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## I. INTRODUCTION

Universal Energy Systems, Inc. (UES) was awarded the United States Air Force Summer Faculty Research Program on August 15, 1984. The contract is funded under the Air Force Systems Command by the Air Force Office of Scientific Research.

The program has been in existence since 1978 and has been conducted by several different contractors. The success of the program is evident from its history of expansion since 1978.

→ The Graduate Student Summer Support Program (GSSSP) is conducted as part of the Summer Faculty Research Program.

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

The program is available to Graduate Students enrolled in either Masters Degree or Doctorate Programs. It has proven especially beneficial to the students who are starting their academic research programs.

Beginning with the 1982 program, research opportunities were provided for 17 graduate students. The 1982 pilot student program was highly successful and was expanded in 1983 to 53 students; there were 84 graduate students in the 1984 program.

In the previous programs, the graduate students were selected along with their professors to work on the program. For the 1985 program, the graduate students were selected on their own merits. They were assigned to be supervised by either a professor on the program or by an engineer at the Air Force Laboratories participating in the program. There were 92 graduate students selected for the 1985 program.

A pilot program for Graduate Student Summer Research 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 supervising professors who hold concurrent SFRP appointments. ←

For the 1985 GSSSP, emphasis was placed on selecting graduate students to be placed with either supervising professors on the SFRP or with the Air Force laboratory/center engineers. There were 120 GSSSP applicants. A total of 92 graduate students were selected to participate in the 1985 program.

UNITED STATES AIR FORCE  
GRADUATE STUDENT SUMMER SUPPORT PROGRAM  
1985  
PROGRAM MANAGEMENT REPORT  
UNIVERSAL ENERGY SYSTEMS, INC.

Program Director, UES  
Rodney C. Darrah

Program Manager, AFOSR  
Major Amos L. Otis

Program Administrator, UES  
Susan K. Espy

Submitted to  
Air Force Office of Scientific Research  
Bolling Air Force Base  
Washington, DC

December 1985

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## II. RECRUITING AND SELECTION

The program is conducted on a nationally advertised and competitive selection basis. Advertising for the 1985 program was conducted via direct mail to all accredited schools. The mailing was sent to the department chairman at the schools. The departments included biology, genetics, ecology, entomology, chemistry, computer science, graphics, mathematics, physics, aeronautical engineering, ceramic engineering, chemical engineering, materials science, mechanical engineering, electrical engineering, metallurgy, nuclear science, and psychology. The brochures were also mailed to all of the participants in the 1984 program. Brochures were mailed to the Presidents of Historically Black Colleges. The brochures were sent to all participating USAF laboratories/centers; distribution was made through AFROTC units on university campuses; information was supplied to all who made requests. Overall, more than 7500 brochures were distributed throughout the country.

In 1982, 91 faculty and 17 students participated in the program. In 1983, 101 faculty and 53 students participated. In the 1984 program there were 152 faculty members and 84 graduate students appointed to the Air Force facilities. For the 1985 program, 154 faculty members and 92 graduate students were assigned to the Air Force laboratory/centers.

Application deadline was February 1, 1985. The selection panels met in February. The announcements of selections were mailed on April 25, 1985.

The 1985 SFRP is published as four separate documents. The reports are entitled Summer Faculty Research Program Management Report and Technical Reports, Volume I, II and III.

## III. SITE VISITS

Visits listed below include those by UES and AFOSR personnel. The faculty, USAF research colleagues, and student participants are generally satisfied with the program. Criticisms were: a) too much paper work to administer program, b) housing difficult to find, c) delays experienced in receiving payment d) 10 weeks too short for research period.

Nov. 4, 1984	Rome Air Development Center Griffis Air Force Base, New York
Nov. 5 & 6, 1984	Geophysics Laboratory Rome Air Development Center Electronics System Division Hanscom Air Force Base, Massachusetts
Nov. 12, 1984	Human Resources Laboratory Williams Air Force Base, Arizona

Nov. 13, 1984 Weapons Laboratory  
Kirtland Air Force Base, New Mexico

Nov. 14, 1984 Frank J. Seiler Research Laboratory  
United States Air Force Academy, Colorado

Nov. 15-18, 1984 USAF School of Aerospace Medicine  
Occupational & Environmental Health Laboratory  
Human Resources Laboratory  
USAF Aerospace Medical Division  
Brooks Air Force Base, Texas

Nov. 19, 1984 Logistics Management Center  
Gunter AFS, Alabama  
and  
Leadership and Management Development Ctr.  
Maxwell AFB, Alabama

Dec. 6, 1984 Armament Laboratory  
Eglin Air Force Base, Florida

Dec. 7, 1984 Engineering and Services Center  
Tyndall Air Force Base, Florida

Dec. 11, 1984 Rocket Propulsion Laboratory  
Edwards Air Force Base, California

April 6, 1985 Air Force Office of Scientific Research  
Bolling Air Force Base, DC

Feb. 18-22, 1985 Selection Meeting  
Brooks Air Force Base, Texas

June 16, 1985 Geophysics Laboratory  
Electronics Systems Division  
Rome Air Development Center  
Hanscom Air Force Base, Massachusetts

June 18, 1985 Rome Air Development Center  
Griffis Air Force Base, New York

July 15, 1985 Human Resources Laboratory  
Williams Air Force Base, Arizona

July 16, 1985 Weapons Laboratory  
Kirtland Air Force Base, New Mexico

July 18, 1985 Frank J. Seiler Research Laboratory  
United States Air Force Academy, Colorado  
and  
Human Resources Laboratory  
Lowry Air Force Base, Colorado

July 19, 1985	School of Aerospace Medicine Human Resources Laboratory Occupational & Environmental Health Laboratory Brooks Air Force Base, Texas
July 22, 1985	Rocket Propulsion Laboratory Edwards Air Force Base, California
July 30, 1985	Logistics Management Center Gunter AFS, Alabama and Leadership and Management Development Ctr. Maxwell AFB, Alabama
April 1, 1985	Armament Laboratory Eglin Air Force Base, Florida
August 2, 1985	Engineering and Services Center Tyndall Air Force Base, Florida

Because of the proximity of UES to Wright-Patterson Air Force Base, several site visits were made to the following laboratories:

Aerospace Medical Research Laboratory  
Aero Propulsion Laboratory  
Avionics Laboratory  
Business Research Management Center  
Flight Dynamics Laboratory  
Human Resources Laboratory  
Logistics Command  
Materials Laboratory  
Wright-Patterson Air Force Base, Ohio

We find that the objectives of the GSSSP are being well served. Summer Fellows indicate that they are performing independent research, and are not being used as "summer help". We have found no abuse of the non-personal services requirements. Research fellows often conduct lectures and seminars at the Air Force locations.

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

#### IV. HISTORICALLY BLACK COLLEGES/UNIVERSITIES (HBCU's) WORKSHOP

In conjunction with the Summer Faculty Research Program, and as part of the UES EEO/Affirmative Action Program, UES sponsored an AFOSR workshop at the NAFEO (National Association for Equal Opportunity in Higher Education) Conference. The workshop was held on April 3 and 4, 1985. The AFOSR six Scientific Directories presented information to acquainted Faculty/Researchers from HBCU's with the opportunities and strategies for participation in basic research programs of AFOSR. UES provided funding for 40 participants from HBCUs to attend the workshop.



The overall evaluation of the Conference by the participants was very favorable. There was great appreciation for the opportunity to interact with the AFOSR Scientific Directors and Program Managers, and successful AFOSR grantees from the black colleges. Many participants commented that the Workshop format, as well as the information presented, was very beneficial. There were many requests for copies of the various presentations which have been forwarded by NAFEO to the respective presenters.

APPENDIX I

This appendix presents the following documents which were distributed to appointees and other program participants.

- A. Information Brochure for Summer Fellows.
- B. Questionnaire for participants and a summary of their replies.
- C. Questionnaire for Air Force laboratory representative and a summary of their responses.

APPENDIX 1.A

INFORMAION BROCHURE

for

SUMMER FELLOWS

on the

1985 USAF-UES GRADUATE STUDENT SUMMER SUPPORT PROGRAM

March 1985

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## I. SUMMER FELLOW OBLIGATIONS

Universal Energy Systems, Inc. (UES) is required by contract to impose certain obligations on you in your status as a Summer 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.

1. Research Goals and Objectives: A statement of research objectives must be provided to UES 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. If you are working with a professor during the appointment, the goals and objectives may be the same as submitted by the professor.
2. Final Report: At the end of your summer research effort, you are required to submit to UES a completed, typewritten scientific report stating the objectives 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 illustrating a suggested format. The final report must first be approved by your Effort Focal Point and then transmitted so as to reach UES by Monday September 30, 1985. Payment of "Compensation" for the final two weeks of your ten-week research period cannot be made until UES has received and approved this report in the required format.
3. 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 UES, along with your final report, by Monday, September 30, 1985. The return of this form is a program requirement; it also must be received by UES before the final compensation payment can be made.
4. U.S. Air Force - Summer Fellow Relationship: The U.S. Air Force and UES understand and agree that the services to be delivered by Summer 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 Summer 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 Summer 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 GSSSP do not require UES or the Summer Fellow to exercise personal judgement and discretion on behalf of the U.S. Air Force; rather, the Summer Fellows will act and exercise personal judgement and discretion on their research programs on the GSSSP conducted by UES.

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

## II. ALLOWABLE TRAVEL EXPENSES

If you live outside of the area where you will be assigned for the summer program, the GSSSP provides potential funding for the trip 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.

You are expected to make your own arrangements for this trip, and after the trip you may invoice UES 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 or your supervising professor.

All travel reimbursements under Summer Fellow appointments are made according to current UES 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. 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 be paid on your submission of an invoice to UES following the invoicing instructions referenced above. In the view of the convenience of having a car at the research location, UES strongly recommends that a private auto be used for travel when practical. Reimbursement when you drive your private auto is at the rate of 20¢ per mile within the above routing restrictions and will be paid on submission of a suitably prepared invoice. These reimbursements cannot be extended to cover travel by your family if they accompany you on either of these authorized trips.

During the ten week summer research period, you will be authorized to receive an expense allowance in lieu of a per diem payment at a rate of \$27 per day for a maximum of 70 days. To receive this allowance, you must invoice for it and be living outside your area of residence.

These items above are the only reimbursable travel allowances authorized under the GSSSP appointment. 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 UES. Note that all disbursements by UES 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, sign, date and attach to each completed invoice a Brief Report of Effort

#### A. PREPARATION OF BRIEF REPORT OF EFFORT

Whenever you submit an Invoice for reimbursement to UES 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 describe innovative techniques and designs or discoveries which may be disclosed as patents. Rights to any inventions or discoveries shall reside with UES 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.

#### B. PREPARATION OF INVOICE FORMAT

The financial items required on the Invoice Format are for COMPENSATION, TRAVEL, EXPENSE ALLOWANCE, AND PER DIEM.

##### Item (1) SOCIAL SECURITY/MAILING ADDRESS

Fill in your name, social security number, and address to which you wish to have your check mailed.

##### Item (2) COMPENSATION

(a) Indicate the dates for which you are claiming compensation, and indicate the number of days you are claiming for compensation.

(b) Multiply this number by \$57.75 for B.S. degree holders and enter the total dollar amount in the blank total charges for service. The accumulated total number of days you claim on this appointment may not exceed the number authorized in your appointment letter.



Item (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 Dept/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, itemized these expenditures for travel reimbursement. Continue them on a separate sheet if necessary.
- (f) Total these travel items and enter the dollar amount for travel in this invoice on the line to the right of Total Travel Expense.

Item (4) EXPENSE ALLOWANCE

This item on the invoice will be used to claim the \$27 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 the expense allowance at your assigned research location.
- (b) Multiply this number by the daily allowance rate of \$27.00 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.

Item (5) PER DIEM

This item is not applicable to the GSSSP.

Item (6) TOTAL

Total items 3 + 4 + 5.

Item (7) INSTRUCTIONS

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 on the right hand side of line 7.

**IMPORTANT:** Indicate in the space provide on each invoice the address to which you want the check mailed.

You must sign and date your invoice in the lower left hand corner as "Summer Fellow" before it is submitted; you **MUST** also have your Effort Focal Point countersign the invoice before it is mailed to UES 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:

Universal Energy Systems, Inc.  
GSSSP Office  
4401 Dayton-Xenia Road  
Dayton, Ohio 45432

IV  
BILL FOR SERVICE

1. \_\_\_\_\_  
Name (First, Initial, Last) Social Security #

\_\_\_\_\_  
Address (Street, City, Zip)

SERVICE: GSSSP Summer Fellow

SERVICE AUTHORIZED BY: Rodney C. Darrah

RATE AUTHORIZED: \$57.75/day for B.S. Degree

This service is for:

Government Contract: Project # 760

Government Contract No. F49620-85-C-0013

2. DATES OF SERVICE: \_\_\_\_\_ TOTAL DAYS OF SERVICE \_\_\_\_\_

TOTAL CHARGES FOR SERVICE: \_\_\_\_\_

ADDITIONAL ITEMIZED REIMBURSABLE EXPENSES: (receipts required for expenditures over \$25.00)

3. TRAVEL: DATE \_\_\_\_\_ DEPT/ARRIVAL  
TIME \_\_\_\_\_

DESTINATION \_\_\_\_\_ MODE \_\_\_\_\_  
AMOUNT \_\_\_\_\_

4. EXPENSE ALLOWANCE: ( \_\_\_\_\_ days @ \$27.00/day) \$ \_\_\_\_\_

5. PER DIEM: (Not Applicable)

6. TOTAL ADDITIONAL EXPENSE: \_\_\_\_\_

7. TOTAL AMOUNT OF BILL: \_\_\_\_\_

\_\_\_\_\_  
Summer Fellow Signature - Date

\_\_\_\_\_  
Telephone

Invoice Approval: \_\_\_\_\_  
Effort Focal Point Signature

X \_\_\_\_\_  
Type or Print Name

Brief Report of Effort  
Attached \_\_\_\_\_

Location: \_\_\_\_\_

Telephone: \_\_\_\_\_

Date: \_\_\_\_\_

Send bill to:  
UNIVERSAL ENERGY SYSTEMS, INC.  
ATTN: GSSSP Office  
4401 Dayton-Xenia Road  
Dayton, Ohio 45432

APPENDIX 1.B

PARTICIPANT'S QUESTIONNAIRE & REPLY SUMMARY

1985 USAF/UES GRADUATE STUDENT SUMMER SUPPORT PROGRAM  
EVALUATION QUESTIONNAIRE  
(TO BE COMPLETED BY GRADUATE STUDENT PARTICIPANT)

Name \_\_\_\_\_ Title \_\_\_\_\_

Dept. (at home) \_\_\_\_\_ Home Institution \_\_\_\_\_

Summer Supervising Professor \_\_\_\_\_

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. Was the work challenging? YES \_\_\_\_\_ NO \_\_\_\_\_. If no, what would have made it so? \_\_\_\_\_  
\_\_\_\_\_

3. Were your relations with your Supervising Professor and research colleague satisfactory from a technical point of view? YES \_\_\_\_\_ NO \_\_\_\_\_  
If no, why? \_\_\_\_\_  
\_\_\_\_\_

4. Suggestions for improvement of relationship(s). \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. 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? \_\_\_\_\_  
\_\_\_\_\_

6. Considering the calendar "window" of ten weeks being limited by varying college and university schedules, please comment on the program length. Did you accomplish: more than \_\_\_\_\_, less than \_\_\_\_\_, about what you expected \_\_\_\_\_?

GRADUATE STUDENT QUESTIONNAIRE  
(Page 2 of 3)

7. Do you feel the Graduate Student appointment should continue to require affiliation with a Summer Research Faculty Member? YES \_\_\_\_\_  
NO \_\_\_\_\_.

8. 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).

9. Were you asked to participate in regular meetings in your laboratory? YES \_\_\_\_\_ NO \_\_\_\_\_. If yes, approximately how often? \_\_\_\_\_  
\_\_\_\_\_

10. Other comments concerning any "extra" activities. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

11. 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? \_\_\_\_\_  
\_\_\_\_\_

GRADUATE STUDENT QUESTIONNAIRE  
(Page 3 of 3)

3. How do you rate the stipend level? Meager\_\_\_\_ Adequate\_\_\_\_  
Generous\_\_\_\_\_.

4. Please give information on housing: Did you reside in VOO\_\_\_\_\_,  
apartment\_\_\_\_\_, other (specify)\_\_\_\_\_? Name and address of apartment  
complex and manager's name. \_\_\_\_\_  
\_\_\_\_\_

5. Would you encourage or discourage expansion of the Student Program?  
Why? \_\_\_\_\_  
\_\_\_\_\_

6. 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. \_\_\_\_\_  
\_\_\_\_\_

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

a. Strong points of the program: \_\_\_\_\_  
\_\_\_\_\_

b. Weak points of the program: \_\_\_\_\_  
\_\_\_\_\_

8. On balance, do you feel this has been a fruitful, worthwhile,  
constructive experience? YES\_\_\_\_ NO\_\_\_\_\_.

9. Other remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY  
(Graduate Student)

A. TECHNICAL ASPECTS

1. Assignment in field of competency and/or interest? Yes - 89  
No - 2

2. Work challenging? Yes - 87  
No - 4

If no, why?

It was good, but if we would have had more input into the planning of the research and direction it went it would have been more challenging.

Not so much cutting and polishing, though this is unavoidable. Re-writing their software was difficult, though.

Opportunity for analysis at a more sophisticated level.

Proper planning such that the flow of work was steady, rather than spradic.

3. Were your relations with colleagues satisfactory? Yes - 88  
No - 3

If no, why?

Supervising Professor did not have a background in research topic. Otherwise, we got along great.

With supervising professor I had one technical discussion during the entire 50 days.

My supervising professor was technically incompetent. The problem was so bad that I question the validity of his academic credentials.

4. Suggestions for improvement of relationships?

Dr. Weiss needs to spend more time at the lab. His encounters with his students should consist of more than "how's it going, guys?", "Fine." "I'm so busy, I'll talk to you later."

Possibly to be treated as an academic equal, but as a colleague with an equal amount of ideas.

Need clarification of work role.



Couldn't have been better.

The relationship between me and my research colleagues was great; I was always treated with respect.

Very good - a real interest in what I wanted to accomplish.

The relations with my supervising professor were excellent, and I therefore have no suggestions what so ever for improvement of the relationship.

Last year we lived together, this year we did not, that helped!

Make work more technically challenging by offering more work and collection of data.

None really; Dr. Armstrong is also Chairman of my graduate committee.

Duties should be more clearly defined prior to the start of the program.

References should be required, and some form of credential check should be implemented.

I think that a regular meeting time should have been established between my professor, our colleagues, and myself to discuss our progress.

I would have enjoyed working with one of my major professors, but found this was not a necessity.

No improvement needed.

Not much improvement is possible - AMRL staff were very helpful and supportive in our work.

None needed. Dr. Silve, Dr. Chapman, were very available and willing to help in every detail.

The relationship with my supervisors were excellent. I look forward to future involvements and the publishing efforts of several scientific papers.

5. Were you afforded adequate facilities? Yes - 86  
No - 5

6. Accomplishment in ten weeks? More than expected - 14  
Less than expected - 25  
About what expected - 52

7. Do you feel the Graduate Student appointment should continue to require affiliation with a Summer Research Faculty Member?

Yes - 52  
No - 39

8. Were you asked to present seminars? Yes - 43  
No - 48

9. Were you asked to participate in meetings? Yes - 52  
No - 39

10. Please give other comments on extra activities:

Had one lab meeting in which Supervising Professor was asked to give report for graduate students. Not very productive since he wasn't familiar with my work.

We were given a tour of the facilities on base where other participants in the GSSSP were working. It was very interesting.

Meetings with people in other shops about other projects.

Efforts were made to cover outside reading assignments by myself, supervising professor Jeremy Jones, USAF Lt. Bruce Edson, which we then held discussions. The reading assignments were sometimes suggested by research A. Harry Klopff.

I was not required to attend the time series seminar; I went because I was using a time series approach on my project.

Social events and lecture by Lab (FDL) Chief Scientist were very good.

Often "extra" activities provided only to supply general information and not technical information. Also, "extra" activities prove a waste of time, typically.

Briefings on computer systems were very helpful and informative.

Briefings given by AFWL personnel concerning AFWL computer facilities were very helpful.

UES dinner was a good way to meet people for those of us who don't live nearby.

I enjoyed meeting the other summer participants but it should have been done sooner in the summer.

I was freely allowed to read much of the papers available here.

Opportunities and/or funding for more in-house or outside seminars in the research area would be a welcome help on a "by choice" attendance basis.

Would have liked more exposure to other projects currently being conducted in the division, i.e., a more extended tour of the AMRL Labs.

I hope we will be presenting some of our activities in Aerospace Medical Convention.

Invited to one seminar which I did attend.

We reviewed a relevant journal article weekly.

Provided some help to other investigators related to my areas of expertise.

I had the opportunity to go to a conference related to my project the first week of the appointment.

Although I did not present a seminar, I did attend a seminar presented by a representative of ONERA. I also had the opportunity to attend the AIAA/ASME/SAE 21st Joint Propulsion Meeting in Monterey, CA.

Was given tour and was allowed to converse with technical of other groups and facilities.

Attendance at Annual Conference on Manual Control was extremely beneficial.

During my stay I was involved in many "extra" activities, such as the changing in command ceremony for LMDC.

Lunch hour basketball was excellent!

The exposure alone gave me additional growth and development. The actual research was most beneficial for me.

