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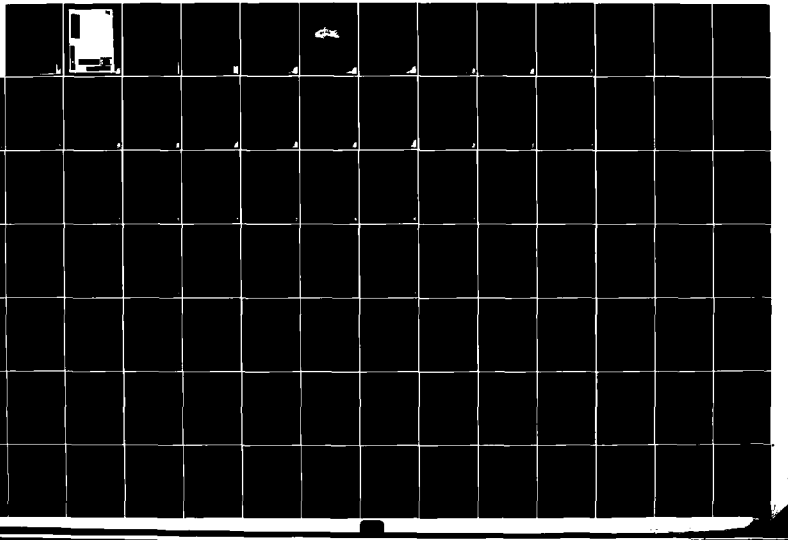

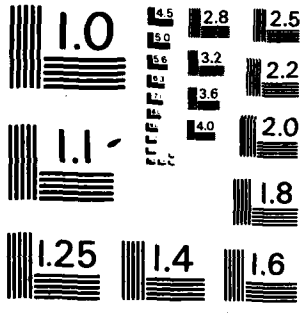

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The United States Air Force Summer Faculty Research Program (USAF-SFRP) Contract was awarded to the Southeastern Center for Electrical Engineering Education on December 14, 1981. The contract is sponsored by the Air Force Office of Scientific Research, Air Force Systems Command, United States Air Force and is conducted by SCEEE.

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(20.) ABSTRACT CONT'D:

The program provides opportunities for research in the physical sciences, engineering, life sciences, business, and administrative seiences. The program has been effective in providing basic research opportinities to the faculty of universities, colleges, and technical institutions throughout the United States.

The program is available to faculty members in all academic grades: instructor, assistant professor, associate professor, professor, department chairman, and research facility directors. It has proven especially beneficial to young faculty members who are starting their academic research programs and to senior faculty members who have spent time in university administration and are desirous of returning to scholarly research programs. Beginning with the 1982 program, research opportunities were provided for 17 graduate students. The 1982 pilot student program was judged highly successful and was expanded for the 1983 program to 53 students.

UNITED STATES AIR FORCE

SUMMER FACULTY RESEARCH PROGRAM

1983

PROGRAM MANAGEMENT REPORT

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION

Program Directors, SCEEE
Warren D. Peele
Earl L. Steele

Program Manager, AFOSR
Major Amos L. Otis

Submitted to

Air Force Office of Scientific Research

Bolling Air Force Base

Washington, DC

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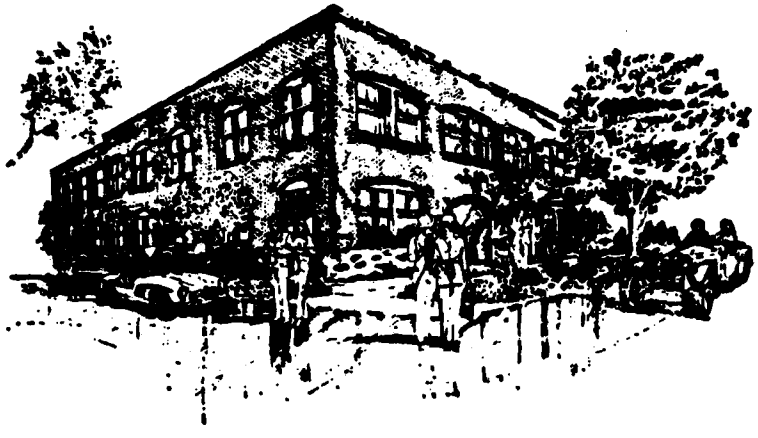

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I. INTRODUCTION AND HISTORY

The United States Air Force Summer Faculty Research Program (USAF-SFRP) Contract was awarded to the Southeastern Center for Electrical Engineering Education on December 14, 1981. The contract is sponsored by the Air Force Office of Scientific Research, Air Force Systems Command, United States Air Force and is conducted by SCEEE.

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The program is available to faculty members in all academic grades: instructor, assistant professor, associate professor, professor, department chariman, and research facility directors. It has proven especially beneficial to young faculty members who are starting their academic research programs and to senior faculty members who have spent time in university administration and are desirous of returning to scholarly research programs. Beginning with the 1982 program, research opportunities were provided for 17 graduate students. The 1982 pilot student program was judged highly successful and was expanded for the 1983 program to 53 students.

Follow-on research opportunities have been developed for a large percentage of the participants in the Summer Faculty Research Program in 1979-1983 period through an AFOSR Minigrant Program.

On 1 September 1983 AFOSR replaced the Minigrant program with a new Research Initiation Program to be administered by SCEEE. The Research Initiation program provides follow-on research awards to home institutions of SFRP participants. Awards are made promptly after completion of summer research to approximately 50 researchers. The award is made for a maximum of $12,000 and a duration of one year or less. Substantial cost sharing by the schools contributes significantly to the value of the Research Initiation Program.

II. RECRUITING AND SELECTION

The program is conducted on a nationally advertised and competitive selection basis. Advertising for the 1983 program was conducted via direct mail to all accredited engineering departments and schools; and all departments of chemistry, physics, mathematics, and computer science. Information on the SFRP was mailed to over 500 department chairman; brochures were made available to all participating USAF Laboratories/Centers; distribution was made through AFROTC units on university campuses; information was supplied to all who made requests. Overall over 7500 brochures were distributed throughout the country.

In the 1979 program, 70 faculty members participated. In the 1980 and 1981 programs, 87 faculty members participated each year; 91 faculty and 17 students participated in the 1982 program. In 1983 the program grew to 101 faculty and 53 students. During 1983 the program was extended

to allow research periods throughout the year. There was one participant during the Spring, 99 during the summer and one during the fall. The 1983 program included 53 students. There were approximately five applicants for each available Summer Faculty Research position in 1983.

Applications were due at SCEEE on or before February 1, 1983. The selection panel convened in February and announcements of selections were made before March 1, 1983.

III. PRE-SUMMER VISIT (Optional)

After each research associate had signed and returned his Appointment letter from the Southeastern Center, he was directed to contact the designated representative at the laboratory/center of assignment to discuss a pre-summer visit. The purpose of the pre-summer visit is basically threefold: 1) to meet laboratory personnel, especially the Effort Focal Point with whom the Research Associate would be working most closely, and to become personally acquainted with the laboratory facilities; 2) to finalize and formalize objectives for the Research Associate's summer research period and report these to SCEEE; 3) to make arrangements for lodging for the research period. The focus of this visit was on making sufficient preparation so that the summer research effort would be effective.

IV. GRADUATE STUDENT SUMMER SUPPORT PROGRAM (GSSSP)

A pilot program for Graduate Student Summer Support via the AFOSR Summer Faculty Research Program (SFRP) was initiated by contract modification on 26 March 1982. The program was developed as an adjunct effort to the SFRP. Its purpose is to provide funds for selected graduate students to work at appropriate Air Force Laboratories or Centers with a supervising professor who holds a concurrent SFRP appointment. SCEEE appointed 17 graduate students representing fifteen (15) schools and ten (10) disciplines in science and engineering in 1982. During the 1983 Program, 53 graduate students representing 36 schools and 18 disciplines were appointed from 117 applicants.

The 1983 GSSSP Program Report is published as two separate documents under the 1983 SFRP Program and are entitled, Graduate Student Summer Support Program Management Report and Technical Report. SCEEE Press, October 1983.

V. AIR FORCE GEOPHYICS SCHOLAR PROGRAM

On 1 June 1982 SCEEE and AFOSR initiated an Air Force Geophysics Scholar Program via modification to the current SFRP Contract. This Program was an extension of the SFRP concept addressed to emerging post doctoral researchers for full year on-site appointments at the Air Force Geophysics Laboratory. The AFGL Scholar Program has been successfully extended by a separate contract providing 15 scholars per year to AFGL.

The Geophysics Scholar Program was initiated on 1 June 1982 with an Application deadline of 1 August 1982. Advertising time was limited to two months for preparation and distribution of materials. This limited

advertising produced twice as many highly qualified applicants as there were positions available (19 applicants for 10 positions), a ratio which provides adequate alternates with a minimal negative impact on unsuccessful applicants. All positions are presently filled. The details of the program will be published in a 1983 separate SFRP report, after the first year of the program has been completed.

VI. SITE VISITS

5-6 July 1983
Visit To: Aerospace Medical Research Laboratory
Aero Propulsion Laboratory
Avionics Laboratory
Flight Dynamics Laboratory
Materials Laboratory
Human Resources Laboratory
Wright-Patterson AFB, Ohio

5 Aug 1983
Visit To: Armament Division
Eglin AFB, Florida

5 Aug 1983
Visit To: Engineering Services Center
Tyndall AFB, Florida

15 July 1983
Visit To: Rome Air Development Center
Griffiss AFB, New York

23-24 June 1983
Visit To: United States Air Force School of Aerospace Medicine
Human Resources Laboratory
Brooks AFB, Texas

Visits listed include those by SCEEE and AFOSR Personnel. The participating faculty are generally satisfied with the mechanics of the program. All faculty, USAF Research Colleagues, and students applaud the GSSSP Program. Criticisms were: (a) advance pay is needed; (b) housing for researchers with families is hard to find; (c) better clerical support is needed on site; (d) on-campus support for students is desirable.

We find that the objectives of the SFRP are being well served. SFRP Research Fellows indicate that they are peforming independent research, and are not being used as "summer help". There are some misconceptions by Research Colleagues and Research Fellows concerning the purpose of the program, i.e. a misconception that the program is generally suitable for repeated research efforts by an individual. We found no abuse of the non-personal services requirements. As expected, enthusiasm is high for the possibilities of follow-on funding by AFOSR at the home university. Research Fellows are being used effectively to conduct lectures and seminars at most locations.

As a record of documentation supplied to the appointees, the SCEEE Information and Appointment Packets are provided in Appendix I of this report.

VII. HISTORICALLY BLACK COLLEGE (HBC) WORKSHOPS

As part of its Affirmative Action Program, SCEEE Proposed several HBC Workshops during the 1981-1982 Academic Year in order to increase the participation of HBC Faculty in the SFRP Program. In view of the late Contract Award date of December 14, 1981, the HBC Workshops were contractually delayed until Fall and Winter of 1982-3 in order to maximize their effectiveness for the 1983 Program.

During the 1982-83 academic year, workshops were held at the following schools:

Talladega College, Talladega, Alabama
Tuskegee Institute, Tuskegee, Alabama
North Carolina Agricultural & Technical State University, Greensboro, North Carolina
Southern University, New Orleans, Louisiana
Southern University, Baton Rouge, Louisiana

VIII. RESEARCH INITIATION PROGRAM

For several years prior to 1983, AFOSR conducted a special follow-on funding program for Summer Faculty Research Program (SFRP) participants which was popularly known as the AFOSR Mini-Grant. That program was superceded in 1983 by the Research Initiation Program conducted by SCEEE.

To compete for a Research Initiation Program award, SFRP participants must submit a complete proposal and proposed budget either during or promptly after their SFRP appointment period.

Each proposal is evaluated for technical excellence, with a special emphasis on relevance to continuation of the SFRP effort, as determined by the Air Force Laboratory/Center. The Final decision is the responsibility of AFOSR.

The most effective proposals are those which are closely coordinated with the SFRP Effort Focal Point and which follow the SFRP effort with proposed research having strong prospects for later sustained funding by the Air Force Laboratory/Center.

The maximum award under the Research Initiation Program is $12,000 plus cost-sharing up to a matching total amount.

The mechanics of applying for a Research Initiation Program award are as follows:

(1) Research Initiation Program proposals of $12,000 plus cost-sharing were to be submitted after August 1, 1983 but no later than November 1, 1983.

2) Proposals are evaluated and a final award decision is the responsibility of AFOSR after consultation with the Lab/Center.

3) The total available funds limit the number of awards to approximately 50, or half the number of 1983 SFRP participants.

4) Awards are negotiated with the employing institution, designating the individual as Principal Investigator, with the period of award having a start date no earlier than September 1, 1983 and a completion date no later than December 15, 1984.

   Employing institutions are encouraged to cost-share since the Program is designed as a research initiation procedure. Budgets must include, where applicable, Principal Investigator time, graduate assistant and support effort, equipment and expendable supplies, travel and per diem costs, conference fees, indirect costs, and computer charges.

In Summary, a Research Initiation proposal must be:

(A) Technically excellent;
(B) A Continuation of SFRP work;
(C) Received no later than November 1, 1983;
(D) Budgeted not to exceed $12,000 plus cost-sharing.

IX. AIR FORCE WEAPONS LABORATORY RESEARCH SCHOLAR PROGRAM

In April 1983, the Air Force Office of Scientific Research, the Air Force Weapons Laboratory, and the Southeastern Center for Electrical Engineering Education initiated an Air Force Weapons Laboratory (AFWL) Research Scholar Program beginning in the Fall of 1983. This program provides research opportunities for selected Engineers and Scientists holding a doctoral degree to work at the Air Force Weapons Laboratory for a one year research period. This program, similar to the AFGL Scholar Program, is also an extension of the SFRP concept.

To be eligible, all candidates must be U.S. Citizens and have a Ph.D. or equivalent in an appropriate technical field. The Scholars are selected primarily from such basic and applied Science and Engineering fields as Physics, particularly Nuclear and Laser Physics, Civil, Electrical Aeronautical, Nuclear and Mechanical Engineering and also from Applied Mathematics and Computer Science. Five positions were available. The deadline for applicants for this AFWL Research Scholar Program was July 15, 1983. A total of 26 applications were received and four appointments have been made.

The first appointments started in the Fall 1983 and are for one year. The program objectives are:

(1) To provide a productive means for Scientists and Engineers holding Ph.D. degrees to participate in research at the Air Force Weapons Laboratory;

(2) To stimulate continuing professional association among the Scholars and their professional peers in the Air Force;

(3) To further the research objectives of the United States Air Force; and

(4) To enhance the research productivity and capabilities of Scientists and Engineers especially as these relate to Air Force technical interests.

APPENDIX I

In this appendix we have collected the following documents which were distributed to appointees and other program participants.

A. Information Brochure for SCEEE Fellows.

B. Questionnaire for participants and a summary of their replies.

C. Questionnaire for Research Colleague at the Air Force Laboratory or Center and a summary of their replies.

D. Questionnaire for Air Force Laboratory Representative and a summary of their responses.

APPENDIX 1.A

INFORMATION BROCHURE

for

SCEEE FELLOWS

on the

1983 USAF-SCEEE SUMMER FACULTY RESEARCH PROGRAM

March 1983

INFORMATION BROCHURE

for

SCEEE FELLOWS

Table of Contents

I. SCEEE FELLOW OBLIGATIONS

SCEEE is required by contract to impose certain obligations on you in your status as a SCEEE Fellow. This section outlines those obligations, and you should read them thoroughly. You are required to sign and return the statement of understanding before the final processing of your appointment can be completed. The following is a list of these obligations:

1. Pre-Summer Visit: A pre-summer visit to your research location is optional. Approval for such a trip may be granted upon your written request to SCEEE along with the written concurrence of the Laboratory/Center representative. The purpose of this visit is to enable you to make your final plans for the summer research period if needed. Reimbursement is paid for allowable travel expenses incurred on a pre-summer trip as indicated in the Allowable Travel Expenses section (page 4) of this brochure. To be reimbursed, you must invoice for it as described in the Information for Invoicing for Compensation and Reimbursement section (page 5) of this brochure.

2. Research Goals and Objectives: A statement of research objectives must be provided to SCEEE prior to the start of the Summer Research period. It should outline your goals and the approach you intend to follow in researching these goals. Neither travel expenses nor expense allowances will be reimbursed until after receipt of your statement of research objectives. The report should also clearly indicate the date of your first working day of the summer research period.

3. Final Report: At the end of your summer research effort, you are required to submit to SCEEE a completed, typewritten scientific report stating the objective of the research effort, the approach taken, results, and recommendations. Information on the required report format will be sent to you with a "FINAL REPORT INFORMATION BULLETIN" and sample report. The final report must first be approved by your Effort Focal Point and then transmitted so as to reach SCEEE by Monday September 19, 1983. Payment of " Compensation" for the final four weeks of your ten-week research period cannot be made until SCEEE has received and approved this report in the required format.

4. Program Evaluation Questionnaire: You will be sent a critique form to complete near the end of your research period regarding your impressions of the program. This critique form should be completed and returned to SCEEE, along with your final report, by Monday, September 19, 1983. The return of this form is a program requirement; it also must be received by SCEEE before the final compensation payment can be made.

5. U.S. Air Force - SCEEE Fellow Relationship: The U.S. Air Force and SCEEE understand and agree that the services to be delivered by SCEEE Fellows under this contract will be non-personal services and the parties recognize and agree that no employer-employee or master-servant relationships will exist between the U.S. Air Force and the SCEEE Fellows. Non-personal services are defined as work performed by an individual who is responsible for an end item (such as a report), free of supervision of the U.S. Air Force and free of an employer-employee relationship.

As a SCEEE Fellow, you will not:

(a) Be placed in a position where you are appointed or employed by a Federal Officer or are under the supervision, direction, or evaluation of a Federal Officer, military or civilian.

(b) Be placed in a staff or policy-making position.

(c) Be placed in a position of command, supervision, administration, or control over Air Force military or civilian personnel or personnel of other contractors or become a part of the U. S. Air Force organization.

The services to be performed under the SFRP do not require SCEEE or the SCEEE Fellow to exercise personal judgement and discretion on behalf of the U.S. Air Force; rather, the SCEEE Fellows will act and exercise personal judgement and discretion on their research programs on the SFRP conducted by SCEEE.

The Air Force will have unrestricted use of and access to all data developed during the period of this appointment.

II. ALLOWABLE TRAVEL EXPENSES

The SFRP provides potential funding for two trips between your home and your assigned research location. As soon as you have signed and returned your appointment letter along with the budget sheet, you will be authorized to receive reimbursement for travel expenses as described below.

As outlined in the SCEEE Fellow Obligations section in this brochure, you may make a pre-summer visit in addition to the trip to and from your assigned research location for your summer effort. You are expected to make your own arrangements for these trips, and after the trips you may invoice SCEEE for reimbursement of allowable expenses in the format described in the Instructions for Invoicing for Compensation and Reimbursement section of this brochure. Closely coordinate your travel plans with your EFFORT FOCAL POINT.

All travel reimbursements under SCEEE Fellow appointments are made according to current SCEEE policy, and deviations from the approved budget are not authorized and will not be reimbursed. In light of these restrictions, you may choose either to travel by common carrier at coach rates or less, by driving your private auto, or by a combination of both. (Please note that funding for rental cars requires ADVANCED WRITTEN approval by SCEEE and SCEEE will not reimburse this expense unless the prior written approval is obtained.) With any of these choices you may claim reimbursement up to the amount for the most direct routing, taking into the account the desirability of routing on interstate highways if you drive your private auto.

Reimbursement for direct route travel by common carrier will thus be paid on your submission of an invoice to SCEEE following the invoicing instructions referenced above. In the view of the convenience of having a car at the research location, SCEEE strongly recommends that a private auto be used for travel when practical. Reimbursement for mileage when you drive your private auto is at the rate of 20¢ per mile within the routing restrictions mentioned above and will likewise be paid on submission of an invoice prepared according to the referenced instructions. These reimbursements cannot be extended to cover travel by your family if they accompany you on either of these authorized trips.

During the pre-summer visit, you will be authorized to claim a per diem reimbursement at the rate of $48.00 per day for a maximum of three days spent at your assigned research location. Instructions for claiming this per diem are also described in the Instructions for Invoicing for Compensation and Reimbursement section of this brochure.

During the ten week Summer Research period, you will be authorized to receive an expense allowance in lieu of a per diem payment. The rate of this allowance is $35 per day for a maximum of 70 days. To receive this allowance, you are required to invoice for it as described in the invoicing reference above.

These items above are the only reimbursable travel allowances authorized for the SFRP appointment. Please be advised that any additional travel expenses incurred during the appointment period will be your personal responsibility.

III. INSTRUCTIONS FOR INVOICING FOR COMPENSATION AND REIMBURSEMENT

Attached is a copy of the Invoice Format that you are required to use to obtain compensation or reimbursement from SCEEE. Note that all disbursements by SCEEE for compensation, travel, and/or other expenses are subject to audit approval, so you must submit receipts substantiating charges invoiced.

In addition, you must prepare and attached to each completed invoice a Brief Report of Effort.

A. PREPARATION OF BRIEF REPORT OF EFFORT

Whenever you submit an Invoice for reimbursement to SCEEE you must also include a brief report describing your activities for the invoice period. To meet this obligation, you must prepare, date, sign, and attach to your completed invoice a Brief Report of Effort describing the research accomplished on the appointment and explain any travel during the invoice period.

This report should include innovative techniques and designs or discoveries which may be disclosed as patents. Rights to any inventions or discoveries shall reside with SCEEE unless determined otherwise by the contracting agency.

The Brief report should never exceed one typewritten page and most often should be considerably shorter than one page.

The following is an example of such a report:

BRIEF REPORT OF EFFORT

Effort has been initiated on pole extraction methods. The modified ordinary least squares technique has been giving fair results. Work is presently being done on finding a better matrix inversion technique for the case when the coefficient matrix is ill-conditioned. Some problems have been encountered with conditioning when the data is filtered.

Travel invoice is for the trip to my research location.

_____June 17, 1983

B. PREPARATION OF INVOICE FORMAT

Detailed instructions on properly completing your Invoice Format for reimbursement are provided below. Review them carefully.

(1) In the opening statement of the claim for remuneration on the invoice format, two dates are required. They are the date of your appointment letter from SCEEE (in the first blank) and the date you signed that letter accepting your appointment (in the second blank).

Other financial items required on the Invoice Format are for COMPENSATION, TRAVEL, EXPENSE ALLOWANCE, AND PER-DIEM. These are now explained individually with examples.

(2) COMPENSATION

(a) In the first blank to the right of COMPENSATION indicate the number of days you are claiming for compensation in this particular invoice next to your *SCEEE Fellow daily rate of* $100.00.

(b) Multiply this number by $100.00 and enter the total dollar amount in the blank at the far right side. Note that the accumulated total number of days you claim on this appointment may not exceed the number authorized in your appointment letter. Some specific details on the compensation days must be provided in the next space.

(c) Under the heading Date, list the date of each of the days you are claiming for compensation, and opposite each date under the heading Place of Activity indicate where you worked on that date.

A sample entry of a correctly completed COMPENSATION item is shown below:

SAMPLE COMPENSATION ENTRY ON INVOICE

COMPENSATION: (10 days @ $100.00 per day)..... $ 1000.00 (II)

Date (Specify exact dates)	Place of Activity
June 2,3 1983	AFAPL/POD High Power Lab
June 6-10, 1983 (inclusive)	WPAFB Computer Center
June 13, 14, 15, 1983	AFAPL/POD High Power Lab

(3) TRAVEL

(a) Under the heading Date indicate the date you departed on your trip and the date you arrived at your destination. If you are invoicing for a round trip, also list the date you departed on your trip and the date you arrived home.

(b) Under the heading Departure/Arrival Time list the departure and arrival times for the corresponding days you listed under Date.

