrors.   | ~ <u>~</u>  | References for Approach Used   |
| Fred. Multiple Resonator Geometries  | Spatial Filters   | Cold (F · H <sub>2</sub> ) Chain (F · H <sub>2</sub> B · F <sub>2</sub> ) |  |
| . 11   | Other Elements  | Other (specify).  | THERMAL DRIVER MODELED (1)   |
| Francia triagral Attentions  | GAIN MODELS (V): Bere Cavity Only   | ENERGY TRANSFER MODES MODELED (V) Reference                               | Arc HesterCombustor  |
| With Kernel Averaging  | Simple Saturated Gain: Detailed Gain  | V. P  | Shock Tube Resistance Heater   |
| Gaussian Quadrature  | BARE CAVITY FIELD MODIFIER MODELS (V): Cartes jan*  | ,   | CATOM DISCOCIATION FROM A  |
| Fast Fourier Transform (FFT):  | Aberrations/Thermal Distortions   | Other   | rate of the second seco |
| Fast Nankel Transform (FMT)  | Arbitrary   | Single Line Model (V)   | Other (specify)  |
| Other (specify)  | selected (specify) Hughes mirror model.   | Multitine Model (V)   | F ATOM CONCENTRATION DETERMINED FROM MODEL?  DILUENTS MODELED  |
|  | Reflectivity Loss   | Equilibrium Rosequilibrium  | MODELS EFFECTS ON MIXING RATE DUE TO (1)   |
| CONVERGENCE TECHNIQUE (V):  Power Comparison x' field Comparison \(\frac{1}{2}\) \(\frac{1}{2}\) \(\frac{1}{2}\) | Serrated: Other   | Number of Laser Lines Modeled   | Notite Boundary Leters Shock Wares Presections (the rnal blockage) Turbulence  |
|  | LOADED CAVITY FIELD MODIFIER MODELS (V)   | Source of Rate Coefficients Used in Code                                  | Other (specify)  |
| ACCELERATION ALGORITHMS USED? NO   | Medium Index Variation:   | LINE PROFILE MODELS (V)   |  |
| multiple eigenvalue/vectorextraction algorithm ( $V_{\rm i}$ ).  | Overlapped Beams / Owner Any number & loca. of gain   | Doptier Broadening<br>Colleconsi Broadening                               | MODELS EFFECTS ON OPTICAL MODES DUE TO (\$)  |
| Other  | FAR FIELD MODELS (V): Beam Steering Removal 1/4 Optimal Focal Search 1/4 Beam Quality 1/4               | Other (apacoft)   | Office (specify)   |
|  | Other   |   |  |
|  |   |   |  |

+also for cylindrical coordinates.
\*(restriction will be removed.)

\*cylindrical in progress.

| CODE | NAME |
|------|------|

| POLRES/POLKESH |  |
|----------------|--|
|                |  |

| RINCIPAL PURPOSE(S)/APPLICAT   |   | dalf-symmetric Unstable Resonator Analysis with  |
|--|---|--|
| two Fourier component  | s for analysis of polarization  | on effect. POLRESH-HSURIA modification.  |
|  |   |  |
|  |   |  |
| ASSESSMENT OF CAPABILITIES:  | Bare resonator analysis for po  | plarization effects.   |
|  |   |  |
| · <del></del>  |   |  |
|  |   |  |
| ASSESSMENT OF LIMITATIONS: _   | No-gain effects, resonato   | or specific HSUR and HSURIA.   |
| <del></del>  |   |  |
|  |   |  |
|  | Models HSIID HSIIDIA line   | ear-linear, PP wax or reflax. Analysis of  |
| DTHER UNIQUE FEATURES:<br>polarization_effects   |   | ear-linear, PP wax or reflax. Analysis of  |
| PATEL LEGICION ETTECTS   | ··  |  |
|  |   |  |
| ORIGINATOR/KEY CONTACT:  | P. Latham P   | (505) 844 -0721  |
| AEUL (ALE  |   | hone:(505) 844 -0721   |
|  |   |  |
| Address Kirtland   | l Air Force Base. New Mexico  | 87117  |
|  |   |  |
|  |   |  |
| AVAILABLE DOCUMENTATION: (T. (1979); W. P. Latham,   | Theory, U - User, RP = Relevant Publication "Polarization Effects in a l  |  |
| AVAILABLE DOCUMENTATION: (T. (1979); W. P. Latham,   |   |  |
| AVAILABLE DOCUMENTATION: (T. (1979); W. P. Latham,   | Theory, U - User, RP = Relevant Publication "Polarization Effects in a l  |  |
| AVAILABLE DOCUMENTATION: (T. (1979); W. P. Latham,   | Theory, U - User, RP = Relevant Publication "Polarization Effects in a l  |  |
| AVAILABLE DOCUMENTATION: (T. (1979); W. P. Latham,   | Theory, U - User, RP = Relevant Publication "Polarization Effects in a l  |  |
| AVAILABLE DOCUMENTATION (T<br>(1979); W. P. Latham,<br>Rear Cone," Applied C   | Theory, U - User, RP = Relevant Publication "Polarization Effects in a l  |  |
| AVAILABLE DOCUMENTATION: (T<br>(1979); W. P. Latham,<br>Rear Cone," Applied C  | = Theory, U - User, RP = Relevant Publication<br>"Polarization Effects in a l<br>ptics, to be published.  |  |
| AVAILABLE DOCUMENTATION: (T<br>(1979); W. P. Latham,<br>Rear Cone," Applied C  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H ptics, to be published.  | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone," Applied C  STATUS:  Operational Currently?: Under Modification?:   | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H Optics, to be published.  Yes  Ves I version for HSURIA, simple s  |  |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone," Applied (  STATUS:  Operational Currently?:  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H ptics, to be published.  | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied C  STATUS: Operational Currently?: Under Modification?: Purpose(s):  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a liptics, to be published.  Yes I version for HSURIA, simple singularly sexperiments.   | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone," Applied C  STATUS: Operational Currently?:   | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H Optics, to be published.  Yes  Ves I version for HSURIA, simple s  | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied C  STATUS:  Operational Currently?:  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H ptics, to be published.  "es I version for HSURIA, simple s duquley's experiments.   | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied C  STATUS:  Operational Currently?:  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H ptics, to be published.  "es I version for HSURIA, simple s duquley's experiments.   | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone," Applied C  STATUS: Operational Currently?:   | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H ptics, to be published.  "es I version for HSURIA, simple s I version for HSURIA, | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied C  STATUS: Operational Currently?:   | Theory, U - User, RP - Relevant Publication "Polarization Effects in a h ptics, to be published.  (es I version for HSURIA, simple s luquley's experiments.  Inment-AFWL I which installed): CDC 176 (AFWL)   | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied C  STATUS: Operational Currently?:   | Theory, U - User, RP - Relevant Publication "Polarization Effects in a h ptics, to be published.  (es I version for HSURIA, simple s luquley's experiments.  Inment-AFWL I which installed): CDC 176 (AFWL)   | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied C  STATUS:  Operational Currently?:  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H ptics, to be published.  "es I version for HSURIA, simple s duquley's experiments.  Imment-AFWL  The which installed): CDC 176 (AFWL)  The Machine language FFT.   | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated saturable gain, ring analysis of Chodzke and  |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied C  STATUS: Operational Currently?:   | Theory, U - User, RP - Relevant Publication "Polarization Effects in a h ptics, to be published.  (es I version for HSURIA, simple s luquley's experiments.  Inment-AFWL I which installed): CDC 176 (AFWL)  The Machine language FFT.  Durposes:   | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied (  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H Optics, to be published.  Yes I version for HSURIA, simple so Industry's experiments.  Industry's experiments.  Industry - AFWL  INSLLIB-LEQ2C - 1ine  ASPLIB-ZRPCC - poly   | n: (RP) G. C. Dente, Applied Optics 18, 2911 half-Symmetric Unstable Resonator with a Coated saturable gain, ring analysis of Chodzke and hear equation solution                         |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied (  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H Optics, to be published.  Yes I version for HSURIA, simple so Industry's experiments.  Industry's experiments.  Industry - AFWL  INSLLIB-LEQ2C - 1ine  ASPLIB-ZRPCC - poly   | n: (RP) G. C. Dente, Applied Optics 18, 2911 half-Symmetric Unstable Resonator with a Coated saturable gain, ring analysis of Chodzke and hear equation solution                         |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied Content of the Part  | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H Optics, to be published.  Yes I version for HSURIA, simple singularly's experiments.  Imment-AFWL I which installed): CDC 176 (AFWL)  The Machine language FFT.  Purpose): IMSLLIB-LEQ2C - line ASPLIB-ZRPCC - poly  ED FOR RUNS:  Core Size (Octal Words)   | (RP) G. C. Dente, Applied Optics 18, 2911  Half-Symmetric Unstable Resonator with a Coated  saturable gain, ring analysis of Chodzke and  ear equation solution  ynomial root solution   |
| AVAILABLE DOCUMENTATION: (T (1979); W. P. Latham, Rear Cone, "Applied C P. Latham, P. La | Theory, U - User, RP - Relevant Publication "Polarization Effects in a H Optics, to be published.  The state of the state | n: (RP) G. C. Dente, Applied Optics 18, 2911 Half-Symmetric Unstable Resonator with a Coated  saturable gain, ring analysis of Chodzke and  ear equation solution  ynomial root solution |

Ĩ

| SICTIVE (1), Transition (2)  Transition (2)  ELO POLARIZATION REPRESENTATION (2)  READ  ELO POLARIZATION (3)  RESON  Transition (3)  PRAIN  OPTIC  PRAIN  PR |  | KINETICS  | GAS DYNAMICS                                |
|--|--|---|---|
|  | RESONATOR TYPE (V). Standing Wave  | GAIN REGION MODELED (V) NORE  | NOZZLE GEOMETRY MODELED (and type) (V) NORE |
|  | Traveling Wave (Ring) Reverse TW   | Compact Region Annuia: Region   | Cylindrical Radielly Flowing                |
|  | BRANCH (V) Positive A Negative   | COORDINATE SYSTEM (Cartesian cylindrical, etc.)   | Reclangular Linearly Flowing                |
|  | OPTICAL ELEMENT MODELS INCLUDED (V)  | Compact Region Annular Region   | Other                                       |
|  | Flat Mirrors X Soherical Mirrors X   | KINETICS GRID DIMENSIONALITY (V):   | COORDINATE SYSTEM                           |
|  | Cylindrical Mitross. Telescopes  | 10 20 30  | FLUID GRID DIMENSION (\$) 10 30             |
| ISIONALITY (V) 10 20   | Scraper Mirrors  | Compact Region  | FLOW FIELD MODELED (V)                      |
| it.  | Asicons Reflaucons   | Annular Region:   | Leminar                                     |
| Annular Region *   | Arbitery   | GAIN REGION SYMMETRY RESTRICTIONS.  | Other                                       |
|  | * * 'sen'i   | Gain Vary Along Optic Axes?. Flow Direction?  | BASIC MODELING APPROACH ( )                 |
| APE(S) ALLOWED (V)   | Parabola Parabola *  | PULSED CW. KINETICS MODELED   | Premised Mining                             |
| Crede Street   | Vanuable Come Offset.  | G REACTIONS MODELED (   | Other (specify)                             |
| Arbitrary  | Other (specify):   |   |   |
| `  | Deformable Mirrors   | (Y· X2 YX· X)   | References for Approach Used                |
|  |  | Cobd (f · 11 <sub>2</sub> )   |   |
| Fixed Multiple Resonator Geometries  | Spends where the second | Hot (H + F2) Chain (f - H2 & H - F2)  |   |
| Modular Muttiple Resonator Geometries  | Other Elements   | Other (specify)   | THERMAL DRIVER MODELED (\$)                 |
| ROPAGATION TECHNIQUE NO PERSON SHOWS AND AND   |  | ENERGY TRANSFER MODES MODELED (V) Reference   | Arc Heater Combustor                        |
| Fresher Integral Algorithms  | GAIN MODELS (V): Bara Canty Only: NODE   | V.T   | Shocy Tube Retailance Heater                |
| With Kernel Averaging *  | Simple Saturated Gain: Detailed Gain   | #. A  |   |
| Gaussian Quadrature  | BARE CAVITY FIELD MODIFIER MODELS (V) NONE   | 2   |   |
|  | Winner Titt Decentration   |   | FATOM DISSOCIATION FROM (V)                 |
| *  | Aberrations / Thermal Distortions  | other control of the | 2 26  |
|  | Arbitrary  | Single Line Model (V)   | Other (specify)                             |
| Gardener Fresnet Kirchhoff (GFK)   | The state of the s | Multilline Model (V.)   | F.ATOM CONCENTRATION DETERMINED FROM MODEL  |
| Other (specify)  |  | Assumed Rotational Population Distribution State (V)  | DILUENTS MODELED                            |
|  | Maria Lors   | Equithrium Nonequilibrium   | MODELS EFFE "TS ON MIXING RATE DUE TO (1)   |
| ONVERGENCE TECHNIQUE (V)   | Output Coupler Edges Rotted  | Number of Laser Lines Modeled   | Mozzle Boundary Layers Shock Waves          |
|  | Secretary Chines   | Source of Rate Coefficients Used in Code  | Presections (thermal blockage)              |
| ome Krylov Matrix Method   | LOADED CAVITY FIELD MODIFIER MODELS (V) NONE   |   | Other (specify)                             |
| HMS USED,  | Medium Inder Variation   | LINE PROFILE MODELS (V)   |   |
| Technique NT 910V  |  | Doppier Broadening  |   |
| EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V).  | Overlapped Brams   | Califeronal Broadening  | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)  |
|  | Other  | ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )   | Medic Index Variations                      |
| One Krylov   |  |   | Other (specify)                             |
| Š.   | Optimal Focal Search Beam Quality  |   |   |
| Other  | Other  |   |   |
|  |  |   |   |

\* H version only

| CODE NAME. | POP |
|------------|-----|
|            | _   |

|   | POP (Phy   | sical Optics Propagation) Code: Physical optics analysis  |
|---|--|---|
|   |  | eric propagation. Not limited to HEL resonators. Can  |
|   | pulsed CO EDL. GDL and joding  |   |
|   | POTON VON PORT OF THE POTON POTON PORT OF THE POTON POTON PORT OF THE POTON PO |   |
|   |  |   |
| SSESSMENT OF C  | APABILITIES General purpose, ver   | satile code which is easily applied to HEL problems   |
|   |  | s, atmospherics, and adaptive optics.   |
|   |  |   |
|   |  |   |
|   | Name 1 3 marks at a second   | Turning and   |
| SSESSMENT OF L  | IMITATIONS NORMAL LIMITS QUE TO  | sampling and aliasing requirements. Iransverse grid<br>2-D Cartesian. 2 <sup>N</sup> x 2 <sup>M</sup> . N+M = 16; (b) 2-D cylindrical |
| 2048 radia  | points v 1 azimuthal modes (1  | 300); (2) Annular region: 1-D cylindrical, 2048   |
|   | its x 1 azimuthal modes (1 · 300   |   |
| Tudiai pon  | res x 1 az maenar modes (1 500   |   |
| THER UNIQUE FE  | Aruse Frinciple Resonator G  | eometries Modeled: HSURIA, Compact Unstable Confocal or   |
|   |  | (or Toric, Toric Unstable Resonators (Annular),   |
|   |  | ace routine allows use of a variety of kinetic models   |
| with the PO   | P. Other features include ZER  | NIKE polynomial decomposition and modification, pulsed or   |
| CW thermal  | blooming, kinetic cooling.   |   |
| Name:   | Dr. Peter B. Mumola  | Phone: (203) 762-4415   |
| Organization:   | Perkin-Elmer Corporation   |   |
| Address:  | 50 Danbury Rd./Ms 241, Wilton  | . Connecticut 06897   |
|   |  | , connectitute 00897  |
| VAILABLE DOCUI  |  | nnt Publication): _(I) Available; (U) Available   |
|   |  |   |
| TATUS   | #ENTATION: (T - Theory, U - User, RP = Releva  |   |
| TATUS Operational Cu  | MENTATION: (T - Theory, U - User, RP = Releva  |   |
| TATUS Operational Cu Under Modifica   | MENTATION: (T - Theory, U - User, RP = Releva<br>reently?: Yes<br>ston? As required  |   |
| TATUS Operational Cu  | MENTATION: (T - Theory, U - User, RP = Releva<br>reently?: Yes<br>ston? As required  |   |
| TATUS Operational Cu Under Modifica   | MENTATION: (T - Theory, U - User, RP = Releva<br>reently?: Yes<br>ston? As required  |   |
| TATUS Operational Cu Under Modrific Purpose(s)  | MENTATION: (T - Theory, U - User, RP = Releva<br>reently?: Yes<br>ston? As required  |   |
| TATUS Operational Cu Under Modrica Purpose(s) Ownership? Proprietary?   | rently? Yes tton? As required  Perkin-Elmer Yes  | ant Publication). (I) Available; (U) Available  |
| TATUS Operational Cu Under Modrica Purpose(s) Ownership? Proprietary?   | rently? Yes tton? As required  Perkin-Elmer Yes  | ant Publication). (I) Available; (U) Available  |
| Operational Cu Under Modrific Purpose(s) Ownership?   | rently? Yes tton? As required  Perkin-Elmer Yes  |   |
| Operational Cu Under Modrice Purpose(s) Ownership? Proprietary? SACHINE/OPERAT  | #ENTATION: (T - Theory, U - User, RP = Releval  reentity? Yes  ston? As required  Perkin-Elmer  Yes  TING SYSTEM (on which installed) CDC, 750   | ant Publication). (I) Available; (U) Available  |
| Operational Cu Under Modifici Purpose(s) Ownership? _ Proprietary? _ SACHINE/OPERAT   | #ENTATION: (T - Theory, U - User, RP = Releval  reentity? Yes  ston? As required  Perkin-Elmer  Yes  TING SYSTEM (on which installed) CDC, 750   | ant Publication). (I) Available; (U) Available  |
| Operational Cu Under Modifici Purpose(s)  Ownership? _ Proprietary? _ NACHINE/OPERAT RANSPORTABLE? Machine Depa                                   | rently? Yes  Rentation: (T - Theory, U - User, RP = Relevance  rently? Yes  Rentation? As required  Perkin-Elmer  Yes  [ING SYSTEM (on which installed)  | ont Publication). (I) Available; (U) Available  |
| Operational Cu Under Modrics Purpose(s) Ownership? Proprietary? ARCHINE/OPERAT TRANSPORTABLE? Machine Depa  | rently? Yes  Rentation: (T - Theory, U - User, RP = Relevance  rently? Yes  Rentation? As required  Perkin-Elmer  Yes  [ING SYSTEM (on which installed)  | ont Publication). (I) Available; (U) Available  |
| Operational Cu Under Modifici Purpose(s) Ownership? _ Proprietary? _ NACHINE/OPERAT RANSPORTABLE? Machine Depa                                    | rently? Yes  Rentation: (T - Theory, U - User, RP = Relevance  rently? Yes  Rentation? As required  Perkin-Elmer  Yes  [ING SYSTEM (on which installed)  | ant Publication). (I) Available; (U) Available  |
| Operational Cu Under Modricu Purpose(s) Ownership? _ Proprietary? _ NACHINE/OPERAT TRANSPORTABLE? Machine Depa                                    | rently? Yes  ston? As required  Perkin-Elmer Yes  TING SYSTEM (on which installed) CDC, 750  Yes  Indent Restrictions  | ont Publication). (I) Available; (U) Available  |
| TATUS Operational Cu Under Modifica Purpose(s) Ownership? _ Proprietary? _ IACHINE/OPERAT RANSPORTABLE? Machine Depe                              | rently? Yes  ston? As required  Perkin-Elmer Yes  TING SYSTEM (on which installed) CDC, 750  Yes  Indent Restrictions  | O. CYBER 176, 1BM 3032, CRAY, CRAY-1 (In progress).   |
| Operational Cu Under Modifici Purpose(s)  Ownership? _ Proprietary? _ IACHIME/OPERAT  RANSPORTABLE? Machine Depe                                  | rently? Yes  rently? Yes  Ricon? As required  Perkin-Elmer  Yes  ING SYSTEM (on which installed) CDC 750  Yes  Index Restrictions  | O. CYBER 176, 1BM 3032, CRAY, CRAY-1 (In progress).   |
| Operational Cu Under Modrice Purpose(s)  Ownership? _ Proprietary? =  AACHINE/OPERAT  TRANSPORTABLE?  Machine Depa  BELF-CONTAINED? Other Codes R | rrently? Yes  Refer As required  Perkin-Elmer Yes  (ING SYSTEM (on which installed) CDC 750  Yes  Indent Restrictions  No.  Equired (name, purpose)  | O. CYBER 176, 1BM 3032, CRAY, CRAY-1 (In progress).   |

| _    |   |
|------|---|
| MAME | i |

| 8   | OPTICS   | KINETICS   | GAS DYNAMICS                                   |
|---|--|--|--|
| RASIC TVPE (1)  | TO THE PERSON OF | 100 miles and 10 |  |
| Physical Optics Coometrical                                       | Traveling Wave (fing) 3 Reverse TW   | Compact Besion Annular Besion  | NOZZER GEOMETRY MODELED (and 1904) (V) TVOTICE |
| FIRED (POLARIZATION) REPRESENTATION (V):                          |  | The state of the s |  |
| Scaler Vertor   | ==   | Compact Retion Annular Retion  | Herianguia', Uneany Howing                     |
| COORDINATE SYSTEM (Carlessen cythodrical, etc.)                   | Flat Mirrors Sphencal Mirrors Y  | 1 9  | Super Company                                  |
| Compact Region BOth Annuar Region Strip                           | Cylindrical Mirrors.   | 10 20 30   |  |
| TRANSVERSE GRID DIMENSIONALITY (V): 1D 2D                         | - 1  | I  | FLOW FIELD MODELED (V): 10:                    |
| Compact Region Cy Ca  | Aucons Westcons Reflasicons  | Annular Region   | Leminar Turbulant                              |
| Annular Region  | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS.   | Other  |
| FIELD SYMMETRY RESTRICTIONS! NONE                                 | Linear   | Gein Vary Along Optic Aues?  | BASIC MODELING APPROACH $(V)$ :                |
| ۶.  | Parabola-Parabola.   | PULSED: CW: KINETICS MODELED   | Premixed:Mixing                                |
| ₹.  | Variable Core Office:  | CHEMICAL PUMPING REACTIONS MODELED (V):  | Other (specify)                                |
| Arbeitas .  | Other (specify)  | - 18 5 18 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  |  |
| CONFIGURATION FLEXIBILITY (V).                                    | Deformable Mirror  | (Y-12 ° YX-X) H  | References for Approach Used                   |
| Fised Smgle Resonator Geometry                                    | Constitution of the contract o | Cold (F · H <sub>2</sub> ):  |  |
| Frued, Multiple Resonator Geometries                              | 9000   | Hot (H + F <sub>2</sub> ): Chain (F · H <sub>2</sub> & H · F <sub>2</sub> ):   |  |
| Modular. Multiple Resonator Geometries                            | Charles and the control of the contr | Other (specify)  | VA CHINGON GRANGO INTRODUCT                    |
| PROPAGATION TECHNIQUE   | יייייייייייייייייייייייייייייייייייייי   | ENERGY TRANSFER MODES MODELED (V): Reference   | Arc Heater Combuston                           |
| Fresnel Integral Algorithms                                       | 3  | V.T.   |  |
| With Karnel Averaging   | Simple Seturated Gain: Octailed Gain.  | V.R.   |  |
| Geussian Quadratura   | Ħ.   | 34.4   | ,,   |
| Fast Fourier Transform (FFT).                                     | Mirror Tift:   | 5  | F. STUM DISSOCIATION FROM ( V ):               |
| Fast Hanket Transform (PMT)                                       | Aberrations/Thermal Distortions:   | Single Line Model (V)  | Other (consectly)                              |
| Garbener-Freenel Kirchhoff (GFK)                                  | Arbitrary: V   | Mutiline Hode  | E ATOM CONCENTRATION NETERMINED TROM MODE:     |
| Other (seperity)  | Selected (specify): AS per TAC IIIITON IIIOUEL   | 7  | DILIENTS MODELED.                              |
|   | Reflectivity Loss.   | Assumed Rotational Population Distribution State (V):  | MODELS EFFECTS ON MIXING RATE DUE TO (V)       |
| CONVERGENCE TECHNIQUE (V):  | Output Coupler Edges: Rolled   | Equitibrium: Nonequilibrium:   | Nozzie Boundary Layers Shock Waves             |
| Power Comparison 7 Field Comperson 7                              | Serand V one Different rad, of   | Number of Leser Lines Modeled:   | Preraections (thermal blockage)                |
| one Phase, RMS Intensity, Coupling.                               | LOADED CAVITY FIELD MODIFIER MODELS (V)  | Source of Rate Coefficients Used in Code   | Other (specify)                                |
| ACCELERATION ALGORITHMS USED?                                     | Medium Index Variation.  | y o savor shoots and   |  |
| Technique Field/Gain averaging, Uynamic                           | Gas Absorption   | Charles Bootstains (V)   |  |
| a veraging.  Multiple eigenvalue/vector extraction algorithm (V): | Overlapped Beams:  | Propose acceptant  | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)     |
| Provi   | Other  | Collisional Broadening   | Media Index Variations                         |
| Other   | ٠.,  | Other (specify)  | Other (specify)                                |
|   | Ophmat focal Search V Been Quality V Adantive ontice evaluation  |  |  |
|   | Atmospheric propagation effects  |  |  |
|   |  |  |  |

| CODE NAME: | PRE-WATSON |
|------------|------------|
|            | <u> </u>   |

| PRINCIPAL PURPOSE   | F/8> /ABBLICATIO  | Wes of conf   | Evaluate impa   | ct on resonator solution of conical element      |
|---|---|---|---|--|
| polarization  |   | M(S) OF CODE:   | LYUTUULE TAIDU  | GE ON TESSUREDI STREET OF SOME OF CHEMEN         |
|   |   |   |   |  |
|   |   |   |   |  |
| ASSESSMENT OF CA  | DARII ITIEE:  | Models po   | larization of   | conical mirror. Allows arbitrary selection of    |
| reflectivity  |   |   |   |  |
|   |   |   |   |  |
|   |   |   |   |  |
| ASSESSMENT OF LIF   | WITATIONS:  | Low resol   | ution, only mo  | dels polarization.                               |
|   |   |   |   |  |
|   |   |   |   |  |
|   |   |   |   |  |
| OTHER UNIQUE FEA  | TURES: Re   | sonator Geom  | etries Modeled  | : half symmetric unstable resonator with rear co |
| Rear cone po  | <u>olarization</u>  |   |   |  |
| <del></del>   |   |   |   |  |
| RIGINATOR/KEY CO  | ONTACT:   |   |   | <del></del>                                      |
| Name:   | Phillip D.  | Briggs  |   | Phone: (213) 884-3851                            |
| Organization: _   | Rockwell I  | nternational  | , Rocketdyne D  |  |
| Address:  | 6633 Canog  | a Ave., Cano  | ga Park, Calif  |  |
|   |   |   |   |  |
| IVAILABLE DUCUMI  | ENTATION: (T = '  | Theory, U = User,   | RP = Relevant Publicat                                | (80) //  |
| AVAILABLE DOCUM   | ENTATION: (T =  | Theory, U = User,   |   | (80) //  |
| RVAILABLE DOCUM   | ENTATION: (T =  | Theory, U = User,   |   | (80) //  |
|   | ENTATION: (T =  | Theory, U = User,   |   | (80) //  |
|   |   |   |   | (80) //  |
| STATUS:   | ently?: Ye  |   |   | (80) //  |
| STATUS:<br>Operational Curr   | ently?: Ye  |   |   | (80) //  |
| STATUS:<br>Operational Curr<br>Under Modificati   | ently?: Ye  |   |   | (80) //  |
| STATUS: Operational Curri Under Modificati Purpose(s): Ownership?:  | ently?: Ye  | S   |   | (80) //  |
| STATUS:  Operational Curr Under Modificati Purpose(s):  Ownership?:  Proprietary?:  | ently?: Ye  | s<br>ed under cor   | AP = Relevent Publical  Itract to AFWL.               | ion): (RP) Various papers in open literature.    |
| STATUS:  Operational Curr Under Modificati Purpose(s):  Ownership?:  Proprietary?:  | ently?: Ye  | s<br>ed under cor   | RP = Relevent Publical                                | ion): (RP) Various papers in open literature.    |
| Operational Curry Under Modificati Purpose(s): Ownership?: Proprietary?: AACHINE/OPERATIR   | Develop NO SYSTEM (on w   | s<br>ed under cor<br>which installed):                                | AP = Relevent Publical  Itract to AFWL.               | ion): (RP) Various papers in open literature.    |
| STATUS: Operational Curry Under Modificati Purpose(s): Ownership?: Proprietary?: AACHINE/OPERATIN   | Develop NO SYSTEM (on w   | ed under cor<br>which installed):<br>th mod.                          | AP = Relevent Publical  Itract to AFWL.               | ion): (RP) Various papers in open literature.    |
| Operational Curri<br>Under Modificatis<br>Purpose(s):<br>Ownership?:<br>Proprietary?:<br>AACHINE/OPERATIP<br>TRANSPORTABLET:<br>Machine Depend                          | Develop No NG SYSTEM (on w Yes, wi  | ed under cor<br>which installed):<br>th mod.                          | AP - Relevent Publical stract to AFWL.  CDC Cyber 176 | ion): (RP) Various papers in open literature.    |
| Operational Curri<br>Under Modificatis<br>Purpose(s):<br>Ownership?:<br>Proprietary?:<br>MACHINE/OPERATIP<br>TRANSPORTABLE?:<br>Machine Dependence: Machine Dependence: | Develop No No SYSTEM (on w Yes, will dent Restrictions:                     | ed under cor<br>mich installed): _<br>th mod.<br>Uses_CDC-            | AP - Relevent Publical stract to AFWL.  CDC Cyber 176 | ion): (RP) Various papers in open literature.    |
| Operational Curri<br>Under Modificatis<br>Purpose(s):   | Develop No NG SYSTEM (on w Yes, wi  | ed under cor<br>mich installed): _<br>th mod.<br>Uses_CDC-            | AP - Relevent Publical stract to AFWL.  CDC Cyber 176 | ion): (RP) Various papers in open literature.    |
| Derational Curry Under Modificati Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATIN TRANSPORTABLET: Mechine Depend  | Develop NO NG SYSTEM (on a Yes, wi dent Restrictions: Yes puired (name, pur | ed under cor which installed): th mod Uses CDC-                       | AP - Relevent Publical stract to AFWL.  CDC Cyber 176 | ion): (RP) Various papers in open literature.    |
| Operational Curry Under Modificati Purpose(s): Ownership?: Proprietary?: ARCHINE/OPERATIN FRANSPORTABLET: Machine Depend  | Develop NO NG SYSTEM (on a Yes, wi dent Restrictions: Yes puired (name, pur | ed under cor which installed): th mod. Uses CDC- pose):               | ntract to AFWL.  CDC Cyber 176 extended core.         | (RP) Various papers in open literature.          |
| Operational Curry Under Modificati Purpose(s): Ownership?: Proprietary?: ARCHINE/OPERATIN FRANSPORTABLET: Machine Depend  | Develop NO NG SYSTEM (on a Yes, wi dent Restrictions: Yes puired (name, pur | ed under cor which installed): th mod. Uses CDC- pose):               | AP - Relevent Publical stract to AFWL.  CDC Cyber 176 | ion): (RP) Various papers in open literature.    |
| Operational Curre Under Modificatis Purpose(s):  Ownership?:  Proprietary?:  MACHINE/OPERATIR  TRANSPORTABLE?:  Machine Depend  SELF-CONTAINED?:  Other Codes Req       | Develop NO NG SYSTEM (on a Yes, wi dent Restrictions: Yes puired (name, pur | ed under cor  which installed):  th mod  Uses CDC-  pose):  FOR RUNS: | ntract to AFWL.  CDC Cyber 176 extended core.         | (RP) Various papers in open literature.          |
| STATUS: Operational Curri Under Modificatis Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATIF TRANSPORTABLE?: Machine Depend SELF-CONTAINED?: Other Codes Req      | Develop NO NG SYSTEM (on w Yes, wi dent Restrictions: Yes puired (name, pur | ed under cor  which installed):  th mod  Uses CDC-  pose):  FOR RUNS: | ntract to AFWL.  CDC Cyber 176 extended core.         | Execution Time (Sec. CDC 7600)                   |

A STATE OF THE PARTY.

PRE-WATSON

| SJIT40   | SOI  | KINETICS   | GAS DYNAMICS                                   |
|--|--|--|--|
| BASIC TYPE (V)                                       | Ġ,   | GAIN REGION MODELED (V) HONE   | NOZZLE GEOMETRY MODELED LANGINGS (\$) 1 (1516) |
| Physical Optics 1. Geometrical                       | Traveling Wave (Ring) Reverse TW                                   | Compact Region Annular Region  | Cylindrical Radially Flowing                   |
| FIELD (POLARIZATION) REPRESENTATION (V)              | BRANCH (V) POSITIVE V NOGATIVE OPTICAL ELEMENT MODELS INCLUDED (V) | COORDINATE SYSTEM (Cartesian cylindrical etc.) Combact Region Annulai Region | Rectangular Linearly Floaring                  |
| COORDINATE SYSTEM (Carlesian cylindrical etc.)       | Flat Merrors Sphancas Mirrors                                      | KINETICS GRID DIMENSIONALITY (V.)  | Other  |
| Compact Region CY Annutar Region                     | Cylindrical Mirrors  | 10 20 30   | COORDINATE SYSTEM FLUID GRID DIMENSION (1) 10  |
| TRANSVERSE GRID DIMENSIONALITY (V) 1D 2D             | Scraper Mirrors  | Compact Region   |  |
| Compact Region                                       | Aucons Reflaucons  | Annular Region   | Lamnar Turbulent                               |
| Annular Region                                       | Arbitary   | GAIN REGION SYMMETRY RESTRICTIONS  | Other  |
| FIELD SYMMETRY RESTRICTIONS? NOTICE                  | Linear   | Gain Yary Along Optic Ases? Flow Direction?                                  | BASIC MODELING APPROACH (\$)                   |
| APE  | Parabola Parabola  | PULSED CW KINETICS MODELED   | Premised Mish                                  |
| Accientation Elliptical Arbetrary                    | Variable Core Offset   | CHEMICAL PUMPING REACTIONS MODELED (V)                                       | Other (specify)                                |
| N FLEXIBILITY (V)                                    | Other (specify)  | ;<br>;<br>;  |  |
| Fred Single Reconsition Geometry                     | Deformable Mirrors   |  | References for Approach Used                   |
| Fixed Multiple Resonator Genmetries                  | Spalial filters Gratings   |  |  |
| Modular Multiple Resunator Geometries                | Other Elements CODE  |  | THERMAI DRIVER MODELED (1)                     |
| PROPAGATION TECHNIQUE                                |  | ENERGY TRANSFER MODES MODELED (V) Reference                                  | Arc Heat                                       |
| freenge briege at Signe chart-a                      | 3  | V.1  | Shock Tube Resistance Meater                   |
| Mith Karner Averaging                                | Simple Salurated Gein Detailed Gain                                | œ >  | Other  |
| Gaussian Quadrature                                  | Ξ  | > >  | FATOM DISSOCIATION FROM (V)                    |
| fast Fourier Fransform (FFT)                         | Mirror 1th Decentration  | Oher.  | f <sub>2</sub> Sf <sub>6</sub>                 |
| Fast Hankel Fransform (FMT)                          | Aberrations/Thermal Distortions                                    | Single Line Model (V)  |  |
| Gardener Svennet Rive hhodf (GFR)                    | Arbitary   | Multime Model (V)  | F. ATOM CONCENTRATION DETERMINED FROM MODEL?   |
| Other ispecify:                                      | Selected (specify)   | Assumed Rotational Population Distribution State (V)                         | DILUENTS MODELED                               |
|  | Netlectivity Loss  | Equitibrium Nonequilibrium   | MODELS EFFECTS ON MIXING RATE DUE TO (\$)      |
| Š  | Output Coupler Edited Collect                                      | Number of Laser Lines Modeled  | Nozzie Boundary Layers Shock Waves             |
| Preer Companyon Fred Comparison Cong. E1genvalue     | LOADED CAVITY FIELD MODIFIER MODELS (V)                            | Source of Rate Coefficients Used in Code                                     | Preseactions (thermal blockage)                |
| ACCELEBRATION ALGORITHMS USED.                       | Medium Index Variation   |  |  |
| Ter nargue   | Gas Abyorption   | LINE PROFILE MODELS (V)  |  |
| MULTIPLE FIGENVALUE (VECTOR EXTRACTION ALGORITHM (V) | Overlapped Beams   | Cuppler Broadening   | MODELS EFFECTS ON OPTICAL MODES DUE TO (1)     |
| , Audus  | Other  | Collisional Broadening   | Media Index Variations                         |
| Other  | FAR-FIELD MODELS (V.) Bean Steering Reinfords                      | Other (specify)  | Other (specify)                                |
|  | Others for at Seal In  |  |  |
|  |  |  |  |
|  |  |  |  |

| CODE NAME | ÇFHT |
|-----------|------|
| CODE NAME |      |

|   |   | The OFHT Louisi  | fast Hankel transform) code was developed as                                   |
|---|---|--|--|
|   | s)/APPLICATION(s) OF CODE<br>ling high Fresnel numb   |  |  |
| , , , , , , , , , , , , , , , , , , ,   |   |  |  |
|   |   |  |  |
|   |   |  |  |
|   |   |  | azimuthally symmetric resonators with collimate                                |
|   |   |  | large variety of unstable resonators, positive                                 |
| determined by   |   | . Modular code   | construction is used with resonator geometry                                   |
| decermined b  | input.  |  |  |
| ASSESSMENT OF LIN   |   |  | ements, resonators with severe azimuthal varia                                 |
| (i.e. 16 mode   | s) and large (-25) Fre  | snel numbers ca  | nnot be adequately sampled.  |
|   |   |  |  |
|   |   |  |  |
| OTHER UNIQUE FEAT   | ures:Models positive  | and negative c   | ompact unstable confocal resonators, rings, ri                                 |
| with IFPA (in   |   | re), misaligned  | and offset axicon cones, and extra cavity pha                                  |
| correction.   |   |  |  |
|   |   | <del></del>  |  |
| ORIGINATOR/KEY CO   | NTACT:  |  | tone: (305) 840-6643   |
|   | Inited Technologies Res   | earch Center, C  |  |
|   |   |  | MIL  |
| Address:  | 0.0. Box 2691, MS-R-48  |  |  |
|   |   | West Palm Beach  | n, Florida 33402   |
|   | 0.0. Box 2691, MS-R-48  | West Palm Beach  | n, Florida 33402   |
|   | 0.0. Box 2691, MS-R-48  | West Palm Beach  | n, Florida 33402   |
| AVAILABLE DOCUME  | 0.0. Box 2691, MS-R-48  | West Palm Beach  | n, Florida 33402   |
| AVAILABLE DOCUME  | P.O. Box 2691, MS-R-48 NTATION: (T = Theory, U = User, R)   | West Palm Beach  | n, Florida 33402   |
| AVAILABLE DOCUME  | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Intly: Yes  No. 10. NS-R-48   | West Palm Beach  | n, Florida 33402<br>nn. None   |
| AVAILABLE DOCUME  STATUS:  Operational Curre  | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Intly: Yes  No. 10. NS-R-48   | West Palm Beach  | n, Florida 33402   |
| AVAILABLE DOCUME  STATUS:  Operational Curre Under Modificatic  | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Intly: Yes  No. 10. NS-R-48   | West Palm Beach  | n, Florida 33402<br>nn. None   |
| STATUS:  Operational Curre Under Modificatic Purpose(s): -  | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Intly: Yes  No. 10. NS-R-48   | West Palm Beach  | n, Florida 33402<br>nn. None   |
| STATUS:  Operational Curre Under Modificatic Purpose(s):  Ownership?:   | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Hilly: Yes  To incorporate multi  | West Palm Beach  | n, Florida 33402<br>nn. None   |
| STATUS: Operational Curre Under Modification Purpose(s): Ownership?: Proprietary?:  | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Hoty: Yes To incorporate multi  UTRC Yes  | West Palm Beach  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS: Operational Curre Under Modificatic Purpose(s): Ownership?: Proprietary? MACHINE/OPERATIN   | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Intly?: Yes To incorporate multi  UTRC Yes G SYSTEM (on which installed):   | West Palm Beach P : Relevant Publication  line loaded cap                  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS: Operational Curre Under Modificatic Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATIN  | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Intity: Yes  To incorporate multi  UTRC  Yes  G SYSTEM (on which installed):  Yes   | West Palm Beach P : Relevant Publication  line loaded cap                  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS: Operational Curre Under Modificatic Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATIN  | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R)  Intly?: Yes To incorporate multi  UTRC Yes G SYSTEM (on which installed):   | West Palm Beach P : Relevant Publication  line loaded cap                  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS:  Operational Curre Under Modificatic Purpose(s):  Ownership?: Proprietary? MACHINE/OPERATIN TRANSPORTABLE?: Machine Depend                    | O.O. Box 2691, MS-R-48  NATION: (T = Theory, U = User, R)  Inity: Yes  To incorporate multi  UTRC  Yes  G SYSTEM (on which installed):  Yes  ent Restrictions None                                    | West Palm Beach P : Relevant Publication  line loaded cap                  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS: Operational Curre Under Modificatic Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATIN TRANSPORTABLE?: Machine Depend:                    | O.O. Box 2691, MS-R-48  NATION: (T = Theory, U = User, R)  Inity: Yes  To incorporate multi  UTRC  Yes  G SYSTEM (on which installed):  Yes  ent Restrictions None                                    | West Palm Beach P : Relevant Publication  line loaded cap                  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS:  Operational Curre Under Modificatic Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATIN TRANSPORTABLE?: Mechine Depend                   | O.O. Box 2691, MS-R-48  NATION: (T = Theory, U = User, R)  Intity: Yes To incorporate multi  UTRC Yes G SYSTEM (on which installed): — Yes ent Restrictions None Yes                                  | West Palm Beach P : Relevant Publication  line loaded cap                  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS: Operational Curre Under Modificatic Purpose(s): Proprietary?: MACHINE/OPERATIN TRANSPORTABLE?: Machine Depend SELF-CONTAINED? Other Codes Req | O.O. Box 2691, MS-R-48  NATION: (T = Theory, U = User, R)  Intity: Yes To incorporate multi  UTRC Yes G SYSTEM (on which installed): — Yes ent Restrictions None Yes                                  | West Palm Beach P : Relevant Publication  line loaded cap                  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS: Operational Curre Under Modificatic Purpose(s): Proprietary?: MACHINE/OPERATIN TRANSPORTABLE?: Machine Depend SELF-CONTAINED? Other Codes Req | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R  Inity): Yes  To incorporate multi  UTRC  Yes  G SYSTEM (on which installed):  Yes  ent Restrictions None  Yes  Sired (name, purpose): None | West Palm Beach P : Relevant Publication  line loaded cap                  | n, Florida 33402<br>n) None<br>habilities by coupling to CL003D kinetics packa |
| STATUS: Operational Curre Under Modificatic Purpose(s): Proprietary?: MACHINE/OPERATIN TRANSPORTABLE?: Machine Depend SELF-CONTAINED? Other Codes Req | O.O. Box 2691, MS-R-48  NTATION: (T = Theory, U = User, R  Inity): Yes  To incorporate multi  UTRC  Yes  G SYSTEM (on which installed):  Yes  ent Restrictions None  Yes  Sired (name, purpose): None | West Palm Beach P : Relevant Publication  line loaded cap  CDC-176, IBM-37 | n. Florida 33402 n. None  Dabilities by coupling to CLOQ3D kinetics packa      |

CODE NAME.