	A (HIGH)			D (LOW)		
11. Technically challenging	A- 57	B- 27	C- 7	D-		
Future research opportunity	A- 54	B- 30	C- 6	D- 1		
Professional association	A- 59	B- 27	C- 4	D- 1		
Enhancement of my academic qualifications	A- 55	B- 31	C- 4	D- 1		
Enhancement of my research qualifications	A- 70	B- 18	C- 3	D-		
Overall value	A- 67	B- 23	C- 10	D-		

B. ADMINISTRATIVE ASPECTS

1. How did you first hear about program?
- |               |   |    |
|---------------|---|----|
| Colleagues    | - | 76 |
| Advertisement | - | 4  |
| Air Force     | - | 5  |
| Direct Mail   | - | 6  |

2. Decisive aspect of application?

NOTE, MANY PUT MORE THAN ONE ANSWER

Area of possible future research funding	-	4
Good research opportunity	-	75
Opportunity to work with USAF	-	5
Location	-	8
Financial support	-	9
Lead to a Thesis	-	3

3. Stipend level?
- |          |   |    |
|----------|---|----|
| Generous | - | 16 |
| Adequate | - | 69 |
| Meager   | - | 6  |

4. Housing information?
- |           |   |    |
|-----------|---|----|
| VOQ       | - | 7  |
| Apartment | - | 46 |
| Other     | - | 38 |

5. Would you encourage or discourage expansion of the Student Program?

Encourage - 91  
Discourage -

Encourage, why?

Excellent work experience for the student, and good benefits for the employer.

Potential for academic/professional growth.

It's an experience where not only learning occurs but practical experience that doesn't happen in the classroom.

The students I worked around were hard working and were an asset to the lab. Also, if the stipend level were raised, this program could aid those presently unable to afford graduate school, thereby increasing scientific base of our country.

It is an excellent opportunity, it provides experience and needed living expense money for graduate students.

This program can be very beneficial to Graduate Students and can provide the Air Force with a broader base of human resources.

I feel that broadening ones scientific exposure is very beneficial.

It gives a student experience first hand, life in the research world.

Excellent opportunity to encounter how research is conducted at facilities.

I feel more students should have the opportunities I have had.

Two - four year graduate students should be given own research projects.

This program is fabulous for giving students what they need - research experience.

This program has been absolutely great for me; it provides good work experience for students and is a good job.

Unique research opportunity and exposure to technical environment.

Excellent exposure to research and development - opportunity to develop research plans.

If not for the GSSSP, I would have never had the opportunity to participate in this mind opening experience, which I believe is very important. I have now been provided with the extra incentive to proceed with my graduate studies, rather than enter the private sector.

There should be enough students to allow the Air Force to get some ties to other research. This is a great opportunity for students to get outside a University experience.

It provides an excellent exposure to the research is done professionally for graduate students.

This is absolutely the most valuable experience I've had during the course of my Ph.D. program.

It is valuable, practical experience with mutual benefits for individual and Air Force.

I think it can provide graduate students with opportunities to work outside their own universities and can aid in career choices.

Has the makings of a good program.

The summer program is a valuable experience.

The program offers experience in the technical field and encourages interaction with colleagues in research and development.

So students have the opportunity to acquire practical skills in their field of interest.

The program is an excellent opportunity for students to gain experience in a research oriented facility and to put to use some of the things learned from school.

I think it is a worthwhile learning experience.

To allow more students the opportunity to work in quality research program.

It is difficult to find a meaningful summer job in one's area of interest.

To involve as many tech. bachelor degreed students as possible.

It gave me exposure to a less "purely academic" research.

It provides a wonderful opportunity for students.

Good experience.

Because getting a student away from his normal environment motivates him to produce. You get enthusiasm.

Neither encourage or discourage as I have a very poor idea of how large the program is.

This is an excellent opportunity for graduate students to gain a firm grasp of basic research.

I found the experience highly rewarding and would like many others to be able to participate.

More extensive research can be done with additional graduate student assistance in addition to providing a larger number of students with the exposure to the research program.

I consider it very worthwhile for as many graduate students as possible to profit from an intense program of research.

To learn research you must do it to understand national defense you must participate.

It gives graduate students an excellent research opportunity at fair wages.

Expansion would be beneficial in providing students with experience.

The experience of actually being involved in an applied research setting with all the rewards and time pressures is a constructive experience.

Providing proper opportunities and supervision exist, it is an excellent learning experience, while giving the Air Force the chance to gain as well.

The program provides the opportunity for students to engage in real world problems and to attempt in resolving them.

Further encourage your researchers, exposures, and valuable contacts.

No opinion. Unsure how large or expensive program is at present.

Neither, you can easily evaluate the program yearly if it remains the same size.

This program offers a unique opportunity for graduate students to gain experience doing government-related research, and to establish work-related contacts.

I don't know enough about its scope to comment.

I think it is a great opportunity for students to see a different type of academic setting.

So more students can get needed research experience.

Give student more research opportunities.

Because more students could benefit from the opportunities available in this program.

It's a good opportunity for students and the Air Force.

It's an excellent way to get experience and make use of your school studies.

It allows the student greater freedom in choosing the goal and direction of the project.

A valuable experience that might be impossible otherwise.

The opportunity is excellent and I feel I accomplished quite a bit.

Good experience with people and equipment.

Excellent opportunity for students, good learning experience.

It was a good experience.

I feel the program not only benefits the student intellectually, but also provides the opportunity to become associated with other professionals in the student's field of interest.

Many students need an opportunity to experience the pace and flow of R&D work.

The opportunity to meet with people working at the leading edge of technology and implementing it is a rare opportunity.

A good learning experience for students into research with support from faculty and/or laboratory colleagues.

I thought it was a fantastic opportunity.

It provides the student with real-world insight into research facilities to allow a better prospective on his scholastic study and research.

Provides an opportunity to work with "outside others" in field of interest.

This is a valuable experience to both the student and Air Force. A great opportunity to exchange information.

The program provides valuable research experience and education that you can't learn in a classroom.

It is really a great experience, if only it were longer.

Stimulates research programs in government labs by providing new ideas.

It is an enormous opportunity for the students.

Guided research is an important part of a doctoral level program. It also makes the graduate more marketable.

Because it will give the student a chance to challenge their minds and use their academic education.

Will give students a chance to further develop techniques for their thesis; to obtain more data.

Maximize the use of facilities in the government laboratories.



Circulate students through the AF labs - this is good for the labs and the students.

It allows students to get away from their "home" university and see and experience different work/research situations.

The research facilities and equipment are great and the interaction with other faculty is very stimulating.

An excellent opportunity to work with professionals in the field with a different slant than just your professor at school.

It provides an opportunity for students to broaden their professional experience.

It is very good for those who need summer support.

The opportunity is excellent and I feel I accomplished quite a bit.

One can only benefit by programs of this type.

6.	<u>Program administration overall rating:</u>	Excellent	-	40
		Good	-	43
		Fair	-	7
		Poor	-	1

7a. Comments on the strong points of the program:

Pay, work experience, challenge.

Experience, remuneration.

Cooperation with the Air Force employees.

Professional association research opportunity in a professional setting.

Experience, professional association.

Experience, meeting researchers in different fields, excellent source for reference in a resume.

Experience with non-academic professional astronomers, good pay, interesting and worthwhile way to spend a summer.

Experience and learning opportunities are very good. Association with other people is helpful for future reference. Good exposure to the research world is provided.

We were fully supported by other departments in our research efforts. Also whatever materials were needed were supplied whenever possible.

It is a very good educational experience. The program exposes a student to new people and ideas that would not be available otherwise.

Introduction into how research facilities operate and instruments used in research.

The opportunity to meet people and to have a broad range of experiences freedom to develop lines of research on my own.

Chance to gain valuable experience working with professional engineers.

The research lab facilities are really good.

This program not only provides students with a good job and valuable work experience; it also exposes them to real world problems which they can help to solve.

Excellent laboratory facilities, interesting research, meet many experts in your field.

Providing the student with a stimulating thought provoking environment, genuine role models, and the accessibility of literature which would have otherwise been inaccessible.

Opportunity to learn what kind of research is currently going on especially in the DOD.

Opportunity for graduate students to work with a professor or researcher, doing state of the art basic research, professional contacts made during research period.

Research opportunity, paper-writing requirement, use of data.

Opportunity for summer salary and summer research in a stimulating environment. Brings together basic researchers from universities and mission-oriented researchers at Air Force installations. It is healthy for both types of researchers to interface regularly.

Real experience, contacts, opportunities for employment.

Freedom in implementing one's own ideas in addressing a research problem.

Good opportunity to work with professional outside of school, financial reimbursement.

Its availability! Also local representing for UES here at AFGL was nice to have, if it would have been needed.

Involvement in current project in research and development.  
Involvement with colleagues in the field.

The opportunities for students to gain experience and do research in their fields.

Good learning experience opportunity to meet and work with scientific research oriented personnel. Prospective job contact for future.

The overall knowledge and experience that can be gained.

Flexibility of working hours, quality facilities, excellent supervisors/peers.

The opportunity to associate with researchers on the front line of technology.

Strong support from AF.

The experience, the chance to meet other people in my field and the stipend.

Good opportunity for grad students and faculty.

Administration, lab affiliation, personal contacts, chance to grow professionally.

Opportunity for research, opportunity for interaction between research scientists.

Overall positive, supportive environment for research.

The UES program is a very good research opportunity as well as a challenging non-academic learning environment.

The UES program provides a unique research opportunity for graduate students to work intensely in their fields of interest.

Bringing out a diversity of people with different backgrounds and training.

Research opportunity for graduate students, freedom of work dates (to an extent), and promotes scientific research.

Any support for scientific research is a strong point.

Accessibility of focal person, interaction with other professionals, opportunity to conduct my own research project.

Good opportunity to gain awareness of military functions, gain excellent professional experience.

Well organized in having a local coordinator and focal point effort. All requirements for comfortable environment attained. Good communication.

Good technical support, very cooperative colleagues, flexible work schedules.

Opportunities for a wider range of research-related activities than found within an academic setting.

The exposure of civilian to the Air Force environment and the exchange of information and new ideas as a result of this exposure.

The program enhances a student's ability to deal with "real" situations and is a chance to gain valuable experience.

Clinical research equipment was very specific and excellent.

It has given me a much needed amount of experimental research experience. Plus it has acquainted me with many interesting and helpful people.

The program is very well managed.

The salary is a strong point. Also, the people in the lab are very willing to help you.

Professional contact/exchange.

(1) the facilities and resources available, (2) the personnel involved in the program (3) the learning experience that is available (4) the stipend.

Good stipend, adequate facilities, good supporting groups.

Opportunities to rub shoulders in this world, facilities.

Organization from getting I.D. cards to the help given in the department.

Gives one a chance to get acquainted with the Air Forces system of research and good chance to use top notch equipment.

Chance to work in the field.

The program can provide a very challenging and rewarding technical experience if the research goals and objectives are arranged with adequate lead time.

Research opportunities, professional affiliations.

Opportunities, exposure to high-level research environment.

The freedom to work freely on a project that interests me.

The chance to do research at an institution with the right equipment, paid on time.

The research opportunity. The experience of working with the Air Force as a contractor.

It allows a graduate student experience with a facility outside the school and can offer a thesis topic based on a practical need for the research.

Ability to work with an established data base.

Basic requirements are reasonable.

Freedom to pursue research of interest and current value.

Just the opportunity to take part as well as the excellent research opportunities there.

Interaction between government laboratory projects and eager graduate student participants - can only bring benefits.

Allows for research on current topics of interest.

Research guidance, support (facilities, personnel).

Giving the student the chance to prove their ability to handle any task given to them. Also to work with professionals and to gain that knowledge which is needed to develop our character.

Gave me the opportunity to work with scientist outside of my discipline; exposed me to instrumentation not available at my home institution.

Excellent research facilities are available to the summer fellow.

Independence for researchers.

Research experience, experience in other types of research situations - first-rate facilities and support.

Good facilities, excellent contact with other researchers, good equipment.

Challenging work, good research environment, independence on project.

Exposure to new research personnel and equipment.

Chance to do work in a facility different from one home institution - this includes facilities/equipment/personnel.

Organization from getting I.D. cards to the help given in the department.

Afford the opportunity for graduate students to do meaningful research and environment conducive for biomedical research.

7b. Comments on the weak points of the program:

Delay in paychecks.

Sufficient communication problems with UES office, failure to inform appointees regarding salary schedules, option of express mail of paycheck.

The first pay check takes a month to get to the student fellow. This is an unsatisfactory situation.

Working in a military installation is limiting in the sense that your research is only desired for the immediate military benefits.

Financial aspects: provide a way to get the students money in the first week, not the third or fourth or sixth. If the student doesn't have enough capital to get started, he/she won't make it.

Upon our arrival I felt that our needs hadn't been fully anticipated.

Many times the program was not technically challenging. The work appeared meaningless at moments.

The time period between receiving requests for payment and issuing and receiving the check are too long.

I have experienced some problems with getting paid, because I was never sent a list of the dates that the invoices would be processed; I think students should be sent this information. Also, my last check was not sent to the address on the invoice.

Too short of a research time otherwise no problems with the program.

Length of program too short.

The program could be extended to 12 weeks as 10 weeks is quite a short time. It seems that there's just not enough time to squeeze everything in. Also, the administration did an extremely poor job of conducting this program.

It's not well publicized in our school.

No salary advance is available to summer participants. This could pose difficulties for graduate students who face substantial travel and start-up costs at their summer research institution (e.g. security deposit on apt, rental payments in advance), because graduate students have very little in the way of steady cash flow, rather, they tend to lead a hand-to-mouth existence. Summer participants should be informed that (being self-employed) they must make their own arrangements to pay social security taxes. I know of 2 graduate students, earlier participants of the GSSSP program, who, lacking experience in such matters, received bills from the IRS for \$300 in interest on overdue social security taxes a year after completing the program. An unexpected bill of that size can be devastating to a graduate student already living in benign poverty.

Transportation and lodging.

Finding the resources to implement a research program proved very difficult at times. A better knowledge about what is available at each research location would be helpful.

A lot of paper work for bi-weekly payments.

Lack of adequate computers, security clearance much too late, expense allowance days should be included for holidays within the work period.

There were some problems with being paid that could be worked out.

The relatively short working period of ten weeks. If possible, twelve weeks would be more appropriate.

Lack of time to develop a serious research topic and program.

The strict guidelines with regards to paper length. This required us to omit much useful information.

The HM unit did not seem to be prepared to us. There was not adequate office space for us.

No immediate supervision.

Somewhat short time to get work done, could easily add a week or two.

None that I can see at this time.

Final report format was ambiguous/awkward: partly technical with journalistic conventions (describing research) and partly conversational (describing program). A more explicit example would have been helpful.

We never got to meet other researchers from institutions beyond Brooks AFB.

Quite a bit of paperwork.

My project was too broad for a 10 week period.

Needed clearer guidance from UES on certain aspects of program.

You need a system to withhold taxes from our paychecks, or at least to make that point clear (that you are not taking any taxes out at all).

The success of the program for any individual depends on the supervising professor and research colleagues. UES might take a more active role in providing structured guidelines of the student role.

The relatively limited timeframe.

Lack of continuity in research is a sore point. Inadequate screening also lets some "stinkers" into the program.

Basic science research equipment was very scarce, time between writing progress report and billing period was too short.

Not enough time to do any really comprehensive research.

We should be able to call UES collect.

No housing assistance, no prepayment (especially for students), no allowance for motel stays en route.

The program isn't geared toward students who did not have a faculty preceptor from their institution.

Low publicity.

Coordination (I don't know how it would be humanly possibly to do any better, either).

I don't feel the importance of establishing research goals and objectives with adequate lead time is emphasized as strongly as it should be. It may be beneficial to require more detailed goals be cooperatively established to ensure the laboratory is fully prepared when the student arrives.



It is too short a period of time to complete a project. A firm knowledge of what must be done and an early start as necessary. But unless someone gives a student this opportunity without a firm knowledge he may never start at all.

Orientation. First day, I was lost. Fortunately, I previously had met with some of the people.

It is short in time duration.

Length of time allowed.

Needs to be advertised to more people. The cocktail hours were basically useless.

Limitations on report length. I had to cut a lot of valuable detail in my report.

The length of time that we had (not enough).

10 week length may be too short for some projects.

I feel that opportunities of this sort are a valuable contribution to the graduate experience and to the respective academic areas of each participating student.

Maintaining communication with your research colleague is difficult if the research facility is a great distance away.

The 10 week period did not allow for report writing - causing a lot of time spent here at home with no compensation.

Remote locations, lack of continuity after the program, too much paper work and administration.

Initial presentation of pertinent information was inadequate, i.e., I don't know what was going on the first 2 weeks.

Ten weeks is a bit short to accomplish a large project.

None that I can see.

The time factor could be increased.

8. Has this been a fruitful, worthwhile, constructive experience?

Yes - 91

No -

APPENDIX 1.C

LABORATORY REPRESENTATIVE'S QUESTIONNAIRE & REPLY SUMMARY

1985 USAF/UES 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?

Excellent\_\_\_ Good\_\_\_ Average\_\_\_ Poor\_\_\_ How could it be improved?

\_\_\_\_\_  
\_\_\_\_\_

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

YES\_\_\_ NO\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

3. Was the number of faculty researchers assigned to your organization satisfactory?

YES\_\_\_ NO\_\_\_ . If not, how many would be desired? \_\_\_\_\_ How do you determine this number?

\_\_\_\_\_  
\_\_\_\_\_



LABORATORY REPRESENTATIVE QUESTIONNAIRE (Page 3 of 5)

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\_\_\_.

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 Names	<u>Superior</u>	<u>Excellent</u>	<u>Average</u>	<u>Poor</u>
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10. Do you believe 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\_\_\_.

LABORATORY REPRESENTATIVE QUESTIONNAIRE (Page 4 of 5)

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

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13. Site visits were made by Program Director and/or Administrator and the AFOSR representative. Do you feel these visits are beneficial to the program participants and Laboratory in understanding the management of the program? YES\_\_\_ NO\_\_\_. Do you feel these visits should be done again next year. YES\_\_\_ NO\_\_\_.

14. UES has a coordinator assigned at your base to assist the Summer Faculty participants in the administration of the program. Did you find this beneficial to the program. YES\_\_\_ NO\_\_\_. Are there any problem areas coordinators should administrator in future years?

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LABORATORY REPRESENTATIVE QUESTIONNAIRE (Page 5 of 5)

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

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THANK YOU

1985 USAF/UES SUMMER FACULTY RESEARCH PROGRAM  
EVALUATION QUESTIONNAIRE  
LABORATORY REPRESENTATIVE

1. How do you rate the correspondence, verbal and telephone communication, and other aspects concerning program administration?

Excellent - 6

Good - 15

Average - 6

Poor -

No Response - 1

How could it be improved?

Send copies of all letters sent to summer faculty, etc., to the lab as well. Send letters of selection and policy letters to the lab first (before researchers).

Send all applications to one source (RADC/XP) for distribution, to eliminate confusion. Discuss final selections with division chiefs before firming up.

Information exchange during "appointment announcements, faculty acceptance or rejection, arrival at laboratory" period could be improved. We lost one appointee (we had only 11 instead of the 12 allocated) because we learned too late an appointee had turned down an offer while we had at least two other good applicants waiting for an offer.

Graduate students have more questions, need more help from UES; sometimes cannot use an official phone. Consider authorizing collect calls.

Security clearance slow. Had one instance of a graduate student's acceptance/subsequent rejection getting confused.

Correspondence was timely; communications friendly.

UES should make effort to simplify the written instructions for the program.

It was difficult to reach anyone at UES to answer questions. Need knowledgeable person at office at all times.

UES contact with the Laboratory officer most responsible for overseeing the faculty research was minimal. Most of the contact appeared to occur between UES and USAF OEHL/CV. Recommend that all sponsoring officers (Branch Chief or Project Officer) be assembled for an orientation meeting concerning the USAF/UES program.



The only experience we have indicates appropriate opportunity to evaluate proposals for summer Faculty Researchers but not graduate studies. Our notification of Mr. Scott Koehn, the graduate student working in Industrial Hygiene, was my name and arrival date no prior notice or contact.

A little better description of how the faculty researcher fits into the SFRP needs to be done. A lot of our faculty didn't know what they could or could not put on their travel voucher for the pre-summer visit or if they were allowed a rental car. Basically, a communication problem. Not sure what the faculty researcher received in the way of a pre-visit package but maybe you could send the information sheet (If there is one) to the labs and get comments on additions or clarifications.

Sufficient and timely information was provided by the UES to prepare for the summer research efforts.

The major problem was obtaining an interim security clearance so that the candidate could work on a classified project, The Strategic Defense Initiative.

Copies of the applicant's packages were late arriving in the Laboratory. Suggest, for the 1986 Program that packages be delivered to the Laboratory Representative sooner, so that more time can be given to the evaluation/selection process by the Laboratory.

2. Did you have sufficient time to conduct an evaluation of applications?

Yes - 23  
No - 5

Comments:

Selection could be done entirely by mail. There is no need to have a selection meeting. All issues that come up could be resolved by mail or phone.

Although some of the applications came in late, we were able to select good candidates.

Its always too short. Candidates "dribbled in," and hard to establish a ranking.

We would like to personal interview to narrow down final selections.

Yes, but we had to hurry; time for evaluation was too short in some cases.

It can be tough integrating late applications into the larger packets.

Could be several weeks longer.

Some evaluators were not available during the short evaluation period. An additional two weeks of evaluation time should be provided.

It would be helpful to receive all applications at the same time.

Additional time would be appreciated since applications received near the deadline don't always get fully evaluated when appropriate S&Es are on TDY or leave.

For the most part, our selection was based on the expressed interests of the faculty member and whether or not these interests could "dovetail" with Laboratory interests or projects. Academic and technical abilities were looked at but, were not the most important aspects for selection.

