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5510/1
Ser 93/435
22 Apr 97

AD-111 731

From: Chief of Naval Research
To: Commanding Officer, Naval Research Laboratory (NRL 1221.1)

Subj: DECLASSIFICATION REVIEW

Ref: (a) NRL ltr 5510 Ser 1221.1/S0051 of 25 Feb 97

Encl: (1) Extract Report, AD 111 731 "Shock and Vibration Survey, June 1956"

1. Reference (a) requested a declassification review be conducted on ONR Report "Harbor Defense, Bulletin No. 4." Since the Chief of Naval Research is not the Original Classification Authority (OCA) for the material contained in that report, I will forward the articles to the appropriate OCAs for review and notify you of the results.

2. Reference (a) also requested a review of the distribution statement assigned to enclosure (1). Distribution Statement "A" may be assigned to this document.

3. Questions may be directed to the undersigned on (703) 696-4619.

Peggy Lambert

PEGGY LAMBERT
By direction

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[redacted]

NRL/STV Survey 6/56

SHOCK AND VIBRATION SURVEY

JUNE 1956



DEPARTMENT OF DEFENSE

WASHINGTON, D. C.

[redacted]

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SHOCK AND VIBRATION SURVEY

A Survey of the Shock and Vibration Research and Development Projects of the Department of Defense

and

An Index of Shock and Vibration Testing Facilities in Government Establishments

Complied and edited by
Elias Klein
R. O. Belsheim
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Prepared by

The Centralizing Activity for Shock and Vibration
of
The Office of the Assistant Secretary of Defense
for Research and Development

DEPARTMENT OF DEFENSE
WASHINGTON, D. C.

FOREWORD

Today, when our technology is developing at a staggering rate, optimum progress in any particular branch of applied science depends largely upon the degree of effectiveness in the coordination of current technical information relating to that subject. In military technology, especially in areas involving security classification, the need to keep the investigator informed of the essential and pertinent findings in his field is of the utmost importance to the defense effort and is made more urgent by the shortage of engineers and scientists.

For these reasons several distinct procedures have been devised for disseminating technical knowledge among working engineers and scientists. One method for following progress in a given field and avoiding unnecessary duplication in the different phases of a project is the use of summary digests of investigations which are continuing along similar lines in various activities. The information given apprises the technical worker of the existing projects currently underway in his field, how extensive they are, and who is doing what.

This survey is intended to serve military engineers and scientists as a guide to progress in the field of shock and vibration. It is the continuation of an earlier (1949) attempt to show the Research and Development Board of the Department of Defense the extent of shock and vibration investigations being pursued by the Service Departments and to help the agencies participating in the program. In addition, the compilation includes the facilities and machines in government activities employed to simulate the shock and vibration field environmental conditions for test and development purposes. It is hoped that this assembly of information will be useful to the investigator.

Elias Klein

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SHOCK AND VIBRATION SURVEY

PART I

SURVEY OF SHOCK AND VIBRATION PROJECTS

INTRODUCTION

In any survey of this type certain problems arise and must be resolved at the outset. Among these are:

(1) The problem of security classification and the limits of the subject matter to be covered,

(2) The sources of information which should be exploited to obtain a thorough coverage,

(3) The amount and type of information to be presented for any given project,

(4) The organization of the many survey items in the most satisfactory manner, and

(5) The most useful method of indexing.

The following remarks outline the methods chosen for assembling and organizing the material and it is hoped that they will help the reader to understand and use the survey.

ASSEMBLY AND ORGANIZATION OF MATERIAL

Security Classification

To obtain as wide a distribution as possible for a majority of the information available on research and development projects in the field of shock and vibration, it was decided that no material of a higher classification than confidential should be presented in the survey. The over-all classification of the publication is also confidential.

Limitation of Subject Matter

In general the scope of the survey was limited to problems of mechanical shock and vibration of a structure, or an equipment. Thus thermal, electrical, and physiological shock problems were excluded, as were problems related to acoustic vibration, ballistic impact, and aircraft flutter. Most of these categories are not normally considered to be shock and vibration. They tend to be rather specialized fields and have their own literature. The projects considered here relate mainly to the protection of mobile service gear. The scope of the survey can best be visualized by examining the organization outline shown in the chart, and which is discussed further below. Actually, any boundaries set up are rather vague and arbitrary, but for practical purposes some attempt had to be made to define them.

Sources of Information

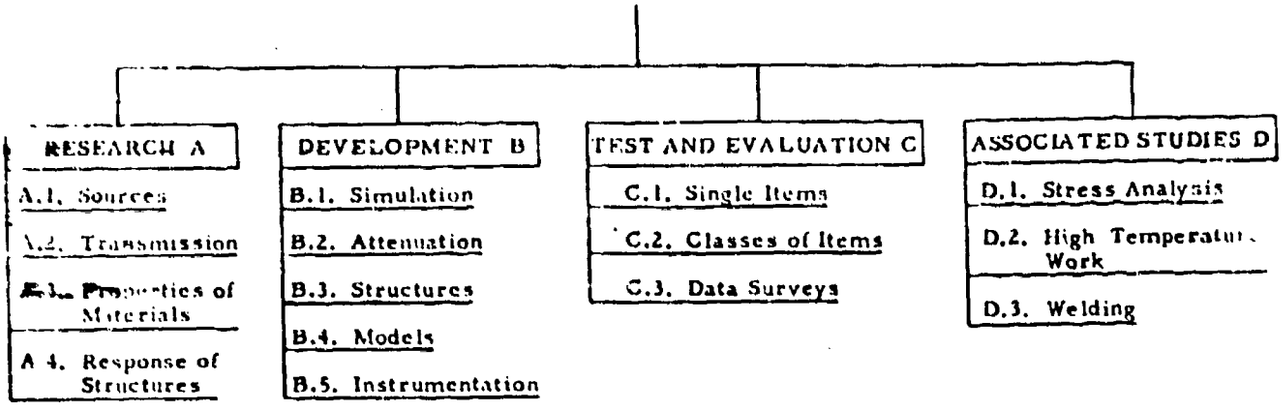
In searching for subject matter, the primary source has been the project cards submitted to the Research and Development Report and Statistical Branch of the Department of Defense. In addition, direct inquiries were made to certain laboratories and activities whose work included shock and vibration projects. While no coverage could ever be complete in a limited period of time, it is believed that nearly all the potential sources of material were investigated. To ensure satisfactory coverage at each source used, a large number of fringe subjects were reviewed and it is probable that most of the items omitted were borderline cases. It is believed that their omission is not serious.

Type of Information Given

A study of the information available from the R & D project cards and an examination of similar surveys on other projects, suggested the type of information to be given and a preliminary survey sheet layout was made. The processing of a number of projects led to some revisions and the final arrangement adopted is shown in the sample Survey Sheet. A few explanatory remarks are necessary for a complete understanding of the survey. A single large project may be presented by many installations and individuals, but each survey item refers only to a particular phase at the working level. To indicate these facts and to assist administrative personnel, the Project No. and the first part of the Title (in parentheses) define the

CHART - ORGANIZATION OF MATERIAL

Department of Defense
Research and Development Project Cards
and Information from Laboratories
and Establishments



KEY

A.1. Sources - Studies concerning input of transient or vibratory motions into structures
A.2. Transmission - Fundamental studies concerning propagation of transient or vibratory loadings through structures
A.3. Properties of Materials - Studies to determine the effects of dynamic loadings on various mechanical properties of materials
A.4. Response of Structures - Fundamental studies to determine the effects of transient or vibratory loadings on structures and components
B.1. Simulation - Studies aimed at controlled duplication of service transient or vibratory loadings
B.2. Attenuation - Studies of methods and mountings which reduce transient or vibratory loads received by structural components
B.3. Studies of items intended to result in improved performance of prototypes under transient or vibratory load conditions
B.4. Models - Studies of scaled items intended to result in improved performance of prototypes under transient or vibratory loading conditions
B.5. Instrumentation - Studies intended to provide adequate facilities for measurement of transient or vibratory loadings and resulting effects in structures
C.1. Single Items - Tests of an equipment or structure to evaluate performance under expected shock and vibration environment
C.2. Classes of Items - Tests of classes of equipments or structures under shock and vibration environment to determine performance and/or typical characteristics for prediction purposes
C.3. Data Surveys - Collections of test data on similar equipments or structures to determine typical characteristics under typical shock and vibration environments
D.1. Stress Analysis - Studies of problems concerning determination of stress, deflection, etc., caused by static loading
D.2. High Temperature Work - Studies of instrumentation, material properties, etc., at high temperatures
D.3. Welding - Studies of items intended to result in improved performance of prototypes under transient or vibratory loading conditions

large project. The Task/Contract/W.O. No., and the second part of the Title define the particular phase of the project described by the sheet. A dashed line following a heading indicates that the information was not available for inclusion. Neither the length of the Description, nor the number of Reports listed are intended to suggest the importance of the project. Each sheet simply presents such information as was available.

Organization of the Material

A grouping of similar projects simplifies the task of a person looking for information of a particular type. The organization of the survey items as shown in the chart was aimed at achieving such a grouping. The items are first grouped under the rather general headings of Research, Development, Test and Evaluation, and Associated Studies. The first three heads include items which are concerned more or less

Sample - Survey Sheet with Explanatory Entries

Survey No: For organization and reference purposes

Project No: For project identification Task/Contract/W.O. No: For identification of particular task as described below

Title: (Main Project Title) Task title of work as described below.

Task Security Classification: _____ Sheet Security Classification: _____

Date Approved: _____ Completion Date: _____

Directing Agency: The Administrative director of the project

Contractor or Laboratory: Name and address of establishment performing the work described below.

Principal Investigator: Name of person in direct charge of work described below.

Description: A brief outline of the work recently done on the task. This information in general was obtained from R & DB project cards, or in some cases direct from the working laboratory.