OFHI

| OPTICS | RESONATOR TYPE (V). Standong Wave | Traveling Wave (Ring) _ 2 Reverse TW |
|--------|-----------------------------------|--------------------------------------|
| 140    |                                   | ics * Georbefrical                   |

other Elements Misaligned and offset cone-Cylindrical Mirrors Spherical Mirrors (Geometric) BRANCH (V): Positive L Negative OPTICAL ELEMENT MODELS INCLUDED (V) Deformable Mirrors Vanable Cone Offset Scraper Mirrors Parabola Parabola Spatial Filters Other (specify) Arbitrary STATE POLARIZATION REPRESENTATION (V) COORDINATE SYSTEM (Cartesian cylindrical etc.) Strip FIELD SYMMETRY RESTRICTIONS? None TRANSVERSE GRID DIMENSIONALITY (🐧) Ompact Region CY Annular Region CY Fixed Multiple Resonator Geometries Rectangular Elliptical CONFIGURATION FLEXIBILITY (V) MIRROR SHAPE(S) ALLOWED .) Fired Single Reconstor Geometry Square Corollar Annular Region HASIC TYPE

oner specify: Radial asympototic propa-Modular Multiple Resonator Geometries Gardener Fresnet Rirchhoff (GFR) ROPAGATION TECHNIQUE Fast Fourier Transform (FFT) Fast Mankel Transform (FMT) Fresnel Integral Algorithms With Kernel Averaging Gaussian Quadrature

MULTIPLE EIGENVALUE /VECTOR EXTRACTION ALGORITHM (V) one Will also use power when loaded Freid Companson ACCELERATION ALGORITHMS USED? YES CONVERGENCE TECHNIQUE (V) Power Companson (Fher

LOADED CAVITY FIELD MODIFIER MODELS (V)

Medium Index Vanation

Gas Absorption

Overlapped Beams

Output Coupler Edges Rolled

Selected (specify) \_\_

Reflectivity Links

Arbetrary ...

Serrated J. Other

## KINETICS

COORDINATE SYSTEM (Cartesian cylindrical Mc.) Compact Region Annular Region KINETICS GRID DIMENSIONALITY (1) GAIN REGION MODELED (V) None Compact Region Annular Region

Wave (Ring) 2 Reverse TW \_\_\_\_

| •                                 | 9      | 22 | 2               |    |
|-----------------------------------|--------|----|-----------------|----|
| Compact Region                    |        |    |                 |    |
| Annular Region                    |        |    |                 |    |
| GAIN REGION SYMMETRY RESTRICTIONS | Y REST | Š  | Š               | _  |
| Gain Vary Along Optic Axes?       | ž.     | Ę  | flow Direction? | ŗ. |

Wancons Reflancens In progress

PULSED CW KINETICS MODELED
CHEMICAL PUMPING REACTIONS MODELED (V)

\$\frac{1}{3} \times \frac{1}{3} \times \f

| 1 - 32   | I o r |  |  |
|--|-------|--|--|
|  |       |  |  |
| The state of the s |       |  |  |

Gratings -

ENERGY TRANSFER MODES MODELED (V). Reference Single Line Model (V) Oher × > >

Detailed Gain (10 MOTK)

GAIN MODELS (V) Bare Cavity Only \_\_\_

Simple Saturated Gain

BARE CAVITY FIELD MODIFIER MODELS (V)

Merror full ... Decentration Aberrations/Thermal Distortions

Assumed Rotational Population Distribution State (V) Equilibrium Nonequitibrium Source of Rate Coefficients Used in Code Number of Laser Lines Modeled Multiline Model A

INE PROFILE MODELS (V) Doppler Broadening \_ Collisional Broadening Other (specify)

FAR FIELD MODELS (V) Beam Steering Removal

Optimal Focal Search \* Beam Quality \*

Other

| NOZZLE GEOMETRY MODELED (and type) (Å) i(CITE CHORDINATE SYSTEM  RECLANGULA: Linearly froming Other COORDINATE SYSTEM FLUIG GRID ONNENSION (Å) 10 20 150 FLUIG GRID ONNENSION (Å) 10 20 150 FLUIG GRID ONNENSION (Å) 10 20 150 FLUIG GRID ONNELED (Å) Laminat  | CAS DIMMICS                                  |
|--|--|
| RECIDENCE READILY Flowing  RECIDENCE READILY Flowing  Other  FLUIG GRID UNDELED (Å )  Lammar   | NOZZLE GEOMETRY MODELED (AND 15PP) (V) 14UNE |
| RECLINGUID LINESTY Flowing  Other  COORDINATE SYSTEM  FULUG GRID DIMENSION (\$\frac{1}{2}\$)  Lammar   | Cylindrical Radially Flowing                 |
| COORDINATE SYSTEM  COORDINATE SYSTEM  FULUG GRID DIMENSION (1) 10 70 10 10 10 10 10 10 10 10 10 10 10 10 10  | Rectangular Linearly Flowing                 |
| COORDINATE SYSTEM FULUG GRID DIMENSION (\$\frac{1}{2}\$) FULUG GRID DIMENSION (\$\frac{1}{2}\$) Lammar   | Other  |
| FLUID GRID DIMENSION (\$\frac{1}{2}\) to 20 190  FLOW FIELD MODELED (\$\frac{1}{2}\) to 20 20 20  FLOW FIELD MODELED (\$\frac{1}{2}\) to 20  MARINE STEPPENSION (\$\frac{1}{2}\) to 20  MARINE STEPPENSION OF TERMINED FROM MODELY  FATOM DISSOCIATION FROM (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MODELS FIELDS ON MIXING RATE OUE TO (\$\frac{1}{2}\) to 20  MIXING RATE OUE T | COORDINATE SYSTEM                            |
| FLOW FIELD MODELED () )  Laminab   | 10 10  |
| Domer September Turburent Omer Sperich Maring Omer (sperich) Maring Model (sperich) Maring Model (sperich) Model   | FLOW FIELD MODELED (V.)                      |
| Other  BASIC MODELING APPROACH 1, 1  Primited Mining  Other (specific Approach () ted  An these Combosine  Since I tube Resistance Healer  Other (specific Approach () ted  Other (specific Approach () ted  F ATOM DISSOCIATION FROM () )  1, 2   | 1  |
| BASIC MODELING APPROACH () ()  Permused Musing Once (specify) An Western et for Approach () () An Western Sinck Fulse Combustion Sinck Fulse Sinck Musing Fatom MODE()  In The Model Combustion For Many Concentration DETERMINED FROM MODE()  MODELS FETECTS ON MAXING RATE DUE TO () () Musing Biomedian Layers Presentions (thermal blockage) Turbulence Other (specify)  | Other  |
| Other (specify)  References for Applicach (1940)  Air Heate Combusion Shock 1 Liber Resistance Heater Other FATOM DISSOCIATION FROM (\$)  1, 2   | BASIC MODELING APPROACH ()                   |
| References for Approach Traco  THERMAL DRIVER MODELED IT, Air Heater Combusion Stock Tuber Resistance Heater  Other FATOM DISSOCIATION FROM (L)  1, Other Light MODELED  Other Light MODELED  MODELS EFFECTS ON MIXING RATE DUE TO (L)  Muster Bundan Lavers  Presentions (thermal blockage)  Other (specify)  | -  |
| References for Approach Lisero  THERMAL DRIVER MODELER LL, An Haster Combustor Sinck Lister Resistance Healer Other  F ATOM DISSOCIATION FROM (L)  7 — 516 Districtly Districtly DILLENIS MODELED MODELS EFFECTS ON MIXING RATE DUE TO (L) MIXING BANCH BOOKS ABREE FREERINGERS (INFERRED BOOKS ABREE)  OTHER BOUNDARY LABORATES  CONFERENCES  OTHER BOUNDARY LABORATES  FREERINGERS OTHER BOUNDARY LABORATES  FREERINGERS OTHER BOUNDARY LABORATES  TURBULER  OTHER BOUNDARY LABORATES  FREERINGERS OTHER BOOKS ABREE  FREERINGERS OTHER BOOKS  | Other (specify)                              |
| References for Approach Lises  THERMAL DRIVER MODELED LT.  An Heater Combusine Sinck Lister Combusine Sinck Lister Combusine Sinck Lister Combusine Other  F ATOM DISSOCIATION FROM (L)  17 —— \$16  DISSOCIATION FROM (L)  18 —— \$16  DISSOCIATION FROM (L)  19 —— \$16  DISSOCIATION FROM (L)  19 —— \$16  DISSOCIATION FROM (L)  19 —— \$16  DISSOCIATION DETERMINED FROM MODEL  DILUENTS MODELED  MODELS EFFECTS ON MIXING RATE DUE TO (L)  MODEL (GRAND CONTRACT)  OTHER BOOK CONTRACT  STORY COMPANY CONTRACT  COMPANY COMPANY CONTRACT  OTHER BOOK                                       |  |
| THERMAL DRIVER MODELED (),  An Heater Short Tube Combusion Short Tube Relation e Heater Other  7 — 316  Other Listen Heater  6 ATOM DISSOCIATION FROM (),  17 — 316  Other Listen Heater  6 ATOM CONCENTRATION DETERMINED FROM MODELY DILUENTS MODELED  MODELS EFFECTS ON MIXING RATE DUE TO (),  MIXING RATE DUE TO (),  MODELS EFFECTS ON MIXING RATE DUE TO (),  MIXING RATE DUE  | References for Approach Used                 |
| THERMAL DRIVER MODELED (),  ALI HESTER  SINCE TUDE  COMPANY  TO MOSSOCIATION FROM (V)  17  TO NOTE TO STREAM MODELED  OTHER TO MODELED  MODELS FFFECTS ON MIXING RATE DUE TO (V)  MODELS FFFECTS ON MIXING RATE DUE TO (V)  MODELS FERENTAL LAWARE  FREAKTHOMS (THERMINED FROM MODEL)  OTHER BOUNDARY LAWARE  FREAKTHOMS (THERMINED FROM MODEL)  |  |
| THERMAL DRIVER MODELED LT.  Air Hease Combusion Since Lide Resistance Heater Other  5 ATOM DISSOCIATION FROM (L)  17 ATOM CONCENTRATION DETERMINED FROM MODEL? DILLUENTS MODELED  MODELS EFFECTS ON MIXING RATE DUE TO (L)   |  |
| Air Heater Combusing Since Liube Resistance Heater Ories Ories 1 ubc Resistance Heater Ories 12 Ubc Sociation From (A) 12 Ubc Sociation Promised Pr   | THERMAL DRIVER MODELED ().                   |
| Since Flube Resistance Health  Other  1-2  Other 1994(4)  F ATOM DISSOCIATION FROM (Å)  F ATOM CONCENTRATION DETERMINED FROM MODEL!  DILUENTS MODELS  MODELS EFFECTS ON MIXING RATE DUE TO (Å)  Nevitte Blundari Layris  Preventions (thermal blockage)  Other (specify)   | 1  |
| F ATOM DISSOCIATION FROM (\$\lambda{\chi}\$)  \$\frac{1}{2} = 516  One- 1594(4)  F ATOM CONCENTRATION DETERMINED FROM MODEL!  DILUENTS MODELS  MODELS EFFECTS ON MIXING RATE DUE TO (\$\lambda{\chi}\$)  MODELS EFFECTS ON MIXING RATE DUE TO (\$\lambda{\chi}\$)  Ferrations (thermal bookage)  Other (specify)   |  |
| F ATOM DISSOCIATION FROM ( ),  1, 2  | Other  |
| Other specify  F ATOM CONCENTRATION DETERMINED FROM MODEL*  DILUENTS MODELED  MODELS EFFECTS ON MIXING RATE OUE TO (\( \),  No.zie Boundan Lawris  Prevactions (thermal book haze)  Other (specify)  | FATOM DISSOCIATION FROM (V)                  |
| Other (specify)  F ATOM CONCENTRATION DETERMINED FROM MODEL*  DILUENTS MODELED  MODELS EFFECTS ON MITING RATE DUE TO (Å)  Neltre Boundary Layris  Prevacions (thermal bookage)  Other (specify)  |  |
| F ATOM CONCENTRATION DETERMINED FROM MODEL* DILUENTS MODELED MODELS EFFECTS ON MIXING RATE DUE TO (Å) Nozite Blundan Lawria Printartions (thermal blockage) Ones (specify)   | Other (specify)                              |
| MIXING RATE DI   | F ATOM CONCENTRATION DETERMINED FROM MODEL?  |
| MODELS EFFECTS ON MIXING RATE DUE TO (L) I fruite Boundan Layers Short Mares Freeschions (hermal blockage) Turbulen e  | DILUENTS MODELED                             |
| ry Layers Shork W  | MODELS FFFECTS ON MIXING RATE DUE TO (\$)    |
| hermal Diochage)   |  |
| Other (specufy)  | -  |
|  | Other (specify)                              |
|  |  |
|  |  |

1111 MODELS EFFECTS ON OPTICAL MODES DUE TO (A) Media Index Variations. Other (s. neify)

| CODE NAME | RASCAL |
|-----------|--------|

| CODE TYPE: Opt  | tics, Kinetics, and Gasdynamics  |
|---|--|
| predictions   | (S)/APPLICATION(S) OF CODE Resonator parameter selection, assess mode control, performance for power and beam quality, resonator perturbation analysis, beam quality budgeting,          |
| set/verify de   | esiqn requirements.  |
| assessment of cap<br>code for kind<br>details).                 | ABILITIES 3-D optics calculation with general field modifier models coupled to AEROKNS etics and qasdynamics calculations. Code uses modular construction (see AEROKNS for models)       |
| ASSESSMENT OF LIM<br>being develop                              |  |
|   | UNES <u>Resonator geometries modeled</u> : HSURIA w/waxicon or reflacion (general surface) on or reflacion (general surface). Beam rotators, axisymmetric mode competition, competition. |
|   | NTACT  |
| (AFWL-TR-77-  | NTATION (T Theory, U User, RP Relevant Publication): (T) Annular Laser Optics Study Final Report   117) (U) Annular Laser Optics Study User's Manual: Loaded Cavity Codes.               |
| STATUS:<br>Operational Curre<br>Under Modificatio<br>Purpose(s) | nuy <u>No</u><br>n: <u>Under development</u>   |
| Proprietary, Ye   | CKWell International  S G SYSTEM (on which installed)()C Cyber 176   |
| TRANSPORTABLE? Machine Depend                                   | With modification. ent Restrictions Uses CDC extended core.  |
| SELF-CONTAINED?<br>Other Codes Requ                             | ured (name, purpose). NOFC   |
| ESTIMATE OF RESOU   | RCES REQUIRED FOR RUNS   |
| Sinall Job Typical Job Large Job                                | Core Size (Octal Words)   Execution Time (Sec. CDC 7600)     200K   SCM   - 200K   LCM   |
| Approximate Number  | of FORTRAN Lines?  |

· · ·

CODE NAME

|     | ľ |
|-----|---|
|     | ı |
|     | ۱ |
|     | ı |
|     | ł |
| _   | ۱ |
| ⋖   | 1 |
| C   | 1 |
| (Z) | 1 |
| -   | 1 |
| ≈   | ŧ |
| -   | 1 |
|     |   |
|     |   |
|     |   |
|     | ſ |
|     | ı |
|     | l |
|     | ſ |

| OPTICS   | SOI  | KINETICS AEROKNS                                     | GAS DYNAMICS   |
|--|--|--|--|
| BASIC TYPE (V)                                   | RESONATOR TYPE (V). Standing Wave  | GAIN REGION MODELED (V)                              | NOZZLE GEOMETRY MODELED (and type) (V)   |
| Physical Optics Geometrical                      | Traveling Wave (Ring) Y Reverse TW   | Compact Region Annular Region                        | Cylindrical, Radially Flowing  |
| FIELD (POLARIZATION) REPRESENTATION (V)          | BRANCH (V.) Positive Y Negative  | COORDINATE SYSTEM (Cartesian cylindrical atc.)       | Rectangular Linearly Flowing   |
| Skalar Welfer                                    | CPTICAL ELEMENT MODELS INCLUDED (V)  | Compact Region Annular Region CY                     | Other  |
| CONDUCTREE STSTEM (Carrellar sylndrical etc.)    | . ۱  | KINETICS GRID DIMENSIONALITY (V)                     | COORDINATE SYSTEM CY   |
| TRANSVERSE GRID DIMENSIONALITY (V) 10 2D         | - 2  |  | FLUID GRID DIMENSION (V) 10 20 30 FLUID FLUID RELD MODELED (V)                 |
| Compact Region                                   | Asicons Reflactions  | Annular Region                                       | Laminar Turbulent  |
| Annular Region                                   | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS                    | oner Scheduled mixing  |
| FIELD SYMMETRY RESTRICTIONS! NONE                | Linear   | Gain Vary Along Optic Axes? Flow Direction?          | BASIC MODELING APPROACH $(V)$  |
| MIRROR SHAPE(S) ALLOWED (V)                      | Parabola Parabola  | PULSED: CW KINETICS MODELED                          | Premised   |
| Elliptical                                       | Variable Core Offset:  | CHEMICAL PUMPING REACTIONS MODELED (V)               | Other (specify)  |
| N FLEXIBILITY (V)                                | Other (specify)  | ;  | Patenting ALOS Final Report  |
| Fired Single Resonator Geometry                  | 1  | Colc (f · H <sub>2</sub> ) · ·                       |  |
| Fixed Multiple Resonator Geometries              | Spatial Filters Calings  | Hot (H · F2) 1 Chain (F · H2 & H · F2)               |  |
| Modular Multiply Resonator Geometries            | Other Elements   | Other (specify)                                      | THERMAL DRIVER MODELED (1)   |
| PROPAGATION TECHNIQUE                            |  | ENERGY TRANSFER MODES MODELED (V). Reference         | Arc Heater Combustor   |
| Fresne) Integral Algorithms                      | ۷.   | v. v. Cohen  | Shock Tube Resistance Heater   |
| With Kernel Averaging.                           | Simple Seturated Gain Defailed Gain  | 8.5  | Onner Not modeled.   |
| Gaussian Quadrature                              | Mirror Titt - Decentration   | vv V Cohen   | F.ATOM DISSOCIATION FROM $(V)$   |
| Fast Fourier fransform (FFT)                     | l E  | Other  | 12   |
| Fast Hankel Transform (FMT)                      | Arthurst   | Single Line Model (V)                                | Other (specify) NF3  |
| Gardener Freschel Krichholf (GFK)                | Calcolad (consists)  | Multiline Model (V)                                  | F.ATOM CONCENTRATION DETERMINED FROM MODEL? *                                  |
| Oner (specify) Midpoint Rule; Com/Ann.           | Reflectivity: ss   | Assumed Rotational Population Distribution State (V) | DILUENTS MODELED HE N  |
| A annual son | Output Coupler Edges Rolled  | Equilibrium Nonequilibrium                           | MODELS EFFECTS ON MIXING RATE DUE 10 (1)  Nozzle Boundary Layers 3 Shock Waves |
| Power Companion y Fred Companion                 | Serrated Other   | Number of Laser Lines Modeled                        | Prereactions (thermal blockage) Turbulence                                     |
|  | LOADED CAVITY FIELD MODIFIER MODELS (V)  | Source of Rate Coefficients Used in Code HANGDOOK Of | Other (specify) Trip   |
| ACCELERATION ALGORITHMS USED?                    | Medium Index Vanation  | LINE PROFILE MODELS (V)                              |  |
| Technique  | Overlapped Beams   | Doppler Broadening F                                 |  |
| Prony  | oner General medium in homogeneities   | Collisional Broadening                               | MODELS EFFECTS ON OFTICAL MODES DOE TO (+) Media Indea Variations              |
| Other  | FAR-FIELD MODELS (V) Beam Steering Removal   | Other (specify)                                      | Other (specify)  |
|  | Optimal Focal Search Weam Quality Beam Optimal Ream phase Cleanup system   |  | 7418   |
|  | one prompting control of the control |  |  |
|  |  |  |  |

\* By equilibrium thermochemistry

| CODE NAME | ROPTICS |  |
|-----------|---------|--|
|           |         |  |

|  | Optical and Kinetics   |
|--|--|
|  | SE(S)/APPLICATION(S) OF CODE Study interaction between rotational nonequilibrium kinetics ar       |
| optical re   | sonator geometry. Also see NORO-I.   |
|  |  |
|  |  |
|  | CAPABILITIES: Since kinetic-fluid dynamic model is qualitative, code provides qualitative          |
|  | ing of nonlinear interactions between kinetics, fluid dynamics, and optical resonator.             |
| under 3 conc   | ting of non-inical interactions beginner kinetics; Train affairings, and operacting                |
|  |  |
|  | LIMITATIONS: Qualitative kinetics and fluid dynamics; strip minor resonator model                  |
|  | by Bell Aerospace Textron) models two mirror stable and unstable resonators.                       |
| (developed   | by bell Actospace textion) inducts the intitol stable and distable resonators.                     |
|  |  |
|  |  |
|  | EATURES: Can take up to 30 lines; because of rotational nonequilibrium kinetics.                   |
| <u>predicts</u> v  | hich lines will lase.  |
|  |  |
| RIGINATOR/KE   | CONTACT:   |
| Name:  | L.H. Sentman Phone: (217) 333-1834   |
| Organization   | Department of Aeronautical and Astronautical Engineering, University of Illinois                   |
| Address:   | 101 Transportation Building, Urbana, Illinois 61801  |
| VAU ABI E DOCI   | MENTATION: (7 = Theory, U = User, RP = Relevant Publication): (RP) Applied Optics 17, 2244 (1978). |
| WAILABLE DOCK  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| STATUS:  |  |
| STATUS:<br>Operational C   |  |
|  | urrently?:Yes  |
| Operational C  | urrently?: Yes   |
| Operational C<br>Under Modifi  | urrently?: Yes   |
| Operational C<br>Under Modifi<br>Purpose(  | urrently?: Yes ation?:   |
| Operational C<br>Under Modifi<br>Purpose(<br>Ownershipt:   | urrently?:Yes  |
| Operational C<br>Under Modific<br>Purpose(<br>Ownership?:<br>Proprietary?:   | urrently?: Yes ation?:   |
| Operational C<br>Under Modific<br>Purpose(<br>Ownership?:<br>Proprietary?:   | urrently?:Yes  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPER/  | urrently?: Yes  ation?:  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPER/  | urrently?: Yes  ation?:  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPEN IRANSPORTABLI Machine Deg                             | urrently?:Yes  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPER/ FRANSPORTABLI Machine Des                            | urrently?:Yes  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPER/ FRANSPORTABLI Machine Des                            | urrently?:Yes  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPER/ TRANSPORTABLI Machine Des                            | urrently?:Yes  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPER/ IRANSPORTABLI Machine Des iELF-CONTAINEE Other Codes | urrently?:Yes  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPER/ TRANSPORTABLE Machine Des SELF-CONTAINEE Other Codes | urrently?:Yes  |
| Under Modifi- Purpose(  Ownership2: Proprietary2: MACHINE/OPER/ TRANSPORTABLI Machine Des SELF-CONTAINEL Other Codes             | urrently?:Yes  |
| Operational C Under Modifi Purpose( Ownership?: Proprietary?: MACHINE/OPEN/ TRANSPORTABLE Machine Dep SELF-CONTAINEE Other Codes | urrently?: Yes  Lation?:   |

The state of

| OPTICS   | sol  | KINETICS   | GAS DYNAMICS   |
|--|--|--|--|
| BASIC TYPE (V) Physical Quice // Geometrical                           | RESONATOR TYPE (V) Standing Wave   | GAIN REGION MODELED (V):   | NOZZLE GEOMETRY MODELED (and type) $(V)$ . Horse contents of the state of the stat  |
| Ē  | >  | 1 3  | Germania: racenty flowing<br>Rectangular Linearly Flowing  |
| Scalar Vector  | optical element models included $\langle V  angle$ :   | Compact Region. Annular Region   | Other  |
| COORDINATE SYSTEM (Cartesian cylindrical, etc.).                       | \$.  | 3  | COORDINATE SYSTEM  |
| Compact Region Annular Region TRANSVERSE GRID DIMENSIONALITY (V) 10 20 | Cylindines Mirrors Telescopes Serabes Mirrors  | Commerci Region:   | FLUID GRID DIMENSION (V) 10 20 30  |
| 5  | Aucons Reflacions  | Annular Region:  | Laminar Turbulent  |
| Annular Region   | Arbitrary  | GAIN REGION SYMMETRY RESTRICTIONS:                                     | Other  |
| FIELD SYMMETRY RESTRICTIONS?   | Linear   | Gain Vary Along Optic Axes?  | BASIC MODELING APPROACH ( $V$ )  |
| Square Circular Strp   | Parabola - Parabola  | PULSED: CW: V KINETICS MODELED CHEMICAL PLIMPING REACTIONS MODELED (V) | Premixed Mixing  |
| Rectangular Eleptical Arbitrary  | Variable Core Offset:  | (x-v2 vx-v)  |  |
| CONFIGURATION FLEXIBILITY (V)  | Deformable Mirrors   | ) x  | References for Approach Used   |
| Fraed. Multiple Resonator Geometries                                   | Spetial Filters: Gralings  | Cod (F · H <sub>2</sub> ):   |  |
| Modular Multiple Resonator Geometries                                  | Other Elements   |  | THE GRAND DEPOSIT OF A STATE OF A |
| PROPAGATION TECHNIQUE NA PERSON CONTRACT ANNOTAR                       |  | ENERGY TRANSFER MODES MODELED (V). Reference                           | Arc Heater Combuston   |
| Fresnel Integral Algorithms  | Simple Saturated Gein Detailed Gain  | vr. /  | Shock Tube Resistance Heater   |
| with Render Averaging  | =  | , tr   | Other  |
| fest Fourner (zanstoem (FFT)   | Mirror Tiff Decentration   |  | FATOM DISSOCIATION FROM (V)  |
| Fest Hankel Transform (FMT)  | Aberrations/Thermal Distortions  | Single Line Model (V.)   | 2 Sf 6 Other (specify)   |
| Cardener Freenet Kirchhoff (GFK)                                       | Arbitrary:   | Muthine Model (V)  | F.ATOM CONCENTRATION DETERMINED FROM MODEL'  |
| Other (specify)  | Seected (specify)  | Assumed Rotational Population Distribution State (V)                   | DILUENTS MODELED   |
|  | Reference Comments of the Comm | Equitibrium Nonequilibrium   | MODELS EFFECTS ON MIXING RATE DUE TO (1)   |
| 5  | Culput Couper cages: Noted   | Number of Laser Lines Wodeled 1858.                                    | Nozzle Boundary Layers Shock Waves   |
| Power Companion Field Companion P                                      | DADED CANTY FIELD MODIFIED MODELS (V)  | Source of Rate Coefficients Used in Code COhen HF rate                 | Prereactions (thermal blockage)Turbulence  |
| ב בווכול ב וחסס בסנפו סקבורס.  | Medium index Vanation  | package, Hinchen's rotational relaxa-                                  | Other (specify)  |
| ACCELERATION ALGORITHMS USED!  | Gas Absorption   | line Parkie Models(V) Spumping distin-                                 |  |
| multiple eigenvalue/vector extraction algorithm ( $V_{ m J}$ ):        | Overlapped Beams   | Doppler Broadening Y Collisional Broadening                            | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)   |
|  | Cher<br>FAR-FIELD MODELS (V) Beam Steening Removal   | Other (specify) Voight profile.  | Weds Index Vanations Other (specify)   |
|  | Optimal Focal Search Beam Guality  |  |  |
|  | Other  |  |  |
|  |  |  |  |

| CODE NAME: | ROTKIN |
|------------|--------|

| CODE TYPE: Opt   | ics, Kinetics, and C   | asdynamics  |  |          |
|--|--|---|--|----------|
|  |  | Prediction of b   | HR/DF chemical laser performance based on coup   | led      |
|  | )/APPLICATION(\$) OF CODE:   |   | rotational, and radiative transfer.  |          |
| rate equation  | analysis of chemica  | al, VIDIACIONAL, I  | Ocacional, and radiacive cransier.   |          |
| <del></del>  |  |   |  |          |
|  |  |   |  |          |
|  | Accurate n   | radiction of laces  | r spectra results from rotational nonequilibri   | um       |
| ASSESSMENT OF CAPA   | BILITIES: ACCUPACE P   | n warm miring mate  | and schedules of flow variables to approxima   | tα       |
|  |  |   |  |          |
| certain physic   | al effects (e.g. b   | oundary layers, si  | nock, etc.) Geometrical optics is used.  |          |
|  |  |   |  |          |
| ASSESSMENT OF LIMIT  | Fabry-Pi   | erot resonator and  | alysis is one-dimensional; fluid dynamic analy   | /S i s   |
|  | ensional, scheduled  |   | atysis to one elimenstation, trans of themse   |          |
| 13 01 01/2 01/10   | instant someoutes  |   |  |          |
|  |  |   |  |          |
|  | <del></del>  |   |  |          |
|  | see Schodulad mi   | xing model with d   | ifferent mixing lengths for primary and second   | iarv     |
| miving zones   | Allows use of line   | ear, exponential.   | or tabular rates.  | <u>-</u> |
| mixing polics.   | 711003 436 01 171  | cary c sponentiary  | 01 000010. 70000   |          |
|  |  |   |  |          |
| ORIGINATOR/KEY CON   |  |   | <del></del>  |          |
|  | . J. Hall  |   | thone: (203) 727-7349  |          |
|  | nited Technologies   |   | mone: \(\frac{\sqrt{\sq}}}}}}}}}} \scrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sq}}}}}}}}} \sqrt{\sq}}}}}}}}}} \sqrt{\sqrt{\sqrt{\sqrt{\sq}}}}}}}}} \end{\sqrt{\sqnt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sq}}}}}}}}} \sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt      |          |
|  |  |   | 00100  |          |
| Address:>  |  |   | 06108  |          |
|  | ilver Lane, E. Hart  | Tora, connecercus   | (DO) D. J. Hall "Botational Monoguilibria  |          |
| AVAILABLE DOCUMEN  | FATION: (T = Theory, U - Use<br>stad Operation in C  | or, RP = Relevant Publicatio  | (RP) R. J. Hall, "Rotational Nonequilibriums" (FFF 10F 0F-12 453 (1976)  | ım       |
| AVAILABLE DOCUMEN<br>and Line-Sele   | TIVER Lane, E. Hart<br>TATION:(T = Theory, U - Use<br>ted Operation in C   | r. RP = Relevant Publicatio<br>W DF Chemical Lase   | on: (RP) R. J. Hall, "Rotational Nonequilibriums,", IEEE JQE, QE-12, 453 (1976).   | ım       |
| AVAILABLE DOCUMEN<br>and Line-Sele   | TATION: (T = Theory, U - Use<br>ted Operation in C   | or, RP = Relevant Publication W DF Chemical Lase  | on: (RP) R. J. Hall, "Rotational Nonequilibriums,", IEEE JQE, QE-12, 453 (1976).   | ım       |
| AVAILABLE DOCUMEN<br>and Line-Sele   | TATION: (T = Theory, U - Use<br>ted Operation in C   | wr. RP = Relevant Publicatio<br>W DF Chemical Lase  | Oblus<br>n): (RP) R. J. Hall, "Rotational Nonequilibrium, IEEE JQE, QE-12, 453 (1976).   | ım       |
| AVAILABLE DOCUMEN<br>and Line-Sele   | TATION: (T = Theory, U - Use<br>ted Operation in C   | or, RP = Relevant Publication W DF Chemical Lase  | O6108<br>n): (RP) R. J. Hall, "Rotational Nonequilibrium):<br>ers", IEEE JQE, QE-12, 453 (1976).   | ım       |
| AVAILABLE DOCUMEN<br>and Line-Sele   | TYPE Lame, E. mark<br>TATION: (T = Theory, U - Use<br>cted Operation in C  | or, RP - Relevant Publication W DF Chemical Lase  | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibricers", IEEE JQE, QE-12, 453 (1976).  | ım_      |
|  | TIVET Lame, E. marc<br>TATION: (T = Theory, U - Use<br>cted Operation in C.  | w. RP - Relevant Publication W DF Chemical Last   | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).   | ım       |
| STATUS:  | TATION: (T = Theory, U - Use<br>cted_Operation_in_C  | w. RP - Relevant Publication W DF Chemical Lasc   | O6108<br>n): (RP) R. J. Hall, "Rotational Nonequilibriuers", IEEE JQE, QE-12, 453 (1976).  | ım       |
| STATUS:<br>Operational Curren  | TATION: (T = Theory, U - Use<br>cted Operation in C  | w. RP - Relevant Publication W DF Chemical Lass   | U6108  n): (RP) R. J. Hall, "Rotational Nonequilibriuers", IEEE JQE, QE-12, 453 (1976).  | ım       |
| STATUS:<br>Operational Curren<br>Under Modification  | TATION: (T = Theory, U - Use<br>cted Operation in C  | or, RP - Refevant Publication W DF Chemical Last  | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibriuers", IEEE JQE, QE-12, 453 (1976).  | ım       |
| STATUS:<br>Operational Curren  | TATION: (T = Theory, U - Use<br>cted Operation in C  | or, RP - Refevant Publication W DF Chemical Last  | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibrium): (RP) Rotational Nonequilibrium): (RP) R. J. Hall, "Rotational Nonequilibrium): (RP) Rotational Nonequilibriu |          |
| STATUS:<br>Operational Curren<br>Under Modification  | TATION: (T = Theory, U - Use<br>cted Operation in C  | or, RP - Refevant Publication W DF Chemical Last  | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).   |          |
| STATUS:<br>Operational Curren<br>Under Modification<br>Purpose(s):   | TATION: (T = Theory, U - Use<br>cted Operation in C<br>representation in C<br>Yes<br>Type No   | W. RP = Relevant Publication W DF Chemical Last   | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).   |          |
| STATUS:  Operational Curren Under Modification Purpose(s):  Ownership?:  | TATION: (T = Theory, U - Use cted Operation in C of the C operation in C operatio | or RP - Refevent Publication W DF Chemical Last   | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibriuers", IEEE JQE, QE-12, 453 (1976).  |          |
| STATUS:  Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?:  | TATION: (T = Theory, U - Use ted Operation in Classification in Cl | w.RP - Relevant Publicatio  | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibrium of the control of the cont | JM       |
| STATUS:  Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?:  | TATION: (T = Theory, U - Use cted Operation in C of the C operation in C operatio | w.RP - Relevant Publicatio  | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).   | JM       |
| STATUS: Operational Curren Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING  | TATION: (T = Theory, U - Usected Operation in Classification in Cl | w.RP - Relevant Publicatio  | O6108  n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).   | JM       |
| STATUS: Operational Curren Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING  | TATION: (T = Theory, U - Usected Operation in Classify:  Yes  No  UTRC  Yes  SYSTEM (on which installed):  | w.RP - Relevant Publicatio  | O6 (08<br>n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).  | JM       |
| STATUS: Operational Curren Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING  | TATION: (T = Theory, U - Usected Operation in Classification in Cl | w.RP - Relevant Publicatio  | U6 (U8) n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).  | m_       |
| STATUS: Operational Curren Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING  | TATION: (T = Theory, U - Use cted Operation in Classification in C | w.RP - Relevant Publicatio  | Obliga<br>n): (RP) R. J. Hall, "Rotational Moneguilibric<br>ers", IEEE JQE, QE-12, 453 (1976).   | JM       |
| Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende   | TATION: (T = Theory, U - Use cted Operation in Classification in C | w.RP - Relevant Publication W DF Chemical Lass  | Ob (US n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).   | ım       |
| Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende   | TATION: (T = Theory, U - Use cted Operation in Classification in C | w.RP - Relevant Publication W DF Chemical Lass  | O6 (U8)  n): (RP) R. J. Hall, "Rotational Nonequilibrium of the control of the co | JIM      |
| Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende   | TATION: (T = Theory, U - Use cted Operation in Classification in C | w.RP - Relevant Publication W DF Chemical Lass  | Ot (US)  (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).   | JIM      |
| Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende   | TATION: (T = Theory, U - Use cted Operation in Classification in C | w.RP - Relevant Publication W DF Chemical Lass  | U6 (U8)  (n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).  | JIM .    |
| STATUS: Operational Curren Under Modification Purpose(s): — Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Requi             | TATION: (T = Theory, U - Use cted Operation in Classification in C | W. RP - Relevant Publication W DF Chemical Lass Univac 1110                                     | n): (RP) R. J. Hall, "Rotational Monequilibriums", IEEE JQE, QE-12, 453 (1976).  | JIM .    |
| STATUS: Operational Curren Under Modification Purpose(s): — Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED: Other Codes Requi              | TATION: (T = Theory, U - Usected Operation in Classification in Cl | w.RP - Relevant Publication W DF Chemical Lass  | U6 (U8 n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).   | ım       |
| STATUS: Operational Curren Under Modification Purpose(s): — Proprietary?: MACHINE/OPERATING TRANSPORTABLE7: Machine Depende SELF-CONTAINED: Other Codes Requi              | TATION: (7 = Theory, U - Usected Operation in Classification in Cl | w. RP - Relevant Publication DF Chemical Lass Univac 1110  Univac 1110  Core Size (Octal Words) | n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).  | ım       |
| STATUS:  Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Requi | TATION: (T = Theory, U - Usected Operation in Classification in Cl | w. RP - Relevant Publication DF Chemical Lass Univac 1110  Univac 1110  Core Size (Octal Words) | n): (RP) R. J. Hall, "Rotational Monequilibriums", IEEE JQE, QE-12, 453 (1976).  | ım       |
| STATUS:  Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Requi | TATION: (7 = Theory, U - Usected Operation in Classification in Cl | w. RP - Relevant Publication DF Chemical Lass Univac 1110  Univac 1110  Core Size (Octal Words) | n): (RP) R. J. Hall, "Rotational Nonequilibriums", IEEE JQE, QE-12, 453 (1976).  | um       |

Ž

| ۲ | • | - | ١ |
|---|---|---|---|
| 3 | ı | 4 |   |
| í |   |   |   |
| • | 5 |   |   |
| ζ |   | 0 | , |
| Ć | 5 | 4 |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |
|   |   |   |   |

| KINETICS GAS DYNAMICS | CONDINATE SYSTEM CENTERIN MODELED (V)  CONDINATE SYSTEM CENTERIN CONDINATE SYSTEM CONDINATE SYS |
|-----------------------|--|
|                       | RESONATOR TYPE (V) Sanding Were  Treating Wave (king)  Treating Wa |
| SJIT90                | PRINCE (A)  PRELO (POLARIZATION) REPRESENTATION (V)  Scalar (Vector (COORDINATE SYSTEM (CATEGOR of COORDINATE SYSTEM (CATEGOR OF CATEGOR of COORDINATE SYSTEM (CATEGOR OF CATEGOR |

| CODE NAME. | SAIC2D |
|------------|--------|
|            |        |

| CODE TYPE:   |  |  |  |   |
|--|--|--|--|---|
|  | ose(s)/APPLICATIO  |  | ovide capabi   | lity of modeling high-order modes in cylindrica   |
| ssessment of<br>annular  | CAPABILITIES Presonator sys  | Provides beam in<br>Stem. Determine  | ntensity and<br>e effects of                                       | <pre>phase distribution throughout any cylindrical/<br/>system perturbations of these distributions.</pre>  |
| ASSESSMENT OF<br>Fresnel i   | LIMITATIONS  | imited to analy  | rsis of beams  | s with azimuthal modes and compact region   |
| THER UNIQUE F  | EATURES.   | dodels HSURIA an   | d traveling  | wave annular ring resonator   |
| PRIGINATOR/KEY Name: Organization: Address:  | Jerry Long<br>Science App  | lications, Inc.  |  | Phone: (404) 955-2663   |
|  |  | Ferry Road, Su<br>Theory U - User RP<br>174 (1975).  | rite 220, At<br>Relevant Publication                               | (DD) F A Critize and A F Cinera   |
| Applied (  | urrently? Yes  | Theory, U . User, RP<br>174 (1975).  | Relevant <sup>p</sup> ublication                                   | (DD) F A Critize and A F Cinera   |
| AVAILABLE DOCU Applied (  STATUS: Operational G Under Modific Purpose(i  Ownership?. Proprietary?:   | urrently? Yes Yes Inco   | Theory U User RP<br>74 (1975).   | Relevant <sup>p</sup> ublication                                   | (RP) E. A. Sziklas and A. E. Siegmer,  /reflaxicon model.   |
| AVAILABLE DOCU Applied ( A | urrently? Yes Yes Inco  U.S. Gover No  VING SYSTEM (on ways) Yes wendent Restrictions on Yes, except Required (name, pur   | Theory U User RP 174 (1975).  Triporate general finment  Requires 37   | ized axicon/ yber 175/170  OK or virtua w. es input fro            | (RP) E. A. Sziklas and A. E. Siegmer,  /reflaxicon model.   |
| AVAILABLE DOCU Applied ( A | urrently? Yes Yes Inco  U.S. Gover No  VING SYSTEM (on ways) Yes wendent Restrictions on Yes, except Required (name, pur   | Theory U User RP 174 (1975).  Triporate general frament  Thich installed)  Requires 37  It as noted belo hequir power extracti   | ized axicon/ yber 175/170  OK or virtua w. es input fro            | (RP) E. A. Sziklas and A. E. Siegmar,  //reflaxicon model.  In memory computer. Some CDC FORTRAN dependent  om kinetics calculations on a subroutine to do  (See GCAL.) |
| AVAILABLE DOCU Applied ( A | U.S. Gover No atting system (on very least on very least o | Theory U - User RP 174 (1975).  Proporate general comment comm | ized axicon/ yber 175/170  OK or virtua w. es input fro on option. | Oreflaxicon model.  Preflaxicon model.  In memory computer. Some CDC FORTRAN dependent computers calculations on a subroutine to do (See GCAL.)                         |



| CZD  |
|------|
| SAIC |
|      |

| OPTICS  | sa   | KINETICS  | GAS DYNAMICS   |
|---|--|---|--|
| SIC TYPE (\L)   | RESONATOR TYPE (V): Standing Wave  | GAIN REGION MODELED (V)                               | NO221E GEOMETRY MODELED (and 1ype) (V)<br>Cylindrical Radially Flowing |
| LD (POLARIZATION) REPRESENTATION (V).   | BRANCH (V) Positive " Negative " OPTICAL ELEMENT MODELS INCLUDED (V)   | -   | Rectangular. Linearly Flowing  |
| JRDINATE SYSTEM (Cartesian, cylindrical, etc.).                                     | Fist Mirrors Spherical Mirrors   | KINETICS GRID DIMENSIONALITY (V)                      | COORDINATE SYSTEM  |
| INSVERSE GRID DIMENSIONALITY (V) 10 20  | Scraper Micrors.   | Compact Region  | FLUID GRID DIMENSION ( $V$ ): 10 20 30 FLOW FIELD MODELED ( $V$ )      |
| ompact Region   | Asicons Abliancons Reflancons  | Annular Region  | Laminar Turbulent  |
| LD SYMMETRY RESTRICTIONS? 1-16 Azimuthal RROR SHAPE(S) ALLOWED (V) MODES IN ANNUJAR | Linear   | Gain Vary Along Optic Axes flow Direction? busingers. | BASIC MODELING APPROACH (V) Premised Mune                              |
| avare Circular V Strip  | Parabota-Parabola:   | UMPING REAC   | Other (specify)  |
| N FLEXIBILITY (V)   | Other (specify):<br>Deformable Mirrors: 4  | L X   | References for Approach Used   |
| sed. Multiple Res: nator Geometries   | Spatial Fifters: Gratings  | Cold (F · H <sub>2</sub> )                            |  |
| odular, Multiple Resonator Geometries   | Other Elements:  | Other (apecity)                                       | THERMAL DRIVER MODELED (V)   |
|   | • .  | ENERGY TRANSFER MODES MODELED (V) Reference           | Arc Heater Combuston Shock Tube Resistance Heater                      |
| ith Kernel Averaging  | Simple Safurated Gain Contained Gain | Y.R   | Other  |
| sst Fourier Transform (FFT)   | Merce Titl Decentration  | Oher  | F-ATOM DISSOCIATION FROM (V)   |
| ast Hankel Transform (PHT)  | Aberrations/Thermal Distortions Arbitrary  | Single Line Wodel (V)                                 |  |
| indense fransk Kirchhoff (GFK) Thei (spacify) Radial asymptotic                     | Selected (specify) Intensity mapping 8   | Muttline Model (V)                                    | F. ATOM CONCENTRATION DETERMINED FROM MODEL?  DILUENTS MODELED         |
| expansion in annular region   | Reflectivity Loss  | Equilbrum Nonequilbrum                                | \ <u>\$</u>  |
| NVERGENCE TECHNIQUE (V)   | Sarated Other  | Number of Laser Lines Modeled                         | Presections (thermal blockage) Turbulence                              |
|   | LOADED CAVITY FIELD MODIFIER MODELS (V)  | Source of Rate Coefficients Used in Code              | Other (specify)  |
| CELERATION ALGORITHMS USED? YES   | Gas Absorption   | LINE PROFILE MODELS (V)                               |  |
| LTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM ( $oldsymbol{V}_i$ .                  | Overlapped Beams "   | Doppler Broadening<br>Collisional Broadening          | MODELS EFFECTS ON OPTICAL MODES DUE TO $(oldsymbol{1})$                |
| ther  | Other FAR-FIELD MODELS (V) Beam Steening Removal   | Other (specify)                                       | Media Index Vanations Other (specify)                                  |
|   | Optimal Focal Search 7 Beam Quality 1  |   |  |
|   | 205  |   |  |
|   |  |   |  |

