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This is the third published Annual Research Progress Report; the editions previous to 1972 were published as Semi-Annual Progress Reports. Further information desired on any project may be obtained by writing to the department listed for the principal investigator, USAF Academy, Colorado 80840.
# TABLE OF CONTENTS

I. **SCIENTIFIC AND ENGINEERING INVESTIGATIONS**

<table>
<thead>
<tr>
<th>A. Department of Aeronautics</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stability and Control of a Canard Configured Missile</td>
<td>1</td>
</tr>
<tr>
<td>2. Design and Construction of a Remotely Piloted Vehicle</td>
<td>2</td>
</tr>
<tr>
<td>3. Experimental Verification of a Computer Transmission Line Model</td>
<td>3</td>
</tr>
<tr>
<td>4. Magnetic Annular Shock Tube</td>
<td>4</td>
</tr>
<tr>
<td>5. Microturbulent Heating of Plasmas</td>
<td>4</td>
</tr>
<tr>
<td>6. Laser Attenuation by Turbulent Air with a Temperature Gradient</td>
<td>5</td>
</tr>
<tr>
<td>7. Wing Section Optimization</td>
<td>6</td>
</tr>
<tr>
<td>8. Ram Wing Surface Effect Vehicle</td>
<td>7</td>
</tr>
<tr>
<td>9. Airborne Laser Laboratory (ALL) Exhaust Ducts</td>
<td>8</td>
</tr>
<tr>
<td>10. A Low-Cost Angle-of-Attack Indicator for Cockpit Display</td>
<td>9</td>
</tr>
<tr>
<td>12. Aerodynamic Holography</td>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Department of Astronautics and Computer Science</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Two Numerical Methods to Solve Realistic Air-to-Air Combat Differential Games</td>
<td>12</td>
</tr>
</tbody>
</table>
3. An Analysis of the Effect of Inaccuracies in the Atmospheric Density Model on Short-Term Low-Altitude Orbit Prediction .......... 13

4. A Satellite Tracking Instrument .................. 14

5. Low-Thrust Solar Electric Propulsion Navigation Simulation Program ......................... 15

6. Computer Programs for System Identification .......... 16

7. Human Operator Identification ....................... 16

8. Riccati Transformation for Gradient Optimization Techniques ................................. 17


10. ASPOL Implementation on Burroughs B6700 ........ 18

11. Implementation of an Integrated Data Base/Management Information System at HQ ARCS ............... 19


13. The Data Administrator .............................. 20

C. Department of Chemistry ......................... 21

1. High Energy Density Electrochemical Cells ....... 21

2. Ladder Polymer Chemistry ........................... 23

D. Department of Civil Engineering, Engineering Mechanics, Materials .......................... 24

1. Self-Erecting Aircraft Shelter ...................... 24

2. Trailing Wire Research Project ..................... 24

3. Polymer Tether Line Evaluation for Balloon Technology .............................................. 25

4. Validation of the Soil Stabilization Index System with Manual Development .................. 26
5. Analysis of Fracture Surfaces by Scanning Electron Microscopy ........................................ 27
6. Development of Oxidation-Resistant Columbium Alloys .............................. 27
7. Investigation of the Wettability between Cobalt Alloys and Nickel Alloys by the Sessile Drop Method .......................... 28
8. Automated Finite Element Mesh Generator ............................................. 29
9. Dynamics of Cracked Structures Using Finite Elements .......................... 29
10. Solar Energy .................................................................................. 30
11. The Design, Construction, and Testing of a Flat Plate, Liquid Medium Solar Collector ........................................ 31
12. Concentrated Solar Energy Study .................................................. 32
13. Pulse Propagation in a Helical Spring ............................................. 32
14. Computer Applications in Civil Engineering .................................. 33
15. Power Conversion Staff Study ...................................................... 34