Reports:

A listing of published reports on the task, as obtained from R & DB project cards, direct laboratory contact or other available sources.

directly with shock and vibration, whereas Associated Studies contains items which, although applicable to some phases of such work, are probably not themselves explicitly shock and vibration items. The subgroupings form further breakdowns of the survey items. Each item was classified on the basis of the ..., Description, and Reports, into the subgroup which best matched the information. Since the classification, even at this level, was sometimes difficult, any further breakdown into smaller groupings would have been very artificial.

The Index

Because no organizational method can satisfy all readers, it was necessary to prepare an index. To be successful an index should be as comprehensive as possible. Accordingly the index has been checked and revised by several individuals with different backgrounds. It is hoped that users of this survey will be relatively successful in finding what they are looking for.

ACKNOWLEDGMENTS

The editors wish to record their appreciation for the cooperation and assistance they have received in compiling this survey. In particular it is desired to acknowledge the efforts of the file room personnel of the Reports and Statistical Branch, Department of Defense. Their willing assistance was of great value in sifting the mass of research material available. Thanks are also due to the many laboratories and activities who searched their files to produce all pertinent information.

RESEARCH

SURVEY NOS:

A.1.1 through A.1.42
A.2.1 through A.2.8
A.3.1 through A.3.81
A.4.1 through A.4.60

SURVEY NO: A.1.1

PROJECT NO: 7647 TASK/CONTRACT/W.O. NO: 76472 and AF 19(122)-441

TITLE: (Terrestrial Physics) Atmospheric Pressure Pulse Measurements.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: AF Cambridge Res. Ctr., GRD, Terrestrial Science Lab.

CONTRACTOR OR LABORATORY: Columbia Univ., New York, N. Y.

PRINCIPAL INVESTIGATOR: M. Ewing

DESCRIPTION: The use of dispersion data has not previously been brought into the long range detection program. However, observations indicate that useful supplementary information may be derived from further study of this property of atmospheric pressure waves.

REPORTS:

(1) "Studies of Frontal, Cyclonic, and Hurricane Microseisms Generated in the Western North Atlantic, Part II, Cyclonic Microseisms," by W. L. Donn, March 1951.

(2) "Further Study of the T Phase," by M. Ewing, F. Press, and J. L. Worzel, July 1951.

(3) "Two Slow Surface Waves Across North America," by F. Press and M. Ewing, August 1951.

(4) "Crustal Structure and Surface Wave Dispersion, Part II, Solomon Islands Earthquake of 29 July 1950," by M. Ewing and F. Press, August 1951.

(5) "An Investigation of Swell and Microseisms from Hurricane of August 13-16, 1946," by W. L. Donn, October 1951.

(6) "Crustal Structure and Surface Wave Dispersion, Part III, Theoretical Dispersion Curves for Suboceanic Rayleigh Waves," by W. S. Jardelzky and F. Press, January 1952.

(7) "Further Study of Atmospheric Pressure Fluctuations Recorded on Seismographs," by M. Ewing and F. Press, March 1952.

(8) "A Comparison of Microseisms and Ocean Waves Recorded in Southern New England," by W. L. Donn, March 1952.

(9) "On the General Solution of the Wave Equation and On Waves Generated at an Interface," by W. S. Jardetzky, July 1952.

(10) "An Investigation of Mantle Rayleigh Waves," by M. Ewing and F. Press, September 1952.

(11) "Microseism Ground Motion at Palisades and Weston," by M. Balik and W. L. Donn, January 1953.

(12) "Mantle Rayleigh Waves from Kamchatka Earthquake of 4 November 1952," by M. Ewing and F. Press, February 1953.

(13) "Crustal Structure and Surface Wave Dispersion, Part IV, The Atlantic and Pacific Ocean Basins," by J. Oliver, M. Ewing, and F. Press, January 1953.

SURVEY NO: [illegible]

PROJECT NO. 1246 TASK/CONTRACT/W.O. NO: 70180

TITLE: (Exterior and Interior Aerodynamics) Sonic Boom Investigation.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Aircraft Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective of this task is to determine through experimental and analytical studies the complete pressure characteristics of the shock waves associated with the Sonic Boom, to evaluate the possible military applications of the Sonic Boom and to extend the existing knowledge of the phenomenon to enable its control. It is presently planned that theoretical studies of the phenomenon will be made both under contract and through internal effort.

SURVEY NO: A.1.3

PROJECT NO: NR 061-017 TASK/CONTRACT/W.O. NO: N6onr 23204

TITLE: (Aeromechanics) Aerodynamic Studies in a Shock Tube.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1947 COMPLETION DATE: 1955

DIRECTING AGENCY: ONR, Mech. Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Mich., Ann Arbor, Mich.

PRINCIPAL INVESTIGATOR: O. Laporte

DESCRIPTION: In order to supplement and extend available knowledge of the aerodynamics of shock, experimental studies are being carried out in a 2- by 7-in. shock tube; appropriate theoretical analyses are included in the work. The problems of the amalgamation of two shock waves facing in the same direction, and of the interaction of shocks with converging channels have been recently studied. A large-sector shock tube has been completed and will be used for studies of convergent and divergent cylindrical shocks.

REPORTS:

(1) "Three-Dimensional Observations on the Passage of Shock Waves over a Rectangular Block," by O. Laporte, Tech. Report No. TAFSWP-703.

(2) "The Passage of Shock Waves Over a Rectangular Block at Various Angles," by E. B. Turner, A. C. Hunting, and A. C. Kolbi, Report No. 53-1.

(3) "The Shock Tube as an Instrument for the Investigation of Transonic and Supersonic Flow Patterns," by F. W. Geiger, and C. W. Mautz.

SURVEY NO: A.1.4

PROJECT NO: NR 061-020 TASK/CONTRACT/W.O. NO: N6ori 10502

TITLE: (Aeromechanics) Shock Tube Flow Investigation.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Princeton Univ., Physics Dept., Princeton, N.J.

PRINCIPAL INVESTIGATOR: W. Bleakney

DESCRIPTION: Fundamental problems concerning the aerodynamics of shock are being investigated, using the large 4- by 18-in. shock tube with associated electronic timing and optical visualization instrumentation. Particular attention is now being directed to the following problems: The refraction of shocks at the interface between two gases; the interaction of a shock with a thermal or other inhomogeneous layer; transient boundary layers in shock tubes; and the reflection and diffraction of shocks about rigid bodies.

REPORTS:

(1) Tech. Report No. II-11, by W. Bleakney
(2) " " No. II-12, by D. R. White and D. K. Weimer
(3) " " No. II-13, by H. H. Bringham, D. K. Weimer, and W. Griffith.
(4) Tech. Report No. II-14, by D. E. Brickl and W. Bleakney
(5) " " No. II-15, by R. E. Smith, February 1954
(6) " " No. II-16, by R. G. Jahn, June 1954

SURVEY NO: A.1.5

PROJECT NO: NR 061-041 TASK/CONTRACT/W.O. NO: N7onr 35803

TITLE: (Aeromechanics) Measurement of Shock Front Properties.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1947 COMPLETION DATE: 1956

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Brown Univ., Providence, R. I.

PRINCIPAL INVESTIGATOR: D. F. Hornig

DESCRIPTION: Measurements have been made of shock-wave thickness and structure in a shock tube through the use of the light reflectivity technique which was developed under this task. The thickness of shocks in a number of gases and liquids have already been determined. Current studies are designed to provide information on the conversion of coherent flow into rotational energy behind a shock, on thermal relaxation effects, and on the dynamic behavior of mixed gases.

REPORTS:

(1) Tech. Report No. 1, by G. R. Cowan and D. F. Horning, 6 April 1949

(2) " " No. 2, by W. M. Flook, Jr. and D. F. Hornig, 16 December 1949

(3) Tech. Report No. 3, by E. Greene, G. R. Cowan, and D. F. Hornig, 20 December 1950

(4) Tech. Report No. 4, by E. Greene and D. F. Hornig

(5) " " No. 5, by W. M. Flook, Jr. and D. F. Hornig, 21 January 1954

SURVEY NO: A.1.6

PROJECT NO: NR 061-092 TASK/CONTRACT/W.O. NO: Nonr 401(11)

TITLE: (Aeromechanics) Shock-Wave Boundary Layer Interaction.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Cornell Univ., Ithaca, N. Y.

PRINCIPAL INVESTIGATOR: Y. H. Kuo

DESCRIPTION: This task involves a program of theoretical research on the effects of viscosity in high-speed aerodynamics. Attention has been directed toward problems of viscous laminar flow with moderate Reynolds numbers and to leading edge shock-wave boundary layer interaction such as occurs on a flat plate in hypersonic flow. The heat-transfer characteristics in the latter case are particularly being studied.

SURVEY NO: A.1.7

PROJECT NO: NR 061-117 TASK/CONTRACT/W.O. NO: Nonr 1224(04)

TITLE: (Aeromechanics) Shock-Wave Diffraction Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Mich., Ann Arbor, Mich.

PRINCIPAL INVESTIGATOR: O. Laporte

DESCRIPTION: Experimental studies are being conducted in a shock tube in order to provide the Armed Forces Special Weapons Project with general and specific information pertaining to the diffraction of shock waves over various obstacles; interferometer studies of the blast diffraction patterns are included.

SURVEY NO: A.1.8

PROJECT NO: 503-04-002 TASK/CONTRACT/W.O. NO: TB3-0112J

TITLE: (Research in Terminal Ballistics) Basic Air Blast Research

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: 1956

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistics Res. Labs.

CONTRACTOR OR LABORATORY: APG, Ballistics Res. Labs., Aberdeen, Md.

PRINCIPAL INVESTIGATOR: C. N. Kingery

DESCRIPTION: To study the diffraction around various shaped scale models of air shock waves produced in the shock tube. To determine scaling and shock-loading parameters and to compare data with full-scale test results from nuclear and H. E. detonations.

REPORTS:

(1) "Comparison of Air Shock Loading on Three-Dimensional Scaled and Full Size Structures, Part II, Structure 3.1a," BRL Tech. Note 976, by C. N. Kingery and J. H. Keefer, February 1955.

