

DTIC FILE COPY

2

REPORT DOCUMENTATION PAGE

Form Approved

OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)

2. REPORT DATE

1 June 1979

3. REPORT TYPE AND DATES COVERED

Final/ 01 May 1978-30 April 1979

4. TITLE AND SUBTITLE

EVALUATION OF LIFE SCIENCES RESEARCH

5. FUNDING NUMBERS

61102F

2313/A3

6. AUTHOR(S)

Julien M. Christensen

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Wayne State University
Dept of Industrial Engineering and Operations
Research, Detroit, Michigan 48202

8. PERFORMING ORGANIZATION
REPORT NUMBER

AFOSR TR- 89-1500

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

AFOSR
BLDG 410
BAFB DC 20332-6448

10. SPONSORING/MONITORING
AGENCY REPORT NUMBER

F49620-78-C-0075

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Evaluations in the behavioral and biomedical sciences were conducted for the Life Sciences Directorate, Air Force Office of Scientific Research. The following tasks were performed on this project (a) an investigation of the human operator in advanced aerospace systems (HOAS), (b) organization of four AFOSR/NL program reviews one on environmental and acceleration physiology, another on visual processes and human operator control, the third on environmental protection and toxic hazards, and the fourth on flight and technical training sciences.

DTIC
ELECTE
DEC 04 1989

14. SUBJECT TERMS

15. NUMBER OF PAGES

13

16. PRICE CODE

17. SECURITY CLASSIFICATION
OF REPORT

unclassified

18. SECURITY CLASSIFICATION
OF THIS PAGE

unclassified

19. SECURITY CLASSIFICATION
OF ABSTRACT

20. LIMITATION OF ABSTRACT

NSN 7540-01-280-5500

Standard Form 298 (890104 Draft)
Prescribed by ANSI Std Z39-18

89 11 20 011

AD-A215 236



WAYNE STATE UNIVERSITY

COLLEGE OF ENGINEERING

DETROIT MICHIGAN 48202

DEPARTMENT OF INDUSTRIAL ENGINEERING
AND OPERATIONS RESEARCH

1 June 1978

To: Dr. Alfred Fregly, Program Manager
Life Sciences, Air Force Office of Scientific
Research, Bolling A.F.B., D.C. 20332

From: Dr. Julien M. Christensen, Principal Investigator
Department of Industrial Engineering and Operations
Research, Wayne State University, Detroit, MI 48202
Report Prepared by Mr. John M. Howard

Subject: EVALUATION OF LIFE SCIENCES RESEARCH
Final Report, Wayne State University
Project 305-0928
U.S. Air Force Office of Scientific Research
Contract No. F49620-78-C-0075

Period of Performance

1 May 1978 30 April 1979

Staffing and Administration

Dr. Julien M. Christensen, Principal Investigator
Dr. Charles E. Hutchinson, Part-time Faculty Member
Mr. John M. Howard, Research/Administrative Assistant
Secretarial Support

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

A. INTRODUCTION

Evaluations in the behavioral and biomedical sciences were conducted for the Life Sciences Directorate, Air Force Office of Scientific Research. The following tasks were performed on this project (a) an investigation of the human operator in advanced aerospace systems (HOAS), (b) organization of four AFOSR/NL program reviews, one on environmental and acceleration physiology, another on visual processes and human operator control, the third on environmental protection and toxic hazards, and the fourth on flight and technical training sciences, and (c) performed an evaluation of a AFOSR research proposal. Further detail of each task is provided in the following sections.

B. HUMAN OPERATORS IN ADVANCED SYSTEMS (HOAS)

Draft copy of the HOAS report is nearing completion. Present plans are to have seven sections to the report. They are:

1. Executive Summary
2. The 2001 World
3. Training
4. Human Factors Engineering
5. Social Sciences
6. Comments on Management of Research
7. Implications of Foreign Human Factors Research

The contribution of Dr. Charles Hutchinson on this part of the contract have been outstanding. We were fortunate, indeed, to be able to avail ourselves of the services of someone with the depth and breadth of understanding that this individual possessor, not to mention his incomparable integrity and concern for the U.S. Air Force and our country.