E. Department of Electrical Engineering .............................................. 35
1. Digital Communications Performance Monitor ................................ 35
2. Generalized Field Data Acquisition System .................................. 35
4. A Simulation Study of Synthetic Aperture Radar ................................ 36
5. Instrumentation Processors for High-Explosive Ground Motion Measurements ........................................ 37
6. Analysis and Improvement of the Focusing System of the Air Force Field Test Telescrop ........................................ 38
7. Noise Meter .................................................................................. 38
8. Implementation of Digital Filters on Microcomputers ........................ 39
9. Thin Film Thermal Detectors ...................................................... 39
10. Absorption Measurements of Metals ........................................... 40
11. On-Axis Tracking Systems ......................................................... 40
12. Skylab LVMS ............................................................................ 41

F. Department of Life and Behavioral Sciences .................................... 41
1. Human Factors Engineering Study on Helmet-Mounted Displays ........ 41
2. Survey of Soviet Research in Behavioral Sciences ....................... 42
3. Muscle Relaxation and Biofeedback as a Stress Management Technique ......................................................... 42
4. Foil Activation Analysis and Thermoluminescent Dosimetry on SKYL AB II ................................................................. 43
5. Systems Analysis of Physiologic Responses to Environmental Stresses .... 44
6. Physiologic Changes in Swine during Hypoxia ............................ 45
7. Lipids and Lipoproteins in USAF Academy Cadets ......................... 45
8. Radiation Dose to Specific Body Organs ........................................ 46
9. Ecological Studies on a Herbicide-Equipment Test Area (TA C-52A), Eglin AFB Reservation, Florida ......................... 46
10. Disposal of Herbicide Orange by Soil Incorporation and Biodegradation ..................................................... 47

G. Department of Mathematical Sciences ........................................... 48
1. Strategic Command, Control, and Communications ....................... 48
2. Oscillation of a Function at a Point .............................................. 49
3. Almost Periodic Solutions of Delay Differential Systems .................. 49
4. An Addendum to Systems of Ordinary Differential Equations ............ 50

H. Department of Physics ................................................................. 50
<table>
<thead>
<tr>
<th></th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lasers, Unstable Resonators</td>
<td>50</td>
</tr>
<tr>
<td>2.</td>
<td>Neutron and Gamma-Ray-Induced Reactions</td>
<td>51</td>
</tr>
<tr>
<td>3.</td>
<td>Holography</td>
<td>52</td>
</tr>
<tr>
<td>4.</td>
<td>Second Harmonic Generation in KD*P</td>
<td>53</td>
</tr>
<tr>
<td>5.</td>
<td>X-ray Diffraction Studies in Organic Esters-Variations in Crystal Structure for Several Chain Molecules</td>
<td>54</td>
</tr>
<tr>
<td>6.</td>
<td>Laser Propagation Through Turbulent Boundaries</td>
<td>54</td>
</tr>
<tr>
<td>7.</td>
<td>EMP Studies</td>
<td>55</td>
</tr>
<tr>
<td>8.</td>
<td>Plasma Modeling</td>
<td>55</td>
</tr>
<tr>
<td>9.</td>
<td>NMR Study of Liquid Crystals</td>
<td>57</td>
</tr>
<tr>
<td>10.</td>
<td>Laser Calorimetry</td>
<td>58</td>
</tr>
<tr>
<td>11.</td>
<td>Solar Energy Panels</td>
<td>58</td>
</tr>
<tr>
<td>12.</td>
<td>Solar Energy Conversion</td>
<td>58</td>
</tr>
<tr>
<td>13.</td>
<td>Estimated Thermal Updraft Index</td>
<td>59</td>
</tr>
<tr>
<td>14.</td>
<td>Radiation Belt Studies</td>
<td>59</td>
</tr>
<tr>
<td>15.</td>
<td>Cloud Droplet Sizing</td>
<td>60</td>
</tr>
<tr>
<td>17.</td>
<td>Study of Battery Electrode Deterioration Using the SEM</td>
<td>62</td>
</tr>
</tbody>
</table>