(2) "Air Blast Loading on a Scaled Three-Dimensional Structure," BRL Report 952, by C. N. Kingery and J. H. Keefer, July 1955.

(3) "Comparison of Air Shock Loading on Three-Dimensional Scaled and Full Size Structures, Part I, Structure 3.1o and 3.1p," BRL Tech. Note 929, by C. N. Kingery and J. H. Keefer, July 1954.

SURVEY NO: A.1.9

PROJECT NO: 503-04-002 TASK/CONTRACT/W.O. NO: TB3-0112H

TITLE: (Research in Terminal Ballistics) Ground Shock Phenomena

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistics Res. Labs.

CONTRACTOR OR LABORATORY: APG, Term. Ballistics Lab., Aberdeen, Md.

PRINCIPAL INVESTIGATOR: B. Perkins, Jr.

DESCRIPTION: To study: (a) Stresses and accelerations in soil and rock produced by chemical and nuclear explosions and the relation of these to vibrations in and damage to buried structures; (b) effect of geological discontinuities on transmission of ground shock; (c) mechanics of crater formation. This is an extension of work started in Div. 2, NDRC at Princeton.

SURVEY NO: A.1.10

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TB2-1241

TITLE: (Basic Blast Measurements of Nuclear Weapons)

TASK SECURITY CLASSIFICATION: S-RD SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Ballistic Res. Labs. Aberdeen, Md.

PRINCIPAL INVESTIGATOR: E. J. Bryant and N. H. Ethridge

DESCRIPTION: Obtain measurements of static pressure-time vs. distance and dynamic pressure-time vs. distance from detonations of nuclear weapons. These measurements are taken with self-recording gages developed by BRL. Measurements of these parameters are to be correlated with damage effects to various type targets.

REPORTS:

(1) "Basic Blast Measurements for Projects 1.14, 3.1 and 3.10, Operation TEAPOT," by E. J. Bryant, N. H. Ethridge, and J. H. Keefer, AFSWP, ITR 1155.

SURVEY NO: A.1.11

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13583 and AF 33(616)-394

TITLE: (Aircraft Structural Design Criteria) Ground Loads Criteria

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Fairchild Aircraft Corp., Hagerstown, Md.

PRINCIPAL INVESTIGATOR: L. T. Waterman

DESCRIPTION: Aircraft loads, load relationships, and related parameters existing during landing, taxiing, and ground handling have been determined. A final report has been submitted.

Further studies of airplane impact, rebound, and run-out during landing are being performed under an extension of this contract. This study is about 10 percent complete.

SURVEY NO: A.1.12

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 61292

TITLE: (Aircraft Structural Design Criteria) Analysis of Supersonic Missile Data.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: WADC, WCLSS-1, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Supersonic missile data have been analyzed for five missiles.

REPORTS:

(1) "Analysis of Data from Five Upper Air Missiles," Technical Report WADC 55-36.

SURVEY NO: A.1.13

PROJECT NO: 1369 TASK/CONTRACT/W.O. NO: 13512 and AF 33(616)-490

TITLE: (Alighting Gear Components) Investigation of Brake Chatter and Squeal.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1943 COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Bendix Products Div., South Bend, Ind.

PRINCIPAL INVESTIGATOR: J. L. Edman

DESCRIPTION: The objective of this task is the determination of the basic cause of brake chatter and squeal; the control of brake chatter and squeal; and the prediction of the vibration exciting characteristics of brakes from laboratory tests. The contractor has conducted extensive laboratory tests, taxi tests and flight tests on a B-25 aircraft. A final report is expected in the near future.

SURVEY NO: A.1.14

PROJECT NO: 1369 TAS./CONTRACT/W.O. NO: 13537 and AF 33(600)-24512

TITLE: (Alighting Gear Components) Study of Theory of Shimmy and Development of Shimmy Damping Devices.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Cornell Aeronautical Lab., Buffalo, N. Y.

PRINCIPAL INVESTIGATOR: W. F. Milliken, Jr.

DESCRIPTION: This task covers a study of the properties of shimmy, and the preliminary and final design of test equipment for use in shimmy tests. Data obtained under this task will be used to establish a specification covering the design of shimmy dampers.

REPORTS:

(1) Progress Reports on Cornell Aeronautical Lab. Contract AF 33(600)-24512.

SURVEY NO: A,1,15

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13458 and AF 33(616)-247

TITLE: (Aeroelasticity, Vibration and Flutter) Analytical Determination of Forcing Functions of Gas Turbine Engines.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

PRINCIPAL INVESTIGATOR: C. H. Wu

DESCRIPTION: The purpose of this task is the determination of the forcing functions generated by typical jet engines so that the likelihood of incompatibility of an engine with the local engine mounting and fuselage structure will be avoided. This will be accomplished by a dynamic analysis in which engine-frame reactions will be derived in terms of the design and operating parameters of the engine.

SURVEY NO: A.1.16

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13466 and AF 33(616)-225

TITLE: (Aeroelasticity, Vibration and Flutter) Theory of Vibratory Pressures Around Supersonic Propellers.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: P. Lieber, Troy, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Supersonic propellers appear to be a major source of noise and vibration in aircraft. No method is available for estimating the noise emitted. An estimation of the alternating pressure field about supersonic propellers is necessary in order to evaluate potential vibration problems and to evaluate and design sound insulation in aircraft. At present this task is concerned with a theoretical study of the pressure fields.

SURVEY NO: A.1.17

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13469 and AF 33(616)-477

TITLE: (Aeroelasticity, Vibration, and Flutter) Rotor-Pylon Vibration in Helicopters

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: C. R. Anderson, New Haven, Conn.

PRINCIPAL INVESTIGATOR: C. R. Anderson

DESCRIPTION: This task will provide data on the mechanics of helicopter vibration as induced by the rotor and transmitted through the pylon. Specific information on the basic physical laws underlying the generation of helicopter vibration is to be obtained. The method of attack is to use a dynamic model of a helicopter to confirm the vibration induced by a harmonically varying drag force in the plane of the rotor. The work to date has largely confirmed the theoretical conditions and analyses.

REPORTS:

(1) "The Response of Helicopter Rotors to Oscillatory Rotor-Plane Drag Forces at the Blades," WADC TR No. 52-270 (Unclassified)

SURVEY NO: A.1.18

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13749

TITLE: (Aeroelasticity, Vibration, and Flutter) Analysis of Helicopter Configurations.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass. and others

PRINCIPAL INVESTIGATOR: H. Miller and others

DESCRIPTION: This task is intended to provide the basic laws for the vibratory forces developed by various rotor configurations as well as for the fuselage response to such forces. Experimental and theoretical studies are to be initially carried out on a tandem-rotor helicopter followed by supplementary work on a co-axial and laterally disposed configuration as needed. On these basic laws will be based the evaluation of future designs as well as criteria for anti-vibration provisions required by such designs.

SURVEY NO: A.1.19

PROJECT NO: 9-38-13-006 TASK/CONTRACT/W.O. NO: AF 18(600)-1225

TITLE: (Helicopter Vibration Reduction) Design Study of Flettner Heligro.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Flettner Aircraft Corp.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An engineering design study will be made to compare the general design and performance characteristics of a conventional helicopter with that of an aircraft combining the best features of a helicopter autogyro.

SURVEY NO: A.1.20

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAMAD-2117.1

TITLE: (Structural Development and Test) Statistical Survey of Flight Accelerations of Service Aircraft.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests are being conducted to obtain detailed statistical data on the frequency with which naval aircraft experience certain vertical flight accelerations. The basic task TED NAM AD-2117 (of which this task is a continuation) provides for acceptance, distribution and maintenance of the NBS statistical accelerometers. The present task provides for the analysis and reporting of the data from these accelerometers. The accelerometer data are to be furnished by the Service Activities to ASL. ASL will submit reports summarizing flight time and acceleration counts by model, squadron, and type of flight, and make statistical analyses of the recorded data.

SURVEY NO: A.1.21

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: NOas 54-344-c

TITLE: (Experimental Structures and Structural Design Criteria) Development of Improved Design Criteria for Aircraft Journal Bearings.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Battelle Memorial Inst., Columbus, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To determine, for various design and operating conditions, the maximum bearing stresses for standard bearing materials used for aircraft fittings and joints having limited motion, a survey has been conducted to obtain background data. A test program has been developed and test work has begun.

REPORTS:

(1) "An Experimental Program for Airframe Plain Bearings Having Motion," BMI Special Report, 30 April 1954.

(2) "The Survey of Applications, Designs, and Problems Concerning Joints Having Motion," BMI Survey Report, 15 September 1954.

SURVEY NO: A.1.22

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOas 53-348-C

TITLE: (Aircraft Structural Loads Development) - Application of Statistical Theory to Seaplane Structural Loads Problems Associated with Landing and Take-off.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Aercon Inc.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The application of spectral density statistical theory to the random loading conditions associated with rough-water operation of seaplanes, has been investigated. The work involved outlining the experimental investigations required, development of methods for statistical treatment of experimental data on seaplane impacts, and the illustration of the utilization of the methods.

REPORTS:

(1) "On the Dynamic Amplification Spectra of Landing Impacts," Aercon, Inc. Final Report No. 1.

(2) "On the Statistical Approach to the Analysis of Dynamic Stresses in Aircraft Structures During Landing," Aercon, Inc. Final Report No. 2.

(3) "Stability, Disturbed Motion, and Loads of a Seaplane Planing Over Ocean Waves," Aercon, Inc. Final Report No. 3.

(4) "Summary and Recommendations for Further Research on a New Approach to Ground Loads Problems," Aercon, Inc. Final Report No. 4.

SURVEY NO: A.1.23

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOas 53-777-C

TITLE: (Aircraft Structural Loads Develcpment) Study to Determine Landing Gear Loads Resulting from Free-Flight Arresting Engagements.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Chance Vought Aircraft, Dallas, Tex.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task was performed in order to determine the arresting behavior and landing gear loads for the F7U-3 and F4U-7 airplanes during free-flight arresting engagements for conventional arresting wire locations and for the arresting wire three feet above the deck.