\* 128 x 128 =8192 +8192/NL

| COOE. | NAME | - 1 |
|-------|------|-----|
|       |      |     |

| SAIC2DV |  |
|---------|--|
|         |  |

| Operational Currently? Yes Under Modification? Yes Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proprietary? No  IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  | ODE TYPE: Opt         | ics   |   |
|--|-----------------------|---|---|
| ssessment of carabilities  sessment of carabilities  provides by am intensity and phase distribution. throughout any cylindrical/ sannular resonator system. Determine effects of system perturbations on these distributions.  Sessment of carabilities system. Determine effects of system perturbations on these distributions.  Limited to analysis of beams with 1-32 azimuthal modes and compact region freshell numbers. 30.  THER UNIQUE FEATURES.  Model's HSURIA and travelling wave annular resonator.  RIGHATOR/KEY CONTACT.  Name Jerry Long Phone: [404) 955-2663  Organization. Science Applications, Inc.  Address. 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339  VALUABLE DOCUMENTATION: Thoru, Uyer, RP. Relevant Publication) (RP) E. A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975).  TATUS  Operational Currently: Yes Under Modification: Yes Under Modification: Yes Under Modification: To complete optimization of vectorized routines  Operations (Williams) (CYBER 203)  RANSFORTABLE: NO Machine Dependent Restrictions. Usus CYBER 203 vector algorithms  ELIC CONTAINED: Yes, except as noted below.  Comber Codes Regulard Game, purpose) Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE Of RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Sob 1000K 20 CYBER 203  Typical Bob 1000K 500-1000 CYBER 203  Small Sob 1000K 500-1000 CYBER 203  Small Sob 1000K 500-1000 CYBER 203  | PINCIPAL PURPOSE(S)   | Provide accurat                             | e, cost-effective method of cylindrical/annular |
| SSESSMENT OF CAPABILITIES   Provides by am intensity and phase distribution. throughout any cylindrical?   |                       |   |   |
| SSESSMENT OF CAPABILITIES System. Determine effects of system perturbations on these distributions.  SSESSMENT OF LIMITATIONS System. Determine effects of system perturbations on these distributions.  SSESSMENT OF LIMITATIONS Limited to analysis of beams with 1-32 azimuthal modes and compact region freshell numbers = 30.  THER UNIQUE FEATURES Models HSURIA and traveling wave annular resonator.  MIGINATOR/KEY CONTACT.  Name Serry Long Phone: [404] 955-2663  Organization Science Applications, Inc. Address: 6500 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339  VALIABLE DOCUMENTATION (T. Theop. U. User, RP Relevant Publication) (RP) E. A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975).  TATUS  Operational Currently? Yes Purposet(1) To Complete optimization of vectorized routines  Omnership? U.S. Government Proposition? No Achitica Complete System in which installed) CYBER 203  RANSPOATABLE: No Machine Dependent Restrictions Usus CYBER 203 vector algorithms  ELECCONTAINED? Yes, except as noted below. Other Goods Required frame, purpose) Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See 6CAL).  STMATE OF RESOURCES REQUIRED FOR HUMS  Core Size (Octal Words) Essecution Time (See, CDC 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  |                       | <del></del>                                 |   |
| SSESSMENT OF LIMITATIONS  SSESSMENT OF LIMITATIONS  Limited to analysis of beams with 1-32 azimuthal modes and compact region in the second compact region in the |                       | and these parameters. (1117)                |   |
| SSESSMENT OF LIMITATIONS  SSESSMENT OF LIMITATIONS  Limited to analysis of beams with 1-32 azimuthal modes and compact region in the second compact region in the |                       | Provides beam intensity and                 | phase distributions throughout any cylindrical/ |
| THER UNIQUE FEATURES Models HSURTA and traveling wave annular resonator.  RIGHATOR/KEY CONTACT. Name. Jerry Long Phone: (404) 955-2663 Organization: Science Applications, Inc. Address: 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339 VALLABLE DOCUMENTATION (T. Theory, U. Quer, RP Relevant Publication). (RP.) E. A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975).  TATUS Operational Currently? Yes Under Modification? Yes Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proposetry? No IACHINE OPERATING SYSTEM (on which installed): CYBER 203  RAMSPORTABLE? No Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED? Yes, except as noted below. Other Codes Required (name, purpose) Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Ab 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  |                       | itor system. Determine effects of           | system perturbations on these distributions.    |
| THER UNIQUE FEATURES Models HSURTA and traveling wave annular resonator.  RIGHATOR/KEY CONTACT. Name. Jerry Long Phone: (404) 955-2663 Organization: Science Applications, Inc. Address: 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339 VALLABLE DOCUMENTATION (T. Theory, U. Quer, RP Relevant Publication). (RP.) E. A. Sziklas, and A. E. Siegman, Applied Optics 14, 1874 (1975).  TATUS Operational Currently. Yes Under Modification? Yes Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proposetry. No IACHINE OPERATING SYSTEM (on which installed): CYBER 203  RANSPORTABLE: No Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED? Yes, except as noted below. Other Codes Required (ame, purpose) Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small do 1000K 20 CYBER 203 Typical Job 1000K 500-1000 CYBER 203 Typical Job 1000K 500-1000 CYBER 203   |                       |   |   |
| RIGINATOR/KEY CONTACT.  Name: Jerry Long Phone: (404) 955-2663  Organization: Science Applications, Inc. Address: 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339  VAILABLE DOCUMENTATION: (T Theory U User RP - Relevant Publication): (RP) E. A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975)  TATUS  Operational Currently: Yes  Purpose(s) To complete optimization of vectorized routines  Ownerthip: No  ACACHINE/OPERATING SYSTEM (on which installed): CYBER 203  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINER: NO  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINER: Yes, except as noted below.  Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC: 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Typical Job 1000K 500-1000 CYBER 203   |                       | ION3  | ms with 1-32 azimuthal modes and compact region |
| RIGINATOR/KEY CONTACT.  Name: Jerry Long Phone: (404) 955-2663  Organization: Science Applications, Inc. Address: 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339  VAILABLE DOCUMENTATION: (T Theory U User RP - Relevant Publication): (RP) E. A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975)  TATUS  Operational Currently: Yes  Purpose(s) To complete optimization of vectorized routines  Ownerthip: No  ACACHINE/OPERATING SYSTEM (on which installed): CYBER 203  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINER: NO  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINER: Yes, except as noted below.  Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC: 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Typical Job 1000K 500-1000 CYBER 203   |                       |   |   |
| Name: Jerry Long Phone: 404) 955-2663  Organization: Science Applications, Inc. Address: 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339  VALABLE DOCUMENTATION: (T. Theory, U. User, RP Relevant Publication): (RP.) E., A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975)  TATUS Operational Currently: Yes Under Modification: Yes Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proprietary: No IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RAMSPORTABLE: No Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED: Yes, except as noted below. Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Smell Job 1000K 20 CYBER 203  Large Job 1000K 500-1000 CYBER 203  | OTHER UNIQUE FEATURE  | s Models HSURIA and traveling wa            | ve annular resonator.                           |
| Name: Jerry Long Phone: 404) 955-2663  Organization: Science Applications, Inc. Address: 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339  VALABLE DOCUMENTATION: (T. Theory, U. User, RP Relevant Publication): (RP.) E., A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975)  TATUS Operational Currently: Yes Under Modification: Yes Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proprietary: No IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RAMSPORTABLE: No Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED: Yes, except as noted below. Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Smell Job 1000K 20 CYBER 203  Large Job 1000K 500-1000 CYBER 203  |                       |   |   |
| Organization: Science Applications, Inc. Address: 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339  VAILABLE DOCUMENTATION: (T. Theory, U. User, RP - Relevant Publication): (RP) E. A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975)  TATUS Operational Currently: Yes Under Modification: Yes Under Modification: To complete optimization of vectorized routines  Ownership: U.S. Government Propose(s): To complete optimization of vectorized routines  Ownership: No IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RANSPORTABLE: No Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED: Yes, except as noted below. Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Small Job 1000K 20 CYBER 203  Large Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203  |                       | mnu lana                                    | (404) 955-2663                                  |
| Address: 6600 Powers Ferry Road, Suite 220, Atlanta, Georgia 30339  VALLABLE DOCUMENTATION: (T. Theory, U. User, RP. Relovant Publication): (RP) E. A. Sziklas and A. E. Siegman, Applied Optics 14, 1874 (1975)  TATUS  Operational Currently? Yes Under Modification? Yes Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proprietary? NO  IACMINE/OPERATING SYSTEM (on which installed): CYBER 203  RANSPORTABLE: NO Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED? Yes, except as noted below. Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job 1000K 20 CYBER 203  Large Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203  | ٠,                    |   | none:   |
| VALLABLE DOCUMENTATION: (T. Theory, U. User, RP - Relevant Publication): (RP) E. A. Sziklas and A. E. Siegman.  Applied Optics 14, 1874 (1975)  TATUS  Operational Currently? Yes  Under Modification? Yes  Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government  Proprietary? No  IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RANSPORTABLE? No  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED? Yes, except as noted below.  Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job 1000K 20 CYBER 203  Large Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203   |                       |   | tlanta, Georgia 30339                           |
| Applied Optics 14, 1874 (1975)  TATUS Operational Currently? Yes Under Modification? Yes Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proprietary? NO  IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RANSPORTABLE? NO Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED? Yes, except as noted below. Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203   |                       |   | (00) 5 4 0 113                                  |
| Operational Currently?: Yes Under Modification? Yes Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proprietary? No  IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RAMSPORTABLE: No Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED?: Yes, except as noted below. Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203   | Applied Optics        | 14, 1874 (1975)                             | · · · · · · · · · · · · · · · · · · ·           |
| Operational Currently: Yes    Ves   Yes  |                       |   |   |
| Under Modification? Yes  Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proprietary? No  IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RANSPORTABLE?: NO  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED?: Yes, except as noted below.  Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203   | STATUS                | Voc   |   |
| Purpose(s) To complete optimization of vectorized routines  Ownership? U.S. Government Proprietary? No  IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RANSPORTABLE?: No  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED? Yes, except as noted below.  Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203   |                       | ·   |   |
| Ownership? U.S. Government Proprietary? No  IACHINE/OPERATING SYSTEM (on which installed): CYBER 203  RANSPORTABLE?: NO  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED?: Yes, except as noted below.  Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203  |                       |   | tonized moutines                                |
| Proprietary? No  IACHINE/OPERATING SYSTEM (on which installed):  | Purpose(s):           | to complete optimization of vec             | torized routines                                |
| Proprietary? No    IACHINE/OPERATING SYSTEM (on which installed):  | Ownership? U.         | S. Government                               |   |
| RANSPORTABLE: NO  Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED: Yes, except as noted below.  Other Codes Required (name, purpose). Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Time (Sec. CDC 7600)  Small Job 1000K 20 CYBER 203  Typical Job 1000K 500-1000 CYBER 203  Large Job 1000K 500-1000 CYBER 203  | N/                    |   |   |
| Machine Dependent Restrictions: Usus CYBER 203 vector algorithms  ELF-CONTAINED? Yes, except as noted below.  Other Codes Required (name, purpose): Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).  STIMATE OF RESOURCES REQUIRED FOR RUNS  Core Size (Octal Words)   Execution Time (Sec. CDC 7600)  Small Job   1000K   20 CYBER 203  Typical Job   1000K   100 CYBER 203  Large Job   1000K   500-1000 CYBER 203   | MACHINE/OPERATING SY  | STEM (on which installed): <u>CYBER 203</u> |   |
| Core Size (Octal Words)  Small Job  Typical Job  Large Job  Large Job  Large Job  Core Size (Octal Words)  1000K   | TRANSPORTABLE?: NO    |   |   |
| Other Codes Required (name, purpose):    Requires imput from kinetics calculations or a subroutine to do gain calculations for power extraction option (See GCAL).    STIMATE OF RESOURCES REQUIRED FOR RUNS   | Machine Dependent i   | Restrictions: Usus CYBER 203 vector alg     | gorithms  |
| STIMATE OF RESOURCES REQUIRED FOR RUNS   | ELF-CONTAINED?: Yes   |   |   |
| STIMATE OF RESOURCES REQUIRED FOR RUNS   Execution Time (Sec. CDU 7600)  | Other Codes Required  |   |   |
| Core Size (Octal Words)   Execution Time (Sec. CDC 7600)   |                       |   |   |
| Typical Job         100CK         100         CYBER 203           Large Job         1000K         500-1000         CYBER 203   | ESTIMATE OF RESOURCES |   | Execution Time (Sec. CDC 7600)                  |
| Large Job 1000K 500-1000 CYBER 203   | ~                     |   |   |
| Carge 30b  | Small Job:            | 1000K                                       |   |
| pproximate Number of FORTRAN Lines: 3000   |                       | 1000K<br>1000K                              | 100 CYBER 203                                   |
|  | Typical Job           | 1000K<br>1000K                              | 100 CYBER 203                                   |

Ì

| OPTICS  | รอ   | KINETICS   | GAS DYNAMICS                                       |
|---|--|--|--|
| ASIC TYPE (V)                                       | RESONATOR TYPE (V) Standing Mare   | GAIN REGION MODELED $\langle V  angle$   | NOZZLE GEOMETRY MODELED Land types (V)             |
| Pryside Optics Commetted at                         | Traveling Wave (Ring)  | Compact Region Annular Region  | Cylindrical Radially Flowing                       |
| ELD POLARIZATION, REPRESENTATION (V)                | BRANCH (1) Positive " Necessite"   | COORDINATE SYSTEM (Carresian cylindrical etc.)   | Rectangular Linearty Froming                       |
| Yalan Vector  | OPTICAL ELEMENT MODELS INCLUDED (1)  | Compact Region Annular Region  | Other  |
| DORDINATE SYSTEM Warreness sylindereal etc.)        | Flat Mirrors 2 Spherical Morrors   | KINETICS GRID DIMENSIONALITY (1)   | COORDINATE SYSTEM                                  |
|   | Cylindriu at Mirrors Telescipes b  | 10 20 30   | FLUID GRID DIMENSION (1) 10 20 30                  |
| RANSVERSE GRID DIMENSIONALITY (V) 1D 2D             | Scraper Mirrors  | Compact Region   | FLOW FIELD MODELED (\$)                            |
| Surpara Region                                      | Aarcons Reffaccons   | Annular Region   | Laminar Turbulent                                  |
| Annula: Region                                      | Arbitary   | GAIN REGION S. MMETRY RESTRICTIONS.  | Other  |
| ELD SYMMETRY RESTRICTIONS: 1-04 dZ17/ULDd1          | Lunear ,   | Gain Vary Along Optic Axes? Flow Direction'  | 3  |
|   | Parabola Parabola  | PULSED CW KINETICS MODELED   | Premised Mising                                    |
| Rectangular Ethorical Arbutary                      | Variable Cone Offset   | CHEMICAL PUMPING REACTIONS MODIFIED (V)  | Other (specify)                                    |
| FLEXIBILITY (V)                                     | Other (specify)  | 3 3  |  |
| Fred Single Resonator Geometry                      | Deformable Mirrors   |  | References for Approach Used                       |
| Fred Multiple Resonator Geometries                  | Spatial Filters Gratings   | <u>-</u> ا   |  |
| Modular Multiple Resonator Geometries               | Other Elements   | 2,   |  |
| ROPAGATION TECHNIQUE                                |  | ENERGY TRANSFER MONEY MONEY IN A 1   |  |
| Freshel integral Algorithms                         | GAIN MODELS (V) Bare Courty Only   | CITED TO THE PROPERTY OF THE P |  |
| With Resolut Averaging                              | Simple Seturated Gain 2  | ~  | Shock Tube Resistance Heater                       |
| Gaussian Quadrature                                 | BARE CAVITY FIELD MODIFIER MODELS $(ar{ar V})$   |  | Other  |
| Fest Four-er Transform (FFT)                        | Muror Titl Decentration  | Other  | FATOM DISSOCIATION FROM (V)                        |
| Fast Hansel Transform (FHT)                         | Aberrations / Thermal Distortions  | Constant and Market A.   | 7 3' 6   |
| Gardener fresnet Krichhoff (GFR)                    | Arbitrary  | STIME THE MODEL (A)  | Capacity (Space)                                   |
| onerispect, Padial asymoptotic                      | Selected (specify) Intensity mapping &   | (A) approximate words  | P. A COM CONCENTRATION DETERMINED FROM MUDEL       |
| expansion in annular region                         | Reflectivity toss  |  | MODELS EFFECTS ON MIXING RATE DUE TO (\$)          |
| ONVERGENCE TECHNIQUE (V)                            | Output Coupler Edges Rolled  | בלתווסניותים ביינים ביי | Norzte Boundary Layers Shock Waves                 |
| Power Comparison * Freid Comparison 2               | Serrated Other   | The state of the s | Preseactions (thermal blockage)Turbulence          |
| Other   | LOADED CAVITY FIELD MODIFIER MODELS $(V)$  | מסקורה כן אשופ היפוניה וויים מסקים וויים מסקים   | Other (specify)                                    |
| CCELERATION ALGORITHMS USED?                        | Medium Index Variation   | LINE PROFILE MODELS (V.)   |  |
| Technique   | tass Absorption  | Doppler Broadening   |  |
| BULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM (V) | Overlapped Bearns  | Colitsional Broadening   | MODELS EFFECTS ON OPTICAL MODES DUE TO $(\lambda)$ |
| Prony   | Other  | Office County and County   | Media Index Variations                             |
| (Aher   | FAR FIELD MODELS (V.) Beam Steering Removal  |  | Other (specify)                                    |
|   | Aniero Cranta  |  |  |
|   | , and the state of |  |  |
|   |  |  |  |

SAIFHT

| DOINGIDAL BURGOSS   | APPLICATION(S) OF CODE Provide ac  | curate, cost-effective method of cylindrical/annular  |
|---|--|---|
|   |  | ding power extraction for use in overall system   |
| optimization.   |  |   |
|   |  |   |
|   | Dyouidos hoam intensit   | and phase distributions throughout any culindrical/   |
| assessment of capab<br>annular reson  | Lines  | y and phase distributions throughout any cylindrical/   |
| annutar reson   | ator system.   |   |
|   |  |   |
|   | Models only circular be  | eams which can be described with 1 - 8 azimuthal modes  |
| ASSESSMENT OF LIMITA  | TIONS TOURS ONLY CITCUIAL PE   | ans which can be described with 1 - 8 azimathat modes   |
|   |  |   |
|   |  |   |
| OTHER UNIQUE FEATUR   |  | nd annular ring resonators, compact unstable confocal   |
| resonators, c   | onfocal and non-confocal HSUR  | IA.   |
|   |  |   |
| ORIGINATOR/KEY CONT.  | ACT.   |   |
| Name:   | Jerry Long   | Phone (404) 955-2663  |
| Organization  | Science Applications, Inc.   |   |
| Address   | 6600 Powers Ferry Road, Suit   | te 220, Atlanta, Georgia 30339  |
| AVALLABLE DOCUMENTA   | TIQN: (T_Theory, U User, RP Relevant P   | (T) HF Laser Subsystem Technology Assessment  |
| [DAKPA Interi   |  | 'ublication);   |
|   |  | gia, July, 1979 (CONFIDENTIAL).   |
|   | m keport), SAI, Atlanta, Georg<br>iklas and A. E. Siegman, Appli   | gia, July, 1979 (CONFIDENTIAL).   |
|   |  | gia, July, 1979 (CONFIDENTIAL).   |
| (RP) E. A. Sz   | iklas and A. E. Siegman, Appli   | gia, July, 1979 (CONFIDENTIAL).   |
| (RP) E. A. Sz   | iklas and A. E. Siegman, Appli   | gia, July, 1979 (CONFIDENTIAL).   |
| (RP) E. A. Sz   | iklas and A. E. Siegman, Appli<br>, Yes<br>Yes   | ofa, July, 1979 (CONFIDENTIAL).<br>ied Optics 14, 1874 (1975).  |
| (RP) E. A. Sz  STATUS: Operational Currently  | iklas and A. E. Siegman, Appli   | ofa, July, 1979 (CONFIDENTIAL).<br>ied Optics 14, 1874 (1975).  |
| (RP) E. A. Sz  STATUS: Operational Currently Under Modification?  | iklas and A. E. Siegman, Appli<br>, Yes<br>Yes   | ofa, July, 1979 (CONFIDENTIAL).<br>ied Optics 14, 1874 (1975).  |
| (RP) E. A. Sz  STATUS: Operational Currently Under Modification?: Purpose(s)  | iklas and A. E. Siegman, Appli<br>, Yes<br>Yes   | ofa, July, 1979 (CONFIDENTIAL).<br>ied Optics 14, 1874 (1975).  |
| (RP) E. A. Sz  STATUS: Operational Currently Under Modification?: Purpose(s)  | iklas and A. E. Siegman, Appli  , Yes Yes To provide generalized axio  | pia, July, 1979 (CONFIDENTIAL).  ied Optics 14, 1874 (1975).  con/reflaxicon model.   |
| (RP) E. A. Sz  STATUS: Operational Currently Under Modification? Purpose(s)  Ownership? Proprietary? No   | , Yes Yes To provide generalized axio  | on/reflaxicon model.  |
| (RP) E. A. Sz  STATUS: Operational Currently Under Modification? Purpose(s)  Ownership? Proprietary? NO MACHINE/OPERATING S   | , Yes Yes To provide generalized axio  | on/reflaxicon model.  |
| STATUS:  Operational Currently Under Modification? Purpose(s)  Ownership? U.S Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE? Y   | , Yes Yes To provide generalized axion Government  Cyber 17  | pia, July, 1979 (CONFIDENTIAL).  ied Optics 14, 1874 (1975).  con/reflaxicon model.   |
| (RP) E. A. Sz  STATUS: Operational Currently Under Modification?: Purpose(s)  Ownership?: Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE?  Machine Dependent  | ; Yes Yes To provide generalized axio . Government  YSTEM (on which installed)  Cyber 17 es Restrictions Requires machine wi   | on/reflaxicon model.  |
| (RP) E. A. Sz  STATUS: Operational Currently Under Modification? Purpose(s)  Ownership? U.S Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE? Y Machine Dependent Code are CDC  | , Yes Yes To provide generalized axio  Government  Cyber 17  es  Restrictions Requires machine wif   | pia, July, 1979 (CONFIDENTIAL).  ied Optics 14, 1874 (1975).  con/reflaxicon model.   |
| STATUS:  Operational Currently Under Modification? Purpose(s)  Ownership? U.S Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE? Y Machine Dependent code are CDC  SELF-CONTAINED?: Other Codes Require  | , Yes Yes To provide generalized axio  Government  STEM (on which installed)  Restrictions Requires machine wife for the control of the contr | pla, July, 1979 (CONFIDENTIAL).  led Optics 14, 1874 (1975).  con/reflaxicon model.  75, 176  ith minimum of 370K or virtual memory; some lines in  24 from kinetics calculations or a subroutine to de   |
| STATUS: Operational Currently Under Modification? Purpose(s)  Ownership? Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE? Machine Dependent code are CDC  SELF-CONTAINED? Other Codes Require  | , Yes Yes To provide generalized axio  . Government  YSTEM (on which installed)  Cyber 17  es  Requires machine wifferstretons Requires Requires machine wifferstretons Requires | pla, July, 1979 (CONFIDENTIAL).  led Optics 14, 1874 (1975).  con/reflaxicon model.  75, 176  ith minimum of 370K or virtual memory; some lines in  24 from kinetics calculations or a subroutine to de   |
| STATUS:  Operational Currently Under Modification? Purpose(s)  Ownership? U.S Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE? Y Machine Dependent code are CDC  SELF-CONTAINED?: Gain calculat  | , Yes Yes To provide generalized axio  Government  STEM (on which installed)  Cyber 17  Es Restrictions Requires machine wiff FORTRAN dependent. Yes, except as noted below, diname, purpose) Requires inputions for power extraction (See   | pla, July, 1979 (CONFIDENTIAL).  led Optics 14, 1874 (1975).  con/reflaxicon model.  75, 176  ith minimum of 370K or virtual memory; some lines in  24 from kinetics calculations or a subroutine to de   |
| STATUS:  Operational Currently Under Modification? Purpose(s)  Ownership? U.S Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE? Y Machine Dependent code are CDC  SELF-CONTAINED?: Gain calculat  | , Yes Yes To provide generalized axio  . Government  . Government  . Government  . Government  . Cyber 17  . Cyber | pla, July, 1979 (CONFIDENTIAL).  ied Optics 14, 1874 (1975).  con/reflaxicon model.  75, 176  ith minimum of 370K or virtual memory; some lines in ut from kinetics calculations or a subroutine to do e GCAL).  Words)   Execution Time (Sec. CDC 7600)                      |
| STATUS:  Operational Currently Under Modification? Purpose(s)  Ownership? U.S Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE? Y Machine Dependent code are CDC  SELF-CONTAINED?: Gain calculat  | , Yes Yes To provide generalized axio  . Government  . Government  . Government  . Government  . Cyber 17  . Ses Restrictions Requires machine wire FORTRAN dependent. Yes, except as noted below. Id (name, purpose) Requires inputions for power extraction (Section Section 1998)  . Secoular of the section of | pla, July, 1979 (CONFIDENTIAL).  ied Optics 14, 1874 (1975).  con/reflaxicon model.  75, 176  ith minimum of 370K or virtual memory; some lines in  at from kinetics calculations or a subroutine to do  a GCAL).  Words)   Execution Time (Sec. CDC 7600)  10 - 50           |
| STATUS:  Operational Currently Under Modification? Purpose(s)  Ownership? Proprietary? No MACHINE/OPERATING S  TRANSPORTABLE? Machine Dependent code are CDC  SELF-CONTAINED? Other Codes Require gain calculat  ESTIMATE OF RESOURCE                               | , Yes Yes Yes To provide generalized axid  . Government  YSTEM (on which installed)  Ess Restrictions Requires machine with FORTRAN dependent. Yes, except as noted below. Id (name purpose) Id  | pla, July, 1979 (CONFIDENTIAL).  ied Optics 14, 1874 (1975).  con/reflaxicon model.  75, 176  ith minimum of 370K or virtual memory; some lines in  ut from kinetics calculations or a subroutine to do  a GCAL).  Words)   Execution Time (Sec. CDC 7600)  10 - 50  50 - 100 |
| STATUS: Operational Currently Under Modification?: Purpose(s)  Ownership? Purpose(s)  Ownership? V.S Proprietary? NO MACHINE/OPERATING S  TRANSPORTABLE? Y Machine Dependent code are CDC  SELF-CONTAINED?: Other Codes Require gain calculat  ESTIMATE OF RESOURCE | , Yes Yes To provide generalized axio  . Government  . Government  . Government  . Government  . Cyber 17  . Ses Restrictions Requires machine wire FORTRAN dependent. Yes, except as noted below. Id (name, purpose) Requires inputions for power extraction (Section Section 1998)  . Secoular of the section of | pla, July, 1979 (CONFIDENTIAL).  ied Optics 14, 1874 (1975).  con/reflaxicon model.  75, 176  ith minimum of 370K or virtual memory; some lines in  at from kinetics calculations or a subroutine to do  a GCAL).  Words)   Execution Time (Sec. CDC 7600)  10 - 50           |

ALC: NO.

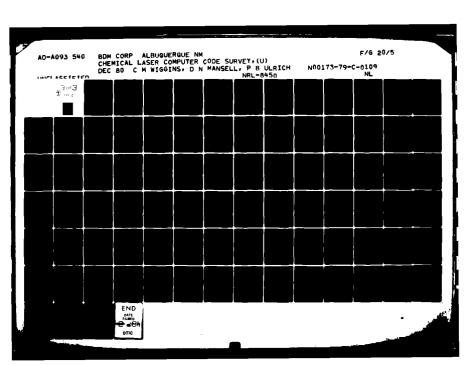
SAIFHT

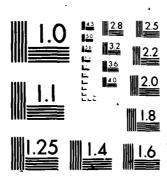
| OPTICS  | S).  | KINETICS  | GAS DYNAMICS   |
|---|--|---|--|
| ASIC TYPE (V)   | RESONATOR TYPE (V) Standing Wave   | GAIN REGION MODELED (V)   | NOZZLE GEOMETRY MODELED Land (5pa) (V)   |
| ELO (POL BRIZATION) REPRESENTATION (V.)               | Travelra Wave (King)   | Compact Region Annular Region   | Cylindrical Radially Flowing   |
| Scalar V Vector                                       | OPTICAL ELEMENT MODELS INCLUDED (V)  | COCKDICK IE STSTEM (Canadam cylindrical etc.) Compact Region Annular Region | Nectangular, Linearly Flowing  |
| OORDINATE SYSTEM (Canessan cylindrical etc.)          | Flat Mirrors Spherical Mirrors   | KINETICS GRID DIMENSIONALITY (V):   | COGRDINATE SYSTEM  |
| Compact Region L. Annular Region C.                   | Cylindrical Mirrora Teleacopes V   | 10 20 40  | FLUID GRID DIMENSION (V) 10 20 30  |
| 8192  | Aurona Marona Marona Marona Marona   | Compact Region  | FLOW FIELD MODELED (V)   |
| Annular Region  | 3  | GAIN REGION SYMMETRY RESTRICTIONS   | Other  |
| NELD SYMMETRY RESTRICTIONS? 1-8 azimuthal             | Linear   | Gain Vary Along Optic Axes? Flow Direction?                                 | BASIC MODELING APPROACH (V)  |
| HRROR SHAPE(S) ALLOWED (V)                            | Parabola Parabola  | PULSEU: CW: KINETICS MODELED  | Prettited Mising   |
| Elhotical   | Variable Cone Offset:  | (X · Y, VX · V)   | Other (specify)  |
| ONFIGURATION FLEXIBILITY (V)                          | Other (specify)  | : I   |  |
| Fixed Single Resonator Geometry                       | Deformable Mirrors   |   | References for Publicaecy Chars.   |
| Fired Multiple Resonator Geometries                   | Spattal Filters Grahmgs  | Hot (H · F <sub>2</sub> ) Chain (f · H <sub>2</sub> & H · F <sub>2</sub> )  |  |
| Modular Multiple Resonator Geometries                 | Other Elements   | Other (specify)   | THEOREM SAVES MODELS AND A LANGUAGE TO A LAN |
| ROPAGATION TECHNIQUE                                  |  | ENERGY TRANSFER MODES MODELED (V) ReferenCe                                 | Arc Heater Combusing   |
| Fresnel Integral Algorithms                           | Sample Saturated Gam / Pensaled Gam  | ν.τ   | Shock Tube Resistance Heater   |
| With Recree Averaging                                 | A STATE OF THE STA | V.R.  | Other  |
| Gaussian Quadrature                                   | MANUAL CAVITY FIELD MODIFIER MODELS (V)  | ^^  | FATOM DISSOCIATION FROM (V)  |
| Fast Fourier Transform (FFT)                          | mirror in  | Other   | 918 51   |
| Fast Hankel Transform (FMT)                           | Aberrations / I hermal [1980/nons  | Single Line Model (V)   | Other (specify)  |
| Gardener Fresnet Kirchhoff (GFK)                      | Arbitrary intensity manning &  | Multitine Model (V)   | F. ATOM CONCENTRATION DETERMINED FROM MODEL?   |
| one (specify) Radial asymptotic expansion             | · .  | Assumed Rotatumal Population Distribution State (1)                         | DILUENTS MODELED   |
| in annular region                                     | Reflectivity Loss !  | Equilibrium Nonecullibrium  | MODELS EFFECTS ON MIXING RATE DUE TO (V.)  |
| ONVERGENCE TECHNIQUE (V)                              | Output Coupler Edges Rolled  | Number of Lacer Lines Modeled   | Nozzie Boundary Layers Shock Waves   |
| Power Companison 1 Field Comparison 2                 | Serrated Other   | Course of Bear Court lead of the Court                                      | Presentions (thermal blockage) Turbulence  |
| Other   | LOADED CAVITY FIELD MODIFIER MODELS (V)  | SCORE OF NAME CORPOR PROPERTY CARGO IN CARGO                                | Other (specify)  |
| ICCELERATION ALGORITHMS USED? Yes                     | Medium Index Variation   |   |  |
| Technique Field and gain averaging                    | Gas Absentition  | LINE PROFILE MODELS (V.)  |  |
| AULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM $(V)$ | Overlapped Beams   | Onppler Broadening  | MODELS EFFECTS ON OPTICAL MODES DUE TO ()  |
| Prony   | Other  | Mulapaga ataganak   | Media Index Variations   |
| Gher  | FAR FIELD MODELS (V) Beam Steering Removal   | Other (specufy)   | Other (specify)  |
|   |  |   |  |
|   |  |   |  |
|   |  |   |  |

| CODE NAME | SAIG: |
|-----------|-------|
|           |       |

| CODE TYPE Ga   | isdynamics and Kinetics   |  |
|--|---|--|
| optimize ope<br>wave optics  | S)/APPLICATION(S) OF CODE(1) To correlate and analysis conditions and geometric configurations. analysis. Lasing and Chemical kinetics modeling liles for gain algorithm (GCAL).  |  |
| correlated t<br>flowfield of<br>geometry. I                                    | ABILITIES Model has been applied to a wide variet the available closed cavity data base well. Utilisquire flow nozzles. Includes effects of base reats expansion plane of source flow as two discource flow region.  TATIONS: | lizes 1-0 gasdynamics to model the 3-2 pressure, mixing rate and source flow |
|  | UNES: Models HF or DF lasing. Single line la<br>made to account for photon production at all l<br>on or laser rate equation.  |  |
| ORIGINATOR/KEY COF Name: Organization. Address: AVAILABLE DOCUMEN (DARPA Inter |   | Laser Subsystem Technology Assessment  |
| STATUS.  Operational Curren  Under Modification  Purpose(s).                   | Vas   | e capability.  |
| Proprietary'   | .S. Government  O Cyber 175  SYSTEM (on which installed) Cyber 175  |  |
| TRANSPORTABLE?   | Yes nt Restrictions None  |  |
| SE_T-CONTAINED?<br>Other Codes Requi   | Yes red (name purpose)  |  |
| ESTIMATE OF RESOUR   | CES REQUIRED FOR RUNS  Core Size (Octal Words) Execution Tir  | na (Sec. CD)/ 7500)  |
| Small Job  |   | ne (sec coc /600)  |

| 001  | OPTICS                                    | KINETICS   | GAS DYNAMICS   |
|--|---|--|--|
| 8451, TYPE (V)   | RESONATOR TYPE ( ) Standing Wave          | CAIN PEGION MODELED (AV)   |  |
| President (2011) Geometrical   | Traveling Mave (Ring) Reverse TW          | Compact Region 3 Annulai Region 3  | NOZZEE GEOMETRY MODELECTION (V)  |
| FIELD (POLARIZATION) REPRESENTATION (V)  | BRANCH (1) Positive Negative              | COORDINATE SYSTEM (Carpenan culturaries) atc.  | Description of the state of the |
| The state of the s | OPTICAL ELEMENT MODELS INCLUDED (V.)      | Compact Region Cd Annular Region CV  | Source flow nozzles  |
| COURDINATE SISTEM ICAMENIAN Syndrical att.   | Flat Mirrors Spherical Mirrors            | KINETICS GRID DIMENSIONALITY (\$)  | COORDINGTE exerted Cartesian or cylinerical  |
| Compact Region Annual Region   | Cylindric at Mirrors Telesuspes           | 19. 20 30  | FLUID GRID DIMENSION (V) 10  |
| TRANSVERSE GRID DIMENSIONALITY (V.) 1D 2D  | Scraper Mirrors                           | Compact Region   |  |
| Compact Region   | Ascons Refessions                         | Annular Region   | Lemmar Turbulent   |
| Annual Region  | Arbutary                                  | GAIN REGION SYMMETRY RESTRICTIONS  | Other  |
| FIELD SYMMETRY RESTRICTIONS?   | Linear                                    | Gain Vary Along Optic Axes? NO Flow Direction? Yes   | BASIC MODELING APPROACH (V)  |
| MIRROR SHAPE(S) ALTONED (V)  | Parabola Parabola                         | PULSED CW . KINETICS MODELED   | Premised Wising  |
| 4 3 10 1   | Variable Cone Offset                      | G REACTIONS MODELED  | Other operate, Clarie sheet approach   |
| The tribunity of   | Other (apeculy)                           |  |  |
| Fired Single Resonation Geometry   | Deformable Mirrors                        |  | References for Approach Used   |
| F sed Multiple Resunator Geometries  | Spatial Filters Gratings                  | Cold (F 142)   |  |
| Modula - Mursple Resumator Geometries  | Other Elements                            | not the state of t |  |
| PROPAGATION TECHNIQUE  |   | Construction of the second of  | سيا  |
| Freshet Integral Algorithms  | GAIN MODELS (V) Bare Cavity Only          | vi Cohen & Bott (1976)   | Arc Heater Corribustor   |
| Probleman general month  | Simple Safurated Gain Detailed Gain       | 0.0  | Shock Tube Resistance Heater   |
| Gaussian Quadrance   | Œ   | >>   | Other  |
| FART FOLICIAN COMMERCION (FFT)   | Mirror Tiff Decentration                  | Chhe   | F ATOM DISSOCIATION FROM (V.)  |
| Fast Manuel Transferrer (FMT)  | Aberrations / Thermal Distortiuns         | Smalle Line Model (N. )  | Other consects NE  |
| Sardanae Frassas Architel (SAR)  | Arbitrary                                 | Multipline Moder   | The second secon |
| Other (specify)  | Selected (aperity)                        |  | PAIGN CONCENTRATION DETERMINED FROM MODEL  |
|  | Reflectivity Lusa                         | Assumed Rotalional Population Unificition State ( )  | MODELS EFFECTS ON MIXING RATE DUE TO (V.)  |
| CONVERGENCE TECHNIQUE (V)  | Output Couples tages, Rolled              | Equitorium Nonekulibrium   | Mozzle Boundary Layers Shock Waves   |
| Priese Comparison  | Serviced Other                            | Number of Laser Unet Modeled   | Prereactions (thermal blockage)  |
| J. Williams  | LOADED CAVITY FIFT DIMODIFIER MODELS (V.) | Source of Nate Coefficients Used in Gode  Cobico. 2, Dorth (1926)  | Orber (specify)  |
| ACCELERATION ALGORITHMS USED   | Medium index Variation                    |  |  |
| attenta a  | Gas Absorption                            | LINE PROFILE MODELS (V.)   |  |
| MULTIPLE FIGENVALUE-VE TOREXTRACTION ALCORITHM (V)   | (Nertapped Beams                          | Doppler Broadering   | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)   |
| Privat   | (Nher                                     | William Control of the Control of th | Media Index Variations A T. F. Liviv (1997), 1997  |
| (Ant)  | ž   | (Nhe (specify)   | (Phys. (aper It)   |
|  | Optimal fix at Search Beam Duality        |  |  |
|  | fither                                    |  |  |
|  |   |  |  |





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

| CODE NAME: | SAIID |
|------------|-------|
|            |       |

| CODE TYPE:  | Optics   |   |
|---|--|---|
| PRINCIPAL PLIPAG  | SE(S)/APPLICATION(S) OF CODE: Provide  | accurate, cost-effective method of linear optical   |
|   |  | sis and the affect of various design perturbations on   |
| these par   |  | 313 GIVE CITE OF THE TOUS MESTER PET CUI DUCTORS OF   |
|   |  |   |
| ASSESSMENT OF O   | CAPABILITIES: Provides beam intensi<br>in a linear resonator.  | ty and phase distribution throughout one transverse   |
|   |  |   |
| ASSESSMENT OF COUPLING  | LIMITATIONS: Models only one tran  | sverse dimension and does not provide for any cross-  |
|   |  |   |
| OTHER UNIQUE F  | EATURES: Models linear confoca   | 1 and non-confocal positive and negative branch   |
| resonator   |  |   |
| ORIGINATOR/KEY  |  | 700 or 200  |
| Name:   | Jerry Long   | Phone: (404) 955-2663   |
| Organization:   |  |   |
|   | Science Applications, Inc.   | 7. 000 8.3 · · · · · · · · · · · · · · · · · · ·  |
| Address:  | 6600 Powers Ferry Road, Su   |   |
| Address:  |  |   |
| Address:  | 6600 Powers Ferry Road, Su   |   |
| Address:<br>AVAILABLE DOCU<br>Applied 0   | 6600 Powers Ferry Road, Su<br>MENTATION: (T = Theory, U = User, RP = Relevant<br>ptics 14, 1874 (1975).  |   |
| Address:  AVAILABLE DOCUM  Applied 0  STATUS:  Operational Co   | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant  Dptics 14, 1874 (1975).   |   |
| Address: AVAHLABLE DOCUL Applied 0  STATUS: Operational Cu  | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant  ptics 14, 1874 (1975).  Arrently: Yes  stion: No  |   |
| Address:  RYAILABLE DOCUM  Applied 0  STATUS:  Operational Co   | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant  ptics 14, 1874 (1975).  Arrently: Yes  stion: No  |   |
| Address:  AVAHABLE DOCUM Applied 0  Applied 0  STATUS:  Operational Cu Under Modific.  Purpose(s)   | 6600 Powers Ferry Road, Su MENTATION: (T = Theory, U = User, RP = Relevant ptics 14, 1874 (1975).  Arrendy: Yes ation: No  |   |
| Address: AVAHABLE DOCU Applied 0  STATUS: Operational C. Under Medific. Purpose(s.  | 6600 Powers Ferry Road, Su MENTATION: (T = Theory U = User, RP = Relevant Dptics 14, 1874 (1975).  Frendly: Yes stion: No  U.S. Government   |   |
| Address: AVAILABLE DOCU Applied 0  STATUS: Operational Co Under Medific Purpose(s  Ownership?: Proprietary?:  | 6600 Powers Ferry Road, Su MENTATION: (T = Theory U = User, RP = Relevant Dptics 14, 1874 (1975).  Frendly: Yes stion: No  U.S. Government   | Publication): (RP) E. A. Sziklas and A. E. Siegman.   |
| Address:  AVAILABLE DOCU Applied 0  Applied 0  STATUS: Operational Cu Under Modific Purpose(s)  Overarbip?: Proprietary?: MACHINE/OPERA*  | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant  ptics 14, 1874 (1975).  Arrendy?: Yes  stion?: No ):  U.S. Government  No  TING SYSTEM (on which installed): Cyber 175  ?: Yes  | Replication): (RP) E. A. Sziklas and A. E. Siegman.   |
| Address:  AVAILABLE DOCU Applied 0  Applied 0  STATUS: Operational Ct Under Modific. Purpose(s.  Proprietary: Proprietary: TRANSPORTABLE: Machine Depri                               | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant  Ditics 14, 1874 (1975).  Frendly: Yes  ation?: No  U.S. Government  No  TING SYSTEM (on which installed): Cyber 175  Yes  andent Restrictions: Has some lines to  | Publication): (RP) E. A. Sziklas and A. E. Siegman.   |
| Address: AVAILABLE DOCUMAPPITED  STATUS: Operational C. Under Medific. Purpose(s. Proprietary?: Proprietary?: MACHINE/OPERA: TRANSPORTABLE Machine Depo                               | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant  Dottics 14, 1874 (1975).  Franchity: Yes  Stion: No  U.S. Government  No  TING SYSTEM (on which installed): Cyber 175  TYPE  Endemt Restrictions: Has some lines the company of the company of the cyber to the cyber  | Publication): (RP) E. A. Sziklas and A. E. Siegman.  5/176  hat are CDC FORTRAN dependent.  |
| Address:  AVAILABLE DOCU Applied 0  STATUS: Operational Cu Under Modific Purpose(s)  Froprietary?:  MACHINE/OPERA*  TRANSPORTABLE: Machine Depi                                       | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant  Dptics 14, 1874 (1975).  Franchity: Yes  Stion?: No  U.S. Government  No  TING SYSTEM (on which installed): Cyber 175  P: Yes  andend Restrictions: Has some lines to  The cyes, except as noted below.   | (RP) E. A. Sziklas and A. E. Siegman.  5/176  hat are CDC FORTRAN dependent.  ut from a kinetic calculation or a subroutine to do                         |
| Address: AVAHABLE DOCU Applied 0  STATUS: Operational Cu Under Medific Purpose(s)  ACHINE/OPERA*  TRANSPORTABLE Machine Depi BELF-CONTAINED: Other Codes R Gain calc                  | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant ptics 14, 1874 (1975).  Arrently: Yes ation?: No ):  U.S. Government No  TING SYSTEM (on which installed): Cyber 175 7: Yes endemt Restrictions: Has some lines to p: Yes, except as noted below. lequired (neme, purpose): Requires inpu  | (RP) E. A. Sziklas and A. E. Siegman.  5/176  hat are CDC FORTRAN dependent.  ut from a kinetic calculation or a subroutine to do ee GCAL).               |
| Address:  AVAHABLE DOCU Applied 0  Applied 0  STATUS: Operational Cu Under Modific Purpose(s)  MACHINE/OPERA*  TRANSPORTABLE Machine Depi BELF-CONTAINED: Other Codes R Gain calc     | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant  Dottics 14, 1874 (1975).  Framework   | (RP) E. A. Sziklas and A. E. Siegman.  5/176  hat are CDC FORTRAN dependent.  ut from a kinetic calculation or a subroutine to do ee GCAL).               |
| Address:  AVAILABLE DOCU Applied 0  STATUS: Operational Cu Under Modific Purpose(s)  Preprietary?: MACHINE/OPERA  TRANSPORTABLE Machine Depi Other Codes R Gain Calc  ESTIMATE OF RES | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant ptics 14, 1874 (1975).  Werently: Yes ation?: No  U.S. Government No  TING SYSTEM (on which installed): Cyber 175  Yes andemt Restrictions: Has some lines the second of the secon | Publication): (RP) E. A. Sziklas and A. E. Siegman.  5/176  hat are CDC FORTRAN dependent.  ut from a kinetic calculation or a subroutine to do ee GCAL). |
| Address:  AVAILABLE DOCU Applied 0  Applied 0  STATUS: Operational Cu Under Modific Purpose(s) Preprietary: Preprietary: TRANSPORTABLE Machine Dependence Other Codes R Qain calc     | 6600 Powers Ferry Road, Su  MENTATION: (T = Theory, U = User, RP = Relevant ptics 14, 1874 (1975).  Arrently: Yes stion: No ):  U.S. Government No  TING SYSTEM (on which installed): Cyber 175 7: Yes sendent Restrictions: Has some lines to p: Yes, except as noted below. lequired (name, purpose): Requires inputations for power extraction (Second Required for Runs: Core Size (Octa 200K  | hat are CDC FORTRAN dependent.  ut from a kinetic calculation or a subroutine to do ee GCAL).  H Words)   Execution Time (Sec. CDC 7600) 5 - 10           |

...