**II. GENERAL RESEARCH IN THE HUMANITIES AND SOCIAL SCIENCES**

<table>
<thead>
<tr>
<th></th>
<th>Department of Astronautics and Computer Science</th>
<th>63</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer Analysis of the Minnesota Multiphasic Inventory (MMPI)</td>
<td>63</td>
</tr>
<tr>
<td>2</td>
<td>An Automated Circulation System for USAFA Library</td>
<td>63</td>
</tr>
</tbody>
</table>

|   | Department of Economics, Geography, and Management                   | 64   |

vii
1. Computation Techniques for Various Gravity Anomaly Convection Terms .......................... 64

2. Computation Techniques for Various Gravity Anomaly Convection Terms and Their Effect Upon the Vertical Computations for Mountainous Areas ....................................................... 64

3. Modern Cartography .............................................. 65

4. The Use of Television Advertising in the 1972 General Election in Colorado .......................... 65

5. An Analysis of the Spatial Functional Organization of Southern Africa and Its Implications for Regional Transportation Systems ................................................................. 66

6. Improving the Quality of and Aggregating Opinions Expressed as Subjective Probability Distributions ................................................................. 66

7. Environmental Influence on Organizational Decision Making: An Experimental Study of the Effects of Information Load and Specificity on Small Group Decision Making ................................................................. 67

8. The Effects of Security Classification Restrictions on Technical Communication .................... 68

9. Communication in Research ........................................ 69

10. Managerial Attitudes and Behavior in a High-and Low-Performing Environment: A Comparative Test of an Expectancy Theory Model ................................................................. 70

11. Test and Implementation of Multimedia, Self-Paced Instruction in the Financial Accounting Course at the USAF Academy ................................................................. 71

C. Department of Foreign Languages ............................... 71

1. A Contrastive Study of Case in Chinese and English ................................................................. 71

2. A Stylistic Analysis of Andre Gide's La Symphonie Pastorale ................................................... 72

D. Department of History .............................................. 72

1. A History of the United States Air Force ...................... 72

viii
2. Oral History Program .......................... 73
4. The Harmon Memorial Lectures in Military History .......................... 73
6. Social and Economic Consequences of WWI in Kenya .......................... 74
7. Nevada's Fighting Irishman: Senator Pat McCarran of Nevada .......................... 74
8. The Development of Aircraft and Doctrine in the Royal Flying Corps, 1912 - 1914 .......................... 75
9. Marshal Suchet and the Administration of Aragon .......................... 75
10. The Mexican Army: 1875 - 1900 .......................... 75

E. Department of Law .......................... 76
1. USAFA Television Cable Hook-up to Pine Valley Elementary School .......................... 76
2. IRS Information Return for CWITF .......................... 76
3. Endowment of Faculty Chairs/Pay Supplements for Permanent Professors .......................... 76
5. Retirement of Permanent Professors .......................... 77
6. Voting by Military Members and Their Spouses in Local School Bond Elections in Colorado .......................... 77
7. Application of Colorado Lottery Laws to "Lucky" Number Drawings at USAFA Athletic Functions .......................... 77
8. Use of Air Force Academy Facilities by Professional Athletes .......................... 78
9. Commissioning of Air Force Academy Graduates as Reserve Officers .......................... 78

ix
10. Use of Air Force Academy Facilities by Non-Profit Organizations Directed Toward Athletic Endeavors  
F. Department of Mathematical Sciences  
1. Net Assessment (Military) of NATO and Warsaw Pact Forces in Central Europe  
G. Department of Political Science and Philosophy  
1. The US/FRG Engineer Exchange Program: An Evaluation  
2. An Inquiry into the Decision-Making Process during a Period of Impending Thermonuclear/Central War: The Information Requirements of Command Central Communications (C^3)  
3. United States Security Interests in Northeast Asia (Classified)  
4. The October War  
5. The Iranian Connection  
6. The Success Criteria and Progression of Insurgency  
7. The Energy Crisis and US Foreign Policy  
8. Revolutionary Warfare in the Middle East  
9. The IRA and Northern Ireland  
10. Comparative Examination of Procedures Used for National-Level Planning, Coordination, and Management of Psychological Operations in the United States, Great Britain, the Federal Republic of Germany, and France  
11. Mongolian People’s Republic  
12. Insurgency in Thailand  
III. RESEARCH AND ANALYSIS OF SPACE AND WEAPONS SYSTEMS