(c) List your destination under the heading Destination.

(d) Under the heading Mode, indicate your principal means of conveyance; i.e., commercial air, private auto, etc.

(e) Under the heading Amount, itemize these expenditures for travel reimbursement. Continue them on a separate sheet if necessary.

(f) Total these travel items and enter the total dollar amount to be reimbursed for travel in this particular submission on the line to the right of Total Travel Expense.

Two examples of correctly completed TRAVEL entries are shown below.

EXAMPLE A: PRE-SUMMER VISIT BY AIRLINE AND PERSONAL AUTO.

TRAVEL: (Attach receipts for all Common Carrier charges. Payment cannot be made without receipts attached to invoice.)

Date	Departure/Arrival Time	Destination	Mode	Amount
5/11-5/11/83	0730/0900	Tyndall AFB, FL	Com'l Air	
5/14-5/14/83	0845/1345	Orlando, Fl (home)	Com'l Air	$ 53.00
2 round trips from home to Orlando Airport (Private Auto) (40 miles x 20¢ per mile = $8.00)				$8.00

Total Travel Expense ..... $ 61.00 (III)

Please note the following comments about EXAMPLE A:

i) The $61 is the sum of all listed travel expenses.

ii) Travel with use of privately-owned vehicle will be reimbursed at the rate 20¢ per mile; the mileage here does not exceed 100 miles.

iii) Receipts for the airfare must be attached in order for these charges to be allowed.

iv) Please remember that SCEEE must give prior written approval for rental car use and without this prior written approval reimbursement for a rental car cannot be paid.

EXAMPLE B: TRAVEL TO RESEARCH LOCATION BY PRIVATE AUTO

TRAVEL: (Attach receipts for all Common Carrier charges. Payment *cannot* be made without receipts attached to invoice.)

Date	Departure/Arrival Time	Destination	Mode	Amount
5/26-6/1/83	0630/1530	Wright-Patterson AFB, Ohio	Private Auto	$480.00

One-way trip from home in Eugene, Oregon to Wright-Patterson AFB, Ohio, (2400 mi x 20¢/mi= $480.00)
(mileage at start: 24162; at end: 26562)

Total Travel Expense ..... $ 480.00 (III)

Please note the following comments about EXAMPLE B:

i) Travel by your private auto in lieu of a commercial carrier is authorized as a convenience to the traveler.

ii) Travel with use of a privately-owned vehicle will be reimbursed at the rate of 20¢ per mile provided mileage is listed with the start and end mileage on each separate use for all distances over 100 miles.

(4) EXPENSE ALLOWANCE

This item on the invoice will be used to claim the $35 per day for reimbursement of costs incurred at your assigned research location.

(a) In the first blank to the right of EXPENSE ALLOWANCE enter the number of days for which you are claiming reimbursement of the expense allowance for costs incurred at your assigned research location.

(b) Multiply this number by the daily allowance rate of $35.00 and enter this total dollar amount in the blank at the far right.

(c) Itemize the days for which you are claiming the Expense Allowance reimbursement. It can include weekend days and holidays as well as regular work days. It does not apply to the pre-summer visit.

The following is a sample of a correctly completed EXPENSE ALLOWANCE item.

SAMPLE

EXPENSE ALLOWANCE: (14 days @ $35.00/day)..... $ 490.00 (IV)

Specific dates covered:
7/2/83 - 7/15/83 (inclusive)

(5) PER-DIEM

This item will be used to claim reimbursement only for Per-Diem charges on the optional pre-summer visit. This cannot exceed three days; only days spent at the actual research site are allowed.

(a) In the first blank to the right of Per-Diem enter the number of days reimbursement being requested. This entry must correlate with an accompanying lodging receipt.

(b) Multiply this number by the $48.00 daily per-diem rate and enter the total dollar amount in the blank at the far right.

Example C below shows a correctly completed PER-DIEM entry.

EXAMPLE C: PER-DIEM ENTRY FOR PRE-SUMMER VISIT

PER-DIEM: (3 days @ $48.00/day) ..... $ 144.00 (V)
Attach receipts for motel charges. Per-Diem cannot be claimed without receipts attached to invoice.)

Please note the following comments about EXAMPLE C:

i) Per-Diem is not applicable to travel time enroute to or from the research location.

ii) A day does not qualify for the per-diem reimbursement without a corresponding lodging receipt.

iii) Each day requested for per-diem reimbursement must be affirmed by a receipt for a night's lodging expense. The lodging receipt must accompany the invoice and must be consistent with the travel reimbursement entry. Note that receipts for lodging for the nights of 5/11, 5/12, 5/13/83 must be attached in order for per-diem of $48.00 per day to be paid and be consistent with the travel request as illustrated in Travel Example A.

iv) The Per-Diem payment does not apply to the summer research period; for the summer research period use instead the Expense Allowance reimbursement entry.

(6) You may combine reimbursement requests for compensation, travel, and per-diem or expense allowance in the same invoice. The total for all items invoiced should be indicated on the blank labeled "GRAND TOTAL FOR INVOICE" in the lower right hand side of line 6.

(7) IMPORTANT: Indicate in the space provided on each invoice the address to which you want the check mailed.

(8) You must sign and date your invoice in the lower right hand corner as "VENDOR" before it is submitted; you MUST also have your Effort Focal Point countersign the invoice before it is mailed to SCEEE. Your Effort Focal Point is an Air Force individual at your research location who will be identified prior to your effort start date.

Invoices should be mailed to:

SCEEE SFRP OFFICE
1101 Massachusetts Avenue
St. Cloud, Florida 32769

SUMMER FACULTY RESEARCH PROGRAM
INVOICE FORMAT

(Brief Report of Effort Attached)

1. I claim remuneration from SCEEE, Inc. via the terms and conditions of the agreement dated_____and accepted_____ as follows:

2. COMPENSATION: (_____days @ $100.00 per day).....$_____(II)

Date (Specify exact dates) *Place of Activity*

3. TRAVEL: (Attach receipts for all Common Carrier charges. Payment cannot be made without receipts attached to invoice.)

Date *Departure/Arrival Time* Destination Mode Amount

Total Travel Expense ..... $_____(III)

4. EXPENSE ALLOWANCE: (_____days @ $35.00/day)..... $_____(IV)

Specific dates covered:

5. PER DIEM: (_____days @ $48.00/day)..... $_____(V)
(Attach receipts for motel charges. Per-diem cannot be claimed without receipts attached to invoice.)

6. GRAND TOTAL FOR INVOICE (Sum of II, III, IV, V above)..... $_____(VI)

7. Please send check to following address:

8. I certify that compensation invoice is not concurrent with compensation received from other Federal government projects, grants, contracts, or employment.

X_____
EFFORT FOCAL POINT SIGNATURE
Location of EFP _____
Telephone _____
Date _____

X_____
VENDOR SIGNATURE
Social Sec. No._____
Telephone_____
Date _____

FOLLOW-ON RESEARCH POSSIBILITIES

As you are aware, the Air Force Office of Scientific Research sponsors the Summer Faculty Research Program. As a companion program intended to encourage further research work with the Air Force, AFOSR also sponsors the Mini-Grant Program. All SCEEE Fellows who have participated in the Summer Faculty Research Program are encouraged to apply for this valuable program. You will receive further information about the Mini-Grant Program during your summer research period. The Mini-Grant Program is administered by AFOSR.

APPENDIX 1.B

PARTICIPANT'S QUESTIONNAIRE & REPLY SUMMARY

QUESTFAC.1

1983 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY PARTICIPANT)

Name_____Title_____
Dept. (at home)_____Home Institution_____
Research Colleague(s)_____
Laboratory Address of Colleague(s)_____
Brief Title of Research Topic_____

A. TECHNICAL ASPECTS

1. Was the offer of research assignment within your field of competency and/or interest? YES____NO____.

2. Did you have a reasonable choice of research assignment? YES___NO___.
If no, why?_____

3. Was the work challenging? YES___NO___. If no, what would have make it so?_____
_____

4. Would you classify your summer effort as research? YES___NO___.
Comment:_____

5. Were your relations with your research colleague(s) satisfactory from a technical point of view? YES___NO___. If no, why?_____
_____

6. Suggestions for improvement of relationship(s)._____
_____
_____

7. Considering the circumstances of a summer program, were you afforded adequate facilities and support? YES___NO___. If no, what did you need and why was it not provided?_____
_____

8. Considering the calendar "window" of ten weeks (limited by varying college and university schedules), please comment on the program length.
Did you accomplish: more than_____, less than_____, about what you expected_____?

9. Do you think that you will continue this or related research efforts upon returning to your home institution (i.e., application for mini-grant and/or other funding)?
YES___NO___. Give brief explanation of your plans._____
_____

PARTICIPANT QUESTIONNAIRE (Page 2 of 4)

10. Were you asked to present seminars on your work and/or your basic expertise? YES___NO___. Please list number, dates, approximate attendance, length of seminars, title of presentations (use reverse side if necessary.)

11. Were you asked to participate in regular meetings in your laboratory? YES___NO___. *If yes, approximately how often?*_____

12. Did you perform travel on behalf of the laboratory? YES___NO___.
Where to?_____
_____Purpose?_____
_____

13. Give a list of any "special" meetings you may have attended or participated in, such as conferences, visiting lectures, etc.

14. Other comments concerning any "extra" activities._____
_____
_____

15. On a scale of A to D, how would you rate this program? (A high, D low)

Technically challenging	A	B	C	D
Future research opportunity	A	B	C	D
Professional association	A	B	C	D
Enhancement of my academic qualifications	A	B	C	D
Enhancement of my research qualifications	A	B	C	D
Overall value	A	B	C	D

B. ADMINISTRATIVE ASPECTS

1. How did you first hear of this program?_____
_____

2. What aspect of the program was the most decisive in causing you to apply?_____
_____

PARTICIPANT *QUESTIONNAIRE* (Page 3 of 4)

3. Considering the time of year that you were required to accept or reject the offer, did this cause you any problems of commitment? YES___NO___.
How could it be improved?_____

4. After your acceptance, was information (housing, location, directions, etc.) supplied to you prior to the summer period satisfactory? YES___NO___.
How could it be improved?_____

5. Did you have any difficulty in any domestic aspects (i.e., locate suitable housing, acceptance in community, social life, any other "off-duty" aspects)? YES___NO___.
If yes, please explain._____

6. How do you rate the stipend level? Meager___Adequate___Generous___.

7. How do you rate the importance of the expense-paid pre-program visit to the work site? Not worth expense___Convenient___Essential___. *Please add any other comments you may have.*_____

8. Please give information on housing: Did you reside in VOQ___, apartment___, other (specify)_____? Name and address of apartment complex and manager's name.

9. Please suggest names (and give source) of organization, mailing lists, or other information you think would be helpful in advertising next year's program._____

10. Do you believe the addition of the Graduate Student Program increased the effectiveness of this program? YES___NO___.

11. Did a student work with you? YES___NO___. If so, please comment on the Graduate Student Support influence on *your* summer research._____

12. Would you encourage or discourage expansion of the Student Program?_____
Why?_____

PARTICIPANT QUESTIONNAIRE (Page 4 of 4)

13. Considering the many-faceted aspects of administration of a program of this magnitude, how do you rate the overall conduct of this program?
Poor___Fair___Good___Excellent___. Please add any additional comments._____

14. Please comment on what, in your opinion, are:

a. Strong points of the program:_____

b. Weak points of the program:_____

15. On balance, do you feel this has been a fruitful, worthwhile, constructive experience?
YES____NO____.

16. Other remarks:_____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY
(Participant)

A. TECHNICAL ASPECTS

1. Assignment in field of competency and/or interest? Yes - 100 No-1

2. Reasonable choice of assignment? Yes - 96 No- 5 If no, why?
Late appointment and lack of awareness of the relationship between SCEEE and the labs. A need was available in one particular area, and I was satisfied with fulfilling it.

3. Work challenging? Yes - 98 No - 3

4. Classify your summer effort as research? Yes - 97 No - 4 Comments:
Primary effort was directed towards developing computational tools. Time was spent developing analytical tools for future use. Given general problem area, did literature review, designed and ran experiment to resolve problem. This group is at the cutting edge of toxicological modeling. It was the front end, or the design of equipment portion of a reseach project. It was a combination of research and evaluation of a system in the early stage of development. Definitely, during the ten week period I easily researched over 100 articles relating to the subject of research. We were able to design a method for examining biological material of mutual interest. The elements of design involved research.

5. Relations with colleague satisfactory? Yes - 98 No - 3 If no, why?
Due to staffing and budget problems, they were too busy to interact as much as we would have liked. There seemed to be difficulty in getting adequate instrumentation. Pressure transducers were damaged beyond repair during calibration thus scrapping the planned experiments. I was placed in a situation where I necessarily had to contend with the "evaluative criticisms" of an engineer whom I can now say in retrospect was only pretending to be a knowledgeable scientist on the research subject, and also a senior Air Force Officer whom unfortunatley has a very unhealthy disrespect for analytical endeavor of any kind.

6. Suggestions for Improvement?
Relations with research colleagues can be improved in two ways: first, the incoming faculty fellow should always be put into direct communication with an individual who has the best interests of the host research center foremost in his own mind and who is also bonafidely knowledgeable as to the role that an "outsider" such as the Fellow can play in providing a new perspective on relevant technical problems currently being encountered by the center; second, the Faculty Fellow should be given the benefit of the doubt as to whether or not he sincerely does want to make a contribution to the total team effort, rather than to make the Fellow feel that the only way he can contribute is if he does exactly what he is told to do and only what he is told to do -- nothing more and nothing less. Provide lab with earlier notice as to who is assigned. Additional staff would allow more time for research as opposed to administration.

7. Afforded adequate facilities? Yes - 94 No - 7

8. Accomplishment in ten weeks? More than expected - 14
Less than expected - 18
About what expected - 69

9. Will you continue this or related research efforts? Yes - 97 No - 4

10. Asked to present seminars? Yes - 51 No - 50

11. Asked to participate in meetings? Yes - 54 No - 47

12. Traveled on behalf of laboratory? Yes - 11 No - 90

13. Participated in "Special" meetings? Yes - 8 No - 93

14. Other comments on extra activities?
Enjoyed the tour of the lab (base?) arranged by the Air Force and the dinner arranged by SCEEE. It would be intellectually stimulating if each participant in the summer faculty program could present a 15 minute mini-seminar to discuss the project on which they are working. Open invitation to attend meetings, lectures, and other labs was much appreciated. I would have enjoyed meeting the 5 other SCEEE researchers at my lab. Such a meeting was never scheduled by the Director's Office.

5.

Technically Challenging?	A - 64	B - 33	C - 4	D - 0
Future Research Opportunity?	A - 76	B - 20	C - 3	D - 2
Professional Association?	A - 60	B - 30	C - 9	D - 2
Enhancement of my academic qualifications?	A - 46	B - 36	C -16	D - 3
Enhancement of my research qualificaions?	A - 62	B - 31	C - 7	D - 1
Overall value?	A - 70	B - 29	C - 2	D - 0

B. ADMINISTRATIVE ASPECTS

1. First hear about program? Colleague - 28, Advertisement - 14,
Air Force - 15, Direct Mail - 44

2. Decisive aspect of application?

Area of possible future research funding - 31, good research opportunity -42 opportunity to work with USAF - 21, Location - 4, Financial support - 3

3. Commitment to program a problem? Yes - 14 No - 87 If yes, explain? Make decision regarding applicants earlier. Announce program earlier.

4. Program information satisfactory? Yes - 73 No - 28

5. Problems in domestic aspects? Yes - 25 No - 76 If yes, explain?
Locating suitable housing was a problem. We had trouble establishing a local checking account and getting merchants to accept our checks. Apparently they have been badly "burned" by the transient population near the base. Housing difficult suggest equivalent of TDY orders be cut to allow VOQ housing. Forward list of housing accommodations highly rated by former SCEEE faculty.

6. Stipend level? Meager - 24 Adequate - 69 Generous - 8

7. Preprogram visit? Not worth expense - 2 Convenient - 28 Essential - 64 N/A - 7

8. Housing information? VOQ - 15 Apartment - 45 Other - 41

9. Mailing list suggestions? Mailing list suggestions have been tabulated for future use.

10. Addition of Graduate Student Program increased effectiveness of program? Yes - 74 No - 8

11. Did a Student work with you? Yes - 41 No - 59 Comments on Graduate Student Support on summer research?
It was very helpful considering I was doing experimental work. My graduate student was beneficial in so many ways and provided someone to just share the research problem with. Extra hands and minds are always of value on research projects if they are used effectively. Outstanding! Although I did not have a graduate assistant, I feel that such an assistant would be helpful in conducting experiments, gathering and reducing data. This would allow acceleration of the research time involved and would expedite research objectives. The assistance of the graduate student aided in 1) development of the research project, 2) completion of comprehensive annotated bibliography, 3) preliminary information for computer storage and retrieval and 4) additional follow-on research.

12. Encourage or Discourage expansion of Student program? Encourage - 65 Discourage - 9

13. Program administration overall rating? Poor - 0 Fair - 2 Good - 35 Excellent - 65

14. A. Strong Points of the Program?
Challenging and interesting project, opportunity to work with Air Force personnel involved in research, opportunity to work with graduate student. Good balance between formal (contract, reporting, accounting) and informal (contact with SAM colleagues, definition of task) parts of program. The topics of study are genuine research problems in the health sciences. The facilities, computer, library, etc., are vastly superior to the ones at my university. Opportunity for a mini-sabbatical, encourages shifts in research direction. Possibility of further funding. Ability to do one's own research with support.

14. B. Weak Points of the Program?
I had trouble fitting 10 weeks into my faculty and professional responsibilities. Strengthen recruitment of minority faculty. The stipend seems quite low. This summer rate pays at a rate even below university compensation, which is already quite low. Too inflexible, fellow seems to have to change his interests to meet those of the Air Force. Selection procedure and assignment of people to branche mine worked out well, but it seemed sort of random. Delays in receiving compensation.

15. Has this been a fruitful, worthwhile, constructive experience?
Yes - 100 No - 1

APPENDIX 1.C

RESEARCH COLLEAGUE'S QUESTIONNAIRE & REPLY SUMMARY

QUESTECH.1

1983 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY PARTICIPANT'S RESEARCH COLLEAGUE)

Name_____Title_____
Division/Group_____Laboratory_____
Name of Participant_____

A. TECHNICAL ASPECTS

1. Did you have personal knowledge of the Associate's capabilities prior to arrival at work site? YES____NO____ If yes, where/how/what?_____

2. Was the Faculty Associate prepared for his project? YES____NO____

3. Please comment on his preparedness/competency/scope/depth of knowledge of subject area:

4. Please comment on the Associate's cooperativeness, diligency, interest, etc._____

5. In your opinion, has his participation in this summer program contributed to an increase in the Associate's potential to perform research? YES____NO____. Comments:_____

6. Did work performed by the Associate contribute to the overall mission/program of your laboratory? YES____NO____ If yes, how?_____

7. Would you classify the summer effort under the SFRP as research? YES___NO___.
Comment:_____

8. Was a Graduate Student assigned to your group this summer? YES___NO___.
If so, did this enhance the research productivity? YES___NO___.
Was it an administrative burden? YES___NO___.

9. Were your relations with the Associate satisfactory from a technical point of view? YES____NO____. Suggestions as to how they might be improved:_____

COLLEAGUE QUESTIONNAIRE (Page 2 of 3)

10. Do you think that by having a Faculty Associate assigned to your group, others in the group benefited and/or were stimulated by his presence? YES___NO___.
Comments:_____

_____

11. Do you feel that the introduction to each other, together with the summer work experience and performance could form a sound basis for continuation of effort by Associate at his home institute? YES___NO___. If yes, how?_____

_____

If no, why not?_____

_____

12. One of the objectives of this program is to identify sources of basic research capability and availability to the USAF. On a scale of A to D, how effective to you think this program will be in that respect? (A high, D low):

A B C D

13. Also, please evaluate (A high, D low):

Opportunity to stimulate group activity	A	B	C	D
Professional association	A	B	C	D
Program administration	A	B	C	D

COLLEAGUE QUESTIONNAIRE (Page 3 of 3)

B. ADMINISTRATIVE ASPECTS

1. When did you first hear of this program?_____

_____

2. Were you involved in the screening and prioritizing of the faculty applicants for your lab? YES___NO____. If yes, do you have any suggestions for improvement of the procedures used?_____

_____

3. How do you rate the importance of the expense-paid pre-program visit to the work site? Not worth expense___Convenient___Essential____. Please add any comments:_____

_____

4. Considering the calendar "window" of ten weeks (limited by varying college and university schedules), please comment on the program length. Were you as a team able to accomplish more than____, less than____, about what you expected____? Comments:_____

_____

5. Would you desire another Faculty Associate to be assigned to you and/or your group/division? YES___NO____. If no, why not?_____

_____

6. Would you desire additional Graduate Students in this program? YES___NO____.

7. Should the Graduate Students continue to be assigned to research <u>with</u> the Summer Research Faculty Member? YES___NO____.

8. Should Graduate Students also be assigned <u>without</u> Summer Research Faculty supervision? YES___NO____.

9. Other remarks:_____

_____

_____

_____

_____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY
(Research Colleague)

A. TECHNICAL ASPECTS

1. Did you have personal knowledge of Associates' capabilities?
Yes - 52 No - 33

2. Was Associate prepared? Yes - 83 No -2

3. Comments on preparedness, etc. in subject area?

Became immediately involved. After short familiarzation period he was able to apply background to new area. Was very well prepared. Was working independently in a few days. Outstanding. Very competent. Well planned in advance. Indepth knowledge. Was able to accurately assess his capability. More knowledge than the scope of the subject experiment required. A perfect match to the required work. Quickly assimilated ideas. Totally unfamiliar with the specifics of this research area other than that which he received from me. Very limited prior experience. Was adequately prepared to meet objective of work. Approach was very good and identified key research areas to be explored. Knowledge of statistical procedures was very good, extremely confident of his abilities.

4. Comments on cooperativeness?

Very flexible. Energetic and eager to achieve. Hard working. Totally cooperative and strove to provide the most professional product possible. Superb. Very enthusiastic about the problem. He combined his outstanding command of the subject with excellent modivation. Excellent in all aspects, fully satisfactory. A high interest in his work. Determined to do an outstanding job. Very dedicated to his work. Showed genuine interest and good academic approach. Completed extra work well beyond what was normally required always willing to assist others in the group. Very cooperative and self-starter. His positive attitude made him a pleasure to work with. Very industrious. Extremely helpful in sharing his expertise.

5. Increase in Associates' research potential? Yes - 83 No -1

6. Did work performed contribute to overall laboratory mission?
Yes - 83 No -1

7. Would you classify the summer effort as research? Yes - 76 No -8

8. Graduate Student assigned to group this summer? Yes -43 No -41
Enhance research? Yes - 43 No -0
Administrative burden? Yes -5 No -38

9. Were technical relations with associate satisfactory? Yes -84 No -1

10. Did Associate stimulate others? Yes -82 No -3

11. Will summer experience and performance form basis for continuation effort by Associate? Yes -77 No -7

12. Effectiveness in respect to capabilities and availability to USAF?
A -44 B -35 C -4 D -0

13. Opportunity to stimulate group activity? A -53 B -27 C -3 D -0
Professional association? A -62 B -19 C -2 D -0
Program administration? A -33 B -45 C -3 D -0

B. ADMINISTRATIVE ASPECTS

1. When did you first hear of program?
1975 - 2 1976 - 2 1977 - 22 1978 - 3 19/9 - 5
1980 - 4 1981 - 8 1982 - 11 1983 - 12

2. Involved in screening and prioritizing? Yes -50 No -32

3. Expense paid pre-program visit? Not worth expense -1 Convenient -15
Essential -64

4. Please comment on program length? How much accomplished? More than -15
Less than -13 What expected -56

5. Want another participant? Yes -84 No -0

6. Additional Graduate Students? Yes -53 No -15

7. Should Graduate Students continue to be assigned with faculty member?
Yes -60 No -3

8. Should Graduate Students also be assigned without faculty supervision?
Yes -35 No -32

9. Other comments?

Prime applications pre-screened for my division were distributed to late and to the wrong person; so I didn't see them until long after final selections were made. Good Program-valuable to us and the faculty associate, we expect good improvements in our project area due to their research. Our experience with program over the past several years has been excellent. Very well administrated locally. The number of positions available in this program are very limited. It appears there is more demand from both faculty and associates as well as the laboratories. Increasing the number of participants is good from both points of view. The SFRP worked very well and opened the door for a continuing effort with the associate and the University, I think the SRF people should be paid more than they are, Its hard to get good people to work for $100/day. I feel that there was a little too much emphasis on the formal final report. Due to this emphasis (no report-no pay), the major concern near the end of the time period, was with the report and not the substance of the work. Associates should be selected early in the year to permit a more convenient pre-program visit.