.

| GAS DYNAMICS | MOZELE GEOMETER MODELED (and type) (V): Cylindrical Backaby France: Described. Lineary France: COORDINATE SYSTEM: Laninary Lineary France: COORDINATE SYSTEM: Laninary Lineary France: Described Coordinate Appendix (V): Laninary Lineary France: Described Coordinate Appendix (V): Premised: Material DRIVER MODELED (V): And Header: Combustion: Shock Tybe: Described Coordinates From VO: Fatoral Dissociation From (V): Fatoral Dissociation From (V): Fatoral Dissociation From (V): Fatoral Dissociation From (V): MODELS EFFECTS ON MISTING RATE DUE TO (V): MODELS Benefity Layer: Discussible Bene | MODELS EFFECTS ON OFTICAL MODES DUE TO (V):<br>Medic inclin (inclination)<br>Other (specifit): |
|--------------|--|--|
| KINETICS     | CANN REGION MODELED (V):  Compact Region:  Compact Region:  Compact Region:  Compact Region:  Compact Region:  Annular Region:  Annular Region SYMMETRY RESTRICTIONS:  Gain Vary Anny Obtic Mana?  PULSED:  CHEMICAL PUBLING REACTIONS MODELED  CHEMICAL PUBLING REACTIONS MODELED  CHEMICAL PUBLING REACTIONS MODELED  CHEMICAL PUBLING REACTIONS MODELED  (X * Y_2 = YZ * Y)  (X * Y_3 = YZ * Y)  (X * Y_4 = YZ * Y * Y)  (X * Y_4 = YZ * Y * Y)  (X * Y_4 = YZ * Y * Y)  (X * Y_4 = YZ * Y * Y)  (X * Y_4 = YZ * Y * Y)  (X * Y_4 = YZ * Y * Y)  (X * Y_4 = YZ * Y * Y)  (X * Y_4 = YZ * Y * Y)  (X * Y_4 = YZ * Y * Y * Y)  (X * Y_4 = YZ * Y * Y * Y * Y * Y * Y * Y * Y * Y  | Dispire Threadening  |
| ортися       | RESONATOR TYPE (V): Standing Wave: Treasing Man (Mnt):   | Overingped Baum:   |
| ò            | FIELD (FORMERATION) REPRESENTATION (V):  FIELD (FOLMERATION) REPRESENTATION (V):  COMBINITE SYSTEM (Extrement cylindrical str.):  Compact Ragion:  Annuals Ragion:  Annuals Ragion:  Annuals Ragion:  Annuals Ragion:  Annuals Ragion:  Annuals Ragion:  FIELD SYMMETRY RESTRICTIONS:  Restringular  CONFEGURATION FLEXIBILITY (V):  Final Ministra Research Geometry  Franch Ministra Research Geometry  Geometry Conference  Franch Ministra Research Geometry  Geometry Conference  Franch Ministra Research  Franch Ministra Research  Geometry Conference  Geometry Conferenc |  |

+ Not accurate for large cross-coupling effects \*

with GCAL

I

| CODE TYPE:  | otics  |  |
|---|--|--|
| PRINCIPAL PURPOSE(S   | )/APPLICATION(S) OF CODE: Modeling of  | rectangular linear resonators and optical trains.  |
|   | Describes have detected  | the state of the s |
| ASSESSMENT OF CAPA<br>rectangular   | resonator system.  | and phase distributions throughout a linear  |
| ASSESSMENT OF LIMIT   | TATIONS: Limited to a combined 2-  | dimensional sampling resolution of 8192 points (64 x 1   |
| OTHER UNIQUE FEATU  | Models compact unstable  | confocal (ABLE, MIRACL, MADS, HELWS) resonators.   |
| ORIGINATOR/KEY CON  | ITACT:   | Phone: (404) 955-2663  |
| Organization:   | Science Applications, Inc.   |  |
| Address:  | 6600 Powers Ferry Road, Suite  | 220, Atlanta, Georgia 30339  |
| AMAN ASK C POSTINGEN  |  | (00) 5 4 0 114   |
| Applied One   | TATION: (T = Theory, U = User, RP = Relevant Publice, 14, 1974, 71075)   | Heaten): (RP) E. A. Sziklas and A. E. Siegman.   |
| Applied Opti  | TATION: (T = Theory, U = User, RP = Relevant Pub<br>CS 14, 1874 (1975)   | McoMon): (RP) E. A. Sziklas and A. E. Siegman.   |
| Applied Opti  | TATION: (T = Theory, U = User, RP = Relevant Publics 14, 1874 (1975)   | Headlen): (RP) E. A. Sziklas and A. E. Siegman.  |
| Applied Opti  | TATION: (T = Theory, U = User, RP = Relevant Publics 14, 1874 (1975)   | Mcadon): (RP) E. A. Sziklas and A. F. Siegman.   |
| Applied Opti  | TATION: (T = Theory, U = User, RP = Relevant Publics 14, 1874 (1975)   | Mcanton): (RP) E. A. Sziklas and A. E. Siegman.  |
| Applied Opti  | TATION: (T - Theory, U - Lear, RP = Relevant Publics 14, 1874 (1975)   | Mcanton): (RP) E. A. Sziklas and A. E. Siegman.  |
| Applied Opti  | TATION: (T = Theory, U = User, RP = Relevant Publics )4, 1874 (1975)   | McaMon): (RP) E. A. Sziklas and A. E. Siegman.   |
| Applied Opti  | TATION: (T = Theory, U = User, RP = Relevant Publics 14, 1874 (1975)   | Mcanton): (RP) E. A. Sziklas and A. E. Siegman.  |
| Applied Opti  | TATION: (T = Theory, U = User, RP = Relevant Publics 14, 1874 (1975)   | Mcanton): (RP) E. A. Sziklas and A. E. Siegman.  |
| STATUS:   | Vac  | Mcanton): (RP) E. A. Sziklas and A. E. Siegman.  |
| STATUS: Operational Curren  | Hyr: Yes   | Mcadon): (RP) E. A. Sziklas and A. E. Siegman.   |
| STATUS:<br>Operational Curren<br>Under Modification   | Hyr: Yes   | Mcanton): (RP) E. A. Sziklas and A. E. Siegman.  |
| STATUS:<br>Operational Curren   | Hyr: Yes   | Mcanton): (RP) E. A. Sziklas and A. E. Siegman.  |
| STATUS:<br>Operational Curren<br>Under Modification   | Hyr: Yes   | Mcanton): (RP) E. A. Sziklas and A. E. Siegman.  |
| STATUS: Operational Curren Under Modification Purpose(s):   | Yes<br>No  | Mccombon): (RP) E. A. Sziklas and A. E. Siegman.   |
| STATUS: Operational Curren Under Modification Purpose(s):   | Hyr: Yes   | Mcadon): (RP) E. A. Sziklas and A. F. Siegman.   |
| STATUS: Operational Curren Under Modification Purpose(s): Ownership?: Proprietary?:   | U.S. Government  |  |
| STATUS: Operational Curren Under Modification Purpose(s): Ownership?: Proprietary?:   | Yes No U.S. Government   |  |
| STATUS: Operational Curren Under Modification Purpose(s): Omership?: Proprietary?; MACHINE/OPERATING  | U.S. Government No system (on which installed):Cyber 175/  |  |
| STATUS: Operational Curren Under Modification Purpose(s): Ownership?: Proprietary?:   | U.S. Government No system (on which (notalled):Cyber_175/1   | 176  |
| STATUS: Operational Curren Under Modification Purpose(s): Ownership?: Proprietary?; MACHINE/OPERATING   | U.S. Government No SYSTEM (on which installed): Cyber 175/   |  |
| STATUS: Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende  | U.S. Government No SYSTEM (on which installed):Cyber 175/' Yes on Restrictions:Contains_some_CDC_F(  | 176  |
| STATUS: Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende  | U.S. Government No SYSTEM (on which installed): Cyber 175/1 Yes TRESTRICTIONS: Contains some CDC FO  | 176  ORTRAN dependent Code.  |
| STATUS:  Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Regui                                | U.S. Government No System (on which installed): Cyber 175/ Yes TRestrictions: Contains some CDC For Yes, except as noted below.  | ORTRAN dependent Code.  from kinetics calculation or a subroutine to do  |
| STATUS:  Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Regui                                | U.S. Government No SYSTEM (on which installed): Cyber 175/1 Yes TRESTRICTIONS: Contains some CDC FO  | ORTRAN dependent Code.  from kinetics calculation or a subroutine to do  |
| STATUS:  Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Regui                                | U.S. Government No System (on which installed): Cyber 175/ Yes TRestrictions: Contains some CDC For Yes, except as noted below.  | ORTRAN dependent Code.  from kinetics calculation or a subroutine to do  |
| STATUS:  Operational Curren Under Modification Purpose(s):  Proprietary?:  MACHINE/OPERATING TRANSPORTABLE?: Mechine Depende SELF-CONTAINED?: Qain calcula  | U.S. Government No SYSTEM (on which installed): Cyber 175/ Yes MRestrictions: Contains some CDC For Yes, except as noted below. Fred (name, purpose): Requires input tions for power extraction option   | ORTRAN dependent Code.  from kinetics calculation or a subroutine to do  |
| STATUS:  Operational Curren Under Modification Purpose(s):  Proprietary?:  MACHINE/OPERATING TRANSPORTABLE?: Mechine Depende SELF-CONTAINED?: Qain calcula  | U.S. Government No System (on which installed): Cyber 175/ Yes TRestrictions: Contains some CDC For Yes, except as noted below.  | ORTRAN dependent Code.  from kinetics calculation or a subroutine to do ns (See GCAL).   |
| STATUS: Operational Curren Under Modification Purpose(s):  Omnership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Mechine Depende SELF-CONTAINED?: Other Codes Regui gain calcula                    | U.S. Government No System (on which installed): Cyber 175/ Yes MRestrictions: Contains some CDC For Yes, except as noted below. Fred (name, purpose): Requires input tions for power extraction option CES REQUIRED FOR RUNS:                          | ORTRAN dependent Code.  from kinetics calculation or a subroutine to do ns (See GCAL).   |
| STATUS: Operational Curren Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Regui gain calcula ESTIMATE OF RESOUR | U.S. Government No SYSTEM (on which installed): Cyber 175/ Yes TRESTRICTIONS: Contains some CDC F( Yes, except as noted below. Fred (name, purpose): Requires input tions for power extraction option CES REQUIRED FOR RUNS: Core Size (Octal Wo. 370K | from kinetics calculation or a subroutine to do ns (See GCAL).  See GCAL SE |
| STATUS: Operational Curren Under Modification Purpose(s):  Omnership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Mechine Depende SELF-CONTAINED?: Other Codes Regui gain calcula                    | U.S. Government No System (on which installed): Cyber 175/ Yes MRestrictions: Contains some CDC F( Yes, except as noted below. Ired (name, purpose): Requires input tions for power extraction option CES REQUIRED FOR NUNS:                           | ORTRAN dependent Code.  from kinetics calculation or a subroutine to do ns (See GCAL).   |

.....

CODE NAME:

| SAI2D |
|-------|
| S     |

| OPTICS   | ıcs  | KINETICS  | GAS DYNAMICS   |
|--|--|---|--|
| BASIC TYPE (V)   | RESONATOR TYPE (V): Standing Wave:                                     | GAIN REGION MODELED (V): Compact Nation: Annular Nation:                                  | NOZZLE GEOMETRY MODÉLED (and typa) (V):<br>Crimárical, Padally Powing: |
|  | BRANCH (V): Poutitive: 1 Negative: 1                                   | COORDINATE SYSTEM (Carlesian, cylindrical, etc.)  | Rectangular, Lineary Flowing:  |
| CONDINATE SYSTEM (Certainer, cylindrical, etc.):-                                | Gritch Element Would's Included (V):  File Mirror: - Spherical Mirror: | Compact Import:   | COORDINATE SYSTEM:   |
| Compact Regen C.A. Annulu Region:  | Cylindrical Mirrors: // Telescopes: // Scrimer Mirrors: //             | Community Beneficia   | FLUID GRID DIMENSION ( $V$ ): 10: 20: 30: 30: 7: 10 MODELED ( $V$ ):   |
|  | Azicons Wallicons Reflaircons  | Annular Region:   | Laminar:Turbulent:   |
| FIELD SYMMETRY RESTINCTIONS: NUNE  | Arbitrary:<br>Umaer:   | GAIN REGION SYMMETRY RESTRICTIONS: Gain Very Mong Optic Ause?:                            | DRING MODELING APPROACH (V):   |
| SHAROR SHAPE(S) ALLOWED (V):<br>SHARK:SHIP:                                      | Parabole-Parabele:   | PULSED: CW. KINETICS MODELED  | Premised: Mising:  |
| Bhritangular V Eligotesi V Arbitrary:  | Verlable Core Offset:<br>Other (specify):                              |   |  |
| CONFIGURATION FLEXIBILITY (Y): Finet. Single Resenter Geometry:                  | Determable Illinors:   | $\begin{pmatrix} V \cdot X_2 = VX \cdot X \end{pmatrix} \qquad H$ Cond if $F + H \cdot J$ | References for Approach Used:  |
| Fluesh Medingle Reconder Geometries  | Special Filters: Gratings:   | ] Green   |  |
|  | Other Demonth:   | Other (specify):  | THERMAL DRIVER MODELED ( $$ :  |
| PROPAGATION TECHNIQUE (various appy), COMPACT ANNULAR French Integral Agorithms: | GAIN MODELS (V): Bare Covity Onty:                                     | ENERGY TRANSFER MODES MODELED (V): National N.T.  | Arc Heater:Combustion:   |
| White Rerus Averaging  | Simple Saturated Cain: Detailed Gain:                                  | # 2   | Shock Tube: Resistance Mester:   |
| Gemeien Quedrahre:   | BARE CAVITY FIELD MODIFIER MODELS (V):                                 | 4.4   | F.ATOM DISSOCIATION FROM (V):  |
| Yeat Fewier Transform (FT): /  | Į.   | Other:  | , s  |
| Gardens- Freenal Kirchhaff (GFK):  | Anthony Intensity mapping  |   | F.ATOM CONCENTRATION DETERMINED FROM MODEL?                            |
| Other (specify):   | Abwing Law.  | Assumed Retational Population Distribution State ( $oldsymbol{V}$ ):                      | DILUENTS MODELED: MODELS EFFECTS ON MIXING RATE DUE TO (V):            |
| CONVERGENCE TECHNIQUE (V):   | 3  | Squitterium. Nemoclatherium<br>Number of Laser Lines Medicad                              | Nozze Beundery Layers:Sheck Waves:                                     |
| Power Compartners:   | LOADED CAVITY FIELD MODFIER MODELS (V):                                | Seurce of Rate Coefficients Used in Code  | Prenactions (thermal blockage):Turbulence:Obser (spacify):             |
| ACCELEBATION ALGORITHMS USED? YES  | Medium Index Variation:  | LINE PROFILE MODELS (V):  |  |
| MULTIPLE ENGEWALUE/VECTOR EXTRACTION ALGORITHM:(V):                              | Destapped Beams: /   | Deptier Bredening   | MODELS EFFECTS ON OPTICAL MODES DUE TO $\langle V \rangle$ :           |
| Phone  | FAR-FIELD MODELS (V): Bean Seering Removal /                           | Other (specify)   | Media Index Variations: Other (specify)                                |
|  | Optimal Facal Search: Pean Quality                                     |   |  |
|  | Other  |   |  |

\* with GCAL

| CODE NAME: | \$0\$ |
|------------|-------|
|            |       |

| CODE TYPE: _   |  |
|--|--|
|  | Optics and Kinetics  |
|  | POSE(S)/APPLICATION(S) OF CODE: (Son-of-Spike); calculation of pulsed HF and DF chemical laser   |
| performan  |  |
|  |  |
|  |  |
|  |  |
|  | FCAPABILITIES: Calculates solutions to coupled thermodynamic, chemical kinetic, and radiation  |
|  | equations for pulsed HF and DF lasers. Utilizes comprehensive model of chemical kinetics   |
| computing  | des rotational nonequilibrium. Treatment of rotational nonequilibrium allows very short  |
| Compacing  | tine.  |
| ASSESSMENT O   | FLIMITATIONS: Restricted to Fabry-Perot cavity.  |
|  |  |
|  |  |
|  | FEATURES: The existing code is strictly a pulse code. Hence there are no flow-field  |
|  | that are pertinent. However, a modification to be known as GSOS (Grandson-of-Spike) is   |
|  | debugged which will incorporate the DESALE-5 mixing model into SOS. The result will be a   |
|  | : CW code with rotation nonequilibrium.  |
| BIGINATOR/KI   | EY CONTACT:  |
| Name:  | Orig: J. Hough;Contact: M. Epstein Phone: (213) 648-6861   |
| Organization   | Aerophysics Laboratory. The Aerospace Corporation  |
| Address:   | P. O. Box 92957, Los Angeles, California 90009   |
| VAILABLE DOC   | :UMENTATION: (T = Theory, U = User, RP = Relevent Publication): (T) "Efficient Model for HF Lasers with  |
| Rotationa  | <u> 1 Nonequilibrium," J.J.T. Hough, Aerospace Corporation, Rpt. SAMSO-TR-78-79, August 15, 19</u>   |
| (U) "SPIK  | E: A Computer Model for the $H_2(D_2) + F_2$ Pulsed Chemical Laser", J.J.T. Hough, Aerospace   |
| Corporati  | on, Rpt. SAMSO-TR-78-84. April 14. 1978. (T) "A Reveiw of Rate Coefficients in the H F<br>Laser System Supplement (1977)," Aerospace Corporation Rpt. SAMSO-TR-78-41, N. Cohen 2   |
|  |  |
| June 8, 1  | <u>978.                                    </u>  |
|  | ······································   |
| TATUS:   |  |
|  | A Yas  |
| Operational (  | · V  |
| Operational (  | feation: Yes   |
| Operational (  | W  |
| Operational (<br>Under Modif<br>Purpose  | Mestion: Yes (a): Extension to CW case.  |
| Operational ( Under Modif Purpose Ownership):  | Meation: Yes  (e): Extension to CW case.  Aerospace Corporation  |
| Operational ( Under Modification Mod | Meation: Yes  (e): Extension to CW case.  Aerospace Corporation  |
| Operational ( Under Modification Mod | Reston: Yes  (a): Extension to CW case.  Aerospace Corporation  No  No  AATING SYSTEM (on which installed): CDC 7600   |
| Operational Under Modif Purpose  Ownership: Proprietary? ####################################  | Reston: Yes  (a): Extension to CW case.  Aerospace Corporation  No  No  AATING SYSTEM (on which installed): CDC 7600   |
| Operational Under Modifi Purpose Ownership: Proprietary? #ACHINE/OPER TRANSPORTABL Machine De  | Restion: Yes  (e): Extension to CW case.  :Aerospace Corporation  :No  RATING SYSTEM (on which installed):CDC 7600  LET:Yes  spendent Restrictions:  |
| Operational Under ModH Purpose  Ownership: Proprietary? ####################################   | Restion: Yes  (e): Extension to CW case.  :Aerospace Corporation :No  RATING SYSTEM (on which installed):CDC 7600  LEP:Yes  spendent Restrictions:   |
| Operational Under ModH Purpose  Ownership: Proprietary? ####################################   | Restion: Yes  (e): Extension to CW case.  :Aerospace Corporation  :No  RATING SYSTEM (on which installed):CDC 7600  LET:Yes  spendent Restrictions:  |
| Operational Under Modification Purpose Ownership: Proprietary? RACHINE/OPER Machine De Machine De DELF-CONTAINE Other Codes  | Reston: Yes  (a): Extension to CW case.  : Aerospace Corporation  : No   |
| Operational Under ModH Purpose  Ownership: Proprietary?  ###################################   | Reston: Yes  (a): Extension to CW case.  : Aerospace Corporation : No  RATING SYSTEM (on which installed): CDC 7600  LEP: Yes spendent Restrictions:   |
| Operational Under Modification Purpose  Ownership: Proprietary? MACHINE/OPER FRANSPORTABL Mechine De SELF-CONTAINE Other Codes  Small Job:   | Reston: Yes  Extension to CW case.  Aerospace Corporation  No  No  Notatine system (on which installed): CDC 7600  Let: Yes  Sepondent Restrictions:   Dec. Yes  Required (name, purpose):  ESOURCES REQUIRED FOR RUNS:  Core Size (Octal Words)   Execution Time (Sec. CDC 7600)  SO  SO  SO  SO  SO  SO  SO  SO  SO  S |
| Operational Under ModH Purpose  Ownership: Proprietary?  ###################################   | Reston: Yes  (a): Extension to CW case.  Aerospace Corporation  No  RATING SYSTEM (on which installed): CDC 7600  LET: Yes  spendent Restrictions:   |

|  | MANE. |  |
|--|-------|--|

| OFTICS   | son  | KINETICS   | GAS DYNAMICS                                 |
|--|--|--|--|
|  | BECOME TO STATE OF ST |  |  |
| Physical Optics Geometrical 4                              | Traveling Wave (Wing):   | Compact Region:  America Region:   | Collectrical Bactails Floring:               |
| FIELD (POLAMZATION) REPRESENTATION (V):                    | BRANCH (V): Positive:Negative:   | COORDINATE SYSTEM (Cornelin, cylindrical, etc.)                              | Becommune Liverin Pomine                     |
| State / Note   | OPTICAL ELEMENT MODELS INCLUDED (V):   | Compact Ragion: Cd. Annular Ragion:  |  |
| COORDINATE SYSTEM (Cartesian, cylindrical, etc.):          | Par Mirrors:Spherical Mirrors:   | KINETICS GRID DIMENSIONALITY (V):  | COORDINATE SYSTEM:                           |
| Compact Ragion Cd. Annales Ragion.                         | Cytindrical Mirrars:   | 10 20 30   | FLUID GRID DIMENSION (V): 10: ZD: 30:        |
| TRANSVERSE GRID DIMENSIONALITY (V): 10 20                  | Scriper Mirrors:   | Compact Region:  | FLOW FIELD MODELED (V):                      |
| Compact Region:  | Autone Neflations  | Annular Bagion:  | Laminus:Turbulent:                           |
| Annular Regen:   | Archite may:   | GAIN REGION SYMMETRY RESTRICTIONS:   | Other  |
| FIELD SYMMETRY RESTRICTIONS?                               | -  | Gain Vary Along Opple Auest: NO flow Direction? NO                           | BASIC MODELING APPROACH (V):                 |
| APE(S) ALLOWED (V  | Parabata-Parabata:   | PULSED: CW: KINETICS MODELED   | Premised: Maing:                             |
| Creater  | Variable Cone Office:  | IG REACTIONS MODELED (   | Other (specify):                             |
|  | Other (specify):   | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  |  |
| CONFIGURATION FLEXIBILITY (V):                             | Determete Minori:  | (v·n2 = vn·n) # //   | Reterences for Approach Used:                |
| freet Stellare Bearrater Commerten.                        | Speakel Fibers. Gratings.  | Card (F. Hz): - D  |  |
| Backer, Braint Berneter Commerter.                         | Other Bemarits:  | Met (N - F <sub>2</sub> ): Chain (f - H <sub>2</sub> & H - F <sub>2</sub> ): |  |
| PROPAGATION TECHNOOLE . Van II.e. 6001/12 [COMPACT ANNULAR |  | Other (specify):   |  |
| Frema Integral Algorithms.                                 | GAIN MODELS (V): Bere Cardy Only:  | ENERGY TRANSFER MODES MODELED (V): Reference                                 | Are Heater: Combuston:                       |
| With Kernel Averaging                                      | Simple Seturated Color. Despited Color:  |  | Sheck Tube: Resistance Heater:               |
| Generalan Quedralung:                                      | 星  |  | Other:                                       |
| Faut Fourier Transform (PFT):                              | Miner Titl:Decentration:   |  | F-ATOM DESCUATION PROM (V):                  |
| Fast Hanhal Transferm (PMT):                               | Aberrations/Thornel Distortions:   | Studen Line Mandai (V):  | Colores (constant)                           |
| Gardener-Freuest-Krebben (GFK):                            | Annual Control   | Martilline Stands (V):   | F-ATOM CONCENTRATION DETERMINED FROM INDOEL? |
| Other (specify):   |  | Assumed Retational Population Discribution State (V):                        | DILUENTS MODELED:                            |
|  | Marie Charles  | Equilibrium: Hongguillorium:   | MODELS EFFECTS ON MIXING RATE DUE TO $(V)$ : |
| CONVENCENCE TECHNIQUE (V):                                 | 2  | Number of Lager Lines Stateshol: 150   | Nozzie Beundery Layers: Sheck Waves:         |
| Perus Compariton:Fladd Comparison:                         | Serrator:Other:  | Source of Rate Coefficients Used in Cade: N_COheff.                          | Prevactions (thermal blackage):              |
|  |  | SAMS0-TR-78-41, June 8, 1978.  | numer (approxy)):                            |
| ACCELERATION ALGORITIMES USED?                             | Gae Absorption:  | LINE PROFILE MODELS (V):   |  |
| MARK THE S PLOTE HE VIECTOR STEELCHOOL ALECCHITICAL (V.)   | Overlighted Beams:   | Dappler Brosdoning:  | 100000000000000000000000000000000000000      |
| Pres   | Other  | Cellipianal Breadaning   | MODELS EFFECTS ON OFTICAL MODES DUE TO (V):  |
|  | FAR-FIELD MODELS (V): Been Searing Removal.  | Other (specify):   | Other (specify):                             |
|  | Optimul Facus Search: Beam Quality:  |  |  |
|  | Other  |  |  |
|  |  |  |  |

| CODE NAME: | TDLCLRC* |
|------------|----------|
|            |          |

|   | Optics, Kinetics, ar   |  |  |                                   |
|---|--|--|--|-----------------------------------|
| PRINCIPAL PURPOS  | SE(S)/APPLICATION(S) OF COD  |  |  | ator analysis of a positive branc |
| <u>confocal u</u>   | nstable resonator w  | ith rectangular spin   | erical mirrors.                              |                                   |
|   |  |  |  | <del></del>                       |
|   |  |  | <del></del>                                  |                                   |
|   | Power ext  | raction from an act  | ive DF medium. O                             | ff-axis geometry configuration.   |
| ADAPTURES :   | at all stations 3.   | D mlot capability.   | Kenetics and mi                              | xing calculations are performed v |
|   | (See AEROKNS for add   |  |  |                                   |
| ALAUNIS.  | (SEE MEMORIES TOT BEE  | artionar desarrage   |  |                                   |
|   |  |  |  |                                   |
| ASSESSMENT OF L   | IMITATIONS: No misalio   | gnment model. No F   | arfield model.                               |                                   |
|   |  |  |  |                                   |
|   | Pagantan   | companies modeled  | nocitivo branc                               | h unstable confocal linear        |
| DTHER UNIQUE FE   | ATURES: <u>Resonator</u><br>with rectangular spi   | herical mirrors O  | . <u>DUSTLIVE DEGNE</u><br>ff-axis decometry | canability.                       |
| resunatur   | WILL FECTALIGNES SPI   | merical militors. V  | II-dx13 geometry                             |                                   |
| ORIGINATOR/KEY  | CONTACT:   |  |  |                                   |
| Name:   | Victor L. Gamiz  |  | Mone: (213) 884                              | -3346                             |
| Organization:   | Rocketdyne, Laser  | Optics   |  |                                   |
| Address:  | 6633 Canoga Ave.,  | Canoga Park, Califo  |  |                                   |
|   |  | ound 34 Turky Turky  | ornia (91304)                                |                                   |
| AVAILABLE DOCUM   | MENTATION: (T = Theory, U =  | User, RP = Relevant Publication  |  | r Testing of Optical Components   |
| (HIPTOC) T  | MENTATION: (T = Theory, U = echnical Proposal.   | User, RP = Relevant Publication Part III, Appendix                     |  | er Testing of Optical Components  |
| AVAILABLE DOCUM   | MENTATION: (T = Theory, U = echnical Proposal.   | User, RP = Relevant Publication Part III, Appendix                     |  | r Testing of Optical Components   |
| AVAILABLE DOCUM<br>(HIPTOC) To  | MENTATION: (T = Theory, U = echnical Proposal.   | User, RP = Relevant Publication Part III, Appendix                     |  | er Testing of Optical Components  |
| AVAILABLE DOCUM   | MENTATION: (T = Theory, U = echnical Proposal.   | User, RP = Relevant Publication<br>Part III, Appendix                  |  | er Testing of Optical Components  |
| AVAILABLE DOCUM   | MENTATION: (T = Theory, U =<br>echnical Proposal, I  | User RP = Relevant Publication<br>Part III, Appendix                   |  | er Testing of Optical Components  |
| AVAILABLE DOCUM   | MENTATION: (T = Theory, U =<br>echnical Proposal, (  | User, RP = Relevant Publicati<br>Part III, Appendix                    |  | r Testing of Optical Components   |
| AVAILABLE DOCUM   | MENTATION: (T = Theory, U =<br>echnical Proposal, (  | User, RP = Relevant Publicate Part III, Appendix                       |  | er Testing of Optical Components  |
|   | MENTATION: (T = Theory, U = echnical Proposal, U   | User RP = Relevant Publication Part III, Appendix                      |  | r Testing of Optical Components   |
|   | MENTATION: (7 = Theory, U = echnical Proposal, U   | User RP - Relevant Publication<br>Part III, Appendix                   |  | er Testing of Optical Components  |
| STATUS:   | MENTATION: (7 = Theory, U = echnical Proposal. )   | User RP - Relevant Publication Part III, Appendix                      |  | r Testing of Optical Components   |
| STATUS:<br>Operational Cus  | MENTATION: (7 = Theory, U = echnical Proposal.   | User RP - Relevant Publicate Part III, Appendix                        |  | r Testing of Optical Components   |
| STATUS:<br>Operational Cur<br>Under Modifica  | MENTATION: (7 = Theory, U = echnical Proposal.   | User.RP - Relevant Publication Part III, Appendix                      |  | r Testing of Optical Components   |
| STATUS:<br>Operational Cur<br>Under Modifica<br>Purpose(s):   | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User RP - Relevant Publication Part III, Appendix                      |  | er Testing of Optical Components  |
| STATUS: Operational Cur Under Modifica Purpose(s): Ownershipt:  | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User RP - Relevant Publicate Part III, Appendix                        |  | er Testing of Optical Components  |
| STATUS: Operational Car Under Modifica Purpose(s): Ownership?: _ Proprietary?: _  | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User, RP = Resevent Publication Part III, Appendix                     | om): (T) High Powe<br>B (V. L. Gamiz).       | er Testing of Optical Components  |
| STATUS: Operational Cur Under Modifica Purpose(s): Ownership?: Proprietary?: MACHINE/OPERAT   | MENTATION: (T = Theory, U = echnical Proposal, I   echnical Proposal I   echnical I   e | User, RP = Resevent Publication Part III, Appendix                     | om): (T) High Powe<br>B (V. L. Gamiz).       | er Testing of Optical Components  |
| STATUS:  Operational Cu Under Modifica Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERAT TRANSPORTABLE?:  | MENTATION: (T = Theory, U = echnical Proposal, I echnical Proposal I echnical  | User, RP = Resevent Publication Part III, Appendix                     | om): (T) High Powe<br>B (V. L. Gamiz).       | er Testing of Optical Components  |
| STATUS:  Operational Cur Under Modifica Purpose(s):  Ownership?:  Proprietary?:  MACHINE/OPERAT  TRANSPORTABLE?:  | MENTATION: (T = Theory, U = echnical Proposal, I   echnical Proposal I   echnical I   e | User, RP = Resevent Publication Part III, Appendix                     | om): (T) High Powe<br>B (V. L. Gamiz).       | er Testing of Optical Components  |
| STATUS:  Operational Cur Under Modifica Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERAT TRANSPORTABLE?: Machine Depar                                       | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User, RP = Resevent Publication Part III, Appendix                     | om): (T) High Powe<br>B (V. L. Gamiz).       | er Testing of Optical Components  |
| STATUS:  Operational Cur Under Modifica Purpose(s):  Ownership?: Proprietary?: MACHIME/OPERAT TRANSPORTABLE?: Machine Doper                                       | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User, RP = Reservent Publication Part III, Appendix  d): CDC Cyber 176 | om): (T) High Powe<br>B (V. L. Gamiz).       | er Testing of Optical Components  |
| STATUS:  Operational Cur Under Modifica Purpose(s):  Ownership?: _ Proprietary?: _ MACHIME/OPERAT  TRANSPORTABLE?: Machine Doperations  BELF-CONTAINED?:          | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User, RP = Resevent Publication Part III, Appendix                     | om): (T) High Powe<br>B (V. L. Gamiz).       | r Testing of Optical Components   |
| STATUS: Operational Cur Under Modifica Purpose(s): Ownership?: _ Proprietary?: _ MACHINE/OPERAT TRANSPORTABLE?: Machine Deper                                     | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User, RP = Resevent Publication Part III, Appendix  d):                | on): (T) High Powe<br>B (V. L. Gamiz).       |                                   |
| STATUS:  Operational Cur Under Modifica Purpose(s):  Ownership?: _ Proprietary?: _ MACHINE/OPERAT  TRANSPORTABLE?: Machine Doper  BELF-CONTAINED?: Other Codes Re | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User, RP = Resevent Publication Part III, Appendix  d):                | M): (T) High Power B (V. L. Gamiz).          |                                   |
| STATUS:  Operational Car Under Modifica Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERAT TRANSPORTABLE?: Machine Depart SELF-CONTAINED?: Other Codes Re      | MENTATION: (7 = Theory, U = echnical Proposal, 1 echnical | User, RP = Reservent Publication Part III, Appendix  d): CDC Cyber 176 | Execution Time (Sec.                         |                                   |
| STATUS:  Operational Cur Under Modifica Purpose(s):  Ownership?: _ Proprietary?: _ MACHINE/OPERAT  TRANSPORTABLE?: Machine Doper  BELF-CONTAINED?: Other Codes Re | MENTATION: (7 = Theory, U = echnical Proposal.   1   1   1   1   1   1   1   1   1   | User, RP = Reservent Publication Part III, Appendix  d): CDC Cyber 176 | M): (T) High Power B (V. L. Gamiz).          |                                   |

<sup>\* 3-</sup>D Loaded Cavity Linear Resonator Code

| - 1  |  |
|------|--|
| 널    |  |
| ₫    |  |
| 룜    |  |
| ٦    |  |
| 1    |  |
|      |  |
| - 1  |  |
| - 1  |  |
| _    |  |
| .1.1 |  |
| 3    |  |
| ₹    |  |
|      |  |

| KINETICS AEROKNS GAS DYNAMICS | CONDINATE SYSTEM (Carnation Cythodical Region Condition Carnation Region Symmetry Restrictions:  Cannation Region Symmetry Restrictions:  Cannation Region Symmetry Restrictions:  Cannation Region Symmetry Restrictions:  Cannation Region Symmetry Restrictions:  Chemical Region Carnation Region  |  |
|-------------------------------|--|--|
| Ş                             | RESONATOR TYPE (½): Sunding Were  Transling Were (Ring): — Reports Tiff: — Compact Region: —  BRANCH (½): President Mirrors — Magative — Compact Region: —  Four Winners — Spherical Mirrors — Compact Region: —  Scraper Mirrors — Spherical Mirrors — Compact Region: —  Autorns — Autorns — Mirrors — Mirrors — Mirrors Region: —  Antolina;  Antolina;  Lineas: — Autorns — Mirrors — Mirrors Region Sylvas — Compact Region: —  Antolina;  Antolina | Special Piters: Grating: Grati |
| OPTICS                        | BASIC TYPE (V)  Prince of Opics  | Final, Surgia Resource Geometries  Final, Margia Resource Geometries  Final, Margia Resource Geometries  Final Adaptive Resource Geometries  Final Final Properties  Geometries  Geometries  Final Found Transform (FTT):  Final Found Transform (FTT):  Geometries  Geometries  Geometries  Final Found Transform (FTT):  Geometries  Geo |

\* Uses equilibrium thermochemistry

| CODE | NAME: |
|------|-------|
| CODE | MAME: |

| TDWORRC* | <br> |  |
|----------|------|--|
|          | <br> |  |

|  | Optics   |  |   |   |                           |                |             |
|--|--|--|---|---|---------------------------|----------------|-------------|
|  |  |  | Performs 3-D wa                                   |   |                           |                |             |
|  |  |  | either two reflaxi                                |   |                           |                |             |
|  |  |  | <del></del>                                       |   |                           |                |             |
|  |  |  |   |   |                           |                |             |
|  |  |  |   |   |                           | 44             |             |
| ASSESSMENT O   | F CAPABILITIES:  | General go                             | eometry specificat                                | tion; i.e.,                                       | ositive or ne             | gative branch, | arbitrary   |
| scraper lo   | cation, analy  | tical gain                             | model. Mirror                                     | nisa lighment                                     | mirror misti              | gure, mirror t | nerma i     |
| distortion   | models, stru   | ts. Kay                                | distribution beam                                 | compactors.                                       |                           | <del> </del>   | <del></del> |
|  |  |  |   |   |                           |                |             |
| ACCECCMENT O   | FLIMITATIONS: H  | alf-plane                              | symmetry. No cro                                  | ss-slit fil                                       | ter model. On             | e V-T transiti | on operati  |
| ASSESSMENT U   | F LIMITATIONS:   |  |   |   |                           |                |             |
|  |  |  |   |   |                           |                |             |
|  |  |  |   |   |                           |                |             |
| OTHER UNIONE   | FEATURES: Res  | onator ge                              | ometries modeled:                                 | unstable r  | ing resonator             | with: PPTANH r | reflaxicon  |
| or waxicon   | beam compact   | or, negat                              | ive (spatial filte                                | er) or posit                                      | ive branch, se            | lf-imaging scr | raper       |
| geometry.  | 180° beam ro   | tation at                              | scraper.  |   |                           |                |             |
|  |  |  |   |   |                           |                |             |
| ORIGINATOR/K   | EY CONTACT:  |  |   |   | ***                       |                |             |
| Name:  | Victor L. G  | amiz                                   | <del> </del>                                      | Phone: (213)                                      | 884-3346                  |                |             |
| Organizatio  | Rocketdyne,  | Laser Op                               | tics  |   |                           |                |             |
| Address:   | 6633 Canoga  | Aug Car                                | noga Park, Califo                                 |   |                           |                |             |
|  |  | AVE., Ca                               | loga raik, carrio                                 | rnia  |                           |                |             |
| AVAILABLE DOC<br>code - Nov  | 1978, G-0-78   | Theory, U = U<br>-1123; (T             | (U) 3-D bare cav                                  | rnia<br><sub>lon):</sub> (I) Simp<br>ity resonato | lified 3-D loa<br>r code. | ded cavity re  | sonator     |
| AVAILABLE DOC<br>code - Nov  | UMENTATION: (T = 1978, G-0-78  | Theory, U = U-1123; (T                 | poy RP = Relevant Publicati<br>(U) 3-D bare cav   | rnia<br>om): (T) Simp<br>ity resonato             | lified 3-D loar code.     | ded cavity res | sonator     |
| AVAILABLE DOC  | UMENTATION: (T = 1978, G-0-78  | Theory, U = U -1123; (T                | of RP = Relevant Publicati                        | rnia<br><sub>pon):</sub> (T) Simp<br>ity resonato | lified 3-D loar code.     | ded cavity re  | sonator     |
| STATUS:  | 1978, G-0-78   | Theory, U = U<br>-1123; (T             | or, RP = Relevant Publicati<br>(U) 3-D bare cav   | rnia<br>(T) Simp<br>ity resonato                  | lified 3-D loa<br>r code. | ded cavity re  | sonator     |
| STATUS:  | 1978, G-0-78   | Theory U = U<br>-1123; (T              | ov (R) 3-Relevant Publicati<br>(U) 3-D bare cav   | rnia<br>pm): (I) Simp<br>ity resonato             | lified 3-D loa<br>r code. | ded cavity re  | sonator     |
| STATUS:<br>Operational<br>Under Modit  | Currently? Yes   | Theory U = U<br>-1123; (T              | ser, RP = Relevant Publicati<br>)(U) 3-D bare cav | rnia<br>opy: (T) Simp<br>ity resonato             | lified 3-D loa            | ded cavity res | sonator     |
| STATUS:<br>Operational   | Currently? Yes   | Theory U = U<br>-1123; (T              | ser, RP = Relevant Publicati<br>)(U) 3-D bare cav | rnia pon: (T) Simp ity resonato                   | lified 3-D loar code.     | ded cavity re  | sonator     |
| STATUS:<br>Operational<br>Under Modil<br>Purposa   | Currently?. Yes  [1978, G-0-78]  Currently?. Yes  [10 Detailed]  | Theory, u = u<br>-1123; (T             | ser, RP = Relevant Publicati<br>)(U) 3-D bare cav | rnia <sub>pon):</sub> (T) Simp ity resonato       | lified 3-D loar code.     | ded cavity res | sonator     |
| STATUS:<br>Operational<br>Under Modil<br>Purpose<br>Ownership?   | Currently? Yes Kestion? Detailed  Rocketdyn  | Theory, u = u<br>-1123; (T             | ser, RP = Relevant Publicati<br>)(U) 3-D bare cav | rnia <sub>pon):</sub> (T) Simp ity resonato       | lified 3-D loar code.     | ded cavity res | sonator     |
| STATUS: Operational Under Modil Purpose Ownership? Proprietaryi  | Currently? Yes  (e): Detailed  Rocketdyn  Yes  | Theory, u = u<br>-1123; (T             | ar, RP = Relevant Publicati<br>)(U) 3-D bare cav  | rnia <sub>pon):</sub> (T) Simp ity resonato       | lified 3-D loar code.     | ded cavity res | sonator     |
| STATUS: Operational Under Modil Purpose Ownership? Proprietaryi  | Currently? Yes Kestion? Detailed  Rocketdyn  | Theory, u = u<br>-1123; (T             | ar, RP = Relevant Publicati<br>)(U) 3-D bare cav  | rnia ponj. (T) Simp ity resonato                  | lified 3-D loar code.     | ded cavity res | sonator     |
| STATUS: Operational Under Modil Purpose Ownership? Proprietary: MACHINE/OPER   | Currently? Yes Regtion? Yes Rocketdyn Yes ATING SYSTEM (on water)  | Theory, U = U = 1123; (T               | CDC Cyber 176                                     | rnia ponj: (T) Simp ity resonato                  | lified 3-D loa            | ded cavity res | sonator     |
| STATUS: Operational Under Modil Purpose Ownership? Propristary: MACHINE/OPER   | Currently? Yes Regtion? Yes Rocketdyn Yes ATING SYSTEM (on water)  | Theory, U = U = 1123; (T               | ar, RP = Relevant Publicati<br>)(U) 3-D bare cav  | rnia ponj. (T) Simp ity resonato                  | lified 3-D loar code.     | ded cavity res | sonator     |
| STATUS: Operational Under Modit Purpose Ownership? Proprietary: MACHINE/OPER TRANSPORTABL                                      | Currently? Yes Currently? Yes Rocketdyn Yes Acketdyn Yes Acketdyn Yes Acketdyn Yes Acketdyn Yes Acketdyn  | Theory, U = U = 1123; (T               | CDC Cyber 176                                     | rnia ponj: (T) Simp ity resonato                  | lified 3-D loa            | ded cavity res | sonator     |
| STATUS: Operational Under Modit Purpose Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De SELF-CONTAINE             | Currently? Yes Currently? Yes Currently? Yes Currently? Yes Control Control Yes Control Co | checkout checkout  Uses ex             | CDC Cyber 176                                     | rnia ppnj: (T) Simp ity resonato                  | lified 3-D loa            | ded cavity res | sonator     |
| STATUS: Operational Under Modit Purpose Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De SELF-CONTAINE             | Currently? Yes Currently? Yes Rocketdyn Yes Acketdyn Yes Acketdyn Yes Acketdyn Yes Acketdyn Yes Acketdyn  | checkout checkout  Uses ex             | CDC Cyber 176                                     | rnia ppnj; (T) Simp ity resonato                  | lified 3-D loar code.     | ded cavity res | sona tor.   |
| STATUS: Operational Under Modit Purpose Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De BELF-CONTAINE             | Currently? Yes Currently? Yes Currently? Yes Currently? Yes Control Control Yes Control Co | checkout checkout  Uses ex             | CDC Cyber 176                                     | rnia ponj: (T) Simp ity resonato                  | lified 3-D loar code.     | ded cavity res | sona tor.   |
| STATUS: Operational Under Modit Purpose Ownership? Proprietary: MACHINE/OPER TRANSPORTABI Machine De SELF-CONTAINE             | Currently? Yes Currently? Yes Currently? Yes Currently? Yes Control Control Yes Control Co | checkout e Uses ex                     | CDC Cyber 176 tended core.                        | pn): (I) Simplify resonato                        |                           | ded cavity res | sonator     |
| STATUS: Operational Under Modit Purpose Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De BELF-CONTAINE Other Codet | Currently? Yes Currently? Yes Kestion? Yes Lestion? Yes A Cocketdyn Yes LATING SYSTEM (on the color) LET: NO L | checkout checkout  Uses ex             | CDC Cyber 176                                     | pn): (I) Simplify resonato                        | lified 3-D loan code.     | ded cavity res | sonator     |
| STATUS: Operational Under Modit Purpose Ownership? Proprietary: MACHINE/OPER TRANSPORTABI Machine De SELF-CONTAINE Other Codes | Currently? Yes Currently? Yes Nostion? Yes Detailed Rocketdyn Yes ATING SYSTEM (on the control of the control o | Checkout  checkout  Uses ex            | CDC Cyber 176 tended core.                        | Execution Tire 100                                | ne (Sec. CDC 7600)        | ded cavity res | sona tor.   |
| STATUS: Operational Under Modit Purpose Ownership? Proprietary: MACHINE/OPER TRANSPORTABL Machine De SELF-CONTAINE Other Codet | Currently? Yes Currently? Yes Rection? Yes Recketdyn Pes LATING SYSTEM (on 1) LET: NO  | checkout  checkout  Uses ex  posee: No | CDC Cyber 176 tended core.                        | pn): (I) Simplify resonato                        |                           | ded cavity res | sona tor    |

