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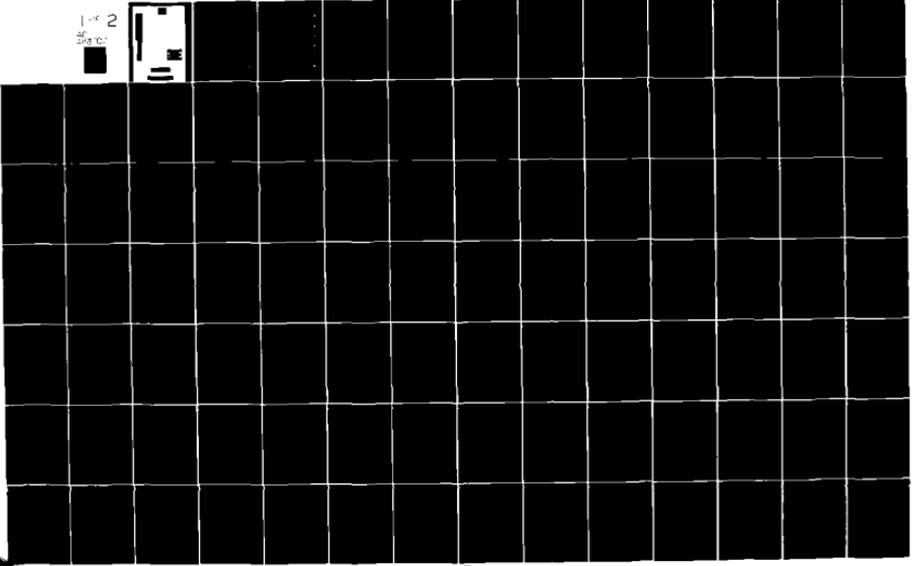
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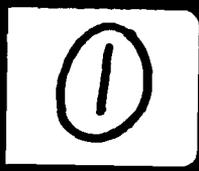
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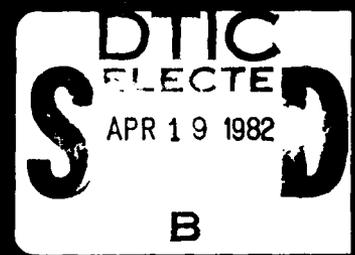
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UNITED STATES AIR FORCE
SUMMER FACULTY RESEARCH PROGRAM

1981

PROGRAM MANAGEMENT REPORT

SOUTHEASTERN CENTER FOR
ELECTRICAL ENGINEERING EDUCATION



WARREN PEELE

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PROGRAM DIRECTOR, SCEEE

PROGRAM MANAGER, AFOSR

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) <p>The United States Air Force Summer Faculty Research Program (USAF-SFRP) is a program designed to introduce university, college, and technical institute faculty members to Air Force research. This is accomplished by the faculty members being selected on a nationally advertised competitive basis for a ten week assignment during the summer intercession to perform research at Air Force Laboratories/centers. Each assignment is in a subject area and at an Air Force facility mutually agreed upon by the faculty member and the Air Force. In addition to compensation and travel expenses, a cost of</p>		

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living allowance is also paid. The USAF-SFRP is sponsored by the Air Force Office of Scientific Research/Air Force Systems Command, United States Air Force, and is conducted by the Southeastern Center for Electrical Engineering Education, Inc.

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1981 USAF/SCEEE SUMMER FACULTY
RESEARCH PROGRAM

Conducted by

Southeastern Center for

Electrical Engineering Education

under

USAF Contract Number F49620-79-C-0038

MANAGEMENT REPORT

Submitted to

Air Force Office of Scientific Research

Bolling Air Force Base

Washington D.C.

by

Southeastern Center for
Electrical Engineering Education

October 1981

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UNITED STATES AIR FORCE
SUMMER FACULTY RESEARCH PROGRAM

1981

PROGRAM MANAGEMENT

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION

I. Introduction and History

The United States Air Force Summer Faculty Research Program (USAF-SFRP) Contract was awarded to the Southeastern Center for Electrical Engineering Education on December 7, 1978. The contract is sponsored by the Air Force Office of Scientific Research, Air Force Systems Command, United States Air Force and is conducted by SCEEE.

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 faculty of universities, colleges, and technical institutions throughout the United States.

The program is available to faculty members in all academic grades: instructor, assistant professor, associate professor, professor, department chairman, and research facility directors. It has proven especially beneficial to young faculty members who are starting their academic research programs and to senior faculty members who have spent time in university administration and are desirous of returning to scholarly research programs.

Follow-on research opportunities have been developed for a large percentage of the participants in the Summer Faculty Research Program in 1979, 1980, and 1981.

ii. Recruiting and Selection

The program is conducted on a nationally advertised and competitive selection basis. Advertising for the 1981 program was placed in Science Magazine, The ASEE Journal and News, and the proceedings of the Frontiers in Education Conference. Information on the SFRP was mailed to over 500 department chairmen; brochures were made available to all participating USAF Laboratories/Centers; distribution was made through AFROTC units on universities campuses; information was supplied to all who made requests. Overall, over 3000 brochures were distributed throughout the country.

In the 1979 program, 70 faculty members participated. In the 1980 and 1981 programs, 87 faculty members participated each year. There were approximately 4 applicants for each available position in the 1981 program.

Applications were due at SCEEE on or before February 1, 1981. The selection panel convened in February and announcements of selection were made before March 1, 1981.

III. The Historically Black College Workshop

SCEEE and AFOSR place special emphasis on the participation of Historically Black Colleges. As a part of the USAF-SFRP, SCEEE conducted an Opportunities in Research Workshop for representatives from 77 Historically Black Colleges. To further emphasize its commitment to Historically Black Colleges, SCEEE negotiated a subcontract with the Atlanta University Center to host the workshop. The purpose of the workshop was to familiarize the attendees with the research and development requirements, facilities, and activities of the Air Force and specifically with opportunities available within the USAF R&D community. There were 127 participants at the workshop.

SCEEE has received substantial encouragement from the Historically Black Colleges since the December 1979 workshop. Twelve Historically Black College faculty members were offered appointments by SCEEE in the 1981 AFOSR Summer Faculty Research Program and 10 participated. The indication is that initiatives such as the Opportunities in Research Workshop will provide a much needed bridge between federal laboratories and the Historically Black Colleges. SCEEE has been encouraged by the Historically Black Colleges to offer a workshop devoted to Opportunities in Research on a bi-annual basis.

IV. 1981 Summer Faculty Research Program Management

After each Research Associate had signed and returned his Appointment Letter to the Southeastern Center, he was directed to contact the designated representative at the laboratory/center of assignment to schedule a pre-summer visit. The purpose of the pre-summer visit was basically threefold:

1) to meet laboratory personnel, especially the Effort Focal Point with whom the Research Associate would be most closely working, and to become personally acquainted with the laboratory facilities; 2) to finalize and formalize objectives for the Research Associate's summer research period and report these to SCEEE; 3) to make arrangements for lodging for the research period. The focus of this visit was on making sufficient preparation so that the summer research effort would be effective. Preceding the summer research period, all Research Associates were provided with detailed written instructions and procedures for obtaining payment for research efforts, travel reimbursement, and lodging cost reimbursement.

Data collected via critique is displayed in this report.

PARTICIPANT'S QUESTIONNAIRE & SUMMARY

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

Name _____ Title _____
Dept. (at home) _____ Home Institution _____
Research Colleague(s) _____
Laboratory Address of Colleague(s) _____
Brief Title of Research Topic _____

A. TECHNICAL ASPECTS

1. Was the offer of research assignment within your field of competency and/or interest?
YES ___ NO ___
2. Did you have a reasonable choice of research assignment? YES ___ NO ___ If no,
why? _____
3. Was the work challenging? YES ___ NO ___ If no, what would have made it so? _____
4. Were your relations with your research colleague(s) satisfactory from a technical
point of view? YES ___ NO ___ If no, why? _____
5. Suggestions for improvement of relationship(s). _____
6. 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? _____
7. Considering the calendar "window" of ten weeks (limited by varying college and univer-
sity schedules), please comment on the program length. Did you accomplish more than _____,
less than _____, about what you expected _____?
8. Do you think that you will continue this or related research efforts upon returning to
your home institution (i.e., application for mini-grant and/or other funding)? YES ___
NO ___ Give brief explanation of your plans. _____
9. 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
resentations (use reverse side if necessary.) _____
10. Were you asked to participate in regular meetings in your laboratory? YES ___ NO ___
If yes, approximately how often? _____
11. Did you perform travel on behalf of the laboratory? YES ___ NO ___ Where to? _____
Purpose? _____

PARTICIPANT QUESTIONNAIRE

Page Two

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

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

14. 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? _____

3. Considering the time of year that you were required to accept or reject the offer, did this cause you any problems of commitment? YES ___ NO ___ How could it be improved? _____

4. After your acceptance, was information (housing, location, directions, etc.) supplied to you prior to the summer period satisfactory? YES ___ NO ___ How could it be improved? _____

5. Did you have any difficulty in any domestic aspects (i.e., locating suitable housing, acceptance in community, social life, any other "off-duty" aspects)? YES ___ NO ___ If yes, please explain. _____

6. How do you rate the stipend level? Meager ___ Adequate ___ Generous ___

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

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

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

PARTICIPANT QUESTIONNAIRE
Page Three

10. Considering the many-facted 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. _____

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

a. Strong points of the program _____

b. Weak points of the program _____

12. Other remarks: _____

THANK YOU!

QUESTIONNAIRE EVALUATION SUMMARY
(83 of 87 PARTICIPANTS REPORTED)

A. TECHNICAL ASPECTS

1. Assignment in field of competency and/or interest? Yes - 83 No - 0
2. Reasonable choice of assignment? Yes - 78 No - 5
a. If no, why? A specific task was assigned. I did not get my first choice of assignment.
3. Work Challenging? Yes - 82 No - 1
4. Relations with colleague satisfactory? Yes - 80 No - 3
a. If no, why? We had widely different backgrounds. I had a change of Research Colleague during the research period.
5. Suggestions for improvement? The Research Colleague should be well prepared; the Research Colleague should have a commitment to the program; the Research Colleague should have more time for interaction; regular meetings should be scheduled; I felt isolated from the mainstream of the laboratory effort. There were numerous complimentary remarks about Research Colleagues.
6. Afforded adequate facilities? Yes - 79 No - 4
7. Accomplishment in ten weeks? More than expected - 23, Less than expected - 15, About what expected - 44
8. Will you continue this or related research efforts? Yes - 81 No - 2
9. Asked to present seminars? Yes - 39 No - 44
10. Asked to participate in meetings? Yes - 54 No - 29
11. Traveled on behalf of laboratory? Yes - 24 No - 59
12. Participated in "Special" meetings? 36 attended conferences, seminars, or presentations.
13. Other comments on extra activities? There were numerous requests for more interaction with other Research Associates.
14. Technically challenging? A - 54 B - 24 C - 4 D - 1
Future research opportunity? A - 63 B - 17 C - 1 D - 2
Professional association? A - 52 B - 25 C - 5 D - 1
Enhancement of academic qualifications? A - 39 B - 41 C - 3 D - 0
Enhancement of research qualifications? A - 42 B - 39 C - 2 D - 0
Overall value? A - 56 B - 27 C - 0 D - 0

Participants Summary
Page Two

B. ADMINISTRATIVE ASPECTS

1. First hear about program? Through brochure - 21, from friend or colleague - 37, through regular publication advertising - 9, through direct mail - 5, through Air Force - 10
2. Decisive aspect of application? Interesting new research area - 11, area of possible future research funding - 31, good research opportunity - 31, opportunity to work in attractive environment - 13, opportunity to work with USAF - 18
3. Commitment to program a problem? Yes - 10 No - 73
a. If yes, explain? More time for decision is required desirable - 7.
4. Program information satisfactory? Yes - 70 No - 13
5. Problems in domestic aspects? Yes - 16 No - 67
a. If yes, explain? Lodging expense reimbursement too small - 7, difficulty in finding short term housing - 10, transportation was a problem - 2, need social opportunities - 2. There were several comments complimenting Mr. Danishek at WPAFB
6. Stipend Level? Meager - 26, Adequate - 56, Generous - 1
7. Preprogram visit? Not worth expense - 1, Convenient - 22, Essential - 55, N/A - 5
8. Housing information? VOQ - 29, Apartment - 31, other - 23
9. Mailing list suggestions? Mailing list suggestions have been tabulated for future use.
10. Program administration overall rating? Poor - 1, Fair - 6, Good - 31, Excellent - 44
a. Comments? Problem of security clearance; invoices were processed rapidly and other aspects run efficiently; was a rewarding 10-week period; program managed in a professional and competent manner; instructions were very clear; invoices were processed promptly and checks always arrived within 7-10 days of mailing invoice to SCEEE; would like to see newsletters telling what other fellows are doing at their labs; Professor Peele was accessible and very helpful--Dan Danishek at WPAFB same; very professional from beginning to end; Professor Peele and his people do a superb job; it was first rate; should have special passes for fellows to get on base - too much time spent getting passes daily; very rewarding and worthwhile experience; very well administered by SCEEE - fairly well by research site; paper work excessive; stipend is low; living and travel not clearly described in information brochure; staff at SCEEE always helpful.
11. A. Strong points of the program? Air Force personnel helpful - 8, opportunity to make contact with government engineers - 5 change of routine - 2, full time work on research project - 3, future research opportunities - 7, entire program good - 4, pleasant working conditions - 4, can research something of your own interest - 3

PARTICIPANTS SUMMARY
Page Three

11. B. Weak points of the program? Too much emphasis on clerical requirements - , lack of funds - , ten week period too short - , lack of information on other AF activities - , Laboratory Representative not within reach, more information on mini-grants, low visibility, unnecessary to have colleague sign invoices, can only be accepted once for the program.

RESEARCH COLLEAGUE'S QUESTIONNAIRE & SUMMARY

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

Name _____ Title _____
Division/Group _____ Laboratory _____
Name of Participant _____

A. TECHNICAL ASPECTS

1. Did you have personal knowledge of the Associate's capabilities prior to arrival at work site? YES ___ NO ___ If yes, where/how/what? _____

2. Was the Faculty Associate prepared for his project? YES ___ NO ___
3. Please comment on his preparedness/competency/scope/depth of knowledge of subject area: _____

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

5. In your opinion, has his participation in this summer program contributed to an increase in the Associate's potential to perform research? YES ___ NO ___ Comments: _____

6. Did work performed by the Associate contribute to the overall mission/program of your laboratory? YES ___ NO ___ If yes, how? _____

7. Were your relations with the Associate satisfactory from a technical point of view? YES ___ NO ___ Suggestions as to how they might be improved: _____

8. Do you think that by having a Faculty Associate assigned to your group, others in the group benefited and/or were stimulated by his presence? YES ___ NO ___ Comments: _____

9. Do you feel that the introduction to each other, together with the summer work experience and performance could form a sound basis for continuation of effort by Associate at his home institute? YES ___ NO ___ If yes, how? _____
If no, why not? _____
10. One of the objectives of this program is to identify sources of basic research capability and availability to the USAF. On a scale of A to D, how effective do you think this program will be in that respect? (A high)

A B C D

COLLEAGUE QUESTIONNAIRE

Page Two

Also, please evaluate:

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

B. ADMINISTRATIVE ASPECTS

1. When did you first hear of this program? _____
2. Were you involved in the screening and prioritizing of the faculty persons' applications for your lab? YES ___ NO ___ If yes, do you have any suggestions for improvement of the procedures used? _____
3. How do you rate the importance of the expense-paid pre-program visit to the work site? Not worth expense ___ Convenient ___ Essential ___ Please add any comments _____
4. Considering the calendar "window" of ten weeks (limited by varying college and university schedules), please comment on the program length. Were you as a team able to accomplish more than ___, less than ___, about what you expected ___? Comments: _____
5. Would you desire another Faculty Associate to be assigned to you and/or your group/division? YES ___ NO ___ If no, why not? _____
6. Other remarks: _____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY
(66 Research Colleagues Reported)

1. Did you have personal knowledge of Associate's capabilities? Yes - 39
No - 27
 2. Was associate prepared? Yes - 63 No - 3
 3. Comments on preparedness, etc., in subject area? Well prepared; excellent background; most impressed; new area and took him time to get up speed; very good; considerable knowledge of subject area; helpful background; scope and depth of knowledge excellent; extremely competent; contributed immediately; very well prepared; extensive experience; authority in his field; prior work valuable; a thorough job of preparation; exceptionally talented researcher; exceptional in every sense; did not have a sufficient background to function independently; a rare blend of theoretical knowledge and understanding of applications; a very broad technical background in the area; well prepared and well organized.
 4. Comments on cooperativeness? All comments were complimentary in varying degrees.
 5. Increase in Associate's research potential? Yes - 61 No - 5
 6. Did work performed contribute to overall laboratory mission? Yes - 65 No - 1
 7. Were technical relations with Associate satisfactory? Yes - 66 No - 0
 8. Did Associate stimulate others? Yes - 63 No - 3
 9. Will summer experience and performance form basis for continuation effort by Associate? Yes - 63 No - 3
 10. Effectiveness in respect to capabilities and availability to USAF?
A - 50 B - 16 C - 5 D - 0
Opportunity to stimulate group activity?
A - 41 B - 23 C - 2 D - 0
Professional association?
A - 51 B - 14 C - 1 D - 0
Program administration?
A - 38 B - 23 C - 3 D - 2
- B. Administrative Aspects**
1. When did you first hear of program? Most answered they knew about program for several years. The answers ranged from 1965 - 1981.
 2. Involved in screening and prioritizing? Yes - 39 No - 25
 3. Expense paid pre-program visit? Not worth expense - 3 , Convenient - 19, Essential - 43
 4. Please comment on program length? How much accomplished? More than - 9, less than - 12, what expected - 45
 5. Want another participant? Yes - 66 No - 0

Colleague Questionnaire

Page Two

6. Other Comments? Well pleased with technical accomplishment; was a useful program to us; very successful program; would like to see similar program but for one year appointments; I regard this program as extremely useful and look forward to next year's candidate; like to see wider dissemination of information on the program; allow time at end for writing, typing, and review of paper; valuable program of mutual benefit to the Air Force and Faculty Research Participant; it is an investment in the future and a critically needed stimulus for our own staff; desire another faculty member; excellent opportunity for AF to get an update on a technical area; the program is very worthwhile; the involvement of graduate and undergraduate students in addition to desiring another faculty associate; this is our 6th year - we find it more valuable each year; program is a good deal! We got good work done at very little cost to us; ten week period is too restrictive; participant brought expertise and left us stimulated and refreshed; rewarding experience to all involved; program is a must at whatever cost.