APPENDIX 1.D

LABORATORY REPRESENTATIVE'S QUESTIONNAIRE & REPLY SUMMARY

QUESTLAB.1

1983 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY LABORATORY REPRESENTATIVE)

Laboratory/Center_____

Name_____

1. How do you rate the correspondence, verbal and telephone communication, and other aspects concerning program administration? Poor___Average___Good___Excellent___.
How could it be improved?_____
_____

2. The participant selection process is two-fold: academic and technical. Did you have sufficient time to conduct an adequate evaluation of applications? YES___NO___.
Comments:_____

3. Was the number of faculty associates assigned to your organization satisfactory? YES___NO___. If not, how many would be desired?_____
How do you determine this number?_____
_____

4. Please rate the expense-paid pre-program visit:
Not worth the expense___Convenient___Essential___.

5. In your opinion is the ten-week time period an optimum length of time to obtain the objective of providing the introduction to each other (associates and laboratory/center personnel and programs)? YES___NO___. If no, what length would it be?_____
Other comments:_____
_____

6. Did your laboratory/center establish a seminar program (or other means) to "tap" the faculty associate's academic knowledge (other than his research assignment)?
YES___NO___. If yes, give description and evaluation._____
_____
_____

7. Did the laboratory/center conduct a general briefing, tour, and/or other formal means of welcome and introduction for the associate(s) assigned to your organization?
YES___NO___.

8. Did you have a formal exit exercise for each associate (such as a final technical briefing presented to the organization management, a private interview, or other)?
YES___NO___.

LABORATORY REPRESENTATIVE QUESTIONNAIRE (Page 2 of 2)

9. In your opinion, what was the overall quality of this year's participants as measured by attitude, technical competence, work habits, production and meaningful research accomplishment?
[Note: These answers will be held confidential.]

List Name(s) Poor Average Excellent Superior

10. Do you believe the addition of the Graduate Student Program enhances the Summer Research Program? YES___NO___.

11. Was a student assigned under the Graduate Student Summer Support Program to your laboratory this summer? YES___NO___.
If so, was their participation productive? YES___NO___.

12. Please furnish any recommendations you may have on improving the Graduate Student segment of the program._____
_____
_____
_____

13. Please furnish any other comments or suggestion to improve the program in future years._____
_____
_____
_____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY
(Laboratory Representative)

1. Rate Correspondence? Poor - 0 Average - 0 Good - 5 Excellent - 13

2. Sufficient time for evaluation? Yes - 16 No - 2

3. Number of associates satisfactory? Yes - 10 No - 9

4. Rate pre-program visit? Not worth expense - 0 Convenient - 5
Essential - 13

5. Ten week period an optimum amount of time? Yes - 13 No - 5

6. Established seminar program? Yes - 8 No - 10

7. Conduct Briefing? Yes - 13 No - 5

8. Exit exercise? Yes - 13 No - 5

9. Quality of participants? Poor - 0 Average - 6 Excellent - 57
Superior - 31

10. Addition of Graduate Student Program enhances SFRP Program?
Yes - 17 No - N/A - 1

11. Was student assigned to your laboratory? Yes - 17 No - 1
Was their participation productive? Yes - 17 No - 0

12. Recommendations on improving Graduate Student segment of program?
Faculty student team that worked together before, no improvements necessary. We'd like them all back next year. Assignment of grad students allowed maximum utilization from faculty member. Program working well. Strongly endorse! Program was handled well for 2nd year, students had no complaints. Student should work with Professor with whom he was associated in normal school year for best results. Student should be allowed a pre-summer visit if not attached to an SFRP Participant.

13. Additional comments or suggestions?
Close contact/coordination between institutional representative and SCEEE is imperative. Program has worked well, SCEEE is to be commended for a well run program. It would be difficult to make suggestions for a better operation. Add two weeks to research period. Once again program was managed in a superior manner, we especially find the SCEEE staff to be outstanding professionals, excellent job in a difficult area.

APPENDIX II

A. Program Statistics

B. List of 1983 Participants

C. Participant Laboratory Assignments

1983 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

Conducted by
SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION, INC.

A. PROGRAM STATISTICS

1. Number of Air Force Installations (Laboratory/Centers) - 25

2. Applications Received (First Choice as Follows) - 462

APL	(W-PAFB)	- 24	HRL/FTD	(Williams)	- 11
AMRL	(W-PAFB)	- 45	HRL/PRD	(Brooks)	- 17
AD	(Eglin)	- 29	HRL/TTD	(Lowry)	- 21
AEDC	(Arnold)	- 10	LMDC	(Maxwell)	- 11
AL	(W-PAFB)	- 10	LC	(W-PAFB)	- 5
BRMC	(W-PAFB)	- 8	LMC	(Gunter)	- 3
ESMC	(Patrick)	- 0	ML	(W-PAFB)	- 27
ESD	(Hanscom)	- 17	RPL	(Edwards)	- 10
ESC	(Tyndall)	- 29	RADC	(Griffiss)	- 30
FDL	(W-PAFB)	- 27	RADC/ET	(Hanscom)	- 19
FJSRL	(USAFA)	- 27	SAM	(Brooks)	- 42
GL	(Hanscom)	- 17	WL	(Kirtland)	- 16
HRL/ASD	(W-PAFB)	- 7			

3. Number of Participants - 101

Number holding Doctorate Degree	96
Number holding Masters Degree	5
Number holding Professor Rank	24
Number holding Associate Professor Rank	41
Number holding Assistant Professor Rank	31
Number holding Instructor Rank	2
Number holding Chairman Rank	1
Other	3

4. Average Age of Participants - 41.7 years

5. Distribution of Participants Location

APL	(W-PAFB)	- 7	HRL/FTD	(Williams)	- 2
AMRL	(W-PAFB)	- 8	HRL/PRD	(Brooks)	- 2
AD	(Eglin)	- 7	HRL/TTD	(Lowry)	- 2
AEDC	(Arnold)	- 3	LMDC	(Maxwell)	- 2
AL	(W-PAFB)	- 5	LC	(W-PAFB)	- 1
BRMC	(W-PAFB)	- 2	LMC	(Gunter)	- 1
ESMC	(Patrick)	- 0	ML	(W-PAFB)	- 6
ESD	(Hanscom)	- 1	RPL	(Edwards)	- 3
ESC	(Tyndall)	- 5	RADC	(Griffiss)	- 6
FDL	(W-PAFB)	- 8	RADC/ET	(Hanscom)	- 2
FJSRL	(USAFA)	- 3	SAM	(Brooks)	-10
GL	(Hanscom)	- 6	WL	(Kirtland)	- 9
HRL/ASD	(W-PAFB)	- 1			

A. PROGRAM STATISTICS (Continued: page 2)

6. Disciplines Represented - 28

Aeronautics & Astronautics	- 1	Industrial & Ops. Engineering	- 1
Aerospace Engineering	- 2	Industrial Engineering	- 2
Applied Mechanics	- 1	Mathematics	- 10
Biology	- 3	Mechanical & Aerospace Eng.	- 1
Chemistry	- 7	Mechanical & Material Science	- 1
Chemical Engineering	- 2	Mechanical Engineering	- 15
Computer Science	- 1	Physical Education	- 1
Electrical Engineering	- 17	Physics	- 17
Electrical Eng./Computer Science	- 1	Physiology	- 2
Electrophysics	- 1	Psychology	- 6
Engineering	- 1	Special Education	- 1
Environmental Engineering	- 2	Statistics	- 2
Fluid Mechanics	- 1	Structural Engineering	- 1
Geology	- 1	Systems Engineering	- 1

7. Number of Colleges/Universities Represented - 74

Alabama, University of (2)
Alabama A & M (3)
Arizona, University of (2)
Arizona State University
Auburn University (3)
Bethany Nazarene College
Boston College
Bronx Community College
California State University
Cincinnati, University of (2)
Clemson University
Cornell University
Dayton, University of (4)
Delaware, University of
Del Mar College
Florida Institute of Tech.
Georgia Institute of Tech.
Hamilton College
Hampton Institute
College of the Holy Cross
Illinois Institute of Tech.
Iowa State University
Jackson State University
Kansas, University of
Kansas State University (2)
Lenoir Rhyne College
Louisiana State University
Lowell, University of (2)
Manhattan College
Southeastern Massachusetts Univ.
Meharry Medical College
Miami University
Miami, University of
Michigan, University of
Mississippi State University
Missouri, University of
New Mexico State University
North Carolina Central University
North Carolina, University of
Oberlin College
Ohio State University
Oklahoma State University
Old Dominion University (2)
Oregon State University
Pennsylvania State University (2)
Pittsburgh, University of
Purdue University
Rose-Hulman Institute of Tech.
Rust College
San Diego State University
Sam Houston State University
Slippery Rock State College
South Carolina State College
State University of New York (3)
Tennessee, University of
Univ. of Tennessee & Space Inst.
Texas A&M University
Texas Lutheran College
Texas Southern University
Texas Tech University (2)
Texas, University of (4)
Toledo, University of (2)
Trinity University
Tufts University
Utah State University (2)
Utah, University of
Vermont, University of
Virginia Military Institute
VPI & SU (4)
Wayne State University
West Virginia University
Wilberforce University
Wisconsin, University of
Wright State Univerity (4)

A. PROGRAM STATISTICS (Continued: page 3)

8. Number of States Represented - 30

Alabama
Arizona
California
Delaware
Florida
Georgia
Illinois
Indiana
Iowa
Kansas
Louisiana
Massachusetts
Michigan
Mississippi
Missouri
New Mexico
New York
North Carolina
Ohio
Oklahoma
Oregon
Pennsylvania
South Carolina
Tennessee
Texas
Utah
Vermont
Virginia
West Virginia
Wisconsin

B. LIST OF PARTICIPANTS

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Richard Anderson Professor University of Rolla Physics Department Rolla, MO 65401 (314) 341-4797	Degree: Ph.D., Physics, 1959 Specialty: Atomic and Molecular Physics and Optics Assigned: RADC/Griffiss
Dr. Richard Andrews Associate Professor University of Michigan Graduate School of Business Administration Ann Arbor, MI 48109 (313) 662-4106	Degree: Ph.D., Statistics, 1973 Specialty: Finite Population Sampling and Data Assigned: LMC
Dr. Francesco Bacchialoni Associate Professor University of Lowell Electrical Engineering Department Lowell, MA 01854 (617) 452-5000	Degree: Doctor in Engineering, 1946 Specialty: Control Systems, Digital Signal Processing, Microprocessors Assigned: GL
Dr. Pradip Bakshi Research Professor Boston College Physics Department Chestnut Hill, MA 02167 (617) 969-0100	Degree: Ph.D., Theoretical Physics, 1962 Specialty: Theoretical Plasma Physics, Quantum Theory, Mathematical Physics Assigned: GL
Dr. Daniel Barr Assistant Professor Virginia Military Institute Electrical Engineering Department Lexington, VA 24450 (703) 463-6236	Degree: Ph.D., Electrical Engineering, 1978 Specialty: Fuzing, Millimeter Waves, Superconductivity, Semiconductors Assigned: AD
Mr Ernesto Barreto Senior Research Associate State University New York Atomic Science Research Center Albany, NY 12309 (518) 457-4930	Degree: MS, Physics, 1960 Specialty: Electrostatics, Electrical Discharges, Combustion Assigned: FDL

B. List of Participants (continued: page 2)

Dr. Stanley Bashkin
Professor
Univeriaty of Arizona
Physics Department
Tucson, AZ 85711
(602) 626-2322

Degree: Ph.D., Physics, 1950
Specialty: Accelerator-based Atomic Physics, Atomic Spectroscopy
Assigned: GL

Dr. Joseph Baumgarten
Professor
Iowa State University
Mechanical Engineering Department
Ames, Iowa 50010
(515) 294-1380

Degree: Ph.D., Mechanical Engineering, 1958
Specialty: Vibrations, Machinery Dynamics
Assigned: AEDC

Dr. Michael Becker
Associate Professor
University of Texas
Electrical Engineering Department
Austin, TX 78712
(512) 471-3628

Degree: Ph.D., Electrical Engineering, 1973
Specialty: Lasers, Laser Material Interactions, Nonlinear Optics
Assigned: WL

Dr. Henry Bertoni
Professor
Polytechnic Institute of NY
Electrophysics Department
Brooklyn, NY 11201
(212) 643-4832

Degree: Ph.D., Electrophysics, 1967
Specialty: Ultrasonic and Electromagnetic Propagation and Diffraction
Assigned: RADC

Dr. Willie Bragg
Program Manager
University of Cincinnati
College of Education
Cincinnati, OH 45221
(513) 475-4542

Degree: Ph.D., Special Education, 1979
Specialty: Mental Retardation, Early Childhood Education, Speech and Hearing
Assigned: SAM

Dr. M. Quinn Brewster
Assistant Professor
University of Utah
Mechanical Engineering Department
Salt Lake City, Utah 84106
(801) 581-7105

Degree: Ph.D., Mechanical Engineering, 1981
Specialty: Thermal Radiation in Particulate Media
Assigned: RPL

Mr Louis W. Buckalew
Associate Professor
Alabama A&M University
Psychology Department
Normal, AL 35762
(205) 322-2489

Degree: MS, Psychology, 1969
Specialty: Drug Response Factors, Human Engineering, Alcohol
Assigned: SAM

B. List of Participants (continued: page 3)

Dr. Chester Canada
Associate Professor
Oklahoma State University
Computer Science Department
Stillwater, OK 74078
(409) 624-5724

Degree: Ph.D., Physics, 1968
Specialty: Materials Response to Dynamic Loading
Assigned: ESC

Dr. Jack Chatelain
Professor
Utah State University
Physics Department
Logan, UT 84321
(801) 750-2936

Degree: Ph.D., Physics, 1957
Specialty: Theoretical Physics
Assigned: WL

Mr. John Cicero
Instructor
Illinois Institute of Technology
Electrical Engineering Department
Chicago, IL 60532
(312) 567-3400

Degree: MSEE, Electrical Engineering, 1978
Specialty: Microprocessor Hardware and Software Design. Multiple Access Satellite Network Protocols
Assigned: HRL/W

Dr. Frank Collins
Professor
University of Tennessee
Aerospace Engineering Department
Tullahoma, TN 37388
(615) 455-0631

Degree: Ph.D., Mechanical Engineering 1968
Specialty: Physical Fluid Dynamics
Assigned: AEDC

Dr. Richard Conte
Assistant Professor
Manhattan College
Mechanical Engineering Department
Bronx, NY 10471
(212) 920-0148

Degree: Ph.D., Mechanical Engineering,
Specialty: Heat Transfer, Numerical Computer Analysis, Solar Energy
Assigned: APL

Dr. Billy Covington
Assistant Professor
Sam Houston State University
Physics Department
Huntsville, TX 77340
(713) 294-1606

Degree: Ph.D., Physics, 1978
Specialty: Solid State Physics
Assigned: ML

Dr. Peter Crane
Assistant Professor
University of Pittsburgh
Psychology Department
Johnstown, PA 15905
(814) 266-9661

Degree: Ph.D., Experimental Psychology, 1979
Specialty: Cognitive Psychology/ Human Factors
Assigned: AMRL

B. List of Participants (continued: page 4)

Dr. Carolyn Crouch
Associate Professor
University of Alabama
Computer Science Department
University, AL 35486
(205) 348-6363

Degree: Ph.D., Computer Science, 1971
Specialty: Information Storage and Retrieval, Operating Systems and Systems Programming
Assigned: AD

Dr. Donald Crouch
Associate Professor
University of Alabama
Computer Science Department
University, AL 35486
(205) 348-6363

Degree: Ph.D., Systems Engineering, 1972
Specialty: Design of Languages, DBMS, Information Systems
Assigned: AD

Dr. Carol Deakyne
Assistant Professor
College of The Holy Cross
Chemistry Department
Worcester, MA 01610
(617) 793-3367

Degree: Ph.D., Theoretical Chemistry, 1976
Specialty: Applications of Molecular Orbital Theory
Assigned: AD

Dr. Terry L. Dickinson
Visiting Professor
Old Dominion University
Psychology Department
Norfolk, VA 23508
(804) 440-4235

Degree: Ph.D., *Psychology*; 1968
Specialty: Industrial/Organizational Psychology and Psychometrics
Assigned: HRL/B

Dr Fred E. Domann
Associate Professor
University of Wisconsin
Physics Department
Platteville, WI 53818

Degree: Ph.D., Physics, 1975
Specialty: Surface Science
Assigned: WL

Dr. James W. Dooley
Assistant Professor
Wright State University
HPER Department
Dayton, OH 45435
(513) 873-3259

Degree: Ph.D., Physical Education, 1979
Specialty: Physical Education
Assigned: SAM

Dr. George R. Doyle
Associate Professor
University of Dayton
Mech. Engineering Department
Dayton, OH 45469
(513) 229-2835

Degree: Ph.D., Mechanical Engineering, 1973
Specialty: Dynamics
Assigned: APL

B. List of Participants (continued: page 5)

Dr. Jonathan C. Dutton
Assistant Professor
Texas A&M University
Department of Mech. Engineering
College Station, TX 77834
(713) 845-5011

Degree: Ph.D., Mechanical Engineering, 1979
Specialty: Fluid Mechanics
Assigned: APL

Dr. John Eoll
Assistant Professor
Lenoir-Rhyne College
Physics Department
Hickory, NC 28601
(704) 328-1741

Degree: Ph.D., Astrophysics, 1976
Specialty: Radiaton Transport, Fluid Dynamics, Nuclear Weapons Effects
Assigned: WL

Dr. Amir Faghri
Associate Professor
Wright State University
Engineering Department
Dayton, OH 45435
(513) 873-2501

Degree: Ph.D., Mechanical Engineering, 1976
Specialty: Heat Transfer, Fluid Mechanics, Engineering Analysis
Assigned: APL

Dr. Hans Fellner
Associate Professor
Slippery Rock State College
Physics Department
Slippery Rock, PA 16057
(412) 794-7781

Degree: Ph.D., Physics, 1973
Specialty: Light Scattering, Liquid Crystals, Phase Transitions
Assigned: AMRL

Dr. Robert Foley
Assistant Professor
Virginia Poly. Inst.
IEOR Department
Blacksburg, VA 24061
(703) 961-7112

Degree: Ph.D., Industrial and Operation Engineering, 1979
Specialty: Operations Res., Queueing Network Theory, Stochastic Processes
Assigned: HRL/WP

Dr. Eddie Fowler
Associate Professor
Kansas State University
Electrical Engineering Department
Manhattan, KS 66506
(913) 532-5600

Degree: Ph.D., Electrical Engineering, 1969
Specialty: Modeling and Simulation/ Speech Recognition and Vocal Tract Modeling
Assigned: WL

Dr. Victor S. Frost
Assistant Professor
University of Kansas
Lawrence, KS 66045
(913) 864-4615

Degree: Ph.D., Electrical Engineering, 1982
Specialty: Communications and Signal Processing
Assigned: RADC

B. List of Participants (continued: page 6)

Dr. Patrick Garrett
Professor and Chairman
University of Cincinnati
Electrical Engineering Department
Cincinnati, OH 45221
(513) 465-4651

Degree: Ph.D., Electrical Engineering, 1970
Specialty: Computer Interface Design for Data Acquisition and Digital Control
Assigned: AL

Dr. Richard Gill
Assistant Professor
Wright State University
Engineering Department
Dayton, OH 45435
(513) 873-2701

Degree: Ph.D., Mechanical Engineering, 1981
Specialty: Human Factors Engineering
Assigned: AMRL

Dr. John Giolma
Assistant Professor
Trinity University
Science Department
San Antonio, TX 78209
(512) 736-7563

Degree: Ph.D., Electrical Engineering, 1975
Specialty: Signal Processing, Modeling and Simulation
Assigned: SAM

Dr. Samuel Green
Associate Professor
Auburn University
Psychology Department
Auburn, Alabama 36830
(205) 826-4412

Degree: Ph.D., Psychology, 1975
Specialty: Statistics, Measurement Theory, Industrial Psychology
Assigned: LMDC

Dr. Arthur Gutman
Associate Professor
Florida Inst. of Technology
Psychology Department
Melbourne, Fla 32901
(305) 723-3701

Degree: Ph.D., Psychology, 1975
Specialty: Experimental and Bio-psychology; Computer Applications
Assigned: HRL/L

Dr. Terry Herdman
Associate Professor
Virginia Tech
Mathematics Department
Blacksburg, VA 24060
(703) 961-5279

Degree: Ph.D., Mathematics, 1974
Specialty: Volterra Integral Equations Ordinary and Functional Differential Equations
Assigned: FDL

Dr. Stuart Hirschfield
Assistant Professor
Hamilton College
Mathematics Department
Clinton, NY 13323
(315) 859-4136

Degree: Ph.D., Computer and Information Sciences, 1978
Specialty: Artificial Intelligence, Software Engineering
Assigned: RADC

B. List of Participants (continued: page 7)

Dr. Craig Holt
Assistant Professor
Tufts University
Electrical Engineering Department
Medford, MA
(617) 628-5000

Degree: Ph.D., Electrical Engineering, 1981
Specialty: Distributed Digital Systems Fault Tolerance
Assigned: ESD

Dr. Kathleen Howell
Assistant Professor
Purdue University
Aeronautics & Astronautics Dept.
West Lafayette, IN 47906
(317) 494-5786

Degree: Ph.D., Aeronautics and Astronautics, 1983
Specialty: Orbit Mechanics, Spacecraft Dynamics
Assigned: RPL

Dr. Gwendolyn Howze
Associate Professor
Texas Southern University
Biology Department
Houston, TX 77021
(713) 527-7005

Degree: Ph.D., Molecular Biology, 1974,
Specialty: Electron Microscopy and and Biochemistry of Cell Nuclei
Assigned: AMRL

Dr. Medhat Ibrahim
Professor
California State Univ., Fresno
Electrical Engineering Department
Fresno, CA 93612
(209) 294-4020

Degree: Ph.D., Electrical Engineering, 1969
Specialty: Electromagnetic Systems and Control and Power Systems
Assigned: APL

Dr. Charles Ih
Professor
University of Delaware
Electrical Engineering Department
Newark, DE 19711
(302) 738-8173

Degree: Ph.D., Physics
Specialty: Optical Communication, Electro-Optics, Holography and Applications
Assigned: RADC

Dr. Gregory Jones
Associate Professor
Utah State University
Computer Science Department
Logan, UT 84322

Degree: Ph.D., Mathematics, 1972
Specialty: Computability, Software Engineering, Operating Systems
Assigned: HRL/L

Dr. Amir Karimi
Assistant Professor
University of Texas San Antonio
Engineering Department
San Antonio, TX 78230
(512) 691-4490

Degree: Ph.D., Mechanical Engineering, 1982
Specialty: Thermal Sciences - Condensation Heat Transfer, Metastable Thermodynamics
Assigned: SAM