Meetings* on "Human Operators in Advanced Systems" (HOAS) Program

Meeting Dates

1978

- | | |
|-------------------|--|
| May 1, 1978 | - Meeting at W.S.U. |
| May 2, 1978 | - Meeting with G.M. personnel, re: Human factors |
| May 4, 1978 | - Meeting with Prof. Ritchie, Wright State re: Human operators |
| May 5, 1978 | - Meeting with Dr. Smith, NIOSH, re: Human operators in semi-automatic systems |
| May 12, 1978 | - Meeting with Mr. Capps, General Electric Safety Director, regarding safety requirements of future systems |
| May 15, 1978 | - Meeting with Dr. Askren, AFHRL, re: HOAS |
| May 17, 1978 | - AFOSR, Bolling AFB, D.C., In attendance, Dr. J. Christensen WSU, Dr. A. Fregly AFOSR/NL |
| May 18, 1978 | - AFOSR, Bolling AFB, D.C., In attendance, Dr. J. Christensen WSU, Dr. A. Fregly AFOSR/NL |
| May 19, 1978 | - ARPA, Arlington, Va., In attendance, Dr. Stephan Andriole, Chief Bio-Cybernetics, ARPA; Lt. Col. R. O'Donnell, AMRL/HE; Dr. A. Fregly and Major J. Thorpe, AFOSR/NL; Dr. J. Christensen WSU. |
| May 19, 1978 | - Washington, D.C., In attendance, Dr. C. Hutchinson and Dr. J. Christensen WSU. |
| May 20, 1978 | - Meeting with SSS, Inc. personnel regarding future contract activities. |
| May 24 - 25, 1978 | - Attend Col. O'Donnell conference on evoked potentials (WPAFB). |
| June 5, 1978 | - Meeting with Ed Deck, General Electric, regarding safety requirements of future systems. |
| June 9, 1978 | - Invited lecture at University of Cincinnati on human factors. |

*Contract and non-contract supported.

Meeting Dates
1978

- June 21, 22, 1978 - Meetings at Wright-Patt, re: HOAS.
- July 14, 1978 - Meeting at OSU, regarding human engineering in future aviation.
- July 17, 1978 - Meeting at Wright State University, Dr. Ritchie, re: HOAS.
- July 26, 1978 - Meeting at AFML, WPAFB, regarding ICAM.
- July 31 - Aug. 1, 1978 - Washington, D.C., In attendance, Dr. A. Fregly, AFOSR/NL; Dr. C. Hutchinson and Dr. J. Christensen, WSU.
- Aug. 7-18, 1978 - University of Michigan - to lecture on Human Factors but also to attend second week (advanced) for ideas regarding future of human factors.
- Aug. 21, 1978 - AFHRL/AS, W-PAFB, Ohio, In attendance, Dr. W. Askren, AFHRL/AS; Dr. C. Hutchinson and Dr. H. Christensen, WSU.
- Aug. 25, 1978 - Meeting at WPAFB (Drs. Topmiller and Askren)
- Aug. 30, 31, 1978 - Meeting with Naval personnel regarding human factors.
- Sept. 8, 1978 - Meeting, Lt. Col. Birt, WPAFB, regarding ICAM.
- Sept. 12, 1978 - Meeting at AFML, WPAFB, regarding ICAM.
- Sept. 25, 1978 - Lecture and meeting on Human Factors, NIOSH, Cincinnati.
- Sept. 27-29, 1978 - Dayton, Ohio, In attendance, Dr. A. Fregly, AFOSR/NL; Dr. D. Topmiller, AFRL/HE, Dr. B. Ostrofsky and 'Doc' E. Keissling, University of Houston, Texas; Dr. C. Hutchinson and Dr. J. Christensen, WSU.
- Oct. 3, 1978 - Meeting, Dr. Versace, Ford Motor Co., regarding human factors.
- Oct. 4, 1978 - Presentation on human factors at NSC, Chicago.
- Oct. 5, 1978 - Telephone conversation between Dr. Ralph Flexman, Director, Aviation Psychology Laboratory, University of Illinois, and Dr. J. Christensen, WSU.