LABORATORY REPRESENTATIVE'S QUESTIONNAIRE & SUMMARY

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

Laboratory/Center _____
Name _____

1. How do you rate the correspondence, verbal and telephone communications, and other aspects concerning program administration? Poor ___ Average ___ Good ___ Excellent ___
How could it be improved? _____

2. The participant selection process is two-fold: academic and technical. Did you have sufficient time to conduct an adequate evaluation of applications? YES ___ NO ___ Comments: _____

3. Was the number of faculty associates assigned to your organization satisfactory? YES ___ NO ___ If not, how many would be desired? _____
How did you determine this number? _____

4. Please rate the expense-paid pre-program visit: Not worth expense ___ Convenient ___ Essential ___

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

6. Did your laboratory/center establish a seminar program (or other means) to "tap" the faculty associates' academic knowledge (other than his research assignment)? YES ___ NO ___ If yes, give description and evaluation. _____

7. Did the laboratory/center conduct a general briefing, tour, and/or other formal means of welcome and introduction for the associate(s) assigned to your organization? YES ___ NO ___

8. Did you have a formal exit exercise for each associate (such as doing his final technical briefing to the organization management, or in 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 and production, and meaningful research accomplishment? (Note: These answers will be held confidential.) QUESTION CONTINUED ON NEXT PAGE.

List Name(s) Poor Average Excellent Superior

LABORATORY REPRESENTATIVE QUESTIONNAIRE
Page Two

9. (CONTINUED)

List Name(s)

Poor Average Excellent Superior

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

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY
(20 of 24 Laboratory Representatives Reported)

1. Rate correspondence? Poor - 0, Average - 2, Good - 8, Excellent - 10
2. Sufficient time for selection? Yes - 20 No - 0
3. Number of Associates satisfactory? Yes - 14 No - 6
4. Rate pre-program visit? Not worth expense - 0, Convenient - 3,
Essential - 17
5. Ten week period an optimum amount of time? Yes - 18 No - 2
6. Established seminar program? Yes - 9 No - 11
7. Conduct briefing? Yes - 17 No - 3
8. Exit exercise? Yes - 15 No - 3
9. Quality of participants? Poor - 0, Average - 7, Excellent - 44,
Superior - 35
10. Comments? Faculty members need more information on expenses; we have been very pleased with enthusiastic manner in which the faculty associates have attacked the assigned research problems; ten weeks is a very short time; this was the best group of SFRP participants we have ever had; highly beneficial to AEDC; we value this program; SCEEE was very helpful in assuring smooth operation; good program; SCEEE does an outstanding job in running this program; SCEEE is the most supportive contractor I have ever dealt with; laboratory personnel were extremely pleased with associates assigned.

APPENDIX I

1. Program Statistics
2. List of 1981 Participants
3. Participant Laboratory Assignments

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

Conducted by
SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION, INC.

PROGRAM STATISTICS

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

2. Applications Received (First Choice as Follows) - 273

APL	(W-PAFB)	- 10	HRL/FTD	(Williams)	- 4
AMRL	(W-PAFB)	- 15	HRL/PRD	(Brooks)	- 5
AD	(Eglin)	- 12	HRL/TTD	(Lowry)	- 20
AEDC	(Arnold)	- 1	LMDC	(Maxwell)	- 13
AL	(W-PAFB)	- 9	LC	(W-PAFB)	- 4
BRMC	(W-PAFB)	- 9	LMC	(Gunter)	- 3
ESMC	(Patrick)	- 11	ML	(W-PAFB)	- 19
ESD	(Hanscom)	- 10	RPL	(Edwards)	- 3
ESC	(Tyndall)	- 21	RADC	(Griffiss)	- 15
FDL	(W-PAFB)	- 10	RADC/ET	(Hanscom)	- 5
FJSRL	(USAF)	- 18	SAM	(Brooks)	- 23
GL	(Hanscom)	- 11	WL	(Kirtland)	- 15
HRL/ASD	(W-PAFB)	- 7			

3. Number of Participants - 87

Number holding Doctorate Degree	- 83
Number holding Masters Degree	- 4
Number holding Professor Rank	- 18
Number holding Associate Professor Rank	- 27
Number holding Assistant Professor Rank	- 41
Number holding Instructor Rank	- 0
Number holding Chairman Rank	- 1

4. Average Age of Participants - 41.6 years

5. Distribution of Participants Location

APL	(W-PAFB)	- 6	HRL/FTD	(Williams)	- 3
AMRL	(W-PAFB)	- 6	HRL/PRD	(Brooks)	- 0
AD	(Eglin)	- 6	HRL/TTD	(Lowry)	- 1
AEDC	(Arnold)	- 2	LMDC	(Maxwell)	- 1
AL	(W-PAFB)	- 8	LC	(W-PAFB)	- 1
BRMC	(W-PAFB)	- 2	LMC	(Gunter)	- 2
ESMC	(Patrick)	- 1	ML	(W-PAFB)	- 6
ESD	(Hanscom)	- 1	RPL	(Edwards)	- 4
ESC	(Tyndall)	- 4	RADC	(Griffiss)	- 3
FDL	(W-PAFB)	- 4	RADC/ET	(Hanscom)	- 2
FJSRL	(USAF)	- 3	SAM	(Brooks)	- 8
GL	(Hanscom)	- 6	WL	(Kirtland)	- 6
HRL/ASD	(W-PAFB)	- 1			

PROGRAM STATISTICS - PAGE TWO

6. Disciplines Represented - 24

Accounting & Decision Science	- 1	Geological Sciences	- 1
Aerospace Engineering	- 2	Geophysics	- 1
Biology	- 4	Industrial & Systems Engineering	- 4
Business Administration	- 1	Management Science	- 1
Chemical Engineering	- 5	Mathematics	- 8
Chemistry	- 8	Mechanical Engineering	- 9
Civil Engineering	- 4	Operations Management	- 1
Computer Science	- 4	Optometry	- 1
Criminal Justice	- 1	Pharmacology	- 1
Decision Science	- 1	Physics	- 5
Electrical Engineering	- 15	Political Science	- 2
Engineering Management	- 1	Psychology	- 6

7. Number of Colleges/Universities Represented - 69

Alabama A & M	Lowell, University of (2)
Alabama/Huntsville, University of	Massachusetts/Amherst, University of
Alaska, University of	Michigan Technological University
Arizona, University of	Mississippi State University (5)
Auburn University	Nebraska/Lincoln, University of
Ball State University	New Jersey Institute of Technology
Bowling Green State University	New Mexico State University
California/Northridge, State University of	New York/Albany, State University
Cedarville College	New York/Buffalo, State University
Central Community State College	New York/Stony Brook, State University
Central State University	North Texas State University
Cincinnati, University of	Notre Dame, University of
Citadel, the	Ohio State University
Clarkson College	Pacific University
Clemson University	Pennsylvania State University
College of the Holy Cross	Princeton University
Colorado, University of	Purdue University
Coppin State College	Rice University (2)
Dayton, University of (2)	Rider College
Drexel University	Rochester Institute of Technology
Duke University	South Dakota, University of
Eastern Washington University	Southern University/Baton Rouge
Fayetteville State University	Southern Louisiana University (2)
Florida Institute of Technology	Stevens Institute of Technology
Florida, University of (2)	Syracuse University
Gannon University	Tennessee State University (2)
Georgia Institute of Technology	Texas A & M University (2)
Grambling State University	Toledo, University of (2)
Indiana State University	Trinity University
Iowa State University	Tuskegee Institute
Kansas State University	Utah State University
Kansas, University of	Virginia Military Institute (2)
Kent State University (3)	Virginia Polytechnic Institute & State University (2)
Kentucky, University of (3)	Washington State University
	Wright State University (4)

PROGRAM STATISTICS - PAGE THREE

8. Number of States/US Territories Represented - 31

Alabama	Mississippi
Alaska	Nebraska
Arizona	New Jersey
California	New Mexico
Colorado	New York
Connecticut	North Carolina
Florida	Ohio
Georgia	Oregon
Indiana	Pennsylvania
Iowa	South Carolina
Kansas	South Dakota
Kentucky	Tennessee
Louisiana	Texas
Maryland	Virginia
Massachusetts	Washington
Michigan	

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Milton J. Alexander Professor Auburn University Management Department Auburn University, AL 36849 (205) 826-4730	<u>Degree:</u> D.B.A., Management Science, 1968 <u>Specialty:</u> Management Information Systems <u>Assigned:</u> LMC
Dr. David W. Allender Associate Professor Kent State University Dept. of Physics Kent, OH 44242 (216) 672-2816	<u>Degree:</u> PhD, Physics, 1975 <u>Specialty:</u> Condensed Matter Theory <u>Assigned:</u> AL
Dr. Martin D. Altschuler Associate Professor SUNY/Buffalo Dept. of Computer Science 4226 Ridge Lea Campus Amherst, NY 14226 (716) 831-3065	<u>Degree:</u> PhD, Physics and Astronomy, 1964 <u>Specialty:</u> Robot Vision, Surface Mapping, Internal Mapping <u>Assigned:</u> SAM
Dr. Aloysius A. Beex Assistant Professor VPI & SU Dept. of Electrical Engineering Blacksburg, VA 24061 (703) 961-6307	<u>Degree:</u> PhD, Electrical Engineering 1979 <u>Specialty:</u> Signal Analysis and Signal Processing <u>Assigned:</u> RADC (Griffiss)
Dr. Jay B. Benziger Assistant Professor Princeton University Dept. of Chemical Engineering Princeton, NJ 08544 (609) 452-5416	<u>Degree:</u> PhD, 1979 <u>Specialty:</u> Surface Science and Catalysis <u>Assigned:</u> RPL
Dr. Albert W. Biggs Professor University of Kansas Dept. of Electrical Engineering 2026 Learned Hall Lawrence, KS 66045 (913) 864-4615	<u>Degree:</u> PhD, Electrical Engineering, 1965 <u>Specialty:</u> Electromagnetics, Radar, Micro- waves, Antennas <u>Assigned:</u> WL
Dr. William G. Bradley Assistant Professor University of AL/Huntsville Electrical Engineering Dept. Huntsville, AL 35899 (205) 895-6139	<u>Degree:</u> PhD, Electrical Engineering, 1973 <u>Specialty:</u> Communication and Radar Systems and Digital Design <u>Assigned:</u> RADC (Hanscom)

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNMENT
Dr. Jerome D. Braverman Professor & Chairman Rider College Dept. of Decision Science & Computers Lawrenceville, NJ 08648 (609) 896-5124	<u>Degree:</u> PhD, Statistics, 1966 <u>Specialty:</u> Statistical Inference, Statistical Decision Theory, Quality Control & Reliability <u>Assigned:</u> RADC (Griffiss)
Dr. Louis W. Buckalew Assistant Professor Alabama A & M University Dept. of Psychology Box 200 Normal, AL 35762 (205) 859-7451	<u>Degree:</u> MS, General Experimental Psychology, 1969 <u>Specialty:</u> Physiological Psychology <u>Assigned:</u> AMRL
Dr. Gale H. Buzzard Assistant Professor Duke University Dept. of Mechanical Engineering and Material Science Durham, NC 27706 (919) 684-2832	<u>Degree:</u> PhD, Mechanical Engineering, 1966 <u>Specialty:</u> Fluid Mechanics, Heat Transfer, System Dynamics <u>Assigned:</u> RPL
Dr. David A. Carlson Assistant Professor University of Massachusetts/Amherst Dept. of Electrical & Computer Engineering Amherst, MA 01003 (413) 545-0973	<u>Degree:</u> PhD, Computer Science, 1980 <u>Specialty:</u> Computer Science, Design & Analysis of Algorithms <u>Assigned:</u> HRL (Lowry)
Dr. Robert E. Carlson Assistant Professor Kent State University Dept. of Biological Science Kent, OH 44242 (216) 672-2266	<u>Degree:</u> PhD, Ecology & Limnology, 1975 <u>Specialty:</u> Ecology, Aquatic Biology <u>Assigned:</u> ESC
Dr. Junho Choi Assistant Professor Florida Institute of Technology Dept. of Electrical Engineering University Boulevard Melbourne, FL 32901 (305) 721-3701 X 430	<u>Degree:</u> PhD, Control Systems & Signal Processing, 1978 <u>Specialty:</u> Modern & Conventional Control Systems <u>Assigned:</u> ESMC

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNMENT
Dr. Hugh W. Coleman Associate Professor Mississippi State University Dept. of Mechanical Engineering P.O. Drawer ME Mississippi State, MS 39762 (601) 325-3260	<u>Degree:</u> PhD, Mechanical Engineering, 1976 <u>Specialty:</u> Turbulent boundary layers - Fluid Mechanics & Heat Transfer <u>Assigned:</u> AD
Dr. David L. Cozart Associate Professor The Citadel Dept. of Mathematics Charleston, SC 29409 (803) 792-7896	<u>Degree:</u> PhD, Mathematics, 1973 <u>Specialty:</u> Programming languages, Statistics <u>Assigned:</u> AL
Dr. Robert W. Cunningham Associate Professor Kent State University Dept. of Physics University Drive, NE New Philadelphia, OH 44663 (216) 339-3391	<u>Degree:</u> PhD, Physics, 1969 <u>Specialty:</u> Solid State Physics <u>Assigned:</u> ML
Dr. Larry R. Dalton Associate Professor SUNY/Stony Brook Dept. of Chemistry Long Island, NY 11794 (516) 246-8601/5068	<u>Degree:</u> PhD, Chemistry, 1972 <u>Specialty:</u> Physical Chemistry, Electronics & Instrumentation Microwaves <u>Assigned:</u> F.ISRL
Dr. Charles B. Davis Assistant Professor University of Toledo Dept. of Mathematics Toledo, OH 43606 (419) 537-2297/2568	<u>Degree:</u> PhD, Statistics, 1976 <u>Specialty:</u> Mathematical & Applied Statistics <u>Assigned:</u> SAM
Dr. Carol A. Deakyne Assistant Professor College of the Holy Cross Chemistry Dept. Worcester, MA 01610 (617) 793-3367	<u>Degree:</u> PhD, Theoretical Chemistry, 1976 <u>Specialty:</u> Applications of Molecular Orbital Theory <u>Assigned:</u> GL
Dr. Donald W. Emerich Professor Mississippi State University Chemistry Dept. P.O. Box CH Mississippi State, MS 39762 (601) 325-3584	<u>Degree:</u> PhD, Chemistry, 1951 <u>Specialty:</u> Analytical Chemistry, Classical Electro-analytical Chemistry <u>Assigned:</u> RPI.

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNMENT
Dr. Joel R. Fried Assistant Professor University of Cincinnati Chemistry Engineering Dept. Mail Location #171 Cincinnati, OH 45221 (513) 475-3500	<u>Degree:</u> PhD, Polymer Science & Engineering, 1976 <u>Specialty:</u> Mechanical Properties, Calorimetry & Rheology of Polymer Blends <u>Assigned:</u> ML
Dr. David E. Greene Assistant Professor Texas A & M University Industrial Engineering Dept. College Station, TX 77840 (713) 845-5531	<u>Degree:</u> PhD, Applied Mathematics, 1973 <u>Specialty:</u> Control Theory, Man Machine Systems, Biological Regulation, PDE, DE <u>Assigned:</u> SAM
Dr. Gurmohan S. Grewal Professor Southern University/Baton Rouge Dept. of Electrical Engineering P.O. Box 11060 Baton Rouge, LA 70813 (504) 771-2317	<u>Degree:</u> PhD, Electrical Engineering, 1969 <u>Specialty:</u> Control Systems, Simulation, State Estimation <u>Assigned:</u> AI
Dr. Paul B. Griesacker Associate Professor Gannon University Dept. of Physics Erie, PA 16508 (814) 871-7338	<u>Degree:</u> PhD, Physics, 1963 <u>Specialty:</u> Physical Optics, Coherent Radiation <u>Assigned:</u> RADC (Griffiss)
Dr. Vijay K. Gupta Assistant Professor Central State University Dept. of Chemistry Wilberforce, OH 45384 (513) 376-6423	<u>Degree:</u> PhD, Chemistry, 1968 <u>Specialty:</u> Physical Chemistry, Physical Organic Laboratory, Physical Science, General Chemistry <u>Assigned:</u> APL
Dr. Kenneth R. Hall Associate Professor Mississippi State University Aerospace Engineering Dept. P.O. Drawer A Mississippi State, MS 39762 (601) 325-3623	<u>Degree:</u> PhD, Aerospace Engineering, 1973 <u>Specialty:</u> Simulation, Flight Dynamics, Control, Optimization <u>Assigned:</u> AD
Dr. Robert M. Harnett Associate Professor & Director Clemson University System Engineering Dept. Clemson, SC 29631 (803) 656-3375	<u>Degree:</u> PhD, Industrial & Systems Engineering, 1974 <u>Specialty:</u> Operations Research, Optimi- zation <u>Assigned:</u> AD