The applications were well done and presented all the facts needed to determine if individual could fit into our current efforts.

Yes for Faculty Researcher. No for graduate student (nor would we have had refusal rights, as I understand).

The evaluation process was too short. Our lab needs at least 2 weeks to be able to disseminate applications to our directorates and get responses. Each directorate must make their priority list and then the Chief Scientist selects from these to make his selection list. That's hard to do when we don't receive all the applications at once. Not sure there's an easy answer if you receive applications shortly before the labs need to make selections, anyway, this was a problem at our lab.

Sufficient opportunity existed for our organization to interview both the principal researcher and research assistants prior to formalizing the arrangements.

Folders were provided in sufficient time for a thorough review. We screened the applicants carefully and were pleased with our selection.

Once the applications were received the RPL turnaround to UES too short to allow Lab wide selection from the applications. An extra week would be helpful. By cutting corners we still made selections.

Could have used more time for the later applicants.

In most cases. We received applications over a period of time. The last ones received were after we had already formalized our selections and therefore could not be considered.

3. Was the number of faculty researchers assigned to your organization satisfactory?

Yes - 20  
No - 8

If no, how many would be desired?

In RADC/ES, one for each branch. We have the bulk of the AFOSR R&D funds in the center. Four would be desired.

By noting requests for such researchers from our scientific staff.

12.

5.

How do you determine this number?

We really had more researchers than we could adequately handle, due to our organizational phase-down. With four faculty and 5 graduate students we were loaded.

For several years, we have had the opportunity of having three faculty assigned which has been good. We were able to use a total of four giving one to each of our R&D branches this year and it worked out well.

Based on the number of SFRP researchers requested by the Laboratory divisions.

AFWL has five technology offices which can utilize SFRP faculty researchers. We would like to place 2 SFRP participants in each of these offices.

Physical space limitations (desk space, etc.) restrict us to maximum of 5. This year we had projects for 6 based on expressed requirements of functional directorates.

5-7. OK this year. Much interest shown at Lab. We couldn't accept some good people. Next year and in future two more positions are requested.

Based on number of acceptable applications received, number of research topics available. We were allotted six slots this year and finally received eight. We could have used up to eleven.

4. Please rate the expense-paid pre-program visit:

Essential	-	19
Convenient	-	7
Not worth the expense	-	2

5. Is ten-week time period an optimum length of time to develop a viable working relationship among the faculty researchers, students, laboratory/center personnel and programs?

Yes - 20

No - 8

Other comments:

While I would not say that 10 weeks was optimal, any shorter time period would be unacceptable.

This is long enough if you "front load" your work with the researcher and get them started on the right foot.

Less than 10 weeks makes it difficult to complete an effort; more cuts into the academic schedule; however, a few professors can (and have) finished in as little as 5 weeks, so applications for shortened tours should be considered as valid.

10 weeks is about right. It might be that a flexible length of appointment varying between 8 and 12 weeks (to be determined by a faculty member and laboratory) would work out better in some cases. An option to consider.

A few extra weeks of work after the faculty researcher has been oriented into the program could provide substantial benefits to the laboratory.

At least 8 weeks seems to be necessary to fully digest the complex processes and procedures used by AFLC. Allowing 10 weeks gives time enough for some preliminary trials and discussions with AFLC personnel.

A variable length of time would be valuable. In some cases the personnel may have been available for another week or two and would have been very productive during that time. However, 10 weeks is generally the amount of time faculty have in the summer.

Because of delays in the Air Force supply system, needed equipment and materials are sometimes not received in time for use during the ten (10) weeks. A more positive method of continuing the work when the researcher returns to the school would help with this problem.

Very few projects can be completed within the 10 week timeframe. Four to six months would be more appropriate, if possible.

For the summer, three months June, July, August be better, 12 weeks. This could start around the end of May until the end of August.

I'm not sure an optimum length of time can be measured for this program. Ten weeks is perhaps out of convenience because of the time constraints of the faculty member, rather than to develop working relationships with the laboratory staff. One of the more serious drawbacks of the short time period is that any supplies or equipment to be ordered in support of the research must be done so at least 3-6 months ahead of the project start date. This is to compensate for the long delays encountered in the supply/procurement process.

This fact coupled with the number of people they interfaced with who were also frequently on travel or leave further justifies the desire to extend the research period.

For a new research candidate, part of the 10 weeks is spent adjusting to the Air Force methods and procedures for doing business so some time is lost from the actual research project.

This period is minimum, and difficult to extend due to time available. Must make every effort to have visitors ready to go upon arrival.

To develop relationship, time should be longer. Some Prof's don't have extra time in their school schedules. A variable time should be possible, up to twelve weeks. One prof sought less time than 10 weeks. An extra 2 weeks beyond 10 would help most projects. Most Prof's said they needed more time to wrap up their projects.

It is a trade off between academic schedules and useful project participation at the laboratory. Ten weeks is a very good choice. Shorter periods would diminish the work performance and longer periods would increase/scheduling restraints.

Depends on the nature of the research. Some laboratory engineers felt they should have a minimum of 15 weeks and up to a year. Other programs such as the mini-grant program and the University Resident Research Program fulfill longer term needs, and again, are often not taken advantage of.

12 weeks would be optimal for AAMRL.

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 - 12  
No - 106

If yes, give description and evaluation.

Meta Analysis techniques - Kraiger - very good presentation.  
Individual Differences in Automatic and Controlled Information Processing - Ackerman - very good technical presentation.

We had an end-of-tour report where the faculty associates gave a presentation, mostly on their work. It was very helpful.

This was accomplished on an individual basis.

Faculty members encouraged to provide seminars on subjects related to their research as well as provide end of tour research.

Because of the diverse fields involved, individual group discussions were used to tap the knowledge of the various associates.

Weekly meetings with staff allowing this input.

Not a seminar program per se, but our candidate Dr. Kolitz provided technical support in interaction with other Air Force and Federal Contractor Research Corporations such as ANSER. In addition, he attended a workshop at MIT which provided further insight in the research project he was assigned.

Informal within Division this summer. Next year a more formal program will be implemented. Informal worked but a longer-tenure (12 weeks) and more seminars would be good. Most Profs felt they had too much to do and too little time to do it.

Very informally, groups were assembled to provide an ad hoc forum in several cases.

Faculty members gave seminars to fellow workers in some cases.

Researchers usually gave at least a final briefing to the sponsoring group and sometimes several presentations were made.

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

Yes - 25  
No - 3

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 - 19  
No - 9

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?

List Names	<u>Superior</u>	<u>Excellent</u>	<u>Average</u>	<u>Poor</u>
	70	62	9	

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

Yes - 24  
No - 1  
No experience - 3

11. Was a student assigned under the Graduate Student Summer Support Program to your laboratory this summer?

Yes - 22  
No - 5  
No experience - 1  
If so, was their participation productive?  
Yes - 22  
No -

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

If graduate students are to work with faculty associates, their tenures should coincide (in most cases). Graduate students require more supervision; therefore, the number of students in a lab should be fewer than the number of professors.

Since their selection occurs after the professors are selected, there is a very real timing problem for the laboratory. I do not know how to solve this without insisting that a graduate student come with his professor and that both applications are evaluated at the same time.

More time for evaluating applications - an increase in number of faculty allocated to the Lab.

We need to get the program information out earlier to increase participation - graduate students are a tremendous asset.

Encourage Summary Faculty applicants to make the program better known to their students.

It would be desirable for some means to be established to enable graduate students to be paid earlier than in the current arrangement.

The graduate students need to have a more structured project than the faculty members do. Sometimes the faculty members lead them and other times the AFLC staff must. More thought needs to be given by both AFLC and the students toward the selection of taskings.

Do not require graduate student to be affiliated with faculty member entered into program as a prerequisite for selection.

Since some of the SFRP researchers came from schools which do not have graduate science/engineering programs, consideration should be given to permitting their advanced undergraduate students to participate in the GSSP.

Need earlier planning, starting with us, no later than February or March. In the past we have found graduate students very helpful.

Additional contact prior to assignment to ensure an appropriate project beneficial to both parties.

Better advertisement of the opportunity both to the faculty members and graduate students.

The graduate student segment significantly contributed to the success of this program and must be continued. The students, under the direct supervision of the principal researcher, execute a substantial amount of work consistent with the SOW requirements.

It seemed that only one graduate student applied with his professor originally. We had two schools represented with a Professor and a student. It seemed to work well, but we had no prior experience with which to compare. I've received no complaints from students about their status or workload.

The addition of Graduate Students is very beneficial to the productivity.

AEDC had both sponsored and independent students and we were well pleased with both categories.

Other than requiring more time to complete the applicant's evaluation process for selection, everyone was extremely pleased with the program.

13. Site visits were made by Program Director and/or Administrator and the AFOSR representative. Do you feel these visits are beneficial to the program participants and Laboratory in understanding the management of the program?

Yes - 21  
No - 3  
N/A - 4



Do you feel these visits should be done again next year?

Yes - 21

No - 5

14. UES has a coordinator assigned at your base to assist the Summer Faculty participants in the administration of the program. Did you find this beneficial to the program?

Yes - 16

No -

N/A - 3

Are there any problem areas coordinators should administrator in future years?

It would help if the base coordinator (WPAFB) would visit me, briefly at beginning of each new summer period for a get-reacquainted visit.

Coordinators need to learn by experience and need to document their experience and recommendations at the end of the summer. Coordinators need to be selected early and start work early (before they are actually on the payroll if that can be worked).

Dr. Bain, our Area Coordinator, worked out very well. She did a thorough job in all respects, was available when needed, and did not hesitate to become involved wherever she could help.

The coordinator's name and phone number should be provided to all of the participants in order that they can call him if there are any questions.

Housing accommodations at WPAFB Visiting Officer's Quarters or Wright State University would be highly desirable.

Additional assistance with housing would be helpful since the VOQ never seems to be available and finding a place to stay for 10 weeks at a reasonable cost is difficult for the faculty and especially the students.

The UES coordinator assigned to assist the Summer Faculty participants never contacted me so I'm unable to answer the question.

Col. Graham coordinated with him, I did not.

Scott Kohnk talked several times with the UES representative and was pleased with assistance received.

More definitive guidance is necessary regarding follow-on research efforts beyond the ten week summer period. This guidance should prescribe specific formats, level of endorsements, timing of application, duration of effort and cost.

Again we did not deal with the coordinator but the candidate's interactions were positive.

More emphasis should be put on finding living quarters for out-of-town Summer Faculty and Graduate Students. Too much of this responsibility fell on the Laboratory Representatives.

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

Some confusion always exists when non-federal individuals come to work for the Government. Being aware of some of the red tape associated with such an assignment ahead of time might be useful to the participants.

It would be beneficial to be able to interview the candidates before selection, both from our point of view and theirs.

Solicit list of potential applicants/universities from laboratory/center prior to mailing out applications to ensure appropriate universities are contacted. Applicants should indicate area of interest, not just resume qualifications.

More information about the program and it's working should be provided to the project officers. It appeared to me, after reading this questionnaire, that I was unaware of a great deal of background information about the USAF/UES Summer Faculty Research Program. Not enough information filtered down. This should be improved in future years.

Most of the work we do requires access to classified information so getting a clearance is essential. Also, if the candidate has any special areas he wishes to work he should express his desires in terms of a Statement of Work and/or Work Plan. This year we established the work structure and coordinated with the candidate.

Anything to allow the profs to get a quick start into their program is helpful. Experimentalists need specialty equipment or chemicals. Its too late to order them after they get to the Lab. A slightly longer tenure (11 or 12 weeks) would help. The pre visit worked well this year. We encourage it. The professors seemed to be time limited. We need to be able to provide administrative support such as typing. This year was a problem as I believe was the year before. UES has responded well to any request. Thank you very much.

We had trouble with security clearances. To the best of my knowledge, some clearances were never received, and when they were, the information was forwarded improperly, or to the wrong office. Need better communication on roles of different people involved in the program, such as who has authority to approve vouchers, proposals, final reports, etc.

UES should attempt to make arrangements for suitable living quarters for out-of-town Summer Faculty and Graduate Students and stop relying upon the Visiting Officers Quarters on base. The VOQ refuses to physically support this program, even though those in charge assure you they will. When the individual arrives, his/her reservation many times is not available and the attitude of those working at the reservations desk is absolutely "unfriendly". Laboratory representatives have used all the influence with the Air Force they can muster, but to no avail. I feel this situation creates a very bad impression on both the U.S. Government as well as UES.

APPENDIX II

- A. Program Statistics
- B. List of 1984 Participants
- C. Participant Laboratory Assignments

APPENDIX II A

Summer Faculty Research Program

Sponsored by  
Air Force Office of Scientific Research

Conducted by  
Universal Energy Systems, Inc.

Program Statistics

## Program Statistics

### 1. Applications Received (by Laboratory)

Organization		1st Choice
APL	(WPAFB)	3
AMRL	(WPAFB)	9
AD	(Eglin)	7
AEDC	(Arnold)	3
AL	(WPAFB)	6
BRMC	(WPAFB)	1
ESMC	(Patrick)	1
ESD	(Hanscom)	5
ESC	(Tyndall)	1
FDL	(WPAFB)	4
FJSRL	(USAFA)	5
GL	(Hanscom)	7
HRL/LR	(WPAFB)	0
HRL/OT	(Williams)	4
HRL/MO	(Brooks)	2
HRL/ID	(Lowry)	3
LMDC	(Maxwell)	8
LC	(WPAFB)	1
LMC	(Gunter)	1
ML	(WPAFB)	14
OEHL	(Brooks)	1
RPL	(Edwards)	2
RADC	(Griffiss)	4
SAM	(Brooks)	18
WL	(Kirtland)	5
Totals		116

### 2. Number of Participants - 92

Number with Bachelors Degree	-	71
Number with Masters Degree	-	21

Program Statistics  
Continued

3. Number of Participants at Each Laboratory

Organization

APL	(WPAFB)	-	3	HRL/LR	(WPAFB)	-	0
AMRL	(WPAFB)	-	9	HRL/OT	(Williams)	-	3
AL	(Eglin)	-	6	HRL/MO	(Brooks)	-	2
AEDC	(Arnold)	-	2	HRL/ID	(Lowry)	-	3
AL	(WPAFB)	-	5	LMDC	(Maxwell)	-	5
BRMC	(WPAFB)	-	1	LMC	(Gunter)	-	0
LC	(WPAFB)	-	2	ML	(WPAFB)	-	12
ESMC	(Patrick)	-	0	OEHL	(Brooks)	-	1
ESD	(Hanscom)	-	2	RPL	(Edwards)	-	2
ESC	(Tyndall)	-	0	RADC	(Griffiss)	-	3
FDL	(WPAFB)	-	3	SAM	(Brooks)	-	15
FJSRL	(USAFA)	-	3	WL	(Kirtland)	-	4
GL	(Hanscom)	-	6				
				Total			92

4. Discipline Represented - 43

Aero Engineering	-	2	Management	-	2
Biology	-	7	Material Science	-	3
Biomechanics	-	2	Mathematics	-	7
Chemistry	-	14	Mechanical Engineering	-	4
Civil Engineering	-	2	Natural Science	-	2
Computer Science	-	1	Nuclear Physics	-	3
Economics	-	2	Physics	-	11
Education	-	1	Pre-Med	-	1
Electrical Engineering	-	5	Psychology	-	8
Engineering	-	3	Sociology	-	2
Geography	-	1	Statistics	-	1
Human Factors Eng.	-	2	Structural Engineering	-	1
Industrial Engineering	-	2	System Science	-	1
Linguistics	-	1			

Program Statistics  
Continued

5. Colleges and Universities Represented - Total 44

Arizona State	- 1	Tennessee Tech.	- 1
Atlanta University	- 1	University of Alabama	- 3
Auburn University	- 1	University of California	- 1
Brown University	- 2	University of Cincinnati	- 1
California State Univ.	- 1	University of Dayton	- 4
Florida Institute of Tech.	- 1	University of Florida	- 6
Howard University	- 1	University of Illinois	- 3
Inst. for Creative Research	- 1	University of Minnesota	- 3
Iowa State University	- 1	University of Missouri	- 1
Kansas State University	- 3	University of Montana	- 1
Louisiana State Univ.	- 1	University of Nevada	- 1
Louisiana Tech University	- 1	University of Notre Dame	- 1
Marshall University	- 1	University of Oklahoma	- 1
Massachusetts Inst. of Tech.	- 1	University of Oregon	- 1
Meharry Medical College	- 9	University of Scranton	- 1
North Carolina A&T State	- 1	Univ. of Southern Louisiana	- 1
Northeastern University	- 2	University of Texas	- 3
Oakland University	- 3	University of West Florida	- 1
Ohio State University	- 4	University of Wyoming	- 1
Rensselaer Polytech Inst RPI	- 1	Washington State University	- 4
Southern Illinois University	- 1	Wright State University	-13
St. Mary's University	- 1	Yale University	- 1
		Total	92



Program Statistics  
Continued

6. States Represented - 30

Alabama	- 4
Arizona	- 1
California	- 3
Connecticut	- 1
District of Columbia	- 1
Florida	- 8
Georgia	- 1
Illinois	- 4
Indiana	- 1
Iowa	- 1
Kansas	- 3
Louisiana	- 3
Massachusetts	- 3
Michigan	- 3
Minnesota	- 3
Missouri	- 1
Montana	- 1
Nevada	- 1
New York	- 1
North Carolina	- 1
Ohio	- 22
Oklahoma	- 1
Oregon	- 1
Pennsylvania	- 1
Rhode Island	- 2
Tennessee	- 10
Texas	- 4
Washington	- 4
West Virginia	- 1
Wyoming	- 1

7. Age of Participants -

Average - 26.2

APPENDIX II B

LIST OF PARTICIPANTS

LIST OF 1985 GRADUATE STUDENT PARTICIPANTS

NAME/ADDRESS

DEGREE, SPECIALTY, LABORATORY ASSIGNED

Shawn Adams  
University of West Florida  
Systems Science Department  
Pensacola, Florida 32514  
(904) 474-2000

Degree: B.S. Systems Science, 1985  
Specialty: Operating Systems  
Assigned: AL

Jay Ambrose  
Washington State University  
Mechanical Engineering  
Pullman, WA 99164-2920  
(509) 335-8654

Degree: B.S., Mechanical  
Engineering, 1984  
Specialty: Thermal-Fluid Sciences  
Assigned: APL

Rosalind Batson  
Wright State University  
Materials Science and  
Engineering Department  
Dayton, Ohio 45435  
(513) 873-2403

Degree: B.S., Materials Science  
and Engineering, 1985  
Specialty: TMT Processing of Rapidly  
Solidified Al-Ti Alloys  
Assigned: ML

Rosalind Bertolo  
Wright State University  
Systems Engineering  
Materials Science  
Dayton, Ohio 45435  
(513) 254-9651

Degree: B.S., Materials Science  
and Engineering, 1985  
Specialty: Physical Metallurey of  
Ti Alloys  
Assigned: ML

Scott Bischoff  
University of Texas Medical  
School at Houston  
7900 Cambridge 11-2G  
Houston, Texas 77054  
(713) 796-2498

Degree: B.S., Biology, 1984  
Specialty: Medicine  
Assigned: SAM

Scott Bradley  
University of Illinois at  
Urbana-Champaign  
Aeronautical and Astronautical  
Engineering  
Urbana, Illinois 61801  
(217) 384-1731

Degree: B.S., Aeronautical and  
Astronautical Engineering,  
1984  
Specialty: Aerodynamics/Flight Dynamics  
Assigned: FDL

Jan Leeman Brooks  
The University of Alabama  
College of Commerce  
and Business Administration  
Dept. of Management and Marketing  
Box J  
University, Alabama 35486  
(205) 348-6090

Degree: M.S., Social Work, 1974  
Specialty: Org'l Behavior  
Assigned: Maxwell

Howard Brown  
The Ohio State University  
Civil Engineering  
2070 Neal Avenue  
Columbus, Ohio 43210  
(614) 422-2771

Degree: M.S., Structural Engineer-  
ing, 1979  
Specialty: Structures  
Assigned: ML

Bernard Bruns  
Wright State University  
Department of Biomedical  
Engineering  
143 E & M Building  
Dayton, Ohio 45435  
(513) 873-3302

Degree: B.S., Natural Science, 1982  
Specialty: Biomedical Engineering  
Assigned: AMRL

Marianne Byrnes  
University of Dayton  
Chemical Engineering Department  
Dayton, Ohio 45409  
(513) 229-2273

Degree: B.S., Chemical Engineering,  
1985  
Specialty: Chemical Engineering  
Assigned: ML

Barbara Carruth  
Wright State University  
Department of Mathematics and  
Statistics  
3640 Colonel Glenn Hwy  
Dayton, Ohio 45431  
(513) 873-2785

Degree: B.S., of Education  
Mathematics, 1968  
Specialty: Statistics  
Assigned: AL

Lori Case  
University of Minnesota  
Department of Psychology  
Minneapolis, Minnesota 55455  
(612) 373-3406

Degree: B.A., Psychology, 1980  
Specialty: Experimental Psychology  
Assigned: HRL/MO

Elizabeth Casey  
University of Illinois  
Mechanical Engineering  
418 Psychology Building  
Champaign, Illinois 61820  
(217) 333-2122

Degree: B.S., Human Factors  
Engineering, 1982  
Specialty: Human Factors Engineering  
Assigned: AMRL

Christine Cato  
St. Mary's University  
Psychology  
San Antonio, Texas 78284  
(512) 436-3011

Degree: B.S., Psychology, 1984  
Specialty: Industrial Psychology  
Assigned: HRL/MO

Fred Chin  
Northeastern University  
360 Huntington Avenue  
Boston, Massachusetts 02174  
(617) 437-2000