B. List of Participants (continued: page 8)

Dr. Jerome Keating
Assistant Professor
University of Texas SA
Mathematics Department
San Antonio, TX 78285
(512) 691-4452

Degree: Ph.D., Mathematical Sciences, 1980
Specialty: Mathematical Statistics
Assigned: SAM

Dr George Kirby
Assistant Professor
West Virginia University
Mech. & Aerospace Eng. Department
Morgantown, West Virginia 26505
(304) 293-4111

Degree: Ph.D., Engineering Mechanics, 1982
Specialty: Experimental Mechanics, Fracture Mechanics, Vibrations
Assigned: FDL

Mr. James Kirkpatrick
Associate Professor
Alabama A&M University
Mathematics Department
Normal, Alabama 35762
(205) 859-7239

Degree: MS, Physics, 1981
Specialty: Applied Mathematics
Assigned: AEDC

Dr. Stephen Krause
Assistant Professor
Arizona State University
Mech. & Aerospace Eng. Department
Tempe, AZ 85287
(602) 965-2050

Degree: Ph.D., Engineering Materials, 1981
Specialty: Electron Microscopy, X-Ray Diffraction, & Properties of Polymers
Assigned: ML

Dr. Madakasira Krishna
Associate Professor
South Carolina State University
Computer Science Department
Orangeburg, SC 29117
(803) 536-7120

Degree: Ph.D., Fluid Mechanics, Numerical Analysis, Computer Science
Specialty: Computational Fluid Mechanics
Assigned: FDL

Dr. William Kyros
Associate Professor
University of Lowell
Mechanical Engineering Department
Lowell, Mass 01854
(617) 459-9357

Degree: Ph.D., Education, 1980
Specialty: Mechanical Behavior of Materials
Assigned: ML

Dr. David C. Lai
Professor
University of Vermont
Comp. Sci. & E.E. Department
Burlington, VT 05405
(802) 656-3330

Degree: Ph.D., Electrical Engineering, 1960
Specialty: Signal Processing and Pattern Recognition
Assigned: RADC

B. List of Participants (continued: page 9)

Dr. Stella Lawrence
Professor
Bronx Community College, CUNY
Electrical Engineering Department
Bronx, NY 10467
(212) 220-6044

Degree: MS, Mathematics, 1951
Specialty: Interference Tolerant Communications Systems, Coding and Data Compression, Fault Tolerant Computers
Assigned: AL

Dr. David Lee
Associate Professor
University of Dayton
Management Department
Dayton, OH 45409
(513) 229-4249

Degree: Ph.D., Industrial Engineering, 1972
Specialty: Operations Management
Assigned: BRMC

Dr. Stanley Lee
Professor
Kansas State University
Industrial Engineering Department
Manhattan, KS 66506
(913) 532-5606

Degree: Ph.D., Chemical Engineering, 1962
Specialty: Systems Engineering, Optimization and Control, Modeling
Assigned: LC

Dr. Mark Lewittes
Assistant Professor
University of Texas SA
Engineering Department
San Antonio, TX 78285
(512) 691-4490

Degree: Ph.D., Electrical Engineering 1982
Specialty: Laser Applications
Assigned: SAM

Dr. Sigurd Lillevik
Assistant Professor
Oregon State University
Elec. & Comp. Engineering Dept.
Corvallis, OR 97331
(503) 758-5318

Degree: Ph.D., Electrical Engineering, 1978
Specialty: Multiprocessor Computers
Assigned: AL

Dr. Stephen Lin
Associate Professor
North Carolina Central University
Chemistry Department
Durham, NC 27707
(919) 683-6463

Degree: Ph.D., Physical Chemistry, 1970
Specialty: Molecular Spectroscopy, Photoelectron Spectroscopy, Computer Simulation of Protein Folding
Assigned: ESC

Dr. Leonard Lion
Assistant Professor
Cornell University
Environment Engineering Dept.
Ithaca, NY 14853
(607) 256-7571

Degree: Ph.D., Environmental Engineering, 1980
Specialty: Chemistry of Water and Wastewater, Applied Aquatic Chemistry
Assigned: ESC

B. List of Participants (continued: page 10)

Dr. Daryl Logan
Associate Professor
Rose-Hulman Institute
Civil Engineering Department
Terre Haute, IN 47803
(812) 877-1151

Degree: Ph.D., Structural Engineering, 1976
Specialty: Structural Design/ Mechanics
Assigned: ESC

Dr. Charles Mastin
Professor
Mississippi State University
Mathematics & Statistics Dept.
Mississippi State, MS 39762
(601) 325-3414

Degree: Ph.D., Mathematics, 1969
Specialty: Computational Fluid Dynamics
Assigned: AD

Dr. Tapaz Mazumdar
Associate Professor
Wright State University
Mathematics & Statistic Dept.
Dayton, OH 45435
(513) 873-2785

Degree: Ph.D., Mathematics, 1971
Specialty: Partial Differential Equations and Related Functional Analysis
Assigned: FDL

Dr. Michael McKee
Assistant Professor
Auburn University
Chemistry Department
Auburn, Alabama 36849
(205) 862-4043

Degree: Ph.D., Chemistry, 1977
Specialty: Inorganic Chemistry, Theoretical Chemistry
Assigned: FJSRL

Dr. Robert McLauchlan
Assistant Professor
Texas Tech University
Mechanical Engineering Dept.
Lubbock, TX 79423
(806) 742-3563

Degree: Ph.D., Mechanical Engineering 1978
Specialty: Fluid-Structure (Acoustic) Interactions
Assigned: WL

Dr. Donald Michelsen
Assistant Professor
Virginia Tech
Chemical Engineering Department
Blacksburg, VA 24061
(703) 961-5157

Degree: Ph.D., Chemical Engineering, 1967
Specialty: Mass Transfer, Hazardous Waste Treatment
Assigned: ESC

Dr. George Miner
Associate Professor
University of Dayton
Physics Department
Dayton, OH 45469

Degree: Ph.D., Physics, 1965
Specialty: Magnetic Resonance, Transport Properties
Assigned: ML

B. List of Participants (continued: page 11)

Dr. Don Mittleman
Professor
Oberlin College
Mathematics Department
Oberlin, OH 44074
(216) 775-8385

Degree: Ph.D., *Mathematics*, 1951
Specialty: Applied Mathematics, ODE, Number Analysis, Geom.PDE,OR
Assigned: FDL

Dr. Charles Moseley
Associate Professor
Ohio State University Lima
Chemistry Department
Lima, OH 45804
(419) 228-2641

Degree: Ph.D., *Organic Chemistry*, 1967
Specialty: Organic Chemistry
Assigned: ML

Dr. *Dale Moses*
Associate Professor
San Diego State University
Aerospace & Engineering Mech. Dept.
San Diego, CA 92182
(619) 265-6074

Degree: Ph.D., Aerospace Engineering, *1981*
Specialty: Subsonic and Transonic Wind Tunnel Testing
Assigned: *FDL*

Dr. Randolph Moses
Instructor
Virginia Poly. Inst.
Electrical Engineering Dept.
Blacksburg, VA *24061*
(703) 961-5114

Degree: *MS, Electrical* Engineering,
Specialty: Digital Signal Processing
Assigned: RADC/Griffiss

Dr. James Mrotek
Associate Professor
Meharry Medical College
Physiology Department
Nashville, TN 37208
(615) 327-6288

Degree: Ph.D., Biology, 1973
Specialty: Physiological Response of Cultured Adrenal Cells to Stressors
Assigned: SAM

Dr. Frederick Nagle
Professor
University of Miami
Geology Department
Coral Gables, FL 33124
(305) 284-4254

Degree: Ph.D., Geology, 1966
Specialty: Field Mapping Geology Caribbean Geology, Minerology
Assigned: GL

Dr. Philip Olivier
Assistant Professor
Louisiana State University
Elec. & Comp. Engineering Dept.
Baton Rouge, LA *70803*
(504) 388-5241

Degree: Ph.D., Electrical Engineering, 1980
Specialty: Mathematical Systems Theory
Assigned: RADC

B. List of Participants (continued: page 12)

Dr. Albert Payton
Associate Professor
Hampton Institute
Chemistry & Phys. Sci. Dept.
Hampton, VA 23668
(804) 727 5609

Degree: Ph.D., Chemistry, 1976
Specialty: Organic Chemistry
Assigned: FJSRL

Dr David Pegg
Professor
University of Tennessee
Physics Department
Knoxville, TN 37916
(615) 974-5478

Degree: Ph.D., Physics, 1970
Specialty: Atomic Physics; Spectroscopy of Fast Moving Ion Beams, Lasers
Assigned: WL

Dr. Gerald Poje
Assistant Professor
Miami University
Zoology Department
Oxford, OH 45056
(513) 529-3624

Degree: Ph.D., Biology & Environmental Health Sciences, 1981
Specialty: Ecological Toxicology
Assigned: AMRL

Dr. L. Pujara
Associate Professor
Wilberforce University
Natural Science Department
Wilberforce, OH 45384
(513) 376-2911

Degree: Ph.D., Mathematics,1971
Specialty: Control Systems, Model Reduction, Mathematical Analysis
Assigned: AL

Dr. David L. Questad
Assistant Professor
Pennsylvania State University
Eng. Sci. & Mech. Department
University Park, PA 16802
(814) 863-2367

Degree: Ph.D., Mechanics & Material Sciences, 1981
Specialty: Polymer Science and Engineering
Assigned: RPL

Dr. Dallas Russell
Professor
Auburn University
Electrical Engineering Dept.
Auburn, AL 36849
(205) 826-4330

Degree: Ph.D., Electrical Engineering, 1975
Specialty: Multivariable Control Systems
Assigned: AD

Dr. Herman Senter
Associate Professor
Clemson University
Mathematical Sciences Dept.
Clemson, SC 29631
(803) 656-3434

Degree: Ph.D., Mathematics, 1973
Specialty: Mathematics, Statistics
Assigned: HRL/B

B. List of Participants (continued: page 13)

Dr. M. Paul Serve
Professor
Wright State University
Chemistry Department
Dayton, OH 45435
(513) 873-2855

Degree: Ph.D., Organic Chemistry, 1965
Specialty: Organic Chemistry Synthesis, Toxicology, Drug Chemistry
Assigned: AMRL

Dr. Robert Sigman
Senior Research Engineer
Georgia Institute of Technology
Aerospace Engineering Department
Atlanta, Georgia 30332
(404) 894-3041

Degree: Ph.D., Aerospace Engineering, 1970
Specialty: Computational Fluid Mechanics, Aeroacoustics, Combustion
Assigned: AD

Dr. Bruce Simon
Associate Professor
University of Arizona
Aero & Mech. Engr. Department
Tucson, AZ 85712
(602) 626-3752

Degree: Ph.D., Mechanical Engineering, 1972
Specialty: Theoretical Mechanics
Assigned: AMRL

Dr. William Squires
Assistant Professor
Texas Lutheran College
Biology Department
Sequin, TX 78155
(512) 379-4161

Degree: Ph.D., Exercise Physiology, 1979
Specialty: Biology
Assigned: SAM

Dr. James Steelman
Associate Professor
New Mexico State University
Electrical Engineering Dept.
Las Cruces, NM 88003
(505) 646-4111

Degree: Ph.D., Electrical Engineering, 1968
Specialty: Tracking Filters, Pointing Systems
Assigned: WL

Dr. James Strickland
Professor
Texas Tech University
Mechanical Engineering Dept.
Lubbock, TX 79409
(806) 742-3563

Degree: Ph.D., Mechanical Engineering, 1973
Specialty: Thermal Fluid Sciences
Assigned: FJSRL

Dr. Timothy Su
Associate Professor
Southeastern Mass University
Chemistry Department
North Dartmouth, MA 02747
(617) 999-8235

Degree: Ph.D., Physical Chemistry, 1971
Specialty: Ion-Molecule Reactions, Gas Kinetics, Atmospheric Chemistry
Assigned: GL

B. List of Participants (continued: page 14)

Dr. Patrick Sweeney
Associate Professor
University of Dayton
Mechanical Engineering Dept.
Fairborn, OH 45324
(513) 229-2238

Degree: Ph.D., Mechanical Engineering, 1977
Specialty: OPS Research, Modeling
Assigned: ML

Dr. Paul Szydlik
Professor
State University of New York
Physics Department
Plattsburgh, NY 12901
(518) 564-2048

Degree: Ph.D., Physics, 1964
Specialty: Theoretical and Computational Physics; Solar Energy
Assigned: APL

Dr. Enoch Temple
Associate Professor
Alabama A&M University
Math Department
Huntsville, AL
(205) 859-7239

Degree: Ph.D., Statistics, 1980
Specialty: Applied Statistics
Assigned: LMDC

Dr. William Terry
Associate Professor
University of Toledo
Industrial Engineering Department
Toledo, OH 43551
(419) 537-2412

Degree: Ph.D., Industrial Engineering, 1977
Specialty: Time Series, Statistics, Stochastic Processes, Computer Integrated Manufacturing
Assigned: BRMC

Dr. John Tomchick
Assistant Professor
Pennsylvania State University
Eng. Sci. & Mechs. Department
State College, PA 16801
(814) 237-1683

Degree: Ph.D., Physics, 1974
Specialty: Solid State-Semiconductors: Transport, Defects, Electron Phonon Int.
Assigned: AL

Dr. Arthur Thorbjornsen
Associate Professor
University of Toledo
Electrical Engineering Dept.
Toledo, OH 43606

Degree: Ph.D., Electrical Engineering, 1972
Specialty: Computer-Aided Circuit Design, Semiconductor device Modeling
Assigned: AL

Dr. Jon Tolle
Professor
University of North Carolina
Mathematics & Operations Research
Chapel Hill, NC 27514
(919) 962-8401

Degree: Ph.D., Mathematics, 1966
Specialty: Optimization, Numerical Analysis
Assigned: AD

B. List of Participants (continued: page 15)

Dr. George Trevino
Associate Professor
Del Mar College
Physics Department
Corpus Christie, TX
(512) 881-6213

Degree: Ph.D., Applied Mathematics, 1969
Specialty: Turbulence and Stochastic Processes
Assigned: WL

Dr. Keith Walker
Professor, Head
Bethany Nazarene College
Physics Department
Bethany, OK 73008
(405) 789-6400

Degree: Ph.D., Physics, 1971
Specialty: Atomic & Molecular Physics
Assigned: APL

Dr. Shih-sung Wen
Professor
Jackson State University
Psychology Department
Clinton, MS 39056
(601) 968-2371

Degree: Ph.D., Educational Psychology, 1971
Specialty: Cognitive Psychology, Learning, Psychological Measurement
Assigned: HRL/W

Dr. Kenneth Williamson
Associate Professor
Oregon State University
Civil Engineering Department
Corvallis, OR
(503) 754-2751

Degree: Ph.D., Environmental Engineering, 1973
Specialty: Environmental Engineering
Assigned: AMRL

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 1)

1983 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

AERO PROPULSION LABORATORY
(Wright-Patterson Air Force Base)
1. Dr. Richard Conte - Manhattan College
2. Dr. Gregory Doyle - University of Dayton
3. Dr. Jonathan Dutton - Texas A&M University
4. Dr. Amir Faghri - Wright State University
5. Dr. Medhat Ibrahim - California State Univeristy/Fresno
6. Dr. Paul Szydlik - State University of New York/Plattsburgh
7. Dr. Keith Walker - Bethany Nazarene College

AEROSPACE MEDICAL RESEARCH LABORATORY
(Wright-Patterson Air Force Base)
1. Dr. Peter Crane - University of Pittsburgh/Johnstown
2. Dr. Hans Fellner - Slippery Rock State College
3. Dr. Richard Gill - Wright State University
4. Dr. Gwendolyn Howze - Texas Southern University
5. Dr. Gerald Poje - Miami University
6. Dr. M. Paul Serve - Wright State University
7. Dr. Bruce Simon - University of Arizona
8. Dr. Kenneth Williamson - Oregon State University

ARMAMENT DIVISION
(Eglin Air Force Base)
1. Dr. Daniel Barr - Virginia Military Institute
2. Dr. Carolyn Crouch - University of Alabama
3. Dr. Donald Crouch - University of Alabama
4. Dr. Charles Mastin - Mississippi State University
5. Dr. Dallas Russell - Auburn University
6. Dr. Robert Sigman - Georgia Institute of Technology
7. Dr. Jon Tolle - University of North Carolina

ARNOLD ENGINEERING DEVELOPMENT CENTER
(Arnold Air Force Station)
1. Dr. Joseph Baumgarten - Iowa State University
2. Dr. Frank Collins - University of Tennessee Space Inst.
3. Dr. James Kirkpatrick - Alabama A&M University

AVIONICS LABORATORY
(Wright-Patterson Air Force Base)
1. Dr. Patrick Garrett - University of Cincinnati
2. Dr. Stella Lawrence - Bronx Community College
3. Dr. Sigurd Lillevik - Oregon State University
4. Dr. John Thomchick - Pennsylvania State University
5. Dr. Arthur Thorbjornsen - The University of Toledo

BUSINESS RESEARCH MANAGEMENT CENTER
(Wright-Patterson Air Force Base)
1. Dr. David Lee - University of Dayton
2. Dr. William Terry - University of Toledo

C. PARTICIPANT LABORATORY ASSIGNMENT (Continued: page 2)

EASTERN SPACE & MISSILE CENTER
(Patrick Air Force Base)

ELECTRONICS SYSTEMS DIVISION
(Hanscom Air Force Base)
1. Dr. Craig Holt - Tufts University

ENGINEERING & SERVICES CENTER
(Tyndall Air Force Base)
1. Dr. Chester Canada - Oklahoma State University
2. Dr. Stephen Lin - North Carolina Central University
3. Dr. Leonard Lion - Cornell University
4. Dr. Daryl Logan - Rose-Hulman Institute of Technology
5. Dr. Donald Michelson - Virginia Tech.

FLIGHT DYNAMICS LABORATORY
(Wright-Patterson Air Force Base)
1. Dr. Ernesto Barreto - State University of New York/Albany
2. Dr. Terry Herdman - Virginia Polytechnic Inst. & State Univ.
3. Dr. George Kirby - West Virginia University
4. Dr. Madakasira Krishna - South Carolina State College
5. Dr. Tapas Mazumdar - Wright State University
6. Dr. Don Mittleman - Oberlin College
7. Dr. Dale Moses - San Diego State University
8. Dr. L. Rai Pujara - Wilberforce University

FRANK J. SEILER RESEARCH LABORATORY
(USAF Academy)
1. Dr. Michael McKee - Auburn University
2. Dr. Albert Payton - Hampton Institute
3. Dr. James Strickland - Texas Tech. University

GEOPHYSICS LABORATORY
(Hanscom Air Force Base)
1. Dr. Francesco Bacchialoni - University of Lowell
2. Dr. Pradip Bakshi - Boston College
3. Dr. Stanley Bashkin - University of Arizona
4. Dr. Carol Deakyne - College of the Holy Cross
5. Dr. Frederick Nagle - University of Miami
6. Dr. Timothy Su - Southeastern Massachusetts University

HUMAN RESOURCES LABORATORY/ADVANCED SYSTEMS DIVISION
(Wright-Patterson Air Force Base)
1. Dr. Robert Foley - Virginia Polytechnic Inst. & State Univ.

HUMAN RESOURCES LABORATORY/FLYING TRAINING DIVISION
(Williams Air Force Base)
1. Dr. John Cicero - Illinois Institute of Technology
2. Dr. Shih-sung Wen - Jackson State University

C. PARTICIPANT LABORATORY ASSIGNMENTS (Continued: page 3)

HUMAN RESOURCES LABORATORY/PERSONAL RESEARCH DIVISION
(Brooks Air Force Base)
1. Dr. Terry Dickinson - Old Dominion University
2. Dr. Herman Senter - Clemson University

HUMAN RESOURCES LABORATORY/TECHNICAL TRAINING DIVISION
(Lowry Air Force Base)
1. Dr. Arthur Gutman - Florida Institute of Technology
2. Dr. Gregory Jones - Utah State University

LEADERSHIP & MANAGEMENT DEVELOPMENT CENTER
(Maxwell Air Force Base)
1. Dr. Samuel Green - Auburn University
2. Dr. Enoch Temple - Alabama A&M University

LOGISTICS COMMAND
(Wright-Patterson Air Force Base)
1. Dr. E. Stanley Lee - Kansas State University

LOGISTICS MANAGEMENT CENTER
(Gunter Air Force Base)
1. Dr. Richard Andrews - The University of Michigan

MATERIALS LABORATORY
(Wright-Patterson Air Force Base)
1. Dr. Billy Covington - Sam Houston State University
2. Dr. Stephen Krause - Arizona State University
3. Dr. William Kyros - University of Lowell
4. Dr. George Miner - University of Dayton
5. Dr. Charles Moseley - Ohio State University/Lima
6. Dr. Patrick Sweeney - University of Dayton

ROCKET PROPULSION LABORATORY
(Edwards Air Force Base)
1. Dr. M. Quinn Brewster - University of Utah
2. Dr. Kathleen Howell - Purdue University
3. David Questad - Pennsylvania State University

ROME AIR DEVELOPMENT CENTER
(Griffiss Air Force Base)
1. Dr. Richard Anderson - University of Rolla
2. Dr. Victor Frost - University of Kansas
3. Dr. Stuart Hirshfield - Hamilton College
4. Dr. David Lai - University of Vermont
5. Dr. Randolph Moses - Virginia Polytechnic Inst. & State Univ.
6. Dr. Philip Olivier - Louisiana State University

ROME AIR DEVELOPMENT CENTER/ELECTRONICS TECHNOLOGY
(Hanscom Air Force Base)
1. Dr. Henry Bertoni - Polytechnic Institue of New York
2. Dr. Charles Ih - University of Delaware

C. PARTICIPANT LABORATORY ASSIGNMENT (Continued: page 4)

SCHOOL OF AEROSPACE MEDICINE
(Brooks Air Force Base)

1. Dr. Willie Bragg - University of Cincinnati
2. Dr. Louis Buckalew - Alabama A&M University
3. Dr. James Dooley - Wright State University
4. Dr. John Giolma - Trinity University
5. Dr. Amir Karimi - University of Texas/San Antonio
6. Dr. Jerome Keating - University of Texas/San Antonio
7. Dr. Mark Lewittes - University of Texas/San Antonio
8. Dr. James Mrotek - Meharry Medical College
9. Dr. William Squires - Texas Lutheran College

WEAPONS LABORATORY
(Kirtland Air Force Base)

1. Dr. Michael Becker - University of Texas/Austin
2. Dr. Jack Chatelain - Utah State University
3. Dr. Fred Domann - University of Wisconsin
4. Dr. John Eoll - Lenoir-Rhyne College
5. Dr. Eddie Fowler - Kansas State University
6. Dr. Robert McLauchlan - Texas Tech. University
7. Dr. David Pegg - University of Tennessee
8. Dr. James Steelman - New Mexico State University
9. Dr. George Trevino - Del Mar College

APPENDIX III

A. Listing of Research Reports Submitted in the 1983 Summer Faculty Research Program

B. Abstracts of the 1983 Associates' Research Reports

RESEARCH REPORTS
1983 USAF-SCEEE SUMMER FACULTY RESEARCH PROGRAM

Volume I Report Number	Title	Research Associate
1	The Feasibility of Recording Atmospheric Interferograms	Dr. Richard Anderson
2	Testing the Representativeness of the Supply Data Bank	Dr. Richard W. Andrews
3	Intelligent Controller for Space Experiments	Dr. Francesco L. Bacchialoni
4	Infrared Earthlimb Emission *Lineshapes* as Signatures of Atmospheric Parameters	Dr. Pradip M. Bakshi
5	An Evaluation of a Cantilever Beam Solid State Accelerometer	Dr. Daniel W. Barr
6	The Gas Heating Phase in Electrical Breakdown	Dr. Ernesto Barreto
7	Laser-Induced Helium Plasma	Dr. Stanley Bashkin
8	Investigation of Liquid Sloshing in Spin-Stabilized Satellites	Dr. Joseph R. Baumgarten
9	Searching for Precursors to Laser-Induced Damage	Dr. Michael F. Becker
10	Propagation Loss in Electrostatically Variable Saw Delay Lines	Dr. Henry L. Bertoni
11	Dilemmas of Combat Psychiatry: World War II and Vietnam	Dr. Willie A. Bragg
12	Effects of Radiative Heat Feedback on Solid Rocket Propellant Combustion	Dr. M. Quinn Brewster
13	Aircrew-Relevant Man-Monkey Analogs for Evaluation of CD Agents: Pitch and Alcohol	Dr. L. W. Buckalew