REPORTS:

(1) "Study to Determine the Landing Gear Loads, Both Main and Nose, Resulting from Free Flight Engagement," CVA Report No. 8857, 22 May 1953.

SURVEY NO: A.1.24

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: TED NPG DE 201

TITLE: (Aircraft Structural Loads Development) Blast Tests on Naval Aircraft Structures.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Proving Ground, Dahlgren, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Components and complete aircraft structures were subjected to TNT explosions to determine experimentally the blast effects on aircraft structures. Free-air-pressure time histories and impact pressures on aircraft components were measured.

REPORTS:

(1) "First Partial Report on Damage to Aircraft by Blast," NPG Report 1058 (Confidential), 3 December 1952.

SURVEY NO: A.1.25

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOa(s) 11027

TITLE: (Aircraft Structural Loads Development) Determination of Seaplane Loads for Eccentric Impact.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Stevens Institute of Tech., Hoboken, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The bow loads were measured on a dynamic scale-model of the Model XJR2F-1 airplane. Tank tests were conducted with a free flight dynamic scale model. Time histories of trim, heave, vertical acceleration, and angular acceleration were obtained. These data were obtained for use in conjunction with analytical studies to develop full-scale seaplane structural design criteria for bow loadings.

SURVEY NO: A.1.26

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Turbojet Compressor and Turbine Blade Vibration

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: National Advisory Committee for Aeronautics, Lewis Flight Propulsion Lab., Cleveland, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The compressor and turbine blades of turbojet engines are subjected to dynamic gas loadings which result in vibration of the blades. The Lewis Flight Propulsion Laboratory is engaged in a study to determine the basic phenomena involved and to find means for alleviating the various vibration problems that arise. Information concerning the sources of the excitations, methods of reducing the excitation and methods of introducing additional damping into the vibrating systems are being sought.

REPORTS:

(1) "Correlation of Vibratory Root Failures and Stress Distribution in J65 Compressor Blades," by A. J. Meyer, Jr. and A. Kaufman, NACA RM E54L24 (Confidential).

(2) "Compressor Blade Vibration and Performance in a J47-23 Turbojet Engine Under Conditions of Rotating Stall," by M. P. Hanson, D. F. Johnson, and A. J. Meyer, Jr., NACA RM E54L20a (Confidential).

(3) "Effect of Annular Inlet Baffles on Rotating Stall, Blade Vibration and Performance of an Axial Flow Compressor in a Turbojet Engine," by D. F. Johnson, A. J. Meyer, Jr., and M. P. Hanson, NACA RM E55C25a (Confidential).

(4) "Experimental Determination of Aerodynamic Forces Normal to the Chord Due to Rotating Stall Actin, on Compressor Blading," by D. F. Johnson and E. L. Costilow, NACA RM E54F14 (Confidential).

(5) "Axial Flow Compressor Rotating Stall and Rotor Blade Vibration Survey Terminated by a Fourth Stage Rotor Blade Failure," by H. F. Calvert, A. A. Medeiros, and F. B. Garrett, NACA RM E54K29 (Confidential).

(6) "Rotating Stall and Rotor Blade Vibration of a 13-Stage Axial Flow Compressor in a Turbojet Engine," by H. F. Calvert, W. M. Braithwaite, and A. A. Medeiros, NACA RM E54J18 (Confidential).

(7) "Effect of Inlet Air Baffles on Rotating Stall and Stress Characteristics of an Axial Flow Compressor in a Turbojet Engine," by S. C. Huntley, M. C. Huppert, and H. F. Calvert, NACA RM E54G09 (Confidential).

Survey No: A.1.26 (Continued)

(8) "Effect of Inlet Temperature on Rotating Stall and Blade Vibrations in a Multistage Axial Flow Compressor," by A. A. Medeiros, H. F. Calvert, and D. B. Fenn, NACA RM E55E05 (Confidential).

(9) "Effects of Inlet Air Flow Distortion on Steady State Altitude Performance on an Axial Flow Turbojet Engine," by E. W. Conrad, M. P. Hanson, and J. E. McAulay, NACA RM E55A04 (Confidential).

SURVEY NO: A.1.27

PROJECT NO: NR 094-215 TASK/CONTRACT/W.O. NO: Nonr 741(00)

TITLE: (Propulsive Systems for Aircraft and Missiles) Flow Field in Supersonic Compressors.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Power Br., Code 429

CONTRACTOR OR LABORATORY: Polytechnic Inst. of Brooklyn, Brooklyn, N. Y.

PRINCIPAL INVESTIGATOR: A. Ferri

DESCRIPTION: The three-dimensional flow in supersonic compressors with large ratios of tip-to-root radii is under theoretical and experimental investigation. Attention has been centered on compressors with complete supersonic flow. To date, however, compressors with a shock wave within the rotor passage have been analyzed only on the basis of two-dimensional considerations. It is proposed to extend this work so as to include three-dimensional considerations.

SURVEY NO: A.1.28

PROJECT NO: NR 094-192 TASK/CONTRACT/W.O. NO: N7onr 39418

TITLE: (Explosive Systems for Aircraft and Missiles) High Chamber Pressure Rocket Motors.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Power Br., Code 429

CONTRACTOR OR LABORATORY: Purdue Res. Foundation, Lafayette, Ind.

PRINCIPAL INVESTIGATOR: M. J. Zucrow, B. Reese, and D. E. Robinson

DESCRIPTION: An experimental and theoretical study is being conducted on the operation of liquid-propellant rocket motors at combustion pressures up to 2000 psi. The work includes a determination of the effect of combustion pressure on combustion oscillations.

SURVEY NO: A.1.29

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TED MTC SI-504

TITLE: Acceleration Tests of 1.8KS, 7800 Rocket Motor.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Naval Air Missile Test Center, Point Mugu, Cal.

PRINCIPAL INVESTIGATOR: T. E. Hanes

DESCRIPTION: Measurement of the shock and vibrational output of the 1.8KS 7800 C3 rocket motor in free flight and during restrained firings.

REPORTS:

SPARROW Sustainer Motor Environmental Tests:

E2-1 Informal Memo Rpt. 28-54
E2-2 " " " 40-54
E2-3 " " " 54-54
E2-4 " " " 61-54
E2-5 " " " 5-55
E2-6 " " " 14-55
E2-7 " " " 15-55

SURVEY NO: A.1.30

PROJECT NO: NR 098-038b TASK/CONTRACT/W.O. NO: Nonr 1369(00)

TITLE: (Fundamental Processes in Jet Propulsion) Theoretical and Experimental Investigations of Nonsteady Flow Phenomena.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Power Br., Code 429

CONTRACTOR OR LABORATORY: Cornell Aeronautical Lab., Buffalo, N. Y.

PRINCIPAL INVESTIGATOR: G. Rudinger

DESCRIPTION: A shock tube is being used to investigate the boundary conditions and friction effects which appear in nonsteady flows. The experimental and theoretical investigation of the reflection of a shock wave from the open end of a duct has recently been completed. Effort is now being directed to the problem of the reflection of shock waves from orifice plates, flares, and nozzles, in order to determine the difference between the actual boundary conditions during the interaction and those existing in the steady state.

SURVEY NO: A.1.31

PROJECT NO: NO 363-446 TASK/CONTRACT/W.O. NO: NOL-A-3d-453-1-55

TITLE: (Wind Tunnel Aeroballistics) Study of Magnus and Damping Forces and Moments.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ordnance (Re3-d)

CONTRACTOR OR LABORATORY: Naval Ordnance Laboratory, White Oak, Md.

PRINCIPAL INVESTIGATOR: J. M. Nestingen

DESCRIPTION: Dynamic-aerodynamic forces and moments are now being determined both subsonically and supersonically in wind tunnels under the direction of NOL. Of particular importance are the damping moment and the magnus moment which are the main determinants of ballistic missile dynamic stability and of general free flight performance. These dynamic forces and moments are being obtained on both bodies of revolution and fin-stabilized missiles.

REPORTS:
Naval Ordnance Lab. Reports: NOLM 10103; NOLM 10108; NOLM 10109; NOLM 10117; NOLM 10122; NOLM 10131.

SURVEY NO: A.1.32

PROJECT NO: NO 372-306 TASK/CONTRACT/W.O. NO: Allot. 45402

TITLE: Explosions in Air.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ordnance (Re2c)

CONTRACTOR OR LABORATORY: Naval Ordnance Laboratory, White Oak, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The object of this task is to provide the necessary information to keep the ordnance designer informed on the amount and type of explosive required to effect certain damage under varying conditions. This information is given in terms of blast parameters (peak pressure, impulse, particle velocity, etc.) which are correlated with damage to targets.

REPORTS:

(1) Summary Technical Report of NDRC, Div. 2, Vol. 1, 1946.

(2) NAORD Reports: 970, 1011, 1052, 986, 1734, 1723, 1749, 1863, 1891, 2221, 2123, 2167, 2264, 2348, 2451, 2474, 2482, 2584, 2753, 2841, 3569, 3738, 2858, 2909, 2984, 2959, 2821, 2890.

(3) "Charge Velocity and Blast Effect," NOLM Report 10983.

SURVEY NO: A.1.33

PROJECT NO: NO 372-314 TASK/CONTRACT/W.O. NO: Allots. 45402 and 45410

TITLE: Underwater Explosives and Explosions.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ordnance (Re2c)

CONTRACTOR OR LABORATORY: Naval Ordnance Laboratory, Exp. Res. Dept., White Oak, Md. and Naval Mine Depot, R&D Div., Yorktown, Va.
PRINCIPAL INVESTIGATOR: P. M. Fye, NOL and J. T. Manley, NMD

DESCRIPTION: The chief objective is to increase the effectiveness of all Navy's underwater weapons. A secondary objective is a better understanding of the shock wave, bubble oscillation and migration, surface effects, and the mechanism by which an underwater explosion causes damage to a submarine, surface vessel, or other target.