Degree: B.S., Industrial Engineer  
Specialty: Industrial Engineer  
Assigned: ESD

Robert Clinton  
Florida Institute of Technology  
Physics Department  
Melbourne, Florida 32901  
(305) 766-8208

Degree: B.S., Physics, 1983  
Specialty: Physics  
Assigned: RADC

Otis Cosby  
Meharry Medical College  
Department of Pediatrics  
1005 D. B. Todd Blvd.  
Nashville, Tennessee 37208  
(615) 327-6221

Degree: B.S., Natural Science, 1983  
Specialty: Medical Student  
Assigned: SAM

David Cullin  
The Ohio State University  
Department of Chemistry  
Columbus, Ohio 43210  
(614) 422-9489

Degree: B.S., Chemistry, 1984  
Specialty: Chemistry  
Assigned: AL

Jennifer Davidson  
University of Florida  
Department of Mathematics  
201 Walker Hall  
Gainesville, Florida 32611  
(904) 392-0281

Degree: B.A., Physics, 1979  
Specialty: Applied Mathematics/  
Topology  
Assigned: Eglin

Stuart Dimock  
California State University  
Department of Chemistry  
Northridge, California 91330  
(818) 885-3381

Degree: B.S., Chemistry, 1984  
Specialty: Organic Synthesis  
Assigned: RPL

Franklin Dunmore  
Howard University  
Department of Physics and  
Astronomy  
Washington D.C. 20059  
(202) 636-6241

Degree: B.S., Physics, 1982  
Specialty: Optics and Solid State  
Physics  
Assigned: RADC

Susan Ebrahimi  
Louisiana Tech University  
Electrical Engineering Dept.  
Ruston, Louisiana 71273  
(318) 255-4975

Degree: B.S., Electrical  
Engineering, 1985  
Specialty: Communications/Signal  
Processing  
Assigned: AMRL

Steven Ernst  
Wright State University  
School of Engineering  
Dayton, Ohio 45435  
(513) 873-2403

Degree: B.S., Materials Science,  
1985  
Specialty: Thermomechanical Processing  
Assigned: ML

Tamara Evans  
Wright State University  
Statistics Department  
Dayton, Ohio 45435  
(513) 873-2785

Degree: B.A., Economics/Mathematics,  
1983  
Specialty: Statistics  
Assigned: LC

Mark Ferrel  
Kansas State University  
Nuclear Engineering  
Manhattan, Kansas 66506  
(913)

Degree: B.S., Nuclear Engineering,  
Physics  
Specialty: Nuclear Engineering  
Assigned: FJSRL

Michelle Ferry  
Wright State University  
Chemistry Department  
3640 Col. Glenn Highway  
Dayton, Ohio 45435  
(513) 873-2855

Degree: B.S., Chemistry, 1984  
Specialty: Organic Chemistry  
Assigned: AMRL

Jeffrey Fischer  
University of Cincinnati  
Mechanical Engineering  
Cincinnati, Ohio 45221  
(513) 475-2738

Degree: B.S., Physics, 1984  
Specialty: Finite Element Theory  
and Applications  
Assigned: WL

Karen Griffin  
North Carolina A & T  
State University  
Greensboro, North Carolina 27405  
(919) 379-7744

Degree: B.S., Economics, 1985  
Specialty: Analysis of Highway  
Assigned: Maxwell

Peggy Grigsby  
Wright State University  
Physics Department  
Dayton, Ohio 45435  
(513) 873-2950

Degree: M.S., Mathematics, 1978  
Specialty: Physics  
Assigned: ML

Tim Haddock  
Arizona State University  
Dept. of Mechanical and  
Aerospace Engineering  
Tempe, Arizona 85287  
(602) 965-3291

Degree: B.S., Physics, 1983  
Specialty: Materials Science  
Assigned: ML

Ernest Hardin  
MIT  
Dept. of Earth  
Atmospheric and Planetary Science  
Earth Resources Laboratory  
42 Carleton Street  
Cambridge, Massachusetts 02142  
(617) 253-7874

Degree: B.S., Applied Geophysics,  
1978  
Specialty: Seismology and Geodynamics  
Assigned: AFGL

Brian Hayes  
Southern Illinois University  
Psychology Department  
Alhambra, Illinois 62001  
(618) 488-7672

Degree: B.A., Psychology, 1982  
Specialty: Industrial/Organizational  
Psychology and Human Factors  
Assigned: HRL/OT

Laura Henderson  
Rensselaer Polytechnic  
Institute  
Physics Department  
Troy, New York 12180  
(518) 274-8208

Degree: B.S., Physics, 1983  
Specialty: Solid State-Condensed Matter  
Assigned: RADC

Sharon Henson  
University of Alabama  
Commerce and Business  
Administration  
University, Alabama 35486  
(205) 348-6090

Degree: MBA, General, 1977  
Specialty: Organizational Behavior  
Assigned: Maxwell

Charles Herd  
Louisiana State University  
Department of Chemistry  
Baton Rouge, Louisiana 70803  
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Degree: B.S., Chemistry, 1982  
Specialty: Analytical/Gas Phase Ion-  
Molecule Association  
Reactions  
Assigned: AFGL

Alan Hodgdon  
University of Texas Health  
Science Center  
San Antonio, Texas 78284  
(512) 691-6011

Degree: B.S., Physical Science,  
1977  
Specialty: Aviation Medicine  
Assigned: SAM

Adrienne Hollis  
Meharry Medical College  
Division of Biomedical Sciences  
1005 D. B. Todd Blvd.  
Nashville, Tennessee 37208  
(615) 329-2311

Degree: B.S., Science in Biology,  
1983  
Specialty: Cellular Physiology  
Assigned: SAM

Emily Howard  
UCLA  
Department of Psychology  
Los Angeles, California 90024  
(213) 825-4061

Degree: M.S., Psychology, 1983  
Specialty: Cognitive Psychology  
Assigned: AMRL

Robert Howard  
Tennessee Technological  
University  
Electrical Engineering Department  
Cookeville, Tennessee 38505  
(615) 528-3397

Degree: M.S., Electrical  
Engineering, 1982  
Specialty: Electromagnetics  
Assigned: AEDC

Mary Anne Hudson  
Marshall University  
Physics and Physical Science  
Huntington, West Virginia 25701  
(304) 696-6738

Degree: B.S., Geography, 1982  
Specialty: Physics  
Assigned: APL

Richard Hunt  
Atlanta University  
Department of Biology  
Atlanta, Georgia 30314  
(404) 681-2800

Degree: M.S., Biology, 1972  
Specialty: Medical Parasitology, EM,  
Biochemistry  
Assigned: SAM



R. Simon Insley  
University of Dayton  
Department of Engineering  
Management and Systems  
300 College Park  
Dayton, Ohio 45469  
(513) 229-2238

Degree: B.S., Applied Mathematics,  
1981  
Specialty: Management Sciences  
Assigned: BRMC

Barbara Johnson  
University of Minnesota  
Industrial/Technical Studies  
Duluth, Minnesota 55812  
(218) 726-8000

Degree: M.I.S., 1985  
Specialty: Industrial Safety  
Assigned: AMRL

Kem King  
The University of Alabama  
College of Commerce and  
Business Administration  
Department of Management  
and Marketing  
University, Alabama 35486  
(205) 348-6090

Degree: MBA, Organizational  
Behavior, 1984  
Specialty: Organizational Behavior  
Assigned: Maxwell

Scott Koehn  
The University of Minnesota  
Industrial Hygiene  
Minneapolis, Minnesota 55455  
(612) 373-8080

Degree: B.S., Chemistry, 1983  
Specialty: Industrial Hygiene/  
Hazardous Waste Management  
Assigned: OEHL

Mark Kruelle  
Yale University  
Mathematics Department  
Box 2155 Yale Station  
New Haven, Connecticut 06520  
(203) 436-1642

Degree: M.S., Mathematics, 1982  
Specialty: Algebra  
Assigned: FDL

Wayne Lundberg  
Wright State University  
Physics Department  
Dayton, Ohio 45435  
(513)

Degree: B.S., Physics, 1984  
Specialty: Metallurgy-Physics  
Assigned: ML

John Lushetsky  
University of Florida  
Department of Engineering Science  
Gainesville, Florida 32607  
(904) 372-5182

Degree: B.S., Engineering Science,  
1985  
Specialty: Optical Engineering  
Assigned: Eglin

Brian McMillin  
University of Illinois  
at Urbana-Champaign  
Mechanical Engineering  
Champaign, Illinois 61810  
(217) 352-6851

Degree: B.S., Mechanical  
Engineering, 1985  
Specialty: Thermal Sciences  
Assigned: RPL

Christopher McNair  
University of Texas at San  
Antonio  
Division of Life Sciences  
Department of Physiology  
San Antonio, Texas 78285  
(512) 691-4458

Degree: B.S., Biology, 1984  
Specialty: Neurophysiology  
Assigned: SAM

Kathleen Malin  
Oakland University  
Department of Linguistics  
Rochester, Michigan 48034  
(313) 370-2175

Degree: M.A., Linguistics, 1985  
Specialty: Linguistics  
Assigned: HRL/IO

Susan Malone  
Northeastern University  
Department of Industrial  
Engineering  
Boston, Massachusetts 01902  
(617) 437-2740

Degree: B.S., Human Factors, 1983  
Specialty: Industrial Engineering  
Assigned: ESD

Rodrigo Mateo  
Meharry Medical College  
Department of Physiology  
1005 D. B. Todd Blvd.  
Nashville, Tennessee 37208  
(615) 327-6204

Degree: B.S., Chemical Engineering,  
1983  
Specialty: Medicine  
Assigned: SAM

Michael Matz  
Ohio State University  
Chemical Engineering Department  
Columbus, Ohio 43210-1180  
(614) 294-2789

Degree: B.S., Chemical Engineering,  
1984  
Specialty: Chemical Engineering  
Assigned: SAM

Michael May  
Wright State University  
Chemistry Department  
3640 Colonel Glenn Highway  
Dayton, Ohio 45435  
(513) 873-2855

Degree: B.S., Chemistry, 1984  
Specialty: Inorganic Synthesis and  
Characterization  
Assigned: AMRL

Julia Memering  
University of Dayton  
Chemical Engineering  
Dayton, Ohio 45409  
(513) 461-0510

Degree: B.S., Chemical Engineering,  
1985  
Specialty: Undetermined  
Assigned: ML

Peter Meyer  
University of Montana  
Chemistry Department  
Missoula, Montana 59801  
(406) 243-6535

Degree: B.A., Chemistry, 1984  
Specialty: Physical Chemistry  
Assigned: Eglin

Brad Mickelsen  
Washington State University  
Department of Civil Engineering  
Pullman, Washington 99164-2910  
(509) 335-2576

Degree: B.S., Civil Engineering,  
1985  
Specialty: Civil Engineering  
Assigned: WL

Augustus Morris  
Wright State University  
Biomedical Sciences Ph.D. Program  
Dayton Ohio 45435  
(513) 253-3041

Degree: B.S., Biomedical  
Engineering, 1981  
Specialty: Biomedical Engineering  
Assigned: AMRL

Sharon Navard  
University of Southwestern  
Louisiana  
Department of Mathematics and  
Statistics  
Lafayette, Louisiana 70504  
(318) 231-6702

Degree: M.S., Statistics, 1984  
Specialty: Mathematical Statistics/  
Operations Research  
Assigned: Eglin

Matthew O'Meara  
University of Notre Dame  
Department of Aerospace/  
Mechanical Engineering  
Notre Dame, Indiana 46556  
(219) 239-7666

Degree: M.S., Aerospace Engineering,  
1985  
Specialty: Aerodynamics-Fluid Dynamics  
(Experimental)  
Assigned: FDL

Pamela Payne  
Meharry Medical College  
Division of Biomedical Sciences  
Department of Pediatrics  
1005 D. B. Todd Blvd.  
Nashville, Tennessee 37208  
(615) 327-6221

Degree: B.S., Chemistry, 1981  
Specialty: Biomedical Sciences  
Assigned: SAM

Matthew Peterson  
Institute for Creation Research  
Department of Physical Sciences  
El Cajon, California 92021  
(619) 440-3043

Degree: B.S., Mathematics, 1982  
Specialty: Astro-Geo Physics  
Assigned: AFGL

Philip Peterson  
Iowa State University  
Department of Industrial  
Engineering  
Ames, Iowa 50013  
(515) 294-9627

Degree: B.S., Industrial  
Engineering, 1983  
Specialty: Industrial Engineering  
Assigned: AMRL

David Plant  
Brown University  
Electrical Engineering  
44 Hidden Street  
Providence, Rhode Island 02906  
(401) 273-4365

Degree: B.S., Electrical  
Engineering, 1984  
Specialty: Quantum Electronics  
Assigned: AFGL

William Rabinovich  
Brown University  
Department of Physics  
Barus and Holley Building  
Providence, Rhode Island 02912  
(401) 863-3078

Degree: M.S., Physics, 1984  
Specialty: Physics  
Assigned: AFGL

Christopher Reed  
University of Florida  
Department of Engineering  
Sciences  
Gainesville, Florida 32611  
(904) 392-0961

Degree: M.S., Engineering Science,  
1984  
Specialty: Computational Fluid  
Dynamics  
Assigned: Eglin

Kathleen Ryan  
University of Scranton  
Department of Biology  
Scranton, Pennsylvania 18510  
(717) 961-7558

Degree: B.S., Biology, 1982  
Specialty: Biochemistry  
Assigned: SAM

Steve Savage  
Washington State University  
Department of Civil Engineering  
Pullman, Washington 99164  
(509) 335-2576

Degree: B.S., Civil Engineering,  
1985  
Specialty: Civil Engineering  
Assigned: WL

Yolman Salinas  
Meharry Medical College  
Department of Medicine  
1005 D. B. Todd Blvd.  
Nashville, Tennessee 37208  
(615) 327-6221

Degree: M.A., Chemistry, 1983  
Specialty: Hyperbaric Medicine  
Assigned: SAM

William Sayers  
Wright State University  
Chemistry Department  
Dayton, Ohio 43210  
(513) 873-2855

Degree: B.S., Chemistry, 1980  
Specialty: Electroanalytical Chemistry  
Assigned: ML

Thomas Schnesk  
Oakland University  
School of Engineering and  
Computer Science  
Rochester, Michigan 48063  
(313) 370-2200

Degree: B.S., Computer Science, 1983  
Specialty: Computer and Information  
Science  
Assigned: HRL/IO

Robert Scott  
Meharry Medical College  
Chemistry Department  
1005 D. B. Todd Blvd.  
Nashville, Tennessee 37208  
(615) 327-6221

Degree: B.S., Chemistry, 1984  
Specialty: Biomedical Sciences  
Assigned: SAM

Gary Scronce  
Kansas State University  
Department of Nuclear Engineering  
Manhattan, Kansas 66506  
(913) 532-6347

Degree: B.S., Nuclear Engineering,  
1984  
Specialty: Nuclear Engineering  
Assigned: FJSRL

James Sirkis  
University of Florida  
Department of Engineering  
Sciences  
231 Aerospace Building  
Gainesville, Florida 32611  
(904) 392-0961

Degree: B.S., Engineering Sciences,  
1984  
Specialty: Experimental Stress Analysis  
(Photo-Mechanics)  
Assigned: Eglin

James Slagel  
Wright State University  
Chemistry Department  
3640 Colonel Glenn Highway  
Dayton, Ohio 45435  
(513) 873-2855

Degree: B.S., Natural Science, 1977  
Specialty: Polymer Chemistry  
Assigned: ML

Richard Stewart  
University of Nevada at Reno  
Mathematics Department  
Carson City, Nevada 89701  
(702) 784-6773

Degree: B.S., Mathematics, 1975  
Specialty: Artificial Intelligence  
Assigned: AL

Kevin Stroh  
Kansas State University  
Nuclear Engineering Department  
Manhattan, Kansas 66506  
(913) 532-2362

Degree: B.S., Nuclear Engineering,  
1984  
Specialty: Nuclear Engineering  
Assigned: FJSRL

John Taranto  
University of Dayton  
Physics Department  
Dayton, Ohio 45409  
(513) 228-7119

Degree: B.S., Physics, 1985  
Specialty: Electro-Optics  
Assigned: AL

Donald Tilton  
Washington State University  
Department of Mechanical  
Engineering  
Pullman, Washington 99163  
(509) 335-1327

Degree: B.S., Mechanical  
Engineering, 1985  
Specialty: Thermal Fluid Sciences  
Assigned: APL

Frances Valley  
Oakland University  
School of Engineering and  
Computer Science  
Rochester, Michigan 48063  
(313) 370-2200

Degree: M.A., Mathematics, 1977  
Specialty: Computer, Information  
Science  
Assigned: HRL/10

Roger Vogel  
University of Missouri  
Electrical Engineering  
Columbia, Missouri 65203  
(314) 882-8373

Degree: B.S., Electrical  
Engineering, 1984  
Specialty: Applied Optics  
Assigned: WL

Joseph Washington  
Meharry Medical College  
Dept. of Microbiology  
1005 Dr. D.B. Todd, Jr. Blvd.  
Nashville, Tennessee 37208  
(615) 327-6281

Degree: B.S., Biology, 1982  
Specialty: Microbiology  
Assigned: SAM

Jennifer Weidner  
University of Florida  
Department of Psychology  
Gainesville, Florida 32611  
(904) 392-1056

Degree: M.A., Gifted Education,  
1983  
Specialty: Cognitive Developmental  
Psychology  
Assigned: LC

Terri Wilkerson  
Ohio State University  
Biomedical Engineering  
Department  
Dreese Laboratory  
Columbus, Ohio 43210  
(614) 422-6018

Degree: B.E.E., Electrical  
Engineering,  
Specialty: Biomedical Engineering  
Assigned: ML

Barbara Wilson  
Meharry Medical College  
Biomedical Sciences  
1005 D. B. Todd Blvd.  
Nashville, Tennessee 37208  
(615) 327-6288

Degree: B.S., Biology, 1983  
Specialty: Pharmacology  
Assigned: SAM

Charles Wilton  
University of Wyoming  
Department of Physics and  
Astronomy  
University Station  
Laramie, Wyoming 82071  
(307) 766-6150

Degree: B.A., Physics and  
Philisophy, 1984  
Specialty: Astrophysics  
Assigned: AFGL

Mary Winfree  
Meharry Medical College  
Physiology Department  
1005 D. B. Todd Blvd.  
Nashville, Tennessee 37208  
(615) 327-6212

Degree: M.S., Community  
Education, 1974  
Specialty: Medical Physiology  
Assigned: SAM

Dorothy Winther  
Auburn University  
Department of Psychology  
Auburn, Alabama 36830  
(205) 826-4412

Degree: M.A., Psychology, 1981  
Specialty: Industrial/Organizational  
Psychology  
Assigned: Maxwell

Charles Woods  
University of Florida  
Department of Psychology  
Gainesville, Florida 32611  
(904) 392-0605

Degree: B.S., Psychology, 1984  
Specialty: Cognitive and Perceptual  
Psychology  
Assigned: HRL/OT

Penny Yee  
University of Oregon  
Department of Psychology  
Eugene, Oregon 97403-1227  
(503) 686-4912

Degree: M.S., Cognitive Psychology,  
1983  
Specialty: Cognitive Psychology  
Assigned: HRL/OT

David Young  
University of Oklahoma  
School of Aerospace  
Mechanical and Nuclear  
Engineering  
Norman, Oklahoma 73019  
(405) 325-5011

Degree: B.S., Mechanical, 1972  
Specialty: Mechanical Engineering/  
Heat Transfer  
Assigned: AEDC



APPENDIX II C  
PARTICIPANT LABORATORY ASSIGNMENT

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 1)

1985 USAF/UES GRADUATE STUDENT SUMMER SUPPORT PROGRAM

AERO PROPULSION LABORATORY (AFWAL/APL)  
(Wright-Patterson Air Force Base)

1. Jay H. Ambrose
2. Mary Anne G. Hudson
3. Donald E. Tilton

AEROSPACE MEDICAL RESEARCH LABORATORY (AMRL)  
(Wright-Patterson Air Force Base)

1. Bernard John Bruns
2. Elizabeth Jean Casey
3. Susan Tucker Ebrahimi
4. Michelle Joanne Ferry
5. Emily Louise Howard
6. Barbara Ann Johnson
7. Michael Alan May
8. Augustus Morris
9. Philip James Peterson

ARMAMENT LABORATORY (AD)  
(Eglin Air Force Base)

1. Jennifer Lee Davidson
2. John Martin Lushetsky
3. Peter David Meyer
4. Sharon Elizabeth Navard
5. Christopher William Reed
6. James Sanford Sirkis

ARNOLD ENGINEERING DEVELOPMENT CENTER (AEDC)  
(Arnold Air Force Station)

1. Robert Paul Howard
2. David Wilson Young

AVIONICS LABORATORY (AFWAL/AL)  
(Wright-Patterson Air Force Base)

1. Shawn Jeffrey Adams
2. Barbara Sue Carruth
3. David W. Cullin
4. Richard A. Stewart
5. John Joseph Taranto

BUSINESS RESEARCH MANAGEMENT CENTER (BRMC)  
(Wright-Patterson Air Force Base)

1. R. Simon Insley

ELECTRONICS SYSTEMS DIVISION (ESD)  
(Hanscom Air Force Base)

1. Fred Chin
2. Susan Claire Malone

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 2)