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNMENT
Dr. Ronney D. Harris Professor Utah State University Dept. of Electrical Engineering UMC 41 Logan, UT 84321 (801) 750-2973	<u>Degree:</u> PhD, Electrical Engineering, 1964 <u>Specialty:</u> Aeronomy - Atmospheric Radiation Transfer <u>Assigned:</u> GL
Dr. Franklin D. Hill Professor Grambling State University Chemistry Dept. Grambling, LA 71245 (318) 247-8397	<u>Degree:</u> PhD, Biochemistry, 1960 <u>Specialty:</u> Lipid Metabolism <u>Assigned:</u> AMRL
Dr. Francis J. Jankowski Professor Wright State University Dept. of Engineering Dayton, OH 45434 (513) 873-2079/2403	<u>Degree:</u> ScD, Physics, 1949 <u>Specialty:</u> Systems Engineering, Nuclear Engineering, Mechanical Engi- neering, Human Factors Engineering <u>Assigned:</u> WL
Dr. Stanley E. Jones Associate Professor University of Kentucky Engineering Mechanics Lexington, KY 40506 (606) 258-2719	<u>Degree:</u> PhD <u>Specialty:</u> Applied Mathematics, Nonlinear Mechanics <u>Assigned:</u> AD
Dr. Paul R. Kalata Assistant Professor Drexel University Dept. of Electrical & Computer Engineering 32nd & Chestnut Street Philadelphia, PA 19104 (215) 895-2251	<u>Degree:</u> PhD, Electrical Engineering, 1974 <u>Specialty:</u> Control Theory, Estimation Theory <u>Assigned:</u> WL
Dr. Richard Y.C. Kwor Assistant Professor University of Notre Dame Dept. of Electrical Engineering Notre Dame, IN 46556 (219) 283-6269	<u>Degree:</u> PhD, Electrical Engineering, 1976 <u>Specialty:</u> Electrical Engineering <u>Assigned:</u> AL
Dr. Richard C. Liu Associate Professor Purdue University Dept. of Industrial Engineering Grissom Hall W. Lafayette, IN 47907 (317) 749-2948	<u>Degree:</u> PhD, IE (Manufacturing), 1973 <u>Specialty:</u> Manufacturing Engineering <u>Assigned:</u> MI

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNMENT
Dr. William S. McCain Assistant Professor Tennessee State University Mechanical Engineering 3500 Centennial Blvd. Nashville, TN 37203 (615) 320-3555	<u>Degree:</u> PhD, Metallurgical Engineering, 1973 <u>Specialty:</u> Aluminum alloys, fabrication & heat treatments of aerospace alloys, rolling, forging, extrusion x-ray diffraction <u>Assigned:</u> ML
Dr. William S. McCormick Associate Professor Wright State University Engineering Dept. Dayton, OH 45435 (513) 873-2403	<u>Degree:</u> PhD, Electrical Engineering, 1967 <u>Specialty:</u> Electrical Engineering <u>Assigned:</u> AL
Dr. Donald F. McCoy Associate Professor University of Kentucky Dept. of Psychology Lexington, KY 40506 (606) 258-8589/5601	<u>Degree:</u> PhD, Experimental Psychology, 1966 <u>Specialty:</u> Learning, Operant Conditioning, Animal Performance <u>Assigned:</u> AMRL
Dr. Henry A. McGee, Jr. Professor & Dept. Head VPI & SU Chemistry Engineering Dept. Blacksburg, VA 24061 (703) 961-6631	<u>Degree:</u> PhD, Chemical Engineering, 1955 <u>Specialty:</u> Cryogenics, Molecular Phenomena & Processes <u>Assigned:</u> WL
Dr. Patrick J. McKenna Assistant Professor University of Florida Mathematics Dept. Gainesville, FL 32611 (904) 392-6721	<u>Degree:</u> PhD, Mathematics, 1976 <u>Specialty:</u> Partial Differential Equations <u>Assigned:</u> FDL
Dr. John R. McNeil Assistant Professor New Mexico State University Dept. of Electrical & Computer Engineering Las Cruces, NM 88003 (505) 646-3115	<u>Degree:</u> PhD, Electrical Engineering, 1977 <u>Specialty:</u> High Energy Laser Optics, Ion Beam Applications <u>Assigned:</u> WL
Dr. Louis A. Martin-Vega Associate Professor University of Florida Industrial & Systems Engineering Dept. Gainesville, FL 32611 (904) 392-1464 X 35	<u>Degree:</u> PhD, Industrial & Systems Engineering, 1975 <u>Specialty:</u> Scheduling, Applied IE & OR <u>Assigned:</u> LMC

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNMENT
Dr. Kishan G. Mehrotra Professor Syracuse University Dept. of Computer & Information Science 313 Link Hall Syracuse, NY 13210 (315) 423-2811	<u>Degree:</u> PhD, Statistics, 1971 <u>Specialty:</u> Discriminant Analysis, Non- parametric Reliability <u>Assigned:</u> SAM
Dr. David F. Miller Assistant Professor Wright State University Mathematics Dept. Dayton, OH 45435 (513) 873-2068/2785	<u>Degree:</u> PhD, Applied Mathematics, 1979 <u>Specialty:</u> Optimization Theory, Optimal Control <u>Assigned:</u> FDL
Dr. Levon Minnetyan Assistant Professor Clarkson College Dept. of Civil & Environmental Engineering Potsdam, NY 13676 (315) 268-4432	<u>Degree:</u> PhD, Structural Mechanics, 1974 <u>Specialty:</u> Nonlinear Structural Analysis, Structural Dynamics <u>Assigned:</u> FDL
Dr. Rex C. Moyer Director & Associate Professor Trinity University Thorman Cancer Laboratory Box 191, 715 Stadium Drive San Antonio, TX 78218 (512) 736-7231/7235	<u>Degree:</u> PhD, Microbiology, 1965 <u>Specialty:</u> Oncology, Microbiology, Virology, Tissue Culture <u>Assigned:</u> SAM
Dr. Steven B. Newman Assistant Professor Central Community State College Physics Dept. 1615 Stanley St. New Britain, CT 06050 (203) 827-7341	<u>Degree:</u> PhD, Atmospheric Sciences, 1978 <u>Specialty:</u> Cloud & Precipitation Physics, Analysis & Forecasting <u>Assigned:</u> GL
Dr. Eugene E. Niemi Jr. Associate Professor University of Lowell Mechanical Engineering Dept. One University Ave. Lowell, MA 01854 (617) 452-5000 X 2768/2312	<u>Degree:</u> PhD, Mechanical & Aerodynamic Engineering <u>Specialty:</u> Aerodynamics, Fluid Mechanics, Thermodynamics <u>Assigned:</u> AEDC
Dr. Samuel Noodleman Adjunct Professor University of Arizona Dept. of Electrical Engineering Tucson, AZ 85721 (602) 626-5210	<u>Degree:</u> B.S., Electrical Engineering, 1937 <u>Specialty:</u> Electric Machines, Rare Earth Magnet Materials <u>Assigned:</u> APL

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNMENT
Dr. William N. Norton Assistant Professor Southeastern LA University Biology Department Box 335 Hammond, LA 70402 (504) 549-2173	<u>Degree:</u> PhD, Entomology, 1975 <u>Specialty:</u> Electron Microscopy, Insect Physiology, Cell Biology, Histology <u>Assigned:</u> AMRL
Dr. Alan H. Nye Assistant Professor Rochester Institute of Technology Mechanical Engineering Dept. 1 Lomb Memorial Drive Rochester, NY 14623 (716) 475-6663	<u>Degree:</u> PhD, MEchanical & Aerospace Science, 1975 <u>Specialty:</u> Solar Magnetohydrodynamics <u>Assigned:</u> GL
Dr. Thomas E. Nygren Assistant Professor Ohio State University Dept. of Psychology 404C W. 17th Avenue Columbus, OH 43210 (614) 422-2935	<u>Degree:</u> PhD, Quantitative Psychology, 1975 <u>Specialty:</u> Measurement & Scaling; Mathe- matical Models of Decision Making <u>Assigned:</u> AMRL
Dr. William W. Payne Associate Professor Virginia Military Institute Civil Engineering Dept. Lexington, VA 24450 (703) 463-6331	<u>Degree:</u> PhD, Civil Engineering, 1976 <u>Specialty:</u> Structural Design & Analysis <u>Assigned:</u> ESC
Dr. John E. Powell Professor University of South Dakota School of Business Dept. of Mathematics Vermillion, SD 57069 (605) 677-5231	<u>Degree:</u> DBA, Quantitive Business Analysis, 1972 <u>Specialty:</u> Computer Applications to Business <u>Assigned:</u> LC
Dr. Robert H. Puckett Professor Indiana State University Dept. of Political Science Terre Haute, IN 47809 (812) 232-6311 X 2591	<u>Degree:</u> PhD, Political Science, 1961 <u>Specialty:</u> US Foreign Policy; American National Security Policy <u>Assigned:</u> AL
Dr. G. Frederic Reynolds Professor Michigan Technological University Dept. of Chemical & Chemical Engineering Houghton, MI 49931 (906) 487-2054	<u>Degree:</u> PhD, Chemistry, 1959 <u>Specialty:</u> Physical Chemistry (Spectroscopy) of Organic Molecules <u>Assigned:</u> FJSRL

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNMENT
Dr. Richard O. Richter Assistant Professor Washington University Civil & Environmental Engineering Pullman, WA 99164 (509) 335-2147/3175	<u>Degree:</u> PhD, Chemistry, 1959 <u>Specialty:</u> Physical Chemistry (Spectroscopy) of Organic Molecules <u>Assigned:</u> ESC
Dr. John J. Riggs Assistant Professor Tuskegee Institute Dept. of Pharmacology School of Veterinary Medicine Tuskegee Institute, AL 36088 (205) 727-8471	<u>Degree:</u> PhD, Pharmacology, 1976 <u>Specialty:</u> Cardiovascular Pharmacology <u>Assigned:</u> AMRL
Dr. Edward J. Rinalducci Professor GIT Dept. of Psychology Atlanta, GA 30332 (404) 894-4260/2680	<u>Degree:</u> PhD, Experimental Psychology, 1966 <u>Specialty:</u> Vision & Visual Perception, Engineering Psychology <u>Assigned:</u> HRL (Williams)
Dr. John M. Roberts Professor Rice University Dept. of Mechanical Engineering & Mathematical Science P.O. Box 1892 Houston, Texas 77001 (713) 527-8101 X3590	<u>Degree:</u> PhD, Metallurgical Engineering, 1960 <u>Specialty:</u> Elastic-Anelastic & Plastic Deformation of Materials <u>Assigned:</u> APL
Dr. Thomas A. Roth Associate Professor Kansas State University Dept. of Chemical Engineering Durland Hall Manhattan, KS 66506 (913) 532-5584	<u>Degree:</u> PhD, Metallurgical Engineering, 1967 <u>Specialty:</u> Metallurgical Engineering <u>Assigned:</u> ML
Dr. Charles D. Sanders Professor Coppin State College Dept. of Psychology 2500 W. North Ave. Baltimore, MD 21216 (301) 383-7410	<u>Degree:</u> PhD, Education & Counseling Psychology <u>Specialty:</u> Psychological Measurement & Evaluation <u>Assigned:</u> HRL (Williams)
Dr. Sarwan S. Sandhu Assistant Professor University of Dayton Chemical Engineering Dept. 300 College Park Ave. Dayton, OH 45469 (513) 229-2627	<u>Degree:</u> Chemical Engineering, Combustion, 1973 <u>Specialty:</u> Combustion, Heat Transfer, Effect Electrical Fields on Heat Transfer Kinetics, Thermodynamics & Laser Interferometry <u>Assigned:</u> APL

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	Degree, Specialty, Laboratory Assignment
Dr. Gerald W. Simila Assistant Professor California State University/Northridge Dept. of Geological Science 18111 Nordhoff St. Northridge, CA 91330 (213) 885-3541	<u>Degree:</u> PhD, Geophysics, 1980 <u>Specialty:</u> Seismology <u>Assigned:</u> WL
Dr. Vina Y. Sloan Professor Eastern Washington University Accounting & Decision Science Dept. 201 Kingston Hall Cheney, WA 99004 (509) 359-7972	<u>Degree:</u> MS, Industrial Engineering, 1981 <u>Specialty:</u> Operations Research Techniques; Corporate Planning <u>Assigned:</u> HRL (Williams)
Dr. Russell W. Smith Assistant Professor N. Texas State University Political Science Dept. Box 5338, NT Station Denton, Texas 76203 (817) 788-2321/2356	<u>Degree:</u> PhD, Political Science/Public Admin- istration, 1976 <u>Specialty:</u> Management <u>Assigned:</u> RPL
Dr. Stanley L. Spiegel Assistant Professor University of Lowell Mathematical Dept. One University Ave. Lowell, MA 01854 (617) 452-5000 X 2512	<u>Degree:</u> PhD, Physics, 1966 <u>Specialty:</u> Numerical Modeling & Computer Simulation <u>Assigned:</u> GL
Dr. Alan K. Stiffler Associate Professor Mississippi State University Dept. of Mechanical Engineering Drawer ME Mississippi State, MS 39762 (601) 325-3260	<u>Degree:</u> PhD, Mechanical Engineering, 1971 <u>Specialty:</u> Fluid Mechanics <u>Assigned:</u> AD
Dr. Lawrence Suchow Professor NJ Institute of Technology Dept. of Chemistry 323 High Street Newark, NJ 07102 (201) 645-5389	<u>Degree:</u> PhD, Chemistry, 1951 <u>Specialty:</u> Solid State Inorganic Chemistry <u>Assigned:</u> RADC (Hanscom)
Dr. Patrick J. Sweeney Associate Professor University of Dayton Engineering Management Dept. Kl. 361 300 College Park Dayton, OH 45469 (513) 229-2238	<u>Degree:</u> PhD, Mechanical Engineering, 1977 <u>Specialty:</u> OPS Research, Quality, Statistics <u>Assigned:</u> BRMC

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Charles J. Teplitz Assistant Professor SUNY/ALBANY Dept. of Operations Management School of Business Albany, NY 12222 (518) 457-4951	<u>Degree:</u> DBA, Decision Science, 1980 <u>Specialty:</u> Operations Management & Physical Distribution <u>Assigned:</u> HRL (Wright-Patterson)
Dr. Albert N. Thompson Assistant Professor Fayetteville State University Dept. of Chemistry Fayetteville, NC 28301 (919) 486-1684	<u>Degree:</u> PhD, Inorganic Chemistry, 1978 <u>Specialty:</u> Porphyrins & Metalloporphyrins <u>Assigned:</u> SAM
Dr. Arthur R. Thorbjornsen Associate Professor University of Toledo Dept. of Electrical Engineering 2801 W. Bancroft Street Toledo, OH 43606 (419) 537-2406/2638	<u>Degree:</u> PhD, Electrical Engineering, 1972 <u>Specialty:</u> Computer aided design of integrated circuits, IC device modeling <u>Assigned:</u> AL
Dr. Richard M. Van Slyke Professor Stevens Institute of Technology Dept. of Electrical Engineering & Computer Science Hoboken, NJ 07030 (201) 420-5606	<u>Degree:</u> PhD, Operations Research, 1965 <u>Specialty:</u> Information Systems <u>Assigned:</u> ESD
Dr. Venugopal S. Veerasamy Assistant Professor Tennessee State University Dept. of Mechanical Engineering Downtown Campus Nashville, TN 37203 (615) 251-1513	<u>Degree:</u> PhD, Mechanical Engineering, 1980 <u>Specialty:</u> Propulsion Engineering, Thermal Sciences, Aeroacoustics <u>Assigned:</u> AEDC
Dr. M.C. Wang Associate Professor Pennsylvania State University Civil Engineering Dept. 212 Sackett Building University Park, PA 16802 (814) 863-0026	<u>Degree:</u> PhD, Geotechnical Engineering, 1968 <u>Specialty:</u> Geotechnical Engineering & Pave- ment Design <u>Assigned:</u> ESC
Dr. Alice Ward Assistant Professor Southern University/Baton Rouge Dept. of Biology P.O. Box 11068 Baton Rouge, LA 70813 (504) 771-5210	<u>Degree:</u> PhD, Cellular, Molecular, & Develop- mental Biology, 1975 <u>Specialty:</u> Cell Biology <u>Assigned:</u> SAM

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Brenton J. Watkins Assistant Professor University of Alaska Geophysical Institute Fairbanks, AK 99701 (907) 479-7479	<u>Degree:</u> PhD, Geophysics, 1976 <u>Specialty:</u> Troposphere & Stratosphere turbulence studies with high power radar also incoherent scatter radar ionospheric research <u>Assigned:</u> GL
Dr. Hsi-Han Yeh Associate Professor University of Kentucky Dept. of Electrical Engineering Lexington, KY 40506 (606) 258-4649	<u>Degree:</u> PhD, Electrical Engineering, 1967 <u>Specialty:</u> Modern Control Theory <u>Assigned:</u> FDL
Dr. Robert L. Yolton Assistant Professor, Director Pacific University Dept. of Optometry Forest Grove, OR 97116 (503) 357-6151 X 272	<u>Degree:</u> PhD, Psychology, 1975 <u>Specialty:</u> Visual System Function & Analysis <u>Assigned:</u> SAM
Dr. Poh Shien Young Associate Professor Mississippi State University Physics Dept. Mississippi State, MS 39762 (601) 325-2806	<u>Degree:</u> PhD, Physics, 1966 <u>Specialty:</u> Sparse Physics, Cosmic Rays, Mathematical Physics, Orbital Determination, Optimal Control <u>Assigned:</u> AD

PARTICIPANT LABORATORY ASSIGNMENT

1981 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

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

1. Dr. Glenn Fanslow - Iowa State University
2. Dr. Dennis Flentge - Cedarville College
3. Dr. Vijay Gupta - Central State University
4. Dr. Samuel Noodleman - University of Arizona
5. Dr. John Roberts - Rice University
6. Dr. Sarwan Sandhu - University of Dayton

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

1. Dr. Louis Buckalew - Alabama A & M University
2. Dr. Franklin Hill - Grambling State University
3. Dr. Donald McCoy - University of Kentucky
4. Dr. William Norton - Southern Louisiana University
5. Dr. Thomas Nygren - Ohio State University
6. Dr. John Riggs - Tuskegee Institute

AD ARMAMENT DIVISION
(Eglin Air Force Base)

1. Dr. Hugh Coleman - Mississippi State University
2. Dr. Kenneth Hall - Mississippi State University
3. Dr. Robert Harnett - Clemson University
4. Dr. Stanley Jones - University of Kentucky
5. Dr. Alan Stiffler - Mississippi State University
6. Dr. Poh Shien Young - Mississippi State University