The damage studies that are included in this project constitute the structural shock effects. These studies were made against certain targets of special interest. As a result of an extensive study and re-examination of full scale trial data, considerable modification has been made in the damage curves previously used.

REPORTS:

(1) "Experimental Tests of Damage to Diaphragms by Shock Waves of Non-Normal Incidence," NavOrd Report 101, December 1946.

(2) "Damage to Thin Steel Cylindrical Sheels, by Under Explosion, II, J. C. Decius and G. Grever, NavOrd Report 106, 21 November 1947.

(3) "Damage to Thin Steel Cylindrical Shells by Underwater Explosions III," by J. C. Decius and W. S. Shultz, NavOrd Report 404, 11 September 1947.

(4) "Damage to Thin Steel Cylindrical Shells by Underwater Explosions IV, Large Charges," by J. C. Decius, NavOrd Report 411.

(5) "Long Range Shock Propagation in Underwater Explosion Phenomena I, by A. B. Arons and D. R. Yennie, NavOrd Report 424, 27 April 1949.

(6) "Long Range Shock Propagation in Underwater Explosion Phenomena II, by A. B. Arons, D. R. Yennie, and T. P. Cotter, Jr., NavOrd Report 478, 16 October 1949.

(7) "Report on Underbottom Explosion Tests Against the Hulks CL-108 and CV-35, Part IV Gas Globe Phenomena," NavOrd Report 1862.

(8) "The Response of Air-Backed Plates to High Amplitude Underwater Shockwaves," NavOrd Report 2462.

(9) "Preliminary Results of Shock Studies on 3/8-Scale Submarine Model 'Minnow,'" UERD Report No. F-3-53, 12 January 1953.

SURVEY NO: A.1.34

PROJECT NO: NR 062-038 TASK/CONTRACT/W.O. NO: NA onr 8-48

TITLE: (Hydromechanics) Forces Developed During Impact of Solids on Surface of Water.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1947 COMPLETION DATE: 1953

DIRECTING AGENCY: Office of Naval Research, Mech. Br., Code 438

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D.C.

PRINCIPAL INVESTIGATOR: S. Levy

DESCRIPTION: The forces which develop during the entry of prismatic, pyramidal, spherical, and conical solids into water, were determined. These bodies were dropped into water from various heights, and the forces and accelerations were measured by appropriate instrumentation.

REPORTS:

(1) "Experimental Determination of Virtual Mass from Measurement of Forces Developed During Entry of Prismatic Solids into Water," by A. E. McPherson, H. L. Byers, and E. V. Hobbs, 16 December 1949.

(2) "Experimental Determination of Virtual Water Mass by Vibration of Pyramidal and Prismatic Floats in Water," by W. Ramberg, 26 May 1947.

(3) "Experimental Determination of Virtual Water Mass from Measurement of Forces Developed During Entry of Pyramidal Solids into Water," by E. V. Hobbs, 30 March 1950.

(4) "Entry of Solids into Water," by E. V. Hobbs.

SURVEY NO: A.1.35

PROJECT NO: NR 062-170 TASK/CONTRACT/W.O. NO: Allot. 38450

TITLE: (Hydromechanics) Treatise on Water-Entry Research.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Naval Ordnance Test Station, Pasadena, Cal.

PRINCIPAL INVESTIGATOR: G. V. Schliestett

DESCRIPTION: A comprehensive treatise on the theory of water-entry impact was prepared. It is expected that this work will serve as a standard reference for designers of air-water weapons.

SURVEY NO: A.1.36

PROJECT NO: NR 062-180 TASK/CONTRACT/W.O. NO: N7onr 43907

TITLE: (Hydromechanics) Forces on Oscillating Submerged Hydrofoils.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Notre Dame, Dept. Eng. Mech., Notre Dame, Ind.

PRINCIPAL INVESTIGATOR: A. G. Strandhagen

DESCRIPTION: A theoretical investigation of heaving and pitching submerged hydrofoils with free-surface effects has taken the following avenues of approach: (1) Studies of fundamental solutions for sources of harmonically varying strength, and vortices of harmonically varying circulation; and (2) a development of the differential equations for an iterative solution. These studies, for a free surface initially at rest, will be extended to a fluid whose free surface initially consists of a regular train of waves.

SURVEY NO: A.1.37

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: PO-10710/54

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Anti-Submarine Type Hulls) Explosive Response Test on Wood and Steel Blocks.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: E. Buchmann and J. G. Batchelder

DESCRIPTION: Tests were conducted on simple floating targets to obtain information on shock wave parameters, pulsation periods, particle velocities, maximum bubble radius, and bubble migration for various kinds and sizes of explosive charges.

REPORTS:

(1) "Experimental Study of Underwater Explosion Phenomena by the Floating Block Method," by E. Buchmann and J. G. Batchelder, DTMB Report C-435 (Confidential), November 1951.

SURVEY NO: A.1.38

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: PO-10742/55

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Anti-Submarine Type Hulls) Information on Parameters of Various Explosives.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, UERD, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: A. E. Keil

DESCRIPTION: Underwater explosive tests were conducted to determine the relative damaging power of various modern aluminized explosions. These tests were conducted against the 3/8-scale submarine model MINNOW and the ex-German submarine U-3008.

REPORTS:

(1) "Effectiveness of HBX-1 and HBX-3 Against Submarine Models, Part II 3/8-Scale Submarine MINNOW," by A. H. Keil and LCDR D. R. Saveker, USN, UERD Report No. 9-1951 (Confidential).

(2) "Comparison of the Effectiveness of HBX-1 and DX-1 Against Submarine Models," by A. H. Keil, UERD Report No. 10-1951.

(3) "Comparison of the Damaging Power of Improved HBX-Type Explosives," Fifth Symposium on Progress in Underwater Explosion Research, 6-8 January 1953, BuShips Report No. 1953-3 (Confidential).

SURVEY NO: A.1.39

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: P.O. 10776/53

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Anti-Submarine Type Hulls) Explosion Test on Unstiffened Panels.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1949 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, UERD, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: H. M. Schauer

DESCRIPTION: To investigate the influence of depth of submergence on reloading, tests were conducted against 4-1/2- by 7-ft unstiffened panels when submerged to various depths.

REPORTS:

(1) Paper-Fourth Conference on Research on Ship Protection Against Underwater Explosions - "Influence of Depth of Submergence on the Reloading of Air-backed Plates," by M. K. Walther, January 1953.

(2) "Supplementary Study of the Influence of Depth of Submergence on the Reloading of Air-Backed Plates," UERD Report F-21-52 (Confidential), 1952.

SURVEY NO: A.1.40

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: P.O. 10776/53

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Anti-Submarine Type Hulls) First Pulse Loading and Hull Rupture of Submarines.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, UERD, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Theoretical studies on the interaction of the explosion phenomena on submerged submarines were conducted and present theories reviewed and applied to practical cases.

The relation between the first pulse loading and hull rupture for submarines at shallow submergence was substantiated by tests against a variety of models. Measurements of the migration of the gas globe in connection with the pulse loading were attempted.

REPORTS:

(1) "Application of Chertock's Whipping Theory to Explosion Tests Against 3/8 Scale Submarine Model MINNOW," UERD Report F-5-53.

(2) "A New Approach to Chertock's Equations for the Whipping Response of Submarines," UERD Report F-6-53.

(3) "Model Tests for Determination of Lethal-Standoff for GUPPY," UERD Report F-7-52.

(4) "Shock Loading Tests on 1/8 Scale Submarine Insert Sections at Shallow Submergence," UERD Report F-12-52.

(5) "First Pulse Loading of GUPPY," UERD Report F-14-52.

(6) "MINNOW Series Explosion Tests Against 3/8 Scale Submarine Model S-2, Part IV: First Damage Test, Vol. III, Analysis of Explosive Loading and Target Response for Damage Tests Against MINNOW," UERD Report 7-52.

(7) "Ranging of Migrating Gas Globes by the Amplitude Method," UERD Report F-9-52.

SURVEY NO: A.1.41

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-128

TITLE: (Structural Design, Ship Structure Committee) Ships at Sea

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Stevens Institute of Technology, Hoboken, N.J.

PRINCIPAL INVESTIGATOR: B. K. Kroukovsky

DESCRIPTION: To study the nature of deep sea ocean waves, to study analytically the motion of ships in a seaway (considering the ship as a rigid body), and to determine experimentally the stresses and accelerations as a consequence of ship motion - the status of related current research work supported by other activities in this field is being reviewed.

SURVEY NO: A.1.42

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: 10700/54 and 10750/55

TITLE: (Vibration and Dynamics of Ships' Structures and Machinery) Vibration Field Tests, Surveys and Investigations.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task covers field and laboratory investigations of the undesirable and damaging oscillatory motions in shipboard machinery which are produced by the operation of the engines.

REPORTS:

(1) "Torsional Vibration Characteristics of the Packard 1B-1700 Diesel Engine," EES Report 050023A, August 1953.

(2) "Torsional Vibration Characteristics of the Hercules Model DNX-V8TS Diesel Engine," EES Report 050023C, October 1953, by ltr. NP/L5/J15(754C).

(3) "Torsional Vibration Characteristics of General Motors Model 6071A Diesel Engine," EES Report 050023B, November 1953, by ltr. NP/L5/J15(754C).

(4) "Torsional Vibration Characteristics of a Caterpillar Model 512AGS Diesel Engine," EES Report 050087A, 4 February 1954.

(5) "Torsional Vibrational Characteristics of Gray-Marine Model Four-D181 Diesel Engine," EES Report 020034A, 4 March 1954, by ltr. NP/L5/J15(754C).

(6) "Torsional Vibration Characteristics of Continental LV-1790 Gasoline Engine as Installed on a Laboratory Dynamometer Test Stand and Aboard an LVTP-5 Vehicle," EES Report 050089, 8 June 1955.

SURVEY NO: A.2.1

PROJECT NO: NR 064-398 TASK/CONTRACT/W.O. NO: Nonr 704(00)

TITLE: (Structural Mechanics and Vibrations) Propagation of Elastic Impact Stresses.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Midwest Res. Inst., Div. of Eng. Sci., Kansas City, Mo.