**FLIGHT DYNAMICS LABORATORY (AFWAL/FDL)**  
(Wright-Patterson Air Force Base)

1. Scott Christopher Bradley
2. Mark Frederick Kruelle
3. Mathew Michael O'Meara

**FRANK J. SEILER RESEARCH LABORATORY (FJSRL)**  
(USAF Academy)

1. Mark Anthony Ferrel
2. Gary Wayne Scronce
3. Kevin Anton Stroh

**GEOPHYSICS LABORATORY (AFGL)**  
(Hanscom Air Force Base)

1. Ernest L. Hardin
2. Charles R. Herd
3. Matthew Carl Peterson
4. David Victor Plant
5. William S. Rabinovich
6. Charles Ripley Allen Wilton

**HUMAN RESOURCES LABORATORY/OT (HRL/OT)**  
(Williams Air Force Base)

1. Brian Christopher Hayes
2. Charles Barrie Woods
3. Penny Linn Yee

**HUMAN RESOURCES LABORATORY/MO (HRL/MO)**  
(Brooks Air Force Base)

1. Lori Lynn Case
2. Christine Elizabeth Cato

**HUMAN RESOURCES LABORATORY/ID (HRL/ID)**  
(Lowry Air Force Base)

1. Kathleen A. Malin
2. Thomas Leonard Schnesk
3. Frances Maureen Vallely

**LEADERSHIP AND MANAGEMENT DEVELOPMENT CENTER (LMDC)**  
(Maxwell Air Force Base)

1. Jan Leeman Brooks
2. Karen Griffin
3. Sharon K. Henson
4. Kim A. King
5. Dorothy A. Winther

**LOGISTICS COMMAND (LC)**  
(Wright-Patterson Air Force Base)

1. Tamara Ann Evans
2. Jennifer McGovern Weidner

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 3)

**MATERIALS LABORATORY (AFWAL/ML)**

(Wright-Patterson Air Force Base)

- |                              |                            |
|------------------------------|----------------------------|
| 1. Rosalind Elizabeth Batson | 7. Tim B. Haddock          |
| 2. Rosalind R. Bertolo       | 8. Wayne Randolph Lundberg |
| 3. Howard William Brown, III | 9. Julia Noel Memering     |
| 4. Marianne T. Byrnes        | 10. William Robert Sayers  |
| 5. Steven Clark Ernst        | 11. James Gerard Slagel    |
| 6. Peggy Jo Grigsby          |                            |

**OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (OEHL)**

(Brooks Air Force Base)

1. Scott Raymond Koehn

**ROCKET PROPULSION LABORATORY (RPL)**

(Edwards Air Force Base)

1. Stuart Harrison Dimock
2. Brian Keith McMillin

**ROME AIR DEVELOPMENT CENTER (RADC)**

(Griffiss Air Force Base)

1. Robert Russell Clinton
2. Franklin John Dunmore
3. Laura Lee (Lucy) Henderson

**SCHOOL OF AEROSPACE MEDICINE (SAM)**

(Brooks Air Force Base)

- |                             |                               |
|-----------------------------|-------------------------------|
| 1. Scott Barry Bischoff     | 9. Pamela Henrietta Payne     |
| 2. Otis Cosby, Jr.          | 10. Kathleen Frances Ryan     |
| 3. Alan Kent Hodgdon        | 11. Yolman Salinas            |
| 4. Adrienne Lynette Hollis  | 12. Robert Lawrence Scott     |
| 5. Richard Alexander Hunt   | 13. Joseph Willard Washington |
| 6. Rodrigo Bleza Mateo      | 14. Barbara Ann Wilson        |
| 7. Michael James Matz       | 15. Mary Lee Winfree          |
| 8. Christopher Louis McNair |                               |

**WEAPONS LABORATORY (WL)**

(Kirtland Air Force Base)

1. Jeffrey Albert Fischer
2. Brad M. Mickelson
3. Steve Joseph Savage
4. Roger A. Vogel

APPENDIX III

- A. Listing of Research Reports Submitted in the  
1985 Graduate Student Summer Support Program
- B. Abstracts of the 1985 Summer Fellow's  
Research Reports

## RESEARCH REPORTS

### 1985 GRADUATE STUDENT SUMMER SUPPORT PROGRAM

<u>Technical Report Number</u> Volume I	<u>Title</u>	<u>Graduate Researcher</u>
1	A Preliminary Study in Neural Modeling Using the Ada Programming Language	Shawn J. Adams
2	Prediction of Heat Pipe Rewetting Behavior	Jay Ambrose
3	The Processing Window For Ti-15V-3Cr-3Al-3Sn	Rosalind Batson
4	Factors Affecting Pendant Dpop Melt Extraction of Selected Titanium Alloys with Insoluble Additions	Rosalind R. Bertolo
5	The Effects of Raphe Stimulation and Iontophoresis of Serotonergic Agents on Granule Cell Activity in Rat Lateral Cerebellar Cortex	Scott B. Bischoff
6	Directional Maneuverability	Scott C. Bradley
7	The Theory and Measurement of the Potential for Combat Effectiveness	Jan L. Brooks
8	Mode II Energy Release Rate in the Delamination of a Composite Laminated Cantilever Beam	Howard Brown
9	Mathematical Modeling of the Human Cardiopulmonary System	Bernard Bruns
10	Characterization of High Temperature Thermal Behavior for Three Acetylene Terminated Resins by Torsion Impregnated Cloth Analysis (TICA)	Marianne T. Byrnes
11	ATR Performance VS Image Measurements	Barbara S. Carruth
12	Individual Differences in Abilities, Learning, and Cognitive Processes	Lori L. Case
13	The Effects of Task Difficulty on Steady State Evoked Potentials in the Frequency Domain	Elizabeth Casey

14	Personality Correlates of Pilot Performance	Christine Cato
15	Methods for Reliability Warranty Verification	Fred C. S. Chin
16	A Novel Method for Measuring Nonuniformities in Metallization Temperature of an Operating Integrated Circuit	Robert R. Clinton
17	The Nyktometer and Low-Contrast Eye Charts in Night Vision Studies	Otis Cosby
18	Experimental Studies Related to III-V Semiconductor Growth and Characterization	David Cullin
19	Labeling the Topographic Features of a Grey Level Image	Jennifer L. Davidson
20	New Synthetic Techniques for Advanced Propellant Ingredients: Investigations into the Synthesis of Aliphatic Triisocyanates	Stuart Dimock
21	Tests of Optical Fibers at Liquid Nitrogen to Liquid Helium Temperatures	Franklin J. Dunmore
22	Speech Recognition for Command and Control	Susan Ebrahimi
23	Preparation of Titanium Base Alloys with Additions of Boron and Erbium for Pendant Drop Melt Extraction	Steven C. Ernst
24	Mathematics of Dyna-METRIC Pipeline Report	Tamara Evans
25	The Effects of Nuclear Radiation on the Optical Characteristics of ( $\text{SiO}_2 - \text{ZrO}_2$ ) on Si Substrate Mirrors	Mark A. Ferrel
26	Metabolism of Indan in Fischer 344 Rats	Michelle Ferry
27	Numerical Calculations for Geometric Attenuation Problem	Jeff A. Fischer
28	Leadership and Management in Military and Non-Military Environments	Karen Griffin

- |    |  |                    |
|----|--|--------------------|
| 29 | Effects of Coherent Scattering on IR Absorption in Doped Semiconductors  | Peggy Jo Grigsby   |
| 30 | Morphology of A PBT/ABPBI Block Copolymer System   | Tim Haddock        |
| 31 | Geoid Undulation Due to Deflected Asthenospheric Flow: Constraints on Lithospheric Geometry at Passive Margins   | Ernest Hardin      |
| 32 | Role of Stimulus Uncertainty in Visual Contrast Sensitivity  | Brian C. Hayes     |
| 33 | NO REPORT  | Laura Henderson    |
| 34 | A Literature Review and Meta-Analysis of the Relationship Between Perceived Task Characteristics and Worker Responses                                    | Sharon Henson      |
| 35 | Temperature Dependence of Some Selected Ion-Molecule Association Reactions   | Charles R. Herd    |
| 36 | Pyridostigmine Bromide   | Alan K. Hodgdon    |
| 37 | The Role of Antioxidant Nutrients in Preventing Hyperbaric Oxygen Damage to the Retina   | Adrienne L. Hollis |
| 38 | Advanced Visual Displays   | Emily Howard       |
| 39 | Optimization Technique for Data Collection Criteria of a Multiple Ratio Single Particle Counter  | Robert Howard      |
| 40 | Free Radical Spectra of PO   | Mary Anne Hudson   |
| 41 | Long Term Life Expectancy Radiation Effects: An Ultrastructural Study of Brain Tumors Developed in Macaca Mulatta Following Exposure to Proton Radiation | Richard Hunt       |
| 42 | The F-15 SPO Support Equipment "Tiger Team"  | R. Simon Insley    |
| 43 | Gender Differences Affecting Respirator Mask Sizing Systems  | Barbara A. Johnson |
| 44 | A Meta-Analysis of the Ohio State Leadership Constructs  | Kem King           |



45 Aircraft Fuel Cell Foam: Industrial Hygiene and Waste Management Considerations Scott Koehn

46 A Note on Solutions of a Hypergeometric Equation Arising in a Missile Miss Distance Methodology Mark F. Kruelle

Volume II

47 Analysis of High-Temperature Compression Data Wayne R. Lundberg

48 Problems Encountered in the Production of Dichromated Gelatin Holograms John M. Lushetsky

49 Natural Language Understanding Using Residential Grammar and its Use in Automatic Programming Kathleen A. Malin

50 Methods for Reliability Warranty Verification Susan C. Malone

51 Gas Transport Mechanisms in High Frequency Ventilation Rodrigo Mateo

52 Temperature Front Sensing in Pressure Swing Adsorptions Systems Michael Matz

53 Modeling the Tissue Solubilities of Halogenated, Methanes, Ethanes, and Ethylenes Michael May

54 Diagnostics of Solid Propellant Combustion Brian McMillin

55 The Effects of Raphe Stimulation and Iontophoresis of Serotonergic Agents on Granule Cell Activity in Rat Lateral Cerebellar Cortex Christopher McNair

56 Factors Affecting Fasil Formulation, Scale-Up and Reclaiming Julia Memering

57 Time to Explosion Studies of Some Potential High Explosives Peter D. Meyer

58 Development of a Routine for Solving the Roots of Characteristic Equations Brad M. Mickelsen

59 Identification and Analysis of an Active Controller Augustus Morris

60	Obtaining Variance Estimates From Smoothed Data	Sharon E. Navard
61	Smoke Visualization Research	Matthew M. O'Meara
62	The Role of Antioxidants in Hyperbaric Oxygen Toxicity to the Retina	Pamela H. Payne
63	A Comparison of Measured and Calculated Attenuation of 28 GHZ Beacon Signals in Three California Storms	Matthew Peterson
64	Maximum Voluntary Hand Grip Torque for Circular Electrical Connectors	Philip Peterson
65	Optical Bistability in Pre-Dissociative Media: A Theoretical Study	David Plant
66	Optical Bistability in Pre-Dissociative Media: A Theoretical Study	William Rabinovich
67	Adaptive Grid Generation for Viscous Flow Problems	Christopher W. Reed
68	An Assessment of the Development of a DNA Probe for Mycoplasma hominis and Ureaplasma urealyticum	Kathleen F. Ryan
69	Gas Exchange in the Rabbit Using High Frequency Ventilation in High Altitude	Yolman Salinas
70	"SPERIL.LSP: A LISP Version of SPERIL-1, An Expert System for Damage Assessment to Buildings"	Steve J. Savage
71	Thermal Stability of Alkyl Silahydrocarbons	William R. Sayers
72	Natural Language Understanding Using Residential Grammar and its Use in Automatic Programming	Thomas L. Schnesk
73	The Role of Antioxidant Nutrients in Preventing Hyperbaric Oxygen Damage to the Retina	Robert L. Scott
74	Transient Effects of Nuclear Radiation on the Optical Properties of (Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> Coated on Fused Silica Substrate) Laser Mirrors	Gary W. Scronce

- |    |   |                           |
|----|---|---------------------------|
| 75 | Improved Taylor Anvil Test  | James Sirkis              |
| 76 | Synthesis of Novel Polybenzimidazole Monomers   | James Slagel              |
| 77 | Modelling/Analysis of Space Based Kinetic Energy Weapon Projectile Flyouts  | Richard Stewart           |
| 78 | The Effects of Radiation on ( $Al_2O_3$ - $SiO_2$ Coated on Fused Silica Substrate) Laser Mirrors   | Kevin A. Stroh            |
| 79 | Computer Automated, Test Mirror Registration System for the Ring Laser Gyro   | John Taranto              |
| 80 | Numerical Modeling of Transient Liquid Metal Heat Pipe  | Donald Tilton             |
| 81 | Natural Language Understanding Using Residential Grammar and its Use in Automatic Programming   | Frances M. Vallyely       |
| 82 | Two Systems for Obtaining Spatial Energy Distributions of Laser Pulses  | Roger Vogel               |
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APPENDIX III B

ABSTRACTS

A PRELIMINARY STUDY IN NEURAL MODELING  
USING THE ADA PROGRAMMING LANGUAGE

by

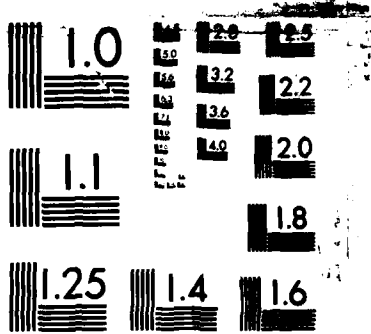
Shawn J. Adams

ABSTRACT

Because neural modeling is an extremely interdisciplinary field which makes the ambitious attempt to formulate mathematical models of neuronal components of the brain, the field inherently lends itself to great complexity and the scientific community at large find themselves unable to reach a common understanding of this microscopic approach to learning and intelligence. Furthermore, claims that the development of a mathematical theory of neural modeling which would prompt yet another "major scientific revolution", justify attempts made herein to investigate and understand the neural equations developed by Stephen Grossberg over the past two decades.

This two-part report addresses 1) the suitability of the Ada programming language as an effective tool in the aid and development of neural models; and 2) exactly how is it, that Grossberg's equations are able to "learn", what types of learning behavior are Grossberg's Equations capable of achieving, and what levels of "intelligence" are Grossberg's Equations capable of attaining.





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



## Prediction of Heat Pipe Rewetting Behavior

by

J. H. Ambrose

### ABSTRACT

The subject of this report is a model developed by Dr. J. E. Beam to describe the behavior of a heat pipe after it has been subjected to a pulsed heat load. The mathematical model consists of a lumped-parameter solution of the energy equation and a prediction of wick rewetting times based on simple mass and momentum balances.

It was hypothesized that a partial dryout of the wick could occur if a heat pipe is subjected to a sudden pulse of heat. Due to capillary pumping the wick should rewet itself after sufficient time has elapsed. Predicted values of the rewetting time agreed well with measured values for low to moderate heat loads, but failed to accurately predict the rewetting time for larger heat loads.

In this work, the rewetting model has been modified to account for the thermal energy stored during the initial pulse period. The revised model utilizes the lumped-parameter solution for the temperature response to estimate the heat storage and includes the effect of variable fluid properties. It is shown to agree better with measured rewetting times for the higher pulsed heat loads.

Rosalind Batson

ABSTRACT

The effect of hot deformation and post-deformation heat treatment on the development of mixed grain structure is investigated for the near-beta Ti-15V-3Cr-Sn-3Al (Ti-15-3-3-3) alloy. Hot forging to a 65% reduction followed by annealing for one hour at temperatures ranging between 1600° F and 2300° F results in a "processing window" for annealing temperatures above 2100° F. Within this range, a uniform recrystallized structure is observed. Analysis of the processing map and the corresponding microstructures is presented and discussed. In addition, recommendations for further work on the processing of the Ti-15-3-3-3 alloy is presented.

FACTORS AFFECTING PENDANT DPOP MELT EXTRACTION  
OF SELECTED TITANIUM ALLOYS WITH INSOLUBLE ADDITIONS

by

Rosalind Bertolo

ABSTRACT

Rapid solidification (RS) processing of titanium alloys containing erbium, boron, or carbon should lead to high strength at low temperatures without a significant loss of ductility. The pendant drop melt extraction (PDME) unit to be used for RS processing requires homogenous stock. The production of homogenous stock and the difficulties encountered are addressed. The effect of various substrates (the quench wheel in the PDME unit) on the cooling rate is examined. Recommendations for studies which may lead to the development of a model to aid choosing the "best" substrate for RS conversion of an alloy using the PDME process have been made.

THE EFFECTS OF RAPHE STIMULATION AND IONTOPHORESIS OF  
SEROTONERGIC AGENTS ON GRANULE CELL ACTIVITY IN RAT LATERAL  
CEREBELLAR CORTEX.

by

Deborah L. Armstrong, Ph.D  
Christopher McNair  
Scott Biscoff

ABSTRACT

Stimulation of the dorsal raphe resulted in modulation of granule cell spontaneous activity. This provides support for the proposal that serotonin functions as a transmitter in the granular layer of the cerebellar cortex, however, the diversity of the observed responses does not permit a precise determination of the nature of the activated synapses. Of the eleven cells that responded consistently, six displayed decreased spontaneous activity, three were excited by the stimulation, and four cells displayed a biphasic response of initial excitation followed by inhibition. The iontophoretic application of serotonin decreased the spontaneous activity of the majority of cells tested and this effect could not be blocked by methysergide. Several cells were excited by serotonin application and this effect could be blocked by methysergide.

DIRECTIONAL MANEUVERABILITY

by

Scott Christopher Bradley

ABSTRACT

Recent trends in aircraft flight control are leading towards the development of a "supermaneuverable" fighter aircraft, one that is capable of flying in the longitudinal post-stall and high sideslip modes. This paper, intended to be one section of a three part paper with other sections written by D. Multhopp and T. Cord, explores the benefits and problems encountered in trying to develop an aircraft capable of high sideslip angles. Also discussed are the feasibility of various approaches along with potential drawbacks.

THE THEORY AND MEASUREMENT  
OF THE POTENTIAL FOR COMBAT EFFECTIVENESS

by

Jan Leeman Brooks

ABSTRACT

The purpose of this study is to report the development of a theoretical model of combat readiness. A review of both civilian and military literature on effectiveness suggests that attitudes toward certain organizational phenomena are important elements of a model of potential for combat effectiveness. The relevant attitudes are those developed about one's job, one's coworkers, one's supervisor, and combat, in general. This paper is the first of two studies of the issue of combat readiness; the second paper will be a report of an empirical test of the model.

THE CALCULATION OF MODE II ENERGY RELEASE RATE  
IN THE DELAMINATION OF COMPOSITE MATERIALS

by

Howard W. Brown

ABSTRACT

An approximate method for the evaluation of mode II energy release rate in the delamination of composite materials is investigated. The model is a cantilever beam consisting of a doubly symmetric composite laminate with a midplane starter crack at the free edge. A modified method of a theory developed by Whitney and Sun is used to evaluate the displacement field and the distribution of interlaminar stresses caused by the loading at the free edge. The results of this modified theory indicate pure mode II delamination of the cantilever. Suggestions for future research in this area are offered.

# MATHEMATICAL MODELING OF THE HUMAN CARDIOPULMONARY SYSTEM

by

Bernard John Bruns

## ABSTRACT

A mathematical model of the human pulmonary system is presented. This six chamber model, designed to improve the modeling of flow in the respiratory tract, is intended to replace the previously used pulmonary model which was incorporated into a cardio-pulmonary model developed under Government Contract 79-0123. This new model uses a Rohrer-type equation for resistance rather than the previously used practice of "curve fitting". This new method is more mechanistic and representative of the physiological system being modeled. Thus, its incorporation into the cardiovascular model should help study the effects of acceleration.



CHARACTERIZATION OF HIGH TEMPERATURE THERMAL  
BEHAVIOR FOR THREE ACETYLENE TERMINATED RESINS  
BY TORSION IMPREGNATED CLOTH ANALYSIS (TICA)

BY

MARIANNE T. BYRNES

ABSTRACT

In this report, I have introduced two steps that were taken toward reaching my summer objective of working toward characterizing the high temperature thermal behavior of three acetylene terminated resins. The two steps taken to achieve this goal were: (1) familiarization with the operation and experimental set-up of TICA; and (2) TICA study of three acetylene terminated resin systems. These steps were very important in order to prepare for future research activities.

ATR PERFORMANCE VS IMAGE MEASUREMENTS

By

Barbara S. Carruth

ABSTRACT

This report describes the theory and methodology used to relate ATR (Automatic Target Recognition) performance with a set of image measurements and human target recognition performance. Statistical techniques described include regression analysis, robust regression, and analysis of binary data.

INDIVIDUAL DIFFERENCES IN ABILITIES, LEARNING, AND COGNITIVE PROCESSES

by

Phillip L. Ackerman and

Lori Case

ABSTRACT

This paper represents the final report of my participation in the 1985 Summer Faculty Research Program in the Test and Training Branch of the Air Force Human Resources Laboratory (AFHRL) located at Brooks AFB. This research program has a combined focus of a) the determination of the basic causes and manifestations of individual differences in learning during skill acquisition and knowledge acquisition task practice; and b) refinement of a theoretical/empirical approach to interrelating cognitive abilities with individual differences in learning -- that provides a foundation for improved predictors of present and future performance in learning and training environments. The approach to these issues involves an integration of information processing theories of learning, practice, and skill acquisition with intellectual/cognitive ability constructs. During this summer research period several experiments have been completed that converge on the derivation of information about individual differences in learning and the relations between cognitive/intellectual abilities and learning.

The Effects of Task Difficulty on  
Steady State Evoked Responses in the Frequency Domain

by  
Elizabeth J. Casey

ABSTRACT

Steady-state Visually Evoked Responses (VERs) to flashing lights were measured for ten subjects as they performed a decision-making task. The gain of the frequency responses tended to be attenuated with increased task difficulty and the phase was shifted negatively when no task was required. This method may become useful as a measure of workload.