AEDC ARNOLD ENGINEERING DEVELOPMENT CENTER
(Arnold Air Force Station)

1. Dr. Eugene Niemi - University of Lowell
2. Dr. Venugopal Veerasamy - Tennessee State University

AL AVIONICS LABORATORY
(Wright-Patterson Air Force Base)

1. Dr. David Allender - Kent State University
2. Dr. David Cozart - The Citadel
3. Dr. John Fleming - Texas A & M University
4. Dr. Gurmohan Grewal - Southern University/Baton Rouge
5. Dr. Richard Kwor - University of Notre Dame
6. Dr. William McCormick - Wright State University
7. Dr. Robert Puckett - Indiana State University
8. Dr. Arthur Thorbjornsen - University of Toledo

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

1. Dr. Harold Fox - Ball State University
2. Dr. Patrick Sweeney - University of Dayton

ESMC EASTERN SPACE & MISSILE CENTER
(Patrick Air Force Base)

1. Dr. Junho Choi - Florida Institute of Technology

PARTICIPANT LABORATORY ASSIGNMENT (Continued)

ESD ELECTRONIC SYSTEMS DIVISION
(Hanscom Air Force Base)
1. Dr. Richard Van Slyke - Stevens Institute of Technology

ESC ENGINEERING & SERVICES CENTER
(Tyndall Air Force Base)
1. Dr. Robert Carlson - Kent State University
2. Dr. William Payne - Virginia Military Institute
3. Dr. Richard Richter - Washington State University
4. Dr. M. C. Wang - Pennsylvania State University

FDL FLIGHT DYNAMICS LABORATORY
(Wright-Patterson Air Force Base)
1. Dr. Patrick McKenna - University of Florida
2. Dr. David Miller - Wright State University
3. Dr. Levon Minnetyan - Clarkson College
4. Dr. Hsi-Han Yeh - University of Kentucky

FJSRL FRANK J. SEILER RESEARCH LABORATORY
(USAF Academy)
1. Dr. Larry Dalton - SUNY/Stony Brook
2. Dr. Peter Freymuth - University of Colorado
3. Dr. Frederic Reynolds - Michigan Technological University

GL GEOPHYSICS LABORATORY
(Hanscom Air Force Base)
1. Dr. Carol Deakyne - College of the Holy Cross
2. Dr. Ronney Harris - Utah State University
3. Dr. Steven Newman - Central Community State College
4. Dr. Alan Nye - Rochester Institute of Technology
5. Dr. Stanley Spiegel - University of Lowell
6. Dr. Brenton Watkins - University of Alaska

HRL/ASD HUMAN RESOURCES LABORATORY/ADVANCED SYSTEMS DIVISION
(Wright-Patterson Air Force Base)
1. Dr. Charles Teplitz - SUNY/Albany

HRL/FTD HUMAN RESOURCES LABORATORY/FLYING TRAINING DIVISION
(Williams Air Force Base)
1. Dr. Edward Rinalducci - Georgia Institute of Technology
2. Dr. Charles Sanders - Coppin State College
3. Dr. Vina Sloan - Eastern Washington University

HRL/PRD HUMAN RESOURCES LABORATORY/PERSONAL RESEARCH DIVISION
(Brooks Air Force Base)

HRL/TTD HUMAN RESOURCES LABORATORY/TECHNICAL TRAINING DIVISION
(Lowry Air Force Base)
1. Dr. David Carlson - University of Massachusetts/Amherst

L.MDC LEADERSHIP & MANAGEMENT DEVELOPMENT CENTER
(Maxwell Air Force Base)
1. Dr. Chris Eskridge - University of Nebraska/Lincoln

PARTICIPANT LABORATORY ASSIGNMENT (Continued)

LC LOGISTICS COMMAND
(Wright-Patterson Air Force Base)
1. Dr. John Powell - University of South Dakota

LMC LOGISTICS MANAGEMENT CENTER
(Gunter Air Force Base)
1. Dr. Milton Alexander - Auburn University
2. Dr. Louis Martin-Vega - University of Florida

ML MATERIALS LABORATORY
(Wright-Patterson Air Force Base)
1. Dr. Robert Cunningham - Kent State University
2. Dr. William Feld - Wright State University
3. Dr. Joel Fried - University of Cincinnati
4. Dr. Richard Liu - Purdue University
5. Dr. William McCain - Tennessee State University
6. Dr. Thomas Roth - Kansas State University

RPL ROCKET PROPULSION LABORATORY
(Edwards Air Force Base)
1. Dr. Jay Benziger - Princeton University
2. Dr. Gale Buzzard - Duke University
3. Dr. Donald Emerich - Mississippi State University
4. Dr. Russell Smith - North Texas State University

RADC ROME AIR DEVELOPMENT CENTER
(Griffiss Air Force Base)
1. Dr. Aloysius Beex - Virginia Polytechnic Institute &
State University
2. Dr. Jerome Braverman - Rider College
3. Dr. Paul Griesacker - Gannon University

RADC/ET ROME AIR DEVELOPMENT CENTER/ELECTRONICS TECHNOLOGY
(Hanscom Air Force Base)
1. Dr. William Bradley - University of Alabama/Huntsville
2. Dr. Lawrence Suchow - New Jersey Institute of Technology

SAM SCHOOL OF AEROSPACE MEDICINE
(Brooks Air Force Base)
1. Dr. Martin Altschuler - SUNY/Buffalo
2. Dr. Charles Davis - University of Toledo
3. Dr. David Greene - Texas A & M University
4. Dr. Kishan Mehrotra - Syracuse University
5. Dr. Rex Moyer - Trinity University
6. Dr. Albert Thompson - Fayetteville State University
7. Dr. Alice Ward - Southern University/Baton Rouge
8. Dr. Robert Yolton - Pacific University

WL WEAPONS LABORATORY
(Kirtland Air Force Base)
1. Dr. Albert Biggs - University of Kansas
2. Dr. Francis Jankowski - Wright State University
3. Dr. Paul Kalata - Drexel University
4. Dr. Henry McGee - Virginia Polytechnic Institute &
State University

PARTICIPANT LABORATORY ASSIGNMENT (Continued)

WL

WEAPONS LABORATORY (Continued)

(Kirtland Air Force Base)

5. Dr. John McNeil - New Mexico State University
6. Dr. Gerald Simila - California State University/Northridge

APPENDIX II

1. Listing of Research Reports Submitted in the
1981 Summer Faculty Research Program
2. Abstracts of 1981 Associates' Research Reports

RESEARCH REPORTS

1981 USAF-SCEEE SUMMER FACULTY RESEARCH PROGRAM

<u>Volume I</u> <u>Report No.</u>	<u>Title</u>	<u>Research Associate</u>
1	The Determination of Input Data Accuracy in the Maintenance Data Collection System	Dr. Milton J. Alexander
2	Superconducting Pair Binding Energy in Degenerate Fermi Systems	Dr. David W. Allender
3	Software for Rapid Remote 3-D Mapping of an Arbitrarily-Complex Object	Dr. Martin D. Altschuler
4	Enhanced Scene Resolution: 2-D Spectral Estimator Approaches	Dr. A.A. Beex
5	Decomposition of Nitromethane Over Metal Oxide Catalysts	Dr. Jay B. Benziger
6	Interaction Between an Electromagnetic Pulse and a Metal Cylinder Connected to a Parallel Plate Guide by a Wire	Dr. Albert W. Biggs
7	Electromagnetic Scattering From Dielectric and Composite Bodies	Dr. William G. Bradley
8	An Investigation of Nonparametric Maintainability and Reliability Test Procedures	Dr. Jerome D. Braverman
9	Environmental Effects on Affect and Psychomotor Performance	Dr. Louis W. Buckalew
10	Thermal Analysis of a Rocket Engine Altitude Test Facility Diffuser	Dr. Gale H. Buzzard
11	Rehosting the Advanced Instructional System	Dr. David A. Carlson
12	The Biological Degradation of Spilled Jet Fuels; A Literature Review	Dr. Robert E. Carlson
13	On-Axis Kalman Tracking Filter for H.S. Vandenberg Aris Systems	Dr. Junho Choi
14	Rough Surface Effects on Turbulent Boundary Layers	Dr. Hugh W. Coleman
15	Interpolation and Approximation Techniques for Gridded Terrain Data	Dr. David L. Cozart
16	Epitaxial Layer Evaluation of III-V Semiconductor Materials	Dr. Robert W. Cunningham

RESEARCH REPORTS (Continued)

<u>Report No.</u>	<u>Title</u>	<u>Research Associate</u>
17	(A) Spectroscopic Analysis and Optimization of the Oxygen/Iodine Chemical Laser and (B) Aluminum-27 NMR of Dialkylimidazolium Chloroaluminate Molten Salts	Dr. Larry R. Dalton
18	Some Aspects of Cardiac Risk Evaluation at the USAF School of Aerospace Medicine	Dr. Charles B. Davis
19	A Molecular Orbital Study of $\text{NO}_3^- \cdot \text{H}_2\text{O}$, $\text{OH}^- \cdot \text{HNO}_3$, AND $\text{H}^+(\text{H}_2\text{O})_m(\text{CH}_3\text{CN})_k$ Cluster Ions	Dr. Carol A. Deakyne
20	Analysis of Several Solid Propellant Stabilizers by DC Polarographic Techniques	Dr. Donald W. Emerich
21	The Impact of Background Characteristics on OAP Test Scores: Developing Baseline Information	Dr. Chris W. Eskridge
22	Radiation Signatures From a Space Power System	Dr. Glenn E. Fanslow
23	Acetylene Terminated Systems: Quinoxalines and Isomeric Sulfones	Dr. William A. Feld
24	A Simulation Framework for the Evaluation of Terrain Following and Terrain Avoidance Techniques	Dr. John A. Fleming
25	Voltametric Studies of the Lithium/Vanadium Oxide Electrochemical Cell	Dr. Dennis R. Flentge
26	Project IMP: Institutionalization Methods and Policies at the Business Research Management Center	Dr. Harold Fox
27	Some Problems of Laser Velocimetry and Unsteady Aerodynamics of Current Interest to the Frank J. Sellar Research Laboratory	Dr. Peter Freymuth
28	Effects of Cloth Substrate and Finish on the Nitrogen Cure of Acetylene Terminated Sulfone (ATS) by Torsion Impregnated Cloth Analysis (TICA)	Dr. Joel R. Fried
29	Application of Conjoint Measurement Theory to the Quantification of Subjective Ratings	Dr. David E. Greene
30	Sensor Noise and Kalman Filter for Aided Inertial Navigation System	Dr. Gurmohan S. Grewal
31	Calibration of Wideband Optical Signal Processor	Dr. Paul B. Griesacker
32	Corrosion Studies of Calcium-Thionyl Chloride Electrolyte Systems	Dr. Vijay K. Gupta

RESEARCH REPORTS (Continued)

<u>Report No.</u>	<u>Title</u>	<u>Research Associate</u>
33	An Investigation Into State Estimation for Air-to-Air Missiles	Dr. Kenneth R. Hall
34	Optimal Recovery From Cratering Attacks on Airbase Prepared Surfaces	Dr. R. Michael Harnett
35	Infrared Clutter: Effects of Air Motion Produced by Auroral Zone Joule Heating	Dr. Ronney D. Harris
36	Catabolism of Toluene in the Bluegill Sunfish	Dr. Franklin D. Hill
37	Studies of the Engineering Design Process: Design of Explosively Driven Generators; Human Factors in Hazardous Activities	Dr. Francis Jankowski
38	Impact of Cylindrical Rods on Rigid Boundaries	Dr. Stanley E. Jones
39	An Information-Theoretic Approach to Target Estimation of a Conical Scan Controlled Laser Radar Tracking System	Dr. Paul Kalata
40	Electrical Characterization of Ion Implantation in GaAs	Dr. Richar Kwor
41	A Review of Current Data Base Systems for Flexible Manufacturing	Dr. Richard Liu
<u>Volume II</u>		
42	Homogeneous Compression of Rapidly Solidified Alumina, Powder Alloy Billets	Dr. William S. McCain
43	Imaging Radar Autofocus Update of an inertial Navigation System by Means of a Kalman Filter	Dr. William S. McCormick
44	The Utility of the Animal Model Concept	Dr. Donald F. McCoy
45	Vibration-Rotation Relaxation in the HF Laser	Dr. Henry McGee
46	Appropriate Far-Field Boudary Conditions for the Numerical Solution of the Navier-Stokes Equations	Dr. Patrick J. McKenna
47	Constituent Monitoring of Evaporation Source Plumes	Dr. J. R. McNeil
48	Development of a Computer Assisted Aircraft Load Planning Model	Dr. Louis A. Martin-Vega
49	A Model for Cath Data and Some Results on the Arbitrary Right Censored Data	Dr. Kishan G. Mehrotra
50	A Direct State Space Approach to the Control of Sampled-Data Systems	Dr. David F. Miller

RESEARCH REPORTS (Continued)

<u>Report No.</u>	<u>Title</u>	<u>Research Associate</u>
51	Transient Analysis of Structures with Distinct Nonlinearities	Dr. Levon Minnetyan
52	Plasmid Fingerprints of Staphylococcus Aureus Strains Isolated From a Toxic Shock Syndrome Female Patient	Dr. Rex C. Moyer
53	An Investigation Into the Nature of the Melting Layer in Stratiform Clouds	Dr. Steven B. Newman
54	Jet Simulation Parameters for Wind Tunnel Model Thrust Reverser Testing	Dr. Eugene E. Niemi, Jr.
55	Analysis of the 60 KVA Permanent Magnet Alternator and a New Rotor Concept for these Type Machines	Dr. Samuel Noodleman
56	The Effects of JP-4 Aviation Fuel on Specific Internal Organs of the Fat-Head Minnow, Pimphale Promelus	Dr. William N. Norton
57	Observations of Sunspot Dynamics and Theoretical Effects of Inhomogeneities in the Solar Convection Zone	Dr. Alan H. Nye
58	Development of a Manual of use for Conjoint Scaling Techniques	Dr. Thomas E. Nygren
59	Evaluation of Nastran to Predict the Dynamic Response of Reinforced Concrete	Dr. William W. Payne, Jr.
60	An Analysis of the Availability, Accessibility and Timeliness of Cost Data Associated with the AFLC Aircraft Modification System with Emphasis on Class IV Modifications	Dr. John E. Powell
61	The Air Force Wright Aeronautical Laboratories Research and Development Planning Process	Dr. Robert H. Puckett
62	Coupling Reactions and Rearrangements of 1,3,5-Triazines	Dr. G. Frederic Reynolds
63	Adsorption of Trichloroethylene by Soils from Dilute Aqueous Systems	Dr. Richard O. Richter
64	The Effects of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) Triiodothyronine (T ₃) Binding to Rat Isolated Hepatic Nuclei	Dr. John J. Riggs
65	Visual Cues in the Simulation of Low Level Flight	Dr. Edward J. Rinalducci

RESEARCH REPORTS (Continued)

<u>Report No.</u>	<u>Title</u>	<u>Research Associate</u>
66	A Metallurgical Investigation of the Internal Bronze Manufacturing Process of NB_3Sn Superconducting Wire	Dr. John M. Roberts
67	Investigation of the Mechanical Properties of Less Than 100% Dense Titanium Powder Metallurgy Compacts	Dr. Thomas Roth
68	Application of Task Analytic Techniques to the Design of a Flight Simulator Instructor/Operator Console	Dr. Charles D. Sanders
69	Study of Dynamic Behavior of a Bluff-Body Diffusion Flame in the APL Combustion Tunnel Facility	Dr. Sarwan S. Sandhu
70	Shear-Wave Velocity Structure Determined From Analysis Rayleigh-Wave Group-Velocity Dispersion	Dr. Gerald W. Simila
71	Operating Various Subsystems of the Total Simulation Systems for Flight Training	Dr. Vina Sloan
72	Enhancing Career Development at the Air Force Rocket Propulsion Laboratory	Dr. Russ Smith
73	Development of a Computer Algorithm for the Automatic Determination of Space Vehicle Potential Utilizing Electrostatic Analyzer Measurements	Dr. Stanley L. Spiegel
74	Plastic Rotating Band Loads and Sliding Resistance Forces	Dr. A. Kent Stiffler
75	Binary and Ternary Compositions and their Physical Properties	Dr. Lawrence Suchow
76	A System Dynamics Model of the Acquisition Process	Dr. Patrick J. Sweeney
77	Analysis of Maintenance Decisions at Lower Echelon Levels Involving Jet Aircraft Engines	Dr. Charles J. Teplitz
78	A Study of the Interaction of Hydrazine Methylhydrazine and Unsymdimethylhydrazine with Porphyrins, Metalloporphyrins, and some Metal Coordination Compounds	Dr. Albert N. Thompson
79	GaAs Mesfet Modeling	Dr. Arthur A. Thorbjornsen
80	Covering Problems in C^3I Systems	Dr. Richard Van Slyke
81	Effects of Acoustic Disturbances on the Boundary-Layer Transition in AEDC Wind Tunnels	Dr. Venugopal Veerasamy

RESEARCH REPORTS (Continued)

<u>Report No.</u>	<u>Title</u>	<u>Research Associate</u>
82	An Evaluation of Air Force Pavement Non-Destructive Testing Method	Dr. M.C. Wang
83	The Effect of One Hundred Percent Oxygen at One ATA and Increased Pressure on the Metabolism of an Organphosphate (Parathion) in the Rat	Dr. Alice Ward
84	Measurements of Turbulence in the Troposphere and Lower Stratosphere using the Millstone Hill 440 MHZ Radar	Dr. Brenton J. Watkins
85	Optimal Design of Digital Flight Control Systems Following an Analog Model	Dr. Hsi-Han Yeh
86	Amplitude Variability of the Steady State Visual Evoked Response	Dr. Robert L. Yolton
87	New Tests of Theories on Shaped Charge	Dr. Poh Shien Young

THE DETERMINATION OF INPUT DATA ACCURACY
IN THE MAINTENANCE DATA COLLECTION SYSTEM

by

Milton J. Alexander

ABSTRACT

The question of input data accuracy in the maintenance data collection system is investigated. It is shown that the level of input data accuracy is subject to two different types of errors - data which should have been entered into the MDCS (Type I errors) and erroneous data which was entered into the MDCS (Type II errors). Techniques were developed to measure both types of errors and field tested on a TAC unit. The two error types may be combined as a joint probability to provide a measure of input data accuracy. When field test data was substituted in the mathematical formulation, the computed input data accuracy level was about one percent, i.e., only about one maintenance action in 100 was being correctly reported into MDCS. Suggestions for improving input data accuracy as well as further research in this area are offered.