PRINCIPAL INVESTIGATOR: M. Goland

DESCRIPTION: The propagation of stress waves in structures and their components are being studied. Numerical results were obtained regarding stresses resulting from an impulsive impact at the center of a beam. A modification of Goland's work on beams, which includes the shear and rotary inertia terms, was made; and the results were extended to the problem on plates.

A study was made to extend the previous theoretical result to sharp impact on a Uflyand-Mindlin plate of indefinite extent.

REPORTS:

(1) "Propagation of Elastic Impact Stresses," by J. L. Lubkin and M. Goland, Tech. Report No. 5.

(2) "The Propagation of Sharp Transients in Uflyand-Mindlin Plates," by J. L. Lubkin, Sept. 1954.

SURVEY NO: A.2.2

PROJECT NO: NR 064-401 TASK/CONTRACT/W.O. NO: Nonr 266(20)

TITLE: (Structural Mechanics and Vibrations) Impact Characteristics of Composite Structures.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Columbia University, New York, N. Y.

PRINCIPAL INVESTIGATOR: B. A. Boley

DESCRIPTION: An attempt is being made to establish analytically the transmission of stress and displacement arising in certain composite structures under shock loadings. The types of structures being considered are trusses, rigid-jointed frameworks, and reinforced plates and shells. The loadings are being applied at first as impacts at the joints and later as distributed shock loading such as blast on the entire structure. The effects of damping are being considered. The study is limited to the elastic range.

REPORTS:

(1) "Some Solutions of the Timoshenko Beam Equations," by B. A. Boley and Chi Chang Chao, Tech. Report No. 3.

SURVEY NO: A.2.3

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: 526 & DA-30-115-ORD-424

TITLE: (Ordnance Basic Research) The Propagation of Large Amplitude Longitudinal Strains in a Work-Hardenable Material.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1954

DIRECTING AGENCY: Watertown Arsenal

CONTRACTOR OR LABORATORY: Cornell Univ., Ithaca, N. Y.

PRINCIPAL INVESTIGATOR: D. F. Gunder

DESCRIPTION: Progress (Cumulative to 1 March 1954): Apparatus has been developed for submitting a prestressed metal rod to longitudinal impact and for measuring strain as a function of time at various points along the rod. It has been found that transient strains always propagate with a velocity nearly equal to the elastic velocity in the material, and that both dispersion and dissipation, where in evidence, were more dependent on the duration of the strain than on its amplitude. For this later reason, it was concluded that a linear model would be adequate for describing the behavior of the material. Theoretical consideration was therefore given to various linear models containing not more than five parameters. The conclusion was reached that if it is desired to use a linear model to describe the propagational properties of a solid material and if zero velocities and infinite phase velocities are not allowed, then the only admissible models are those which contain a spring in parallel with one or more Maxwell units or the equivalent of such models. To determine the validity of the linear model, the problem of a semi-infinitely long rod subjected to constant velocity impact was solved using a number of different models, and the quasi-linear model was found to be adequate. The final report has been received and the contract has been terminated.

REPORTS:

(1) "The Propagation of Large Amplitude Longitudinal Strains in a Work-Hardenable Material," by D. A. Stuart, 23 p., Figures, Bibliography (Cornell University, Dept. of Engineering Mechanics and Materials, Final Report), 27 February 1954.

SURVEY NO: A.2.4

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: 788 & DA-30-115-ORD-459

TITLE: (Ordnance Basic Research) Attenuation of Waves Produced by Explosions in Visco-Elastic Materials.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1954

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistic Research Labs.

CONTRACTOR OR LABORATORY: Rensselaer Polytechnic Inst., Troy, N. Y.

PRINCIPAL INVESTIGATOR: P. Lieber and H. C. Mattice

DESCRIPTION: Progress: (1 December 1953 - 28 February 1954). Attempts have been made to solve directly the differential equations obtained relative to the equations of motion, using the 'Kelvin Solid.' The variables in the equation are separable and a solution in terms of arbitrary constants was easily obtained. Attempts to evaluate the constants of integration [illegible]ed strongly to the necessity of an additional condition, wh[illegible] probably be of the nature of an energy relationship. Experimental [illegible] analytical work has been done with the idea in mind that a [illegible]ing p[illegible]omenon may be primarily significant in the propagation and absorption of energy in soils. The analytical work has been directed toward formulating the problem of a time-dependent pressure function applied uniformly to the wall of a spherical cavity embedded in an infinite, homogenous "Maxwell Material," and an experimental set up has been used to obtain visual and semi-qualitative observations on the behavior of soils subjected to impact. Results to date are inconclusive.

SURVEY NO: A.2.5

PROJECT NO: 7647 TASK/CONTRACT/W.O. NO: 76470 and AF 19(122)-436

TITLE: (Terrestrial Physics) Seismic Wave Propagation Studies.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Air Force Cambridge Research Center, GRD, Terrestrial Science Lab.

CONTRACTOR OR LABORATORY: Cal. Inst. of Tech., Pasadena, Cal.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This is background research with no specific device or techniques in view, but it will contribute to the development of earth shock damage criteria.

REPORTS:

(1) "The Dispersion of Surface Waves on Multilayered Media," by N. A. Haskell, Geophys. Res. Paper No. 9, GRD, AFCRC, August 1951.

(2) "A Note on Air Coupled Surface Waves," by N. A. Haskell, Bull. Seis. Soc. Am. 41:295 (1951).

(3) "Asymptotic Approximation for the Elastic Normal Modes in a Stratified Solid Medium," by N. A. Haskell, Geophys. Res. Paper No. 22, GRD, AFCRC, September 1953.

(4) Prog. Report No. 1, AF19(122)-436, 31 May 1951
" " No. 2, " 1 September 1951
" " No. 3, " 1 December 1951
" " No. 4, " 1 March 1952

(5) "Note on Sound Waves in the Atmosphere Generated by a Small Earthquake," by H. Benioff, M. Ewing, and F. Press, submitted jointly as Tech. Rpt. NO.13 under Contracts: AF19(122)-441 and AF19(122)-436, May 1951.

(6) Prog. Report No. 5, AF19(122)436, 1 June 1952
" " No. 6, " 2 September 1952

(7) "The Response of Strain and Pendulum Seismographs to Surface Waves," by H. Benioff and B. Gutenberg, Bull. Seis. Soc. Am. 43:229, July 1952.

(8) "Bibliography of Microseisms," by B. Gutenberg and F. Andrews, Scientific Report No. 1, September 1952.

(9) Prog. Report No. 7, AF19(122)-436, 1 December 1952
" " No. 8, " 1 March 1953
" " No. 9, " 1 June 1953

(10) "Microseisms, Microbaroms, Storms, and Waves in Western North America," by B. Gutenberg, Trans. Am. Geophys. Union, 34:161 (1953).

SURVEY NO: A.2.6

PROJECT NO: R-352-70-5 TASK/CONTRACT/W.O. NO: ---

TITLE: (Aeroelasticity) Dynamic Behavior of Shells.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command, Office of Sci. Res.

CONTRACTOR OR LABORATORY: Columbia Univ., New York, N. Y.

PRINCIPAL INVESTIGATOR: G. Herrman

DESCRIPTION: Shell theories are to be derived from broad physical principles (the general principles of mechanics), and studies are to be made of their applicability to dynamic problems. The applicability studies will include a study of the propagation of elastic harmonic waves in circular cylinders on the basis of the theories derived under this project and on the basis of previously existing theories, and also included is a study of the propagation of elastic waves in circular cylinders on the basis of the three-dimensional theory of elasticity.

SURVEY NO: A.2.7

PROJECT NO: NR 340-040 TASK/CONTRACT/W.O. NO: Nonr 222(04)

TITLE: (Explosion Waves) Theory of Shock Waves in Solids

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mathematics Br., Code 432

CONTRACTOR OR LABORATORY: Univ. of Cal., Berkeley, Cal.

PRINCIPAL INVESTIGATOR: C. B. Morrey, Jr. and E. Pinney

DESCRIPTION: This contract provides for the analyses of theories which describe and predict the manner in which strong pressure pulses are propagated through solid materials. From the kinetic theory of matter and statistical mechanics, equations of hydrodynamics are derived which may be applied to the propagation of large-amplitude waves in the ground. The ground is regarded as a mixture of solid particles and a gas or liquid.

SURVEY NO: A.2.8

PROJECT NO: NR 340-130 TASK/CONTRACT/W.O. NO: Nonr 285(07)

TITLE: (Explosion Waves) Diffraction of Blast Waves

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 9/15/51 COMPLETION DATE: 6/30/55

DIRECTING AGENCY: Office of Naval Research, Mathematics Br., Code 438

CONTRACTOR OR LABORATORY: New York Univ., New York, N. Y.

PRINCIPAL INVESTIGATOR: H. F. Ludloff

DESCRIPTION: To obtain a better understanding of the diffraction of shock waves around obstacles of various shapes, the following theoretical studies are being made:

(1) The determination of the pressure field caused by a shock wave passing over an airfoil,

(2) The collision of a shock wave with a wall of arbitrary shape,

(3) The diffraction of a strong shock wave by a slender, axially symmetric body, and

(4) The diffraction of weak and medium shocks advancing over a steep corner of arbitrary angle.

SURVEY NO: A.3.1

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: 79 and DA-36-061-ORD-237 and DA-36-061-ORD-379

TITLE: (Ordnance Basic Research) Investigation of Dynamic Moduli and Damping of Metals over a Broad Frequency Range.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Ordnance Research

CONTRACTOR OR LABORATORY: Pennsylvania State Univ., State College, Pa.

PRINCIPAL INVESTIGATOR: J. N. Brennan

DESCRIPTION: Scope (1) - Investigation at sonic frequencies to extend the range downward to the small strain range, (2) Theoretical investigations to compute the values of the propagation constants of metals, and (3) High frequency investigations to obtain useful quantitative data for the propagation constants of a variety of metals of interest to engineers.