## Personality Correlates in Pilot Performance

by

Eona Fiedler, Ph.D. and Christine Cato

### ABSTRACT

This paper reports on literature reviews of both the typical pilot personality profile, as well as the personality correlates of flight training outcome and flight safety. Next, the analyses of two different studies are reported. The first study found that combat ready fighter pilots from eight NATO countries scored similarly on the personality factors of conscientiousness and experimenting (Cattell's 16PF). The second study reports on the effectiveness of the Pilot Personality Inventory (PPI) in predicting Undergraduate Pilot Training (UPT) outcome. Similar to previous findings in this area, it was found that the PPI was not able to reliably predict UPT outcome across different samples of pilots. The next section of this paper presents the general conclusions from both the literature reviews and the results of the above studies. Finally, the most promising future approaches for studying (1) the use of a personality measure to predict pilot performance, and (2) future research possibilities with the Defense Mechanism Test, which is currently being used by several European countries, are discussed.

METHODS FOR RELIABILITY WARRANTY VERIFICATION

by

Carolyn DeLane Heising,  
Fred C. S. Chin

ABSTRACT

Methods for reliability warranty verification have been developed and applied to actual USAF systems under design and production. Two principal methods are described. The first is a procedure for predicting USAF system performance in the field (as measured by the variable Mean Time Between Failures (MTBF)), and is based on a Bayesian statistical updating approach. The second is a procedure for tracking maintenance data to verify the variable Mean Time Between Maintenance Actions (MTBMA). In addition, alternative reliability warranties are reviewed, and recommendations made as to which are preferable, particularly with respect to their ease of verification. It was found that the warranties which either guarantee the field MTBF with a verification test, or guarantee the field MTBMA are preferable to other alternatives, including the Reliability Improvement Warranty (RIW). The Bayesian procedure for updating system reliability estimates was found to be very useful in estimating USAF performance, and is recommended for implementation as a method for tracking reliability warranties in practice.

A Novel Method for Measuring Nonuniformities in  
Metallization Temperature of an Operating  
Integrated Circuit

by

Robert R. Clinton

ABSTRACT

A nonuniform temperature distribution was observed along the metallization and on the top surface of an integrated circuit. Very small latex SEM calibration spheres were distributed over the circuit, and their changes of shape and contrast, due to melting, allowed us to discern hotter and cooler regions on the chip. Much of what was observed seemed to indicate that electromigration can take place at a relatively low temperature, around  $113^{\circ}\text{C}$  or less. This indicates that bulk diffusion cannot be the only mechanism in the process. Further discussion of the thermal calibration of the spheres, effects of the surface, and effects of the vacuum is also given. Various difficulties involved with the technique and some proposals to overcome them are given as well.

THE NYKTOMETER AND LOW-CONTRAST  
EYE CHARTS IN NIGHT VISION STUDIES

by

Otis Cosby, Jr.

ABSTRACT

The eye utilizes both rods and cones in distinguishing objects at night. This phenomenon is referred to as mesopic vision. Because of the Air Force's interest in improving night vision of flyers, a mesopic vision tester (or Nyktometer) was purchased from Germany for the purpose of evaluating its usefulness as a screening device. Twenty-eight flyers, who did not have any eye pathology, volunteered for testing. In addition, they were asked to read two low-contrast eye charts. Hence, it was possible to establish normal limits for both devices. Also there appeared to be a direct correlation between their performances on the eye chart and the Nyktometer.



Experimental Studies Related to III-V Semiconductor  
Growth and Characterization

by

Mr. David Wm. Cullin II

ABSTRACT

Experiments in three areas relating to the growth and characterization of semiconductor materials were attempted during this summer fellowship period. Efforts in the first area, photo-assisted molecular beam epitaxy, were aimed at overcoming substrate temperature problems in the growth of heterostructure materials. Attempts to perform preliminary experiments in this area were frustrated by equipment delivery delays and problems. Construction of the apparatus and preliminary measurements were conducted in the second area of research, the kinetics and decomposition of metal organics of interest to metal organic chemical vapor deposition. These results showed difficulties in using the original doser design and quadrupole mass spectrometer. Subsequent changes improved the apparatus performance.

LABELING THE TOPOGRAPHIC FEATURES OF

A GREY LEVEL IMAGE

by

Jennifer L. Davidson

ABSTRACT

The purpose of this paper is to describe a method for labeling the topographic features of a grey level image. The surface in three-dimensional space described by the grey level intensity values of the image resembles a three-dimensional topographic relief map. The topographic features we chose to investigate are peaks, ridges, cliffs, mesas, prairies, valleys, canyons, ravines, and sinks. The labeling procedure is an image processing technique available for use in the Image Processing Lab at Eglin AFB, and is a method to be used in conjunction with other image processing algorithms to detect high-value targets such as buildings, bridges, petroleum tanks, and runways. Nine masks were developed that represent a local neighborhood of a topographic feature. For example, a peak point represents a local maximum. Each pixel in the image is given a label corresponding to one of these nine masks. Connected components of pixels with grey level values in a certain range are located, and the corresponding mask values of those pixels are examined to determine which topographic label the component should receive. The tests that label a component count the percentage of occurrence of each mask value in the component, and a significant percentage of peak points, for example, will label the component a peak. When a label was attached to a component, the algorithm was fairly accurate. However, a number of significant components, mostly peaks, were unlabeled.

New Synthetic Techniques for Advanced  
Propellant Ingredients: Investigations into  
the Synthesis of Aliphatic Triisocyanates

by

Stuart H. Dimock

ABSTRACT

Investigations were conducted into the practical synthesis of four new primary, primary, primary, aliphatic triisocyanates. The intent of these syntheses was to develop an industrially applicable method of preparation for pilot plant operation in composite propellant manufacture.

The routes investigated were the direct replacement of a satisfactory leaving group with the weak cyanate nucleophile and the reaction of phosgene with the appropriate primary amine. Synthesis of several intermediates including 2-(bromomethyl)-2-methyl-1,3-propanedibromide, 2-(methanesulfonatomethyl)-2-methyl-1,3-propanebismethanesulfonate, 2-(benzenesulfonatomethyl)-2-methyl-1,3-propanebisbenzenesulfonate, 2-(azidomethyl)-2-methyl-1,3-propanediazide, and 2-(aminomethyl)-2-methyl-1,3-propanediamide.

No successful route to the target compounds was found, however, continuing research with the listed intermediates is expected to be productive and future funding will be sought through the Air Force Office of Scientific Research.

TESTS OF OPTICAL FIBERS AT LIQUID NITROGEN TO LIQUID HELIUM TEMPERATURES

by

Franklin J. Dunmore

Abstract

This report contains the objectives, apparatus procedures, results and recommendations springing forth from the research of Dr David Y. Chung, my Summer Faculty Research Supervising Professor, and I, of testing possible preliminary designs of low temperature optical fiber sensors, Section III deals with vacuum systems, Section IV deals with the optical systems, Section VI contains the experimental procedure, and results, Section VII contains the recommendations that spring forth from our results, and the last part contains acknowledgements and thanks for the assistance and cooperation we have received while here at Rome Air Development Center.

SPEECH RECOGNITION FOR COMMAND AND CONTROL

by

Susan T. Ebrahimi

ABSTRACT

The objective set for the research period was twofold. The first goal was to test the TI Speech Command board's recognition performance using utterances taped under different noise conditions. The second goal was to design a speech recognition board around NEC's Speech Recognition LSI Set [1].

A great deal of difficulty was encountered in simply trying to enroll and update the taped practice utterances into the TI Professional Computer to form templates. After much trial and error, a procedure in which utterances were first edited with the SPIRE software running on a Symbolics machine was adopted, and templates could be made reliably. Once an acceptable enrollment procedure was found, the work progressed swiftly and without incident. Percentage recognition scores were obtained from the gathered data.

The hardware design of the speech recognition board was completed. Its basic components include the NEC Speech Recognition LSI set along with pattern registration memory and clock generation circuitry. A Z80 processor with EPROM as well as RAM storage is included so that all speech recognition software may be resident on the board itself. Finally, an interface between the speech recognition board and its S-100 host computer is included.

It is suggested that testing of the speech recognition board, development of its operating software, and the addition of a speech synthesis function be accomplished as a part of a continuing research effort.

PREPARATION OF TITANIUM BASE ALLOYS  
WITH ADDITIONS OF BORON AND ERBIUM FOR  
PENDANT DROP MELT EXTRACTION

by  
Steven C. Ernst

ABSTRACT

The effect of dispersoid forming elements in rapidly solidified (RS) titanium base alloys (Ti-6Al-4V, Ti-10V-2Fe-3Al, Ti-15V-3Cr-3Sn-3Al, Ti-20Mo) is to be investigated. Additions of boron, carbon, cerium/sulphide and erbium are to be eventually made to the base alloys and RS converted by the pendant drop melt extraction (PDME) process. The work that has been performed to date has involved the preparation of the boron and erbium containing base alloys that are to be RS converted. The primary concern in alloy preparation is the uniformity of composition. This is a requirement of the PDME process if the chemistry of the RS product is to be controlled. The problem of segregation in boron and erbium containing alloys has been evaluated. In the alloys with erbium additions, only microsegregation was found and therefore are satisfactory for PDME. Large scale segregation problems were present in the base alloys with the boron addition. Methods of eliminating the problem have been considered and have been discussed.

Mathematics of Dyna-METRIC Pipeline Report

by

Tamara A. Evans

ABSTRACT

In the examination of the mathematics of Dyna-METRIC's pipeline calculations, an error was found when the system had previous peacetime flying. The calculations of parts that were owed to the base were found to underestimate the true number of parts that the base had not yet received. Thus, this underestimation affects the calculations of expected backorders which in turn affects the estimation of the availability of aircraft. Also, the pipeline segment report does not appear to clearly define what the numbers presented mean. Perhaps there is a better way to present the pipeline report.

THE EFFECTS OF NUCLEAR RADIATION ON THE OPTICAL  
CHARACTERISTICS OF (SiO<sub>2</sub>-ZrO<sub>2</sub> ON Si SUBSTRATE) MIRRORS

by

MARK A. FERREL

ABSTRACT

Radiation induced absorption in optical components has recently become the concern of at least two projects, Strategic Defense Initiative and Inertial Confinement Fusion. Understanding the damage mechanisms and formulating accurate theoretical models is essential in order to minimize radiation induced damage.

Using a least squares fit to preirradiation, iodine laser damage data the function below was found to best fit the damage data.

$$D = 1 - e^{-A(X-B)} \quad (1)$$

Where  $A=0.288 \text{ mJ}^{-1}$  and  $B=8.2 \text{ mJ}$ .  $D$  is fractional damage at a given laser pulse energy ( $X$ ). Equation (1) has a standard deviation of  $\pm 0.0528$ , almost half that of the previously used arctangent function.

The 50% laser damage threshold was not found to change significantly regardless of the function ( $35.544 \text{ J/cm}^2$  to  $37.62 \text{ J/cm}^2$ ).

The only available post irradiation analysis at this time was performed at a fluence of  $1.5(22) \text{ neutrons/m}^2$ . The mirrors had a change in peak reflectivity (which is at  $\lambda = 1.319 \text{ }\mu\text{m}$ ) of 27.6%. All samples showed visible signs of flaking which suggests lattice-vacancy clustering.



METABOLISM OF INDAN IN FISCHER 344 RATS

by

Michelle J. Ferry

ABSTRACT

The study of the metabolism of indan by Fischer 344 rats was implemented to compliment recent research of other fused cyclic systems. Physiological effects include weight loss among both sexes of rats, but more pronounced in the males and nephropathy in male rats only. Identification of urinary metabolites confirmed the presence of 1-indanol, 1-indanone, 2-indanol, 2-indanone, 5-indanol, cis-1,2-indandiol, and trans-1,2-indandiol. Two other major metabolites have been characterized as hydroxy-ketones by spectral data, but the exact positions of these groups are unknown. Kidney homogenate extracts yielded 1-indanone and 1-indanol in the male but not the female rat.

NUMERICAL CALCULATIONS for GEOMETRIC ATTENUATION PROBLEM

by

Jeff A. Fischer

ABSTRACT

The majority of my time was spent writing fortran programs which accomplished a wide variety of numerical tasks. However, the major thrust of my effort was directed toward solving one analytically intractable integral. This integral was solved numerically for several iterated values of each of the four parameters. Then one parameter was curve fit for certain iterated values of the other parameters. After completing nearly all the curve fits to within ten-percent error, my professor discovered a way to represent the source geometries such that the integral became solvable analytically. Thus, all curve fitting was now obsolete. The remainder of my time was spent generating data for the exact expression, which was composed of an infinite sum of trigonometric terms.

Karen Griffin

Abstract

This literature review covers leadership and management in military and non-military environments. Definitions of leadership and management are discussed and differences between the two are explored. Military leadership education and training are discussed. Current issues in leadership are explored. Finally, several recent studies on leadership and management are reviewed in detail.

Effects of Coherent Scattering on IR Absorption  
in Doped Semiconductors

by

Peggy Jo Grigsby

Abstract

This research focused on the specific problem of coherent scattering effects or optical channeling, produced by multiple internal reflections from flat, parallel faces of a polished wafer. This compounds the problem of obtaining absorption coefficients from transmittance data. After obtaining an expression relating the transmittance to the absorption coefficient, different methods of approximations were investigated and the most promising was inverted and applied first to idealized data sets and then to actual data sets. Results from both the coherent scattering formula and the incoherent scattering formulas were compared and an attempt was made to find a combination of these two that transformed the transmittance data to an absorption coefficient that was essentially linear.

## MORPHOLOGY OF A PBT/ABPBI BLOCK COPOLYMER SYSTEM

by

Tim Haddock

### ABSTRACT

This study characterizes the morphology of a PBT/ABPBI triblock copolymer using the techniques of wide angle x-ray diffraction (WAXD), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). Additionally, the results of this study on the fiber and film forms of the PBT/ABPBI block copolymer are compared with the earlier results from morphology studies of fiber and film of PBT/ABPBI physical blends. It is found that the triblock copolymer system has a similar morphology to the physical blend system. The  $C > C_{cr}$  film in each case is phase-separated, although the size of the phase-separated regions for the copolymer are about one-tenth the size of those in the physical blend. The phase-separated regions are chiefly composed of PBT crystallites. The  $C < C_{cr}$  fiber in each case is a "molecular composite", with phase separation limited to 3 nm crystallites. The molecular dispersion leads to improved mechanical properties. The copolymer fiber has increased tensile strength and ductility over the physical blend fiber, with only a small drop in modulus.

**Geoid Undulation Due to Deflected Asthenospheric Flow:  
Constraints on Lithospheric Geometry at Passive Margins**

**Ernest Hardin**

**ABSTRACT**

Estimates of the thickness of continental lithosphere vary according to the physical observations and interpretative models used to derive them. Seismic travel time and surface wave dispersion models, together with petrological explanations of the 220 km velocity discontinuity, suggest a relatively shallow (~200 km) continental basal depth. In contrast, deductions drawn from heat flow, rheological, and mineralogical observations, along with careful definition of terms such as lithosphere, define a model for continental lithospheric thickness up to 400 km. The thermal structure of the oceanic plates up to at least 60 MY age is well defined, and verified by observation of the associated compensation. Passive margins are of interest since the two structural regimes meet here, and parameters such as asthenospheric flow should be continuous across the boundary. Such continuous flow would be required to accommodate any transition in lithospheric thickness by deflection upward or downward, resulting in viscous forces acting on the underside of the lithospheric plates. Numerical models derived from simple margin geometries and Stoke's flow indicate that the magnitude of the geoid undulation is observable for relatively rapid thickness transitions and asthenospheric viscosity of  $10^{19}$  Pa-sec. Constant viscosity, isothermal calculations suggest that a steeply varying margin must have a step height of no more than 10-30 km in order for the dynamic geoid contribution to be consistent with geoid and structural observations.

## ROLE OF STIMULUS UNCERTAINTY IN VISUAL CONTRAST SENSITIVITY

by

David L. Kohfeld, Brian Hayes

### ABSTRACT

This research involved the study of contrast sensitivity under conditions of stimulus uncertainty and event uncertainty. In Experiment 1, contrast sensitivity functions (CSFs) were generated at six spatial frequencies when the threshold stimulus was either predictable (i.e., cued or blocked) or unpredictable (uncued and intermixed). The resulting CSFs were the same for the three cueing conditions. Experiment 2 revealed a change in the CSF when the sequence included catch trials (event uncertainty) in conjunction with unpredictable spatial frequencies (stimulus uncertainty). The data were then collected into separate distributions for the catch trial and no-catch trial conditions, and deconvolving the former distribution from the latter resulted in a difference model that was gamma in form. The CSFs in both experiments provided support for a version of multichannel theory which assumes that a wide range of spatial frequency channels can be monitored simultaneously. The distributional analyses revealed that contrast sensitivity measures are composed of at least two component processes, sensory detection and response initiation. It appears that stimulus and event uncertainty have selective influence on the response stage, and a theory of the neural mechanisms that underlie the response process is offered. Finally, a practical implication of this work is that undesired "false alarm" (response criterion) bias can be reduced when the method of increasing contrast includes both catch trials and stimulus uncertainty in the sequence.

Laura Henderson

No Report Submitted



A LITERATURE REVIEW AND META-ANALYSIS OF THE RELATIONSHIP  
BETWEEN PERCEIVED TASK CHARACTERISTICS AND WORKER  
RESPONSES

by  
Sharon Worley Henson

ABSTRACT

A review of the literature based on the Hackman and Oldham Job Characteristics Model published over the last five years revealed that, although some progress has been made, research in the area is still in an exploratory stage. A meta-analysis revealed that other moderators of the job design response relationship, in addition to growth need strength, exist and are yet to be identified. Research on contextual moderators is warranted, using longitudinal data and multiple job ratings rather than the usual cross-sectional, self-ratings data.

Temperature Dependence of Some Selected  
Ion-Molecule Association Reactions

by

Charles R. Herd

ABSTRACT

A mutual interest in the temperature dependence of ion-molecule association reactions has allowed us to work at the Air Force Geophysics Laboratory at Hanscom AFB. A variable temperature selected ion flow tube (SIFT) was used to study several halide ion addition reactions, most notably, the ion-molecule association reactions of the boron trihalides with a halide ion, which may have a radiative stabilization pathway. The temperature dependence of the reactions was studied to gain further insight into the general mechanism by obtaining more information about the individual steps involved. Further work that could be carried out would involve theoretical calculations of the temperature dependence of the reactions studied and of the dissociation rate coefficient. Also experimental work to determine the radiative rate coefficient and to investigate some interesting chemistry displayed by some of the systems could be done.

PYRIDOSTIGMINE BROMIDE

by Alan K. Hodgdon

ABSTRACT

The research I participated in this summer involves the drug pyridostigmine bromide (PB). This drug, an acetylcholinesterase inhibitor, will actively but reversibly bind to acetylcholinesterase at neuromuscular junctions and other nerve synapses. The Air Force has recently purchased a large amount of this drug in tablet form and plans to use it prophylactically for aircrew and others when toxic nerve agents are being used. Although this drug has been known for many years and has been used in selected clinical cases, it has never been thoroughly tested in the unique environment of aviation. The thrust of this research effort is to develop procedures which can be used to evaluate and quantify the effects of PB as it relates to aircrew performance under altitude,  $+G_z$  forces, and spatial disorientation. The first phase of this project will be the development of a screening protocol to measure various physiological and mental performance functions without the imposition of aviation stresses. Protocol development proceeded throughout the summer despite a temporary hold on the project from the Advisory Committee on Human Experimentation (ACHE) whose decision has now been reversed.

The Role of Antioxidant Nutrients in Preventing Hyperbaric Oxygen Damage to the Retina

by

Adrienne L. Hollis

ABSTRACT

Dietary deficiency of both vitamin E and selenium were found to promote the toxic effects of hyperbaric oxygen to the retina. Vitamin E and selenium are micronutrients that play important roles in protection against in vivo lipid peroxidation and generation of toxic free radicals. Rats were fed diets either deficient in vitamin E and selenium (basal or B diet) or supplemented with both these micronutrients (the B+E+Se diet). Animals in each dietary group were further divided into a group that received hyperbaric oxygen (HBO) treatment or a group that received no HBO treatment (non-HBO). HBO treatment was at 3.0 atmospheres absolute (ATA) of 100% oxygen for 1.5 hrs per day, 5 days per week. Electroretinograms (ERGS), which measure the electrophysiological responses of the retina to light, were measured in all groups after 2 and 4 weeks of HBO treatment. No differences in a- or b-wave ERG amplitudes were apparent after 2 weeks of HBO treatment. After 4 weeks there was a significant decrease in the a- and b-wave ERG amplitudes of rats fed the B diet and treated with HBO compared with rats fed the B diet but not treated with HBO. HBO had no effects on the ERG amplitudes of rats fed the B+E+Se diet.

## ADVANCED VISUAL DISPLAYS

by

Emily Howard

### ABSTRACT

This report describes the results of work conducted during the period June 8 - August 23, 1985 on two projects concerned with the design of visual displays in pilot aircrew stations. The first project investigated a novel concept in visual displays available for a variety of applications. The RAPCOM (short for rapid communication) display (1) can present a wide array of information (aircraft status, mission commands, etc.) to the pilot while eliminating his need to make eye movements. Studies of reading performance have shown that while an individual spends roughly 200 msec between successive fixations during reading, only 50-100 msec of that time is actually necessary for comprehension (2). Preliminary results on the effects of speeding up a person's access to information by holding fixation constant are presented. The second project investigated the possibility of presenting aircraft attitude (primarily pitch and roll) information to the pilot's peripheral vision using a helmet-mounted display (3). The peripheral retina seems particularly effective in perceiving one's spatial orientation (4). A tentative model of this display has been constructed and will soon undergo testing.