SUPERCONDUCTING PAIR BINDING ENERGY

IN DEGENERATE FERMI SYSTEMS

by

David W. Allender

ABSTRACT

The binding energy of Cooper pairs in degenerate Fermi systems in one and three dimensions is examined as a function of the carrier density, the cut-off energy of the attractive interaction, and the momentum of the pair. It is found that when the cut-off energy is sufficiently small compared to the effective BCS interaction parameter, the binding energy as a function of momentum, q , has two relative maxima: one at $q = 0$ and one at q greater than twice the Fermi momentum in a one dimensional system. Thus a metastable state is predicted. Large momentum pairing in three dimensions is also examined. Results are related to experimental observations and recommendations are made for further research.

SOFTWARE FOR RAPID REMOTE 3-D MAPPING OF AN
ARBITRARILY-COMPLEX OBJECT

by

Martin D. Altschuler

ABSTRACT

The development of interactive software for dependable remote nondestructive 3-D surface mapping of an arbitrarily-complex object in real time is well under way. Hardware/software techniques and trade-offs have been investigated for the rapid (in parallel) laser illumination, imaging, and triangulation of 16,000 points of an unknown surface. To produce an operational device for real-time anthropometric measurement (for example, to measure real-time changes in human-body anatomy and work motions in a zero-gravity space environment) requires developing, implementing, testing, and packaging optimal algorithms for (1) multi-directional laser-array illumination, (2) multi-directional imaging, and (3) rapid dependable calibration of cameras and laser arrays. Needed resources are an interactive raster graphics facility and a compatible host computer. If funding is available, an operational real-time surface mapping system can be produced within two years.

ENHANCED SCENE RESOLUTION: 2-D SPECTRAL ESTIMATOR APPROACHES

by

A.A. (Louis) Beex

ABSTRACT

In this report, an initial performance evaluation is presented for two modern spectrum estimators, used in the context of resolution enhancement in scenes with limited support. This is to identify the potential these methods may have in a practical environment.

The availability of limited sets of observations has spurred procedures for extending data beyond the observation limits, in order to defeat the classical Rayleigh resolution. The one-step extrapolator /2/ is one such approach, that is extended and implemented in the 2-D setting. The potential of this one-step extrapolator is demonstrated, but also the enormous sensitivity to any type of noise, which renders this particular extrapolation algorithm of low practical value.

A different approach is to assume a parametric model for the stochastic process that underlies the data. The 2-D autoregressive moving average (ARMA) model is rather general, and leaves one with a difficult parameter estimation problem. The difficulty of implementation pays off in a high resolution property for certain classes of signals, and a relative robustness in the presence of noise.

DECOMPOSITION OF NITROMETHANE
OVER METAL OXIDE CATALYSTS

by
Jay B. Benziger

ABSTRACT

In the course of this work, the reaction of nitromethane over NiO/alumina and Cr₂O₃/alumina catalysts was examined to determine the feasibility of developing a nitromethane based monopropellant system. The kinetics of nitromethane decomposition over those two catalysts were found to be adequately represented by Langmuir -Hinshelwood expressions

$$r = -k_s C_s \frac{K_e P}{1 + K_e P}$$

under conditions $T = 100 - 300^{\circ}\text{C}$, $P = 1 - 100$ torr. The kinetic parameters $k_s C_s$ and K_e were measured and used to fit the data over the entire temperature range. It was found that nitromethane decomposition caused catalyst deactivation due to carbon deposition, which was due to the fuel rich nature of the nitromethane. The rate of deactivation was found to increase with decreasing temperature. Lastly, a reactor model was presented to display the qualitative features of operation of a monopropellant system. Catalyst bed length and preheat temperature and feed temperature were identified as the important parameters in determining system response time.

INTERACTION BETWEEN AN ELECTROMAGNETIC PULSE AND A
METAL CYLINDER CONNECTED TO A PARALLEL PLATE GUIDE BY A WIRE

by

Albert W. Biggs

ABSTRACT

The interaction between an electromagnetic pulse (EMP) and a metallic cylinder, connected to one side of a parallel plate guide by a wire, is analyzed. The axes of the cylinder are collinear and perpendicular to the walls of the guide. The EMP is a transverse electromagnetic (TEM) wave with the electric field intensities of the frequency components being perpendicular to the guide walls. The surface currents and charges induced on the cylinder and wire surfaces are dependent upon the geometry or spatial dimensions of the structure normalized with respect to the width of the guide.

ELECTROMAGNETIC SCATTERING FROM
DIELECTRIC AND COMPOSITE BODIES

by

Dr. William G. Bradley

ABSTRACT

The methods of computing scattered fields from dielectric bodies are reviewed. The procedure that is required to extend some of these methods to include the computation of bistatic cross sections is considered. A literature search showed that little work has been done on scattering from composite bodies. Carbon composites are of particular interest, and experimental and analytic work is proposed. The possibility of controlling the scattering cross sections by the design of special composite materials is considered. Specifically, it may be possible to construct a composite with $\mu_r = \epsilon_r$. This is relevant to the theory of absorbers in scattering where additional work is proposed.

AN INVESTIGATION OF NONPARAMETRIC MAINTAINABILITY AND
RELIABILITY TEST PROCEDURES

by

Jerome D. Braverman

ABSTRACT

A wide body of nonparametric statistical tests was investigated to determine which, if any, are applicable, either as described or with modifications, to the maintainability/reliability demonstration problem. The nonparametric tests having the greatest potential for this application belong to the category of one-sample tests of location. Of these, the sign test and the Wilcoxon signed rank test appear to be directly applicable to the maintainability demonstration problem as alternatives to the currently used parametric tests, particularly when sample sizes are small and/or parametric assumptions cannot be validated.

A group of tests called "normal scores tests" also appear to be applicable to the maintainability demonstration problem while the "exponential scores test" may be applicable to the reliability demonstration problem. These tests should be the subject of future research effort. It is also recommended that further research into the general area of order statistics, a class to which the previous tests belong, be continued.

ENVIRONMENTAL EFFECTS ON AFFECT AND PSYCHOMOTOR PERFORMANCE

by

L. W. Buckalew

ABSTRACT

Scientific and public information sources have suggested or alluded to beneficial effects to humans of exposure to negative air ions. Claims include improved performance, reduced anxiety and depression, increased attention level, and enhanced physiological condition. While some evidence does support some of these claims, the clarity, validity, and reliability of findings are clouded by methodological problems of control and a lack of standardization in treatment and equipment, with particular problems in too narrow a spectrum of response considerations. This study investigated the effects of negative air ions, as produced by commercially available air purification/negative ion generation instrumentation, on a wide range of affective, cognitive, psychomotor, and physiological measures. Dependent variables included anxiety, grip magnitude, digit symbol coding, motor dexterity, reaction time, tracking, pulse, blood pressure, and temperature. Two groups of 12 subjects, similar in age, sex, education, and physical condition, were subjected to either 6 continuous hours of negative ion exposure or 'normal' ion exposure. Repeated measures (0,3,6 hours) on each of 10 variables were obtained for each subject. MANOVA comparisons of each group's change scores (0 vs 3, 0 vs 6, 3 vs 6 hour) revealed no significant differences between groups, and consideration of group differences on individual variables for both 0 vs 3 hour and 0 vs 6 hour change reflected no significance for any variable. It was concluded that the air ion condition resulting from treatment with air purifiers/negative ion generators did not produce any generalized effect or alteration of specific affective, performance, or physiological measures.

THERMAL ANALYSIS
OF A
ROCKET ENGINE ALTITUDE TEST FACILITY DIFFUSER

by

Gale H. Buzzard

ABSTRACT

Simulated altitude testing of a rocket engine places a severe thermal load upon whatever device is used to contain the rocket engine exhaust plume and maintain the simulating low pressure. Analysis of the problem is considerably complicated for the complex two phase exhaust flow resulting from the combustion of high energy, metallized solid propellants. Such a propellant exhausts large quantities of very energetic solid particles. The thermal load imposed as these particles impinge upon the containment of the exhaust plume is capable of exceeding that of the convective load from the plume. One means of containing the exhaust plume under these conditions is a water cooled diffuser. Models for the heat loads on such a diffuser are discussed and recommendations are made for implementing a computational capable of predicting the maximum wall and coolant temperatures under test conditions.

REHOSTING THE ADVANCED INSTRUCTIONAL SYSTEM

by

David A. Carlson

ABSTRACT

This report investigates a number of issues involving the rehosting of a computer-based instructional system from its present hardware configuration to a more affordable one. Specifically, four alternative approaches to the rehosting effort are analyzed in terms of their cost-effectiveness, and the problems that will occur in the transformation of the system's database are discussed. The report offers a set of general guidelines to be followed during the rehosting effort along with suggestions of areas where further study is required.

THE BIOLOGICAL DEGRADATION OF SPILLED JET FUELS:
A LITERATURE REVIEW

by

Robert E. Carlson

ABSTRACT

Biodegradation of many of the components of Air Force fuels does occur, although most studies have been done under laboratory conditions, and the extrapolation of the findings to natural rates of biodegradation is premature. Many factors affect biodegradation rates, including the nature and concentration of the specific hydrocarbon compound, the species of bacteria present and their quantity, and environmental factors such as nutrient availability, temperature, and oxygen concentrations. Initial concerns should be first, the determination of the importance of biodegradation relative to other loss factors such as volatilization and sediment sorption, and second, the determination of the ultimate fate of recalcitrant compounds and their metabolites.

ON-AXIS KALMAN TRACKING FILTER FOR H.S. VANDENBERG ARIS SYSTEMS

by

Junho Choi

ABSTRACT

The Metric Accuracy Improvement Program (MAIP) has been rigorously studied during the last couple of decades at the Eastern Test Range, Patrick Air Force Base in Florida for the Advanced Range Instrumentation Ships (ARIS). To improve the accuracy, several approaches have been launched on a modernization program aimed at upgrading various systems such as computer hardware, calibration, timing systems, etc. In this work on-axis tracking algorithm was proposed through a several possible extended Kalman filter along with the brief review of the present tracking technique and coordinate algorithm.

Simulation was conducted on two-states Kalman filter and six-states Kalman filter to observe the feasibility of on-axis tracking purpose. Results indicate that the initializations are very important on the basis of the need for updating the measurement statistics of the maneuvering target which can effectively correct the differences between the measurement and filtering estimates.

Several areas for additional and continuing work are suggested to achieve the goals.

ROUGH SURFACE EFFECTS ON
TURBULENT BOUNDARY LAYERS

by

Hugh W. Coleman

ABSTRACT

The prediction of the fluid dynamic and thermal behavior of a turbulent boundary layer on a surface of arbitrary roughness is considered. The equivalent sand-grain roughness concept is examined in some detail, and it is concluded that (1) assumptions inherent in the concept are not supported by recent data, (2) there is currently no acceptable method for determining the equivalent sand-grain roughness for a general rough surface on which no skin friction data are available, and (3) experimental data and physical arguments indicate that heat transfer probably does not scale with equivalent sand-grain roughness. Brief comments on a discrete element approach to the problem are presented, and suggestions for further research are made.

INTERPOLATION AND APPROXIMATION TECHNIQUES
FOR GRIDDED TERRAIN DATA

By

David L. Cozart

ABSTRACT

Various interpolation and approximation techniques which are applicable to terrain data defined on a square grid are described. Most of these techniques have the potential for data compaction, i.e., effectively representing the given data using less computer memory than required by the raw data. The amount of compaction obtained depends upon 1) the technique used, 2) the allowable error in representing the data, 3) the grid spacing, and 4) the raw data values. Some of the methods are two stage processes involving both approximation and interpolation. For each technique, the advantages and disadvantages of the method are discussed. One two stage technique is proposed for further research. A method of comparing the different techniques is also described.

EPITAXIAL LAYER EVALUATION OF III-V SEMICONDUCTOR MATERIALS

by

Robert W. Cunningham

ABSTRACT

Problems associated with the electronic evaluation of epitaxial layers on substrates have been studied. Two models for the measurable resistivity voltage of van der Pauw type specimens have been investigated to determine the importance of both the epi layer and substrate. A simple circuit model indicates the epi layer resistivity may be determined with negligible error under conditions that may be obtained in the laboratory. When the model is applied to the Hall effect an identical result is obtained. A more sophisticated model for the resistivity voltage is suggested but detailed solution has not been completed. Electrical measurements on several specimens are reported and the data is in reasonable agreement with other specimens. Suggestions for continued work are offered.

(A) SPECTROSCOPIC ANALYSIS AND OPTIMIZATION OF THE OXYGEN/
IODINE CHEMICAL LASER AND (B) ALUMINUM-27 NMR OF DIALKYL-
IMIDAZOLIUM CHLOROALUMINATE MOLTEN SALTS

by

Larry R. Dalton

ABSTRACT

The development of a computer correlated electron paramagnetic resonance/optical emission spectrometric/mass spectrometric (EPR/OES/MS) facility was undertaken for the analysis of the gas-phase chemical reactions in the oxygen/iodine chemical laser. The objective was EPR detection of the $O_2(^3\Sigma)$, $O_2(^1\Delta)$, $I(^2P_{3/2})$, $I(^2P_{1/2})$ and $I_2(^3\Pi)$ species with simultaneous EPR/OES monitoring of the $O_2(^1\Delta)$ and $I(^2P_{1/2})$ species. Failure by Varian Associates to complete upgrading of the EPR facility prevented realization of the original objectives although the feasibility of OES detection within a microwave cavity was demonstrated. Aluminum-27 NMR spin-spin and spin-lattice relaxation measurements were carried out on dialkylimidazolium chloroaluminate molten salts. NMR linewidths measured at ambient temperatures employing a FT-150 spectrometer varied from 60 Hz to 11 Hz in going from $AlCl_3$ concentrations of 0.3 to 0.5N and from 11 Hz to greater than 2000 Hz in going from 0.5N to 0.7N. In the former region linewidths were observed to exhibit a minimum with temperature while in the latter region linewidths were observed to monotonically decrease with increasing temperature. These measurements may permit a fast, non-invasive characterization of molten salt solutions.

SOME ASPECTS OF CARDIAC RISK EVALUATION
AT THE USAF SCHOOL OF AEROSPACE MEDICINE

by

Charles B. Davis

ABSTRACT

Various statistical and biometrical aspects of coronary artery disease screening at the USAFAM are investigated, including the following: the selection of an appropriate data base from which to estimate risk functions; the missing data inherent in any such data base assembled over years, and procedures for using incomplete records in estimation; a multivariate binary/normal distribution suited for those missing data procedures; and the construction of statistical models incorporating measures of disease severity, including two-stage (latent and acute) models of the disease process. The data base constructed as suggested is described, and specific guidance for fitting the proposed models is offered.

A MOLECULAR ORBITAL STUDY OF $\text{NO}_3^- \cdot \text{H}_2\text{O}$,
 $\text{OH}^- \cdot \text{HNO}_3$, AND $\text{H}^+(\text{H}_2\text{O})_m(\text{CH}_3\text{CN})_k$ CLUSTER IONS

by

Carol A. Deakyne

ABSTRACT

The structure and energetics of $\text{NO}_3^- \cdot \text{H}_2\text{O}$, $\text{OH}^- \cdot \text{HNO}_3$, $\text{H}^+(\text{CH}_3\text{CN})$, $\text{H}^+(\text{H}_2\text{O})(\text{CH}_3\text{CN})$, and $\text{H}^+(\text{CH}_3\text{CN})_2$ have been investigated ab initio at the STO-3G and 4-31G basis set levels. Fully optimized geometries have been obtained for the cations and for several conformations of $\text{OH}^- \cdot \text{HNO}_3$. Partial geometry optimization is shown to be sufficient for $\text{H}^+(\text{H}_2\text{O})(\text{CH}_3\text{CN})$. The hydrogen bond in $\text{H}^+(\text{H}_2\text{O})(\text{CH}_3\text{CN})$ is asymmetric and much of the positive charge is localized on the proton; the hydrogen bond in $\text{H}^+(\text{CH}_3\text{CN})_2$ is symmetric and the positive charge is more delocalized. The data on $\text{H}^+(\text{H}_2\text{O})(\text{CH}_3\text{CN})$ are consistent with a hydrogen bond which is stabilized primarily by an electrostatic interaction. The results for $\text{H}^+(\text{CH}_3\text{CN})_2$ are evidence for predominantly covalent binding in the H-bond in that ion. Calculated proton affinities and bond dissociation energies are in reasonable agreement with experiment, particularly when they are calculated via isodesmic reactions. Suggestions are made for follow-on research in these areas.

ANALYSIS OF SEVERAL SOLID PROPELLANT STABILIZERS

BY DC POLAROGRAPHIC TECHNIQUES

by

Donald W. Emerich

ABSTRACT

The polarographic reduction of N-Methyl-p-nitroaniline, 2-Nitro-diphenylamine (2-NDPA), and 4-Nitrodiphenylamine (4-NDPA), resp., was demonstrated using a Princeton Applied Research (PAR) Model 174A Polarographic Analyzer with Drop Timer. The polarographic cell consisted of the PAR two-piece cell body, dropping mercury electrode, platinum counter electrode, and silver-silver chloride in 0.1 formal sodium chloride in methanol as reference electrode. Solutions of the stabilizers were prepared in methanol containing 0.3 formal lithium perchlorate as supporting electrolyte.

Each compound exhibited a single reduction wave (Sampled DC or Pulse modes) or single peak (Differential Pulse mode). Efficient oxygen removal from the solutions is required to secure satisfactory polarograms. Half-wave potentials observed using the Sampled DC mode (versus the above-mentioned reference electrode) were: -0.97 v. for the N-Methyl-p-nitroaniline, -0.80 v. for the s-Nitrodiphenylamine, and -0.86 v. for the 4-Nitrodiphenylamine. The limiting current (Pulse mode) and the peak current (Differential Pulse mode) is directly proportional to concentration, within the limits of precision obtained, for each of the stabilizer solutions, respectively.