Meeting Dates
1978

- Oct. 9, 1978 - Meeting with Col. O'Donnell, WPAFB, regarding EP
- Oct. 14, 1978 - Meeting with Dr. Ruffel-Smith, Great Britain, regarding future human factors requirements
- Oct. 17, 1978 - Human Factors Society Annual Meeting, Detroit, Michigan, In attendance, Dr. F. Muckler, Prog. Dir., Design of Manned Systems, Navy Personnel R & D. Ctr.; Dr. J. Christensen, WSU
- Oct. 20, 1978 - Meeting with Mr. Portner, Detroit, regarding future safety requirements.
- Nov. 8, 1978 - Meeting with Col. O'Donnell, WPAFB.
- Nov. 20, 1978 - Meeting with 'Doc' Keissling (former AFSC colonel) regarding future systems requirements.
- Nov. 30, 1978 - Meeting with Profs. Crampton & Colle, Wright State, regarding future human factors requirements
- Dec. 9, 1978 - Meeting (Detroit) with Hugh Hodgens, Chrysler Defense, regarding human factors requirements (Army systems - esp. logistics)
- Dec. 12, 1978 - Meeting with Boeing Wichita human factors personnel, regarding future ICAM requirements.
- Dec. 20, 1978 - Meeting with Dr. Van Cott and staff, NBS, regarding future human factors data requirements.

1979

- Jan. 17, 1979 - AMRL/HE, WPAFB, Ohio, In attendance, Dr. D. Topmiller, Chief, Systems Research Br.; Dr. J. Christensen, WSU.
- Jan. 31, 1979 - Meeting, Boeing personnel, regarding ICAM requirements.
- February 20, 1979 - AFFDL, WPAFB, Ohio, In attendance, Dr. W. Lamar, AFFDL; Dr. J. Christensen, WSU.
- Feb. 26-28, 1979 - Meeting with attendees at SAE (Detroit) regarding human factors requirements.
- March 1, 1979 - AMRL/HE, WPAFB, Ohio, In attendance, Lt. Col. J. Birt; Dr. J. Christensen, WSU.

Meeting Dates1979

- March 5, 1979 - AMD, Brooks AFB, Texas, in attendance, Dr. Bryce Hartman, AMD, School of Aerospace Medicine; and Dr. Gerald Milechi, ONR; Dr. J. Christensen, WSU.
- March 6-8, 1979 - Tri-Services Human Factors Engineering Technical Advisory Group, (TAG), San Antonio, Texas; Dr. J. Christensen, WSU. Private meeting with many attendees (e.g., Muchler, Koorce, etc.) regarding human factors requirements.
- March 16, 1979 - AMRL/HE, WPAFB, Ohio, in attendance, Lt. Col. J. Birt; Dr. J. Christensen, WSU.
- March 20, 1979 - Discussions with Colonel Keissling regarding human factors (esp. Ostrofsky's work).
- March 21-22, 1979 - Navy Safety Ctr., University of Indiana, Bloomington, Indiana: Discussions with Navy personnel, Dr. J. Christensen, WSU.
- April 3-4, 1979 - Attend Miami Valley Safety meeting (speaker and private discussions regarding safety in future systems).
- April 16, 1979 - Meeting with NSC attendees regarding safety requirements.
- April 17, 1979 - Meeting with Dr. Parsons, regarding his work on the Lt. Col. Birt Human Engineering project.
- April 19, 1979 - Meeting with local ASQC chapter, regarding future quality control problems.
- April 27, 1979 - Washington D.C., in attendance, Dr. C. Hutchinson and Dr. J. Christensen, WSU.

PERSONS CONTACTED BY DR. CHARLES E. HUTCHINSON ON (HOAS) PROGRAM

Dr. Amos Perlmutter
Professor of Government and Politics
American University
Washington, DC

Dr. Ralph Canter
Director of Manpower Studies
Army Research Institute for Behavioral Studies

Dr. Thomas Collins
Directorate of Physics
Air Force Office of Scientific Research

Dr. Arthur B. Sweney, Director
Center for Human Appraisal
Wichita State University
Wichita, Kansas

Dr. Robert Sasnor
Director of Planning
Army Research Institute for Behavioral Studies

Dr. Jacob Barber
Chief Psychologist
Office of Deputy Chief of Staff, Personnel
Hq U.S. Army, Pentagon

Mr. Arthur Barber
Consultant
Bethesda, Maryland

Dr. Davis Bobrow, Director
Center for Political Studies
University of Maryland
College Park, Maryland

Colonel Karl Wiegand, Chief
Policy Plans Division
Director of Plans
Air Force Systems Command

Dr. Bernard Kulp
Chief Scientist
Director of Laboratories
Air Force Systems Command