Report Number	Title	Research Associate
14	Combined Blast and Fragment Loading on Reinforced Concrete	Dr. Chester E. Canada
15	Finite Element Preliminaries in EMP Environments	Dr. Jack E. Chatelain
16	Multiple Cockpit Combat Mission Trainer Network	Dr. John A. Cicero
17	The Use of a Unique Heat Tranfer Probe to Measure Spacecraft Rocket Plume Contamination	Dr. Frank G. Collins
18	A Computer Program for the Automatic Generation of a Two-Dimensional Finite Difference Mesh to Investigate the Heat Transfer Characteristics on Arbitrary High-Temperature Turbine Blades	Dr. Richard V. Conte
19	Raman and Infrared Spectroscopy of Extrinsic P-Type Silicon	Dr. B.C. Covington
20	Human Factors Comparison of Touch Screen and Voice Command Data Entry on a Command, Control, and Communications System	Dr. Peter M. Crane
21	Performance Analysis and Evaulation in a Local Area Network	Dr. Carolyn J. Crouch
22	The Impact of ADA on USAF Computational Support Services	Dr. Donald B. Crouch
23	A Molecular Orbital Study of OH^-. H_2O, $H^+(CH_3CN)_k(H_2O)_m$, And $H^+(HCN)_n$ Cluster Ions	Dr. Carol A. Deakyne
24	Models for Evaluating the Validity and Accuracy of Performance Rating	Dr. Terry L. Dickinson
25	Searching for Precursors to Laser-Induced Damage	Dr. Fred E. Domann
26	Hyperbaric Oxygenation (HBO) Alteration of Metabolism and Cardiovascular Function During and Following Exercise Conditioning	Dr. James W. Dooley

Report Number	Title	Research Associate
27	Natural Frequencies and Mode Shapes of Uniform Beams	Dr. George R. Doyle, Jr.
28	Time-Dependent Calculations of Swirling Nozzle Flow	Dr. J. Craig Dutton
29	An Evaluation of Two Nuclear Weapons Effects Computer Programs	Dr. John G. Eoll
30	Axial Variation of Local Heat Flux Along the Condenser Section of a Double-Wall Artery High Capacity Heat Pipe	Dr. Amir Faghri
31	Windscreen Haze Characteristics Studies	Dr. Hans G. Fellner
32	Mirem and Mission Phasing	Dr. Robert D. Foley
33	Hemp Vulnerability/Survivability of Computer Networks	Dr. Eddie R. Fowler
34	An Approach to the Design of an Adaptive Spread Spectrum Modem	Dr. Victor Frost
35	Quantization Error Analysis for the DeAnza Image Processor	Dr. Patrick Garrett
36	Pilot Workload and G-Stress	Dr. Richard T. Gill
37	Identification of Rapid Eye Movement by Computer During Discrete Tracking Tasks	Dr. John P. Giolma
38	An Evaluation of the Measurement System Used by the Leadership and Management Development Center for the Assessment of Its Consulting Efforts	Dr. Samuel B. Green
39	Reinforcement Induced Stereotypy of Sequential Behavior	Dr. Arthur Gutman
40	A Two-Dimensional Aeroelastic System	Dr. Terry L. Herdman
41	An Integrated Approach to Interface Design	Dr. Stuart H. Hirshfield

Report Number	Title	Research Associate
42	Message Routing Methods for a Tactical Air Control System Communication Network	Dr. Craig S. Holt
43	Attitude Control Issues for Large Flexible Space Systems	Dr. Kathleen Howell
44	A Scanning Electron Microsopical Study of Periosteum from Rat and Monkey	Dr. Gwendolyn B. Howze
45	Cycloconverter Modeling for Variable Speed Drives	Dr. Medhat A.H. Ibrahim
46	A Novel Modulation Technique for FDM for Optical Fiber Communication	Dr. Charles S. Ih
47	Software Fault-Tolerance/ Diagnostics for Single-User Systems	Dr. Gregory W. Jones
48	A Thermal Evaluation of the "LSSI" Liquid-Cooled System: An Engineering Perspective	Dr. Amir Karimi
49	A Statistical Method for the Serial Comparison of Vector Cardiograms	Dr. Jerome P. Keating
50	Short Crack Behavior for Flaws Emanating from Fastener Holes	Dr. George C. Kirby
51	An Evaluation of the Mathematical Process and Formulation for Case Mounted Displacement Sensors	Dr. James Kirkpatrick
52	Tem Morphology Study of Molecular Composites of Polymers	Dr. Stephen J. Krause
53	Analytical Representation of Afterbody Surface of X-24C-10D Reentry Vehicle	Dr. Madakasira Krishna
54	Mechanical Characterization of Carbon-Carbon Composites for Turbine Engine Design: A State-of-the-Art Review	Dr. William Kyros

Report Number	Title	Research Associate
Volume II		
55	Performance of Image Restoration Filters in Machine Recognition	Dr. David C. Lai
56	Evaluation of Proposed Integrated Communication Navigation Identification Avionics (ICNIA) Architectures for Their Fault Tolerance Characteristics and Potentials	Dr. Stella Lawrence
57	Decision Aids for Selecting Air Force Manufacturing Technology Projects	Dr. David R. Lee
58	An Assessment of Wartime Availability of Recoverable Items	Dr. E. Stanley Lee
59	Laser Densitometer Design	Dr. Mark E. Lewittes
60	Real-Time Data Quality Assessment of Distributed Data Acquisition Systems	Dr. Sigurd L. Lillevik
61	Photochemical Reactions in a Small Indoor Smog Chamber	Dr. Stephen F. Lin
62	Partitioning Equilibria of Volatile Pollutants in Three Phases Systems	Dr. Leonard W. Lion
63	Evaluation of Projectile Impact on Earth Covered Structures	Dr. Daryl L. Logan
64	Numerical Solution of the Euler Equations on Dynamic Grids	Dr. C. Wayne Mastin
65	Approximate Evaluation of Optimal Control Minimizing Noncoercive Cost-Functionals Over Unbounded Sets; Hyperbolic Systems	Dr. Tapas Mazumdar
66	A Study of the CH_2NO_2 Radical Using a Multiconfiguational Approach	Dr. Michael L. McKee
67	Investigation of Vibration Problems with Heterodyne Holographic Interferometer	Dr. Robert McLauchlan

Report Number	Title	Research Associate
68	Use of Colloidal Gas Aphrons (CGA's) for Treating Hazardous Wastes	Dr. Donald L. Michelsen
69	Transport and Electron Paramagnetic Resonance Studies of Infrared Detector Materials	Dr. George K. Miner
70	Synergetic Maneuvers	Dr. Don Mittleman
71	Approaches to Synthesis of Some Novel Polybenzimidazole Monomers	Dr. Charles G. Moseley
72	Boundary Corrections for Low Speed, Solid Wall Wind Tunnels	Dr. Dale F. Moses
73	Combined Time Space Filtering for HF Antenna Array Systems	Dr. Randolph L. Moses
74	Raman Spectroscopy of Inhibited and Stimulated, Normal and Neoplastic Cultured Human and Mammalian Cells	Dr. James J. Mrotek
75	Combined Magnetic and Gravity Anomalies: A Guide to Crustal Type and Tectonics in the Southeastern Indian Ocean and Caribbean Regions	Dr. Frederick Nagle
76	Using Artificial Intelligence in Avionic Fault Isolation	Dr. Philip D. Olivier
77	Organic Reactions in Room Temperature Chloroaluminate Molten Salts	Dr. Albert L. Payton
78	A Method of Sensing Small Changes in the Angular Separation of Crossed Laser and Neutral Particle Beams	Dr. David J. Pegg
79	Evaluation of Naphthalene Toxicity Using Short Term Exposure and the Amphipod, Gammarus Tigrinus	Dr. Gerald V. Poje
80	Simplification of Nonlinear Systems	Dr. L. Rai Pujara

Report Number	Title	Research Associate
81	The Effect of Large Deformation on the Fracture Mechanics of Solid Propellants	Dr. David L. Questad
82	The Application of an Extended Kalman Filter to the Design of a Bank-to-Turn Missile Autopilot	Dr. Dallas W. Russell
83	Analysis of Pilot Selection Data	Dr. Herman F. Senter
84	Effect of Jet Fuel JP-4 Fractions on Fischer 344 Male Rats	Dr. M. Paul Serve
85	Secondary Muzzle Flash in Rapid Fire Cannons	Dr. Robert K. Sigman
86	Poroelastic Models of the Intervertebral Disk	Dr. Bruce R. Simon
87	Effects of Fluid Shifts and Hypovolemia in Individuals with Different Working Capacities While Resting at a Five Degree Declination	Dr. William G. Squires
88	Pinhole Beam Sensors II	Dr. James Eldon Steelman
89	Dynamic Stall: A Study of the Constant Pitching Rate Case	Dr. James H. Strickland
90	Experimental and Theoretical Investigations of Negative Ion-Polar Molecule Reactions	Dr. Timothy C.K. Su
91	A Dynamic Mini-Model for Space Technology Resource Allocation	Dr. Patrick J. Sweeney
92	Early Performance of the Gallium Arsenide Photovoltaic Array on the Living Plume Shield (Lips) Satellite	Dr. Paul P. Szydlik

Report Number	Title	Research Associate
93	Building a Multiple Regression Equation When Many Variables Are Available	Dr. Enoch C. Temple
94	A Preliminary Investigation of of the Utility of Linear Digital Filters for Analyzing Economic System Performance Data	Dr. William R. Terry
95	Shallow Donor Impurity Binding Energies in Asymmetric Quantum Wells	Dr. John Thomchick
96	Statistical Simulation and Correlation Studies of GAAS Mesfets	Dr. Arthur R. Thorbjornsen
97	Delivery Accuracy	Dr. Jon W. Tolle
98	An Introductory Dynamical Theory for Fully Compressible Trubulence	Dr. George Trevino
99	Electronic Excitation of Atomic Xenon By Electron Impact	Dr. Keith G. Walker
100	Effects of Graphic Information on Reading Comprehension: Eye Movements in Reading Text with Graph	Dr. Shih-sung Wen
101	Intragastric Administration of Dibromomethane to Rats	Dr. Kenneth J. Williamson

THE FEASIBILITY OF RECORDING ATMOSPHERIC INTERFEROGRAMS

by

Richard Anderson

ABSTRACT

A survey of the literature indicates that atmospheric interferograms were recorded and have been used to verify certain aspects of the theory of turbulence. Self-referencing interferograms have not been recorded. They could be used in reproduction to produce distorted wavefronts. The intent of the research was to record self-referencing interferograms under conditions of various degrees of turbulence. The amount of turbulence would be measured at certain points along the laser beam propagation path, so C_n^2 will be known for each interferogram.

After some initial experimentation it is evident that a Mach-Zehnder will be difficult to align and presents fringe visibility problems. A Smartt interferometer is an alternate instrument for the recording of self-referencing interferograms. Problems related with its use are discussed in this paper. Also, an alternate interferometer is discussed.

TESTING THE REPRESENTATIVENESS OF THE SUPPLY DATA BANK

by

Richard W. Andrews
and
Frederick J. Gentner

ABSTRACT

The objective of this project was to investigate the representativeness of the Air Force Supply Data Bank (SDB) with respect to the Air Force Standard Base Supply System (SBSS). As a working definition of representativeness, we require that a sample include at least one unit from each stratum. In addition, a sample should be balanced. That is, the sample mean and standard deviation should be close to the population mean and standard deviation on all test variables. By interviewing Air Force management, familiar with the SBSS, 78 supply test variables were subjectively selected. A statistic B, which measures closeness was used to compare alternative data banks.

The statistical methodology was accomplished by writing and executing two FORTRAN programs, BASEREP and BCOMP. BASEREP tests the representativeness of a SDB by random generating 100 alternative SDB's with the same coverage and comparing their values of B. BCOMP enables sensitivity analysis to be performed on the values of B.

Two SDB's are considered, one with 12 bases and one with 6 bases. Both of these have the same coverage. The SDB with 6 bases is better balanced for 11 of the 12 months tested. By using BCOMP the bases and the test variables that cause balancing problems are determined.

It is recommended that the 6 base SDB be augmented with one additional base so as to cover the entire Air Force, and that any data bank be tested monthly for representativeness.

INTELLIGENT CONTROLLER FOR SPACE EXPERIMENTS

by

Francesco L. Bacchialoni

ABSTRACT

This document reports the investigation on operational requirements and architecture of an intelligent controller designed to support AFGL scientific experiments in space. This controller is designed to minimize the workload of the operator, by testing automatically various subsystems of the experiment hardware, and conducting the experiment.

INFRARED EARTHLIMB EMISSION LINESHAPES AS SIGNATURES OF ATMOSPHERIC PARAMETERS

by

Pradip M. Bakshi

ABSTRACT

The relationship of infrared earthlimb emission lineshapes to atmospheric parameters is investigated. An analytical treatment is developed for the calculation of emission lineshapes for isolated lines, including Doppler, collisional and self-absorption effects, in a planetary atmosphere viewed in the limb as a function of tangent height. The line spectral radiance is shown to be represented by a product of two factors, the first a weighted average of the ratio of the upper to lower level populations of the emitter and the second a simple function of the total absorption along the line of sight. The analytical forms, with suitable approximations, (i) make more transparent the relationship between various features of the spectral lineshapes and the underlying atmospheric parameters, and (ii) enable one to infer many important features of the lineshape with considerable saving in computing time as compared to direct numerical integration of the radiation transport equation.

AN EVALUATION OF A CANTILEVER BEAM SOLID STATE ACCELEROMETER

by

Daniel W. Barr

ABSTRACT

Solid state accelerometers produced in a batch process are characterized for potential application in Safe and Arming and Fuzing systems. The devices sense positive and negative accelerations by monitoring stress in an etched silicon beam which bends with G loading. The stress is detected by resistors diffused in the beam whose values change with stress due to the piezoresistive effect. The device uses a bridge configuration of resistors placed to enhance sensitivity. Eight devices representative of the process are tested and reveal the acceleration detection sensitivity is linear and averages $8.4X10^{-5}$ volts/G for a 10 volt bridge bias between -100 and +100 G. Acceleration sensitivity shows degradation with time. Transverse sensitivity is directional and does not exceed 8 percent of major axis sensitivity. The devices show offset voltages due to slight bridge imbalance which are temperature dependent. Mechanically the beams behave as second order systems subject to a resonant mode which is excited by impulsive loading. Beam resonances range from 1180 to 5319 hertz and show damping ratios from $3.4X10^{-3}$ to $1.57X10^{-2}$. The accelerometer in its present form is not suited for application in safe and arming and fuzing systems due to low sensitivity, temperature dependent offset, susceptibility to resonance induced by mechanical shock and time dependent sensitivity drift. Proposed design changes which enhance the applicability of the device include the use of Ion Implantation and a fully active bridge structure. Time dependent sensitivity drift and variance in the temperature coefficients of the resistors in the bridge remain the primary limitations of the cantilever beam solid state accelerometer.

The Gas Heating Phase in Electrical Breakdown*

Ernesto Barreto
Atmospheric Sciences Research Center
State University of New York at Albany
Albany, NY 12222

Abstract

This report focuses attention on the neglected gas heating stage associated with a spark. A brief review is followed by summaries of recent experimental and theoretical investigations. It is shown that in all cases gas heating is preceded by the formation of a weakly ionized plasma. The transformation to a strongly ionized gas requires additional ionization that can be associated with several different physical processes: In small gaps ($\leq$ 3.0 mm) with metal electrodes, the influx of electrons from a cathode spot with at least a single cell is responsible for gas heating. In longer gaps (1 to 3 cm) highly luminous ionization waves are produced. These can be reflected at the electrodes and increase the degree of ionization. They are well known but not clearly explained in longer discharges. This stage is followed by the formation of hot filaments either at the electrodes or in mid gap. These seem to be associated with the onset of effective ion-electron interactions. In large surface discharges ($\sim$ 1.0 m) the glow and hot channel behind it constitute a stable propagating unit that seems to be controlled by three body electron-ion recombination. The properties of these gliding discharges are similar to those of lightning leaders. In all cases there is strong evidence to support the concept of fluid dynamic effects associated with the hot electron population in the weakly ionized gas. Thus the propagation of stable discontinuities, either strong (shocks) or weak, is shown to be possible.

*Work supported by the Office of Naval Research, the Wright Patterson Air Force Aeronautical Laboratories and the Air Force Office of Scientific Research.

Laser-Induced Helium Plasma

by

Stanley Bashkin

ABSTRACT

A spectroscopic study was made of a laser-induced helium plasma. The intensities of several spectral lines were studied as a function of gas pressure and time subsequent to the initiating laser pulse. The widths of some lines were measured as a function of time. The information was used to determine the electron temperature and density as a function of time, and also to identify certain restrictions on the kinds of transitions which can occur in the plasma. From the latter, some problems which appear in the literature have been solved. The essential feature of the solution is that angular momentum must be conserved, a requirement which limits the final states which can be formed.

INVESTIGATION OF LIQUID SLOSHING IN SPIN-STABILIZED SATELLITES

By

Joseph R. Baumgarten

and

Daniel E. Hill

ABSTRACT

Certain configurations of spin-stabilized spacecraft consistently develop a coning or nutating motion during the perigee burn. This motion consists of sinusoidal oscillations about the pitch and yaw axes at the same frequency, but with a 90° phase difference. The sloshing of liquid fuel stores is suspected as a source of these nutations. The moving liquid in its spherical containers has been modeled as an equivalent pendulum, pivoted with the main body of the payload, and moving relative to it with rotating constraint. The equations of motion of the spacecraft with a pendulum system have been derived. Numerical solution is accomplished on the digital computer. Comparison is made to flight test data of actual spacecraft.

Searching for Precursors to Laser-Induced Damage

by

Michael F. Becker

and

Fred E. Domann

Abstract

Several experimental techniques are investigated to try to find a precursor to permanent damage caused by laser radiation. These techniques include charge emission, neutral particle emission, surface photoconductivity, and surface potential measurements. The techniques are applied to a wide variety of optical materials: diamond-turned copper, silicon, and various dielectric films on fused silica substrates. Charge emission was found to be a useful technique, and its extension to multi-pulse experiments is recommended. Neutral particle emission was too insensitive to be useful. Photoconductivity data were gathered, but an ultrahigh vacuum system in conjunction with photon cleaning is probably necessary to gather meaningful data. Suggestions for further investigations are offered, including a surface potential probe.

PROPAGATION LOSS IN ELECTROSTATICALLY VARIABLE SAW DELAY LINES

by

Henry L. Bertoni

ABSTRACT

Variations in SAW time delay due to an applied D.C. electric field has been suggested as a means for achieving the phase shift needed for each radiating element in phased-array antennas. Important device parameters are: 1) insertion loss, and; 2) sensitivity of delay change to D.C. terminal voltage. These parameters can be in competition, in that device modifications intended to improve one parameter may make the other worse. These parameters are considered for the normal-field configuration, and for the in-plane configuration in which both D.C. electrodes are on the same surface as the SAW. The in-plane configuration can have high voltage sensitivity if the electrodes are close together, but diffraction loss for this case is found to be large for long path lengths. Methods for limiting diffraction loss without reducing voltage sensitivity are investigated.

DILEMMAS OF COMBAT PSYCHIATRY: WORLD WAR II AND VIETNAM

by

Willie A. Bragg
and
Cynthia B. Bragg

ABSTRACT

A review was conducted to investigate issues surrounding combat psychiatry. The focus of this investigation was to examine the development of combat psychiatry from the Civil War to Vietnam. Special attention was given to World War II and Vietnam conflict relative to incidence, diagnosis and treatment of psychiatric casualties. The results demonstrate the significant gains made in preventive psychiatry. Recommendations for further study are outlined.

EFFECTS OF RADIATIVE HEAT FEEDBACK ON SOLID ROCKET PROPELLANT COMBUSTION

by

M. Quinn Brewster

ABSTRACT

The effects of particle-enhanced radiative heat feedback on steady and transient combustion of solid propellants is investigated. Radiative influence on the steady-state burn rate, the linearized pressure-coupled response function and ignition/extinction phenomena are considered. It is shown that under typical motor conditions although the radiative flux is usually a small fraction of the total heat flux, the radiative flux is often preferentially absorbed by particle additives in the propellant. This results in pre-heating of the particles which can produce a "glo-plug" effect at the burning propellant surface wherein hot particles (inert or reactive) act as ignition sources for gas-phase chemical reactions. This effect may be profitably exploited in controlling high-frequency instability. It is also shown that at low pressures and low burn rates particle radiation can be a controlling influence in ignition/extinction phenomena. Particularly, the variation of the lower pressure deflagration limit with particle loading can be completely accounted for with proper consideration of particle radiation. Many such observations, often arbitrarily attributed to catalytic and other effects, may be actually radiative in origin.

AIRCREW-RELEVANT MAN-MONKEY ANALOGS FOR EVALUATION OF CD AGENTS: PITCH AND ALCOHOL

by

L. W. Buckalew

ABSTRACT

With the growing possibility of military personnel encountering chemical environments in any future conflicts, a major research thrust exists for the evaluation of CD agents to protect the viability of military operations. USAF interests are primarily concerned with flight line operations. The major problem in testing CD agents is their toxic nature which, except for a very restrictive range of doses, often precludes use of human subjects. One solution to this is the use of non-human primates and extrapolation to humans. However, it becomes necessary to develop and validate task/performance man-monkey analogs. This project was devoted to exploring the feasibility of an analog of relevance to aircrew operations. Within task and testing parameters imposed by previous USAF CD research using monkeys, a potential task analog was developed involving the Primate Equilibrium Platform (PEP), GAT-1, and a compensatory tracking task. This task is equilibrium-based and uses the pitch plane. Alcohol is suggested as the agent, as it may readily be administered to both humans and monkeys thus facilitating provision of comparative data. Recommendations reflect on major considerations for continuing efforts to develop and validate this task analog: standardization of physiological (sensory) modality, use of a roll plane in combination with pitch, and redefinition of 'equivalent' drug doses.

COMBINED BLAST AND FRAGMENT LOADING ON REINFORCED CONCRETE

by

Dr. Chester E. Canada and Douglas J. Yovaish

ABSTRACT

A preliminary computational procedure is developed to predict the dynamic response of reinforced concrete to the combined blastwave and fragment loading arising from the near-by detonation of a metal-encased high explosive charge. For the physical models and scaled distances used here, the predicted shockwave profiles in concrete for cased and uncased charges are significantly different. The spatial gradient at the shockfront for a cased charge is relatively steeper yielding conditions more conducive for spalling.

If spalling occurs, less concrete is available to resist local shear failure; so, the probability of perforation is increased. This rationale appears to be consistent with recent experimental programs which show concrete spalling and perforation to be significantly greater for a cased charge than for an uncased charge.

FINITE ELEMENT PRELIMINARIES IN EMP ENVIRONMENTS

by

Jack E. Chatelain
Steven A. Roberts

ABSTRACT

The use of the finite element method is investigated to evaluate what functional forms would satisfy boundary conditions and asymptotic wave forms. It is shown that vector spherical harmonics used in conjuction with Bessel functions or negative powers of r could be useful. The possibility of multipole moments both in the source and wavefield as solution to the problem is indicated. Suggestions for further research are offered.