An attempt to quantitate the concentration of 4-NDPA in the methanol extract of a solid propellant sample by DC polarography using the Pulse mode and the Differential Pulse mode was not successful due, presumably, to interference by other compounds extracted with the stabilizer that also are reduced at the dropping mercury electrode and at potentials that overlap the wave of the stabilizer. The necessity for separation of the methanol extracted compounds prior to the polarographic quantitation of the stabilizer is evident.

THE IMPACT OF BACKGROUND CHARACTERISTICS

ON OAP TEST SCORES:

DEVELOPING BASELINE INFORMATION

by

Chris W. Eskridge, Ph.D.

ABSTRACT

In an attempt to enhance the validity of the Organizational Assessment Package (OAP) as an organizational assessment instrument, this project sought to determine the nature and extent of the variance in OAP scores that could be explained due to the impact of background characteristic variables, and to develop standardized background test score coefficients to control for the impact of such variables. To achieve this end, the data were subjected to a zero order correlation analysis, an eta² analysis, a breakdown analysis of variance, and a multiple classification analysis.

It was found that background characteristic variables accounted for a significant amount of variance in OAP scores. When controlling for the impact of background characteristics, OAP scores tended to decrease slightly in size. It was additionally found that background information variables accounted for a relatively large portion of the variance in period of time change scores. When controlling for such background factors, most OAP scores still increased over time, but at a reduced rate. These findings emphasize the need and usefulness of the standardized background test score coefficients for both consulting and evaluation purposes.

RADIATION SIGNATURES FROM A SPACE

POWER SYSTEM

by

GLENN E. FANSLAW

ABSTRACT

Magnetic fields produced by the switching currents in the power conditioning circuitry of a space power system are investigated. A theoretical worst-case condition determines the field produced if all of the power available is used to drive a loop antenna. Experimental measurements show that the actual fields radiated from a power system will be much lower than the worst-case condition. It is concluded that the radiation signatures from a space power system would not be easily detectable on the earth.

ACETYLENE TERMINATED SYSTEMS:
QUINOXALINES AND ISOMERIC SULFONES

by
William A. Feld

ABSTRACT

The use of a 95% m-dibromobenzene: 5% p-dibromobenzene mixture in place of pure m-dibromobenzene in a series of cuprous oxide catalyzed coupling reactions was shown not to affect product distributions. It was also determined that cupric oxide gives identical product distributions to those obtained from cuprous oxide. A new symmetrically substituted quinoxaline, 2,3-bis(4-bromophenoxyphenyl)-quinoxaline was synthesized and fully characterized. A one-pot acetylenic coupling reaction involving iodoaromatics and phenylacetylene was developed. Recommendations for using the results of these projects are offered.

A SIMULATION FRAMEWORK FOR THE EVALUATION OF TERRAIN FOLLOWING AND
TERRAIN AVOIDANCE TECHNIQUES

by

John A. Fleming

ABSTRACT

The structure of a simulation for the evaluation of automatic terrain following/terrain avoidance/obstacle avoidance flight is specified. Models for the components of a TF/TA/OA system are proposed. A generator for realistic synthetic terrain is developed and a model for the Digital Land Mass Simulation (DLMS) data base is given and implemented. Finally, a description of the path generation problem is given and research remaining to be done in this area is outlined.

VOLTAMMETRIC STUDIES OF THE LITHIUM/VANADIUM OXIDE

ELECTROCHEMICAL CELL

by

Dennis R. Flentge

ABSTRACT

The cell composed of a lithium metal anode and a vanadium oxide, V_6O_{13} , cathode has been examined using cyclic voltammetry. The cell was found to discharge in several distinct steps and showed reasonable rechargeability. The cell capacity was found to be 80 Ah/kg V_6O_{13} .

by:
Dr. Harold Fox

Abstract

"Project IMP: Institutionalization Methods and Policies at the Business Research Management Center" discusses opportunities for translating future research results into action. This report lays out options only. It does not offer recommendations. The principal findings from interviews and secondary sources are:

1. A focus on institutionalization would alter drastically BRMC's methods and procedures. An illustrative set of new procedures appears in the report.
2. Two major premises of such new management methods are: (a) Institutionalization becomes an integral part of every phase of a project, and (b) User involvement in all phases is imperative.
3. BRMC is at a crossroads, and a new articulation of its mission may be in order. Viewed broadly, the articulation includes a decision on the levels of organizational and financial support. The report discusses many possibilities and their ramifications with respect to BRMC's mission, management process, and organization and staffing.
4. Decision makers can select a combination of policies and methods that melds into a cohesive strategy for institutionalization. In the words of two experts on this subject, referenced in the report, "It would be reckless to suggest that there exists a technique or research style which could force or guarantee implementation success."

SOME PROBLEMS OF LASER VELOCIMETRY AND UNSTEADY AERODYNAMICS OF
CURRENT INTEREST TO THE F.J. SEILER RESEARCH LABORATORY

by
Peter Freymuth

ABSTRACT

The following problems of current interest have been addressed:

- a. The velocity range of the dual beam TSI anemometer has been considered.
- b. The error in velocity measurement due to noise has been considered for the dual beam TSI anemometer as well as for its proposed three-velocity five beam system.
- c. The possible retrieval of a Doppler burst from noise by means of a digital frequency analyzer has been considered.
- d. The use of plexiglass for optical windows of the laser beam system has been explored for practical purposes.
- e. Toward an investigation of the vortical development for a uniformly accelerated airfoil.

EFFECTS OF CLOTH SUBSTRATE AND FINISH ON THE
NITROGEN CURE OF ACETYLENE TERMINATED SULFONE (ATS)
BY TORSION IMPREGNATED CLOTH ANALYSIS (TICA)

by

Joel R. Fried

ABSTRACT

Temperature scans (0-350°C) of acetylene terminated sulfone (ATS) in nitrogen were obtained by torsion impregnated cloth analysis (TICA) using a variety of standard finished and unfinished cloths including quartz, glass, and graphite fabrics. Comparison of results with those obtained by ATS/unfinished glass TICA indicate that the appearance of the highest temperature peak in the loss curve of the unfinished glass sample is not a result of an anomalous curing process but arises from degradation of a cloth impurity, probably an organic binder used in the weaving process. The degradation products are believed to act as a temporary plasticizer for the curing resin. Thermogravimetric analysis and cloth heat treatment experiments support this conclusion. Unfinished quartz has been found to be a superior substrate for TICA applications both for ATS cure studies and as a TICA matrix to study the sub-T_g and T_{ll} transitions of four high temperature engineering thermoplastics.

APPLICATION OF CONJOINT MEASUREMENT THEORY

TO THE QUANTIFICATION OF SUBJECTIVE RATINGS

by

David E. Greene

ABSTRACT

Conjoint measurement theory, as applied to the quantification of subjective ratings, is introduced and evaluated through a prototype example in which measures of aircraft quality are used to compare a new fighter aircraft with other classes of fighter aircraft. An ordinal scale of aircraft quality is determined through pilot rank orderings of cells in a two factor rating matrix. Conjoint measurement theory is used to convert this ordinal scale to one with interval properties. The relationship of additive conjoint measurement with the analysis of variance is noted. Two conjoint measurement methods are considered: monotone analysis of variance MONANOVA and delta-scaling. Additive conjoint measurement in this application has two primary problems. First, unless there are many levels in each factor, slight changes in the rank orderings produce major changes in the measurement scale. Second, it is difficult to determine whether the measurement scale is a true improvement over the ordinal scale. Conjoint measurement theory appears to be especially useful in scaling the factors and in modeling the factor relationships.

SENSOR NOISE AND KALMAN FILTER FOR AIDED

INERTIAL NAVIGATION SYSTEM

by

Gurmohan S. Grewal

ABSTRACT

Inertial Navigation System, barometric altimeter, TACAN, and ILS are used to achieve a synergistic combination of the outputs of individual subsystems. Kalman filter is used to provide an ideal method for data processing in this multisensor navigation system. The filter design begins with the development of mathematical and statistical error models to describe the truth system. The truth model is simplified and reduced, in steps, to lower the computation burden on the on-board computer. The covariance analysis and the Monte Carlo method of testing the performance of the Kalman filters based on reduced and simplified system models are discussed. Suggestions for further research in the area of fault detection and isolation are offered.

CALIBRATION OF WIDEBAND OPTICAL

SIGNAL PROCESSOR (WOSP)

by

Paul B. Griesacker

ABSTRACT

The physical principles of the operation of an electro-optical signal processor using the Coherent Light Valve to modulate the optical wave and a high resolution vidicon TV camera as the output transducer are discussed. System characteristics are presented. System start up and shut down procedures are suggested and system diagnostics are explained. The results of initial calibration and resolution measurements are presented and an exhaustive list of recommendations relative to future development of the WOSP system are listed.

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CORROSION STUDIES OF CALCIUM-THIONYL CHLORIDE

ELECTROLYTE SYSTEMS

by

Vijay K. Gupta

ABSTRACT

The Calcium-thionyl chloride battery system is very attractive from the point of view of combining high energy density with a high degree of system safety. The most pressing problem in this system is the high self discharge rate of Calcium (corrosion). In order to understand the problem of calcium corrosion, the corrosion studies of calcium in thionyl chloride and different electrolytes have been carried out as function of time and temperature. The present study has indicated that calcium metal surface can be effectively cleaned and polished and the metal is highly sensitive to air and moisture. High purity of solvent and electrolytes and the moisture content of chemicals are very significant as far as the corrosion of calcium metal is concerned. Pure thionyl chloride causes less corrosion as compared to lithium or calcium electrolytes. The amount of corrosion increases with the passage of time and the rate of corrosion is significantly affected by the increase in temperature. Further studies incorporating different additives to the electrolyte have been suggested for further work. The use of calcium alloys rather than pure calcium has also been suggested as a possible direction of further research to achieve high energy density and safe battery systems.

AN INVESTIGATION INTO STATE ESTIMATION FOR AIR-TO-AIR MISSILES

by

Kenneth R. Hall

ABSTRACT

The use of modern control theory in the development of the guidance algorithms for homing missiles requires full knowledge of the state vector for producing the optimal control law. In the majority of situations encountered, this state information is not available directly from the measurements but must be deduced from the actual measurements. The process of obtaining the desired state information from the measurements is known as state estimation and is the subject of this study. The estimation procedure requires that a model of the state vector propagation be created, and the output of the model is used to construct estimates of the measurements. As the measurements are made, the discrepancy between the actual measurements and the estimated measurements is used to adjust the state estimates of the model. This study will address the creation of an estimation algorithm (the extended Kalman filter), the application of the theory to the missile control problem, and then discuss the use of the available information in allowing the filter algorithm to adapt to the noise characteristics of the problem. Numerical results are obtained and compared to information from other sources. Suggestions for further research are offered.

OPTIMAL RECOVERY FROM CRATERING ATTACKS
ON AIRBASE PREPARED SURFACES

by

R. Michael Harnett

ABSTRACT

The problem of locating minimum-repair areas on airbase prepared surfaces which meet operational requirements is addressed. Both runways and taxiways are considered. An algorithm is described which achieves exact optimal solutions for the runway problem recognizing variation in crater repair difficulty. The algorithm is shown through computational experiments to feature increased computational efficiency compared to existing solution methods. An algorithm is described which achieves exact optimal solutions for the taxiway problem recognizing variation in crater repair difficulty. Computer codes for the algorithms are provided. Suggestions for further research in this area are offered.

INFRARED CLUTTER: EFFECTS OF AIR MOTION
PRODUCED BY AURORAL ZONE JOULE HEATING

by

Ronney D. Harris

ABSTRACT

Irregularities, or clutter, in the earth's infrared profile may cause problems in Air Force infrared surveillance systems. One such irregularity may be produced by particle precipitation and Joule heating in the auroral zone. Vertical air motion induced by this heating can carry infrared active molecules above the dissociation level resulting in patches of enhanced infrared radiation scattering. A two-dimensional self-consistent model of the neutral gas motion has been developed. The problems associated with a general numerical solution of the Navier-Stokes equations for compressible gases have been discussed, and a specific scheme to solve these equations for our model are outlined.

CATABOLISM OF TOLUENE IN THE BLUEGILL SUNFISH

by

Franklin D. Hill

ABSTRACT

The catabolism of toluene by bluegill sunfish exposed to a high, non-lethal, aqueous concentration of the non-labelled hydrocarbon is investigated. No catabolic product of toluene could be identified in fish bile following hydrocarbon exposure. The inability to identify certain expected catabolic products is discussed. Suggestions for further research in this area are offered.

STUDIES OF THE ENGINEERING DESIGN PROCESS:
DESIGN OF EXPLOSIVELY DRIVEN GENERATORS; HUMAN
FACTORS IN HAZARDOUS ACTIVITIES

by

Francis J. Jankowski

ABSTRACT

This study looks at two design problem areas for insights into developing better engineering design methods. An examination of current practice in explosively driven magnetic compression generators shows a need for emphasizing the systems approach, with attention to efficiency, safety factors and constraints, and evaluating alternative approaches. Conservative and "forgiving" design approaches are proposed for initial engineering designs.

The application of human factors to improving safety in hazardous activities is examined. A study of accident statistics suggests that other countries, particularly Japan, may have a better safety record than the U.S.A. Japanese business and management practices are reviewed; these may have application to safety. Several stress and stress-related factors are examined. Reducing high stress will improve safety. A systems approach to the application of human factors to the improvement of safety appears essential.

Suggestions for the execution of engineering design and for further research are offered.

IMPACT OF CYLINDRICAL RODS ON RIGID BOUNDARIES

by

Stanley E. Jones

ABSTRACT

A new formulation of the normal rod impact problem is given. The rod is divided into two regions: that which is undergoing plastic deformation and that which is not. The material formulation in the plastic zone is discussed in detail, along with an application to the rigid/perfectly plastic rod. Conclusions and recommendations are given in the last section of the report.

An Information-Theoretic Approach To Target Estimation
of a Conical Scan Controlled Laser Radar Tracking System

by:

Dr. Paul Kalata

ABSTRACT

High energy laser systems with highly accurate measurements as target tracking sensors use a conical scan process to obtain a target capture and tracking within the narrow beamwidth. This searching process and the target tracking algorithm are major factors in the performance of the laser radar/target tracking system. The summer research results presented in this paper use information-theoretic concepts in establishing laser radar/target tracking performance bound independent of the filtering algorithm. A computer program was developed to calculate the lower bound of the estimation error variation due to a dithered signal, non-linear gaussian glint measurement process.

ELECTRICAL CHARACTERIZATION
OF ION IMPLANTATION IN GaAs

by

Richard Kwor

ABSTRACT

Two separate projects are reported. The first is the study of the effect of two-stage annealing of sulfur-implanted GaAs. Electrical activations for samples annealed at 900 °C for 15 min. are compared with samples annealed at 700 °C for 15 min. and then 900 °C for 15 min. The results show a slight improvement of mobility and activation for two-stage annealed samples. Further research in this area is suggested. The second part is the fabrication and testing of Se-ion implanted MESFETs made from GaAs substrates obtained from various suppliers. The FET performances are used in a study of the correlation between device characteristics and substrate properties.

A REVIEW OF CURRENT DATA BASE SYSTEMS FOR FLEXIBLE MANUFACTURING

by

Dr. Richard Liu

ABSTRACT

Three different data base models; namely, hierarchical, relational and network, are reviewed. Related data base schema designs are discussed.

HOMOGENEOUS COMPRESSION OF RAPIDLY SOLIDIFIED

ALUMINUM POWDER ALLOY BILLETS

by

William S. McCain

ABSTRACT

A program to collect data required for developing constitutive equations for compressible solids was initiated. Billets of partially dense, rapidly solidified aluminum alloy CT-91(x7091) were warm and hot compressed under homogeneous strain conditions to develop flow curves and strain rate sensitivity data. These data are to form the basis for further work in materials behavior modeling, process modeling and process model validation.

IMAGING RADAR AUTOFOCUS UPDATE OF AN
INERTIAL NAVIGATION SYSTEM BY MEANS
OF A KALMAN FILTER

by

William S. McCormick

ABSTRACT

The value of an Autofocus update of an INS is investigated. Three cases are considered: (1) centripedal acceleration only; (2) centripedal and line-of-sight acceleration; and (3) centripedal and line-of-sight acceleration as well as attitude error effects. The extended Kalman filter configuration was employed using the versatile SOFE Monte Carlo simulation program. Measurement matrices were defined for each of the three cases. Simulation results indicated an observability problem for Case (1). Suggestion for further work was included.

THE UTILITY OF THE ANIMAL MODEL CONCEPT

BY

DONALD F. MCCOY

ABSTRACT

The evaluation of aircrew performance can be accomplished in two separate but related ways. First, one can explore and describe the performance capabilities of the human operator under various simulated environments. Second, a researcher can use the behavior of an animal (preferably a primate) as a performance model for that of the human operator. Perhaps this simpler approach will lead to the discovery of fundamental behavioral mechanisms which support aircrew performance. Additionally, the animal preparation enables the use of various invasive procedures through which physiological substrates of performance can be elucidated. The viability of the animal model concept was delineated in two general ways during the reporting period. First, the utility of the animal preparation was described in a series of weekly seminars dealing with the logic, methods and application of animal learning concepts. Second, two animal behavior studies were initiated during the 10 week report period. These studies are currently in progress. It is believed that the results of these studies will demonstrate the viability of the animal model concept. Suggestions for future research along these lines are offered.

ABSTRACT

VIBRATION-ROTATION RELAXATION IN THE HF LASER

by

Dr. Henry McGee

The literature on rotational and vibration relaxation in HF has been reviewed. The rates of these processes are critical to the design of large devices such as ALPHA, and yet our understanding is meager. The areas of minimum understanding are identified and the recommendations are made for further work.