OPTIMIZATION TECHNIQUE FOR DATA COLLECTION CRITERIA  
OF A MULTIPLE RATIO SINGLE PARTICLE COUNTER

by

ROBERT P. HOWARD

ABSTRACT

The theoretical concepts of particle size determination using a MRSPC are examined to determine its usefulness and develop a method of optimizing data collection criteria of the MRSPC. A computer was used to generate theoretical ratioed light intensities scattered by a single spherically shaped particle into detectors of the MRSPC for particle diameters between .1 and 10 micrometers. The intensity scattered into the  $j$ th detector is given by  $I_j(\theta, P, \lambda)$ . A "confusion factor",  $\epsilon$ , was calculated for different combinations of intensities that would be scattered into the detectors of a MRSPC from a single particle. The combination that yields the maximum  $\epsilon$  gives the optimal data collection criteria. The maximum  $\epsilon$  gives an indication of allowable measurement and interpretation errors.

FREE RADICAL SPECTRA OF PO

by

Ralph Oberly

and

Mary Anne Hudson

ABSTRACT

A spectroscopic study of phosphorus monoxide, or PO, has been undertaken to determine the feasibility of using this spectra as a detection mechanism for certain chemical warfare agents. The B-X band system was selected for study based on equipment available in the laboratory. Several relevant papers were then found through a literature search on this topic.

The preliminary experimental program has produced PO band head emission spectra in the 325 nm region in preparation for looking for LIF band head emission spectra. A computer program has been written for an Apple II computer that calculates the line positions for all branches in the PO B-X band system. These line positions can be used to determine the location of band heads in the spectra.

LONG TERM LIFE EXPECTANCY RADIATION EFFECTS:  
AN ULTRASTRUCTURAL STUDY OF BRAIN TUMORS DEVELOPED  
IN MACACA MULATTA FOLLOWING EXPOSURE TO  
PROTON RADIATION

by

Betty Ruth Jones, PH.D.  
Richard Alexander Hunt, Graduate Assistant

ABSTRACT

In 1964 the United States Air Force School of Aerospace Medicine (USAFSAM) and the National Aeronautics and Space Administration (NASA) initiated a series of whole body experiments to determine the effects of space radiation primarily proton radiation on Macaca mulatta (Rhesus Monkey). Out of 453 exposed primates, 21 developed brain tumors concentrated at an energy level of 55 MeV and between 200-1200 rads. No tumors were observed in control animals. The focus of one phase of the current research was to study the ultrastructure of these tumors in addition to specifically assessing tumor type and confirming light microscopy tumor diagnosis. As a result of this study techniques of electron microscopy (EM) and the transmission electron microscope have proven to be useful for the precise cellular classification and identification of specific markers for tumor diagnosis.



The F-15 SPO Support Equipment "Tiger Team"

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by

Patrick J. Sweeney, Ph.D.  
R. Simon Insley, B.A.

ABSTRACT

As a result of the news media's recent exposure of a number of "overpriced" items purchased by the government and the subsequent pressure to avoid such news stories, the F-15 System Program Office (SPO) formed a "Tiger Team" to explore alternative methods of procuring support equipment (SE). The objectives of the team were to reduce costs on support equipment, eliminate overpricing, and serve as a test for developing a methodology for determining fair prices for SE.

Using component breakout procedures and criteria of criticality, complexity, drawing availability, and prime contractor termination cost reasonability, the team selected for consideration 118 of the over 3300 F-15 SE items. These 118 were identified to be procured from other than the prime contractor. It was not possible to compute the offsetting government costs as a result of these procurements from a small disadvantaged 8(a) firm, however, the gross savings were 78 percent.

The F-15 SPO is developing a checklist that should assist in future determinations of fair SE prices.

## GENDER DIFFERENCES AFFECTING RESPIRATOR MASK SIZING SYSTEMS

By

Barbara A. Johnson

### ABSTRACT

At this time there is not an accepted, standardized sizing system for respirator masks. Most use one or two male measurements (the most common being face length, face breadth, or mouth width) to sort people into size categories. This study carries the size category analysis a step further and investigates the relationships of other dimensions within the size category, thereby testing the assumption that men and women with the same face length and face breadth can wear the same size mask. This is done in two parts. The first is a comparison of men and women in the same face length and face breadth categories for a selected sizing system. The second is a comparison of men and women at the same face length and face breadth point, using least squares regression. The point method will indicate proportional differences which are important regardless of the particular size category or size system which is used.

A statistical analysis was done using the computer resources and Statistical Analysis Program (SAS) at the Air Force Aerospace Medical Research Laboratory, Human Engineering Division and a literature search conducted at the Wright Patterson Air Force Base Technical Library. The data used in the analysis was from the 1977 Army Survey. SAS procedures run were T Tests, Regression and Plots. F Test scores were hand calculated using regression output.

Results indicate that differences between men and women with equal face lengths and face breadths for bitragion menton arc and bitragion submandibular arc (involving the chin and jaw area) are statistically significant and important. These differences may prevent women from obtaining a proper respirator mask fit with a mask designed for male facial proportions.

A META-ANALYSIS OF THE DWIS STATE LEADERSHIP CONSTRUCTS

by

Samuel J. ...

Abstract

Meta-analyses of the in-flighting structure and consideration of constructs of leader behavior with their corresponding correlates were conducted in an effort to explain variation between studies. Results of the analyses indicate that true differences exist between studies on these constructs and further moderator studies on these variables are warranted.

NATURAL LANGUAGE UNDERSTANDING USING RESIDENTIAL GRAMMAR AND  
ITS USE IN AUTOMATIC PROGRAMMING

by

Dr. Peter J. Binkert  
Dr. Christian C. Wagner

Mr. Thomas L. Schnesk  
Ms. Frances M. Vallely  
Ms. Kathleen A. Malin

The research outlined here focuses on the development of a methodology for the creation of a natural language interface. It includes a set of software tools and procedures based on a non-transformational theory of language called Residential Grammar (RG; Binkert, 1983, 1984, 1985). The development of the natural language tools began with two parallel efforts. The computer science team worked on the implementation of the LISP version of the RG syntactic parser of English, while the linguistic team concentrated on the development of a first set of semantic features out of which the case relations of language could be defined. Once completed, the natural language understanding tool could be integrated into a computer's operating system to act as an interface between a computer system and a computer user. This would reduce the confusion caused by the various command languages on different computer systems.

METHODS FOR RELIABILITY WARRANTY VERIFICATION

by

Carolyn DeLane Heising  
Susan C. Malone

ABSTRACT

Methods for reliability warranty verification have been developed and applied to actual USAF systems under design and production. Two principal methods are described. The first is a procedure for predicting USAF system performance in the field (as measured by the variable Mean Time Between Failures (MTBF)), and is based on a Bayesian statistical updating approach. The second is a procedure for tracking maintenance data to verify the variable Mean Time Between Maintenance Actions (MTBMA). In addition, alternative reliability warranties are reviewed, and recommendations made as to which are preferable, particularly with respect to their ease of verification. It was found that the warranties which either guarantee the field MTBF with a verification test, or guarantee the field MTBMA are preferable to other alternatives, including the Reliability Improvement Warranty (RIW). The Bayesian procedure for updating system reliability estimates was found to be very useful in estimating USAF performance, and is recommended for implementation as a method for tracking reliability warranties in practice.

Gas Transport Mechanisms in High Frequency Ventilation

by

Mr. Rodrigo Mateo

ABSTRACT

An increase in the clinical use of high-frequency ventilation (HFV) necessitates further inquiry into the mechanisms of gas transport within the airways. Different modes of HFV are classified based on their frequency range. Studies on normal respiratory function and studies using various models of different airway geometries are used to derive and support proposed mechanisms in HFV. These mechanisms are region-dependent, and include Pendelluft, Direct Alveolar Ventilation, Convective Streaming, Taylor Dispersion, and Molecular Diffusion. They occur as a continuum, and Reynolds and Womersley numbers are two of their common governing parameters. Mathematical models exist for some of these mechanisms, and improved techniques of analysis should produce models with greater accuracy in predicting actual lung behavior.

### Acknowledgements

I would like to thank the Air Force Systems Command, the Air Force Office of Scientific Research, and the USAF School of Aerospace Medicine for sponsoring this research. Special appreciation is extended to Dr. Kenneth G. Ikels of Brooks Air Force Base in San Antonio, Texas, for his support and guidance.

### TEMPERATURE FRONT SENSING IN PRESSURE

#### SWING ADSORPTION SYSTEMS

by

Michael J. Matz

### Abstract

The feed step in pressure swing adsorption systems can be controlled by temperature front sensing. If thermocouples are inserted into a packed column at two different points, an effective velocity of the shock front can be calculated by monitoring the slopes of temperature versus time at each position. Temperature increases suddenly when adsorption occurs, and the concentration and temperature fronts become identical. If the pressure drop across the bed is insignificant compared to the total pressure, the concentration front will move with a constant velocity. Consequently, a better prediction of the feed step time for OBOGS units can be made utilizing the whole column during operation.

MODELING THE TISSUE SOLUBILITIES OF HALOGENATED  
METHANES, ETHANES AND ETHYLENES

by

Paul G. Seybold, Ph.D.

and

Michael A. May

ABSTRACT

Experimental solvent:air and tissue:air partition coefficients for 25 halogenated methanes, ethanes, and ethylenes in saline solution, olive oil, and rat blood, muscle, liver, and fat tissues have been examined using theoretical molecular modeling techniques. Two graph theoretical approaches (the distance method of Wiener and the connectivity index method of Randić, Kier, and Hall) and an approach utilizing ad hoc molecular descriptors were employed. Satisfactory regression models were obtained with both the Randić-Kier-Hall approach and the ad hoc descriptors approach. The latter method revealed that fluorine substituents decrease tissue solubilities, whereas both chlorine and bromine substituents increase tissue solubilities, with the relative influence being  $Cl < Br$ . Tissue solubilities could also be conveniently represented in terms of contributions from oil and saline solubilities.



## DIAGNOSTICS OF SOLID PROPELLANT COMBUSTION

by

John P. Renie and Brian K. McMillin

### ABSTRACT

This report details the summer activities at the Air Force Rocket Propulsion Laboratory of a Summer Faculty Fellow and a Graduate Student in the field of diagnostics as applied to the study of solid propellant combustion. At the onset of the research effort, a detailed literature review of diagnostic techniques was pursued with particular emphasis placed on those methods that are optical in nature, and therefore, non-intrusive. Also, strong emphasis was directed to the laser-based techniques currently being used to determine both temperature and species concentration in a reactive system such as the combustion zone above a deflagrating solid propellant surface. Experimental investigations were conducted in the AFRPL servo-controlled combustion bomb which permits extended observation of the combustion event. A particular class of solid propellant formulations was selected for investigation - this being a series of AP/HTPB composite propellants wherein the oxidizer particle size distribution was carefully monitored. In summary, the laser-based diagnostic technique referred to as laser-induced fluorescence (LIF) is considered to be a good candidate to use to determine temperature and species data in solid propellant flames, however, continued research is warranted since the reaction zone is very complex with quantitative analysis of such data suspect at best. In addition, spectroscopic emission data for the radical species involved in the combustion reaction can easily be obtained with such data lending credence to the claim that reactions are occurring at a much larger distance from the propellant surface than theoretically modeled.

**THE EFFECTS OF RAPHE STIMULATION AND IONTOPHORESIS OF  
SEROTONERGIC AGENTS ON GRANULE CELL ACTIVITY IN RAT LATERAL  
CEREBELLAR CORTEX.**

by

Deborah L. Armstrong, Ph.D  
Christopher McNair  
Scott Biscoff

**ABSTRACT**

Stimulation of the dorsal raphe resulted in modulation of granule cell spontaneous activity. This provides support for the proposal that serotonin functions as a transmitter in the granular layer of the cerebellar cortex, however, the diversity of the observed responses does not permit a precise determination of the nature of the activated synapses. Of the eleven cells that responded consistently, six displayed decreased spontaneous activity, three were excited by the stimulation, and four cells displayed a biphasic response of initial excitation followed by inhibition. The iontophoretic application of serotonin decreased the spontaneous activity of the majority of cells tested and this effect could not be blocked by methysergide. Several cells were excited by serotonin application and this effect could be blocked by methysergide.

FACTORS AFFECTING FASIL FORMULATION,  
SCALE-UP AND RECLAIMING

by  
Julia N. Memering

ABSTRACT

This study is primarily concerned with characterizing the production of FASIL (fluoroalkylarylene siloxanylene), a fuel resistant elastomer. Of particular interest are the various formulations, factors affecting polymerization, and a reclaiming scheme for recycling monomer.

The major findings of the report are as follows:

- Two FASIL formulations nearly meet the standards needed. These should be further explored.
- The best filler system found in this study consists of a combination of Silica H, Elastomag, and Vul-Cup R. Other possibilities should be investigated since this system could be improved.
- The two most desirable characteristics of the polymer are linearity and high molecular weight.
- Reaction mechanisms for polymerization and reclamation still need to be determined in order to better understand the processes involved and to better tailor reactive environments to obtain the highest quality and quantity polymer possible.
- Different chemicals for the reclaiming process should be sought since the present ones appear to be producing branched chains from the cross-linked samples.

Time to Explosion Studies of Some Potential High Explosives

Peter D. Meyer\*

ABSTRACT

EAK and BAK [mixtures of Ammonium Nitrate (AN), Potassium Nitrate (KN) and either of Ethylenediammonium Dinitrate (E), Butanediammonium Dinitrate (B)] are candidates for the category of an Insensitive High Explosive (IHE). The thermal characteristics of these candidate IHE's are studied by means of time to explosion analysis in order to obtain some predictive models of decomposition of these nitrate salts.

\* Physics Department, University of Montana, Missoula, MT 59801

DEVELOPMENT OF A ROUTINE FOR SOLVING THE ROOTS  
OF CHARACTERISTIC EQUATIONS

BY

Brad M. Mickelsen

ABSTRACT

In this report I have introduced the steps that were taken to reach my summer objective of developing a computer algorithm to quickly solve for the roots of characteristic equations. These characteristic equations are the solutions to the natural frequencies of roof elements in buried concrete structures. The steps taken were: 1) Initiating Background work; 2) Obtaining background Information on the Equation; and 3) Developing the Algorithm. These steps have provided me with a solid base for continuing the research.

I have proposed to continue my work to develop a more efficient algorithm. I have also proposed to use the knowledge obtained from that work and apply it toward more complex structures such as two way slab systems involving the Mindlin Plate Theory.

IDENTIFICATION AND ANALYSIS OF AN ACTIVE CONTROLLER

by

Augustus Morris Jr.

ABSTRACT

An active stick controller has been constructed at AAMRL which is capable of producing external forces by means of a hydraulic actuator in a feedback mode. In this study, the active stick controller is designed to behave as a rate feedback controller. This active controller is compared with a passive stick controller through step responses and with two other stick controllers through steady state tracking of a quasi-random disturbance signal. Results show that lower RMS error scores are possible with the active controller as compared to other controllers. Also the step response data show that the active controller is behaving as it should theoretically for a system with rate feedback.

OBTAINING VARIANCE ESTIMATES FROM SMOOTHED DATA

by

Sharon E. Navard

ABSTRACT

The problem addressed in this report is that of determining how variances are propagated through a smoothing filter. Raw bomb position data obtained from fixed cameras are smoothed, then position and velocity estimates are obtained from the smoothed points; an estimate of the variance of these position and velocity estimates is desired. A brief description of current procedures is presented, followed by descriptions of two approaches which can be used to estimate these variances. The first method is based on the currently used data multiplier method of moving polynomial arc smoothing. The second approach, which is better developed, is based on standard regression theory. Results of a study on reducing the size of the data set are also presented.

SMOKE VISUALIZATION RESEARCH

by

Matthew M. O'Meara

ABSTRACT

A research effort aimed at developing the necessary techniques for efficient and effective use of flow visualization in the Subsonic Aerodynamic Research Laboratory (SARL) was conducted. The specially designed Smoke Flow Research Channel was used to perform a series of experiments involving various aspects of flow visualization. A reliable hot-wire anemometry data acquisition system was developed and used to accurately document the disturbance environment in the test channel. The turbulence levels in the appropriately configured tunnel were found to be well within the range anticipated in the SARL inlet flow. The longitudinal turbulence intensities measured in the center of the tunnel were found to be very repeatable, but measurements of the lateral turbulence intensities were affected by fan motor induced mechanical vibrations. Preliminary kerosene smoke visualization tests indicated that modifications and additional study are necessary before a similar system can be effectively used in the full-scale facility.



ABSTRACT

Pamela H. Payne

Hyperbaric oxygen treatment was found to adversely affect the electrophysiological response of the retina to light in rats fed a basal diet deficient in both vitamin E and selenium (the B diet). Both vitamin E and selenium are micronutrients that play essential roles in preventing in vivo lipid peroxidation. After 4 weeks of hyperbaric oxygen treatment (3.0 ATA of 100 % oxygen, 1.5 hrs per day, 5 day/week) rats fed the B diet deficient in vitamin E and selenium showed decreased ( $p < 0.005$ ) in a-wave amplitudes ( $83 \pm 13$  uV, N=8) and b-wave amplitudes ( $255 \pm 30$  uvolts) compared with a-wave amplitudes ( $151 \pm 12$  uV, N=17) and b-wave amplitudes ( $369 \pm 29$  uvolts) for rats fed an identical B diet but not treated with hyperbaric oxygen. Rats fed a basal diet supplemented with both vitamin E and selenium (the B+E+Se diet) or with vitamin E alone (the B+E diet) showed fairly constant a- and b- wave amplitudes that did not decrease after 4 weeks of hyperbaric oxygen treatment. Dietary antioxidants appear to provide protection from hyperbaric oxygen damage to the retina.

A COMPARISON OF MEASURED AND CALCULATED  
ATTENUATION OF 28 GHZ BEACON SIGNALS  
IN THREE CALIFORNIA STORMS

by

Larry Vardiman  
and  
Matthew Peterson

ABSTRACT

Three case studies of attenuation through stratiform and convective Sierra Nevada storms from the winter of 1979-1980 were studied. A 28 GHz (1.05cm) dual channel radiometer was positioned on the Sacramento Valley floor just upwind of the central Sierra. It measured the signal strength from the COMSTAR satellite and brightness temperature from the cloud along the same path. Microphysics data from a cloud physics aircraft were used to calculate attenuation and brightness temperature from the same cloud volume.

Measured and calculated values of attenuation for weak precipitation agree, however large differences for heavier precipitation do not permit a conclusion regarding the importance of snow above the melting layer on attenuation. Flight patterns used to acquire the hydrometeor data may have contributed to the differences.

## MAXIMUM VOLUNTARY HAND GRIP TORQUE FOR CIRCULAR ELECTRICAL CONNECTORS

Dr. S. Keith Adams  
and  
Philip J. Peterson

### ABSTRACT

A study employing twenty male and eleven female subjects was performed to determine maximum hand grip torque that can be exerted when tightening or loosening circular electrical connectors. A static, sustained three-second exertion was used as the strength criterion. Torque was applied to simulated connector rings with diameters of 0.9, 1.5, and 2.0 inches and was measured by means of a single bridge torsional load cell. Other variables tested included the type of grip employed (full or fingertip), orientation of the connector (front, right side, or rear facing behind a barrier), the use of work gloves and chemical defense gloves, the height of the connectors (60% and 85% of the maximum reach height) and the direction of rotation. Hand grip torque strength was found to be directly related to connector diameters with similar strength patterns exhibited for tightening and loosening. Higher torque was exerted when the connectors were on the subject's right side, and tightening and loosening effort corresponded to flexing and extending the wrist parallel to the forearms. The use of gloves resulted in higher torque in most situations. Connector height and direction of rotation had little effect on torque strength.

**Optical Bistability in**  
**Pre-dissociative media:**  
**A Theoretical Study**

by  
William S. Rabinovich  
and  
David V. Plant

**Abstract**

We have theoretically studied absorbtive optical bistability (OB) in a Fabry-Perot etalon containing a media that exhibits pre-dissociative states. We have derived a three level version of the Maxwell-Bloch equations and specialized them to the case of two levels connected by a field and a third level that contains the dissociated atoms. A pump pulse modelled on a Q-switched ruby laser was used and the differential equations were solved using a Runge-Kutta-Fehlberg algorithm. The results show that molecules that pre-dissociate exhibit a very different signature in optical bistability indicating that this may be a method for detecting the existence of a dissociative upper state. Furthermore, when the molecular relaxation rates are within an order of magnitude of the pre-dissociation rate it may be possible to use OB to determine the pre-dissociation rate.

In addition a set-up for studying Laser Induced Diffusion in molecular gases was constructed.

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In addition a set-up for studying Laser Induced Diffusion in molecular gases was constructed.

Adaptive Grid Generation For Viscous Flow Problems

by

Christopher W. Reed

ABSTRACT

A two dimensional adaptive grid generation method is being developed for use with the axisymmetric thin layer Navier-Stokes code to solve transonic projectile flow problems. A quasi two dimensional adaptive grid generation scheme based on a one dimensional variational principle has been developed to provide a starting grid for the solution to a two dimensional grid generation scheme. Proper forms for the weight functions controlling the adaptation have been determined and the two dimensional grid generation equations have been coded and tested on a rectilinear grid. Results indicate that the quasi two dimensional grid generation method is stable and fast but that the resulting grids lack orthogonality. Use of the two dimensional adaptive grid generation scheme, however increases orthogonality.