<sup>\*3-</sup>D Wave Optics Ring Resonator Code

CODE NAME:

VAME: TOMORRC

| The Symmetry.   | Transling View (Vir. Sanding Wave.  Transling View (Vir.): Sanding Wave.  Transling View (Vir.): Manage 178:  BRANCH (V): Pusible: — Vegative: — Vegat | ANN WEGION WODELED (V): NOTE  Compact Region:   | GAS DYNAMICS  MOZZE GEDMETRY MODELED (and upps) (V): NOTE Optication, That the state of the stat |
|---|--|---|--|
| ACCELEATION ALGORITHMS USED:ILU  RECHIQUE  BULTIFIC ENGENYALUE/VECTOR EXTRACTION ALGORITHM: (V):  Proty  Other  1 | Ges Abserption: Overlapped Bearn: Overlapped Bearn: Other: Optimal Food Search: Optimal Food Search: Optimal Food Search:  | LINE PROFILE MODELS (V): Despire Breadwring: Collisional Breadwring: Other (seecity): | MODELS EFFECTS ON OPTICAL MODES DUE TO (V): Needs haden Variablems: Other (specify)  |

| CODE NAME: | TMRO |  |
|------------|------|--|
|            |      |  |

€ ₩

|  | tics. Kinetics. an   |  |   |                 |
|--|--|--|---|-----------------|
| PRINCIPAL PURPOSE  | (S)/APPLICATION(S) OF CO   | DE: Version of MRC   | for toric resonators (TMRO).  |                 |
|  |  |  |   |                 |
| **********   | Mode?  | s l=0 mode for hal   | f symmetric or confocal toric ring or standing  |                 |
| ASSESSMENT OF CAL<br>Wave resonate   | MORE TIES.   | nomical screen code  |   |                 |
|  |  |  |   |                 |
| ASSESSMENT OF LIA<br>has the same  |  | imuthal variations<br>properties in the o  | modeled. No axicon. Provides only a mode whain region as CROQ.  | hich            |
| OTHER UNIQUE FEA   | runes: Toric reso  | onator modeled.  |   |                 |
|  |  |  |   |                 |
| DRIGINATOR/KEY CO  |  |  | (2) 2) 525 2404   |                 |
| Name:<br>Organization:   | Donald L. Bullock<br>FRW DSSG  |  | Phone: (213) 535-3484   |                 |
| Address:   | 21/1162 One Cnace  |  |   |                 |
|  | (1/1102, one space   | : Park, Redondo Bea  | ch, California 90278  |                 |
| AVAILABLE DOCUME   |  |  | (=)   | codes           |
|  | NTATION: (T = Theory. U =<br>), contain much in  | User, RP = Relevant Publication; (U): no   |   | codes<br>manual |
|  |  | User, RP = Relevant Publication; (U): no   | (=)   | codes<br>manual |
|  | NTATION: (T = Theory. U =<br>), contain much in  | User, RP = Relevant Publication; (U): no   | (=)   | codes<br>manual |
|  | NTATION: (T = Theory. U =<br>), contain much in  | User, RP = Relevant Publication; (U): no   | (=)   | codes<br>manual |
|  | NTATION: (T = Theory. U =<br>), contain much in  | User, RP = Relevant Publication; (U): no   | (=)   | codes<br>manual |
| November 78  | NTATION: (T = Theory. U =<br>), contain much in  | User, RP = Relevant Publication; (U): no   | (=)   | codes<br>manual |
| November 78  | NTATION: (T = Theory, U = ), contain much in ). Listings avail   | User, RP = Relevant Publication; (U): no   | (=)   | codes<br>manual |
| November 78  | NTATION: (T = Theory, U = ), contain much in ). Listings avail   | User RP = Relevant Publication (U): no able.   | ion: (T): none; however, the BLAZER and MRO one, but nearly same as MRO (use BLAZER user  | manual          |
| November 78  STATUS: Operational Curre Under Modificati Purpose(s):  | NTATION: (T = Theory, U = ), contain much in ). Listings avail   | User RP = Relevant Publication (U): no able.   | (=)   | manual          |
| November 78  STATUS: Operational Curro   | NTATION: (T = Theory, U = ), contain much in ). Listings avail   | User RP = Relevant Publication (U): no able.   | ion: (T): none; however, the BLAZER and MRO one, but nearly same as MRO (use BLAZER user  | manual          |
| November 78  STATUS: Operational Curr Under Modificati Purpose(s): dispersion de   | NTATION: (T = Theory, U = ), contain much in ). Listings avail    Listings avail   Yes   Yes   Yes   For ACLOS Progrescription.  | User RP = Relevant Publication (U): no able.   | ion: (T): none; however, the BLAZER and MRO one, but nearly same as MRO (use BLAZER user  | manual          |
| November 78  STATUS:  Operational Curre Under Modificati Purpose(s): dispersion de   | NTATION: (T = Theory, U = ), contain much in ). Listings avail    Ves  | User RP = Relevant Publication (U): no able.   | ion: (T): none; however, the BLAZER and MRO one, but nearly same as MRO (use BLAZER user  | manual          |
| November 78  STATUS: Operational Curre Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?:   | NTATION: (T = Theory, U = ), contain much in ). Listings avail  bently: Yes  ont: Yes  For ACLOS Progrescription.  Government No   | User RP = Relevant Publication (U): no able.   | ified for rotational nonequilibrium and anoma   | manual          |
| November 78  STATUS: Operational Curre Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?:   | NTATION: (T = Theory, U = ), contain much in ). Listings avail    Ves  | User RP = Relevant Publication (U): no able.  able.  am, TMRO being mod  cod: CYBER 174 TRW.   | ified for rotational nonequilibrium and anoma   | manual          |
| November 78  STATUS: Operational Curry Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?: MACHINE/OPERATIF  | NTATION: (T = Theory, U = ), contain much in ). Listings avail  bently: Yes  ont: Yes  For ACLOS Progrescription.  Government No   | User RP = Relevant Publication (U): no able.   | ified for rotational nonequilibrium and anoma   | manual          |
| November 78  STATUS: Operational Curry Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?: MACHINE/OPERATIF  | NTATION: (T = Theory, U = ), contain much in ). Listings avail    Listings avail   Yes   Yes   For ACLOS Progrescription.   Government   No  | User RP = Relevant Publication (U): no able.  able.  am, TMRO being mod  cod: CYBER 174 TRW.   | ified for rotational nonequilibrium and anoma   | manual          |
| November 78  STATUS: Operational Curry Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?: MACHINE/OPERATIP  TRANSPORTABLE?: Machine Depare                                    | NTATION: (T = Theory, U = ), Contain much in ). Listings avail   | User RP = Relevant Publication (U): no able.  able.  am, TMRO being mod  cod: CYBER 174 TRW.   | ified for rotational nonequilibrium and anoma   | manual          |
| November 78  STATUS:  Operational Curry Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?: MACHINE/OPERATIF  TRANSPORTABLE?: Machine Depend                                   | NTATION: (T = Theory, U = ), contain much in ). Listings avail   | User RP = Relevant Publication (U): no able.  able.  am, TMRO being mod  active CYBER 174 TRW. AFWL CYBER 17.                          | ified for rotational nonequilibrium and anoma  TSS 6, NOS/BE  | manual          |
| STATUS:  Operational Curry Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?: MACHINE/OPERATIF  TRANSPORTABLE?: Machine Depend  | NTATION: (T = Theory, U = ), contain much in ). Listings avail  antity: Yes For ACLOS Progrescription.  Government No  MG SYSTEM (on which install Yes  dent Restrictions: CDC  No | User RP = Relevant Publication (U): no able.  able.  am, TMRO being mod  cod: CYBER 174 TRW.   | ified for rotational nonequilibrium and anoma  TSS 6, NOS/BE  | manual          |
| November 78  STATUS: Operational Curry Under Modificati Purpose(s): dispersion de  Ownership: Proprietaryr: MACHINE/OPERATIP  TRANSPORTABLE7: Machine Depend  SELF-CONTAINED7: Other Codes Req   | NTATION: (T = Theory, U = ), contain much in ). Listings avail   | Jser RP = Relevant Publication (U): no able.  am, TMRO being mod  am, TMRO being mod  cod: CYBER 174 TRW AFWL CYBER 17                 | ified for rotational nonequilibrium and anoma  TSS 6, NOS/BE  | manual          |
| November 78  STATUS: Operational Curry Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?: MACHINE/OPERATIP  TRANSPORTABLE?: Machine Depend  SELF-CONTAINED?: Other Codes Req  | NTATION: (T = Theory, U = ), contain much in ). Listings avail   | User RP = Relevant Publication (U): no able.  able.  am, TMRO being mod  cam, TMRO being mod  cam, TMRO being mod  cam, TMRO being mod | ion): (T): none; however, the BLAZER and MRO one, but nearly same as MRO (use BLAZER user of the first same as MRO (use BLAZER user of the first same as MRO (use BLAZER user of the first same as MRO (use BLAZER user of the first same as MRO (use BLAZER user of the first same as MRO (use BLAZER user of the first same as MRO (use BLAZER user of the first same as MRO (use BLAZER user of the first same as MRO (use BLAZER and MRO one) and the first same as MRO (use BLAZER and MRO one) as MRO (use BLAZER user of the first same as MRO | manual          |
| November 78  STATUS:  Operational Curry Under Modificati Purpose(s): dispersion de  Ownership?: Proprietary?: MACHINE/OPERATIF  TRANSPORTABLE?: Machine Depend  SELF-CONTAINED?: Other Codes Req | NTATION: (T = Theory, U = ), contain much in ). Listings avail   | User RP = Relevant Publication (U): no able.  able.  am, TMRO being mod  cam, TMRO being mod  cam, TMRO being mod  cam, TMRO being mod | ified for rotational nonequilibrium and anoma  //TSS 5, NOS/BE  | manual          |

ě

CODE NAME:

188 188

| OFFICE | RESONATOR TYPE (V): Standing Wave | Traveling Wave (Ring). V Reverse TW | BRANCH (V): Positive V Negative         | OPTICAL ELEMENT MODELS INCLUDED | Plat Mirrors Spherical Mirrors                    | Cylindrical Mirrors               | Scraper Mirrors:                              | Asicons        | Arbitrary      | . Unear:                         | Parabola-Parabola:    | Variable Cone Offset:           | Other (specify):               | Deformable Mirrors              | Spetial Fitters: Grafings:           | Other Elements: Toric mirro            |  | GAIN MODELS (V): Bare Cavity Only. | Simple Seturated Gain: Detailed ( | 3                              | Perior I'll: Decentration    | Aberrations/Thermal Distortions | Arbitrary                        | Selected (specify) | Reflectivity Loss | Output Coupler Edges Rolled | Serrated Other                  |
|--------|-----------------------------------|-------------------------------------|---|---------------------------------|---|-----------------------------------|---|----------------|----------------|----------------------------------|-----------------------|---------------------------------|--------------------------------|---------------------------------|--------------------------------------|--|--|------------------------------------|-----------------------------------|--------------------------------|------------------------------|---------------------------------|----------------------------------|--------------------|-------------------|-----------------------------|---------------------------------|
| _      | BASIC TYPE (V)                    | Physical Optics V Geometrical       | FIELD (POLARIZATION) REPRESENTATION (V) | Scalar Vector                   | COORDINATE SYSTEM (Cartesian, cylindrical, etc.): | Compact Region Annular Region, CV | TRANSVERSE GRID DIMENSIONALITY ( $V$ ): 15 20 | Compact Region | Annular Region | FIELD SYMMETRY RESTRICTIONS? L-U | Square Circular Strip | Rectangular Eliptical Arbitrary | CONFIGURATION FLEXIBILITY (V): | Fued. Single Resonator Geometry | Fixed, Multiple Resonator Geometries | Modular, Multiple Resonator Geometries | PROPAGATION TECHNIQUE SE TO ALTON COMPANY ANNUE NA | Freshel Integral Algorithms        | With Kernel Averaging             | Gaussian Quadrature (Modified) | Fast Fourier Transform (FFT) | Fast Mankel Transform (FMT)     | Gardenar Fresnal Kirchhoff (GFK) | Other (specify)    |                   | CONVERGENCE TECHNIQUE (V):  | Power Companion Field Companion |

| KINETICS  Annular Repon  (Correstan cylindrical set  Annular Repon  (ST 20 30  TRY RESTRICTIONS:  MART   |
|--|---|
| Singe Line Model (V) Multime Model (V)  Assumed Relational Production Detribution State (V)  Equilibrium Nonequilibrium  Number of Leser Lines Modeled 24  Source of Rate Coefficients Used in Code 14 Coben.  LINE PROFILE MODELS (V):  Depote Broadening Collisional Broadening C | Other (1994-17)  F. ATOM CONCENTRATION DETERMINED FROM MODEL! VEST DILLENTS MODELE FRECTS ON MILHIG RATE DUE TO (1) NOTE BOUNDAY LAYER  FURNACIONAL LAYER  FURNACIONAL LAYER  FURNACIONAL LAYER  FURNACIONAL LAYER  FURNACIONAL LAYER  FURNACIONAL LAYER  OTHER (1994-17)  MADELS EFFECTS ON OPTICAL MODES DUE TO (1)  MAGINE INDEX VENERIOR  OTHER (1994-17) |

\* in the mixed stream

FAR.FIELD MODELS (V) Beam Steering Removal

Beam Quality

Optimal Focal Search

LOADED CAVITY FIELD MODIFIER MODELS  $(oldsymbol{\sqrt{}})$ 

Medium Index Variation

Overlapped Beams Gas Absorption

BULTIPLE EIGENVALUE/VECTOR EXTRACTION ALGORITHM  $\langle V 
angle$ 

ACCELERATION ALGORITHMS USED? NO

| CODE NAME:  | TWODNOZ |
|-------------|---------|
| TODE IMAGE. |         |

|  | Calculate nearle flow including boundary layer and inviccid   |
|--|---|
| PRINCIPAL PURPO<br>core analys   | SE(S)/APPLICATION(S) OF CODE: Calculate nozzle flow including boundary layer and inviscid   |
| co.c unulys  |   |
|  |   |
|  |   |
| ASSESSMENT OF  | APABILITIES: Can calculate two dimensional or axisymmetric nozzle flow. Uses local  |
| Similarity   | boundary layer solution coupled with inviscid core solution.  |
|  | <del></del>   |
|  |   |
| ASSESSMENT OF  | IMITATIONS: Does not calculate boundary layer profiles as presently formulated.   |
|  |   |
|  |   |
|  |   |
| OTHER UNIQUE F   | :ATURES:  |
|  |   |
|  | <del></del>   |
| 000000000000000000000000000000000000000  | ^^***   |
| ORIGINATOR/KEY<br>Name:  | D. Haflinger/P. Lohn Phone (213) 536-1624   |
| Organization:  | TRW DSSG  |
| Address:   | RI/1038, One Space Park, Redondo Beach, California 90278  |
|  | MENTATION: (T = Theory, U = User, RP = Relevant Publication): (T): None.  |
| WANITABLE GOCO   |   |
|  | motivation: (1 - risoly, b - ossi, nr - natisal radication).  |
|  | MENTATION: (1 - THEORY, U - OSDI, NY - NORTERN PHONEQUOID).   |
|  | MENTATION: (1 - THEORY, U - Coat, NY - NAMED PROPERTY.)   |
|  | MENTATION: (1 - Meay, 0 - Oser, Nr - Newvent plantegoot).   |
|  | Matter (1 - Theory, U - Oser, Nr - Newten plantauri).   |
|  | Martini (1 - Mevy, 0 - Ose, nr - Newten planeaut).  |
|  | Matter (1 - Medy, U - Oser, Nr - Newten plantation).  |
| STATUS:  |   |
| STATUS: Operational Co   | Vac   |
|  | irrently?: Yes  |
| Operational Cu   | orrentty?:Yes   |
| Operational Cu<br>Under Modific  | orrentty?:Yes   |
| Operational Cu<br>Under Modific<br>Purpose(s   | arrently?: Yes ation?:  |
| Under Modific<br>Purpose(s<br>Ownership?:  | rrently?: Yes ation?:   |
| Operational Co<br>Under Modific<br>Purpose(s<br>Ownership?;<br>Proprietary?:   | TRW   |
| Operational Co<br>Under Modific<br>Purpose(s<br>Ownership?;<br>Proprietary?:   | rrently?: Yes ation?:   |
| Operational Co<br>Under Modific<br>Purpose(s<br>Ownership?;<br>Proprietary?:   | TRW  TRW  CDC 6600  |
| Operational Country Modific Purpose(s  Ownership?:   | TRW  TRW  CDC 6600  Yes   |
| Operational Country Modific Purpose(s  Ownership?:   | TRW  TING SYSTEM (on which installed): CDC 6600  Tyes  Indem Restrictions:  |
| Operational Country Modific Purpose(s  Ownership?:   | TRW  TRW  TING SYSTEM (on which installed): CDC 6600  - Yes sindent Restrictions:   |
| Operational Ct Under Modific Purpose(s  Ownership?: Proprietary?: MACHINE/OPERA  TRANSPORTABLE Machine Depo                              | TRW  TRW  TING SYSTEM (on which installed): CDC 6600  - Yes sindent Restrictions:   |
| Operational Ct Under Modific Purpose(s  Ownership?: Proprietary?: MACHINE/OPERA  TRANSPORTABLE Machine Depo                              | TRW  TING SYSTEM (on which installed): CDC 6600  Yes  Indent Restrictions:  |
| Operational Ct. Under Modific Purpose(s  Ownership?: Proprietary?: Proprietary?: TRANSPORTABLE Machine Depi                              | TRW  TRW  TRW  TING SYSTEM (on which installed): CDC 6600  - Yes sindemt Restrictions: - Yes sequired (name, purpose):                      |
| Operational Ct. Under Modific Purpose(s  Ownership?: Proprietary?: Proprietary?: MACHINE/OPERA  TRANSPORTABLE Machine Depi Other Codes R | TRW  TRW  FING SYSTEM (on which instelled): CDC 6600  - Yes sendent Restrictions: - Yes equired (name, purpose):  DURCES REQUIRED FOR RUNS: |
| Operational Ct Under Modific Purpose(s Ownership?: Proprietary?: MACHINE/OPERA TRANSPORTABLE Machine Depo SELF-CONTAINED: Other Codes R  | TRW  TRW  TRW  TING SYSTEM (on which installed): CDC 6600  - Yes sindemt Restrictions: - Yes sequired (name, purpose):                      |
| Operational Ct. Under Modific Purpose(s  Ownership?: Proprietary?: Proprietary?: TRANSPORTABLE Machine Depi                              | TRW  TRW  FING SYSTEM (on which instelled): CDC 6600  - Yes sendent Restrictions: - Yes equired (name, purpose):  DURCES REQUIRED FOR RUNS: |

|   | 1 |  |
|---|---|--|
|   | Ì |  |
|   | Į |  |
|   | 1 |  |
|   | I |  |
|   | ı |  |
| _ | I |  |
| ٦ | j |  |
| Ž | 1 |  |
| ٤ | 1 |  |
| ž | 1 |  |
| ۰ | t |  |
|   | ı |  |
|   | ı |  |
|   | ł |  |
|   |   |  |

| 140   | OPTICS                                    | KINETICS  | GAS DYNAMICS   |
|---|---|---|--|
| BASIC TYPE (V): None Physical Optics Geometrical                                | RESONATOR TYPE (V): Standing Wave.        | GAIN REGION MODELED (V): None   | NOZZLE GEOMETRY MODELED (and type) (V):                                      |
| FIELD (POLARIZATION) REPRESENTATION ( $$ ):                                     | BRANCH (V): Positive:                     | COORDINATE SYSTEM (Certesian, cylindrical, etc.)                                | Rectangular, Linearly Flowing.   |
| Scalar. Vector  | OPTICAL ELEMENT MODELS INCLUDED (V):      | Compact Region: Annular Region:   | Other  |
| COUNTINA IE 2151EM (Gentalani, cymorca, etc.): Compact Repor. — Annuar Repor. — | <u> </u>                                  | KINETICS GRID DIMENSIONALITY (V.):  | COORDINATE SYSTEM: CART/AXISYMMETRIC   |
| TRANSVERSE GRID DIMENSIONALITY ( $$ ): 1D 20                                    | Scraper Mirrors:                          | Compact Region:   |  |
| Compact Region  | Asicons Reflacions                        | Annular Region:   | Laminar:Turbulent:   |
| FIELD SYMMETRY RESTRICTIONS?  | Arbitrary                                 | GAIN REGION SYMMETRY RESTRICTIONS: Gain Vary Along Optic Asset: Flow Direction? | BASIC MODELING APPROACH (V):   |
| \S  | Perabola Perabola:                        | PULSED: CW: KINETICS MODELED  | Premised: V Mising:  |
| Square:Cercular:Strip:BhetangularElipical:Arbitary:                             | Variable Cone Offset:                     | CHEMICAL PUMPING REACTIONS MODELED (V): $(x + y_1 + y_2 + y_3 + y_4 + y_4)$     | Other (specify):   |
| 22  | Other (specify):                          | £ =   | References for Approach Used:  |
| Fixed, Single Resonator Geometry:   | County Filters                            | Cold (F + H <sub>2</sub> ):   |  |
| Fised, Multiple Resonator Geometries:   | County Charles                            | Hot (H + F <sub>2</sub> ): Chain (F + H <sub>2</sub> & H + F <sub>2</sub> ):    |  |
| Modular, Muhipie Resonator Geometries:  |   | Other (specify):  | THERMAL DRIVER MODELED (V):  |
| PROPAGATION TECHNIQUE (Val. 1747 apply). COMPACT ANNIGUAL                       | CAIN MODELS (V): Rem Contr. Date.         | ENERGY TRANSFER MODES MODELED ( $ar{m{V}}$ ): Reference                         | Arc Heater:Combustor:  |
| With Land American  | Simple Seturated Gain:                    | V.T.  | Shock Tube: Resistance theser.   |
| Geussian Quadrature:  | BARE CAVITY FIELD MODIFIER MODELS (V):    | 3.7   | Other:   |
| Fast Fourier Transform (PFT):   | Mirror Till:Decentration:                 |   | F-ATOM DISSOCIATION FROM (V)   |
| Feet Henkel Transform (PHT):  | Aberrations/Thermal Distortions:          | Single Line Model ( $$ ):   | Other (specify)  |
| Gardenar-Freenal-Kirchhaff (GFK):   | Abstray:                                  | Mutiline Model (V):   | F-ATOM CONCENTRATION DETERMINED FROM MODEL!                                  |
| Other (specify):  | Mulacitats Los:                           | Assumed Rotational Population Distribution State (V):                           | DILUENTS MODELED:  |
| CONVERGENCE TECHNIQUE (V):  | Output Coupler Edges: Rolled:             | Equilibrium:  | MODELS EFFELIS ON MIGHNE RATE DUE TO LY J. Nozzie Boundary LayersShock Weves |
| Power Comparison: Field Comparison:   | Serrated:Other:                           | RANGES OF LEBET LAND WOODSOO.   | Presections (thermal blockage)Turbulence                                     |
| Other   | LOADED CANTY FIELD MODIFIER MODELS (V):   |   | Other (specify):   |
| ACCELERATION ALGORITHMS USED?   | Medium Index Variation:<br>Saa Abunyasium | LINE PROFILE MODELS (V):  |  |
| Technique:  BELL TIPLE ELERNALUE AVECTOR EXTRACTION ALGORITHM: (V):             | Overlapped Beams:                         | Doppler Broadening.   | MONETE EFFECTE ON OPTICAL MODES PHIS TO (V)                                  |
| Prov.   | Other                                     | Collisional Broadening  | MODELS EFFECTS ON OFFICIAL MODES DOE TO (W)                                  |
| Other   | MODELS (V):                               | Other (specify):  | Other (specify)  |
|   | Optimal Focal Search: Beam Quality:       |   |  |
|   | Other                                     |   |  |
|   |   |   |  |

| CODE NAME: | URINLA2 |
|------------|---------|
| CODE NAME: | URINLA2 |

\*

| CODE TYPE:UDI  | ics   |  |  |
|--|---|--|--|
| BOINCIPAL PURPOSE/   | S)/APPLICATION(S) OF CODE   | . Models cylindri                                  | cal lasers with arbitrary axicon (except noneve  |
| waxicon). Bar  | e resonator code w  |  | de control and beam quality.   |
|  |   |  |  |
| Unstable Resor   | ator with Internal  | Non-Linear Axicom                                  | (URINLA2).   |
|  |   |  |  |
| ASSESSMENT OF CAP  | ABILITIES: Computati  | onally accurate, u                                 | ses full OPD matrix treatment of axicon, very  |
| flexible for o   | lesign.   |  |  |
|  |   |  |  |
|  |   |  |  |
|  | Communication   | anally along number                                | w of Caussian points and Founier components  |
| ASSESSMENT OF LIMI   | TATIONS: COMPUTATI  | nability on CYRED                                  | r of Gaussian points and Fourier components<br>176. Half plane symmetry required for misalig |
| Timited by Tal   | de core storage ca  | olinoan all tilt                                   | axes parallel, and at 90° from decentration  |
| direction.   | iii gecentrations c   | orinear, arr tirt                                  | axes paratter, and at 30 from decentration   |
| direction.   |   |  |  |
| OTHER UNIQUE FEAT  | Resonators m  | ndeled HSURIA "                                    | HSURIA" with toric back mirror, or TURIA. Mode   |
|  |   |  | ons, tip unloaded axicons, and variable magnit   |
| tion axicons.  |   |  | The same and the same same same same same same same sam                                      |
|  |   |  |  |
| ORIGINATOR/KEY CO  | ITACT:  |  |  |
| Name:  | Donald L. Bullock   |  | thone: (213) 535-4384  |
| Organization:  | TRW DSSG  |  |  |
| Address:   |   | Park, Redondo Bea                                  |  |
| (U): Program   | URINLA2 User Manua  | ser, RP = Relevant Publication 1, June 1978; List  | n): (T): Annular Laser Mode Studies Final Repo<br>ings available.                            |
| (U): Program   | URINLA2 User Manua  | ser, RP = Relevant Publication  1, June 1978; List | n): (T): Annular Laser Mode Studies Final Repo   |
|  | URINLA2 User Manua  | sev. RP = Relevant Publication                     | <sub>ற:</sub> (I): Annular Laser Mode Studies Final Repo<br>ings available.                  |
|  | rety?: Yes  | sev.RP = Relevant Publication  1, June 1978; List  | <sub>ற:</sub> (T): Annular Laser Mode Studies Final Repo<br>ings available.                  |
| STATUS:  | yely): Yes  | sev. RP = Relevant Publication  1, June 1978; List | <sub>ற:</sub> (T): Annular Laser Mode Studies Final Repo<br>ings available.                  |
| STATUS:<br>Operational Curre   | yely): Yes  | sev. RP = Relevant Publication  1, June 1978; List | n): (I): Annular Laser Mode Studies Final Repo   |
| STATUS:<br>Operational Currel<br>Under Modificatio   | yely): Yes  | sev. RP = Relevant Publication  1, June 1978; List | n): (I): Annular Laser Mode Studies Final Repo   |
| STATUS:  Operational Currer  Under Modification  Purpose(s): —   | ntly?: Yes<br>No  | sev. RP = Relevant Publication  1, June 1978; List | nj. (I): Annular Laser Mode Studies Final Repo   |
| STATUS:  Operational Currer Under Modification Purpose(s):  Ownership?:  | My): Yes No Government  | sev. RP = Relevant Publication  1, June 1978; List | n): (I): Annular Laser Mode Studies Final Repo   |
| STATUS: Operational Currer Under Modification Purpose(s): — Ownership?: Proprietary?:  | No Yes No Government No   | AFIN CADED 130                                     |  |
| STATUS: Operational Currer Under Modification Purpose(s): — Ownership?: Proprietary?:  | My): Yes No Government  | AFIN CADED 130                                     |  |
| STATUS:  Operational Currer Under Modification Purpose(s):  Ownership?:  Proprietary?:  MACHINE/OPERATING  | No Yes No Government No   | , AFWL CYBER 176,                                  |  |
| STATUS:  Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?   | Government No SYSTEM (on which installed)   | AFWL CYBER 176,                                    |  |
| STATUS:  Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?   | Government No system (on which installed)   | AFWL CYBER 176,                                    |  |
| STATUS: Operational Currer Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende  | Government No SYSTEM (on which installed)   | AFWL CYBER 176,                                    |  |
| STATUS: Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende   | Government No SYSTEM (on which installed) With modification and Restrictions:CDC on 1 | AFWL CYBER 176,                                    |  |
| STATUS: Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende   | Government No System (on which installed) With modification and Restrictions:COCon1   | AFWL CYBER 176,                                    |  |
| STATUS:  Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende  | Government No SYSTEM (on which installed) With modification and Restrictions:CDC on 1 | AFWL CYBER 176,                                    |  |
| STATUS:  Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATIN:  TRANSPORTABLE?: Machine Depend:  SELF-CONTAINED?: Other Codes Requ                  | Government No SYSTEM (on which installed) With modification and Restrictions:CDC on 1 | AFWL CYBER 176,                                    | NOS/BE   |
| STATUS: Operational Currer Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Requi                     | Government No System (on which installed) With modification on Restrictions:          | AFWL CYBER 176,                                    |  |
| STATUS:  Operational Currer Under Modification Purpose(s):  Ownership?: Proprietary?: MACHINE/OPERATINE TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Requ ESTIMATE OF RESOUL | Government No SYSTEM (on which installed) With modification and Restrictions:         | AFWL CYBER 176, by  Core Size (Octal Words)        | NOS/BE   |
| STATUS: Operational Currer Under Modification Purpose(s): Ownership?: Proprietary?: MACHINE/OPERATING TRANSPORTABLE?: Machine Depende SELF-CONTAINED?: Other Codes Requi                     | Government No SYSTEM (on which installed) With modification and Restrictions:         | AFWL CYBER 176,                                    | NOS/BE  Execution Time (Sec. CDC 7600)   |

URINLAZ

| BASIC TYPE (V)   | ICS RESONATOR TYPE (V) Sandeng ware   | KINETICS GAIN REGION MODELED (V): NOTE   | GAS DYNAMICS  MOZZE GEOMETRY MODELED GAT THE TOTAL SECONDARY (V) NOTE |
|--|---|--|---|
| Physical Optics — Geometrical ————————————————————————————————————                     | Traveling Wave (Bing) Braves TW BRANCH (V): Pretens V Negative OPTICAL ELEMENT MODELS INCLUDED (V): | Compact Region Annulae Region COORDINATE SYSTEM (Cartesian cylindrical, etc.) Compact Region Annulae Region Annulae Region | Cylindrical Radially Flowing<br>Rectangula: Linearly Flowing          |
| ¥ -  | Plat MirrorsSpherical MirrorsChhindreal Mirrors   | KINETICS GRID DIMENSIONALITY (V):  | COORDINATE SYSTEM. FLUID GRID DIMENSION (V): 15 20 30                 |
| TRANSVERSE GRID DIMENSIONALITY (V): 10 20 Compact Pages                                | Scraper Merrors Asicons Whascors Refrascors   | Compact Region<br>Annuter Region   | FLOW FIELD MODELED (V):<br>LammarTurbulent:                           |
| Annual Region FIELD SYMMETRY RESTRICTIONS: Half-plane.                                 | Arbitrary   | GAIN REGION SYMMETRY RESTRICTIONS: Gain Vary Mong Optic Asan? Frow Direction?  | Other BASIC MODELING APPROACH (V):                                    |
| MATROR SHAPE(S) ALLOWED (V) Square   | Perabole Perabole   | PULSED: CW. KINETICS MODELED CHEMICAL PUMPING REACTIONS MODELED (V):   | Premised Maring Other (seecity)                                       |
| Partengular Elliptical Arbitrary CONFIGURATION FLEXIBILITY (V):                        | Verlable Cons Offset Other (specify)  | K · V <sub>2</sub> - VA · V<br>V · K <sub>2</sub> · VA · V   | References for Automach Used  |
| Frued, Single Resonator Geometry Freed, Multiple Resonator Geometries                  | Spatial Filters Carbrids  | - 1  |   |
| Moduler, Multiple Resorator Geometries   | and waxicons, P-P reflaxicons   | Other (specify)  |   |
| Fremal Integral Algorithms   | GAIN MODELS (V): Bare Conty Only  | ENERGY TRANSFER MODES MODELED (Y): November  | Arc Hapler Combuston Shock Tube Resistance Haster                     |
|  | BARE CAVITY FIELD MODIFIER MODELS (V):  | V. 18  | Cother  |
| Fast Fourier Transform (FFT)   | More TR Decemberon  | Other  | F2  |
| Gardenge Freezel Kirchhaff (GFK)   | Aberrations only.   | Single Line Model (V)  | Other (specify)  F.ATOM CONCENTRATION DETERMINED FROM MODEL?          |
|  | Metactivity Loss:   | Assumed Rotational Population Distribution State $\langle V \rangle$   | DILUENTS MODELED  |
| CONVERGENCE TECHNIQUE (V):   | 5   | Equilibrium Monequilibrium Number of Laser Lines Modeled:  | Notzle Boundary Layers Shock Wares                                    |
| Press Comparison Fluid Comparison /  | LOADED CAVITY FIELD MODELS (V):   | Source of Rate Coefficients Used in Code:  | Prehections (thermal blockage)Turbulence                              |
| ACCELERATION ALGORITHMS USED? Yes  | Medium Inden Varietion<br>Get Aberginon   | LINE PROFILE MODELS (V):   |   |
| multiple engenvalue/vector extraction algorithm ( $V$ ):                               | Overlapped Beems  | Doppler Broadening:<br>Collisional Broadening  | MODELS EFFECTS ON OFTICAL MODES DUE TO $(\sqrt{\cdot})$               |
|  | FAR FIELD MODELS (V): Bearn Steamer Permusi   | Other (specify)  | Made Index Variations   |
| Ilgebraic Eigenvalue   | Optimel Focal Search / Beam Quality   |  |   |
| H. Wilkinson, Oxford   | Other   |  |   |
| *(Cf. The Algebraic Eigenvalue<br>Problem, J. H. Wilkinson, Oxford<br>(1965), p. 578). |   |  |   |

| CODE NAME | VIINT |
|-----------|-------|
|           |       |

10 Merchin

| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODECOLUMN ATES TI  | low between wedges for hypersonic wedge modeling.  |
|--|--|
|  |  |
| (Viscid Inviscid Interaction Program (VIINT))  |  |
| <del></del>  |  |
| TOTAL OF CALLES  | s-inviscid flow field with shocks, reflected shocks,   |
| and shock-body interactions. Considers transver  | rse pressure gradients in the supersonic flow.   |
|  |  |
|  |  |
| ASSESSMENT OF LIMITATIONS  | <del></del>  |
| nage and the state of the state |  |
|  |  |
|  |  |
| OTHER UNIQUE FEATURES:   |  |
|  |  |
|  |  |
| DRIGINATOR/KEY CONTACT:  | Phone (213) 536-4024   |
| Name: J. Ohrenberger TRW DSSG  | Phone: (213) 535-4024  |
| Organization: 18W 033G  88/1012, One Space Park, Redondo Bea   | ach, California 90278  |
|  |  |
| AVAILABLE DOCUMENTATION: (T = Theory, U = User, RP = Relevent Public<br>for Reentry Application", J.T. Ohrenberger, Prej   | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  |
|  | pared for Ballistic Missile Detense Adv. Tech.   |
| Center, DASG60-76-C-0043, April 1977; (U): "Con  | mputer Program Description and Users Manual of a Nea   |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under   | mputer Program Description and Users Manual of a Nea<br>r Laminar or Turbulent Boundary Layer Conditions,"   |
| Center, DASG60-76-C-0043, April 1977; (U): "Con<br>and Far Wake Modeling Analysis for Reentry under<br>J.T. Ohrenberger, Prep. for Ballistic Missile De  | mputer Program Description and Users Manual of a Nea<br>r Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1979   |
| Center, DASG60-76-C-0043, April 1977; (U): "Con<br>and Far Wake Modeling Analysis for Reentry under<br>J.T. Ohrenberger, Prep. for Ballistic Missile De<br>Ohrenberger, J.T. and Baum, E "A Theoretical N  | mputer Program Description and Users Manual of a Near<br>Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1979<br>Model of the Near Wake of a Slender Body in Supersor  |
| Center, DASG60-76-C-0043, April 1977; (U): "Con<br>and Far Wake Modeling Analysis for Reentry under<br>J.T. Ohrenberger, Prep. for Ballistic Missile De<br>Ohrenberger, J.T. and Baum, E., "A Theoretical N<br>Flow,", AIAA Journal Vol. 10, No. 9, September  | mputer Program Description and Users Manual of a Nea<br>r Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1979   |
| Center, DASG60-76-C-0043, April 1977; (U): "Con<br>and Far Wake Modeling Analysis for Reentry under<br>J.T. Ohrenberger, Prep. for Ballistic Missile De<br>Ohrenberger, J.T. and Baum, E., "A Theoretical N<br>Flow," AIAA Journal Vol. 10, No. 9, September   | mputer Program Description and Users Manual of a Near<br>Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1979<br>Model of the Near Wake of a Slender Body in Supersor  |
| Center, DASG60-76-C-0043, April 1977; (U): "Con<br>and Far Wake Modeling Analysis for Reentry under<br>J.T. Ohrenberger, Prep. for Ballistic Missile De<br>Ohrenberger, J.T. and Baum, E., "A Theoretical N<br>Flow,", AIAA Journal Vol. 10, No. 9, September  | mputer Program Description and Users Manual of a Near<br>Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1979<br>Model of the Near Wake of a Slender Body in Supersor  |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Network,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No. 72-116 (Jan., 1972)   | mputer Program Description and Users Manual of a Near<br>Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1979<br>Model of the Near Wake of a Slender Body in Supersor  |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical N Flow,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972)  **Coperational Currently?** Yes  | mputer Program Description and Users Manual of a Near<br>Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1979<br>Model of the Near Wake of a Slender Body in Supersor  |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical N Flow,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972)  **TATUS: "Yes Under Modification!"   | mputer Program Description and Users Manual of a Near<br>Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1979<br>Model of the Near Wake of a Slender Body in Supersor  |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Network,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972)  **TATUS: Operational Currently: Yes Under Modification:  **Purpose(s):  | mputer Program Description and Users Manual of a Near<br>Laminar or Turbulent Boundary Layer Conditions,"<br>efense Systems Command, DASG60-76-C-0043, March 1975<br>Model of the Near Wake of a Slender Body in Supersor  |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Notes of the Control of | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June   |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical N Flow,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972)  **TATUS: "Yes Under Modification: Purpose(s):  Ownership: IRW Proprietary: On file at ARC Facility, BMDATC.  | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical N Flow,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972)  **TATUS: "Yes Under Modification: Purpose(s):  Ownership: IRW Proprietary: On file at ARC Facility, BMDATC.  | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile Ohrenberger, J.T. and Baum, E., "A Theoretical N Flow,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972)  TANKER OF THE CONTROL O | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile Ohrenberger, J.T. and Baum, E., "A Theoretical N Flow,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972)  STATUS: Yes  Under Modification?: Yes  Under Modification?: TRW  Proprietary?: On file at ARC Facility, BMDATC, MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600  | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Nonemberger, and Nonemberger, "A Theoretical Nonemberger, Nonem | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Notes of the Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Notes of the Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Notes of the Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Notes of the Missile Ohrenberger, "A Theoretical Notes of the Missile Oh | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical N Flow,", AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972) TATUS: "Yes Under Modffication!" Yes Under Modffication!" TRW Proprietary! On file at ARC Facility, BMDATC, MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/7600 TRANSPORTABLE! Yes Machine Dependent Mestrictions:   | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De, Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De, Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De, Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De, "AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972) STATUS.  Operational Currently: Yes Under ModelMication: Yes Under ModelMication: Purpose(s):  Ownership: IRM Proprietary: On file at ARC Facility, BMDATC, MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/760(  | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1979 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De, Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De, Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De, Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De, "AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972) STATUS.  Operational Currently: Yes Under ModelMication: Yes Under ModelMication: Purpose(s):  Ownership: IRM Proprietary: On file at ARC Facility, BMDATC, MACHINE/OPERATING SYSTEM (on which installed): CDC 6600/760(  | mputer Program Description and Users Manual of a New Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1975 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                       |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Missile Department of the Missile Department of Theoretical Missile Department of Theoretical Missile Department of Missile D | mputer Program Description and Users Manual of a Near r Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1978 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June  Huntsville D  Execution Time (Sec. CDC 7600) |
| Center, DASG60-76-C-0043, April 1977; (U): "Con and Far Wake Modeling Analysis for Reentry under J.T. Ohrenberger, Prep. for Ballistic Missile De Ohrenberger, J.T. and Baum, E., "A Theoretical Notenberger, AIAA Journal Vol. 10, No. 9, September 1970). AIAA Paper No., 72-116 (Jan., 1972)  **Operational Currently?**  **Under Modification?**  **Purpose(s):**  **Operational Currently?**  **Oper | mputer Program Description and Users Manual of a Near Laminar or Turbulent Boundary Layer Conditions," efense Systems Command, DASG60-76-C-0043, March 1975 Model of the Near Wake of a Slender Body in Supersor 1972, pp. 1165-1172. AIAA Paper No., 70-792 (June Huntsville                                      |