APPROPRIATE FAR-FIELD BOUNDARY CONDITIONS FOR THE
NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS

by

Patrick J. McKenna

ABSTRACT

The problem of prescribing fictitious far-field boundary conditions at an artificial boundary is discussed. Several boundary conditions which have been used in the literature are compared with two newly proposed sets. The proposed boundary conditions are shown to be non-reflecting and superior in both accuracy and time to convergence. Graphs showing the numerical results for the different types of boundary conditions are displayed and the wave motion is demonstrated. In particular, reflecting boundary conditions are shown give rise to fictitious variations of a periodic wavelike nature.

CONSTITUENT MONITORING OF EVAPORATION SOURCE PLUMES

by

Dr. J. R. McNeil

ABSTRACT

Thin film physical characteristics depend to a great extent upon the techniques used for deposition. In particular, films of ThF_4 have been deposited from different sources (boats, e-beam, etc.) and have displayed different absorption characteristics. A system of monitoring plume constituents has been implemented that employs mass spectroscopy. Drawbacks to this approach include low sensitivity for detecting plume constituents. Plans have been made to modify the deposition system in order to improve the sensitivity. Optical absorption and emission spectroscopy have been evaluated, but these techniques also appear to have low sensitivity to species in the plume, particularly molecular and impurity constituents.

DEVELOPMENT OF A COMPUTER ASSISTED
AIRCRAFT LOAD PLANNING MODEL

by

Louis A. Martin-Vega

ABSTRACT

The main objective of this applied research effort was to assist the Logistics Planning Office at Gunter AFS in their attempts to describe, model and develop computer assisted approaches to the aircraft load planning problem. Part of the research effort involved visits to locations where actual deployments were carried as well as meetings with experienced load planners throughout the course of the study. Information gathered from these visits and meetings was analyzed and documentation concerning the way the aircraft loading problem is approached by load planners was developed. A test data base was also developed and used to compare loading plans generated by manual load planners with existing computer assisted approaches. These comparisons resulted in a consensus that existing computer assisted approaches are still of limited practical value. Based on the insight obtained from the analysis, documentation and testing, a general methodology was developed which could serve as a foundation for the future development of computer assisted approaches. The feasibility of using microcomputer technology to assist in aircraft load planning was also explored yielding what appears to be a very promising area for future applied research in this area. Suggestions for basic research into the mathematical structure of the aircraft loading problem are also included.

A MODEL FOR CATH DATA AND SOME RESULTS ON THE
ARBITRARY RIGHT CENSORED DATA

by

Kishan G. Mehrotra

ABSTRACT

Two problems of interest in bio-statistics are considered in this paper. In the first part we discuss a model which can be used to predict the amount of blockage in arteries, given some important factors such as age, cholesterol and blood pressure. How well this model explains the data, collected at the School of Aerospace Medicine, Brooks AFB, Texas, is currently under investigation.

The problem of comparing two populations when the data is collected with arbitrary right censoring is also investigated. In past ten years several tests have been proposed to compare two populations under arbitrary right censoring schemes. First we prove that several, seemingly different, two sample tests are the same. Next, we perform a small sample study to compare the power and asymptotic level of significance of these tests.

A DIRECT STATE SPACE APPROACH TO
THE CONTROL OF SAMPLED-DATA SYSTEMS

by

David F. Miller

ABSTRACT

Simple and direct algorithms for the control of multivariable sampled-data systems are presented. Both the digital redesign and the direct digital design problems are considered. A "period optimal" digital control problem is formulated, and a general solution methodology is discussed. Emphasis is placed upon developing adaptive control design methods which are uncomplicated, responsive, and which avoid the computational complexities of many conventional state space techniques. Complete algorithmic solutions of the output matching and signal tracking problems for linear systems are given. In both cases, the solutions reduce to solving systems of linear equations. A unique feature of this work is the effective incorporation of conventional data holds into the digital controller for the purposes of smoothing and predicting sampled signals. A simple numerical example illustrates the effectiveness of the output matching algorithm.

TRANSIENT ANALYSIS OF STRUCTURES
WITH DISTINCT NONLINEARITIES

By
Levon Minnetyan

ABSTRACT

A new hybrid method is formulated for the transient response analysis of certain structural systems with isolated nonlinear components. The method is aimed to achieve an optimal solution path that will reliably predict the dynamic response of all structural components. Options on substructuring and requirements for orthogonality of rigid body and flexible modes are stated. The solution procedure incorporates a time-history analysis of the nonlinear response with a frequency domain analysis of the linear modes. The linear modes that affect the response of nonlinear structural components are also included in the time-history analysis. The resulting nonlinear response time-histories are used as external inputs for the analyses of linear substructures. The response of linear structural components is determined through the frequency domain. The frequency domain analysis uses a larger number of modal coordinates to realistically simulate the details of substructural response. The application of the method to the modeling of taxiing aircraft is studied.

PLASMID FINGERPRINTS OF STAPHYLOCOCCUS AUREUS STRAINS
ISOLATED FROM A TOXIC SHOCK SYNDROME FEMALE PATIENT

by

Rex C. Moyer

ABSTRACT

The objective was to use plasmid fingerprinting as a means of identifying various strains of a bacterial pathogen isolated during disease outbreaks among Air Force personnel and to determine if it would help track nosocomial infections.

Four isolates of Staphylococcus aureus from the urine, cervix, and throat from a female patient with toxic shock syndrome which could not be differentiated by conventional techniques were used as models. Escherichia coli V517 and other strains with plasmids of known molecular weight were used as reference DNA. Plasmid DNAs were purified by several techniques (and modifications thereof). DNAs were electrophoresed on 0.8% agarose vertical slab gels. The electropherograms were stained with ethidium bromide and photographed with long wave UV light. Molecular weights of plasmid DNAs were estimated by comparison of their migration with plasmids of known molecular weight. The plasmid fingerprints of S. aureus isolates from the 3 different body sites were all unique but plasmid fingerprints from the two isolates from urine were identical. Different

DNA isolation techniques yielded different plasmid fingerprints, therefore, precise numbers of plasmids and their molecular weights were not obtained.

I conclude that plasmid fingerprinting can differentiate various S. aureus strains and probably will be useful for tracking nosocomial infections.

AN INVESTIGATION INTO THE NATURE OF THE MELTING LAYER
IN STRATIFORM CLOUDS

by

Dr. Steven B. Newman

ABSTRACT

Research into the nature of the melting layer in mixed stratiform clouds has been conducted in the Cloud Physics Branch of the Air Force Geophysics Lab (AFGL). An extensive reference list has been compiled, covering some 35 years of published work concerning the melting layer and the radar bright band.

In addition, the problem of defining the boundaries of the melting layer have been examined. It is postulated that the 0°C dry bulb isotherm may not always be the best threshold level for the top of the melting layer. Instead, the 0°C wet bulb level is examined, and a relationship between airmass stability and the height difference between these two levels is developed. The lower boundary of the melting layer remains undefined, primarily due to lack of a concrete definition of the "end" of melting.

A simple model of snowflake aggregation and breakup has been developed. It is shown that at reasonable cloud ice contents, the aggregation and breakup of snowflakes just above the melting layer results in considerable ice multiplication, as well as growth. The increase in both size and number concentration of snowflakes entering the melting layer may play a considerable role in enhancing the radar echo intensity in the melting layer resulting in the radar bright band.

JET SIMULATION PARAMETERS FOR WIND TUNNEL MODEL

THRUST REVERSER TESTING

by

Eugene E. Niemi, Jr.

ABSTRACT

An investigation is made of the simulation requirements necessary for wind tunnel tests of aircraft models using thrust reversers. Dimensional analyses are reviewed to determine the kinds of parameters that theoretically must be scaled to accurately represent a thrust reverser test. Previous test results are examined as a guide in deciding which of these parameters are most important in simulation.

It is found that the following parameters should be simulated to get reliable wind tunnel test data from thrust reversers: ratio of jet exit static pressure to free stream static pressure, p_e/p_∞ ; jet exit Mach number, M_e ; jet exit specific heat ratio, γ_e ; and product of gas constant and temperature of exiting jet, $(RT)_e$. Various gases are suggested for use in wind tunnel tests, based on these results.

The hysteresis effect in thrust reverser flow attachment to an aircraft fuselage is examined. Suggestions for future research in this area are made.

Recommendations for future wind tunnel tests to study thrust reverser behavior are made. Several types of tests are recommended.

ANALYSIS OF THE 60 KVA PERMANENT MAGNET
ALTERNATOR AND A NEW ROTOR CONCEPT
FOR THESE TYPE MACHINES

by

Samuel Noodleman

ABSTRACT

The design of the 60 KVA alternator as used in the VSCF Power Generating System was reviewed and calculations made of the flux distribution in the machine.

The study concentrated on the permanent magnet rotor design. An analysis of the flux produced by the magnets in the rotor with the present tangential configuration shows that much of the flux is lost in leakage. Only about 50 percent of the magnetic field as generated in the permanent magnets reaches the stator windings and generates useful electrical energy.

A rotor design using the permanent magnets in a radial orientation is proposed. This concept requires less permanent magnet material and will provide more electrical output for the same size and weight. Because the fields generated by the currents in the stator windings do not link as much iron in the proposed rotor, the stator winding inductances are reduced and the inherent voltage regulation of the alternator is improved.

An analysis is also made of the new rotor concept with higher energy rare earth-cobalt magnet materials and some of the design changes required to better utilize this type permanent magnet material.

THE EFFECTS OF JP-4 AVIATION FUEL ON SPECIFIC INTERNAL ORGANS

OF THE FAT-HEAD MINNOW, PIMEPHALE PROMELUS

by

William N. Norton

ABSTRACT

Water-soluble fractions of petroleum-derived JP-4 fuel induce ultrastructural alterations of the kidney, gill, pseudo-branch and nasal epithelium of the fat-head minnow, Pimephale promelus. There appears to be no common ultrastructural effect among the organs studied in regard to the degradation of a specific cellular organelle. The sole tissue which exhibits extensive cellular degradation is the nasal epithelium. The lesions are manifested in the form of myeloid bodies and electron-dense figures. A proliferation of vacuoles and a disruption of mitochondria-tubule complexes is evident in the pseudo-branch of experimental fish. Cellular membranes associated with the surface of gill filaments and secondary lamellae maintain their integrity throughout the investigation, however, focal sites of pillar cell degradation are evident. Within the kidney endothelial cells associated with convoluted tubules undergo degradation as characterized by the fragmentation of plasma membranes.

OBSERVATIONS OF SUNSPOT DYNAMICS AND
THEORETICAL EFFECTS OF INHOMOGENEITIES
IN THE SOLAR CONVECTION ZONE

By

Alan H. Nye

ABSTRACT

Observations giving high resolution in wavelength, time, and horizontal space were taken of sunspots to determine the characteristics of oscillations at different heights. There was a high correlation between velocity and magnetic field fluctuations in the umbral photosphere. These oscillations excite waves which move the penumbra vertically in phase. There was no correlation between velocities observed at chromospheric and photospheric levels. This implies that wave mode eigenfunctions are sharply peaked in height, which imposes useful constraints on any theoretical sunspot model.

Observations of the surface of the solar convection zone show the presence of trapped nonradial acoustic waves whose frequencies shift with time. A theoretical analysis of a simple model shows that inhomogeneities in the sound speed will lead to shifts in the eigenfrequencies of the trapped modes. An arbitrary two dimensional perturbation on a uniform sound speed is decomposed into its fourier components, each of which causes a shift of a single eigenfrequency. The eigenfunctions are all perturbed which leads to a spreading of the ridges in the (k, ω) plane similar to those observed.

DEVELOPMENT OF A MANUAL OF USE FOR

CONJOINT SCALING TECHNIQUES

by

Thomas E. Nygren

ABSTRACT

Conjoint measurement methodology offers a new and potentially useful approach for obtaining psychological scale values for components of multi-dimensional attributes. An investigation of this methodology and its mathematical foundations was conducted. Six computer based algorithms that can be used to perform specific kinds of conjoint analyses were generalized and documented for wider application as subjective assessment techniques. Following a discussion of the mathematical foundations, the six programs (CONJOINT, PCJM2, NONMETRG, MONANOVA, DISTRIB, and DUALDIST) are each summarized with respect to their function as conjoint analysis techniques. Shortcomings of the current state of lack of systematic research efforts dealing with methodological and statistical issues in conjoint analysis are discussed. Suggestions for further research are then presented.

EVALUATION OF NASTRAN TO PREDICT THE DYNAMIC
RESPONSE OF REINFORCED CONCRETE

By

William W. Payne, Jr.

ABSTRACT

This report evaluates the ability of the finite element program NASTRAN to analyze reinforced concrete structures under dynamic loads. Experimental data from a quarter scale model test of an underground shelter was used to validate the computer projections.

NASTRAN is a general purpose structural analysis program containing several types of finite elements and several displacement analysis approaches. For this study five different computer models of reinforced concrete were used. The models were composed of the following elements:

1. Plate membrane elements.
2. Plate membrane and rod elements.
3. Plate bending elements.
4. Plate bending-membrane elements.
5. Plate bending-membrane and beam elements.

Static Analysis and Transient Analysis Approaches were used to evaluate the computer model.

Favorable results were obtained for the plate membrane and rod element model using the Transient Analysis Approach. Strain in the reinforcing rods, time to maximum strain, and time to return to zero strain were used to compare the experimental data to the computer predictions.

AN ANALYSIS OF THE AVAILABILITY, ACCESSIBILITY
AND TIMELINESS OF COST DATA ASSOCIATED WITH
THE AFLC AIRCRAFT MODIFICATION SYSTEM WITH
EMPHASIS ON CLASS IV MODIFICATIONS

by

John E. Powell

ABSTRACT

Modification of existing Air Force systems is receiving increased emphasis when faced with escalating costs of labor and materials associated with obtaining replacement systems. Approximately ninety percent of all modifications are designated Class IV and are concerned with safety of flight, mission essential and logistics as contrasted with Class V modifications which are designed to provide a new or improved capability. Approximately 80% of the Class IV modifications are IV-B, mission essential. It is not possible to budget all Class IV modifications required to maintain and update USAF aircraft. This research project looks at currently used allocation methods and observes several possible shortcomings. Suggestions are made for further research associated with the costing and prioritizing algorithms.

THE AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
RESEARCH AND DEVELOPMENT PLANNING PROCESS

by
Robert H. Puckett

ABSTRACT

The AFWAL research and development planning process is investigated from the viewpoint of political science. Suggestions are offered concerning how AFWAL could interface more effectively with the external environment. The results of interviews with Air Force and Department of Defense officials in Washington, D.C., are presented. The contention is made that Air Force research and development planning must be integrated with (a) international political forecasts and (b) international context analysis. Suggestions for further research in this area are offered.

COUPLING REACTIONS AND REARRANGEMENTS OF 1,3,5-TRIAZINES

by

G. Fredric Reynolds

ABSTRACT

Some unique chemistry of s-triazines is described involving the coupling of organic substrates containing acidic protons to the halogen sites on the triazine ring. In this manner, chains and rings of s-triazines can be formed. Rearrangements of oxygen-substituted s-triazine esters to nitrogen-substituted s-triazine esters are described, and a mechanism for the catalyzed rearrangement is proposed that is consistent with the kinetic data obtained.

ADSORPTION OF TRICHLOROETHYLENE BY SOILS
FROM DILUTE AQUEOUS SYSTEMS

by Richard O. Richter

ABSTRACT

The adsorption of trichloroethylene (TCE) onto inorganic soil fractions was studied to determine whether these materials might be significant sinks for chlorinated hydrocarbons. Results indicate that inorganic soils adsorbed TCE in the following order of capacity: goethite, kaolinite, amorphous manganese oxyhydroxide, montmorillonite. Organic peat and a soil from a TCE-contaminated aquifer were also used as adsorbents. As expected due to its organic carbon concentration, the peat had a greater capacity to remove TCE from solution. The aquifer soil had a capacity between that of kaolinite and manganese oxide. Freundlich adsorption isotherms were developed for the soils and K and $1/n$ values were determined.

Calculations using the isotherm equations for the inorganic soils and the octanol/water partitioning adsorption equation of Karickhoff indicate that when the amount of organic carbon in a composite soil is small compared to the clay content (less than 1 to 5), it is possible for the inorganic fraction to control the adsorption of TCE.

Further adsorption studies, both batch and column should be conducted to learn the behavior of halogenated hydrocarbons, such as TCE, in groundwater aquifers. The role of the inorganic soil fraction in the adsorption process should not be underestimated.

THE EFFECTS OF 2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN (TCDD)
ON
TRIIODOTHYRONINE (T₃) BINDING TO RAT ISOLATED HEPATIC NUCLEI

by
JOHN J. RIGGS

ABSTRACT

The toxic effects caused by 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) are remarkably similar to those caused by certain long-chain perfluorinated fatty acids. The Air Force is interested in these chemicals because TCDD was a contaminant of herbicide formulations used in Vietnam and derivatives of the perfluorinated fatty acids are used today as surfactants in fire fighting foams. Their mechanisms of toxicity, in particular TCDD, remain unknown. Because of the structural similarity between TCDD and triiodothyronine (T₃), it was of interest to determine if TCDD antagonized the binding of T₃ to its nuclear receptor sites. Animals were treated with a single dose of TCDD (50 µg/kg IP) and sacrificed 7,9,14, and 21 days after treatment. The livers were removed, nuclei were isolated, incubated with 0.5 pM of radioactive T₃ solution alone or with increasing amounts of non-radioactive T₃ (1.0 to 1000 pM). In the control animal (acetone/corn oil) 6% of incubated T₃ was specifically bound to the Triton X-100 washed nuclei. Treated animals sacrificed at 7,9,14, and 21 days showed a decrease in specific T₃ binding of 65%, 80%, 98% and 98%, respectively. The data clearly showed a decrease in T₃ binding capacity in TCDD treated animals. A Scatchard plot showed a single class of T₃ binding sites, with an apparent association constant of $7.8 \times 10^8 \text{ M}^{-1}$, and a binding capacity of 1.36 picomoles T₃ for nuclei obtained from 0.25g of liver.