MULTIPLE COCKPIT COMBAT MISSION TRAINER NETWORK

by

John A. Cicero

ABSTRACT

The feasibility of a multiple cockpit combat mission trainer (CMT) is investigated. It is shown that a cable network can be used to connect together many CMTs over a large geographical area. The cable channel is divided into a critical portion and a noncritical portion. The critical portion uses a time division multiple access (TDMA) technique to broadcast CMT position and attitude to all other CMTs in the network. The noncritical data portion uses a random access protocol to broadcast weather, threat information, etc., to all CMTs in the network. An analysis technique is presented which easily evaluates the random access protocol. Suggestions for further research in this area are proposed.

THE USE OF A UNIQUE HEAT TRANSFER PROBE TO MEASURE SPACECRAFT ROCKET PLUME CONTAMINATION

by

Frank G. Collins

ABSTRACT

Hot wire probes have failed to find the same usefulness in rarefied flows that they have found in continuum flows because the convective cooling is masked by the conductive loss to the wire supports and, at lower pressures, by the radiative loss. In the present work, a free-molecule probe was constructed which had head thermistor heaters placed at its ends to keep the wire at a uniform temperature, thus eliminating the support conduction loss. The radiation loss was comparable to the convection loss at high Mach numbers for $n\ U < 10^{24}/m^2 s$ (n = number density, U = velocity). Under those conditions the probe was shielded, with the inner radiation shield maintained at the probe temperature.

The probe was designed to measure the boundary layers inside a Mach 4 conical nozzle and the nozzle external backflow region. p_o = 10 Torr, $T_o = 500^{\circ}K$ and gas will be CO_2. These tests will be performed in the near future.

A COMPUTER PROGRAM FOR THE AUTOMATIC GENERATION OF A TWO-DIMENSIONAL FINITE DIFFERENCE MESH TO INVESTIGATE THE HEAT TRANSFER CHARACTERISTICS ON ARBITRARY HIGH-TEMPERATURE TURBINE BLADES

By

Richard V. Conte, Ph.D.

ABSTRACT

A program was undertaken to enable the utilization of advanced computer codes to investigate the heat transfer characteristics of arbitrary high-temperature turbine blades. The success of such a procedure begins with the modeling of the region in space occupied by the turbine blade together with the specification of appropriate boundary conditions. A computer code was written that would accept an arbitrary set of turbine blade coordinates and display them on a plotter. The blade data is then manipulated to achieve the desired orientation and appropriate mathematical functions are fitted between the blade coordinates. A cubic-spline, circle and straight line were used as the interpolating functions. When all the data points are satisfactory fitted, a two-dimensional mesh is fitted to the interpolated blade coordinates. The grid generated is customized to the particular test conditions being investigated.

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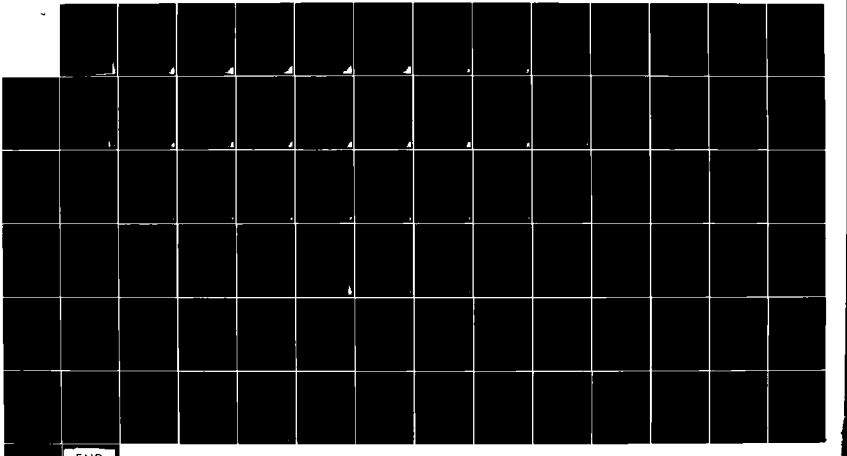

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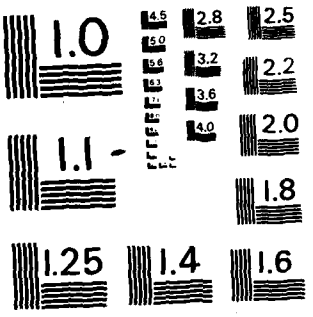


Raman and Infrared Spectroscopy of Extrinsic P-Type Silicon

by

B. C. Covington

ABSTRACT

We present the results of a Raman spectroscopy study made at room and liquid helium temperatures of silicon samples conventionally doped with one of the Group IIIA elements boron, aluminum, gallium, indium, or thallium.

We attempt to observe a previously reported Raman electronic scattering line in boron-doped silicon. The failure to observe this line at approximately 23.4 mev is attributed to the type of laser used and perhaps to the quality of the sample. We report several temperature dependent lines of unknown origin.

A detailed study as a function of annealing temperature is made of neutron transmutation-doped silicon (gallium). Comparisons are made to a previous study of neutron transmutation-doped pure silicon and silicon (boron).

Suggestions for additional research are made.

HUMAN FACTORS COMPARISON OF TOUCH SCREEN AND VOICE COMMAND DATA ENTRY ON A COMMAND, CONTROL, AND COMMUNICATIONS SYSTEM

by

Peter M. Crane

ABSTRACT

Two data entry devices, touch sensitive screens and voice command, were evaluated on a command, communications, and control (C^3) simulator. The simulator incorporated color coded, interactive graphics and required subjects to acknowledge incoming messages, interpret them, and send out summary reports. Data were collected on task performance from eight subjects first using touch screen input and then voice command input. Subject preferences were also collected. Results show that both systems worked well. The only consistant problem observed was that one word was frequently rejected by the voice recognition system. Subjects expressed a slight preference for voice input but both systems were acceptable. It is recommended that both input systems be incorporated into the C^3 simulator after the vocabulary set and screen positions are optimized.

PERFORMANCE ANALYSIS AND EVALUATION IN A LOCAL AREA NETWORK

by

Carolyn J. Crouch

ABSTRACT

Performance evaluation is of particular concern in a local area network composed of nonhomogeneous mainframe nodes for which only perfunctory performance evaluation statistics are known. This report identifies performance measures that should be applied in such circumstances, discusses modes of implementation, and investigates approaches to and implications of performance evaluation in local area networks. Recommendations are made for future research.

THE IMPACT OF ADA ON USAF COMPUTATIONAL SUPPORT SERVICES

by

Donald B. Crouch

ABSTRACT

The feasibility and desirability of using Ada as the standard language for virtually all applications in the computational support organizations of the USAF are investigated. It is concluded that the power and flexibility of the language make it ideally suited for use in such organizations but that the programming environment of these organizations will have to be enhanced considerably before it becomes feasible to adopt it extensively. Ada's impact on the existing environment is explored in detail. Suggestions for further research in this area are made.

A MOLECULAR ORBITAL STUDY OF $OH^-\cdot H_2O$, $H^+(CH_3CN)_k(H_2O)_m$, AND $H^+(HCN)_n$ CLUSTER IONS

by

Carol A. Deakyne

ABSTRACT

The structures, energetics, and charge distributions of $OH^-\cdot H_2O$, $H^+(H_2O)_2$, $H^+(H_2O)(CH_3CN)$, $H^+(CH_3CN)_2$, and $H^+(HCN)_n$, n=1-4, have been investigated ab initio at several basis set levels. Fully optimized geometries of symmetric and asymmetric $OH^-\cdot H_2O$ have been obtained utilizing the MP2/6-31+G** basis with the frozen core approximation. At this level of calculation, the asymmetric form is slightly more stable. Partial geometry optimizations have been initiated for the $H^+(H_2O)_m(CH_3CN)_k$ ions at the 3-21G level and compared with the 4-31G results. Both basis sets yield a symmetric hydrogen bond in $H^+(H_2O)_2$ and asymmetric hydrogen bonds in $H^+(CH_3CN)_2$ and $H^+(H_2O)(CH_3CN)$. For the latter cluster, the proton is positioned closer to the CH_3CN in accordance with the relative proton affinities of H_2O and CH_3CN. Completely and partially optimized structures of the $H^+(HCN)_n$, n=1-4, clusters have been calculated using the 4-31G and 6-31G** basis sets with and without inclusion of electron correlation. The ions are linear, and for $n \geq 4$ there will be mixtures of linear ions of nearly equal stability present at equilibrium. Both of the dimers $[HCNH...NCH]^+$ and $[HNCH...NCH]^+$ may be in the system at the lower temperatures at which the trimers and tetramers are formed. The computed proton affinities and solvation energies, $\Delta E_{n-1,n}$, are in good agreement with experiment, with the exception of $\Delta E_{2,3}$. The theoretical data suggest that $\Delta H^o_{2,3}$ should be larger than the value reported. The structural changes, charge redistributions and proton migrations obtained for these complexes at each successive HCN is bound indicate that: 1) the central ion is $HCNH^+$, 2) there is a cooperativity effect among the hydrogen bonds, and 3) the first solvent shell is not filled until two more HCN's are added to $HCNH^+$. Suggestions are made for follow-on research in these areas.

MODELS FOR EVALUATING THE VALIDITY AND ACCURACY OF PERFORMANCE RATINGS

by

Terry L. Dickinson

ABSTRACT

Ratings are an important source of information about job performance. For many jobs, objective measures of performance are not available or are impractical to obtain so that ratings are the sole source of information. Unfortunately, performance ratings are a distorted source of information.

The multitrait-multimethod and person perception designs have been used to investigate the distortions in ratings. The purpose of using these research designs is to isolate the factors that distort the ratings and to use this knowledge to improve the quality of performance ratings. The goal of the present research was to develop a design that combined both the multitrait-multimethod and person perception designs.

Each design was discussed, and examples were presented to illustrate that design. The combination design was used to isolate the influence of rater, ratee and context factors on the quality of performance ratings. Future research was recommended to understand and utilize these factors to improve performance ratings.

Searching for Precursors to Laser-Induced Damage

by

Michael F. Becker

and

Fred E. Domann

Abstract

Several experimental techniques are investigated to try to find a precursor to permanent damage caused by laser radiation. These techniques include charge emission, neutral particle emission, surface photoconductivity, and surface potential measurements. The techniques are applied to a wide variety of optical materials: diamond-turned copper, silicon, and various dielectric films on fused silica substrates. Charge emission was found to be a useful technique, and its extension to multi-pulse experiments is recommended. Neutral particle emission was too insensitive to be useful. Photoconductivity data were gathered, but an ultrahigh vacuum system in conjunction with photon cleaning is probably necessary to gather meaningful data. Suggestions for further investigations are offered, including a surface potential probe.

HYPERBARIC OXYGENATION (HBO) ALTERATION OF METABOLISM AND CARDIOVASCULAR FUNCTION DURING AND FOLLOWING EXERCISE CONDITIONING

by

James W. Dooley

ABSTRACT

Qualification for compression chamber operations was secured by enrollment in and completion of the Compression Chamber Team Training (CCTT) course, B30ZY9300-007, PDS code WS3. Since time and equipment availability restrictions threatened the completion of the proposed study, the scope of the study was expanded, and a new proposal was developed for submission to the Advisory Committee on Human Experimentation. The newly proposed project will be attempted in the Summer of 1984 and entails measurement and evaluation of acute and chronic physiologic responses to eight weeks of aerobic exercise conditioning performed at 2 ATA in hyperbaric oxygenation (HBO) conditions. Physiologic and metabolic variables include heart rate, ECG, impedance derived stroke volume (ZCG) for cardiac output determination, blood pressure, $\dot{V}O_2$ max, serum lipids and lipoproteins, complete blood count (CBC) and percent body fat.

NATURAL FREQUENCIES AND MODE SHAPES OF UNIFORM BEAMS

by

George R. Doyle, Jr.

ABSTRACT

Most machinery contains rotating shafts that possess some unbalance. This unbalance results in a self-excited lateral vibration, which reaches a maximum value when the operating speed is near a lateral natural frequency. This report contains a summary of the derivation of natural frequency and mode shape equations for uniform beams. In addition to lateral motions, longitudinal and torsional vibrations were also included. Each of these three modes of vibration were established with various classical (fixed, free, and pinned) and nonclassical (inertial and spring load) boundary conditions. Second order effects of rotary inertia, shear deformation, and axial load were also considered. Finally, a rigid body pitch plane analysis of a shaft supported by N bearings was made.

TIME-DEPENDENT CALCULATIONS OF SWIRLING NOZZLE FLOW

by

J. Craig Dutton

ABSTRACT

The effect of swirl on the mass flow, thrust, and flowfield characteristics of supersonic, converging-diverging nozzles has been investigated. A widely used and well tested time-dependent code (VNAP) for predicting two-dimensional, compressible, internal flows has been modified to include the swirl velocity component. The required modifications involve the integration of an additional momentum equation, the inclusion of additional terms in the original equation set, and re-formulation of the boundary conditions to reflect the addition of the tangential velocity component. The resulting modified code (SNAP) has been used to predict the flowfield and performance characteristics of a converging-diverging nozzle at various levels of swirl. The results indicate that for swirl numbers of approximately 0.4 or less, reductions in the nozzle mass flowrate and thrust on the order of 10 percent or less can be expected. The most pronounced effect of swirl on the nozzle flowfield is to cause a large increase in the axial velocity near the centerline as compared to the no-swirl case.

AN EVALUATION OF TWO NUCLEAR WEAPONS EFFECTS COMPUTER PROGRAMS

by

John G. Eoll

Robert O. Calvert, Jr.

ABSTRACT

Work was performed on two FORTRAN programs used to model two separate nuclear weapons effects problems. The first code, the widely used HULL hydrodynamic code, was evaluated as to the possibility of including the effect of dust scattering in the radiation transport section of the code. It is our conclusion that considerable work needs to be done with HULL before the scattering effect can be included. Specific recommendations are described in detail.

The second code worked on was a family of FORTRAN programs used to model fallout problems. We combined the programs AFIT, BRAVO3, and SMEAR into a single interactive code named NCG capable of running on a PDP 11/24 minicomputer. Specific attention was paid to including a detailed wind field in the calculation of the distribution of fallout particles.

AXIAL VARIATION OF LOCAL HEAT FLUX ALONG THE CONDENSER SECTION OF A DOUBLE-WALL ARTERY HIGH CAPACITY HEAT PIPE

by

Amir Faghri
Christine L. Rainey

ABSTRACT

A new technique was developed to experimentally measure local heat flux and heat transfer coefficient along the condenser section of a heat pipe. This design consists of installing circul r fins along the condenser section of a double-wall artery high capacity heat pipe. This method allows for overall heat flux as well as the local variation. In addition, a better cooling performance was achieved with this design compared to conventional cooling jackets. The trend in local heat flux and heat transfer coefficients are the same and show a high value at the end of the adiabatic section and decreases toward the end of the condenser section. The experimental result shows an overall energy balance. The general behavior of the individual fin agrees with the analytical result obtained from heat conduction analysis.

WINDSCREEN HAZE CHARACTERISTICS STUDIES

by

Hans G. Fellner

ABSTRACT

Bird impact resistant aircraft transparencies manufactured from laminated plastics exhibit considerably poorer optical properties than the glass windshields they are replacing. After being in service on aircrafts their quality decreases even further as their surfaces become pitted and scratched. This study reports the first measurements of the angular dependence of the haze level in new and deteriorated F-111 aircraft windshield material samples. The measurements were used to successfully predict the loss in contrast (visibility) of a target when it was viewed through the windshield materials, which were oriented in several ways with respect to the design eye position.

MIREM AND MISSION PHASING

by

Robert D. Foley

ABSTRACT

MIREM was developed to analyze the reliability of the ICNIA avionics system during single-phase missions. In this paper, we develop a way of extending MIREM's capability to analyzing multi-phase missions. During the development, several questions about the existing implementation of MIREM arose. Specifically, MIREM uses two approximations, at least one of which works poorly on some test problems. Thus, it is recommended that MIREM's accuracy on realistic problems be evaluated. A method for testing MIREM is developed which could be incorporated into MIREM if MIREM is insufficiently accurate on realistic problems.

HEMP VULNERABILITY/SURVIVABILITY OF COMPUTER NETWORKS

by

Dr Eddie R Fowler

ABSTRACT

This report presents an analytical approach for quantifying the message traffic through-put degradation of a computer network in a high altitude electromagnetic pulse (HEMP) environment. The ARPANET/DDN is characterized to provide information as to which attributes to incorporate in a computer network simulation model. Plots of the HEMP generated E-field are presented. An E-field strength contour map superimposed on orthogonal projection of the USA for one height of burst (HOB) is presented. Finally suggestions for further research in this area are presented.

AN APPROACH TO THE DESIGN OF AN ADAPTIVE

SPREAD SPECTRUM MODEM

By

Victor Frost

Abstract

The capability to reprogram spread spectrum (S.S.) modems on a short term basis to reflect changes in the environment will soon exist. An adaptive S.S. modem (ASSM) would insure maximum instantaneous link performance and graceful degradation of the overall system performance. This report outlines an approach to the design of an ASSM. The major design issues are identified and a research plan to address these issues is presented.

Quantization Error Analysis For The DeAnza Image Processor

Patrick Garrett

ABSTRACT

The prevailing time-amplitude step-interpolator A/D quantization process offers a quantitative basis for relating the DeAnza image processor system specifications to image accuracy through derivation of a quantization levels/noise relationship. It is shown that significant noise is generated by system quantization which is deterministic, and that pixel detection and measurement are influenced accordingly. Independent frame averaging is shown to be equivalent to increasing the number of quantization levels available from higher sample rates with a corresponding reduction in quantization noise. The DeAnza obtains 1.7 samples per pixel for a 512 x 512 pixel frame which is inadequate for reliable threshold detection until four frames are averaged to provide 1-bit resolution. Thirty frame averages are determined to provide 4-bit resolution which is necessary to resolve the 10 grey levels from an image-intensifier equipped Vidicon. Further, averaged resolution cannot exceed the A/D converter wordlength because of data quantization truncation at the LSB value, but for the DeAnza resolution is limited to 7 bits following 256 averages maximum for a 512 x 512 pixel frame. This analysis demonstrates one element of a total system error budget whose investigation is recommended.

PILOT WORKLOAD AND G-STRESS

by

Dr. Richard T. Gill

ABSTRACT

The purpose of this study was to assess the effects of G-stress, in particular +Gz, on pilot workload. However, due to time constraints the actual experiment has not yet been completed. It will be conducted in 3 phases (static training, dynamic training, and data collection) and will employ two different techniques (primary task performance and subjective ratings) to assess the impact of G-stress on pilot workload. In the static training phase, subjects will practice solving two-dimensional mazes in a normal +1Gz environment. For the dynamic training phase, subjects will continue to practice solving two-dimensional mazes but in a +Gz environment ranging from +1Gz to +6Gz in the AFAMRL human centrifuge, the Dynamic Environmental Simulator. The data collection phase will be a repeat of the dynamic training phase with an additional experimental condition wherein the subject will be provided with the optimal maze solution and merely have to trace the cursor through the solution path. Both the time required to solve a maze and subjective ratings will then be used to assess the effect of +Gz on pilot workload. In addition, comparisons of maze solution times, both with and without the solution provided, between the various levels of +Gz, will provide a measure of the effects of G-stress on the pilot's cognitive abilities.

IDENTIFICATION OF RAPID EYE MOVEMENTS BY COMPUTER DURING DISCRETE TRACKING TASKS

by

John P. Giolma and J. Evans Lyne

The identification of rapid eye movements (saccades) and the extraction of performance parameters by digital computer is described. Algorithms written in Fortran are described that use signal noise estimates, main sequence relationships and the digitally derived eye velocity waveform to locate saccades of a half degree and larger. Recommendations are provided for future applications under other tracking conditions and for the improvement of the infrared eye movement recorder.

An Evaluation of the Measurement System Used by the Leadership and Management Development Center for the Assessment of Its Consulting Efforts

Samuel B. Green

ABSTRACT

The purpose of the present research was to evaluate the measurement system employed by the Leadership and Management Development Center (LMDC) for the assessment of their consulting efforts. A number of changes were recommended after reviewing the literature pertainent to the measurement problems encountered by LMDC. Recommendations were made regarding the theory underlying the measures, their psychometric properties, and proper methods of interpretation. Throughout the report, emphasis was placed on the analysis of organizational units rather than individuals within the units. Finally, some suggestions were made concerning possible future research.

REINFORCEMENT INDUCED STEREOTYPY OF SEQUENTIAL BEHAVIOR

by

ARTHUR GUTMAN

ABSTRACT

The purpose of this report is to interface a major applied issue in Air Force technical training with basic research issues in the area of Learning and Memory. The final product is a proposal to conduct four basic research experiments relating to the deleterious effects of positive reinforcement on incidental learning and transfer of learning on a sequential learning task. The long-range purpose of the proposed research is to create a more general program of research to investigate the more global conditions that produce and, more importantly, prevent these deleterious effects.

A TWO-DIMENSIONAL AEROELASTIC SYSTEM

by

Terry L. Herdman

ABSTRACT

In the classical formulation the aerodynamic loads depend on the instantaneous motion of the vehicle. That is, for example the lift at time t is modeled as a function of the velocity components at time t but not on any previous values. However, it is well known that the aerodynamic forces depend to some extent on the flow in the wake behind a lifting surface so that some "memory" effects are expected. The inclusion of these effects in flight-mechanics problems leads to a model including functional differential equations. A complete dynamic model is formulated for a two-dimensional system in which the elastic motions of a structure are coupled with the motion of the surrounding fluid. Suggestions for further development of a well-posed state space formulation are offered.

AN INTEGRATED APPROACH TO INTERFACE DESIGN

by

Stuart H. Hirshfield

ABSTRACT

The question of how to design software systems requiring sophisticated user interfaces is investigated. Current systems have been evaluated and have been found wanting in terms of a variety of performance criteria. It is postulated that these shortcomings are attributable to (1) the lack of a formal design methodology which addresses properties idiosyncratic of such systems, and (2) the fact that two of the most sought-after performance criteria ("friendliness" and "domain independence") are to a certain extent *incompatible*. A *semi-formal* design methodlolgy based on data flow techniques is proposed which represents an integrated approach to design wherein the extended interface and the tool are attended to equally. Furthermore, the methodology provides a framework for addressing the aforementioned incompatiblity. Finally, suggestions for continued research in this area are offered.

MESSAGE ROUTING METHODS FOR A TACTICAL AIR CONTROL SYSTEM COMMUNICATION NETWORK

by

Craig S. Holt

ABSTRACT

An investigation is made of possible routing methods for use in a communications network linking Tactical Air Control System Command and Control centers. Important qualities for the routing method are assumed to be ability to work in a distributed, amorphous network, ability to adapt reliably to frequent changes in the network, and ability to take advantage of one-way communication links. Previous routing methods are reviewed and a new method is proposed. In the proposed method each nodal unit reports the status of its inward links to all other units. Through these "updates" each unit is able to construct its own "model" of the system, and develop routing tables. A preliminary comparison of the methods is made, and areas for future research are recommended.

ATTITUDE CONTROL ISSUES FOR LARGE FLEXIBLE SPACE SYSTEMS

by
K.C. Howell

ABSTRACT

Attitude control for large, flexible systems involves the on-orbit functions of disturbance cancellation, pointing, maneuvers, stationkeeping and shape control. The auxiliary propulsion system, although not solely responsible for these activities, will certainly interact with all of these functions. It is necessary to understand these interfaces in order to effectively design a control system. This work considered some of the issues involved in control/propulsion interactions. In particular, three methods, at various stages of development, were examined which attempt to determine the optimal number and distribution of actuators for effective attitude control.