į

| ?    |  |
|------|--|
| LME. |  |

| GAS DYNAMICS       | MOZZIE GEOMETRY MODELED (und 1980) (V) | Personal leading from a                     | Office of the state of the stat | COORDINATE SYSTEM CART. and Cylind.             | FLUID GRID DAMENSHON (V) 10 20 7 30 10 10 10 10 10 10 10 10 10 10 10 10 10 | Lemmas / Turbulens | one Turb capability available.    | PASIC MODELING APPROACH (V)                | •                   |                                  | References for Approach Used          |                                    | THE BRIAL DAIVER MODELED (V.)          | Arc Honner Combinator                       | Shech Tube Beautiance Heater | Other                | FALOR DISSOCIATION FROM (V)   | Offer (specify)                | F.ATOM CONCENTRATION DETERMINED FROM MODEL? NO. | DILUENTS MODELED   | MODELS EFFECTS ON WAKING RATE BUE TO (V) | , (manufactual contraction)   | Other (specify)                              |                               |   | MODELS EFFECTS ON OFTICAL MODES DUE TO (V)            | Other (specify)                            |                                  |       |
|--------------------|--|---|--|---|--|--------------------|-----------------------------------|--|---------------------|----------------------------------|---------------------------------------|------------------------------------|--|---|------------------------------|----------------------|-------------------------------|--------------------------------|---|--|--|-------------------------------|--|-------------------------------|---|---|--|----------------------------------|-------|
| KINETICS           | GAIN REGION MODELED (V) None           | COORDINATE SYSTEM (Consumer criminated oc.) | Compact Region Annualis Region   | 3   | Commerci Remain  | Annulus Region     | GAIN REGION SYMMETRY RESTRICTIONS | Gam Vary Mong Optic Asset: Flow Derection? |                     |                                  | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | <u>:</u><br>ا<br>ا                 |  | EMERGY TRANSFER MODES MODELED (V) Reference | *1                           | A 14                 | Other                         | Single Line Bedel (V)          | Multiline Meder (V)                             | Assumed Restitional Population Distribution State $\langle V  angle$ | Equilibrium Ponequilibrium               | Number of Laser Lines Madeled | Seurce of Rate Ceefficients Used in Cade     | /6                            | CINE PROFILE MUDELS (V). Deppler Breadening | Celheronal Broadening                                 | Other (specify)                            |                                  |       |
| <b>OPTICS</b> None | MESONATOR TYPE (V) Sending Wave        | BRANCH (V) Peatrus                          | OPTICAL ELEMENT MODELS INCLUDED $(V)$  | Ret Merzes                                      | Cylindrical Birrers  | Aacons             | Arbergy                           |  | Personal Personal   | Owner (specusy)                  | Deformable Morrors                    | Special Pitters                    | Other Elements                         | CANS MOTHER (V). But Comm.                  | Smerte Sahumbed Gate:        | -                    | Mirrer TRI Decembation        | Meanwheat, Thermal Destartions |   | Particular (max  | Owent Courte Edges Rolled                | Serrated                      | LOADED CAWTY FIELD MODIFIER MODELS $(f V)$ . | Bedium todas Vanlation        | Gas Absorption                              | Overlepped Beams                                      | FAR-FIELD MODELS (V) Beam Swarfing Remonal | Optimal Focal SearchBeen Quality | Other |
| 40                 | BASIC TYPE (V) None                    | FIELD (POLARIZATION) REPRESENTATION (V)     | Scalar Vactor  | CODRIDINATE SYSTEM (Carbosan cylindrical, etc.) | TRANSVERSE GRID DINECNSIONALITY (V): [10 ] 20                              |                    | Annular Begon                     | MIRROR SHAPE(S) ALLOWED (V):               | Square CrecularBinp | Rectaingular Eligibial Arbitrary | Finet. Single Reseaser Georgey        | Frasi, Mulliple Resenter Geometres | Mediales Shalliple Recenter Geometries | PROPAGATION TECHNIQUE                       |                              | Chargeson Quedrature | Fast Feumer Transferrin (FFT) | Face Manked Transform (FMT)    | Gardenne France Erreinner (OFR)                 | Other (specify)  |  | CONVERGENCE TECHNIQUE (V):    | П  | ACCELERATION ALCORITHMS USED? | Technique                                   | BOULTIFLE EIGENVALUE/VECTOR ETTRACTION ALGORITMR:(V): |  |                                  |       |

| CODE NAME: | WAP* |
|------------|------|
|            | 8    |

|  | sdynamics  |  |  |  |
|--|--|--|--|--|
| DOINCIDA) BUDBOOS  | SYARM ICATION(S) OF CODE: To determit  | ne base flow between laser nozzle. Detailed analysi  |  |  |
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE: 10 determine base flow between laser nozzle. Detailed analysis of base flows, recirculation and embedded subsonic zone, boundary remnant lip and wake shock |  |  |  |  |
| formation ar   |  |  |  |  |
|  |  |  |  |  |
| ASSESSMENT OF CAP  | Analysis extendable  | through saddle to the intermediate near wake.  |  |  |
|  |  | c reactions. Parabolized Navier-Stokes (finite   |  |  |
|  |  | mined uniquely by saddle point technique.  |  |  |
|  |  |  |  |  |
| ASSESSMENT OF LIM  |  | istry directly. Two dimensional (but can handle  |  |  |
|  |  |  |  |  |
|  | Can handle bace injection  |  |  |  |
| OTHER UNIQUE FEAT  | umes:Can handle base injection.  |  |  |  |
|  |  |  |  |  |
| ORIGINATOR/KEY CO  | VTACY:   | Phone: (213) 536-4024  |  |  |
|  | TRW DSSG   | Phone: (213) 530-4024  |  |  |
| Organization,  | 88/1012, One Space Park, Redondo E   | Posch California 00270   |  |  |
|  |  |  |  |  |
| for Reentry  | .TATION:(T = Theory, U = User, RP = Relevant Publi<br>Application." J.T. Chrenberger, Pi | Monthon): (T): "Turbulent Near Wake Modeling Analysis rep for Ballistic Missile Defense Adv. Tech. Center. |  |  |
| DASG60-76-C  | -0043. April 1977: (11): "Computer   | r Program Description and Users Manual of a Near and   |  |  |
|  |  | Laminar or Turbulent Boundary Layer Conditions."   |  |  |
|  |  | Defense Systems Command, DASG60-76-C-0043, March 197   |  |  |
|  |  |  |  |  |
| sonic Flow,"<br>(June 1970).   | AIAA Journal, Vol. 10, No. 9, Ser<br>AIAA paper 72-116 (Jan 1972)                        | 1 Model of the Near-Wake of a Slender Body in Super-<br>ptember 1972, pp. 1165-1172. AIAA paper No. 70-792 |  |  |
| Operational Curre  | W  |  |  |  |
| Under Modification   | •  |  |  |  |
| Purpose(s):  |  |  |  |  |
|  |  |  |  |  |
| Ownership?:  | IRW  | C 11   |  |  |
| Proprietary?:  | On file at ARC Facility, BMDATO  | ., Huntsville  |  |  |
| MACHINE/OPERATING  | SYSTEM (on which installed): CDC 7600  |  |  |  |
| TRANSPORTABLE?:  |  |  |  |  |
| Machine Depende  | m Restrictions:  |  |  |  |
|  | Yes  | <del></del>  |  |  |
| SELF-CONTAINED?  | 159  |  |  |  |
|  | ired (name, purpose):  |  |  |  |
| Other Codes Requ   | ired (name, purposa):  |  |  |  |
| Other Codes Requ   | <del></del>  | de) Execution Time (Sec. CDC 7600)   |  |  |
| Other Codes Requi  | ces REQUIRED FOR RUNS:  Core Size (Octal Wort  |  |  |  |
| ESTIMATE OF RESOUR   | red (name, purpose):  CES REQUIRED FOR RUNS:   | de) Execution Time (Sec. CDC 7600)   |  |  |

<sup>\*</sup> Wake Analysis Program

CODE NAME:

| OPTICS   |  | KINETICS  | GAS DYNAMICS                                |
|--|--|---|---|
|  |  |   |   |
|  | RESONATOR TYPE (V): Standing Wess        | GAIN REGION MODELED (V): None                       | NOZZLE GEOMETRY MODELED (and type) (V):     |
| Physical Uplics Geometrical  | Traveling Wave (Ming)                    | Compact Region Annular Region                       | Cytindrical Radially Flowing                |
| FIELD (POLAMIZATION) REPRESENTATION (V):   | BRANCH (V): Positive                     | COORDINATE SYSTEM (Consum. cylindrical. etc.)       | Rectangular, Linearly Flowing:              |
| Scaler tector  | OPTICAL ELEMENT MODELS INCLUDED $(V)$ :  | Compact Region Annular Region                       | Other                                       |
| COORDINATE SYSTEM (Cartesian, cylindrical asc.)  | Flat Merrors. Spherical Mirrors          | KINETICS GRID DIMENSIONALITY (V):                   | come arts eversa. Cartesian                 |
| Compact Region Annualize Region  | Cylindrical Mirrors                      | OE 02 01  | FLUID GRID DIMENSION (V): 10                |
| TRANSVERSE GRID DIMENSIONALITY (V): 10 ZD  | Scraper Morens                           | Compact Magon                                       | •   |
| Compact Region   | Aurona Melauioens                        | Annular Region                                      | Laminar L Turbulant                         |
| Annales Region   | Artitrary                                | GAIN REGION SYMMETRY RESTRICTIONS:                  | Other:                                      |
| FIELD SYMMETRY RESTRICTIONS!   | Linge                                    | Gam Vary Along Optic Asse? Flow Direction?          | BASIC MODELING APPROACH (V):                |
| IMPROP SHAPE(S) ALLOWED (V).   | Prestole Prestole                        | PULSED: CW: KINETICS MODELED                        | Premised. Y Minng:                          |
| Square Circular Strip  |  | UMPING REAC   | Other (appecity)                            |
| Nectargular Eliphotal Arbertary  | Variable Core Office:                    | (1.72 71.7)   |   |
| COMPIGURATION FLEXIBILITY (V)  | Other (apacify):                         | ۔۔  |   |
| Fraed, Single Resonator Geometry   | Ophermable Merces                        |   | References for Approach Used                |
| Fract Mutrale Mesonates Geometres  | Spatial Filters:                         | ι   |   |
| Modular Multiple Reconger Geometres  | Other Elements                           | 100 (N · 12) Chem (F · 112 & M · 12)                |   |
| PROPACATION TECHNOMIS  |  | Other (specify)                                     | THERMAL DRIVER MODELED (V):                 |
| _  | GAIN MODELS (V): Bere Cavity Only        | ENERGY TRANSFER MODES MODELED (V) Reference         | Arc HeaserCombustor                         |
|  | Shrate Serveted Gain                     | 1,4   | Shock TubeResettince Heater                 |
|  |  | **  | Other                                       |
|  | Marror TR. Decembration                  | **  | F.ATOM DISSOCIATION FROM (V)                |
| Fast Saurae Transform (FFT)  | }  | Other   | f <sub>2</sub>                              |
| Fact Hamber Transform (FHT)  |  | Single Line Bodel (V)                               | Other (specific)                            |
| Gardener Freezest Krethhoff (GFK)  |  | Mottline Medel (V)                                  | F-ATOM CONCENTRATION DETERMINED FROM MODEL! |
| Other (specify)  | Seecond (opensy):                        | Assumed the stoom foundation Constitution State (V) | DILUENTS MODELED                            |
|  | Reflectivity Late                        |   | MODELS EFFECTS ON MIXING RATE DUE TO (V)    |
| CONVERGENCE (ECHANQUE (V)  | Output Chupter Edgine Rolled             | reparation  | Nozza Boundary Layers Sheck Wares           |
| Part Congestor   | SeriatedOther                            | Number of Later Lines Modeled                       | Promochers (Berms) Hoches)                  |
|  | LOADED CANTY FIELD MODIFIER MODELS (V)   | Source of Rate Coefficients Used in Code            | Office (seech)                              |
|  | Medium Index Varietion                   |   |   |
| Perhaps Andreas Carlo  | Ges Absorption                           | LINE PROFILE MODELS (V)                             |   |
| men tres a substanta to custome artifaction as constitute (V.)   | Overlapped Basms                         | Doppler Broadening                                  | ,   |
| Providence of the control of the con |  | Collegens' Bradening                                | MODELS EFFECTS ON OPTICAL MODES DUE TO (V)  |
|  | FAR PIELD MODELS (V) Sour Secure America | Other (specify)                                     | Metho Index Vanalitens                      |
|  | Optimal Focal Search                     |   | Other (specify)                             |
|  | 1  |   |   |
|  |  |   |   |
|  |  |   |   |

#### Section IV

#### SUPPLEMENTARY INFORMATION FOR LONG SURVEY FORM

### INTRODUCTION

The first two columns in the long survey form relate to the capability of the code to perform optical modeling of the electromagnetic fields in the laser cavity. The third column summarizes the key features of the gain region chemical kinetic processes available in the code. The last column deals with the gasdynamic properties treated by the code.

This section provides supplementary background information keyed to the survey form format and ordering of topics. This brief narrative provides introductory material to the user of this survey who may not be conversant with some portions of this broad, complex physical, chemical, and computational problem. Some or all of the material will be well known to the reader. Where it is not, we do not claim to provide an in-depth, self-contained description of phenomena but, rather, a brief highlighting of the topics so that the reader can get an immediate impression of the nature of the material and the degree of completeness of its treatment by the codes.

We must, furthermore, warn the reader that the individual codes treat a number of these phenomena very differently, so the general description given here may vary from the approach in a particular code.

In short, those readers who require special, in-depth knowledge of any particular topic treated here should seek that level of information from the key contact person denoted on the first page of the long form or from the references given.

# **OPTICS (COLUMN 1)**

## **Basic Type**

Codes generally fall into two categories: (a) those that use geometrical ray tracing techniques either to get usually quick, zeroth order analyses or evaluations of optical resonator performance or to evaluate optical component specifications in systems such as telescopes beam transfer, etc. An example would be a misalignment sensitivity study or the generation of OPD (optical path differences) for input to a physical optics code; (b) physical optics codes that calculate propagation by nearly exact algorithms can predict resonator modes and can account for physical optics phenomena such as diffraction and dispersion.

# Field (Polarization) Representation

The electromagnetic field is fundamentally a vector field.\* In the general case, any valid resonator analysis must accommodate to the vector character of the electromagnetic field. Nevertheless, to simplify the treatment of these complex problems, we are highly motivated to find special cases where a scalar or single vector component treatment is valid.

In the case of an empty resonator, the scalar treatment is valid when a single component of the electromagnetic vector field can propagate through the entire resonator and back to the starting point without any coupling to other components of the field.

As an example, consider the reflection of light incident along the axis of a conical reflector. The field configurations that do not mix are those whose transverse polarization is everywhere either parallel with or perpendicular to the plane of incidence locally. If some other field configuration is incident, such as plane-polarized light, mixing will occur and an orthogonal polarization will result.

Thus, the inclusion of conical elements inside the resonator that scramble the field-polarization vector has led to the development of more detailed codes that keep track of the polarization vector at each field point. These vector codes divide the polarization into two components and combine or resolve the components as necessary at the end of each propagation leg.

The case of a loaded resonator introduces additional complications. In an empty resonator where a scalar treatment is valid, the scalar treatment of modes with orthogonal polarizations may proceed independently. In a loaded resonator, the polarization may couple through such effects as saturation differences of the gain medium and mirror distortion, since only one polarization component may be absorbing. Thus for a scalar treatment to be valid in the loaded resonator, we must suppress all but the desired polarization mode.

Finally, Maxwell's equations predict a depolarization term given by

 $\mathbf{E} \cdot \nabla \ln n^2$ 

where E is the electric field and n is the complex index of refraction. For media in which gradients in index are negligible in a wavelength, the latter term can be neglected compared with terms retained in the Helmholtz equation, i.e., the term

 $n^2k^2\mathbf{E}$ ,

where k is the wave number.

For most media of interest in the high-energy chemical laser problem, this condition is well satisfied.

<sup>\*</sup>One might even argue that because of the peculiar properties of the cross product, the electromagnetic field is actually a second-rank tensor field.

### Coordinate System

The numerical algorithms for beam propagation are simpler, usually more efficient, and possibly more accurate when the coordinate system (or system of grid points where the field is specified) matches the resonator geometry. In chemical laser resonators two types of beams are typically encountered, compact beams and annular beams (Fig. IV-1). Circular compact beams and annular beams are best described by use of a cylindrical coordinate system, and beams of square and rectangular cross section typically should use Cartesian coordinates. The particular curvature of a wavefront (spherical, cylindrical, planar, etc.) usually does not influence the choice of coordinate system. One reason for this is because most numerical propagation algorithms are simplified by propagating planar wavefront beams. In this case the appropriate curvature corresponding to a given optical element is formulated as a phase sheet\* which then multiplies the field. The more general codes offer the user a choice of coordinate systems for describing compact region fields that are selected according to the geometry of the elements to be modeled. Cartesian coordinates are usually not considered appropriate for representing annular beams because of the large number of grid points that would be typically involved in modeling cases of interest. In fact, usually a restriction is even forced on the general use of cylindrical coordinates, which leads to the use of so-called strip algorithms for propagating annular beams. (The strip propagator is elaborated upon in later discussions on specific propagators.)

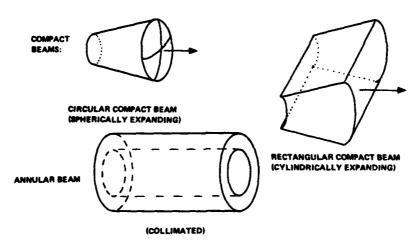


Fig. IV-1 - Types of beams

#### Transverse Grid Dimensionality

Many times, codes are developed based on tradeoffs between numerical accuracy, code capability, and computer run time. The simplest codes are one-dimensional (1-D) and are relatively fast, running at the expense of the ability of model asymmetric phenomena such

<sup>\*</sup>Assuming, as is usually the case, that the curvature is sufficiently small that amplitude differences over the range of OPDs can be ignored.

as misalignments.\* One-dimensional codes can be used to provide reasonable approximations for laser power, spectral content, mode shapes and separation, mirror flux loads, axisymmetric thermal distortions (such as thermal bowing), and misalignments in the flow direction for short gain lengths. Two-dimensional (2-D) codes more accurately model more complex phenomena such as misalignments, two-dimensional asymmetry of the media, arbitrary mirror distortions, and strut obscurations; thus, 2-D codes offer the capability of performing a number of important sensitivity studies encountered in practical resonators that cannot be handled with the 1-D codes.

The dimensionality selected is related to the highest expected spatial frequency structure developed in the electromagnetic field due to diffraction, gain medium inhomogeneities, flow properties, etc. Typical upper limits dictated by computer machine capabilities for current (1980) state-of-the-art machines are listed below.

|                            | Dimensionality                      | Fresnel Number      |
|----------------------------|-------------------------------------|---------------------|
| 1-D problem<br>2-D problem | $2^{10} - 2^{11} \\ 2^8 \times 2^8$ | 100 - 500 $20 - 40$ |

The implications of machine restrictions on array sizes carbon appreciated by a simple example. Suppose the required sampling leads to a grid of  $128 \times 128$  points. This leads to a basic array of over 16,000 points, and at each point we have both the real part and the imaginary part of the complex field amplitude. If we wish to store only the field amplitude and phase in a source plane and an observation plane, we require a total of  $64~K_{10}$  storage locations even before we have loaded the computer program.

We can easily get a rough estimate of the number of grid points required in an observation plane from the following considerations. Let us imagine an infinite-slit aperture with transverse dimension 2a and an observation plane located a distance R downstream.

The single-slit diffraction pattern has half-cycle nulls a distance d apart in the observation plane, where d is given by

$$d=\frac{\lambda R}{2a}.$$

This distance can also be written in terms of the Fresnel number of the source as seen from the observation plane; we obtain

$$d=\frac{a}{2N_{\rm F}}.$$

<sup>\*</sup>This does not necessarily imply that they are more efficient.

For good sampling, we require about four points per half-cycle at the highest spatial frequency so that the spacing of points required is just d/4. If the characteristic transverse dimension on the observation plane is also of order 2a, we find that the total number of points required in one transverse dimension is given by

$$m=\frac{2a}{d/4}=16N_{\rm F}.$$

Thus for a Fresnel number mension. Of course this falls to zero as one approx

f 50, we may require as many as 800 points in the transverse direment may be eased if the amplitude at the source aperture s the edge of the source grid.

In addition, when doing a detailed kinetics and gasdynamic calculation as well (see below) these arrays of field quantities must be retained at sequential times or transverse points for use in the calculation of gain as the molecules flow away from the nozzle exit plane.

When a machine core is exhausted, techniques are devised to extend the effective storage by overlay and mass storage (disk) usage. With the advent of vector, parallel processing machines of effectively unlimited core, many of these restrictions will be removed and only cost will dictate the limits of the size of problems to be attempted.

# Field Symmetry Restrictions

In some instances, quasi-two-dimensional codes are assembled that assume field symmetry about a line or point. Codes also can be tailored to model systems that are circularly symmetric. These codes have definite field symmetry restrictions. Often, code users take advantage of field symmetry by specifying only the nonrepeating portion of the field. Thus one can reduce the total number of required grid points by a factor of n where there is n-fold symmetry, without affecting the field resolution.

## Mirror Shapes Allowed

Codes that have been assembled with one type of coordinate system are usually restricted in their ability to model mirror shapes fitting another coordinate system. Two-dimensional Cartesian codes do an excellent job in modeling square or rectangular mirrors, and an inefficient job in modeling elliptical or circular shapes. One-dimensional Cartesian codes can model strip mirrors (mirrors that are considered infinitely long in one dimension). Elliptical mirrors that are circular or of moderate eccentricity can be handled by cylindrical coordinate codes.

The field modification by a mirror usually takes the form of an amplitude and phase change imposed on the field at the mirror plane. This introduces the effects of mirror curvature and absorption. Actual measured data on mirror shape, curvature, and reflectivity can be used as well, if available, provided that the code has been designed to accept such data.

# Flexibility of Configuration

There appear to be only three approaches or philosophies taken in building detailed resonator codes. These are: (a) codes developed to model only one specific resonator type (e.g., the HSURIA\*), (b) codes that allow the user to select one of several different preprogrammed resonator models usually by simply setting certain flags in the input files, and (c) codes that attempt to provide the user complete freedom to model any resonator he chooses (the modular codes). In the latter approach, the code builder attempts to provide, in a useful format, all necessary submodels that could be of interest in modeling resonators over as wide a range as possible and leaves to the code user the task of representing his own resonator by utilizing modules in the proper sequence. Essentially, the user writes his own executive program, which amounts to a particular sequence of calls to the various modules (subroutines models) representing a complete set of operations on the field in transversing one round trip through the resonator.

There are obvious advantages and disadvantages to a given approach. The fixed, single resonator code is of little use unless it models the resonator of interest. On the other hand, its limited scope offers the possibility of making it highly efficient and cost effective to run. Also, compared to the other code configurations, it should be the easiest to use given that all these code types are performing the same level of analysis. The fixed, multiple resonator code configuration offers the capability of modeling several different resonators with relative ease. Using one basic code to model several different resonators for performance comparisons is advantageous since the numerical precisions will be nearly the same. Such code configurations require a more complex logical structure; they can become unwieldy if too many resonator models are included. Finally, the multiple, modular code construction approach offers very great modeling flexibility in return for a great amount of foresight in the selection and interfacing of a large number of physical models on the part of the code builder, as well as the time required to construct the iteration loop to represent a particular resonator on the part of the user. The advantage is that a user will (in principle) have to learn how to use only one code. Disadvantages are that it is extremely difficult to predict all the necessary code features and build a code that is both simple and efficient to use.

Often, cost and/or schedule constraints have dictated the approach to code construction. Single-purpose codes can be built in several months by those already familiar with the physical models and the numerical algorithms. Modular codes, on the other hand, require many man-years of planning and construction before they can be used.

# Propagation Technique

We turn now to the question of calculating the electromagnetic field at a downstream location when its amplitude and phase are specified on some surface upstream. The surface need not be planar, but it is often so chosen to simplify the calculations.

There are two basic propagator types, the integral type using the Huygens-Fresnel principle and the differential equation type derived from the paraxial wave equation. Each type can deal with a complete vector field, but to simplify our discussion we assume that the problem has been structured so that a scalar treatment is valid. Our discussion here is oriented toward numerical calculations. Later we will touch briefly on analytical treatments.

<sup>\*</sup>Half-symmetric unstable resonator with internal axicon.

# Paraxial Wave Equation

In the scalar version of paraxial wave treatment we assume that a single transverse component propagating in the z-direction can be written as the real part of the expression

$$E_{r}(x,y,z,t) = \Psi(x,y,z) \exp(ikz - i\omega t),$$

where  $\Psi$  satisfies the paraxial wave equation

$$\nabla_T^2 \Psi + 2ik \frac{d\Psi}{dz} + k^2 \left[ \frac{n^2(x, y, z, t)}{n_o^2} - 1 \right] \Psi = 0.$$
 (1)

The refractive index may be complex if it is to include gain. If the gain is to be introduced as one or several isolated gain sheets, we set  $n = n_0$  and the last term in Eq. (1) drops out.

Huygens-Fresnel or Integral Equation [1]

In the paraxial approximation, the field at any observation point downstream is given by

$$\Psi(P) = -\frac{ik}{2\pi} \int_{s_1} \frac{\Psi(s_1) \exp(ikR)}{R} ds_1 , \qquad (2)$$

where the integral extends over the area of the source aperture  $s_1$ , R is the distance from each element in  $s_1$  to the observation point P, and  $\Psi(s_1)$  is the complex field as a function of position in the source plane.

Comparison of the Two Approaches

Since the integral equation and the paraxial wave equation are alternative approaches to the same problem, we expect that both approaches will yield the same correct answer. The question for discussion, then, is which approach can be more readily implemented in a given case.

In comparing the two approaches, we find that the integral propagator seems to be the natural choice for a long propagation distance. The integral is evaluated in a single step from the source plane to the observation plane. The numerical integration of the differential equation, on the other hand, is expected to require many steps for a long propagation distance.

As the propagation distance decreases, the quantity  $\exp(ikR)$  in Eq. (2) will begin to oscillate more rapidly as we move across the aperture carrying out the numerical integration. The number of one-half cycles of oscillations is given by the Fresnel number  $N_F$ , defined by

$$N_{\rm F} = a^2/(R\lambda) \,, \tag{3}$$

where a is the radius of the source aperture,  $\lambda$  is the wavelength, and R is as before. For good accuracy in our numerical integration, we may require somewhere between four and eight points per Fresnel number; thus, as the distance to an observation point R decreases, the Fresnel number increases to a value of, say  $N_{\rm F}=100$ ; we require between 400 and 800 radial grid points. If, in addition we introduce tilt or otherwise destroy the axial symmetry, the total number of grid points can climb rapidly into the range of  $10^3$  to  $10^4$ . This discussion assumes, of course, that the phase and amplitude of  $\Psi(s_1)$  vary at a slower rate than  $\exp(ikR)$ , a condition not always met in practice. For relatively short distances and corresponding large values of  $N_{\rm F}$ , the paraxial wave equation seems the natural choice. In the limit of short distances we have the geometric optics solution in which the electric field can be expressed in terms of the second derivatives (or equivalently, the radius of curvature of the phase fronts) of  $\Psi(s_1)$  in the source plane.

In numerical calculations, the values for the electromagnetic field are always presented on a grid of finely spaced points. The configurations of the grids and the total number of points are important issues. One is always faced with the tradeoff between computer storage requirements and calculation speed on the one hand and accuracy requirements on the other.

The early calculations were often carried out with Cartesian coordinate and square or rectangular grid systems. The early fast Fourier transform (FFT) (to be discussed later) algorithms were easily applied to these systems. For circularly symmetric systems, however, this is not an efficient grid system. Accordingly, radial systems were introduced and suitable integral propagators were developed for azimuthally decomposed fields. For an axisymmetric system, the number of grid points for a given level of sampling can be reduced substantially. Even when the axial symmetry is disturbed by such factors as tilts, mirror distortions, and struts, one often samples relatively heavily in r and relatively thinly in  $\theta$ , with an overall increase in sampling efficiency compared to a Cartesian system.

Before we leave our discussion of basic considerations, we mention briefly some of the analytic techniques and contrast them with the numerical techniques.

Since the early work of Horowitz [2] on the empty cavity modes of the perfectly aligned infinite strip resonator, slow and steady progress has been made with the analytic techniques. Butts and Avizonis [3] have studied the cylindrically symmetric bare resonator. Ellenwood and Meyer [4] have obtained preliminary results on the empty perfect HSURIA resonator. The analytic studies are significantly limited by the fact that they cannot deal with the general cases of major interest. Nevertheless, to the degree that they can handle important ideal cases, they serve a useful role for baseline comparison purposes. Some workers also feel that they retain closer contact with the basic physics of the problem.

المتعارض والمناه والمتعارض والمتعارض والمتعارض

Although the large numerical codes are held in mixed regard within the community, they do appear to hold promise for accurate numerical results for all cases of interest. The full set of cases of interest spans a much wider range of phenomena than those that can be handled by the analytic approaches.

The large codes may be plagued with long run times, considerable expense, and uncertain results, particularly for those cases where there is no convergence. We do not yet seem to have achieved the happy circumstance of efficient and economic computer codes producing results of high confidence for all the realistic cases of interest.

## Some Specific Propagators

We present now a brief discussion of some of the features of several propagators used in practice. We will discuss only Huygens-Fresnel algorithms, since these are the most often used. The ordering here follows that of the survey form.

# Kernel Averaging

This technique takes account of the fact that a relatively fine grid is required to sample rapid variations in the quantity  $\exp(ikR)$  in Eq. (2), whereas a coarser grid is generally adequate for the field distribution in the source aperture. The  $\exp(ikR)$  grid can be computed once and the values for the field amplitude obtained by interpolation.

#### Gaussian Quadrature

This is a well-known technique for carrying out numerical integration with a given accuracy and fewer grid points than those used in the evenly spaced grids. The grid points must be spaced unevenly to effect this improvement. A nonuniform weighting function is used. One possible penalty is the requirement for interpolation to obtain the field values at the proper locations in the source plane. In addition, for large Fresnel numbers, sampling restrictions lead to prohibitive run times.

## Fast Fourier Transform

The FFT is a well-known technique [5] by which the number of steps required to carry out an integration of an  $N \times N$ -point 2-D function expanded in an  $N \times N$  series of basis functions may be reduced from  $\approx N^2$  to  $\approx N \log_2 N$ , which is a substantial saving when N is  $\geq 100$ . In its original version the FFT is suited to the case of a rectangular grid system. To carry out the procedure, one takes the (fast) Fourier transform of the field distribution in the source plane, propagates this transform to the observation plane with a simple multiplication, and finally, if desired, calculates the inverse (fast) finite Fourier transform.

#### Fast Hankel Transform

The FHT transform has been described by Siegman [6]. The Hankel transform and the Fourier transform are very closely related. In fact, the result of a zeroth order Hankel transform is numerically equal to that of a double Fourier transform in x and y when the function being transformed is cylindrically symmetric. Higher order Hankel transforms accommodate cases where, for example,  $\cos m\theta$  symmetries are present.

# Gardner-Fresnel-Kirchhoff

The Gardner transform [7] is applied to Eq. (2), resulting in a Gardner-Fresnel-Kirchhoff (GFK) algorithm. If the Fresnel integral is written in terms of the cylindrical coordinate variables r and  $\theta$ , the  $\theta$  integrations can be carried out analytically for circularly symmetric fields. As it stands, the form of the remaining integral over  $\gamma$  does not lend itself to any of the fast transform techniques. However, if we apply the Gardner transform to the radial coordinate, the new variables u and u' appear in the form (u - u'), which is a form of a convolution to which the fast transform techniques can be applied. Both FHT and GFK methods use the Gardner transform. The FHT requires an additional Fourier transform, since a convolution is not used.

# Strip Propagators

The strip propagator [8] is the appropriate one for the one-dimensional strip resonator problem in which the fields are independent of the coordinate along the strip. These propagators are applied in the annular region of circularly symmetric HSURIA resonators. Strip propagators are of interest because we anticipate great difficulty in handling the number of grid points required for a fully general treatment. We can understand these requirements from the following considerations. Let us imagine an annulus 60 cm in diameter with a 4-cm shell which is 400 cm long. From Eq. (3) we take the Fresnel number

$$N_{\rm F} = \frac{2^2}{(3 \times 10^{-4}) \, 400} \approx 33$$
.

If we assume that the annulus can be considered as an infinite strip closed on itself, then about 500 points are required to properly model the field through the thickness. If now we add the possibility of an angular dependence around the annulus, we may require one to several orders of magnitude more points to model the fields properly, depending on the magnitude of the angular variations. A Fourier decomposition is made in the azimuthal components. These fields are then carried along separately.

# Convergence

Convergence in laser resonators is an iterative process that amounts to reflecting the field around the resonator until the field distribution is repeated to within a multiplicative constant from one iteration to the next. This constant is related to the mode eigenvalue. The iterative procedure is terminated when the field stabilizes to within a convergence criterion. In some codes the measure of convergence is taken to be the (normalized) power in the field fed back into the resonator immediately after outcoupling. Convergence is reached when either (a) a certain number of the last computed values of the feedback power are all within some prescribed amount, or (b) the most recently computed minimum and maximum values of the feedback power agree to some preset number of decimal places. Convergence can also be established by requiring the point-to-point variation in the field distribution to be less than a prescribed amount for consecutive iterations.

When the two largest eigenvalues have nearly the same value, e.g., for resonators of nearly integer equivalent Fresnel number, convergence to the dominant eigenvalue can be quite slow if obtainable at all. In such situations convergence acceleration algorithms are sometimes used to predict the eigenvalue in hopes of reducing the number of iterations to convergence.\* Since the results obtained with some algorithms can be misleading or erroneous, they should be utilized with caution.

# Eigenvalue/Eigenvector Extraction [9]

In modern unstable resonator calculations, it is very important to determine a resonator's transverse mode behavior to ensure adequate transverse mode discrimination and insensitivity to small mirror misalignments (tilts, translations, decentrations, etc.). This means that, typically, several high-order transverse modes of the resonator, in addition to its lowest, need to be calculated. Ordinarily, however, numerical unstable resonator solutions yield only one eigenvalue, i.e., the one associated with the dominant, or lowest loss, mode represented by the stable (self-replicating) field distribution at convergence. Thus, to obtain information about some other (higher order) mode, one must somehow extract the known modes from the initial field distribution and reiterate the resonator to convergence. There are two basic problems with this approach. First, finding many eigenvalues (and transverse modes) one at a time for a complex resonator can be very expensive, since convergence must be reached every time. It would not be unusual for higher order modes to converge more slowly. Second, due to numerical inaccuracies, it could be very difficult to completely extract a known (lower order) eigenvalue from the starting field distribution, to prevent its dominating again after many iterations.

The Prony method, which provides an effective algorithm for extracting all of the significant lowest order modes in a resonator eigenvalue calculation, is one means of alleviating the problems just discussed [10]. Furthermore, with this method several different transverse modes of a resonator can be found without iterating the field to convergence! This is obviously a very powerful technique and provides an important measure of both power and efficiency to be considered in trading off resonator optics codes for use in higher order mode calculations.

# **Resonator Type**

Standing-wave resonators have mirrors at either end of a cavity that reverse the beam direction, causing it to alternately retrace its path in the opposite direction. Field points inside standing-wave resonators have a bidirectional flux traveling through them. Traveling-wave resonators, commonly called ring resonators, circulate the mode unidirectionally (if properly designed). Sometimes, poorly designed traveling wave resonators can support reverse running modes, which are generally undesirable.

<sup>\*</sup>For example, see Aitken's method as discussed in J. H. Wilkinson, The Algebraic Eigenvalue Problem, Oxford University Press, Cambridge, 1965, p. 578.

#### **Branch**

The branch of a resonator relates to the stability diagram [11] for two-element resonators, made up of spherical mirrors at unequal curvature (see Fig. IV-2), which is equivalent to a sequence of lenses of alternating focal length  $f_1 = R_1/2$ ,  $f_2 = R_2/2$  equally spaced a distance d apart.

One identical subelement of this sequence of lenses is a space d followed by a lens of focal length  $f_1$ , followed by another space d, and finally the second lens of focal length  $f_2$ . By applying the appropriate paraxial ray transfer matrix to this subelement and requiring that one-half the trace of this matrix be between -1 and 1, we arrive at the condition for stability. That is, for the optical system representing the complete round trip in the resonator mirror system, we have the equivalent lens sequence shown in Fig. IV-3.

The matrix operations are, for this sequence,

$$\begin{bmatrix} 1 & d \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -\frac{1}{f_1} & 1 \end{bmatrix} \begin{bmatrix} 1 & d \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -\frac{1}{f_2} & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 - d/f_2 & 2d - d^2/f_1 \\ \\ -\frac{1}{f_1} - \frac{1}{f_2} + \frac{d}{f_1 f_2} & 1 - \frac{d}{f_1} - \frac{2d}{f_2} + \frac{d^2}{f_1 f_2} \end{bmatrix}.$$

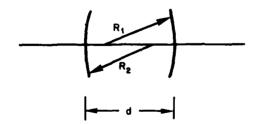


Fig. IV-2 - General open optical resonator

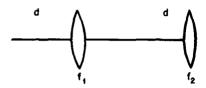


Fig. IV-3 — Equivalent lens sequence for open optical resonator

Stability requires that  $-1 \le 1/2$  (trace)  $\le 1$ , or,

$$-1 < 1/2 \left[ 2 - \frac{2d}{f_1} - \frac{2d}{f_2} + \frac{d^2}{f_1 f_2} \right] < 1$$
.

Thus,

$$0 < \left(1 - \frac{d}{R_1}\right) \left(1 - \frac{d}{R_2}\right) < 1$$
 for stable resonators

where we have substituted  $f_1 = R_1/2$  and  $f_2 = R_2/2$ . Let  $g_1 = 1 - d/R_1$  and  $g_2 = 1 - d/R_2$ . Then the unstable resonators split into two categories

positive branch 
$$g_1g_2 \ge 1$$

and

negative branch 
$$\mathbf{g}_1\mathbf{g}_2 \leq 0$$
.

The stability diagram is a plane representing all combinations of  $g_1g_2$ , as in Fig. IV-4. A special case of great interest is the confocal resonator for which the focal points of the mirrors coincide. The condition of confocality is given by

$$f_1 + f_2 = d$$

which leads to contours of confocality

$$g_1 = g_2/(2g_2 - 1)$$

on the stability diagram.

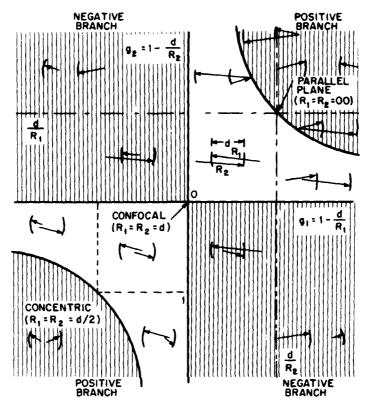


Fig. IV-4 — Stability diagram. Unstable resonator systems lie in shaded regions.

The positive-branch confocal resonator has  $g_1$  and  $g_2$  positive, but the curvatures of the mirrors are of opposite sign. The negative-branch confocal resonator has both curvatures positive, but  $g_1$  and  $g_2$  are of different sign. Thus, the negative-branch resonator has a real internal focus. These examples are shown in Fig. IV-5. Both have fundamental mode collimated outputs.

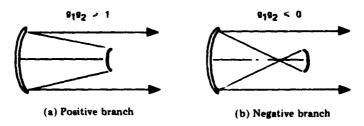
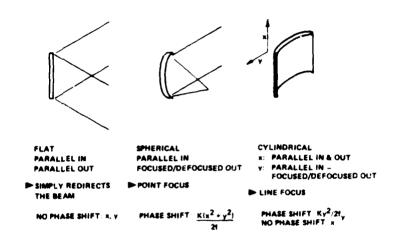


Fig. IV-5 - Two classes of confocal resonator

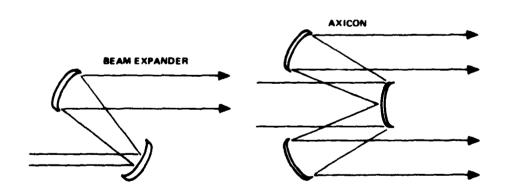
# **Optical Element Models Included**

Most optics codes are capable of modeling standard components such as those discussed in this section.

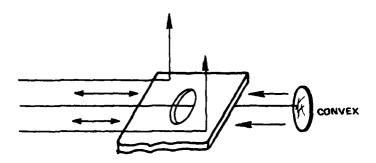
Flat, spherical, and cylindrical mirrors are standard optical components.



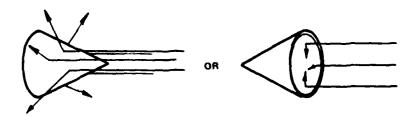
Telescopes, intra- or extracavity, are used to enlarge or reduce beam sizes.



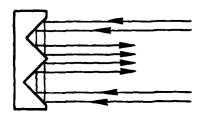
Scraper mirrors are placed between the end mirrors of unstable resonators to outcouple the beam. A scraper mirror is usually a flat with a hole in it, placed near the convex cavity mirror. (Note: Usually not modeled.)



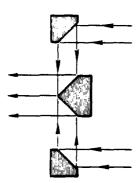
Axicon is the generic term for an axisymmetric, cone-shaped optical element.



Waxicon is the term for a compound axicon (two cones) whose cross section is W-shaped. An annular input beam is transformed into a compacted beam traveling in the opposite direction.



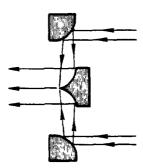
Reflaxicon refers to a compound axicon that compacts an annular beam without reversing the beam direction.



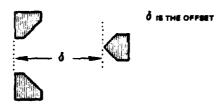
Arbitrary refers to the surface contour of the axicon. Arbitrary axicons can be designed to change the beam phase or intensity profiles.

Linear model: surface contour is a line of revolution, resulting in a true cone section.

Parabola-parabola model: the inner and outer cone of surfaces are parabolas of revolution. These configurations spread the compact beam to reduce flux loading on optical elements.



Variable cone offset is the axial separation between the inner and outer cones and is a code variable.



Deformable mirrors refers to a mirror whose surface contour is adjustable by use of a series of actuators. When a deformable mirror is coupled to a feedback system of sufficient bandwidth, an adaptive optic system results. This can be used to offset aberrations induced in the intracavity beam by gain media inhomogeneities and fluctuations, mirror deformations, or jitter.

Spatial filters refers to an aperture stop placed near a focal point to restrict passage of a beam to those elements that can be focused through the aperture. Since unwanted modes have energy in the wings of the focal pattern, the filter acts as a suppressant by removing this energy from the feedback loop. If the passage to a "point" focus is impossible due to high flux, then a cylindrical lens can be used to form a line focus, thereby spreading out the beam power over a greater area. In this case the filter is a line aperture.

Gratings are linear, circular, or holographic contours of wavelength dimensions etched or ruled into a mirror to disperse the beam.