AN ASSESSMENT OF THE DEVELOPMENT OF A DNA PROBE FOR MYCOPLASMA HOMINIS  
AND UREAPLASMA UREALYTICUM

by

Kathleen F. Ryan

ABSTRACT

A rapid and simple test for the presence of Mycoplasma in clinical specimens would be of immense value in the diagnosis of conditions in which these organisms may be the etiological agents. The commercially available Mycoplasma TC Kit was found to be of no use in the testing of clinical specimens. An initial investigation into the development of a DNA probe for M. hominis and U. urealyticum was undertaken. Cultural conditions, efficient DNA isolation techniques, and exact protocols for agarose gel electrophoresis were established for these organisms. The initial data indicate that additional work is warranted and that a DNA probe can successfully be developed. Preliminary investigations suggest that M. hominis and U. urealyticum both possess plasmid DNA molecules. If confirmed by further investigation, these studies will demonstrate the first plasmid found in U. urealyticum.

GAS EXCHANGE IN THE RABBIT USING HIGH  
FREQUENCY VENTILATION IN HIGH ALTITUDE

by

Mukul R. Banerjee  
and Olman Salinas

ABSTRACT

The efficiency of a high frequency flow interruption technique in maintaining an adequate gas exchange in the rabbit was tested, first at ground level and then in a hypobaric chamber at 8,000 feet simulated altitude. This was immediately followed by retesting under ground level conditions. Four adult New Zealand White male rabbits were used. The anesthetized and intubated rabbits, injected with a muscle relaxant, were ventilated at 1.5, and 7 Hz with a minute ventilation of 1.2, 3 liters per minute respectively. Data were collected for approximately one hour at each frequency. The parameters recorded were: systemic arterial pH,  $PCO_2$ ,  $HCO_3$ ,  $PO_2$ , blood pressure, heart rate, proximal air way pressure, inspired and expired flow rates, inspired and expired volume, concentration of  $O_2$  and  $CO_2$  in mixed expired air. The high-frequency ventilation technique utilized did not adversely affect the arterial  $PCO_2$  of rabbits at high altitude. Also, the arterial-alveolar  $PO_2$  ratio showed an improvement at high altitude with high-frequency ventilation. We conclude that high-frequency ventilation maintained an adequate pulmonary gas exchange in rabbits at high altitude.



"SPERIL.LSP: A LISP Version of SPERIL-1,  
An Expert System For Damage Assessment to Buildings"

by

STEVE J. SAVAGE

ABSTRACT

In this report I have outlined the research tasks that were assigned to me by Dr. Timothy Ross of the Air Force weapons Laboratory. The major objective of my summer research effort was to convert the computer code SPERIL-1, written in the computer language C, into a code written in the LISP computer language. This was accomplished in four steps, as follows. (1) Familiarization with the C computer language; (2) Familiarization with the LISP computer language; and (4) the actual conversion of SPERIL-1 to LISP.

The final goal of this research effort is to use the logic of SPERIL-1 to develop a similar type expert system in LISP. This reasoning code, to be known as DAPS, will be used to assess structural damage to buried facilities subjected to intensive impulsive pressures.

Thermal Stability of Alkyl Silahydrocarbons.

by

William R. Sayers

ABSTRACT

The thermal stability of two different hydraulic fluid stocks was studied by subjecting the fluids to thermal stress followed by capillary gas chromatography analysis and the measurement of kinematic viscosity.

MLO 82-507 was a mixture of silahydrocarbons, and MLO 82-546 was a mixture of aliphatic hydrocarbons.

NATURAL LANGUAGE UNDERSTANDING USING RESIDENTIAL GRAMMAR AND  
ITS USE IN AUTOMATIC PROGRAMMING

by

Dr. Peter J. Binkert  
Dr. Christian C. Wagner

Mr. Thomas L. Schnesk  
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The Role of Antioxidant Nutrients in Preventing Hyperbaric Oxygen Damage to the Retina

by

Robert L. Scott

ABSTRACT

Dietary deficiency of both vitamin E and selenium were found to promote the toxic effects of hyperbaric oxygen to the retina. Vitamin E and selenium are micronutrients that play important roles in protection against in vivo lipid peroxidation and generation of toxic free radicals. Rats were fed diets either deficient in vitamin E and selenium (basal or B diet) or supplemented with both these micronutrients (the B+E+Se diet). Animals in each dietary group were further divided into a group that received hyperbaric oxygen (HBO) treatment or a group that received no HBO treatment (non-HBO). HBO treatment was at 3.0 atmospheres absolute (ATA) of 100% oxygen for 1.5 hrs per day, 5 days per week. Electroretinograms (ERGS), which measure the electrophysiological responses of the retina to light, were measured in all groups after 2 and 4 weeks of HBO treatment. No differences in a- or b-wave ERG amplitudes were apparent after 2 weeks of HBO treatment. After 4 weeks there was a significant decrease in the a- and b-wave ERG amplitudes of rats fed the B diet and treated with HBO compared with rats fed the B diet but not treated with HBO. HBO had no effects on the ERG amplitudes of rats fed the B+E+Se diet.

TRANSIENT EFFECTS OF NUCLEAR RADIATION ON THE OPTICAL PROPERTIES OF

(Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> COATED ON FUSED SILICA SUBSTRATE) LASER MIRRORS

by

Gary W. Scronce

ABSTRACT

Since one of the major thrusts of the Strategic Defense Initiative concerns the use of high powered lasers in a variety of uses, the need to know the effects of various types of nuclear radiation on laser optical components is of great importance.

The mirrors studied in this instance were composed of alternating layers of Al<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> on a substrate of fused silica. The coatings were deposited by an electron beam at quarter-wavelength thicknesses and have a maximum reflectivity at a wavelength of 248 nm. The mirrors are for use in a KrF laser system.

The effect of gamma radiation on the mirrors was the primary goal of the study, but because of the high dose and dose rates desired, high-energy electrons were used to simulate gamma-ray effects. Mirrors #9-11 were shot with more dose than the others (125 krad) at a dose rate of 2.8 krad/ns. Preliminary analysis of the data has shown that at doses of this level or lower, little or no discernable change in reflectivity was caused by irradiation of the mirrors.

## IMPROVED TAYLOR ANVIL TEST

by

Jim Sirkis

### ABSTRACT

Techniques for improving the Taylor Anvil Test were explored. A Crans Schardin camera aided in recording the plastic wave propagation during impact. The timing of the impact and the initiation of the camera framing became the critical problem to be solved. Many timing circuits were devised and evaluated in search of a circuit which needed the least adjustment. The best results were obtained by placing a trigger emitter-detector pair close to the anvil in conjunction with a manual delay circuit.

James Slagel

ABSTRACT

Synthesis schemes for the preparation of monomers for poly(1,5(7)-dihydrobenzo[1,2-d:4,5-d]diimidazole-2,6-diyl) and poly(1,5-diphenylbenzo[1,2-d:4,5-d]-diimidazole-2,6-diyl) are proposed. Specific monomers discussed are 1,5(7)-dihydrobenzo[1,2-d:4,5-d]-diimidazole-2,6-dicarboxylic acid, 5,6-diaminobenzimidazole-2-carboxylic acid and  $N^1, N^4$ -diphenyl-1,2,4,5-tetraaminobenzene.

The preparation of certain key intermediates for each of the monomers are described. Specific compounds discussed are 5-nitro-2-trichloromethylbenzimidazole, 1,2-di(p-toluenesulfonamido)-4,5-diaminobenzene, 1,2-diamino-4,5-dinitrobenzene, 1-amino-3-(trichloroacetamido)-4,5-dinitrobenzene and  $N, N'$ -diphenyl-2,5-diaminoterephthalic acid.

MODELLING/ANALYSIS OF SPACE BASED KINETIC ENERGY WEAPON

PROJECTILE FLYOUTS

by

Carl G. Looney,  
Richard A. Stewart

ABSTRACT

The most critical capability of Kinetic Energy Weapons is that of hitting a target at large distances in space. Any analysis of the requirements to yield that ability depends upon a model of the projectile flyout that includes the sensor resolution/errors, the tracking errors for both target and projectile, algorithms for computing controls to cause an intercept, and a submodel for moving the target and projectile realistically. In this work we examine the needs and develop algorithms and a computer program for a model that will be usable in trade-off studies. Such trade-off analyses are to be used to define the required state-of-the-arts levels in sensing, tracking, guiding in space based defensive systems, and to compare systems proposed by contractors. The program code needs testing, validation and tuning to be ready for use in trade-off and performance analyses.



THE EFFECTS OF RADIATION ON (Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> COATED ON  
FUSED SILICA SUBSTRATE) LASER MIRRORS

by

Kevin A. Stroh

ABSTRACT

Radiation damage, in this case electron or gamma-ray damage, to optical components of Strategic Defense Initiative (SDI) systems is of vital importance to the future security of many nations. Experiments contained in this report simulate the effects of high flux high energy gamma-rays on Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> coated, fused silica substrate laser mirrors. These laser mirrors are designed for use with a KrF laser and for use in an SDI system. The gamma-ray effects are simulated by using an electron linear accelerator (LINAC). By simulating the gamma-ray effects, models of radiation damage to optical properties of the mirrors, e.g., mirror reflectivity, transmission and absorption, can be used to determine mirror reliability. Mirror reliability is the ultimate question to be resolved since KrF laser powers are on the order of terrawatts and any significant increase in absorption in the laser mirror, due to radiation effects or other effects, will mean the destruction of the mirror and the failure of the system.

COMPUTER AUTOMATED, TEST MIRROR REGISTRATION SYSTEM  
FOR THE RING LASER GYRO

by

Rex Berney

and

John Taranto

ABSTRACT

The goal of the project was to develop an automatic optical element positioner for the ring laser gyro experiment. Various schemes for using a CCD line scan camera for precision positioning of optical elements were investigated. It was found that one micron precision repositioning of an optical element could be achieved using scattered laser light and appropriate optics. An interface for the CCD line scan camera to the LSI-11/23 computer was designed and built, and the controlling software, both FORTRAN and MACRO code, was written.

## NUMERICAL MODELING OF TRANSIENT LIQUID METAL HEAT PIPE

by

Donald Tilton

### ABSTRACT

The purpose of this research was to investigate the survivability of a liquid metal heat pipe under adverse thermal loading to the condenser section. A numerical model was developed to explain the transient phenomena observed while testing a Hughes Inconel 617 liquid sodium heat pipe, described in [1]. This pipe was tested under two different loading conditions. For the first case, a spot on the condenser was illuminated with a CO<sub>2</sub> laser. The second case used a clam shell radiant heater to supply the condenser heat input. For both cases the external axial temperature profile versus time was recorded for various incident intensities and condenser coverages.

The temperature versus time profile obtained theoretically using the numerical model compared very closely to those obtained experimentally. The model also clearly shows the direction of the mass flow of the vapor, and whether condensation or evaporation is taking place at any given location along the pipe. From this information heat pipe reversal and failure can be predicted. The model also includes a dry out prediction. The model can be easily modified for use in a variety of different situations.

NATURAL LANGUAGE UNDERSTANDING USING RESIDENTIAL GRAMMAR AND  
ITS USE IN AUTOMATIC PROGRAMMING

by

Dr. Peter J. Binkert  
Dr. Christian C. Wagner

Mr. Thomas L. Schnesk  
Ms. Frances M. Vallely  
Ms. Kathleen A. Malin

The research outlined here focuses on the development of a methodology for the creation of a natural language interface. It includes a set of software tools and procedures based on a non-transformational theory of language called Residential Grammar (RG; Binkert, 1983, 1984, 1985). The development of the natural language tools began with two parallel efforts. The computer science team worked on the implementation of the LISP version of the RG syntactic parser of English, while the linguistic team concentrated on the development of a first set of semantic features out of which the case relations of language could be defined. Once completed, the natural language understanding tool could be integrated into a computer's operating system to act as an interface between a computer system and a computer user. This would reduce the confusion caused by the various command languages on different computer systems.

TWO SYSTEMS FOR OBTAINING SPATIAL  
ENERGY DISTRIBUTIONS OF LASER PULSES

by

Roger A. Vogel

ABSTRACT

Two systems for obtaining spatial energy distributions of laser pulses are discussed. Two detectors, a vidicon and a photodiode array are described as well as a digital image processor. Electronic circuits, interfacing each of the two detectors to the image processor have been built, and are described.

AN ASSESSMENT OF THE DEVELOPMENT OF A DNA PROBE FOR MYCOPLASMA HOMINIS  
AND UREAPLASMA UREALYTICUM

by

Joseph W. Washington

ABSTRACT

A rapid and simple test for the presence of Mycoplasma in clinical specimens would be of immense value in the diagnosis of conditions in which these organisms may be the etiological agents. The commercially available Mycoplasma TC Kit was found to be of no use in the testing of clinical specimens. An initial investigation into the development of a DNA probe for M. hominis and U. urealyticum was undertaken. Cultural conditions, efficient DNA isolation techniques, and exact protocols for agarose gel electrophoresis were established for these organisms. The initial data indicate that additional work is warranted and that a DNA probe can successfully be developed. Preliminary investigations suggest that M. hominis and U. urealyticum both possess plasmid DNA molecules. If confirmed by further investigation, these studies will demonstrate the first plasmid found in U. urealyticum.

Problem Solving Teams, Quality of Work Life, and Plans and Programs,  
Management Sciences (XRS): A small scale solution to a small scale  
problem

by

Jennifer McGovern-Weidner

ABSTRACT

Morale and job satisfaction were outlined by structured interview in DCS Plans and Programs XRS. No major problems were uncovered through the interviews. But in the interest of pursuing excellence a small group problem solving group system was designed for use in XRS for solving employee complaints and management problems - by having some management by participation. A six months retesting will be collected and a regression line of satisfaction will be drawn. It is predicted to show participation in the program yields higher satisfaction and higher morale.

Scanning Electron Microscopy Analysis of  
an Activated LSI Chip Employing a Voltage Contrast Technique

by

Terri Wilkerson

ABSTRACT

The scanning electron microscope is a powerful instrument for failure analysis. A number of failure analysis techniques exist. This paper deals with a voltage contrast testing procedure. Voltage contrast analysis is being used more frequently as an important approach to evaluation and failure analysis of complex microcircuits. This trend will likely continue as higher levels of complexity and smaller size circuit elements are used.



RAMAN SPECTROSCOPY OF GLYCOSAMINOGLYCANS FROM CORNEA

by

Boake L. Plessy and Barbara Wilson

ABSTRACT

Research was continued in the development of Raman spectroscopy as a non-invasive probe to monitor structural changes in glycosaminoglycans from cornea as a function of the development, maturation, and senescence of the selected species. Keratan sulfate and chondroitin-4-sulfate extracted from bovine cornea were characterized and further fractionated by alcohol precipitation in preparation for spectroscopic examination by laser Raman techniques. Infrared spectroscopy and classical colorimetric methods indicated one relatively pure sample of each glycosaminoglycan expected. Development of a laser Raman spectrometer based on commercial Jarrell-Ash and Bausch and Lomb 0.5 meter Ebert type monochromators was initiated. Spectral bands were observed for several compounds using a single monochromator mode and stray-light was significantly reduced in a dual-monochromator mode. The results indicate that a cost effective Raman spectrometer system can be developed around commercially available optical and electronic components.

# GRAPHIC ANALYSIS OF IRAS LOW-RESOLUTION SPECTRA

by

Charles R.A. Wilton

## ABSTRACT

I have written computer programs which display spectra collected by the IRAS satellite along with spectra calculated for theoretical blackbodies and quantify the emission/absorption strengths for features in the observed spectra. It is also possible to directly compare the spectra as well as the isolated features of any of the sources observed by the low-resolution spectrometer.

PRELIMINARY RESEARCH FOR THE STUDY ON NORMOBARIC  
OXYGEN CONCENTRATION EFFECTS ON CULTURED  
MOUSE MACROPHAGE RESPONSES

by

Mary L. Winfree

ABSTRACT

This project was initiated to explore the possibility that hyperbaric oxygen accelerates wound healing in Air Force Personnel by effecting the activity of cells that produce free radicals. This project was in preparation for the study entitled: NORMOBARIC OXYGEN CONCENTRATION EFFECTS ON CULTURED MOUSE MACROPHAGE RESPONSES.

The purposes of this investigation were:

- (a) To determine which cultured cell line would be a suitable subject for the normobaric study.
- (b) To determine which procedure would best measure the free radicals produced by that cell line.
- (c) To design and test flasks that would permit control of the gas environment in which the cells were cultured.
- (d) To survey the literature of the field.

Four cell lines of macrophages were tested for free radical production, and three somatic cell lines were also tested. The macrophage lines tested were: RAW264, a transformed mouse macrophage; P388D, a different transformed mouse macrophage; a primary culture of sheep spleen macrophages and a primary culture of macrophages extracted from pork spleens. The somatic tissues consisted of VERO, a transformed fibroblastic tissue; cell line 14613, derived from transformed rabbit kidney; and MCR-6, a transformed lung tissue. A cell line called McCoy rejected, prior to testing, when it failed to pass sterility checks.

Of the lines tested, the mouse macrophage, RAW264 gave the most consistant results, producing measurable quantities of free radical in response to stimulation by target compounds. This cell line was adopted for use in the normobaric study, and is discribed in more detail in that report. The use of this cell line minimized animal requirements.

Of the somatic cells tested, the MCR-6 lung tissue showed the most activity indicative of free radical formation. However, the amount of luminescence was low and difficult to separate from background values. If a more sensitive method of measuring free radical production could be found, the use of this tissue might be considered.

Two target compounds were tested: (a) Bovine serum albumin (BSA) attached to luminol, (b) Sheep red blood cells, coated with luminol, and opsinized with zymogin. Of the two compounds, the BSA-luminol provided the target which gave the most consistent results and which stimulated the greatest response from the RAW264 cell line.

Three types of flasks were tested. The first, a prototype, was able to withstand 2 atmospheres of pressure, for short periods of time, but did not fit into the luminometer, a device used to measure the light produced by free radicals reacting with luminol. The second was able to withstand 2 atmospheres for longer periods of time, could be fitted into the luminometer, but could hold only limited numbers of cells. However, this device may prove useful in future studies, where pressure becomes a more important factor. Because large numbers of cells were required, and the gas environment had to be carefully controlled, a method was developed which permitted cells to be gassed at normobaric tensions while maintaining them in their original culture flasks. This proved the most cost effective for the normobaric study. In addition, as part of this project, fiber optic oxygen sensors were standarized against cutaneous oxygen probes in the flask media.

## Abstract

Dorothy A. Winther

With the introduction of an all-volunteer military force, investigation of organizational commitment within the military becomes a salient issue. This study performed confirmatory factor analytic tests on a model of commitment antecedents from data obtained from 5,406 Air Force personnel. A test of the basic model demonstrated an inadequate fit of the theoretical model to the sample data. It was only after construct-irrelevant method variance was taken into account that the model was determined to adequately represent the data.

THE EFFECTS OF STEREOSCOPIC VS. NON-STEREOSCOPIC  
DISPLAYS ON TARGET DETECTION AND TARGET MOTION  
DETECTION IN FLIGHT SIMULATION.

by

Charles B. Woods

ABSTRACT

This study involved the comparison of stereoscopic and non-stereoscopic displays in target detection and target motion detection. It was performed in the flight simulator environment utilizing an Air Force T-38 trainer cockpit, computer generated imagery presented through collimating optics, and PLZT stereoscopic goggles. There were 4 tasks implemented in this study: A.) target detection, and B.) lateral, C.) perpendicular, and D.) oblique, motion detection. It was found that, as suspected, there were no significant differences between displays for tasks A and B. Contrary to the hypotheses, there were also no significant differences found in tasks C and D for display type. Differences in target origin and direction of motion were found and these, as well as possible explanations for the lack of display effect and the importance of stereoscopic displays in flight simulation, are discussed.

## FOCUSSING VISUAL ATTENTION

by

Penny L. Yee

### ABSTRACT

Two studies are reported that examine the focussing of visual attention. The first study traces the time course of component processes involved in moving attention in the visual field. A peripheral cue flashed in one of four positions (6 degrees left, right, above or below fixation) indicated which of four targets subjects were to identify. In one set of conditions the interval between the cue and target (CTOA) varied to measure the time course of engaging attention. In another set of conditions an engaging stimulus (a square or digit) appeared at varying intervals before the cue (SCOA) to measure the time course of disengaging attention. The dependent measure was the proportion of correctly identified targets in each time interval. Results for the engage conditions indicated that the efficiency of identifying targets increased as the CTOA increased. And as expected, the engaging stimuli in the disengage conditions produced different levels of performance.

The second study examined the consequences of selectively focussing attention on one stimulus in a visual display and the mental representations achieved by those that are unattended. An earlier study suggested that representation of ignored items experience a form of priming that extends to related items. The data presented here support these results.

A COMBINED CONDUCTION, CONVECTION, and RADIATION HEAT TRANSFER  
MODEL for ALUMINUM OXIDE PARTICLES WITHIN a ROCKET PLUME

by

David Wilson Young

ABSTRACT

Heat transfer processes occurring in spherically shaped, micron sized, aluminum oxide,  $Al_2O_3$ , particles entrained within the exhaust plume of a solid propellant rocket are examined. A computer program using an implicit finite difference scheme was developed to model one-dimensional heat transfer. The program treats the combined effects of conduction, convection, and radiation in a given particle and considers the thermophysical properties such as thermal conductivity, specific heat, and material density as variables with respect to temperature. The radiative portion of the code is structured to treat the particles as a purely absorbing and emitting gray medium with no scattering.

The heat transmission within aluminum oxide particles inside the exhaust plume of a given rocket can be parametrically studied using this code. The temperature distribution within a particle may be determined as a function of time or distance along with the determination of the conductive and radiative heat fluxes. Further, the program may be used to predict the point or location within the plume at which the particles will change phase from liquid to solid.



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