Lt. Col. Donald Calvert
AFSC/XO
Air Force Systems Command

"Doc" Kiesling
Department of Operations Research
University of Houston
Houston, Texas

Dr. Glen Bryan, Chief
Group Psychology Division
Office of Naval Research
Arlington, Virginia

Dr. Marshall Farr, Chief
Personnel and Manpower Research Branch
Office of Naval Research
Arlington, Virginia

Dr. Robert Schwartz
Office of the Special Assistant for Studies and Analyses
Hq U. S. Air Force

Major Oak de Berg
Secretariat
Air Force Scientific Advisory Board
Chief of Staff
United States Air Force

Commander Powers
Secretariat
Defense Science Board
Director of Defense Research and Engineering

Commander Paul Chatelier
Office of the Director of Defense Research and Engineering

Dr. S. N. Roscoe
Illiana Corporation
Urbana, Illinois

Dr. Jesse Orlansky
Institute for Defense Analyses
Arlington, Virginia

Dr. Anthony Cacioppo
Chief Scientist
Foreign Technology Division
Air Force Systems Command
Wright Patterson Air Force Base, Ohio

Dr. William Askren
Advanced Systems Division
Air Force Human Resources Laboratory, AFSC
Wright Patterson Air Force Base, Ohio

C. PROGRAM REVIEWS

Annually, the Air Force Office of Scientific Research, Life Sciences Directorate holds program reviews in four scientific areas, environmental and acceleration physiology, visual processes and human operator control, environmental protection and toxic hazards, and technical and flight training. The purpose of these reviews is to provide an opportunity for AFOSR/NL contractors and grantees to present progress of current work and planned investigation for future research.

For the four program reviews listed below, Wayne State University served as the conference organizer. The following services were provided: organized the group of qualified experts in the specific scientific area; and prepared and transmitted to these individuals a pre-review announcement. In addition, logistic and administrative support were supplied at two of the reviews.

Review of Basic Research in Environmental and Acceleration Physiology

The review was held at the U.S. Air Force Academy, Colorado Springs, Colorado, 12-13 September, 1978. The three qualified experts listed below reviewed and evaluated the presentations and provided guidance for future AFOSR sponsored basic research. See review panel reports of September 12-13, 1978 to AFOSR/NL. See W.S.U. Administrative Report, 17 November 1978.

Review Panel Members: Dr. Ernest McCutcheon
Department of Physiology
School of Medicine
University of South Carolina
Columbia, South Carolina 29208

Dr. Al Swan
114 Rivershire Lane
Lincolnshire, Illinois 66015

Dr. Raymond H. Murry
Chairman
Department of Medicine
Life Sciences Building
Michigan State University
East Lansing, Michigan 48224

Review of Basic Research in Visual Processes and Human Operator Control

The review was held at Sinclair Community College, Dayton, Ohio, 26-28 September, 1978. The three scientists listed below served on the review panel to evaluate the presentations and provide guidance for future AFOSR sponsored basic research. See reviewer's reports of 26-28 September, 1978 to AFOSR/NL. The review was attended by nearly eighty individuals representing the Air Force, Navy, industry, private research organizations and universities. The on-site administrative support was provided by Christensen, Hutchinson and Howard. See W.S.U. Administrative Report, 21 November 1978.

Review Panel Members: Dr. Herschel W. Leibowitz
 Department of Psychology
 614 Psychology Building
 Pennsylvania State University
 University Park, Pennsylvania 16802

Dr. Kenyon DeGreene
 4345 Chaumont Road
 Woodland Hills, California 91364
 and
 Institute of Safety and Systems Management
 University of Southern California
 Los Angeles, California 90007

Dr. John W. Senders
 Department of Industrial Engineering
 University of Toronto
 Toronto, Ontario
 CANADA, M5S-1A4

Review of Basic Research in Environmental Protection and Toxic Hazards

The review was held at the Quality Inn-Airport, Los Angeles, California, 16-17 January, 1979. The two qualified experts listed below served on the review panel to evaluate the presentations and provide guidance for future AFOSR sponsored basic research. See individual panel members reports to AFOSR/NL, February, 1979. The review was attended by sixty-two individuals representing the Air Force, Army, industry, private research organizations and universities. The on-site administration support was provided by Howard. See W.S.U. Administrative Report, 1 March 1979.