## Gain Models

Bare cavity models do not contain gain models but mathematically normalize the circulating flux to unity after each round trip. Simple saturated gain models use a simple gain algorithm for homogeneous and inhomogeneous broadening to boost the intracavity flux on each round trip. Detailed gain models calculate the gain by taking into account the actual number densities of active media at each field point and consider effects such as cascading, mixing, and deactivation. These models are summarized in the sections of the survey form dealing with kinetics (column 3) and gasdynamics (column 4).

# **Bare Cavity Field Modifier Models**

Field modifiers are mathematical operations applied to the intracavity field at selected points to model various resonator elements such as mirrors or errors. For instance, errors due to thermal distortion of a laser mirror can be calculated once the field is predicted at

the plane of the mirror. An algorithm is then used to determine the mirror distortion, which in turn is converted to a phase error and added point by point to the field phase.

Recent work by Felsen, Dente, and others on the effect of the mirror edges on resonator mode stability and control have resulted in the comments on output coupler edges: rolled, serrated, etc.

# **Loaded Cavity Field Modifier Models**

In loaded cavity models (gain included), field modifiers to simulate gain sheets as well as errors in the gain medium index of refraction, gaseous resonant or nonresonant absorption of the intracavity flux, or the effects of overlapped beams in detailed three-dimensional gain packages are sometimes modeled. The gain is a function of the laser intensity; hence, matrix methods are not usable, since the problem is nonlinear.

## Far-Field Models

Far-field models are used to project a beam with a certain intensity and phase profile taken at the resonator output into the far field for purposes of evaluating beam quality. Errors in the output beam phase such as tilt and focus need to be removed in some instances in order to properly evaluate the residual beam quality. Beam quality is usually calculated by measuring the fraction of the total power that passes through an aperture of fixed size and comparing the ratio of the theoretically perfect beam to the predicted beam by one of a number of simple algorithms.

#### KINETICS

#### Introduction

The objective of the chemical kinetics subroutines in these computer codes is to calculate the gain coefficient by taking account of the detailed rates of pumping, deactivation, and stimulated emission of the vibrational states of the excited product molecules in the chemical reaction of the laser medium. These instantaneous point solutions are then coupled with fluid flow models (cf. discussion of column 4 of survey form) of various degrees of sophistication to describe the gain as a function of position transverse to the laser light beam propagating between the mirrors. Since the pumping and stimulated emission rates are dependent in part on the local intensity of laser light at the site of each molecule in the stream, one sees immediately that the most comprehensive solutions require that self-consistency be established (the laser light appears both as a cause and an effect of the molecular kinetics).

The gain coefficient  $\alpha$  is calculated at a discrete plane along the propagation direction (z) and is used in the radiative transfer equation to calculate the local intensity I;

$$\frac{dI}{dz} = I\alpha$$
.

The gain coefficient is derived from the details of the complex behavior of the molecules, which derives from functions of the following factors.

- 1. Their combustion formation processes (rate coefficients)
- 2. Collisions with other molecules (foreign and self-broadening and energy transfer)
- 3. Their motion at the temperature of the flowing, expanding gas (Doppler broadening)
- 4. Rotational and vibrational populations (Boltzmann or non-Boltzmann distribution plus partition function)
  - 5. Einstein coefficients for stimulated emission and competing deactivation modes.

# Gain Region Modeled

If the gain generator is in the compact region of an annular device, as it is in laboratory test beds in many cases, the model is appropriate for that configuration—that is, for example, linear banks of nozzle and parallel flow. If the gain generator is in the annular region, then cylindrical symmetry dictates a  $(r, \theta)$  coordinate system to model the radial diverging gain medium.

# Kinetics Grid Dimensionality and Symmetry

The molecular effects summarized above are calculated for each transverse point in the region intercepted by the laser beam modes in the most sophisticated models. For some geometries and flow patterns, an approximation of one-dimensional kinetics is assumed and implemented by averaging over the transverse coordinate perpendicular to the flow direction. The variation of gain along the optic axis is achieved by use of more than one transverse plane for the kinetics/gasdynamics calculation. One does so only with care, however, since this gain calculation can be very time consuming. Typically, one to three gain "sheets" are used, although some lasers have been studied with as many as six sheets. A rule of thumb is about one per meter of HF. One tries to keep the gain X length product between sheets such that the intensity rises linearly.

# **Chemical Reactions Modeled**

The reactions modeled for use in high-energy lasers have generally fallen into three catetories: (a) cold, (b) hot, and (c) chain. *Cold* and *hot* are terms referring to the relative exothermicity of the one reaction compared with the other. The cold reactions are given by the class of halogen-hydrogen reactions

$$X + H_2 \rightarrow HX + H$$
,

where X is any of the halogen atoms F, Cl, Br, or I, and H can be replaced by D. The hot reactions are given by the class of atom transfer reactions,

$$H + X_2 \rightarrow HX + X$$
.

The energy to be distributed among the reaction products is  $-\Delta H + E_{\alpha}$  where  $\Delta H$  is the change in enthalpy of the reaction and  $E_{\alpha}$  is the activation energy needed to overcome the potential barrier between the two initially stable reactants. The reference to cold and hot reactions can be understood by reference to energy values for a specific reaction. For example,

$$F + H_2 \rightarrow HF^* + H$$

has

$$-\Delta H + E_{\alpha} = 34 \text{ kcal },$$

whereas

$$H + F_2 \rightarrow HF^* + F$$

has

$$-\Delta H + E_{\alpha} = 102 \text{ kcal }.$$

Since this excess energy appears as excited state  $\mathrm{HF}^*$ , one sees that much higher vibrational levels are possible in the hot reaction.

The higher exothermicity of the hot reaction can be attributed to the difference between the very weak bonding of  $F_2$  and strong dissociation energy at 0 kelvins from v = 0 of HF. The difference of about 100 kcal is sufficient to excite HF vibrationally to v = 11.

The chain reaction occurs with a mixture of  $\rm H_2$  and  $\rm F_2$  so that both the hot and cold reactions are present in the gain medium, supplying the necessary H and F atoms to activate the excited HF molecules. In addition, the hot reaction allows energetic interaction of  $\rm F_2$  with the excited HF above a minimum vibrational level to create a surplus of F atoms via the branch

$$\mathrm{HF}^*(v \ge v_{\mathrm{min}}) + \mathrm{F}_2 \rightarrow \mathrm{HF}(v = 0) + 2\mathrm{F}$$
.

The difference in exothermicity and hence in available vibrational energy for population inversion is clearly seen in the following coordinate energy level diagrams for  $F/H_2$  and  $H/F_2$  reactions. In Fig. IV-6 the energies shown are for one mole of reactants. The  $k_i$  and  $k_i$  are the rate constants for activation and recombination, respectively.

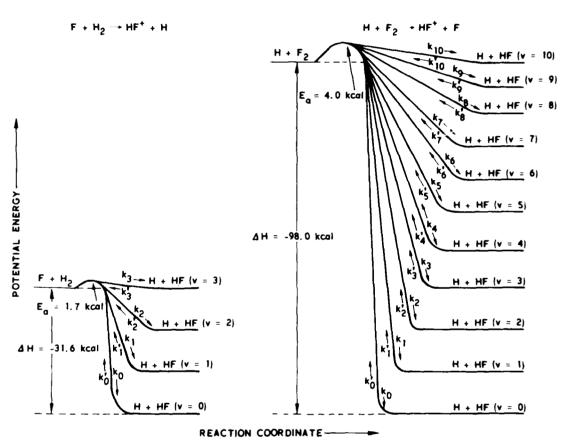


Fig. IV-6 — Reaction coordinate diagrams for  ${\rm F/H_2}$  and  ${\rm H/F_2}$  reactions [12a]

# Modeling of Energy Transfer Modes

Deactivation of the inverted population occurs via stimulated emission together with competing radiative and collisional processes. Relaxation rate coefficients are used in the computer calculations to account for the self-deactivation of the hydrogen halides and for their deactivation by other species of atoms, molecules, and radicals present in the flowing medium.

The energy transfer occurs through either vibrational-translational reactions or vibrational-vibrational reactions. The vibrational-vibrational (rotational, V-T(R)) reactions are exemplified by

$$\begin{array}{c} k_{v,v-\Delta v} \\ \text{HX}(v) + M & \longrightarrow \\ \text{HX}(v-\Delta v) + M + \Delta E(v,\Delta v) \end{array}$$

where  $k_{v,v^-\Delta v}$  is the rate coefficient, v is the initial vibrational level of HX, and  $\Delta v$  is the number of vibrational quanta transferred to the chaperone specie molecule M as translational and/or rotational energy. This type of transfer leads, clearly, to a real loss of available quanta for stimulated emission at vibrational level v. In the vibrational-vibrational (v,v') reaction

$$k_{v,v'}$$
  
 $HX(v) + AB(v') \Longrightarrow HX(v - \Delta v) + AB(v + \Delta v)$ ,

energy remains in vibrational states. In the case of self-deactivation, lasing species are preserved in v, – v' transfer.

#### Single vs Multiline

Since the vibrational-rotational levels are populated and deactivated at different rates, the inversion condition necessary for lasing depends on the instantaneous relative population between all V-R levels and therefore changes with time. Thus the spectral output of the chemical laser is generally *multiline*. The line profile as a function of the transverse flow coordinate is in general different for each line because of differences in gain distribution.

#### **Rotational Population Distribution**

To avoid excessive computational time, the assumption of rotational state population equilibrium is usually made. The partition function describes a Boltzmann distribution in this case. At the low pressures encountered in some HF laser designs, this assumption is not necessarily a good one. If, for example, collisional rates are greatly exceeded by stimulated emission rates, then the equilibrium assumption is suspect. Brute-force inclusion of rate equations for each J level would lead to inordinate run time and expense. Thus various simplifying assumptions are made, including empirical distributions fit to small-signal gain and chemiluminescence data. Care must be exercised, however, since in the absence of lasing, the Boltzmann distribution is very well fitted to available data.

# Line Profile Models

The natural line width of the lasing transition is broadened by collision and the Doppler effect. In high-pressure devices (> 75 torr), collisional broadening dominates. In low-pressure devices (< 5 torr), Doppler broadening dominates. A convenient method for inclusion of both effects is to use the Voight function defined by

$$K(x,y) = \frac{y}{\pi} \int_{-\infty}^{\infty} \frac{e^{-t^2} dt}{y^2 + (x-t)^2}.$$

The line profile at wavenumber  $\omega$  is then

$$\Phi(\omega; v, J, m) = \left(\frac{\ln 2}{\pi}\right)^{1/2} \frac{1}{\alpha_{\mathrm{DP}}(v, J, m)} K(x, y)$$

where

$$\int_{\omega_{c-\infty}}^{\omega_{c+\infty}} \Phi(\omega) d\omega = 1$$

$$x = (\ln 2)^{1/2} \frac{|\omega - \omega_{c}(v,J,m)|}{\alpha_{\mathrm{DP}}(v,J,m)}$$

$$y = (\ell n \ 2)^{1/2} \, \frac{\alpha_{\mathrm{LR}}(v,J)}{\alpha_{\mathrm{DP}}(v,J,m)} \, . \label{eq:y}$$

Also,  $\alpha_{\rm DP}$  and  $\alpha_{\rm LR}$  are the Doppler and Lorentz HWHM (half widths at half maximum), respectively. For laser operation at line center ( $\omega = \omega_{\rm c}$ ), x = 0 and the Voight function [12b] reduces to the exact formula

$$K(0,y) = \left[1 - \operatorname{erf}(y)\right] \exp(y^2)$$
.

Then in the limit of pure Doppler broadening (y = 0 and K(0,0) = 1), the line profile becomes

$$\Phi_{\rm DP}(\omega_{\rm c}) = \frac{(\ln 2/\pi)^{1/2}}{\alpha_{\rm DP}},$$

whereas in the (Lorentz) limit of pure collisional broadening  $(y \to \infty)$  and  $K(0,y) \approx 1/y\sqrt{\pi}$  it becomes

$$\Phi_{\rm LR}(\omega_{\rm c}) = \frac{1}{\pi \alpha_{\rm LR}}$$

For operation at other than line center ( $\omega \neq \omega_c$ ), approximate algebraic expressions for the Voight function exist [13].

# GASDYNAMICS

#### Background

Gasdynamics, the fourth column on the detailed code survey form, describes the capability of the code to account for the fluid mechanical properties of the gases as they are mixed and transported through the laser and, in particular, to account for the effects of gas mixing on the production rate and spatial distribution of HF\* (or DF\*), which determine power production.

### Nozzle Type and Geometry Modeled

There are basically two distinct overall nozzle bank geometries that define the shape of the gain region: cylindrical and rectangular. The specific nozzle elements themselves usually reflect geometries characteristic of subsonic or supersonic flows. There are many different types of chemical laser nozzles. The cylindrical, radially flowing nozzle banks produce a gain region of annular cross section as seen in Fig. IV-7. The gases flow radially outward and hence the streamlines diverge. Rectangular, linearly flowing nozzle banks (shown in Fig. IV-8) produce a gain region of rectangular cross section with parallel streamlines. In either geometry the flow is transverse to the optical beam path.

#### **Coordinate System**

The representation and calculation of fluid flow phenomena are usually simplified when the chosen coordinate system reflects the flow field geometry. It is often important to be aware of which coordinate system is used in a given code, expecially when that code is to be combined with another for extended calculations or when a code is being considered as a candidate for analyzing a problem of given geometry where the run time, cost, and/or accuracy should be compromised if the coordinate system and problem geometry were not the same.

# Fluid Flow Grid Dimension

This section requests specification of the spatial dimensionality of the numerical fluid dynamics grid. The ability to accurately represent actual physical phenomena increases (as do the run time and cost) as fluid grid dimensionality is increased from one to say, three dimensions. Certain phenomena may actually require four dimensions, three spatial dimensions and time, in order to be modeled satisfactorily. Other phenomena may be adequately modeled by only a single spatial variable in a time-independent calculation. There may be no advantage at all in using a code with higher dimension capability than is required for a given analysis, although there are usually significant cost, run time, and job turnaround penalties.

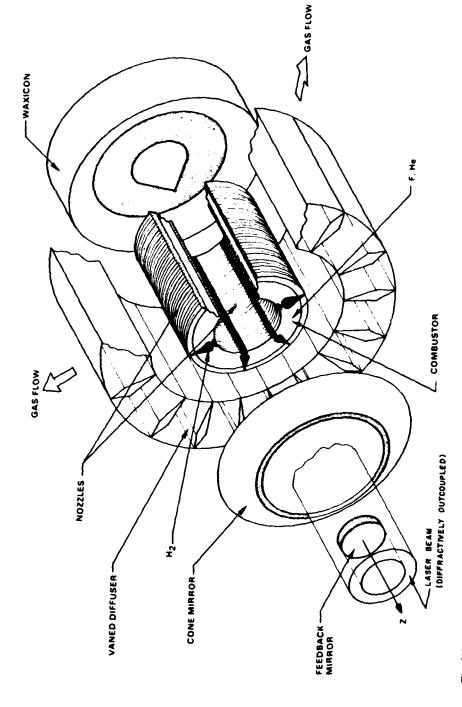


Fig. IV-7 — Hypothetical combustion-driven CW HF chemical laser employing a cylindrical, radially flowing nozzle bank and a HSURIA resonator producing an annular gain region

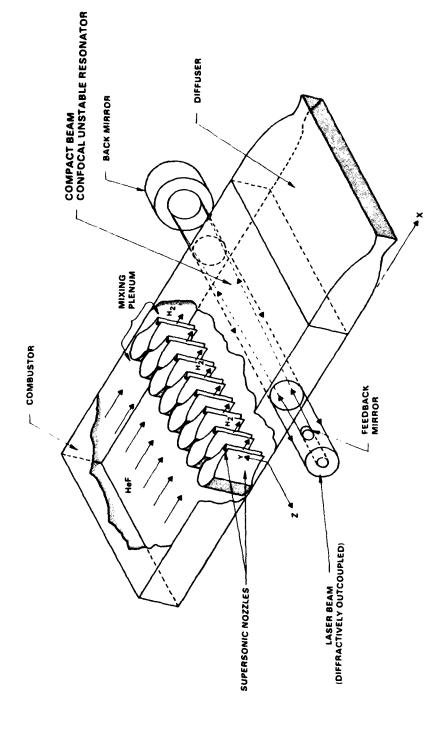


Fig. IV-8 — Hypothetical combustion-driven CW HF chemical laser employing a rectangular, linearly flowing nozzle bank and a positive-branch, compact-beam, confocal unstable resonator

Equally important (but ignored in the survey) in assessing the suitability of a code for a given problem is the actual number of grid points per grid dimension allowed, which determines the maximum sizes of the arrays that can be handled by the computer, and which for a given set of geometrical dimensions determines the maximum achievable resolution.

#### Flow Field Modeled

Typically the supersonic HF/DF mixing laser must solve a number of gasdynamical problems because the type of mixing influences the mixing rate that affects the lasing process. The mixing rate depends on whether the mixing in the laser cavity is laminar, transitional, or turbulent. Since this is a question that has not been fully resolved, the capability of a code for modeling a variety of flow field conditions is an important measure of its usefulness in certain types of performance analyses.

# **Basic Modeling Approach**

When F and  $(H_2 \text{ of } D_2)$  are mixed in a flowing system, the chemical reaction producing HF\* (or DF\*) begins as soon as the reactants come into contact. As a result the overall rate and spatial distribution of HF\*(or DF\*) produced by such a reaction is governed by both the chemical reaction rate and by the rate of mixing. Attempts to model the influence of both rates on power production and distribution in the cavity lead first to an investigation of two limiting cases, the so-called premixed and mixing- or diffusion-rate dominated cases.

In the premixed approach the rate of mixing or diffusion of F and  $H_2$  is considered to be very fast compared to the reaction rate, and therefore the production of  $HF^*$  is limited by the chemical reaction rate. In this case gases are allowed to mix before the chemical reaction starts, hence the production of  $HF^*$  (and laser gain) occurs downstream from the mixing. Thus, in this limiting case the diffusion equations that describe the mixing process are ignored. This approach also leads to a considerable simplification in modeling.

In the mixing-rate-dominated approach, the rate of mixing (or diffusion) is considered to be slow in comparison to the chemical reaction rate, and therefore power production is governed by the mixing process.

As might be expected, neither limiting case is considered sufficiently accurate for modeling the coupling of finite diffusion and chemical reaction rates necessary for adequately describing HF production in CW HF lasers. As a result, other approaches have been developed that attempt a more realistic modeling approach, i.e., one that is intermediate between the limiting cases. For example, there is the so-called flame sheet solution approach. In this approach the mixing process is incorporated into the premixed solution through the use of a flame sheet diffusion profile [12]. Such approaches are referred to as scheduled mixing.

There are many approaches to modeling chemical lasers [12,14]. Generally they can be divided into two overall categories—those that are basically numerical and those that are analytical. Some of these are loosely grouped by category below in terms of (generally speaking) decreasing rigor, scope, and complexity:

# Detailed Numerical Approaches

There are three main detailed numerical approaches, which are given here, with appropriate references.

- Rigorous attempts at mixing solutions (possibly with kinetic and radiative processes) included work by the following researchers:
- A. W. Ratliff, J. Thoenes, and S. D. Smith, "Method of Characteristics Laser and Mixing Program Theory and User's Guide," vol. IV, Technical Report RK-CR-73-2, Lockheed Missiles and Space Co., Huntsville, Ala., 1973.
- B. R. Bronfin, et al., "Development of Comprehensive Laser Computer Models," United Aircraft Research Laboratories Report K911252, Nov. 1971.
- B. R. Bronfin, et al., "Development of Chemical Laser Computer Models," Air Force Weapons Laboratory Technical Report AFWL-TR-73-48, Kirtland AFB, July 1973.
- "ALFA Code," Air Force Weapons Laboratory Technical Report AFWL-TR-78-19, Kirtland AFB, Feb. 1979. An upgrade of the LAMP code incorporating turbulent nozzle flows, cylindrical laser configurations, pressure-unbalanced cavity flows, effects of rotational nonequilibrium, and multiline lasing for analysis of CW chemical lasers.
- "APACHE Code," Los Alamos Scientific Laboratory Report LA-7427, Jan. 1979. Time-dependent finite difference code for modeling a multicomponent chemically reactive fluid flow interacting with an intense radiation field.
- D. B. Rensch and A. N. Chester, "Chemical Laser Mode Control Program," Final Technical Report, Contract DAAH01-70-C-1082, Hughes Research Laboratories, Malibu, Calif., 1971.
- W. S. King and H. Mirels, "Numerical Study of a Diffusion Type Chemical Laser," Amer. Inst. Aeronaut. Astronaut. J. 10, 1647 (Dec. 1972).
- Flame-sheet solutions incorporating mixing processes into premixed solutions through use of flame-sheet diffusion profile include those reported in "A Simplified Model of CW Diffusion-Type Chemical Laser," by H. Mirels, R. Hofland, and W. S. King, Amer. Inst. Aeronaut. Astronaut. J. 11, 156 (1973).
- Premixed solutions (which ignore the diffusion equations which describe the mixing process) include the works of Emanuel, et al., and Meinzer, et al.:
- G. Emanuel, W. D. Adams, and E. B. Turner, "RESALE-1: A Chemical Laser Computer Program," Aerospace Corporation Report TR-0172(2776)-1, El Segundo, Calif., 1972.
- R. A. Meinzer, et al., "CW Combustion Mixing Chemical Laser: HF, DF," Proceedings of the 6th International Quantum Electronics Conference, Tokyo, Japan, Sept. 1970.

# Approximate Analytical Approaches

- Variable gain-length mixing model:
- J. E. Broadwell, "Effect of Mixing Rate on HF Chemical Laser Performance," Appl. Opt. 13, 962 (1974).
  - Flame-sheet mixing scheme utilizing premixed solutions;
- R. Hofland and H. Mirels, "Flame-Sheet Analysis of CW Diffusion-Type Chemical Lasers, I. Uncoupled Radiation," Amer. Inst. Aeronaut. Astronaut. J. 10, 420 (Apr. 1972).
- H. Mirels and R. Hofland, "Flame-Sheet Analysis of CW Diffusion-Type Chemical Lasers, II. Coupled Radiation," Amer. Inst. Aeronaut. Astronaut. J. 10, 1271 (Oct. 1972).
- H. Mirels, "Interaction Between Unstable Optical Resonator and CW Chemical Laser," Amer. Inst. Aeronaut. Astronaut. J. 13, 785 (June 1975).
- J. M. Herbelin, "Continuous-Wave (F + H<sub>2</sub>) Chemical Lasers: A Temperature-Dependent Analytical Diffusion Model," Appl. Opt. 15, 223 (Jan. 1976).
  - Premixed solutions (which ignore diffusion):
- G. Emanuel, "Analytical Model for a Continuous Chemical Laser," J. Quant. Spectrosc. Radiat. Transfer 11, 1481 (1971).
- G. Emanuel and J. S. Whittier, "Closed-Form Solution to Rate Equations for an F + H<sub>2</sub> Laser Oscillator," Appl. Opt. 11, 2047 (1972).

# Thermal Driver Modeled

The thermal driver refers to the process of generating the oxidizer, atomic fluorine, usually from  $F_2$ ,  $SF_6$ , or  $NF_3$ . There are a number of different types of thermal drivers including arc heaters, shock tubes, resistance heaters, combustors, and chemical reactions. Whatever the method, it is necessary to produce a known, large concentration of F atoms with the thermal driver and then mix F with  $H_2$  or  $D_2$  in a fast expansion through a supersonic mixing nozzle. Figure IV-9 shows the role of the thermal driver in relation to mixing, population inversion, and pressure recovery. In the figure a combustor illustrates the production of atomic fluorine by burning nitrogen triflucride in ethylene. It is important to accurately control the desired degree of fluorine dissociation, mass flow, and temperature of the F atoms since these quantities directly affect the laser operating point (defined by the combustor and nozzle diluent ratios  $\beta_c/\beta_n$  and mass flux  $\dot{m}/A$ ), and hence the power production.

### F-Atom Dissociation From:

Specifies the compound (F<sub>2</sub>, SF<sub>6</sub>, NF<sub>3</sub>, etc.) from which atomic fluorine is obtained as modeled by the code. (See *Thermal Driver Modeled*.)

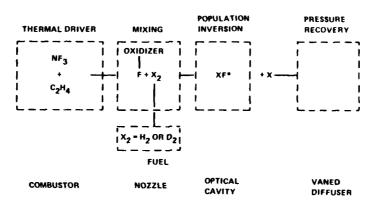


Fig. IV-9 — A CW mixing Hf/DF chemical laser illustrating use of a combustor as thermal driver

#### F-Atom Concentration Determined From Model?:

This question is posed to help determine the extent of computer model capability.

#### **Diluents Modeled**

Diluents (He,  $N_2$ , etc.) added to the mixing plenum play a very important role in establishing the laser operating point and hence the amount of power produced under a given set of conditions. It is of interest in measuring the capability of a computer model to determine the types of diluents and the extent to which their effect on laser performance is modeled. Often one may want to conduct tradeoff studies with several different diluents and/or diluent ratios as functions of other device parameters to optimize power output.

# Models Effects on Mixing Rate Due To:

In the supersonic HF mixing laser there are many gasdynamical phenomena that will affect the mixing rate (and hence the detailed gain profile and power production). Thick laminar boundary layers of F and He can form along a nozzle wall and have a tendency to separate, giving rise to shock waves that can intersect in the flow outside of the nozzle. In assessing code capabilities it is important to determine whether such models are included.

## Models' Effects on Optical Modes Due To:

Effects producing gain medium inhomogeneity arising from pressure, density, or refractive index variations can couple to and alter optical modes. Sonic or ultrasonic waves traveling in the active medium may cause these mode/media interactions.

. .

## REFERENCES

- 1. J. W. Goodman, Introduction to Fourier Optics, McGraw-Hill, New York, 1968, p. 40.
- 2. P. Horowitz, "Asymptotic Theory of Unstable Resonator Modes," J. Opt. Soc. Amer. 63, 1528-1542 (1973).
- 3. R. R. Butts and P. V. Avizonis, "Asymptotic Analysis of Unstable Resonators With Circular Mirrors," J. Opt. Soc. Amer. 68, 1071-1076 (1978).
- 4. J. Ellinwood and F. Meyer, Aerospace Corporation, private communication, 1980.
- 5. For example, see E. A. Sziklas and A. E. Siegman, Appl. Optic. 14, 1874 (Aug. 1975).
- 6. A. E. Siegman, "Quasi-Fast Hankel Transform," Optics Lett. 1, 13 (July 1977).
- 7. W. D. Murphy and M. L. Bernabe, "Numerical Procedures for Solving Nonsymmetric Eigenvalue Problems Associated with Optical Resonators," Appl. Opt. 17, 2359 (Aug. 1978).
- 8. A. G. Fox and T. Li, "Resonant Modes in a Maser Interferometer," Bell Syst. Tech. J. 40, 453 (1961).
- 9. W. P. Latham, Jr., and G. C. Dente, "Matrix Methods for Bare Resonator Eigenvalue Analysis," Appl. Opt. 19, 1618 (1980).
- A. E. Siegman and H. Y. Miller, "Unstable Optical Resonator Loss Calculations Using the Prony Method," Appl. Opt. 9, 2729 (Dec. 1970). Also, W. D. Murphy and M. L. Bernabe, "Numerical Procedures for Solving Nonsymmetric Eigenvalue Problems Associated with Optical Resonators," Appl. Opt. 17, 2359 (1978)
- 11. A. E. Siegman, An Introduction to Lasers and Massers, McGraw-Hill, New York, 1971, Chapter 8. See also, A. E. Siegman, "A Canonical commutation for Analyzing Multi-element Unstable Resonators," IEEE Trans. QF 1. (5) 1976)
- 12. R. W. F. Gross and J. F. Bott, eds. Handbook of themical Lasers, John Wiley & Sons, New York, 1976.
  - a. p. 398
  - b. p. 488
- 13. E. E. Whiting, J. Quantum Spectrosc. Radiat Transfer 8, 1379 (1968).
- 14. J. M. Herbelin, Appl. Opt. 15, 223 (Jan. 1976)

#### **BIBLIOGRAPHY**

The following references are intended for users of this document who may not be familiar with one or more areas addressed by the survey or who may want a more detailed introduction to the subject. This list is not intended to be exhaustive; it does not contain references to numerous important papers.

- R. W. F. Gross and J. F. Bott, eds., Handbook of Chemical Lasers, Wiley, New York, 1976.

  This represents probably the best comprehensive review of chemical lasers. Individual chapters have been written by leaders of their respective areas of technology.
- K. Smith and R. M. Thomson, Computer Modeling of Gas Lasers, Plenum Press, New York, 1978.

Although this text addresses primarily  ${\rm CO}_2$  laser chemistry, it is a good example of the breadth and level of detail achievable in modeling gas lasers.

- A. E. Siegman, An Introduction to Lasers and Masers, McGraw-Hill, New York, 1971.

  This introductory text covers the fundamental physics of lasers. Chapter 8 gives a good introduction to the theory of stable resonators.
- J. W. Goodman, Introduction to Fourier Optics, McGraw-Hill, New York, 1968.

  Material presented here is fundamental to modern diffraction and propagation algorithms.
- J. D. Anderson, Gasdynamic Lasers: An Introduction, Academic Press, New York, 1976. Comprehensive discussion of CO<sub>2</sub> gasdynamic lasers technology, developed from first principles.
- S. Jacobs, M. Sargent III, and M. O. Scully, eds., *High Energy Lasers and Their Applications*, Addison-Wesley, Reading, Mass., 1974.

Chapter 5 by P. V. Avizonis reviews CO<sub>2</sub> electrical, CO<sub>2</sub> gasdynamic, and HF chemical lasers.

# Appendix A CHEMICAL LASER CODE CAPABILITY SURVEY FORM

| OPTICAL CAVITY CODE   |
|---|
| GENERAL (Please complete if different from 2.1 and 3.1)  CODE NAME: |
| PROGRAM NAME (if applicable):                                       |
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE:                        |
|   |
|   |
|   |
|   |
|   |
| ASSESSMENT OF CAPABILITIES:   |
|   |
|   |
|   |
| ASSESSMENT OF LIMITATIONS:  |
|   |
|   |
|   |
|   |
| ORIGINATOR/KEY CONTACT:   |
| Name:   |
| Organization:   |
| Address:  |
| Phone:  |
| AVAILABLE DOCUMENTATION:  |
| Theory Manuals:   |

|       | User Manuals:                                    | _        |
|-------|--|----------|
|       |  | -        |
|       | Listings:  | -        |
|       | Other Relevant Publications:                     | -<br>-   |
| CT A  | TUS:   | -        |
| 3 I A | Operational Currently?:                          |          |
|       | Under Modification?:                             |          |
|       | Purpose(s):                                      | -        |
|       |  | <b>-</b> |
|       | Ownership?:                                      | _        |
|       | Proprietary?:                                    |          |
| MAC   | HINE/OPERATING SYSTEM (on which installed):      | -        |
| ΓRΑ   | NSPORTABLE?:                                     | -        |
|       | Machine Dependent Restrictions:                  | -        |
| SEL   | F-CONTAINED?:                                    | -        |
|       | Other Codes Required (name, purpose):            | -        |
|       |  | -        |
| EST   | IMATE OF RESOURCES REQUIRED FOR RUNS:            | 7600\    |
|       | Core Size (Octal Words) Execution Time (Sec, CDC | 7600)    |
|       | Small Job:                                       |          |
|       | Typical Job: Large Job:                          |          |
|       | Approximate Number of FORTRAN Lines:             |          |

| CODE STRUCTURE                                       |
|--|
| BASIC TYPE (√):                                      |
| Physical Optics:                                     |
| Geometrical:   |
| FIELD (POLARIZATION) REPRESENTATION (√):             |
| Scalar:  |
| Vector:  |
| COORDINATE SYSTEM (Cartesian, cylindrical, etc.)     |
| Compact Region:                                      |
| Annular Region:                                      |
| TRANSVERSE GRID DIMENSIONALITY ( <b>√</b> ): 1-D 2-D |
| Compact Region:                                      |
| Annular Region:                                      |
| FIELD SYMMETRY RESTRICTIONS?:                        |
| MIRROR SHAPE(S) ALLOWED (♥):                         |
| Square:  |
| Rectangular:   |
| Circular:  |
| Elliptical:  |
| Strip:   |
| Arbitrary:   |
| CONFIGURATION FLEXIBILITY ( ):                       |
| Fixed, Single Resonator Geometry:                    |
| Fixed, Multiple Resonator Geometries:                |
| Modular, Multiple Resonator Geometries:              |
| Other (describe):                                    |

| PROPAGATION TECHNIQUE ( $$ all that apply):  | COMPACT      | ANNULAR     |
|--|--------------|-------------|
| Fresnel Integral Algorithms:                 |              |             |
| With Kernel Averaging:                       |              |             |
| Gaussian Quadrature:                         |              |             |
| Midpoint Rule:                               | -            |             |
| Romberg:                                     |              |             |
| Simpson:                                     |              |             |
| Trapezoidal:                                 |              |             |
| Fast Fourier Transform (FFT):                |              |             |
| Fast Hankel Transform (FHT):                 |              |             |
| <pre>Gardener-Fresnel-Kirchhoff (GFK):</pre> |              |             |
| Other (specify):                             |              |             |
| Finite Difference Algorithms                 |              |             |
| Method (specify):                            |              |             |
|  |              |             |
| CONVERGENCE ( <b>√</b> ):                    |              |             |
| Technique:                                   |              |             |
| Power Comparison:                            |              |             |
| Field Comparison:                            |              |             |
| Other (specify):                             | <del></del>  |             |
| Acceleration Algorithms Used?:               |              |             |
| Technique:                                   |              |             |
| MULTIPLE EIGENVALUE/EIGENVECTOR EXTRACTOR AN | LGORITHMS (V | <b>'</b> ): |
| Prony:                                       |              |             |
| Other (specify):                             |              |             |
|  | <del></del>  |             |
|  |              |             |
| RESONATOR MODELING FEATURES                  |              |             |
|  |              |             |
| GENERAL CAPABILITIES:                        |              |             |
| Stability ( <b>√</b> ):                      |              |             |
| Stable Resonators:                           |              |             |
| Unstable Resonators:                         |              |             |

1.3

| Type ( <b>√</b> )  |               |             |
|--|---------------|-------------|
| Standing Wave:   |               |             |
| Traveling Wave (Ring):   |               |             |
| Reverse Traveling Wave:  |               |             |
| Branch ⟨ <b>√</b> ⟩:   |               |             |
| Positive:  |               |             |
| Negative:  |               |             |
| Optical Element Models Included ( $oldsymbol{}$ ):   |               |             |
| Flat Mirrors:  |               |             |
| Spherical Mirrors:   |               |             |
| Cylindrical Mirrors:   |               | <del></del> |
| Telescopes:  |               |             |
| Scraper Mirrors:   |               |             |
| Axicons  | Waxicons      | Reflaxicons |
| Arbitrary:   |               | <u> </u>    |
| Linear:  |               |             |
| Parabola-Parabola:   |               |             |
| With Offset Cones:   | 4 - L. C      |             |
| Other (specify):   |               |             |
| Deformable Mirrors:  | -             |             |
| Spatial Filters:   |               |             |
| Gratings (specify type):   |               |             |
| Other Elements (specify):  |               |             |
|  |               |             |
| PRINCIPAL RESONATOR GEOMETRIES MODELED(e.g. HS<br>Confocal, Unstable P-P Waxicon/Linear Waxico<br>Ring With Spatial Filter, etc; Please List): | n Negative Br |             |
|  | · <del></del> |             |
|  |               |             |
|  |               |             |
|  |               |             |
|  |               |             |
|  |               |             |

| GAIN  | MODELS (♥):                             |                     |  |
|-------|---|---------------------|--|
|       | Bare Cavity Only:                       |                     |  |
|       | Simple Saturated Gain:                  |                     |  |
|       | Detailed Model (see 2.0 below):         |                     |  |
| BARE  | CAVITY FIELD MODIFIER MODELS (♥):       |                     |  |
|       | Mirror Tilt:                            |                     |  |
|       | Mirror Decentration:                    |                     |  |
|       | Aberrations/Thermal Distortion          |                     |  |
|       | Arbitrary:                              | <del></del>         |  |
|       | Selected (specify):                     | <del> </del>        |  |
|       | Reflectivity Loss:                      |                     |  |
|       | Output Coupler Edges                    |                     |  |
|       | Rolled:                                 |                     |  |
|       | Serrated:                               |                     |  |
|       | Other:                                  |                     |  |
| LOADE | ED CAVITY FIELD MODIFIER MODELS ( $$ ): |                     |  |
|       | Refractive Index Variation:             |                     |  |
|       | Gas Absorption:                         |                     |  |
|       | Overlapped Beams (for flux updating     | ):                  |  |
|       | Number of overlaps Allowed:             | · <del>/··/··</del> |  |
|       | Other (see 2.0, 3.0):                   |                     |  |
|       |   |                     |  |
|       |   |                     |  |
| FAR F | FIELD MODELS (🎷):                       |                     |  |
|       | Beam Steering Removal:                  |                     |  |
|       | Optimal Focal Search:                   |                     |  |
|       | Beam Quality:                           |                     |  |
|       | Atmospheric Propagation Effects:        |                     |  |
|       | Other:                                  | <del> </del>        |  |
|       |   |                     |  |
|       |   |                     |  |

| CENEDAL /Discussion and in the   |                           |
|----------------------------------|---------------------------|
|                                  | fferent from 1.1 and 3.1) |
| PROGRAM NAME (if applicable):    |                           |
| PRINCIPAL PURPOSE(S)/APPLICATION | ON(S) OF CODE:            |
|                                  |                           |
|                                  |                           |
|                                  |                           |
|                                  |                           |
| ASSESSMENT OF CAPABILITIES:      |                           |
|                                  |                           |
|                                  | <del></del>               |
|                                  |                           |
| ASSESSMENT OF LIMITATIONS.       |                           |
| ASSESSMENT OF EIMITATIONS.       |                           |
| ·                                |                           |
|                                  |                           |
|                                  |                           |
| ORIGINATOR/KEY CONTACT:          |                           |
| Nam <b>e</b> :                   |                           |

| AVAILABLE (  | OCUMENTATION:                        |
|--------------|--------------------------------------|
| Theory       | Manuals:                             |
|              |                                      |
|              |                                      |
| User M       | fanuals:                             |
|              |                                      |
|              |                                      |
| Listir       | ngs:                                 |
|              |                                      |
| Other        | Relevant Publications:               |
|              |                                      |
| ·            |                                      |
| STATUS:      |                                      |
| Operat       | cional Currently?:                   |
| Under        | Modification?:                       |
| F            | Purpose(s):                          |
| _            |                                      |
| 0wners       | hip?:                                |
| Propri       | etary?:                              |
| MACUINE /ODE | CRATING CVCTCM ( bisk issats 11 . 1) |
| MACHINE/ OPE | RATING SYSTEM (on which installed):  |
| TRANSPORTAR  | BLE?:                                |
|              | e Dependent Restrictions:            |
| nachii       | be bependent Restrictions.           |
| <del></del>  |                                      |
| SELF-CONTAI  | NED?:                                |
|              | Codes Required (name, purpose):      |
|              |                                      |
|              |                                      |
| <del></del>  |                                      |

| Small Job: Typical Job: Large Job:  |     | ESTIMATE OF RESOURCES REQUIRED FOR RUNS:                |
|---|-----|---|
| Typical Job: Large Job: Approximate Number of FORTRAN Lines:  2.2 CODE STRUCTURE/FEATURES  GAIN REGION (▼): Compact Region: Annular Region: COORDINATE SYSTEM (Cartesian, cylindrical, etc.) Compact Region: Annular Region: KINETICS GRID DIMENSIONALITY (▼) Compact Region: Annular Region: GAIN REGION SYMMETRY RESTRICTIONS: Gain Vary Along Optic Axis?: Flow Direction?: KINETICS TYPE MODELED (▼): Pulsed: CW: CHEMICAL PUMPING REACTIONS MODELED (▼): Hot Reaction (X+H₂): Hot Reaction (X+H₂ and H+X₂): Chain Reaction (X+H₂ and H+X₂):  |     | Core Size (Octal Words)   Execution Time (Sec, CDC 7600 |
| Large Job: Approximate Number of FORTRAN Lines:  2.2 CODE STRUCTURE/FEATURES  GAIN REGION (\$\sqrt{\psi}\$:   |     | Small Job:  |
| Large Job:  Approximate Number of FORTRAN Lines:  2.2 CODE STRUCTURE/FEATURES  GAIN REGION (\$\sqrt{\psi}\$):  Compact Region:  Annular Region:  CORDINATE SYSTEM (Cartesian, cylindrical, etc.)  Compact Region:  Annular Region:  KINETICS GRID DIMENSIONALITY (\$\sqrt{\psi}\$)  |     | Typical Job:  |
| GAIN REGION (1/):  Compact Region:  Annular Region:  COORDINATE SYSTEM (Cartesian, cylindrical, etc.)  Compact Region:  Annular Region:  KINETICS GRID DIMENSIONALITY (1/)  Compact Region:  Annular Region:  Annular Region:  GAIN REGION SYMMETRY RESTRICTIONS:  Gain Vary Along  Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED (1/):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED (1/):  Cold Reaction (X+H <sub>2</sub> ):  Hot Reaction (X+H <sub>2</sub> ):  Chain Reaction (X+H <sub>2</sub> ) and H+X <sub>2</sub> ):  |     |   |
| GAIN REGION ( $\checkmark$ ):  Compact Region:  Annular Region:  COORDINATE SYSTEM (Cartesian, cylindrical, etc.)  Compact Region:  Annular Region:  KINETICS GRID DIMENSIONALITY ( $\checkmark$ )  Compact Region:  Annular Region:  GAIN REGION SYMMETRY RESTRICTIONS:  Gain Vary Along  Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED ( $\checkmark$ ):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED ( $\checkmark$ ):  Cold Reaction (X+H <sub>2</sub> ):  Hot Reaction (X+H <sub>2</sub> ):  Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):   |     | Approximate Number of FORTRAN Lines:                    |
| Compact Region: Annular Region: COORDINATE SYSTEM (Cartesian, cylindrical, etc.)  Compact Region: Annular Region:  KINETICS GRID DIMENSIONALITY (**)  Compact Region: Annular Region: Annular Region: GAIN REGION SYMMETRY RESTRICTIONS: Gain Vary Along Optic Axis?: Flow Direction?:  KINETICS TYPE MODELED (***):  Pulsed: CW: CHEMICAL PUMPING REACTIONS MODELED (***):  Cold Reaction (X+H <sub>2</sub> ): Hot Reaction (H+X <sub>2</sub> ): Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):  | 2.2 | CODE STRUCTURE/FEATURES                                 |
| Annular Region:  COORDINATE SYSTEM (Cartesian, cylindrical, etc.)  Compact Region:  Annular Region:  KINETICS GRID DIMENSIONALITY (**)  Compact Region:  Annular Region:  Annular Region:  GAIN REGION SYMMETRY RESTRICTIONS:  Gain Vary Along  Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED (**):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED (**):  Hot Reaction (X+H <sub>2</sub> ):  Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):  |     | GAIN REGION (✔):  |
| Annular Region:  COORDINATE SYSTEM (Cartesian, cylindrical, etc.)  Compact Region:  Annular Region:  KINETICS GRID DIMENSIONALITY (**)  Compact Region:  Annular Region:  Annular Region:  GAIN REGION SYMMETRY RESTRICTIONS:  Gain Vary Along  Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED (**):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED (**):  Hot Reaction (X+H <sub>2</sub> ):  Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):  |     | Compact Region:   |
| COORDINATE SYSTEM (Cartesian, cylindrical, etc.)  Compact Region:  Annular Region:  KINETICS GRID DIMENSIONALITY (*\forallow*)  |     |   |
| Annular Region:  KINETICS GRID DIMENSIONALITY (\$\sqrt{y}\$)  |     |   |
| KINETICS GRID DIMENSIONALITY (♥)  Compact Region:  Annular Region:  GAIN REGION SYMMETRY RESTRICTIONS:  Gain Vary Along  Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED (♥):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED (♥):  X=F X=D  Cold Reaction (X+H <sub>2</sub> ):  Hot Reaction (X+H <sub>2</sub> ) and H+X <sub>2</sub> ):   |     | Compact Region:   |
| Compact Region: Annular Region:  GAIN REGION SYMMETRY RESTRICTIONS:  Gain Vary Along  Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED (▼):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED (▼):  Hot Reaction (X+H₂):  Chain Reaction (X+H₂ and H+X₂):  |     | Annular Region:   |
| Annular Region:  GAIN REGION SYMMETRY RESTRICTIONS:  Gain Vary Along  Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED (\$\sqrt{\sq}\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sq}}}\sigma\sigma\sighta\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sq\synt{\sqrt{\sqr |     | KINETICS GRID DIMENSIONALITY (V) 1-D 2-D 3-D            |
| GAIN REGION SYMMETRY RESTRICTIONS:  Gain Vary Along Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED (*\formsign*):  Pulsed: CW: CHEMICAL PUMPING REACTIONS MODELED (*\formsign*):  Cold Reaction (X+H <sub>2</sub> ): Hot Reaction (X+H <sub>2</sub> ): Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):  |     | Compact Region:   |
| Gain Vary Along Optic Axis?: Flow Direction?:  KINETICS TYPE MODELED (♥):  Pulsed: CW: CHEMICAL PUMPING REACTIONS MODELED (♥):  X=F X=D  Cold Reaction (X+H₂): Hot Reaction (H+X₂): Chain Reaction (X+H₂ and H+X₂):   |     | Annular Region:   |
| Optic Axis?:  Flow Direction?:  KINETICS TYPE MODELED (\$\sqrt{v}\$):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED (\$\sqrt{v}\$):  X=F  |     | GAIN REGION SYMMETRY RESTRICTIONS:                      |
| Flow Direction?:  KINETICS TYPE MODELED ( ):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED ( ):  Cold Reaction (X+H <sub>2</sub> ):  Hot Reaction (H+X <sub>2</sub> ):  Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):  |     | Gain Vary Along   |
| KINETICS TYPE MODELED (♥):  Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED (♥):  X=F X=D  Cold Reaction (X+H <sub>2</sub> ):  Hot Reaction (H+X <sub>2</sub> ):  Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):   |     | Optic Axis?:  |
| Pulsed:  CW:  CHEMICAL PUMPING REACTIONS MODELED ( <b>V</b> ):  X=F   |     | Flow Direction?:  |
| CW:CHEMICAL PUMPING REACTIONS MODELED ( $\checkmark$ ): $X=F                                    $   |     | KINETICS TYPE MODELED ( ):                              |
| CHEMICAL PUMPING REACTIONS MODELED ( $\checkmark$ ): $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  |     | Pulsed:   |
| CHEMICAL PUMPING REACTIONS MODELED ( $\checkmark$ ): $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  |     | CW:   |
| Cold Reaction (X+H <sub>2</sub> ):  Hot Reaction (H+X <sub>2</sub> ):  Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):   |     | CHEMICAL PUMPING REACTIONS MODELED (♥):                 |
| Hot Reaction (H+X <sub>2</sub> ):  Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):   |     | X=F   |
| Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):  |     | Cold Reaction (X+H <sub>2</sub> ):                      |
| Chain Reaction (X+H <sub>2</sub> and H+X <sub>2</sub> ):  |     | Hot Reaction (H+X <sub>2</sub> ):                       |
|   |     |   |
|   |     |   |
|   |     |   |

| ENER        | GY TRANSFER MODES MODELED ( $oldsymbol{V}$ ): Follows (reference)   |
|-------------|---|
|             | V-T:  |
|             | V-R:  |
|             | V-V:  |
|             | Other (Specify):  |
|             | Single Line Model (V):  |
|             | Multi-Line Model ( <b>√</b> ):                                      |
|             | Assumed Rotational Population Distribution State ( $oldsymbol{}$ ): |
|             | Equilibrium:  |
|             | Non-Equilibrium:  |
|             | Number of Laser Lines Modeled:                                      |
|             | Source of Rate Coefficients Used in Code:                           |
| LINE        | PROFILE MODELS (√):   |
|             | Doppler Broadening:   |
|             | Collisional Broadening:   |
|             | Other (specify):  |
|             |   |
| OTHE        | R UNIQUE FEATURES:  |
|             |   |
|             |   |
|             |   |
|             |   |
|             |   |
|             |   |
|             |   |
|             |   |
|             |   |
| <del></del> |   |
|             |   |
|             |   |

| GAS DYNAMICS   |
|--|
| GENERAL (Please complete if different from 1.1 and 2.1) CODE NAME: |
| PROGRAM NAME (if applicable):                                      |
| PRINCIPAL PURPOSE(S)/APPLICATION(S) OF CODE:                       |
|  |
|  |
|  |
|  |
|  |
| ASSESSMENT OF CAPABILITIES:  |
|  |
|  |
|  |
|  |
| ASSESSMENT OF LIMITATIONS:   |
|  |
|  |
|  |
|  |
|  |
| ORIGINATOR/KEY CONTACT:  |
|  |
| Name:  |
| Name:<br>Organization:   |
| Name:Organization:Address:   |
| Name:<br>Organization:   |
| Name: Organization: Address: Phone: AVAILABLE DOCUMENTATION:       |
| Name: Organization: Address: Phone:                                |
| Name: Organization: Address: Phone: AVAILABLE DOCUMENTATION:       |
| Name: Organization: Address: Phone: AVAILABLE DOCUMENTATION:       |