A. Department of Astronautics and Computer Science
   1. Air-to-Air Fire Control Research
   2. Gunship
   3. Sight Line Autopilot (SLAP) Research
   4. Backup Space Navigation System
   5. Backward Traveling Missile
   6. Electronic Warfare Effectiveness Evaluation

B. Department of Civil Engineering, Engineering Mechanics, and Materials
   1. Dynamic Photoelastic Analysis of an Explosive Testing System
   2. Analytical Optional Control Solutions for Hyper-velocity Reentry Vehicles

C. Department of Electrical Engineering
   1. Evaluation of TAC CONTROLLER Simulation

D. Department of Mathematical Sciences
   1. Automatic Pattern Recognition (APR) for Space Object Identification (SOI)

IV. MANPOWER, PROCUREMENT, AND LOGISTIC STUDIES

A. Department of Economics, Geography, and Management
   1. The Economic Impact of Air Force Academy Graduates
   2. Project "EOQ"
   3. Project "POL"
4. Project "Procurement Productivity Indices" .... 100
5. Improvement of PIEMAN Maintenance Model .... 101
7. Impact of the Section 8(a) Program on the Department of Defense Budget .......... 102
8. System for Establishing Contractor Ceilings for Independent Research and Development (IR&D) and Bid and Proposal (B&P) Costs (PROJECT NOTADS) .... 102
10. Logistics Organization Design .......... 104
11. Macrologistics Systems Analysis .......... 105
12. PIEMAN--Persistent Indicators for Estimating Manpower Needs in AFLC Air Logistics Centers .......... 106
13. Uniform Reorder Quantities and Stock Levels .......... 106
15. The Impact of Military Expenditures on Domestic Small Business Enterprises .......... 108

B. Department of Mathematical Sciences .......... 109
   1. Impact of Certain Incentives on the Service Asses- sion Rate .......... 109
   2. UPT Assignment Criteria .......... 109
   3. Regression Analysis Model for the Prediction of GPA Scores .......... 110

C. The Academy Library .......... 112
   1. Air Force Graduate Education Policy .......... 112
   2. Management Survey of the USAF Academy Academic Library .......... 113

   xii
6. Physiologic Changes in Swine during Hypoxia

Principal Investigators: Colonel Peter B. Carter and Majors John W. Watters and Louis F. Wailly, Department of Life and Behavioral Sciences

The animal of choice for this experiment was the pig because of the similarities to cardiovascular response observed in man. The subjects were baselined under room-air conditions and then stressed on 10% and 5% respired oxygen. The following physiologic responses were monitored throughout the experimentations: blood pressure, heart rate, respiratory rate, and body temperature. Periodic blood samples were drawn to measure $pO_2$, $pCO_2$, pH, and Hct.

This was a pilot study for a more intensive investigation of cardiovascular kinetics during environmental stress which will be initiated in the near future.

7. Lipids and Lipoproteins in USAF Academy Cadets

Principal Investigators: Major Eugene L. Arnold, Department of Life and Behavioral Sciences

This is a continuing project to obtain data on serum lipid and lipoprotein levels in order to evaluate what changes are attributable to natural maturation, to diet, and to the environment (social pressure, exercise, altitude, etc.) of USAF Academy cadets during their four years at the Academy and during the following two years.

Blood samples are collected from cadets at the USAF Academy periodically for analyses of serum lipids, lipoproteins, and related factors. Less frequently, lean body mass is estimated for correlation
with the lipid data. Estimates are made periodically of caloric intake, of the composition of the diet, and of the degree of emotional stress experienced by the subjects of the study.