Progress (1 Dec 1953 - 31 May 1954) - The theoretical investigation of propagation velocity has been continued, and the frequency-impedance characteristics of the barium titanate transducers has been experimentally studied. Measurement of the velocity of pulsed longitudinal waves in aluminum has continued, and the velocities of propagation of longitudinal waves in brass, copper, and steel rods have been measured. Dispersion curves of these latter were similar to that of aluminum, and there was no measurable dispersion effect found in the investigation of the propagation of shear waves. An investigation has also been made of the variation of internal friction with temperature in 1010 steel and in high purity iron with a carbon content of 0.02%. Apparatus for studying the longitudinal vibration phase has been modified to extend the operating range down into the small amplitude range. Five specimens previously examined at strain amplitudes ranging upward from 10^{-5} have been retested at amplitude of from 10^{-7} to 10^{-5}. Small amplitude data will be obtained on all specimens.

REPORTS:

(1) "Large Amplitude Vibrations of Rods and Tubes at Audio Frequencies," by J. N. Brennan, J. Acous. Soc. Am. 25:610, July 1953.

(2) "Ultrasonics in Metals," by J. N. Brennan, 31 August 1952, 14 pp, Pa. State College, Eng. Res. Dept., First Annual Report.

(3) "Analysis of Damping in Elastic Solids," by C. E. Duke, 18 December 1952, 37 pp, Bibliography, Pa. State College, Eng. Res. Dept., Tech. Report No. 1.

(4) "Dynamic Properties of Metals," by J. N. Brennan and J. A. Sauer, 31 August 1953, 27 pp, Figures, Pa. State College, Eng. Res. Dept., Tech. Report No. 2.

(5) "A Study of Internal Friction in Metals," by J. A. Sauer and J. W. Brennan, not dated, 24 pp, Tables, Figures, Pa. State College.

(6) "On the Motion of Elastic Thermally Conducting Solids," by M. Lesser and C. E. Duke, not dated, 13 pp, Pa. State College.

Survey No.: A.3.1 (Continued)

(7) "Dynamic Properties of Metals," by J. N. Brennan and J. A. Sauer, 30 September 1953, 4 pp, Pa. State College, Eng. Res. Dept., Second Annual Report.

(8) "Internal Friction in Aluminum Alloy Rods at Sonic Frequencies and Large Amplitudes," by J. A. Sauer and J. N. Brennan, Pa. State College.

SURVEY NO: A.3.2

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: 231 and DA-30-069-ORD-683 and DA-30-069-ORD-1338

TITLE: (Ordnance Basic Research) Impulse Loads.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1954

DIRECTING AGENCY: Watertown Arsenal

CONTRACTOR OR LABORATORY: New York Univ., College of Eng., New York, N.Y.

PRINCIPAL INVESTIGATOR: G. Gerard

DESCRIPTION: Progress (1 Dec. 1953 - 31 May 1954) - The impact tube and associated instrumentation has essentially been completed and exploratory tests are being run on various materials, e.g., 2 S-O Aluminum, type 302 annealed stainless steel, and 1010 annealed low carbon steel. Dynamic diaphragm tests were made at a strain rate of about 1 in./sec. and corresponding static tests were made of the same diaphragms to determine any increase in dynamic properties over the static values. The tensile stress-strain characteristics of the materials used have been determined in the 0^{o}, 45^{o}, and 90^{o} directions with regard to the grain direction of the material. Data reduction has been substantially completed and the analysis of the reduced data is in progress. The investigation of the aerodynamic behavior of the impact tube has been continued and experiments have been completed which were designed to study the rounding off effect observed. The conclusion has been drawn that the effect is primarily due to the manner in which the sealing diaphragm is ruptured. It has also been observed that the fracturing of the sealing diaphragm is apparently communicated to the pressure gages well in advance of the time estimate based on the sound velocity in the gas. This phenomenon will be the basis for continuing study.

REPORTS:

(1) "The Impact Tube," by G. Gerard and H. Slater, N. Y. Univ., College of Eng., Tech. Report 277-1, March 1954.

SURVEY NO: A.3.3

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: 187 and DA-36-034-ORD-969 and DA-36-034-ORD-1456

TITLE: (Ordnance Basic Research) Plastic Deformation and Fracture of Metals at High Rates of Strain.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1954

DIRECTING AGENCY: Frankford Arsenal

CONTRACTOR OR LABORATORY: Lehigh Univ., Bethlehem, Pa.

PRINCIPAL INVESTIGATOR: C. W. Curtis

DESCRIPTION: PROGRESS: (29 Nov 1953 - 28 May 1954)

A report has been prepared on the second-mode vibrations of the Pochhammer-Chree frequency equation, wherein it has been stated that the experimental evidence has been obtained for the existence of second mode contributions to elastic strain pulses propagating along a cylindrical bar. Research has been conducted on four problems concerned with propagation of strain pulses along solid bars. A series of measurements has been completed on determining the propagation velocity of a longitudinal elastic pulse immediately after its initiation at the end of a bar. A 24-ft. magnesium bar has been obtained and freely suspended in front of the shock tube, and measurements are in progress for determining the dispersion of an elastic pulse at large distances from the stressed end. A report is being prepared summarizing studies of the reflection and transmission of an elastic pulse at a discontinuous change in cross section of a cylindrical bar, and equipment has been virtually completed for studying the propagation of a plastic pulse by a new experimental method.

REPORTS:

(1) "Plastic Deformation and Fracture of Metals at High Rates of Strain," by C. W. Curtis, Lehigh Univ., Inst. of Res., Annual Report, September 1952.

(2) "Plastic Deformation and Fracture of Metals at High Rates of Strain," by C. W. Curtis, Lehigh Univ., Inst. of Res., Annual Report, September 1953.

(3) "The Behavior of Metals Subjected to High Rates of Loading," by C. W. Curtis.

(4) "Second Mode Vibrations of the Pochhammer-Chree Frequency Equation," by C. W. Curtis.

SURVEY NO: A.3.4

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TS1-48

TITLE: Granite State

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, D&PS, Aberdeen, Md.

PRINCIPAL INVESTIGATOR: V. P. Deines

DESCRIPTION: Laboratory and field firing tests are being conducted to determine the effect of impact and vibration stresses on material subjected to "Granite State" attack. Development and Proof Services physical test lab facilities and special hydraulic jack target setups are being utilized for this project work by D&PS, APG. The stress investigation is only one phase of the D&PS project work on granite state.

REPORTS:

TS1-48, 14th Report, Formal Report Issued
P59791, Firing Record Issued
TS1-48, 23rd Report, Formal Report Being Reviewed
P61542, Firing Record Issued
TS1-46, 27th Report, Formal Report Issued

SURVEY NO: A.3.5

PROJECT NO: NR 017-307 TASK/CONTRACT/W.O. NO: Nonr 17700

TITLE: (Solid State Physics) Plastic Deformation of Solids.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Physics Br., Code 421

CONTRACTOR OR LABORATORY: Univ. of Ill., Dept. Physics, Urbana, Ill.

PRINCIPAL INVESTIGATOR: J. S. Koehler

DESCRIPTION: The investigator is studying crystal imperfections: dislocations, vacancies, interstitials, etc., and their conduct under and effect upon plastic deformation of metals, and ionic crystals. During this period effort will be concentrated on attempts to demonstrate "hollow" dislocations in brittle materials, observation of dynamically stressed crystals using optical birefringence, studies of the mechanism of twinning in copper and aluminum, and measurement of internal damping caused by crystal dislocations.

REPORTS:

(1) "Scattering Approximation for Transparent Nucleus Model," by M. Greenberg, J. Chem. Phys. 91:454 (1953).

(2) "On the Theory of the Ising Model of Ferromagnetism," by G. F. Newell and E. Montroll, Rev. Mod. Phys. 25:353 (1953).

(3) "Vibration Spectrum of a Simple Cube Lattice," by G. F. Newell, J. Chem. Phys. 91:227 (1953).

SURVEY NO: A.3.6

PROJECT NO: NS 013-123 TASK/CONTRACT/W.O. NO: P.O. 10750/55

TITLE: (Ferrous Alloys) Materials Used in Propulsion Shafting.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: M. R. Gross

DESCRIPTION: The following tests have been conducted:

(a) Tests to ascertain whether or not segregation noted on one end of a forging would result in lowering the alternating torsional fatigue properties of the material. Tests completed.

(b) Test 040034, to determine torsion and bending fatigue at key ways in main propulsion shafting material, has been completed.

(c) Test 040034, tests have been made on several carbon-vanadium steel forgings for propulsion shafting to determine tensile and yield strength values. Tests are continuing.

(d) Test 040041, investigation of material for tailshafts, has been completed.

REPORTS:

(1) "Alternating Torsion Fatigue Tests of Specimens Taken from Piece of Propulsion Shafting," by H. C. Ellinghausen, EES Report C-3722, 22 June 1950.

(2) "Test of Stress Concentration at Keyways in Main Propulsion Shafting Material," by R. B. Niederberger, EES Report 4D(2)966904, 25 January 1952.

(3) "Investigation of Carbon-Vanadium Steel Forging for Ships' Propulsion Shafting," by H. C. Ellinghausen, EES Report 4D(3)966904, February 1952.

(4) "Second Progress Report on Investigation of Carbon-Vanadium Steel Forgings for Ships' Propulsion Shafting," by H. C. Ellinghausen, EES Report 030034A, 20 May 1953.

(5) "Stress Concentration at Keyways in Main Propulsion Shafting Material," by M. R. Gross, EES Report 040034C, 15 July 1953.

(6) "Investigation of Materials for Tailshaft Specimens," by W. L. Williams, Am. Soc., Naval Architects and Marine Eng., EES Report 040041A.

SURVEY NO: A.3.7

PROJECT NO: NS 013-123 TASK/CONTRACT/W.O. NO: P.O. 10750/55

TITLE: (Ferrous Alloys) Armor Steel Containing a Minimum of Critical Alloy.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Six alloy steels containing no nickel were compared with currently used Ni-Cr-STS on the basis of Charpy V-notch impact properties, tensile and other properties. Impact tests were also made to determine temper embrittlement.