A-12

| Lis      | ngs:  |
|----------|---|
| Oth      | Relevant Publications:                                  |
|          |   |
| STATUS:  |   |
| 0pe      | tional Currently?:                                      |
|          | Modification?:  |
|          | Purpose(s):   |
| 0wn      | ship?:  |
| Pro      | ietary?:  |
| MACHINE/ | ERATING SYSTEM (on which installed):                    |
| TRANSPOR | BLE?:   |
| Mac      | ne Dependent Restrictions:                              |
| SELF-CON | INED?:  |
|          | Codes Required (name, purpose):                         |
| ESTIMATE | F RESOURCES REQUIRED FOR RUNS:                          |
|          | Core Size (Octal Words)   Execution Time (Sec, CDC 7600 |
| Sma      | Job:  |
| Тур      | al Job:   |
| Lar      | Job:  |
| App      | ximate Number of FORTRAN Lines:                         |

# 3.2 CODE STRUCTURE/FEATURES

| COORDINATE SYSTEM (Cartesian, cylindrical, etc.):  NOZZLE GEOMETRY MODELED (  ) (and nozzle type(s) if known): |
|--|
| Cylindrical-radially flowing:  |
| Rectangular-linearly flowing:  |
| Othon (specify).   |
| FLUID GRID DIMENSIONALITY (V):   |
| · · ·  |
| 1-D:   |
| 2-D:   |
| 3-D:   |
| FLOW FIELD MODELED (V):  |
| Laminar:   |
| Turbulent:   |
| Other:   |
|  |
|  |
|  |
| BASIC MODELING APPROACH (♥):   |
| Premixed:  |
| Mixing:  |
| Other (specify):   |
|  |
|  |
|  |
| References for Approach used:  |
|  |
|  |
| THERMAL DRIVER MODELED ( <b>V</b> ):   |
| Arc Heater:  |
| Combustor:   |
| Shock Tube:  |
| Resistance Heater:   |
| Other (specify):   |
|  |

| Nozzle Boundary Layers?:  Shock Waves?:  Pre-Reaction (thermal blockage, etc.)?:  Turbulence?:  Other (specify):  MODEL EFFECTS ON OPTICAL MODES DUE TO (*\formstyle{\formstyleft}):  Index of refraction variation?:  Other (specify)?: | MODEL | . EFFECTS ON MIXING RATE DUE TO (♥):    |      |
|--|-------|---|------|
| Shock Waves?:  Pre-Reaction (thermal blockage, etc.)?:  Turbulence?:  Other (specify):  MODEL EFFECTS ON OPTICAL MODES DUE TO (*\nabla):  Index of refraction variation?:  Other (specify)?:   |       | 1 <del>-</del> 1                        |      |
| Turbulence?:  Other (specify):  MODEL EFFECTS ON OPTICAL MODES DUE TO (♥):  Index of refraction variation?:  Other (specify)?:  OTHER UNIQUE FEATURES:   |       |   |      |
| Turbulence?:  Other (specify):  MODEL EFFECTS ON OPTICAL MODES DUE TO (♥):  Index of refraction variation?:  Other (specify)?:  OTHER UNIQUE FEATURES:   |       | Pre-Reaction (thermal blockage, etc.)?: |      |
| MODEL EFFECTS ON OPTICAL MODES DUE TO (  Index of refraction variation?:  Other (specify)?:  OTHER UNIQUE FEATURES:  |       | -                                       |      |
| MODEL EFFECTS ON OPTICAL MODES DUE TO (  Index of refraction variation?:  Other (specify)?:  OTHER UNIQUE FEATURES:  |       | Other (specify):                        |      |
| Index of refraction variation?:  Other (specify)?:  OTHER UNIQUE FEATURES:   |       |   |      |
| Index of refraction variation?:  Other (specify)?:  OTHER UNIQUE FEATURES:   | MODEL | . EFFECTS ON OPTICAL MODES DUE TO (√):  |      |
| Other (specify)?:  OTHER UNIQUE FEATURES:  |       | Index of refraction variation?:         |      |
| OTHER UNIQUE FEATURES:   |       |   |      |
|  |       |   | ···- |
|  |       |   |      |
|  |       |   |      |
|  | OTHER | NINTOHE FEATURES.                       |      |
|  | J     |   |      |
|  |       |   |      |
|  |       |   |      |
|  |       |   | ···· |
|  |       |   |      |
|  |       |   |      |

# Appendix B RESEARCHERS AND SURVEY MAILING LIST

# POTENTIAL MAILING LIST FOR CODE SURVEY

# **Novel Resonator Program Contractors**

TRW

| *Ь. L. Bullock (1), (2),                          | (4) | ALL HEL Gain model, IMOPA, BLAZER, codes ring resona- MRO, CROQ, and tor, optical models rotator BRIA, URINLA2  |
|---|-----|---|
| K. T. Yano (1), (2), (4                           | )   | IMOPA, ring resonator, optical rotator, BRIA  |
| J. B. Kaelberer (2)                               |     | IMOPA   |
| D. Dee (2)  |     | BLAZER, MRO   |
| *H. W. Behrens (2)                                |     | BLAZER, MRO   |
| C. L. Merkle (2) T. Sugimura (2) R. D. Hughes (2) |     | Monte Carlo laser flow, ALFA,<br>LAMBDA nozzle, HYWND.<br>Modeled chemical laser (CL) flow-thru noz-<br>zles; modeled recirculating flow regions and<br>fuel/oxidizer stream merging. |
| R. S. Lipkis (2)                                  |     | Gain modeling, saturation effects, hole burning, mode pulling.  |
| H. M. Bobitch (2) J. Munch (2) A. Murthy (2)      |     | Ring resonator with optical rotator (BRIA). Used double waxioon setup and evaluated mode control by measuring beam quality (BQ).  |
| R. K. Delong (2)                                  |     | MIRACL performance  |
| P. M. Livingston (2), (4                          | 4)  | Doppler shift produced by HYWND   |
| S. Jarvis (3)                                     |     |   |
| J. Miller (4)                                     |     |   |
| O. Minnick (4)                                    |     |   |
| K. Vogelsang (5)                                  |     |   |
|   |     | teview, December 5 and 6, 1978, NRL.<br>emical Laser Symposium, August 28-30,   |

<sup>\*</sup>Survey recipient

1979, AFWL.

- (3) Attendees, ICAO/IFLA Review, April 10, 1979, AFWL.
- (4) Distribution List for Novel Resonators for High Power Chemical Lasers Program.
- (5) ADABECS Technical Interchange Meeting, September 12-14, 1979.

#### Rocketdyne

- \*R. Brandewie (1), (2), (4), (5)
- (All codes

Physical optics codes; geo-

and models)

metrical optics code (GOPWA)

J. B. Shellan (1), (4), (5)

HSURIA performance analysis

G. A. Tyler (1), (5)

Ring resonators with spatial filters

T. Waite (1), (2), (3), (4)
\*D. Holmes (2), (3)
P. Briggs (2)

Mode-media interactions in HSURIA

with flowing gain model

G. E. Mevers (5)

(All codes

Resonator configurations,

and models) alignment

F. D. Feiock (3), (5)

(All codes

Resonator configurations,

and models) alignment

- T. Marks (4)
- V. L. Gamiz (5)

Compensatory misalignment in ring resonators

#### Pratt & Whitney/United Technologies Research Center

#### Pratt & Whitney

P. E. Fileger (2) W. B. Watkins (2)

Anchored CLOQ3D kinetics model to CL-XI nozzle data as part of IFLA annular ring

study.

\*R. Quinnell (2), (3)

Used ALFA tilt sensitivity, IFLA rings, injection-locked annular resonator

- R. Schmidtke (4)
- R. Freeman (4)
- \*J. Campbell (3), (4)
- J. M. Bruckler (3)
- G. MacClafferty (4)

<sup>\*</sup>Survey recipient

UTRC R. L. Hall (2) CLOQ3D studies using ALFA code of mixing H. R. Garcia (2), (3), (4) regions; rotational nonequilibrium; wave optics. Garcia only: Injection-locked annular resonator. P. Slaymaker (2) Tilt misalignment sensitivity studies on R. Tansey (2) unstable negative-branch ring resonators K. E. Oughstun (2), (3) (IFLA). Forward/reverse mode sensitivity studies. A. W. Angelbeck (2) Analysis and computer modeling of injection-G. E. Palma locked annular resonator. Also compact rings. Geometrics and wave optics. J. J. Hinchen (2) Rotational relaxation and linewidths for DF R. H. Hobbs (2) compared to HF. Pressure broadening measurement. J. M. Spinhirne (3) R. Freiberg (3) Perkin-Elmer \*P. B. Mumola (1), (2), (4) Mode selectivity in annular resonators, radial D. Stoler (1), (2) strut effects on mode control, HSURIA comparison. P. W. Milonni (2) Anomalous dispersion in HF/DF. Broadening. F. Way (4) **Non-NOVEL Resonator Program Contractors** 

Bell Aerospace

W. Brandkamp (1), (4)

T. F. Buddenhagen (1), (3)

\*S. W. Zelanzy (2)
W. A. Chambers (2), (3)
M. Subbiah (2)
L. Lang (2)

Extended BLAZE to STARE, a rotational equilibrium code modeling upstream-down-stream coupling across optical axis. Compares with CL-XI nozzle data.

<sup>\*</sup>Survey recipient

W. Solomon (4)

W. L. Rushmore (2)

Aerospace Corporation

\*R. A. Chodzko (1), (2), (4)
H. Mirels (1), (4)
E. B. Turner (2)
S. B. Mason (2)

R. L. Varwig (2)
P. L. Smith (2)
C. P. Wang (2), (4)

C. G. Coffer (2) R. W. F. Gross (2)

J. F. Bott (2) R. F. Heidner (2)

R. L. Wilkins (2)
M. A. Kwok
G. I. Segal (2)
E. F. Cross (2)
R. H. Ueunten (2)

\*N. Cohen

\*W. Warren (4)

W. J. Schafer Associates

\*W. Evers (1), (2), (4)

G. W. Zeiders (1), (2), (4)

E. Gerry (4)

R. Schaefer (2)

Efficient nonrotational equilibrium model

Experimental HSURIA with linear waxicon and rear flat. Tip and outer cone obscuration studies, strut obscuration studies, polarization studies. HSURIA w/rear cone comparisons.

Phase detectors based on optical heterodyning with acousto-optic modulator for control of adaptive optics. Anomalous dispersion studies.

Multiline HF tuning and phase control. Anomalous dispersion in HF.

Upper vibrational level deactivation in HF/DF. Absolute rate coefficient for  $F + H_2$  and  $F + D_2$ . Oxygen-iodine laser; upper vibrational level deactivation in a HF/DF.

Temperature dependence of vibrational relaxation from upper vibrational levels of HF and DF. V-R and V-V studies.

Experimental study of significance of R-T equilibrium in presence of V-R collisional transfer.

Temperature dependence and rate coefficients for  $F + H_2$ ,  $F + D_2$ ,  $H + F_2$ , and  $D + F_2$  pumping reactions.

<sup>\*</sup>Survey recipient

Science Applications, Inc.

- \*F. Horrigan (Boston) (1), (4)
- J. Long (Atlanta) (1)
- \*R. Wade (Atlanta) (1), (3), (4)
- S. S. Howie (Atlanta) (2) K. E. Patterson (Atlanta) (2)
- H. Ford (Atlanta) (4)
- \*R. Hodder (Stuart) (4)

MIT Lincoln Laboratory

- \*A. J. Morency (1), (2)
- R. Osgood (1), (2)
- \*C. A. Primmerman (1), (2)
- R. Rediker (4)
- L. Marquet (4)
- \*J. Herrman

Air Force Weapons Laboratory

- A. Paxton (1), (2), (3), (4)
- \*W. Plummer (1), (3), (5)
- G. C. Dente (2)
- R. Butts (3), (4), (5)
- T. Salvi (2), (4)
- L. D. Buelow (3)
- \*B. Deuto (3)
- P. Latham (3)
- R. F. Shea (2), (3)
- R. Bower (4)
- \*Survey recipient

Modeled gasdynamics of high area relief nozzles.

Modeled propagation of arbitrarily polarized electric fields via physical optics code.

HSURIA, rings, three-level cascading HF/DF media.

All resonators and codes.

Polarization effects in HSURIA with real cone.

Atmospheric effects; thermal blooming.

Physical optics codes, kinetics, and fluid dynamics.

Modular physical optics codes (MOC3).

Oxygen-iodine kinetics.

W. H. Lowrey (2)
H. D. McIntire (2)
W. H. Swentner (2)

W. H. Swantner (2) geometric ray-tracing

\*N. L. Rapagnani

The BDM Corporation

\*T. R. Ferguson (2), (3)

G. T. Worth (2)

\*D. N. Mansell (2), (3), (4)

C. M. Wiggins (2), (5)

Hughes Aircraft Company

M. Greenfeld (3)

\*D. Fink (3), (4)

\*B. J. Skehan (4)

J. Fitts (4)

W. B. King

R. Cubalchini

\*I. Abrahmowitz

Ford Aerospace

\*V. F. Pizzurro (3), (5)

P. Valliones (4)

\*R. Buchheim (5)

GE Company/RESD

\*J. B. Gilstein (4)

\*Survey recipient

Interferometric testing of waxicons and reflaxicons and aberration balancing using two geometric ray-tracing codes.

Physical optics codes URINLA2, GURDM, MOC3, PROPAGATORS.

Physical optics codes GURDM, MOC3, intra/extra cavity adaptive optics.

Geometric codes POLYPAGOS, IPAGOS, MCPPAGOS, IMOPA.

Physical optics codes HSURIA with rear flat, positive- and negative-branch ring resonator, spatial filtering, self-imaging (GENRING, SARAD).

Optics.

LPTS code.

Beam Control Systems (LPTS code).

Beam Control Systems (BREUX code).

- C. S. Draper Lab
- J. Valge (4)
- \*C. Whitney (4)

AVCO Everett Research Labs

\*J. Daugherty (4)

Johns Hopkins Applied Physics Laboratories

\*R. Gorozdos (4)

Pacific Sierra Research

\*A. Shapiro (4)

ITEK Corp.

\*J. R. Vyce (4)

Lawrence Livermore Lab

\*J. Emmett (4)

Lockheed Missile and Space Company

\*R. Stewart (4)

Los Alamos Scientific Laboratory

- \*C. Fenstermacher (4)
- J. Ramshaw (4)

McDonnel Douglas Astronautics

W. Gaubatz (4)

Director, Naval Research Laboratory

- P. Ulrich (1), (4)
- W. Watt (4)
- S. C. Lin (1), (4)

<sup>\*</sup>Survey recipient

- L. Sica (1), (4)
- W. C. Carter (1), (4)
- L. Drummeter (4)
- J. MacCallum (4)
- J. Walsh (1)

Under Secretary of Defense (RE&S)

R. Airey (4)

Defense Advanced Research Projects Agency (Info)

- A. Pike (1), (4)
- \*R. C. Sepucha (1)
- U. S. Army Missile R&D Command (MIRCOM)
- \*C. J. Albers (1), (4)
- \*J. M. Walters (1)

Deputy Assistant Secretary of the Navy

T. A. Jacobs (4)

Office of Naval Research

W. Condell (4)

Naval Sea Systems Command

- D. Finkleman (4)
- \*J. Stregack (4)

Rome Air Development Center

R. Ogrodnik (4)

<sup>\*</sup>Survey recipient

| Polytechnic Institute of New York              | ? |   |
|--|---|---|
| S. H. Cho (2)<br>L. B. Felsen (2)              | } | Circular mirror resonators with axicons modeled using ray optics; cone tip and edge diffraction studied.                    |
| University of Illinois                         |   |   |
| *L. H. Sentman (2)<br>P. Bradbury (2)          | } | Efficient rotational nonequilibrium model. V-R and V-V relaxation in HF and DF.   |
| Sandia Laboratories                            |   |   |
| *J. B. Moreno (2)                              |   | HF chemical laser models for laser fusion.  |
| Michigan State University                      |   |   |
| *R. L. Kerber (2) R. C. Brown (2) K. Emery (2) | } | Evaluation of rotational nonequilibrium models for R-R, and V-R transitions. Computer simulation.                           |
| D. H. Stone (2)                                |   | Developed statistical model to correlate relative rate coefficients in HF/DF pumping.                                       |
| R&D Associates                                 |   |   |
| J. M. Green (2) *R. D. Melville T. K. Tio (2)  | } | Gas breakdown in CL resonators (HSURIA) with rear cone. Gas breakdown on line focus of axicons in presence of dirty helium. |

<sup>\*</sup>Survey recipient

# FINAL MAILING LIST CODE SURVEY

|                        | No.  |                                     |
|------------------------|------|-------------------------------------|
| Name and Phone         | Cys. | Address                             |
| Dr. Don L. Bullock     | 5    | TRW DSSG                            |
| 213-535-3484           |      | One Space Park                      |
| Dr. H. W. Behrens      | 3    | Redondo Beach, CA 90278             |
| Dr. R. A. Brandewie    | 5    | Rocketdyne Division                 |
| 213-884-3844           | _    | Rockwell International              |
| Dr. Dale A. Holmes     | 3    | 6633 Canoga Avenue                  |
| 213-884-3367           |      | Canoga Park, CA 91304               |
| Mr. Robert D. Quinnell | 5    | Pratt & Whitney Aircraft            |
| 305-840-4949           |      | Government Products Division        |
| Dr. Joseph L. Campbell | 3    | P.O. Box 2691                       |
| 305-840-4173           |      | West Palm Beach, FL 33402           |
| Dr. H. Robert Garcia   | 5    | United Technologies Research Center |
| 305-840-1327           |      | Optics & Applied Technology Lab     |
| Dr. A. W. Angelbeck    | 3    | P.O. Box 2691                       |
|                        | -    | West Palm Beach, FL 33402           |
|                        |      | W 550 1 mm Bouon, 1 B 00 10 2       |
| Dr. P. B. Mumola       | 5    | The Perkin-Elmer Corporation        |
| 203-762-4415           |      | Electro-Optical Division            |
|                        |      | 50 Danbury Road                     |
|                        |      | Wilton, CT 06897                    |
| Mr. S. W. Zelazny      | 3    | Bell Aerospace Textron              |
| 716-297-1000           |      | Division of Textron                 |
|                        |      | Buffalo, NY 14240                   |
| Dr. R. A. Chodzko      | 2    | Aerospace Corporation               |
| 213-648-7390           | _    | 2350 El Segundo Blvd.               |
| Dr. N. Cohen           | 2    | El Segundo, CA 90045                |
| Dr. Walter R. Warren   | 2    | El begando, en booto                |
|                        | 24   |                                     |
| Dr. William Evers      | 2    | W. J. Schafer Assoc.                |
| 703-525-6435           |      | 1901 N. Fort Myer Dr.               |
|                        |      | Suite 803                           |
|                        |      | Arlington, VA 22209                 |
| Dr. Frank Horrigan     | 1    | Science Applications, Inc.          |
| 617-275-2200           |      | 3 Preston Court                     |
| -                      |      | Bedford, MA 01730                   |
|                        |      | · · · · · · · · · · · · · ·         |

| Dr. Richard Wade<br>404-955-2663 | 1 | Science Applications, Inc.<br>6600 Powers Ferry Rd.<br>Suite 220<br>Atlanta, GA 30339          |
|----------------------------------|---|--|
| Dr. R. Hodder                    | 1 | Science Applications, Inc.<br>201 Southwest Monterey<br>Suite 30<br>Stuart, FL 33494           |
| Mr. A. J. Morency                | 2 | Massachusetts Institute of Technology,   |
| 617-862-5500                     |   | Lincoln Laboratory   |
| Dr. C. A. Primmerman             | 1 | P.O. Box 73  |
| Dr. Jan Herrman                  | 1 | Lexington, MA 02173  |
| Major William Plummer            | 5 | Air Force Weapons Laboratory   |
| 505-264-0721                     |   | AFWL/ALR   |
|                                  |   | Kirtland AFB, NM 87117   |
| Mr. B. Deuto                     | 2 | Air Force Weapons Laboratory   |
| 505-264-1704                     |   | AFWL/LRE   |
|                                  |   | Kirtland AFB, NM 87117   |
| Mr. N. L. Rapagnani              | 2 | Air Force Weapons Laboratory   |
|                                  |   | AFWL/ALC   |
|                                  |   | Kirtland AFB, NM 87117   |
| Dr. Thomas R. Ferguson           | 5 | The BDM Corporation  |
| 505-264-8568                     |   | 1801 Randolph Rd., S.E.  |
| Mr. Dennis N. Mansell            | 3 | Albuquerque, NM 87106  |
| 505-843-7870                     |   |  |
| Dr. David Fink                   | 3 | Hughes Aircraft Company  |
| 213-391-0711                     |   | Centinela and Teale Streets  |
| Dr. B. J. Skehan                 | 2 | Culver City, CA 90230  |
| Dr. I. Abrahmowitz               | 2 |  |
| Mr. Vito F. Pizzurro             | 2 | Ford Aerospace/FACC  |
| 714-759-6679                     |   | Ford Road  |
| Mr. Robert Buchheim              | 2 | Newport Beach, CA 92663  |
| Dr. Jack B. Gilstein             | 2 | GE Company/RESD<br>Advanced Laser Program Dept.<br>3198 Chestnut St.<br>Philadelphia, PA 19101 |
| Ms. C. Whitney                   | 1 | Charles Stark Draper Laboratory<br>555 Technology Square<br>Cambridge, MA 02839                |

| Dr. J. Daugherty  | 1      | AVCO Everett Research Labs<br>2385 Revere Beach Parkway<br>Everett, MA 02149                                   |
|---|--------|--|
| Dr. R. Gorozdos   | 1      | Applied Physics Laboratory<br>Johns Hopkins University<br>Johns Hopkins Road<br>Laurel, MD 20810               |
| Dr. A. Shapiro  | 1      | Pacific Sierra Research<br>1456 Cloverfield Blvd.<br>Santa Monica, CA 90404                                    |
| Mr. J. R. Vyce  | 1      | ITEK Corporation Optical Systems Division 10 Maguire Road Lexington, VA 02173                                  |
| Dr. J. Emmett   | 1      | Lawrence Livermore Laboratory<br>P.O. Box 808<br>Livermore, CA 94551   |
| Mr. R. Stewart  | 4      | Lockheed Missile & Space Co.<br>Research & Development Division<br>Sunnyvale, CA 94086                         |
| Dr. C. Fenstermacher  | 2      | Los Alamos Scientific Laboratory<br>L Division<br>P.O. Box 1663<br>Los Alamos, NM 87554                        |
| Mr. William Gaubatz   | 1      | McDonnell Douglas Astronautics<br>Dept. 226, Mail Stop 14-1<br>5301 Bolsa Avenue<br>Huntington Beach, CA 92647 |
| *Dr. Peter B. Ulrich<br>Code 6504, 202-767-3069<br>*Dr. Sam C. Lin<br>Code 6530, 202-767-3068 | 1      | Naval Research Laboratory<br>4555 Overlook Avenue, S.W.<br>Washington, DC 20375                                |
| *Dr. Alan Pike<br>*Dr. R. C. Sepucha  | 1<br>1 | Defense Advanced Research Projects Agency<br>1400 Wilson Blvd.<br>Arlington, VA 22209                          |

<sup>\*</sup>Information copy only

| *Dr. J. Stregack                 | 1 | Naval Sea Systems Command<br>PMS/405-PM-22<br>Washington, DC 20362                                   |
|----------------------------------|---|--|
| *Mr. R. Ogrodnik                 | 1 | Rome Air Development Center<br>Griffiss AFB, NY  |
| Dr. L. B. Felsen<br>516-694-5500 | 2 | Polytechnic Institute of New York<br>Farmingdale, NY 11735   |
| Dr. L. H. Sentman                | 2 | University of Illinois<br>Aeronautical & Astronautical<br>Engineering Department<br>Urbana, IL 61801 |
| Dr. J. B. Moreno                 | 3 | Sandia Laboratories<br>Laser Physics Research<br>Division 4212<br>Kirtland AFB, NM 87117             |
| Dr. R. L. Kerber                 | 2 | Michigan State University<br>East Lansing, MI 48824  |
| Dr. R. D. S. Melville, Jr.       | 2 | R & D Associates<br>P.O. Box 9695<br>Marina del Rey, CA 90291  |
| Subtotal: 115<br>Extra: 20       |   |  |

<sup>\*</sup>Information copy only

135

Total

# Appendix C BELL AEROSPACE CODES RESPONSE

This appendix contains two tables summarizing the analysis capability related to the Bell Aerospace Textron laser and reports detailed information on 28 codes. This information is provided as submitted by Bell Aerospace Corp.

 ${\it Table C-1-Laser Design Related Computer Analysis Capabilities \ at \ Bell}$ 

|                              |                  | -     | _            | -        |                        |               | 1        | 7        | _  | 7       | 7         | 7        | 7          | _            |  |              |                |              |
|------------------------------|------------------|-------|--------------|----------|------------------------|---------------|----------|----------|--|---------|-----------|----------|------------|--------------|--|--------------|----------------|--------------|
|                              | 3                | E     | 3            | BELL     | (BELL)                 | 3             | (BELL)   | (BELL)   | (BELL)                                       | BELL)   | (BELL)    | (BELL)   | BELL       | (SCI)        | TRW)   | BELL)        | BELL           | (BELL)       |
|                              | (8611)           | BELL  | BELL         | 8        | 8                      | (BELL)        | <b>#</b> | 삚        | ᆲ  | 삐       | 8         | 삘        | 9          | 2            | E  | 9            | <u> </u>       | 9            |
| CODE                         | -                | -     | ~            | _        | _                      |               |          | 1        |  | 1       | _         |          | ı          |              |  |              |                |              |
| 0002                         | 1                | ١     | 1            |          | S                      | COMOC 3DPNS   | - 1      | ì        | - }  | ì       | ì         | ١        | i          | ١ ١          |  | 1            | ı              | l            |
|                              | 1 1              |       |              |          | 2DNS                   | اقا           | ₹        | اہ       | ı  |         | - !       | ı        |            | i            |  |              |                | ٠.           |
|                              |                  |       | _            |          |                        | ["]           |          | S.       | . 1  |         | Į         | . [      | _ [        |              | ļ I  |              | 5              | 12           |
| KEY                          | _ 1              | =     | BLAZE III    | BLAZE IV | COMOC                  | ISI           | COMOC    | COMOC    | 8  | N       | m         | 0        | NORO II    | ACCOS        | MRO.2  | ابيا         | ابيا           | OPT          |
| FEATURES,                    | BLAZE            | BLAZE | Ą            | AZ       | Σ                      | [≳            | 2        | 죍        | CNCDE  | DIFF    | DIFF      | NORO     | 8          | ပ္ပြ         | 8  | BLAZE        | BLAZE          | w            |
| METHODOLOGY,                 | <u> </u>         | ఠ     | ם            | 퓹        | ŭ                      | ŏ             | ŏ        | ١٥       | õ  | ō       | ۵         | Ž        | Z          | à            | Σ  | =            | (a)            | Œ            |
| STATUS                       | ا <sub>-</sub> ا | 2     | 8            | 4        | ي                      | اما           | 7        | 8        | 6  | ٥       | Ξ         | 12.      | 13         | 4            | 2  | ا ع          | 5              | œ            |
|                              | ب                |       | ш            | Ľ        | _                      | Н             |          | _        |  | -       | -         | 1        | 1          | Ë            | 두  | 두            | F              | F            |
| 1 ANALYZE COMBUSTOR          | ·                | •     | •            | ╙        | L                      | •             | 븯        | •        | •  | -       | _         | Н        | _          | ⊢            | ╀  | •            | ┢╌             | ├-           |
| 2. ANALYZE NOZZLE            | _                | L     | •            | L        | Ļ                      | Ш             | •        | •        | •  | Н       | Н         | Щ        | ــا        | ⊢            | <del> </del> -   | -            | ├              | ⊢            |
| 3 ANALYZE OPTICAL CAVITY     | Ŀ                | •     | •            | •        |                        | •             | Щ        |          | •  | Н       | _         | •        | •          | Ļ            | ı.   | ⊢            | <del> -</del>  | ┡            |
| 4. ANALYZE OPTICS            | ᆫ                | L     | ┖            | L        | ┖                      | Н             | •        | •        | $\vdash$                                     | •       | •         | <b>—</b> | <b>-</b> - | •            | ŧ۰   | ₩            | •              | ۱º           |
| 5 ANALYZE DIFFUSER EJECTORS  | L                | _     | •            | 乚        |                        |               |          | L        | ۰  | Н       | ш         | Ļ        | ļ          | <del> </del> | ╁  | <del> </del> | ╀╌             | ₩            |
| 6 OPERATIONAL                | •                | •     | •            | L        | L                      | •             | •        | •        | •  | Н       | L         | •        | <u> </u>   | ₽            | •  | •            | <del>∤</del> ≂ | ╀╌           |
| 7 IN DEVELOPMENT             | L                | L     | Щ            | •        |                        | ┖             | L.,      | L_       | L  | •       | •         | Ļ        | •          | ⊢            | ↓  | <del>↓</del> | ļ٠             | ╀            |
| 8. MODIFYING FOR IBM 360     | L                | L     | L            | L        | L                      | ┖             | Ш        | L        | L  | L.,     | L         | ļ        | <b>!</b>   | Ļ            | ∔_   | ╄            | Ļ              | ╀            |
| 9. THREE DIMENSIONAL         | L                | L     | L            | L        | L                      | ₽             | Ш        | L        | L  | Ц       | •         | Ļ.,      | L_         | •            | ╀  | Ļ            |                | ╀            |
| 10 TWO DIMENSIONAL           | L                | L     | •            | •        | 1.                     | 上             | •        | •        | L  | •       | Щ         | ㄴ        | ┞-         | ↓_           | ↓_   | 1.           | ↓_             | ╄-           |
| 11 ONE DIMENSIONAL           | Ŀ                | •     |              | L.       | L                      | L             | 匚        | L        | •  |         | _         | •        | •          | ╄            | ╀  | ļ.,          | Ļ              | ↓_           |
| 12 FLUID ANALYSIS            | Ŀ                | •     | •            | •        | •                      | •             | L        | L        | •  | Ш       | _         | ļ.,      | Ŀ          | Ļ            | ↓_   | Į.           | ļ٠             | <del> </del> |
| 13 STRUCTURAL ANALYSIS       | $\mathbf{L}$     | L     |              | $\Box$   | L                      | L             |          |          | L  | $\perp$ | <u> </u>  | 1        | ↓_         | ╄            | 4  | ╄.           | 1              | 1            |
| 14. THERMAL ANALYSIS         | $\mathbf{L}$     | Τ.    |              | $\Box$   | L                      | L             | •        | ┖        | L  | L       | L         | L        | ↓_         | ╄            | ┸  |              | Ļ              | 4_           |
| 15. COMPUTES LASER POWER     | Г                | •     | Π            |          | L                      | L             | L        | <u> </u> | L  | L       | Ш         | 上        | L          | ┸            | 1.   | 1            | 1.             | 1            |
| 16 GENERAL CHEMISTRY         | 1•               | •     | •            | Ī∙       | Π                      | L             |          | L        | L  | L       | L         | _        | •          | ┺            | 4  | ┸            |                | 4_           |
| 17 PREMIXED                  | T•               | •     | Ι.           | Γ        | Ι                      | L             |          |          | •  | L       | L         | L        | L          | 丰            | ┵  | ╄            | 4-             | ╄            |
| 18 SCHEDULED MIXING          | ${f L}$          | 1.    | $\mathbf{L}$ | Γ        |                        | L             | L        | L        | L  | l•      | Ŀ         | L        |            | ┸            | 4  | •            | ↓_             | ↓_           |
| 19. LAMINAR MIXING           | ${f L}$          | •     | ▣            | •        | •                      | •             | $\perp$  | L        | ┺  | •       | <b>!•</b> | ┺        |            | ╀            | 4-   |              | Ų•             | 4-           |
| 20. TURBULENT MIXING         | Т                | ┱     | •            | •        | •                      | •             | $\perp$  | L        | L  | •       | <u> •</u> | L        | Ŀ          | L            | ┸  | ┷            | ┸              | ╀            |
| 21 TURB CHEM INTERACTION     | T                | ┪     | •            | •        | ]•                     | •             | L        | L        | L  | •       | 10        | L        | 1.         | ┸            | ↓_   | ┸            | ┸              | ↓_           |
| 22 20 N.S. EQS               | T                | Т     | Т            | T        | Т                      | $\mathbf{I}$  | L        | L        | L  | 1_      | L         | L        | L          | ┸            | 1  | ┸            | 1              | 1            |
| 23 BOUNDARY LAYER EQS.       | Т                | Т     | •            | Ι        | I                      | •             | L        |          | L  |         | L         |          | L          | ┸            | 1  | 1.           | 1              | 1            |
| 24 PARABOLIC N S EQS         | 1                | Т     | Т            | •        | Τ                      | L             |          | L        | L  | L       | L         | $\perp$  | L          | l            | ┵  | 4            | ┸              | 1            |
| 25 FREE SHEAR LAYER ANALYSIS | Т                | Т     | Ι            | Τ        | I                      | ${\mathbb T}$ |          | L        | L  | L       | 1         | 1        | L          | l            | ┵  | ┸            | ┸              | ┵            |
| 26 METHOD OF CHARACTERISTICS | T                | Т     | Т            | Τ        | Т                      | Τ.            | L        | L        | L  | L       | L         |          | L          | ┸            | ┵  | ┸            | 1              | ┸            |
| 27. CONTROL VOLUME ANALYSIS  | 1                | Т     | Τ            | Τ        | ${f I}$                | L             | L        | $\perp$  | •  | 1_      | 上         | L        | L          | ⊥            | ┸  | 1            | 1              | 1            |
| 28 FINITE ELEMENT            | $\mathbf{T}$     | T     | Ι            | Τ        | I                      | <u> </u>      | •        |          | L  | L       | 丄         | ┸        | ┸          | $\perp$      | 4  |              | -              | +            |
| 29 FINITE DIFFERENCE         | Т                | Т     | T            | Τ        | Ι                      | ${\mathbb L}$ | L        | L        | L  | L       | L         | L        | L          | ┸            | ┵  |              | 1.             | 4            |
| 30 EXPLICIT INTEGRATION      | Т                | Τ     | Ι            | Τ        | 1                      | •             | •        | •        | <u>.                                    </u> | $\perp$ | ┸         | ┸        | L          | ┸            | _  | 丄            | 4              | $\perp$      |
| 31 IMPLICIT INTEGRATION      | •                | 10    | 1            | Т        | $\mathbf{I}$           | Ι             | L        | 1        | L  | 1       | ┸         | 1        | ┸          | 1            | 4  | 1            | -              | 1            |
| 32 EXPLICIT IMPLICIT         | Т                | T     | Ţ●           | 1        | ${f T}$                |               | L        | Ι.       | L  |         | L         | ┸        | L          | ┸            | 1  |              | 4              | 4            |
| 33 FFT                       | $\mathbf{I}$     | I     | $\perp$      | Ι        | Ι                      | Ι             |          | $\Gamma$ |  | •       | •         | 4        | 1          | 1            | 4  | 4            | 10             | -            |
| 34 ROTATIONAL NON EQUIL      | I                | Ι     | Ι            | I        | Ι                      | Ι             |          | L        |  | L       | 1         | Į•       | -          | 4            | 4  | 4            | 4.             | _            |
| 35 SIMPLIFIED CHEMISTRY      | ${f I}$          | Ι     | Ι            | Ι        | $\mathbf{I}^{\bullet}$ | •             | L        |          | L  | ļ.      | ┸         | 10       | ᆚ          | 4            | 4.   | 1            | 4              | 1            |
| 36 SIMPLIFIED FLUID MECH     | $\mathbf{I}^{-}$ | T     | Ι            | I        | Ι                      | Ι             | L        | $\perp$  | 1  | $\perp$ |           | 1.       | _          | ┵            | 4  | 1            | 1              | +1           |
| 37 FAB PEROT CAVITY          | T                | T     | ī            | Τ        | Ι                      | Ι             | $\Gamma$ | Ι        | Г  |         | L         | 1.       | 1          | 4            | _  | 1            | 4              | 1            |
| 38 UNSTABLE RESONATOR        | $\mathbf{L}$     | Ι     | Ι            | Ι        | Ι                      | $\perp$       | L        | L        | $\perp$                                      | [●      | •         | 4        | ┵          | 4            | 4  | 4            | 4              | • •          |
| 39 COMPUTES ZERO POWER GAIN  | 1.               | 1     | 1            | •        | ıŢ                     | $\perp$       | L        | L        |  |         | $\perp$   | $\perp$  | $\perp$    | ┵            | 4  | 1            | ᆚ              | -            |
| 40 COMPUTES MEDIA QUALITY    | 1                | J     | I            | I        | I                      |               |          | $\perp$  | 1  | 1       | ┸         | 1        | 1          | 1            | 1  | 1            | -              | •            |
| 41 COMPUTES SPECTRAL DIST    | Т                | T     | Τ            | Τ        | T                      | Т             | 7        | T        | T  | Γ       | 1         | 1        |            | $\perp$      | $\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$ | ᆚ            | _ا             | <u>•</u>     |

Table C-2 — Bell Aerospace Codes

#### **RESONATOR ANALYSIS CAPABILITY**

| FEATURES                                     | CODES | GOAD<br>(1) | ARM-D<br>(2) | ARM-G<br>(3) |
|--|-------|-------------|--------------|--------------|
| (1) OPERATIONAL ON IBM 370                   |       | Х           |              | х            |
| (2) OPERATIONAL ON CYBER 176                 |       |             |              |              |
| (3) GEOMETRIC ANALYSIS                       |       | Х           |              | х            |
| (4) DIFFRACTIVE ANALYSIS                     |       |             | х            |              |
| (5) r-X MODELED                              |       |             | X            |              |
| (6) r- θ-Z MODELED                           |       | X           |              | Х            |
| (7) LOADED CAVITY                            |       |             | х            |              |
| (8) DIFFRACTIVELY COMPUTES FFBQ              |       |             |              | Х            |
| (9) MODELS HSURIA RESONATOR                  |       |             | Х            | Х            |
| (a) INTERNAL FOCUS WAXICON                   |       | Х           | Х            | Х            |
| (b) CONFOCAL REAR CONE                       |       |             | Х            |              |
| (c) VTT ABERRATIONS                          |       | Х           |              |              |
| (d) REFLAXICON                               |       |             | X            | Х            |
| (10) MODELS RING RESONATOR                   |       |             | X            | Х            |
| (11) MODELS STRUT EFFECTS                    |       |             |              |              |
| (12) MODELS MISALIGNMENT AND TILT<br>EFFECTS |       |             |              | х            |
| (13) MODELS MIRROR THERMAL DIST.             |       |             |              |              |
| (14) MODELS MEDIA EFFECTS                    |       |             |              |              |

NOTES: (1) THE ARM-D CODE MODELS r-  $\theta$  -Z IN COMPACTED LEG ONLY, SRM-D IS USED IN ANNULAR LEG.

- (2) \*DENOTES HAC SUPPLIED CODE CAPABILITY.
- (3) CODE (3) PROVIDES SAME CAPABILITY, HOWEVER, ARM-G ALLOWS FOR INTERACTIVE MODE OPERATION DUE TO REDUCED CORE SIZE REQUIREMENT.
- (4) DENOTES FEATURE CURRENTLY BEING INCORPORATED,
  DENOTES FEATURE NOT YET EXERCISED BUT WITH THE CAPABILITY
  FOR ANALYSIS CURRENTLY EXISTING.

# DATE