8. Radiation Dose to Specific Body Organs

Principal Investigators: Colonel Peter B. Carter and Majors Louis F. Wailly and John W. Watters, Department of Life and Behavioral Sciences

The objective of this effort is to continue the development of the Computerized Anatomical Man Model (CAM model), described in MDC G4655, for application to the analysis of space radiation hazards and radiation dose monitoring systems for Shuttle Orbiter and Shuttle payloads, i.e., Sortie Modules. This phase is devoted to generation of precise body self-shielding data for selected, radiation-sensitive body organs and to providing a general capability in the program to generate such data for body postures other than the one explicitly included in the CAM model.

The CAM model will be utilized to generate precise mass distribution data for selected body organs. These mass distribution data will be in a collapsed form in which angular orientation is not preserved. Data for spatially distributed organs will be furnished in a volume integrated form as well as for individual points within the organ.

9. Ecological Studies on a Herbicide-Equipment Test Area (TA C-52A), Eglin AFB Reservation, Florida

Principal Investigators: Lt Col William E. Ward, Major Charles E. Thalken, and Captains Alvin L. Young and William J. Cairney, Department of Life and Behavioral Sciences

Sponsored by Air Force Logistics Command/DS and Air Force Systems Command/SDWC
This project is concerned with determining the ecological consequences of applying massive quantities of military herbicides (346,117 pounds), via repetitive applications over a period of 8 years (1962-1970) to an area of approximately 1 square mile. Data have been obtained in the persistence, degradation, and/or disappearance of the herbicides and the contaminant 2,3,7,8-tetrachlorodibenzo-p-dioxin from the Test Area's soils and drainage waters and their subsequent effects (direct or indirect) upon the vegetative, faunal, and microbial communities.

Publications

One technical report (AFATL-TR-74-12, Eglin AFB, Florida) has been published on this project. An additional report will be prepared following summer 1974 efforts.

10. Disposal of Herbicide Orange by Soil Incorporation and Biodegradation

Principal Investigators: Lt Col William E. Ward, Majors Eugene E. Arnold and Charles E. Thalken, and Captains Alvin L. Young and William J. Cairney, Department of Life and Behavioral Sciences

Sponsored by Air Force Logistics Command/DS

Concern over the level of contamination of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) herbicide by the teratogen 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) may result in the disposal of selected USAF surplus inventories of herbicide Orange. A potential disposal method is that of soil incorporation. The soil incorporation method is based on the premise that high concentrations of phenoxy herbicide and TCDD will be degraded to innocuous products by the combined action of soil microorganisms and soil chemical hydrolysis.
Data from field sites in Florida, Kansas, and Utah indicate rapid degradation of Orange herbicide and its contaminant following soil incorporation at rates of 1,000-4,000 pounds active ingredient per acre. Associated ecological studies of the incorporation sites have indicated that only minimal ecological damage results from either the incorporation technique or the applied herbicide.

Publications

One report has been published on this effort. A concluding technical report is in progress.

G. Department of Mathematical Sciences

1. Strategic Command, Control, and Communications

Principal Investigators: Colonel R. R. Lochry, Lt Col J. B. Tindall, Lt Col D. G. Balish, Department of Mathematical Sciences; Lt Col C. M. Glass, Department of Electrical Engineering; Major D. Murray, Department of Political Science and Philosophy; Captain D. Willis, Department of Astronautics and Computer Science

Sponsored by the Air Force Weapons Laboratory, Kirtland AFB, New Mexico

FY 74 began with the Strategic Communications Workshop (SCW), held in August at the Air Force Academy. Major General Lee M. Paschall was the keynote speaker, and representatives of OJCS/J3/J6, USAF/SA, NORAD, SAC, USN/NESC, DCS, DNA, AFWL, NELC, and many civilian contractors participated. The purpose of the SCW was to focus on the requirements of communications modeling and to gain some exposure to the modeling efforts of other DOD agencies. Our own efforts in research have produced some notable results and promise of more to come.