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The effort described in this Annual Report pertains to two separate areas. Research was performed and data collected on the response of the living human to a wide range of impact-accelerative forces applied to the human along various vectors. In this area data bases were reorganized and updated, computer programs were designed, implemented, tested and/or used to maintain, update, search and/or summarize information in these data bases. Motion pictures were digitized, EKG data were

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processed and a graphical analysis display system was designed and implemented. In the second area, research was performed to determine the effects of ship motions on humans. Performance tests were generated and computer programs were written to edit output from these tests and for analysis of the test outputs.

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OFFICE OF NAVAL RESEARCH
Contract N00014-78-C-0121
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# ANNUAL REPORT

In support of the Joint Army/Navy Air Crew
Impact Injury Prevention Program

For the Period from 17 October 1979 to
15 December 1980

by

Harvey E. Sbisa & Rodney W. Thorpe

15 December 1980

QEI, Incorporated
119 The Great Road
Bedford, MA 01730

## INTRODUCTION

Presented herein is the Annual Report describing QEI, Incorporated's Technical Support of the Joint Army/Navy Air Crew Impact Injury Prevention Program at the Naval Biodynamics Laboratory (formerly the Naval Aerospace Medical Research Laboratory (NAMRL)), New Orleans, LA. This report covers the time period between 17 October 1979 and 15 December 1980. The effort described in this report consists largely of computer program design, coding and testing, program set-up and operation, systems analysis and design and data reduction and processing.

The major sections of this report are listed below:

## A. HORIZONTAL SLED INERTIAL HISTORY DATA BASE

During this reporting period effort by QEI, Incorporated personnel was expended in the following areas of the Horizontal Sled Inertial History Data Base Project:

a. Plots of converted inertial data for Horizontal Sled Runs LX3332 through LX3715 were produced.

b. Nine updated versions of the Horizontal Sled Inertial History Data Base were produced.

c. 383 History Reports for the Horizontal Sled Runs from LX3332 through LX3715 were produced.

d. Outputs of conversion of data from specified sled runs performed months earlier were produced.

e. Outputs of X-Ray Anthropometry Data Digitization and Transformation process for the subjects up through H108 were produced. An updated version of the Horizontal Sled Inertial History Data Base incorporating the outputs of the X-Ray Anthropometry Data Digitization and Transformation referred to was formed.

f. Special Reports on subjects H093, H105 and H106 for runs in the -X,+Y direction with three inertial configurations, the HOLD, HOSD and LOLD configurations, sorted by G level, were produced from information in the Horizontal Sled Inertial History Data Base.

## B. HORIZONTAL SLED MEDICAL DATA BASE

During this reporting period effort was expended in the following areas of the Horizontal Sled Medical Data Base Project:

a. Seven updated versions of the Horizontal Sled Medical Data Base were produced.

b. 358 Medical Reports including Cardiological Reports on the Horizontal Sled Run LX3332 through Run LX3690 were produced.

d. Medical forms from Run LX3332 through LX3690 were coded and keypunched.

Effort was also expended on the following Special Human Research Reports:

a. Two Subject Qualification Summary Reports

b. Report on Subject H080 covering all of the post run symptoms shown by the subject.

## C. SLED MOTION PICTURE DIGITIZATION

During this reporting period QEI personnel produced Sled Motion Picture Digitizations of the following Horizontal Sled Runs by using the Photo Digitizing System:

a. 21 reels camera calibration film

b. 1038 reels human run film

c. 348 reels voluntary motion (head nod) film

d. 15 reels animal runs film

e. 102 reels dummy runs film

f. 42 reels of previously digitized film re-digitized to correct inaccuracies

An Average Target Position Calculator program was also designed, implemented and debugged to analyze the variability in image location of the Sled Runs. Use of this program will enable experimenters to better position the cameras during a Horizontal Sled Run and thus obtain better, more accurate information.

## D. EKG DATA PROCESSING

During this reporting period effort was expended in the following areas on the EKG Data Processing Project:

a. Several EKG Reports for each human subject, generated from data in the Horizontal Sled Inertial History and the Horizontal Sled Medical Data Bases were produced.

b. Reports on certain Horizontal Sled animal runs were produced by combining animal EKG data with appropriate data from the Horizontal Sled Medical Data Base.

## E. EFFECTS OF SHIP MOTION

A number of computer programs were written and runs were made with these programs to analyze input from tests on human volunteers subjected to various types of ship motion.

A computer program was designed, implemented and debugged to edit and transform raw emisis data into a more appropriate format. Two computer programs were designed, implemented and debugged to compare theoretical and empirical emisis functions.

A computer program to edit input to the Posner Test Scoring Program was written and debugged. Runs were made using the Posner Test Scoring Program on edited input.

A computer program to generate a specified number of specific types of Pattern Recognition Tests was written and debugged. A computer program to generate a specified number of copies of specified discrete sets of the Baddeley Grammatical Reasoning Test was written and debugged.

A number of computer runs were made to analyze the scoring of edited test results from the Baron Reaction Time Test, the Collins and Quillian Verbal Learning Tasks Test, the Meyer Verbal Learning Tasks Test and Moran's Five Factors Test for a number of subjects.

## F. EXPERIMENTER GRAPHICAL ANALYSIS DISPLAY SYSTEM

A computer program called the Experimenter Graphical Analysis Display System (EGADS) has been designed, implemented and debugged to graphically display mean, maximum and minimum data scores for a day along with an individual's score, permitting detection of erroneous score data. This program also permits least squares regression analysis of time series data.

## G. UNIVAC 1108 REMOTE TERMINAL OPERATIONS

QEI, Inc. personnel have provided assistance to NBDL during this reporting period with the UNIVAC 1108 Remote Terminal Operations. Job-turn-around time has been good with a fairly low error rate.

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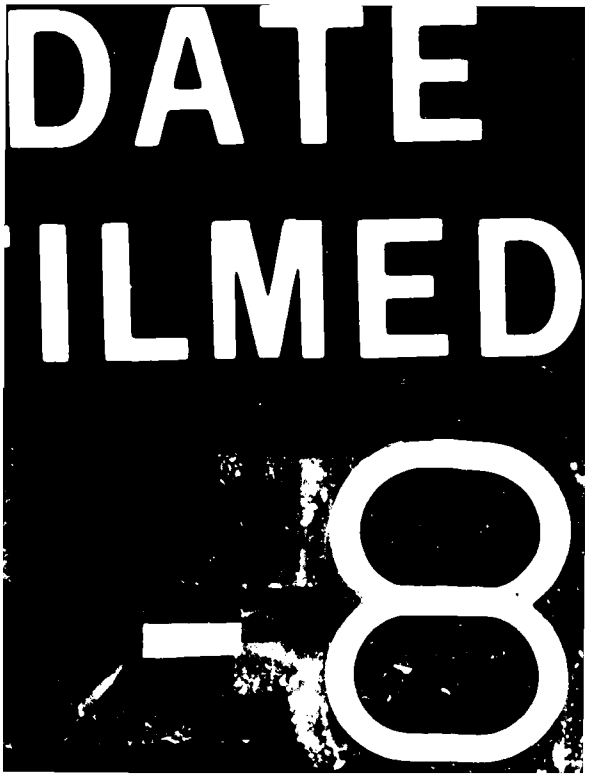
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