A Scanning Electron Microsopical Study of Periosteum from Rat and Monkey

by

Gwendolyn B. Howze

Abstract

The normal or unstimulated structure of the periosteum has been studied by scanning electron microscopy. In the two species studied, rat and Rhesus monkey, five distinct morphological regions can be discerned. The top-most fibrous layer is a coherent layer of fibers in an interknitted array. Intermixed with the fiber bundles are many blood vessels. Below the top layer is a second fibrous layer in which the fibers are more loosely arranged and mixed with a few cells. A third region contains cells, fibers and blood vessels in an apparently random innominate distribution. Cells are plentiful in this region. The fourth layer is highly cellular. In the monkey, the cells are stratified in layers, with each layer separated by a network of fibrils. The fifth region, "juxta-matrix" is apparently one cell layer thick, in which the cells are strongly attached to the subjacent bone matrix.

In both species collagenous fibers are most plentiful and are composed of fibrils in parallel array. The fibers characteristically are covered with a meshwork of fibrils which usually contain particulate structures of unknown composition. The collagenous fibrils appear to differ in the two species. In both species the majority of the cells contain numerous cytoplasmic processes.

CYCLOCONVERTER MODELING FOR VARIABLE SPEED DRIVES

by

Medhat A. H. Ibrahim

ABSTRACT

A mathematical model of the cycloconverter was developed. The model would accept a variable voltage variable frequency supply. The output frequency and SCRs conduction angle can be controlled. A three-phase static load made of resistance in series with an inductance was used for testing the model and results of the simulation were given. A model of the brushless dc motor was suggested for the dynamic loading of the cycloconverter. Suggestions for further research in this area, are offered.

A NOVEL MODULATION TECHNIQUE FOR FDM

FOR OPTICAL FIBER COMMUNICATION

by

Charles S. Ih

University of Delaware

Newark, De. 19711

ABSTRACT

A new laser beam modulation technique suitable for FDM (Frequency-Division-Multiplexing) for Optical Fiber Communication (OFC) is described. Two methods for implementing this new modulation technique have been studied. One uses a SWAOM (Standing-Wave-Acouto-Optical-modulator) and the other employs a Mach-Zehnder interferometer with an AOM and injection-locked lasers. The first is simpler in operation and can operate to several GHz. The second is more complicated but is capable of operating to several tens of GHz. A fairly detailed experimental investigation was made for the first. We also studied the characteristics of the second, including some experimental techniques. The FDM system using this modulation technique is suitable for multi-channel simultaneous analog and digital information transmissions.

SOFTWARE FAULT-TOLERANCE/DIAGNOSTICS FOR SINGLE-USER SYSTEMS

by

Gregory W. Jones

ABSTRACT

The rapidly increasing use of microcomputer systems by isolated, relatively inexperienced Air Force personnel puts a severe strain on software. Programs must be designed to handle routine errors without user intervention and to give maximum support to the user when errors occur that can't be handled automatically. Failure to do this causes frustration, resentment, error and even rejection of the software.

This report covers the basic concepts underlying fault-tolerance in software and diagnostics for users, as well as describing the general techniques for implementing them. The report then focuses on detailed, specific techniques for supporting the goals of error -avoidance, -handling and -investigation. Hardware considerations are basically ignored.

The Air Force has contracted for an Instructional Support System, modeled on the current Advanced Instructional System. This software will be widely used by non-experts in remote locations, and the report describes current and projected diagnostic needs for the AIS and ISS. Suggestions are made for specific changes and additions to ISS, as well as for additional research in the general area of fault-tolerance and diagnostics.

A THERMAL EVALUATION OF THE "LSSI" LIQUID-COOLED SYSTEM: AN ENGINEERING PERSPECTIVE

by

Amir Karimi

ABSTRACT

The thermal performance of each component of the "LSSI" (Life Support Systems, Inc.) liquid-cooled system has been investigated. The cooling system consists of a vest-hood arrangement, a heat exchanger unit, and a control display unit (housing a pump and a temperature control valve). This study covers the evaluation of the freezing time of the ice cartridge, determination of the thermal efficiencies of the vest and heat exchanger units, and evaluation of thermal gains of the working fluid from the environment. Comments are also made on the reliability of the control display unit components.

This study suggests that the vest, in its present configuration, is not satisfactory to meet demands of the groundcrew personnel. Several recommendations are offered to improve the present system. Additionally, it is suggested that further investigation be conducted to improve the vest and the heat exchange unit.

A STATISTICAL METHOD FOR THE SERIAL COMPARISON OF VECTOR CARDIOGRAMS

by

Jerome P. Keating

ABSTRACT

In the absence of clinical standards to detect serial changes in cardiograms, statistical procedures are proposed as an alternative. These procedures are all preceded by a dimension reducing orthonormal transformation of the original digitized cardiogram into a lower dimensional feature space. In feature space, multivariate test criteria are given for the detection of changes in covariance matrices or mean vectors of the cardiograms. The flexibility is provided to compare the cardiograms of the same individual pairwise or simultaneously. In addition, a peripheral test of independence of beats within a cardiogram is given. Some pertinent remarks are also made about controlling the overall level of significance and its impact on the application of these techniques to cardiograms of USAF pilots.

SHORT CRACK BEHAVIOR FOR FLAWS EMANATING FROM FASTENER HOLES

By

George C. Kirby

ABSTRACT

Apparent stress intensity factors are found for short fatigue cracks emanating from fastener holes by the Anderson-James backcalculation technique. Empirical formulas for the stress intensity factor as a function of crack length are also derived. For crack lengths of 0.01 inches (0.25 mm) to 0.2 inches (5 mm), the empirical formulas agree well with accepted solutions of cracks radiating from holes. For cracks lengths of less than 0.01 inches (0.25 mm) the accepted solutions diverge from those derived herein. It is found that the stress intensity factor is independent of the crack location and load transfer through the fastener. Also, the "short crack effect" reported by other investigators was not corroborated. Suggestions for follow up research to this project are offered.

AN EVALUATION OF THE MATHEMATICAL PROCESS AND FORMULATION FOR CASE MOUNTED DISPLACEMENT SENSORS

by

James Kirkpatrick

Susie A. Hobbs (Graduate Student)

ABSTRACT

A review of the data Analysis Principles of case mounted displacement sensors are validated relative to their algebraic significance and derivations from the standard equation of motion.

Some basic properties of fourier series and transform are discussed. We are primarily concerned with the recapture of f from f if additional information concerning f is known. The proof relies basically on Cesaro Summability, Planchereal Theorem, and the Lebesque Dominated Convergence Theorem. Meanwhile, we can relate the fourier transform to the prominent Paley-Weiner Theorem in the theory of entire functions, that is an entire function is analytic throughout the finite complex plane. This gives the assurances for symmetric inversions formulations for the recapture of f from f.

TEM MORPHOLOGY STUDY OF MOLECULAR COMPOSITES OF POLYMERS

by

Dr. Stephen J. Krause

ABSTRACT

Transmission electron microscopy (TEM) is used to study 30% PBT / 70% ABPBI fibers to determine if a composite has been formed at the molecular level. It is concluded from dark field images and diffraction patterns that micron-sized aggregates rich in PBT crystallites form within an ABPBI rich matrix when fiber is spun or film is cast from solution above a critical concentration. However, when fiber and film was processed from solution below a critical concentration, the PBT is dispersed as crystallites no larger than 30 Å in size. Thus, the existence of a molecular-level composite has been confirmed by TEM.

ANALYTICAL REPRESENTATION OF AFTERBODY SURFACE OF X-24C-10D REENTRY VEHICLE

By

Madakasira Krishna

ABSTRACT

As a first step in the generation of three dimensional grid for the X-24C-10D reentry vehicle the afterbody surface is represented analytically. The coordinate system is constructed by a series of coaxial crosssections. A computer code is developed, which can be easily adapted for use with new generation of computers.

MECHANICAL CHARACTERIZATION OF CARBON-CARBON COMPOSITES FOR TURBINE ENGINE DESIGN: A STATE-OF-THE-ART REVIEW

by

William Kyros

ABSTRACT

A review of the state-of-the-art of the mechanical characterization of carbon-carbon composites for advanced gas turbine engines was conducted. The purpose of the review was to establish a basis for defining areas of potential research in the mechanical characterization of carbon-carbon materials. The design methodology for laminated composites is delineated and clarified; the turbine engine application is presented as the context for identifying relevant materials for consideration, defining required mechanical properties and test methods as well as for analytical methods of property prediction. The general conclusion drawn from this review is that there are insufficient material properties and an inadequate data base for conducting reliable stress analyses of gas turbine engines. Further, it is observed that the computer codes currently in use to generate preliminary properties require experimental validation. Finally, areas of research are identified.

PERFORMANCE OF IMAGE RESTORATION FILTERS IN MACHINE RECOGNITION

by

David C. Lai

ABSTRACT

Various image restoration filters are evaluated and compared based on their performances in machine classification under a variety of blur and noise conditions. These filters are analyzed to provide in-sight that may lead to ideas for designing new filters and the development of guidelines for applications of these filters in practice. Experimentation is designed to evaluate and compare performance of selected filters under various conditions. Performance measures appropriate to our application are derived. Results are reported and suggestions for further research are offered.

EVALUATION OF PROPOSED INTEGRATED COMMUNICATION NAVIGATION IDENTIFICATION AVIONICS (ICNIA) ARCHITECTURES FOR THEIR FAULT TOLERANCE CHARACTERISTICS AND POTENTIALS

By

Stella Lawrence

ABSTRACT

An assessment of the fault tolerant merits of the hardware and software designs of two proposed Integrated Communication Navigation Identification Avionics (ICNIA) terminals was made. The ITT candidate system is a "software radio" utilizing transversal filters to convert from carrier to baseband frequencies. The TRW candidate system design is a conventional superhetrodyne radio system utilizing mixing and downconversion. Classical fault tolerance implies component redundancy for the entire system; however in ICNIA-fault-tolerance the communication navigation identification (CNI) system functions are prioritized and the most critical functions are preserved at the expense of less critical ones. The ITT and TRW architectures represent a first step in the application of the principles of fault tolerance to avionics CNI system design. Suggestions are offered for further research in this area.

DECISION AIDS FOR SELECTING AIR FORCE MANUFACTURING TECHNOLOGY PROJECTS

By

DAVID R. LEE

ABSTRACT

The availability and level of development of specific manufacturing technologies directly impact the U.S. Government's ability to achieve certain national defense objectives. The Air Force Manufacturing Technology (MANTECH) Program, begun some 35 years ago, supports the development of advanced manufacturing technologies for application at contractor and Air Force facilities.

In a resource constrained environment, the situation involves deciding which MANTECH projects to select and how to allocate resources. Both of these decisions are complex, partially defined processes involving many variables. This research, however, only focuses on the project selection process, with specific attention on evaluation of the decision variables.

With a semi-structured problem, intuitive judgement by the decision maker is an essential part of the decision process. Thus, the objective of this research was to develop decision aids, or management tools, to assist the decision maker in selecting projects to receive MANTECH support. This report describes the methodology employed, describes the major factor categories, and presents a method for summarizing these decision variables.

AN ASSESSMENT OF WARTIME AVAILABILITY OF RECOVERABLE ITEMS

by

E. Stanley Lee, Ph.D.

ABSTRACT

The most critical test of the adequacy of the logistics systems of the Air Force is during the worst scenario such as the initial war surge period or any other critical period when the demands far exceed the anticipated repair or transportation capabilities. In order to assess the war time readiness and sustainability and in order to obtain the best logistics policies during the worst scenario, the true dynamics during this period must be analyzed and accurately modeled based on war time emergency criteria and characteristics which are completely different from peace time.

The true dynamics with limited repair and transportation capabilities for recoverable items during the worst scenario are analyzed by the use of simple examples. Due to its simplicity in computation, the deterministic fluid approximation is analyzed and appears to be ideally suited to model the complicated and large Air Force logistics system during the worst scenario. To further up-grade the model to include the stochastic characteristics, diffusion approximation of the queueing theory can be used. Another possible approach is the formulation of new stochastic processes which may be easier to handle than the traditionally stochastic processes encountered in queueing theory.

LASER DENSITOMETER DESIGN

by

Joanne M. Foley
and
Mark E. Lewittes

ABSTRACT

A design for an automated laser densitometer is presented. The design allows for the measurement of the optical density of samples with high attenuation factors. Such materials are used for or have the potential for use as laser protective eyewear.

The densitometer is designed to measure optical densities as high as 8±.1 OD. Both pulsed and continuous laser sources are incorporated in the densitometer. Wavelengths in the range 488 nm to 1064 nm are available. A microcomputer provides the automation of the laser densitometer, prompting the user through the measurement procedure, making the measurements, and ultimately performing the calculations to determine the optical density of the sample.

REAL-TIME DATA QUALITY ASSESSMENT OF DISTRIBUTED DATA ACQUISITION SYSTEMS

by

Sigurd L. Lillevik

Christopher T. W. Rentola

ABSTRACT

This report describes a 10-week research effort to study the data quality of the Avionics Laboratory's TSCF distributed data acquisition system. This facility generates data for validating Air Force models and for sensor evaluation. A second-order, alpha-beta tracker was designed to predict the value of a parameter one sample in advance. Thus, whenever the difference of the predicted and actual data exceed a threshold value, erroneous data are detected. To demonstrate this principle and to develop an off-line aid for detecting erroneous data, a software package called DBQA was written, debugged, and verified. This software package was used to evaluate raw data and obvious data excursions were correctly detected as erroneous data. These results indicate that the method will work very well in a real-time environment.

PHOTOCHEMICAL REACTIONS

IN A SMALL INDOOR SMOG CHAMBER

BY

Stephen F. Lin and Burton D. Price

ABSTRACT

Photchemical reactions were studied in a small indoor smog chamber using long-path Fourier transform infrared spectroscopy. Three types of experiments were carried out to characterize the smog chamber: the irradiation of background air, ozone decay in the absence of light, and photooxidation reactions of the propene-NO_x-air system. The absorbance-time profiles of major products were determined in the background air system. The ozone decay rate was determined. The concentration-time profiles of reactants and major products were determined and important reaction mechanisms were mentioned for the propene-NO_x-air system.

PARTITIONING EQUILIBRIA OF VOLATILE POLLUTANTS IN THREE PHASE SYSTEMS

by

Leonard W. Lion and Doug Garbarini

ABSTRACT

Volatile pollutants in unsaturated ground water systems are partitioned between the gaseous, aqueous, and solid phases. Equilibria between aqueous solution, the atmosphere, and a solid adsorbent are evaluated in this research. An equilibrium head space technique is employed to determine Henry's Law constants and activity coefficients for components of JP-4 Fuels and for trichloroethylene. Sorption equilibria for these same compounds are also determined on aluminum oxide (Al_2O_3) with and without humic acid coating materials, on humic acids in the absence of Al_2O_3, and on naturally occurring Air Force base soils.

EVALUATION OF PROJECTILE IMPACT ON EARTH COVERED STRUCTURES

by

Daryl L. Logan

ABSTRACT

The capability of earth covered reinforced concrete structures to withstand the local response of impacting projectiles is investigated . Soil and concrete penetration, as well as thickness of structure concrete wall necessary to prevent perforation and scabbing, are predicted. The influence of parameters soil penetrablity index, soil cover thickness, concrete compressive strength, concrete thickness and impact velocity on the local response are examined. It is shown that for ranges of parameter values of interest soil penetrability index and soil cover thickness have the greatest influence on allowable missle weight (frontal pressure) at which incipient backface scabbing of the concrete wall occurs. The implementation of the results is demonstrated for data recorded from missle debris resulting from an actual aircraft shelter explosion experiment. The results indicate that nearly all data falls within safe limits of realizable parameter values. Implications for siting earth covered structures with respect to aircraft structures are evident. Suggestions for further research are indicated.

NUMERICAL SOLUTION OF THE EULER EQUATIONS ON DYNAMIC GRIDS

by

C. Wayne Mastin

ABSTRACT

A method is developed for solving the Euler equations on two-dimensional regions with moving boundary components. An algorithm is presented for moving the interior grid points to follow the moving boundary component, and the modifications necessary for implementing the finite-volume algorithm for solving the Euler equations on a moving grid are stated. These concepts have been incorporated in a computer program and preliminary numerical results are presented.

APPROXIMATE EVALUATION OF OPTIMAL CONTROL MINIMIZING NONCOERCIVE COST-FUNCTIONALS OVER UNBOUNDED SETS; HYPERBOLIC SYSTEMS

by

TAPAS MAZUMDAR

ABSTRACT

In this report we give a preliminary iterative approximation procedure to solve the optimal control scheme that leads to the minimization of a, possibly noncoercive, specified performance index of a system governed by the usual type of hyperbolic equation. The minimization is over specified types of closed convex sets that may possibly be unbounded.

A STUDY OF THE CH_2NO_2 RADICAL USING A MULTICONFIGUATIONAL APPROACH

by

Micheal L. McKee

ABSTRACT

The CH_2NO_2 radical is used as a model for first likely reactive species in the decomposition of high energy materials such as TNT (1,3,5-trinitrotoluene) or HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-Tetrazocine). Radical species can be observed in an ESR cavity during the inductive phase of decomposition however their identity is not clearly established. Semiempirical, single configurational, and eventually multiconfigurational ab initio calculations were carried out to determined the ground electronic state and the electronic distribution. Ab initio calculations based on a single configuration plus correlation could not distinguish the ground state. The MCSCF results indicate that the ground state is a planar $^2A''$ state which results from the interaction of the planar $^2B_1$ and $^2A_2$ states that cross at a common C_{2v} geometry and which leads to a favorable asymmetric distortion from C_{2v} symmetry to a lower C_s symmetry. A similar distortion was observed by Davidson and coworkers for NO_2. The $^2A''$ state is 14.6 kcal/mol more stable than the $^2B_1$ state and 19.9 kcal/mol more stable than the $^2A_2$ state. The staggered $^2B_2$ state which is the C_{2v} ground state is 6.8 kcal/mol higher than $^2A''$ state. The planar $^2A''$ ground state has considerable spin density on the carbon and some on one oxygen in agreement with ESR results.

I. INTRODUCTION:

The nitromethyl radical has been postulated to be invloved in a number of different phenomena. In a study[1] of nitromethylation of aromatic compounds it was determined that the radical had appreciable electrophilic character. The only products formed were through reactions at the carbon suggesting that it was the more reactive center. Interestingly in the reaction with manganese (III) acetate

INVESTIGATION OF VIBRATION PROBLEMS WITH HETERODYNE HOLOGRAPHIC INTERFEROMETER

by

Dr. Robert A. McLauchlan, P. E.

ABSTRACT

An investigation was made of the mechanical/acoustic vibration sources of the large ($\lambda/35$) RMS surface errors in 10 in. beam wavefronts measured with the AFWL/ARAA heterodyne holographic interferometer, wavefront sensor (HET) system. Seismometer, etc. vibration sensor measurements, HET optical system measurements and a simple undamped resonant frequency analysis were used to identify the attached acoustic/wind screen as a significant local "source" of nominal 30 and 40 Hz, pitch and yaw vibratory modulations of the HET optical beams. Supporting studies relevant: (a) rigid body motion of the HET optical table system, (b) flexural and torsional motion of HET optical table, and (c) impact of vibrating motion on differential hologram fringe modulation function were performed and are also discussed in this report.

USE OF COLLOIDAL GAS APHRONS (CGA'S) FOR TREATING HAZARDOUS WASTES

by
Donald L. Michelsen
Wade L. Auten

Abstract

Colloidal Gas Aphrons, a microdispersion of stable small air bubbles (15 to 50 mμ) in air, have proven to be effective in separation processes. The purpose of this laboratory study was to explore their effectiveness in treating hazardous wastes by 1) evaluating their flow characteristics through soil matrices (for removal or scouring of pollutants and for in-situ biodegradation); 2) quantifying their adhesion and retention in various saturated matrices (impoundments) for subsequent in-situ biodegradation; and 3) determining the feasibility of an extraction/flotation process for removing ortho dichlorobenzene (dissolved hazardous organics) from contaminated water using CGA's for flotation.

Extensive results on flow of CGA through a coarse golf course sand documented the importance of surfactant, type and concentration, and pretreatment on CGA flow characteristics.

The adhesion and retention of CGA's in a flooded impoundment were very promising. Water was displaced with 0.56 to 1.25 air/water volume ratio injected in the saturated sand and 75% retention of these bubbles one month later.

Finally, while testing was limited, CGA's provided encouraging phase separation (clarification) in an extraction/flotation process for removing soluble ortho dichlorobenzene from water using a good decane solvent (high partition coefficient).

TRANSPORT AND ELECTRON PARAMAGNETIC RESONANCE STUDIES OF INFRARED DETECTOR MATERIALS

by

George K. Miner, Ph. D.

ABSTRACT

Through interaction with the Materials Laboratory, an experimental apparatus for Hall Effect and resistivity measurements has been established in the Physics Department at the University of Dayton. It operates over a temperature range of 4 to 400K. The system has been tested with silicon and gallium arsenide and compared to a comparable system at the Materials Laboratory. It has proved to be reliable for supplemental measurements for that laboratory. An electron paramagnetic resonance spectrometer has been used to examine similar gallium arsenide materials and comparisons made to earlier silicon work. Preliminary work indicates that with some dopants there are weak but as-yet unidentified signals at 77 and 300K. There remains the possibility of identification of the defects responsible.

Synergetic Maneuvers

by

Don Mittleman

Abstract

A procedure that may allow the specification of a synergetic maneuver from one Keplerian orbit to another, lying in a different plane and with different pedigree, depends on knowing the equations of motion of the vehicle on the transfer orbit. When the transfer orbit is also Keplerian, solutions to this problem for different impulse requirements have been given. When the transfer orbit is not Keplerian but subject to drag, a solution is known for an optimal, two-impulse transfer trajectory subject to a very special form of the drag. To attempt to apply the technique to the case of interest, hypersonic flight through a resisting atmosphere, requires the reformulation of the differential equations. Initially, these equations are cast in a form suitable for numerical integration on a high-speed computer. The desired form needs to be more amenable for theoretical analysis. This reformulation is done in this report. Suggestions for continued research in this area are offered.

APPROACHES TO SYNTHESIS OF SOME NOVEL POLYBENZIMIDAZOLE MONOMERS

by

Charles G. Moseley

ABSTRACT

Rigid rod aromatic-heterocyclic polymers such as polybenzimidazoles have high strength and high thermooxidative stability and are useable as structural materials for aerospace vehicles. Thus, a literature search was carried out and methods of synthesis proposed for two model compounds and three novel monomers which could possibly be polymerized to useful polybenzimidazoles. The monomers studied are N^1,N^5-diaryl-1,2,4,5-benzenetetramines, N^1,N^4-diphenyl-1,2,4,5-benzenetetramine, and 4-amino-3-anilinobenzoic acid. Experimental work was then carried out in the laboratory in an attempt to synthesize one of the monomers (N^1,N^4-diphenyl-1,2,4,5-benzenetetramine) by adding ammonia to N,N′-diphenyl-p-benzoquinonediimine. The desired reaction did not occur in six attempts made under various conditions. Recommendations for further research in this area were then made.

BOUNDARY CORRECTIONS FOR LOW SPEED, SOLID WALL WIND TUNNELS

by

Dale F. Moses

ABSTRACT

A plan of experiments is discussed for developing a subsonic, three dimensional wall correction code, based on a method due to Sears, into a form which can be efficiently used with solid wall wind tunnels. The inherent accuracy of the code is addressed and ways are identified for reducing calculational errors. The state-of-the-art of transonic, three-dimensional, slotted wall boundary corrections is reviewed and recommendations are made for further research in this area.