VISUAL CUES IN THE SIMULATION OF LOW LEVEL FLIGHT

by

Dr. Edward J. Rinalducci, Ph.D

ABSTRACT

Visual cues used by pilots to maintain altitude in low level flight simulation were examined. In particular, terrain texture in the form of black vs. white topped inverted cones, the presence or absence of vertical development, and the effects of rate of motion on terrain features were investigated using pilots who varied in flying experience. Less experienced pilots demonstrated increases in their mean altitude and RMS deviation with an increase in airspeed or with an increase in airspeed combined with a lack of vertical development in terrain features. Experienced pilots on the other hand, only showed increases in mean altitude and RMS deviation with an increase in airspeed. No differences were found between all black and white topped cones. Suggestions are made for application of research findings to CIG development and pilot training.

A METALLURGICAL INVESTIGATION OF THE INTERNAL BRONZE
MANUFACTURING PROCESS OF Nb₃Sn SUPERCONDUCTING WIRE

by

DR. JOHN MELVILLE ROBERTS

ABSTRACT

An introductory basic type of metallurgical investigation has been carried out on nominally 13 wt.% Sn bronze rods and Nb/bronze multifilamentary composite wires. These studies have included optical metallographic, scanning electron microscopy and x-ray microprobe techniques. Preliminary ageing studies of the quenched in metastable α phase in 13 wt.% Sn bronze have been made up to 220°C. This program of study was carried-out in an attempt to learn more about unwanted and often premature failures occurring in these Nb/bronze multifilamentary wires during manufacture. Defects such as voids, chemical inhomogeneities, tin rich phases and abnormally large and possibly discontinuous Nb filaments in these wires have been observed. The consequences of these defects upon the success of manufacturing high quality Nb₃Sn superconducting wire are briefly discussed. The concept of the "limiting bronze grain size" and possibly the "limiting sub-grain structure size" imposed upon the bronze matrix by the Nb filaments has been discussed and preliminary observations of these effects are presented. Numerous suggestions for further research in this area are offered. The concept of a new matrix alloy for the internal bronze process is suggested and it is pointed out higher temperature superconductors, i.e. better than Nb₃Sn, should be investigated.

INVESTIGATION OF THE MECHANICAL PROPERTIES
OF LESS THAN 100% DENSE TITANIUM POWDER
METALLURGY COMPACTS

by

Thomas A. Roth

ABSTRACT

A possible method to improve the mechanical properties of porous powder compacts by altering the surface condition of the compacts through the use of shot-peening to reduce surface porosity is used to study the tensile properties of elemental blend Ti-6Al-4V. The effects of a stress-relief treatment of the shot-peened material are considered. Tensile test data, along with studies of the porosity and microstructure, suggest improvement is to be found in the fatigue behavior of the material rather than in the tensile properties. Suggestions for further research examining the effect of shot-peening on the fatigue behavior of the less than 100% dense material are offered.

Application of Task Analytic Techniques to the Design
of A Flight Simulator Instructor/Operator Console

by

Charles D. Sanders

ABSTRACT

Instructional Systems Development (ISD) has contributed to the efficiency and low cost of air flight training through the medium of the simulator. Task analysis is a component of ISD, and its application to the improvement of devices such as simulator instructor/operator consoles will continue to enhance the quality of flight training. Task analytic techniques are inextricably interwoven into the design of an instructor/operator console. The application involves the process, persons, and a machine within the context of a flight simulator. The tasks of the instructor and student are primary in the design process. The efficiency and economy of the task analytic process has implications for its use in the future developments of automated flight training.

STUDY OF DYNAMIC BEHAVIOR OF
A BLUFF-BODY DIFFUSION FLAME IN THE APL
COMBUSTION TUNNEL FACILITY

by

Sarwan S. Sandhu

ABSTRACT

An experimental study to gain insight into the dynamic behavior of the combustion process in the APL combustion tunnel facility has been initiated with the intent of utilization of information attained from such a study to develop a mathematical model for the prediction of combustion process in a combustor of the APL combustor type. From the preliminary data acquired dependence of fireball frequency and velocity on air/fuel flow rates, effect of axial location on the frequency, and, fireball and nonemitting region number distribution versus time length are presented. A qualitative global mechanism for relative increase or decrease in fireball frequency is proposed.

SHEAR-WAVE VELOCITY STRUCTURE DETERMINED
FROM ANALYSIS RAYLEIGH-WAVE GROUP-VELOCITY DISPERSION

by

Gerald W. Simila

ABSTRACT

The moving window technique has been utilized successfully to extract group-velocity dispersion data from high-explosive ground motion records. Fundamental Rayleigh-wave group-velocities (225-264 m/sec) have been determined for period range 50-164 msec. The Haskell method has been used to model the dispersion data. The resulting shear-wave velocity distribution for the McCormick Ranch test site is $V_s = 244-400$ m/sec for depth range 0 - 22 m. In addition, possible body wave dispersion has been observed. Suggestions for further research in this area are presented.

OPERATING VARIOUS SUBSYSTEMS OF THE TOTAL
SIMULATION SYSTEMS FOR FLIGHT TRAINING

by

Dr. Vina Sloan

ABSTRACT

In order for these results to be valid, it is necessary for the configuration and performance of the subsystems involved be known and to remain constant during the research project so that measured performance variation can be correctly attributed to subjects performance variations. In addition, that configuration control should be maintained over the entire system so that intellegent decisions can be made regarding the allocation of resources and establishment of priorities for the development of the system. This refers and is directed toward establishing these configuration control policies.

ENHANCING CAREER DEVELOPMENT AT THE AIR FORCE ROCKET
PROPULSION LABORATORY

by

Russ Smith

ABSTRACT

The importance of an effective career development program for an R & D organization, especially for a major Air Force laboratory is investigated. There was widespread interest in an enhanced program at the Rocket Propulsion Laboratory. An exhaustive analysis of top management's concerns, capabilities and constraints of the military and civilian personnel systems, supervisors' and managers' criteria for selection, promotion and transfer, and employees' expectations of a career development program was conducted. This research led to the generation of twenty-five recommendations. Suggestions for further research in this area are offered.

DEVELOPMENT OF A COMPUTER ALGORITHM FOR THE AUTOMATIC DETERMINATION OF SPACE
VEHICLE POTENTIAL UTILIZING ELECTROSTATIC ANALYZER MEASUREMENTS.

by

Stanley L. Spiegel

ABSTRACT

A real time technique for determining space vehicle potential using electrostatic analyzer (ESA) positive ion count data has been developed. The method involves examining the count ratios in adjacent ESA energy channels and searching for a precipitous increase in this ratio with increasing energy, or alternatively for a statistically significant increase in the plasma distribution function, derivable from the ion counts. The satisfaction of either condition indicates charging to the level of the higher ESA channel. Tests of the algorithm, using data from the P78-2 satellite have shown excellent agreement with independent estimates of vehicle potential. Hence the algorithm appears suitable to be employed with an ESA of appropriate design for the purpose of automatically activating discharge mechanisms should vehicle potential exceed some critical value.

PLASTIC ROTATING BAND LOADS AND SLIDING RESISTANCE FORCES

by

A. Kent Stiffler

ABSTRACT

A theory is presented for the determination of the projectile resistance forces in interior ballistics. Emphasis is placed on the engraving process for plastic rotating bands. It is proposed that the normal contact stress is constant during engraving and is given by the material flow pressure. Normal loads and friction forces are dependent on the growth of the contact area. The theory is in agreement with experimental data.

The contact stress following the engraving process can be changed by several dynamic sources: (1) projectile spin; (2) projectile compression from acceleration; (3) gas pressure on the barrel wall; (4) rotating band wear. These sources are examined to establish post-engraving contact stresses.

Suggestions for further research on high velocity friction coefficients are offered.

BINARY AND TERNARY COMPOSITIONS AND THEIR PHYSICAL PROPERTIES

by

Lawrence Suchow

ABSTRACT

Literature studies have been made on (1) compositions with the nickel arsenide structure, (2) growth of large, untwinned crystals of cadmium telluride, and (3) preparation of mercury cadmium telluride thin films. Area 1 will be the basis for an Air Force minigrant proposal for follow-on research. Laboratory research recommendations are also made in areas 2 and 3. A fourth area of endeavor has led to a new explanation of the effectiveness of adding impurities as a means of growing dislocation-free indium phosphide crystals from the melt. A paper on this topic will be submitted for publication, and a recommendation for use of the explanation in designing laboratory experiments is given.

A SYSTEM DYNAMICS MODEL
OF THE ACQUISITION PROCESS

by

Patrick J. Sweeney

ABSTRACT

Numerous instances have been reported concerning cost overruns, delivery delays, and substandard performance characteristics of acquisitions in government and industry. The dynamic models in this report assess portions of the acquisition process as dynamic feedback systems. The report includes sub-models of the Technology, Weapon System, Financial, Resources, Production and Operations Sectors. Additional work will include the Need, Political, Allied, and Enemy Sectors. Continuations of the effort will include bringing the ten sub-models together into one major model. The model should then be tested and validated. The final result will be an all inclusive dynamic computer simulation model of the functioning acquisition system in the Department of Defense. This model can then be used as a policy evaluation mechanism.

ANALYSIS OF MAINTENANCE DECISIONS AT LOWER
ECHELON LEVELS INVOLVING JET AIRCRAFT ENGINES

by

Charles J. Teplitz

ABSTRACT

The existence of diagnostic errors in the decision processes of jet aircraft engine maintenance is investigated. The sources of such errors and their remedies have often gone undiscovered. The effort discussed in this paper was designed (1) to provide a conceptual framework for the analysis of decisions in the maintenance process on jet aircraft, (2) to illustrate the interactions between various factors affecting maintenance decisions, and (3) to identify some major sources of diagnostic errors. Using a simulation model of the maintenance process, insight was gained into the causes and effects of diagnostic errors on jet aircraft maintenance. Suggestions for further research in this area are offered.

A Study of the Interaction of Hydrazine Methylhydrazine and Unsym-dimethylhydrazine with Porphyrins, Metalloporphyrins, and some Metal Coordination Compounds

by

Albert N. Thompson

Abstract

Hydrazine, Methylhydrazine and Unsym-dimethylhydrazine have been shown to react favorably with some porphyrins, metalloporphyrins and first transition series metal coordination compounds. The reaction of the hydrazines with certain porphyrins suggests an initial acid-base reaction followed by an oxidation reduction process. An oxidation reduction reaction is also observed for the reaction of the hydrazines with the metalloporphyrins and the transition metal compounds. The metals in both the metalloporphyrins and the metal compounds are reduced by the hydrazines to lower oxidation states.

Suggestion for follow up research in the area of hydrazine chemistry are given.

GaAs MESFET MODELING

by

Arthur R. Thorbjornsen

ABSTRACT

A mathematical model of a GaAs MESFET has been incorporated into a standard integrated circuit analysis program (SPICE2G). Because of their proprietary nature, it is difficult to obtain a copy of a circuit analysis program that contains a built-in MESFET model. This report contains detailed information on how holders of the SPICE2G program may modify their program to include a GaAs MESFET model. The model is valid for nonlinear DC analysis, linear AC small signal analysis, and nonlinear transient analysis. The results of several example circuit simulations are given. Some directions for future research are also given.

COVERING PROBLEMS IN

C³I SYSTEMS

by

Richard Van Slyke

ABSTRACT

A common problem in the study, design, and deployment of Command, Control, Communications, and Intelligence (C³I) Systems is minimizing the cost of satisfying various kinds of coverage requirements. Two examples are repeater coverage for terminals in tactical radio networks and radar surveillance. Mathematical techniques for finding optimal coverings have been well studied by the Operations Research community. Unfortunately, previously developed techniques ignore requirements of particular concern to the Air Force. Most important of these is the need for redundant coverage to provide reliability and to reduce vulnerability to attack. Also of concern is the need for algorithms that have guaranteed computation time requirements for use in real time applications. New algorithms for finding coverings satisfying these requirements are described. The results of extensive testing are reported. An experimental computer implementation is described. Finally, these techniques are applied to radio repeater location in tactical communication networks in Western Germany.

EFFECTS OF ACOUSTIC DISTURBANCES ON THE
BOUNDARY-LAYER TRANSITION IN AEDC WIND TUNNELS

by

Dr Venugopal Veerasamy

ABSTRACT

Boundary-layer transition prediction techniques are reviewed. Experimental results show that free-stream disturbances (acoustic sound, turbulence, and temperature fluctuation, etc.) contribute to the early transition process. At subsonic speeds the dominant disturbances are turbulence and/or acoustic vibrations. At transonic speeds the acoustic noise generated by the test section porous or slotted walls is predominant. At supersonic - hypersonic Mach numbers, the radiated noise from the turbulent boundary layer on the tunnel walls is the dominant source of disturbance. A mathematical model is proposed to predict the early transition due to acoustic interaction. Further theoretical and experimental programs are suggested.

AN EVALUATION OF AIR FORCE PAVEMENT
NON-DESTRUCTIVE TESTING METHOD

by
M.C. Wang

ABSTRACT

The strengths and weaknesses of the current Air Force non-destructive pavement testing (NDPT) method have been reviewed, and its effectiveness for routine applications has been evaluated.

The NDPT method is composed of two main components -- the data collection equipment and the PREDICT computer code. The data collection equipment contains an impulse loader with the necessary instrumentation and a desk-top computer for preliminary data analysis and evaluation. The entire equipment is housed in a van which is air transportable and therefore satisfies the Air Force's need of rapid worldwide deployment. The PREDICT is a finite element program which is capable of performing nonlinear analysis for both rigid and flexible pavements.

It is concluded that the current NDPT method is an effective tool for evaluating a pavement's structural capacity in terms of fatigue life. However, further improvement is needed. Recommendations for the improvement are offered.

THE EFFECT OF ONE HUNDRED PERCENT OXYGEN AT ONE ATA AND INCREASED

PRESSURE ON THE METABOLISM OF AN ORGANOPHOSPHATE

(PARATHION) IN THE RAT

by

Alice Ward

ABSTRACT

In vivo studies have been carried out to determine the effect of 100% oxygen at ambient and increased pressure on the metabolism of the organophosphorous insecticide, parathion. Groups of rats administered a single intraperitoneal dose of the agent (4.5 mg/kg) were either treated immediately or after a period of ten minutes with 100% oxygen at 1 ATA or 2.4 ATA. Results indicate that oxygen at 1 ATA and 2.4 ATA does not prevent the formation of paraoxon, the toxic metabolite of parathion. Also oxygen at these pressures does not appear to influence the degradation of paraoxon. It appears that 100% oxygen at 2.4 ATA may enhance the conversion of parathion to paraoxon.

MEASUREMENTS OF TURBULENCE IN THE TROPOSPHERE AND LOWER STRATOSPHERE
USING THE MILLSTONE HILL 440 MHZ RADAR

by
Brenton J. Watkins

ABSTRACT

A program of experiments has been conducted to make intercomparisons of the refractivity turbulence structure constant (C_n^2) in the upper troposphere and lower stratosphere. The Millstone Hill 440 Mhz turbulence scatter radar was operated simultaneously with a number of Air Force Geophysics Lab balloon experiments. [The balloon data yield temperature fluctuation profiles that may be converted to C_n^2 profiles]. On one night a stellar scintillometer was also operated for data comparison purposes. The data indicated large (factor of 100) variations of C_n^2 with time and height. The decrease of C_n^2 with altitude ($\sim 1.4\text{db/km}$) is generally similar to that reported by other workers, however on two days the slope was considerably less. The absolute magnitude of C_n^2 from these radar data was greater (factor of 10) than found at other radar sites. However the C_n^2 data gathered in 1968 at the Millstone Hill site show similar magnitudes to those reported here.

OPTIMAL DESIGN OF DIGITAL FLIGHT CONTROL
SYSTEMS FOLLOWING AN ANALOG MODEL

by

Hsi-Han Yeh

ABSTRACT

The problem of designing a digital controller to replace an analog controller in a flight control system is studied. The objective of the research is to develop a method for synthesizing the z-transfer function of the digital controller which operates at a given sampling rate and preserves the characteristics of the original continuous system as much as possible.

The mathematical tool used in this research is an extended maximum principle of the Pontryagin type, which enables one to synthesize the output signal of a zero-order hold following the digital controller. A performance index of integral squared difference between the continuous state trajectory of the digital control system and that of the continuous model is selected as a means to preserve the performance characteristics. The rationale in the choice of this performance index is that the state trajectories of a continuous control system and a digital control system can be compared over the entire time axis, whereas the comparison between their frequency responses becomes meaningless as the signal frequency approaches the folding frequency.

The z-transfer function of the digital controller is obtained in terms of the parameters of the continuous model. Recommendations for further research in this area are made.

AMPLITUDE VARIABILITY OF THE STEADY STATE

VISUAL EVOKED RESPONSE

by

Robert L. Yolton

Abstract

The amplitude of the human visual evoked response (VER) has been found to be a somewhat unreliable indicator of vision and/or perception. In this study, the reliability of the steady state VER was determined for nine normal subjects using fast Fourier transform analysis procedures with 1.0 Hz and 0.25 Hz frequency bin resolutions. No correlations were found between changes in VER amplitudes and subjects' reports of shifts in attention, accommodation, fixation, or perceived organization of the stimulus.

Analysis, using analog filtering and Fourier techniques, demonstrated that there was no significant and sustained amplitude modulation of the VER by any frequency (including alpha) and that frequency drift of the VER did not contribute significantly to its amplitude variability.

A modeling approach to variability, using mixed sine waves to simulate different signal/noise ratios, established that a significant portion of the VER variability can be accounted for by noise which occurs at the same frequency as the VER and which is not ensemble averaged out of the VER data during initial processing. An empirically determined reliability versus signal/noise ratio curve is presented which shows the minimum variability which can be expected for any given signal/noise ratio.

NEW TESTS OF THEORIES

ON

SHAPED CHARGE

by

Poh Shien Young

ABSTRACT

Two theories on the penetration of the lined shaped charge in targets have been reviewed and compared with the recent experimental data. Under this investigation is the relationship between the penetration depth and time. The discrepancies between the theoretical and experimental values exist. Explanations and suggestions for further research in this field are offered.

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