Review Panel Members: Dr. Paul W. Smith
1324 NE 56th Street
Oklahoma City, Oklahoma 73111

Dr. C.H. Ward
Department of Environmental Science
and Engineering
P.O. Box 1892
Rice University
Houston, Texas 77001

Review of Basic Research in the Flight and Technical Training Sciences

The review was held at the U.S. Air Force Academy, Colorado Springs, Colorado, 27-29 March, 1979. A single reviewer was selected on this project to join five other reviewers on a panel to evaluate the presentations and provide guidance for future AFOSR sponsored basic research. See reviewer's report to AFOSR/NL, April 1979. See W.S.U. Administrative Report, 18 April 1978.

Review Panel Member: Dr. Lloyd Kaufman
Department of Psychology
New York University
4 Washington Place
New York, NY 10003
and
4 Hemlock Lane
Roslyn Heights, NY 11577

Recommendations for Future Program Reviews

1. It is recommended that facilities for hosting future program reviews be selected in the following order: U.S. Air Force Academy, Colorado Springs; second, other universities and colleges; and third, hotel/conference centers. Our experience has shown that this order is the most cost-efficient for the following reasons: (a) low or waived facility meeting room fees, (b) availability, variety, and very low rental cost on audio-visual equipment, (c) convenience of support services (e.g. typing, duplicating, lecture aids, etc.) and (d) beverage services, however, are comparable across the three facility categories.
2. Program managers should insist upon absolute audio-visual equipment requirements from their contractor/grantee presenters a week before the review.

3. Develop a format for insuring a higher quality more lengthy abstract from each contractor/grantee presenter for inclusion in the review program. In addition, several of the review panel members have indicated the need for more in-depth information on each project. It is suggested that if possible the statement of work (SOW) from each project be collated and made available to the review panel members several weeks prior to the review. This should greatly facilitate their ability to provide a more thorough program evaluation.
4. Review Panel comments regarding future program reviews.
 - a. An evening tutorial review on various selected topics would be valuable.
 - b. Increase the discussion time/paper to approximately 10 minutes.
 - c. Would like full papers instead of abstracts.
 - d. Reviewer site-visits to contractor/grantee laboratories would be valuable.
 - e. Need for control of monopolization of discussion by certain persons.
 - f. Reviewers need guidelines about present and future Air Force needs and goals.
 - g. Speaker time should be aloted on the basis of the quantity of material to be presented.

D. RESEARCH PROPOSAL EVALUATION

For this task, Wayne State University (WSU) performed an evaluation on one AFOSR/NL research proposal. In the accomplishment of this evaluation, WSU developed a statement of criteria (see below) and selected three outside evaluators. The evaluators were three qualified scientists selected from a list, prepared in advance and agreed upon by the Directorate of Life Sciences.

The research proposal entitled "Basis for Long Term Bioeffects of RF Radiaiton" was evaluated by the following panel.

Evaluation Panel:	Dr. Ross Adey Veterans Administration Jerry L Pettis Memorial Veterans Hospital 11201 Benton Street Loma Linda, California 92357
-------------------	--

Dr. James C. Lin
Department of Electrical and Computer
Engineering
Wayne State University
Detroit, Michigan 48202

Dr. Stephan F. Cleary
Department of Biophysics
Virginia School of Medicine
Virginia Commonwealth University
Richmond, Virginia 23298

The statement of criteria developed by Wayne State University for evaluation of the AFOSR/NL proposals is as follows:

STATEMENT OF CRITERIA FOR EVALUATION OF AFOSR PROPOSALS

1. Scientific Merit of Proposal

- (a) If the basic research project was successful, in what way and what extent would it contribute to an extension of the scientific understanding in this area? Is it expected to be an elaboration of present scientific theory or to provide a foundation for new theory? Please do not evaluate the proposal with regard to the issue of Air Force or AFOSR relevance. This will be accomplished by the AFOSR.
- (b) Is the proposal current with regard to the "state of the art" in its area of science?
- (c) Will the expected results from the proposed basic research fill a void in the area of science?

2. Methods

- (a) Is the technical approach sound?
- (b) Is the experimental design feasible and reasonable?
- (c) Are explicit hypothesis stated of a basic research nature or is the proposed work more general in its aim?
- (d) Is the statistical treatment of the data sufficient?

3. Qualifications of the Research Team

- (a) Is there reasonable evidence that the principal investigator and staff will be able to perform the tasks being proposed?