COMBINED TIME SPACE FILTERING FOR HF ANTENNA ARRAY SYSTEMS

by

Randolph L. Moses

ABSTRACT

This report investigates methods for combined time-space adaptive filtering of HF receiver antenna array data. These two-dimensional filters attenuate interference and noise components in the received data to facilitate effective channel equalization processing. The filtering algorithms are derived by first modeling the received data array as a two-dimensional ARMA process. Algorithms for estimating the AR coefficients in this model are then developed. These AR coefficients are used as the weights of the two-dimensional filter. In addition, computationally efficient recursive algorithms that combine the AR coefficient estimation and data filtering operations are derived. Suggestions for performance evaluation of these filters and recommendations for future research in this area are also presented.

RAMAN SPECTROSCOPY OF INHIBITED AND STIMULATED, NORMAL AND NEOPLASTIC CULTURED HUMAN AND MAMMALIAN CELLS

by

James J. Mrotek

ABSTRACT

Y-1 mouse adrenal tumor cells and two human respiratory tract fibroblast cell lines (HEP-2, transformed, and MRC-5, non-transformed) were used for laser-Raman spectroscopy. One spectral line group observed with non-stimulated Y-1, MRC-5, and HEP-2 cells was similar to bacterial cell lines; the lines may represent laser photon scattering by high energy-containing compounds such as ATP. Comparing spectra from HEP-2, MRC-5 and Y-1 cells, total spectral lines increased in the order: HEP-2, Y-1 and MRC-5. ATP increased adrenal cell steroid production and caused increased numbers of lines in both Stokes and anti-Stokes wavelengths; anti-Stokes activity is seldom observed in Raman spectra. The spectra common to all living cells was masked by the extreme ATP spectral activity. HEP-2 molecules produced significant numbers of tightly grouped, adjacent Raman spectral doublet and triplet patterns not observed with non-transformed fibroblasts. Cultured human and mammalian cell line preliminary results suggested that spectroscopy may produce significant new information about spectral signatures of intracellular molecules and intracellular energy transduction.

COMBINED MAGNETIC AND GRAVITY ANOMALIES: A GUIDE TO CRUSTAL TYPE AND TECTONICS IN THE SOUTHEASTERN INDIAN OCEAN AND CARIBBEAN REGIONS

by

Frederick Nagle

ABSTRACT

As a consequence of a literature search to provide a geologic foundation for magnetic and gravity anomalies described by Sailor and Lazarewicz[1,2], it is evident that several large geographic features in the southeastern Indian Ocean may be, at least in part, continental. If any or all of them are continental, then reconstruction models for Antartica- India- Australia will have to be modified.

For one of these areas, the Kerguelen Plateau, there are deep sea core samples in storage, not yet studied in detail, which could help resolve this question. Preparatory steps have been taken for submission of a proposal to the Antartic Branch of the National Science Foundation.

Three model sites are designated for combined analysis of gravity and magnetic data to determine rock types and crustal structure. Ultimately such determinations could be done for other areas from satellite data alone.

Work has begun on a J/p (anomalous magnetization/anomalous density) map for the Caribbean. Since so much detail is known about the rocks and structure of this region, this map could serve as an interpretive guide for anomalies already known in the Indian Ocean or elsewhere.

USING ARTIFICIAL INTELLIGENCE IN AVIONIC FAULT ISOLATION

BY

PHILIP D. OLIVIER

ABSTRACT

The properties of any procedure for isolating faults in avionic equipment are investigated. So that the procedure is suitable for use with artificial intelligence techniques. The application of one such procedure to one device is described. Suggestions for further research are offered.

ABSTRACT

ORGANIC REACTIONS IN ROOM TEMPERATURE CHLOROALUMINATE MOLTEN SALTS

Albert L. Payton
Hampton Institute

Mixtures of some organic chloride salts and aluminum chloride form new salts that are liquid below room temperature. The mixture of 1-methyl-3-ethylimidazolium chloride (MeEtImCl) and aluminum chloride ($AlCl_3$) is one such ionic liquid. It is liquid substantially below room temperature, has good thermal stability at high temperature, has a low vapor pressure, and dissolves both organic and inorganic compounds. Earlier work at the Frank J. Seiler Research Laboratory showed that some of the MeEtIm chloroaluminate melts promoted Friedel-Crafts reactions. The Lewis acidity of the melts presumably catalyzed the formation of reactive alkylating and acylating intermediates, which resulted in high yields of alkyland acyl-substituted aromatic compounds. In this project the scope and optimimum conditions for Friedel-Crafts reactions in the MeEtIm chloroaluminate melts were examined. Also, the utility of the reactions was tested by preparing polyalkylated aromatic compounds with large alkyl substituents, which may have some use as synthetic lubricants or hydraulic fluids.

The optimization of reaction conditions involved a study of the effect of temperature, reactant composition, reaction time and melt compostion on the rate of reaction, distribution of products and yields of desired products. Briefly, the best results were obtained by running the reactions at low temperature for longer times to reduce side products. The rate of reaction could also be controlled by adjusting the proportion of $AlCl_3$ in the melt, as long as the $AlCl_3$ was in excess over the MeEtIm. An example of a large alkyl polysubstuted benzene was synthesized by acylating benzene with octanoyl chloride followed by Wolf-Kishner reduction of the carbonyl. This monosubstituted product was used as the starting material for two subsequent acylations and reductions, resulting in a 1,2,4-substituted product. The physical properties of the product were not examined due to time limitations.

A METHOD OF SENSING SMALL CHANGES IN THE ANGULAR SEPARATION OF CROSSED LASER AND NEUTRAL PARTICLE BEAMS

by

David J. Pegg

ABSTRACT

Small changes in the angular separation of crossed laser and particle beams can be sensed by monitoring the strength of the interaction between the two beams. This monitor signal will be proportional to the population of the upper level of the absorbing transition. The sensitivity of the method depends on the signal-to-noise ratio and width of the monitor signal. Optical and non-optical monitor signals have been considered.

EVALUATION OF NAPHTHALENE TOXICITY USING SHORT TERM EXPOSURE AND THE AMPHIPOD, GAMMARUS TIGRINUS

by
Gerald V. Poje

ABSTRACT

Pulsed releases of toxic chemicals, such as occur with accidental spills, are poorly modelled by traditional bioassay techniques. The toxicity of naphthalene, an important constituent of jet fuels, is examined using short term exposures typical of a spill event. Median lethal concentration over the range of short term exposure durations are described for the crustacean, Gammarus tigrinus. Sublethal impact upon growth and reproductive parameters are quantified. Short term exposure to naphthalene resulted in altered feeding and mating behaviors. Morphological alteration of gill tissue using scanning electron microscopy is discussed. Sugestions for further research in this area is offered.

SIMPLIFICATION OF NONLINEAR SYSTEMS

By

L. Rai Pujara

ABSTRACT

In this report, a technique for the simplification of those nonlinear systems whose nonlinearities can be represented by continuous functions is presented. The method is based upon constructing an equivalent *nonlinear system in which* the linear and nonlinear signals appear as orthonormal signals. The simpler model is selected from this equivalent system. The technique is illustrated by a numerical example.

The Effect of Large Deformation on the Fracture Mechanics of Solid Propellants

by

David L. Questad

ABSTRACT

Most solid propellants consist of an elastomeric binder containing a high volume fraction of filler particles. The propellants, therefore, are composite materials which, under deformation, are susciptible to microstructural damage, crack growth and fracture. The damage occurs mostly due to debonding at the filler/binder interface, and fracture may result from a single large flaw propagating through the damaged propellant or from the coalescence of many smaller cracks which have been induced by debonding. The deformation of a solid propellant involves nonlinear viscoelastic effects as well as irreversible deformation. A general theory of deformation, failure and fracture is impracticle, so a number of assumptions and simplifications are made in order to develop workable theories. This paper reviews some of the current thinking on failure and fracture in sclid propellants.

THE APPLICATION OF AN EXTENDED KALMAN FILTER TO THE DESIGN OF A BANK-TO-TURN MISSILE AUTOPILOT

by

Dallas W. Russell

ABSTRACT

In the past, missile autopilots have been designed using classical control techniques. The bank-to-turn missiles will require improved performance. Modern control and estimation theory are promising approaches to achieving improved performance. An Extended Kalman Filter that estimates system states and time-varying parameters has been designed for a low-order model with good results. It is recommended that this effort be continued beginning with simpler mathematical models of a generic missile; a set of equations, with numerical values for all the parameters is included.

ANALYSIS OF PILOT SELECTION DATA

by

Herman F. Senter

ABSTRACT

Historical data on test performance scores and the individual characteristics of student pilots were analyzed to identify measures most highly associated with success in pilot training school. Groups of scores from psychomotor tests, from flight training lessons and from the Air Force qualifying examinations were studied separately as well as jointly for their relationship to training school attrition. A regression equation to predict the likelihood of success in training based on selected grades and characteristics of individuals was developed.

EFFECT OF JET FUEL JP-4 FRACTIONS ON FISCHER 344 MALE RATS

by

Dr. M. Paul Serve'

ABSTRACT

The effects of jet fuel JP-4 on the kidneys and livers of male Fischer 344 rats were studied in order to ascertain whether all hydrocarbons produce similar effects. JP-4, after separation into boiling range fractions, was administered intragastrically to the rats. Weight loss and urine production were studied for 48 hours. Gross pathological as well as histopathological examination of the kidneys and livers of the rats 2 days and 10 days post-exposure to the JP-4 indicated that kidney and liver damage was maximized early. The rats appeared to be able to repair any damage by day 10. The higher boiling fractions of JP-4 appeared to be the most toxic.

SECONDARY MUZZLE FLASH IN RAPID FIRE CANNONS

by

Robert K. Sigman

ABSTRACT

The problem of secondary muzzle flash in rapid fire aircraft cannon has been investigated. An additional mechanism for initiation of secondary flash has been discovered, which is not present in single fire cannons or in single shot firings, which are generally used to test for secondary flash. This initiation mechanism is associated with blow-by or leakage of hot propellant gas past the rotating band. Computer programs have been prepared for prediction of the flow field within the barrel ahead of the projectile and for the interior ballistics of a leaking gun. Recommendations are offered for further research in this area.

POROELASTIC MODELS OF THE INTERVERTEBRAL DISK

by

Bruce R. Simon

ABSTRACT

Analytical, experimental, and finite element models were developed for spinal motion segments including the vertebra and the intervertebral disk (IVD). The cortical and cancellous bone were assumed to be elastic, whereas the disk tissue (nucleus and annulus) were assumed to behave "poroelastically" as deformable porous solids through which a fluid can flow. Simple one-dimensional poroelastic models were used to estimate mechanical parameters for creep response data for rhesus IVD's (L_2 - L_3 level). A prototype axisymmetric finite element model of the rhesus IVD (L_2 - L_3 level) was developed. Deformation, internal stress, pore fluid pressures, and pore fluid motion results were obtained for spinal motion segments in axial compression subjected to static, step (creep), and steady-state (sinusoidal) loading. The results of this project demonstrate that meaningful poroelastic models can be developed which will allow a detailed consideration of the mechanics of spinal motion segments. Models of this type will be applicable to the study of aircraft ejection phenomena; crash injury; disk degeneration, enucleation, and herniation processes; as well as provide a fundamental understanding of the relation of possible fluid motion in the disk to internal stresses, pressures, and pathways for transport of materials to and from the avascular regions of the IVD.

EFFECTS OF FLUID SHIFTS AND HYPOVOLEMIA IN INDIVIDUALS WITH DIFFERENT WORKING CAPACITIES WHILE RESTING AT A FIVE DEGREE DECLINATION

by

Debra K. Rotto
Diane M. Rotto
William G. Squires

ABSTRACT

Data from actual space flight studies have demonstrated functional abnormalities and changes of the cardiovascular system immediately post-flight. Interest lies in what occurs to the body during exposure to zero gravity that could account for these post-flight alterations in cardiovascular functions. During zero gravity or head-down rest, the hydrostatic intra- and extravascular pressure gradients that are normally present in the upright position are abolished or minimized. This causes a headward shift of body fluids from the lower portions of the body cavity. This massive fluid shift induces adaptive changes in other body systems, such that reexposure to normal gravitational forces produces signs of of orthostatic intolerance. These adaptive changes include the following: inhibition of the renin-angiotensin and ADH systems, diuresis, decreased blood volume, weight loss associated with diuresis and decreased blood volume, inhibition of sympathetic activity due to decreased levels of circulating catecholamines and increased activity of the carotid sinus nerve, decreased stroke volume, no change (or slight increase) in arterial pressure, cardiac output, or the contractile state of the heart, compensatory bradycardia, increased right and left atrial filling pressures and central venous pressure, increased left ventricular end-diastolic volume and left ventricular ejection fraction, decreased leg volumes and increased forearm volumes. Preliminary studies were done on a dog and the expected changes in the cardiovascular parameters were found. Contractility of the heart increased, left ventricular pressure increased, left ventricular end-diastolic pressure increased, heart rate decreased, renal blood flow and carotid blood flow increased, and systemic arterial pressure increased after the dog was tilted five degrees head-down for one hour.

PINHOLE BEAM SENSORS II

by

James Eldon Steelman

ABSTRACT

Several different mechanizations of pinhole sensing of neutral particle beams were presented. Possible scintillators are examined and a scintillator followed by a "bent microscope" and a CCD detector is analyzed in detail. This system includes a laser alignment system and the assumption is made that the quantity to be measured is the distance between the pinhole beam spot and the laser spot. A five lens system is presented for detecting beam rotation and parallel displacement. The analysis indicates that beam centroid location within less than 1 μm is possible.

Two experiments are suggested. One uses a UV laser to create scintillation and provides operational experience with the system. The other experiment uses the 800 MeV LAMPF beam to determine the response versus dose for various scintillators.

The conclusion is presented that a pinhole system can satisfactorily detect the low energy "skirts" of the beam. Unfortunately, the relationship between the skirts of the beam and the centroid of the beam is uncertain.

DYNAMIC STALL: A STUDY OF THE CONSTANT PITCHING RATE CASE

by

James H. Strickland

ABSTRACT

Data were collected for an airfoil undergoing a pitching motion in which the pitching rate $\dot{\alpha}$ remained constant. These data included surface pressure data which were obtained by a previous investigator, smoke-wire flow visualization data, and airfoil surface mounted hot-wire velocity data. Large scale vortical structures on the suction side of the airfoil were seen to form during the pitching motion. As indicated from the surface pressure data, as well as the surface velocity data, these structures are highly energetic and have relatively long residence times near the airfoil. Significant increases in lift occur due to the presence of these vortical structures. These data were also compared to the predictions of an analytical model (USTAR2). Reasonable agreement between the experiment and analysis were obtained up to moderate angles of attack.

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF NEGATIVE ION-POLAR MOLECULE REACTIONS

by

Timothy C. K. Su

ABSTRACT

The rate constants for proton-transfer reactions of OH^-, NH_2^- and O^- with HCN and $CH_3CN$and for the displacement reactions of OH^- and O^- with methyl halides have been measured in the gas phase in the temperature range 200K-500K using a selected ion flow tube. Rate constants of the fastest reactions are very close to the collision rate constants predicted by the trajectory method. It was observed that the reaction efficiency decreases as exothermicity decreases and the reaction probability of S_N2 reactions decreases as temperature increases. A trajectory calculation is also developed for the kinetic energy dependence of ion-polar molecule collision rate constants.

A DYNAMIC MINI-MODEL

FOR SPACE TECHNOLOGY RESOURCE ALLOCATION

by

Patrick J. Sweeney
Stephen C. Cooley

ABSTRACT

The report outlines a rationale and methodology that can be used to allocate resources in the Air Force Research and Developement Space Program. The results of allocations are shown both graphically and in tabular form. The report addresses mission priorities and work unit (research projects) selection and shows how each can affect the overall mission accomplishment. That work unit subjective probability of success estimates have traditionally been overly optimistic is also addressed and a potential solution is discussed. The dynamic model developed can easily be utilized to search out best overall solutions and for exercising "what if" opportunities. An extensive bibliography of resource allocation model evaluations is included.

EARLY PERFORMANCE OF THE GALLIUM ARSENIDE PHOTOVOLTAIC ARRAY ON THE LIVING PLUME SHIELD (LIPS) SATELLITE

by

PAUL P. SZYDLIK

ABSTRACT

The electrical characteristics of an array of gallium arsenide photovoltaic cells in earth orbit on the Living Plume Shield (LIPS) satellite are studied as a function of time in orbit. A theoretical solar cell model and least-squares methods are used to extract those characteristics from current vs. voltage data corrected to one sun and 28°C. The decrease in electrical output of the array is related to the equivalent 1 MeV electron fluence required to produce the observed decrease. Results for the first 172 days in orbit show either that deterioration of the array based on the anticipated radiation environment is greater than expected or that the equivalent 1 MeV electron fluence for the orbit is about an order of magnitude greater than predicted.

Building a Multiple Regression Equation When Many Variables Are Available

by

Enoch C. Temple

ABSTRACT

This paper summarizes some of the problems encountered when a linear model is constructed from a large set of potential regressor variables. Limitations imposed on the multiple regression coefficient by survey data are discussed. The problem of multicol linearity is reviewed. A method of selecting a set of regressor variables and simultaneously identifying multicollinearities is presented through an example.

A PRELIMINARY INVESTIGATION OF THE UTILITY OF LINEAR DIGITAL FILTERS FOR ANALYZING ECONOMIC SYSTEM PERFORMANCE DATA

by

William Robert Terry, Ph.D.

ABSTRACT

The utility of linear digital filter (LDF) methods for analyzing performance data for economic systems was investigated. LDF methods typically used for analyzing physical systems were found to be not well suited for analyzing economic systems. Alternative methods for analyzing economic systems were identified. Data series from a number of economic systems of interest to the Air Force were identified and LDF models were fitted to each series and selected pairs of series. Analysis of the models fitted to the individual series indicated that the assumption of independent errors was not usually appropriate and that LDF methods could be used to account for such dependencies. Analysis of the simultaneous behavior of selected pairs of series indicated that feedback relationships could exist between certain pairs of series and that multivariate LDF models could be appropriate. The analysis of attempts to model certain pairs of series also indicated that a non-linear digital filter method could be needed.

Shallow Donor Impurity Binding Energies in Asymmetric Quantum Wells

by

John Thomchick

ABSTRACT

The energy of an electron bound by a donor impurity center inside a GaAs/AlGaAs layered structure has been investigated. In the present study the donor impurity atom was assumed to be located at an arbitrary site inside a GaAs layer sandwiched between two GaAlAs layers with differing Al concentrations. The different Al concentrations cause different potential energy barrier heights on the two sides of the GaAs layer resulting in an asymmetric quantum well. The calculation was formulated so that the binding energies could be obtained as a function of the ratio of the barrier heights at the two interfaces, as a function of the location of the impurity atom inside the GaAs layer, and as a function of the width of the GaAs layer.

STATISTICAL SIMULATION AND CORRELATION STUDIES OF GAAS MESFETS

by

Arthur R. Thorbjornsen

ABSTRACT

A method for the statistical simulation of GaAs MESFETs has been tested by comparing simulated device data with measured device data. The Kolmogorov-Smirnov two-sample goodness of fit test indicated that the simulated and measured parameter values have the same distribution in about 70% of the cases tested. The MESFET model used produces correlation coefficients between parameter values that have realistic values for all except one device parameter. Overall, the simulation method seems to produce results that are adequate for design purposes. A statistical test on measured device data indicates that the distance separating two GaAs MESFETs has no effect on correlation.

DELIVERY ACCURACY

by

JON W. TOLLE

ABSTRACT

The Delivery Accuracy Working Group (DAWG) has recently begun to produce delivery accuracy figures for unguided air-to-surface bombs launched by high performance aircraft. This report contains a description and a critical study of the methodology behind the production of these figures. In addition, the predicted range errors are compared to actual errors observed in training tests for the F111 A/E aircraft. Recommendations are put forth for improvements in delivery accuracy analysis.

AN INTRODUCTORY DYNAMICAL THEORY FOR FULLY COMPRESSIBLE TURBULENCE

by

George Treviño

ABSTRACT

A stochastic theory for use in the study of the dynamics of fully compressible turbulence is presented for the case where the turbulence is isotropic. It is shown that the time-decay of all correlation tensors encountered in this theory is dependent upon the equations of both continuity and Navier-Stokes; the qualitative implication of this kinematic-kinetical "coupling" is that in the formulation of an appropriate "closure", kinematics (and kinematical constraints) must be explicitly included in the closure scheme. A closure is formulated by adapting the method of "modified tensor invariants".

ELECTRONIC EXCITATION OF ATOMIC XENON BY ELECTRON IMPACT

by

Keith G. Walker

ABSTRACT

The 6p and 6p' optical excitation functions of atomic xenon have been measured from onset to 100 eV's. Particular interest has centered on their pressure dependence. Most of the levels betray a pressure sensitivity for electron energies greater than 25 eV's. Higher np, ns and nd levels have been measured and many of these excitation functions exhibit a pressure dependence. Resonant type structure around 20 eV has also been observed in many of the functions. The xenon excitation functions have been measured when various amounts of helium are mixed with the xenon. Some functions are changed drastically while others appear 'inert' against the helium. Possible mechanisms for the above behavior are discussed.

EFFECT OF GRAPHIC INFORMATION ON READING COMPREHENSION:

EYE MOVEMENTS IN READING TEXT WITH GRAPH

by

Shih-sung Wen

ABSTRACT

This study compared reading comprehension between reading verbal text with a graph, and reading verbal text without a graph. Eye movements in reading were monitored, recorded, and analyzed to examine patterns of interaction between text reading and graph viewing. Results showed that (a) text reading with graph slightly but not significantly improved reading comprehension of the text, (b) reading text with graph decreased both reading time and the number of eye fixations on the text and (c) the graph was attended primarily in the second half a reading period, especially in the final quarter. An implication of using eye tracking techniques to study reading was discussed. Some limitations of the study were observed and a follow-on study with changes in sampling and design was recommended.

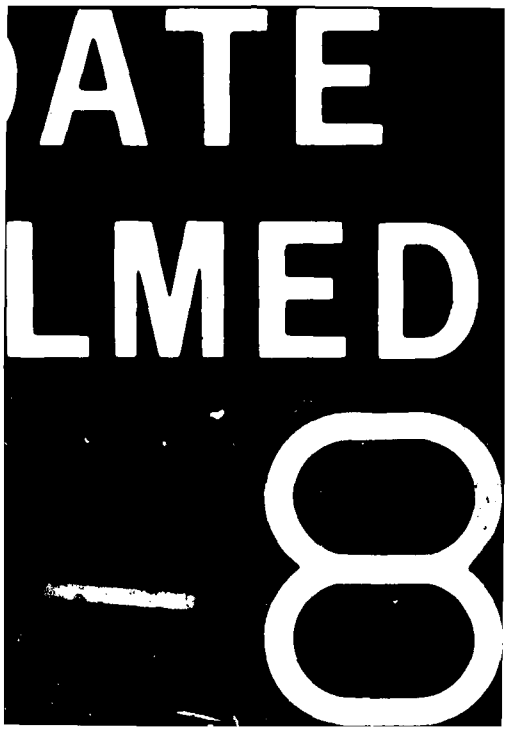
INTRAGASTRIC ADMINISTRATION OF DIBROMOMETHANE TO RATS

by

KENNETH J. WILLIAMSON AND LYNN E. CASHION

ABSTRACT

Partition coefficients for dibromomethane for saline, rat bile, corn oil, and mineral oil were determined by gas absorption. Dibromomethane was orally dosed to rats in saline at 10, 20, 50, and 100 mg/kg and the resulting time course for blood concentrations of the parent compound and carboxyhemoglobin were measured. The time traces were simulated using a physiological toxicokinetic model including partitioning to various body compartments, first-order absorption from the gut lumen, liver metabolism, kidney excretion, and exhalation. The model could not accurately simulate the experimental data with a single first-order absorption coefficient applied to all the dosages.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