SURVEY NO: A.3.8

PROJECT NO: NS 013-123 TASK/CONTRACT/W.O. NO: P.O. 10748/53

TITLE: (Ferrous Alloys) Investigation of Boron Treated Steels.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Studies are being made under EES Test 040034 on a number of boron steels. The effects of size on the normalized and tempered properties has been completed. Impact and fatigue tests will be made.

SURVEY NO: A.3.9

PROJECT NO: NS 013-123 TASK/CONTRACT/W.O. NO: P.O. 10750/55

TITLE: (Ferrous Alloys) Properties of 12% Chrome Castings.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Preliminary tests have been conducted to determine if hydrogen embrittlement from cathodic polarization might be contributing to failures of 12% Cr. propellers. In addition a series of heavy cast sections have been obtained for laboratory study to determine tension, impact, and hardness as affected by heat treatment.

REPORTS:

(1) "Summary Report on Failed Cast 12% Chromium Steel Propeller Blades," by M. R. Gross, EES Report 040034B, 8 July 1953.

(2) "Investigation of Cast 12%-Chrome Steel Propeller Alloy," by W. H. Asche, EES Report 040034D, 12 January 1955.

SURVEY NO: A.3.10

PROJECT NO: NR 031-005 TASK/CONTRACT/W.O. NO: N6ori 07104

TITLE: (Properties of Metals and Alloys) Fatigue of Metals.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1946 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Metallurgy Br., Code 423

CONTRACTOR OR LABORATORY: Univ. of Ill., Dept. of Theoretical and Applied Mech., Urbana, Ill.

PRINCIPAL INVESTIGATOR: T. J. Dolan

DESCRIPTION: The behavior of metals is being studied under repeated stress and the factors influencing fatigue strength and fretting fatigue. Such factors include state of stress, range of stress, stress gradients, overstressing and understressing, residual stresses, size effect, strain hardening, temperature, composition, and microstructure. Analytical studies are combined with a comprehensive laboratory program involving metallurgical factors as well as stress and geometry.

REPORTS:

(1) "An Experimental Study of the Influence of Fluctuating Stress Amplitude on Fatigue Life of 75S-T6 Aluminum," by H. T. Corten, G. M. Sinclair, and T. J. Dolan, Tech. Report No. 37, January 1954.

(2) "The Influence of Repeated Loads on the Residual Stresses in Inelastically Deformed Beams," by T. M. Elsesser and H. T. Corten, Tech. Report No. 38, June 1954.

(3) "An Appraisal of the Prot Method of Fatigue Testing," by H. T. Corten, T. Dimoff, and T. J. Dolan, Tech. Report No. 34, June 1954.

(4) "An Investigation of Strain Aging in Fatigue," by J. C. Levy and G. M. Sinclair, Tech. Report No. 39, August 1954.

(5) "Fatigue as a Factor in Pressure Vessel Design, by T. J. Dolan, Tech. Report No. 40, August 1954.

SURVEY NO: A.3.11

PROJECT NO: NR 031-049 TASK/CONTRACT/W.O. NO: N6onr-27301

TITLE: (Properties of Metals and Alloys) The Fracture of Metals.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1947 COMPLETION DATE: 1956

DIRECTING AGENCY: Office of Naval Research, Metallurgy Br., Code 423

CONTRACTOR OR LABORATORY: Case Inst. of Tech., Dept. of Metallurgical Eng., Cleveland, Ohio

PRINCIPAL INVESTIGATOR: W. M. Baldwin

DESCRIPTION: Investigations are conducted on the factors affecting the fracture of metals. Emphasis in this study is being placed on the role of hydrogen in brittle fracture of steel. The effects of hydrogen distribution in the sample and strain rate and temperature are being studied. The effects of brittle external layers of various kinds on the ductility of otherwise ductile metals are being correlated. A study is being made of the effect of structure on ductility. A number of structures are being artificially made in which hard isolated phases are surrounded by soft matrices. Studies of the effect of particle size, shape, and distribution are being made.

REPORTS:

(1) "Strain Aging Behavior of Rheotropically Embrittled Steel," by E. J. Ripling, Tech. Report No. 28, March 1954.

(2) "Overcoming Rhetopic Embrittlement by Torsional Prestrain," by I. Rozalsky, Tech. Report No. 29, June 1954.

(3) "The Effect of Prestraining Under Different Stress States on the Fracture and Flow Properties of 2S-O Aluminum," by I. Rozalsky, ASM Trans. 47:77 (1955).

(4) "The Influence of Strain Rate and Temperature on the Ductility of Austenitic Stainless Steel," by G. W. Form and W. M. Baldwin, Jr., Tech. Report No. 30, September 1954.

SURVEY NO: A.3.12

PROJECT NO: NR 031-115 TASK/CONTRACT/W.O. NO: N6onr-27401

TITLE: (Properties of Metals and Alloys) Effects of Alloying Elements on the Impact Properties of Quenched and Tempered Steels.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1947 COMPLETION DATE: 1952

DIRECTING AGENCY: Office of Naval Research, Metallurgy Br., Code 423

CONTRACTOR OR LABORATORY: Illinois Inst. of Tech., Chicago, Ill.

PRINCIPAL INVESTIGATOR: M. Baeyertz

DESCRIPTION: This task was established to provide for an investigation of the effects of alloying elements on the impact properties of quenched and tempered alloy steel.

REPORTS:

(1) "The Effect of Carbon Content on the Notched-Bar Impact Properties of Quenched and Tempered Steel," by M. Baeyertz, W. F. Craig, and J. P. Sheehan.

(2) "Influence of Austenite Grain Size on Impact Properties of 0.40% Carbon Medium Alloy Tempered Martensite," by M. Baeyertz, W. F. Craig, and J. P. Sheehan.

(3) "Effects of Ferrite Grain Structure Upon Impact Properties of 0.80% Carbon Spheroidite," by M. Baeyertz, W. F. Craig, and E. S. Bumos.

(4) "The Effects of Mo/P Ratio Upon the Notched-Bar Impact Properties of Tempered Martensite," by M. Baeyertz, W. F. Craig, and J. P. Sheehan.

SURVEY NO: A.3.13

PROJECT NO: NR 031-285 TASK/CONTRACT/W.O. NO: N6onr-24418

TITLE: (Properties of Metals and Alloys) The Mechanics of Yielding.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1948 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Metallurgy Br., Code 423

CONTRACTOR OR LABORATORY: Cal. Inst. of Tech., Pasadena, Cal.

PRINCIPAL INVESTIGATOR: D. S. Clark

DESCRIPTION: Previous investigations have shown that, for materials which exhibit a definite yield point, a time delay is involved before plastic deformation (yielding) occurs when the material is rapidly loaded to stresses greater than the static yield point. The time required for plastic deformation to begin becomes less as the stress is increased above the static yield point. This time delay is being studied as a function of strain-rate, stress, and temperature, within the temperature range of -50° F and 200° F. Work also is proceeding on a study of stress-strain relations under impact loading and on the effect of impurity atoms on preyield microstrains.

REPORTS:

(1) "A Comparison Between Dislocation Theory and Experimental Measurements of Delayed Yield in Steel," by T. Vreeland, Jr., and D. S. Wood, Tech. Report No. 8, April 1954.

(2) "Interaction of Discontinuous Yielding in Ductile Molybdenum," by J. A. Hendrickson, D. S. Wood, and D. S. Clar, Tech. Report No. 9, 1954.

(3) "The Influence of Stress and Temperature on the Time for the Initiation of Plastic Deformation in an Annealed Low Carbon Steel," by D. S. Wood and D. S. Clark.

(4) "A Study of the Mechanism of the Delayed Yield Phenomenon," by R. Vreeland, D. S. Wood, and D. S. Clark.

(5) Tech. Report No. 5, by J. E. Johnson, D. S. Wood, and D. S. Clark, March 1952.

(6) Tech. Report No. 6, by T. Vreeland, Jr., D. S. Wood and D. S. Clark, September 1952.

(7) Tech. Report No. 7, by J. E. Johnson, D. S. Wood, and D. S. Clark, February 1953.

SURVEY NO: A.3.14

PROJECT NO: NR 031-356 TASK/CONTRACT/W.O. NO: N5ori 07841

TITLE: (Properties of Metals and Alloys) Ductile Fracture of Metals.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1949 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Metallurgy Br., Code 423

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Dept. of Metallurgy, Cambridge, Mass.

PRINCIPAL INVESTIGATOR: J. Wulff

DESCRIPTION: This task is concerned with a fundamental study of the flow and fracture of metals. The relative importance of the inclusion content and of the oriented microcrack structure in brittle fracture is being evaluated by varying the purity and previous deformation of the specimens. The brittle characteristics are being determined by tensile and fatigue tests. The effect of the austenite to ferrite transformation on the strength and formability characteristics of stainless steel as a function of strain is being studied as a second phase of this task. A third phase is concerned with a study of triaxial compressive deformation, making use of a specimen designed to eliminate frictional effects from the compressive surfaces.

REPORTS:

(1) "Mechanical Anisotropy in Some Ductile Metals," by W. A. Backofen and B. B. Hundy, Inst. of Metals J. 81: (1952-53).

(2) "Mechanical Anisotropy in SAE 4340 Steel," by D. S. Fields, Jr., W. A. Backofen, and J. Wulff, Technical Report No. 4.

(3) "The Tensile Fracture of Copper Prestrained in Torsion," by A. J. Shaler and W. A. Backofen.

(4) "The Torsion Texture of Copper," by W. A. Backofen.

SURVEY NO: A.3.15

PROJECT NO: NS 011-083 TASK/CONTRACT/W.O. NO: P.O. 10719/55

TITLE: (Development of High Strength Steels for Pressure Hulls and Other Applications) Investigation of Notch-Toughness Properties of High Strength Steel.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: N. A. Kahn

DESCRIPTION: The following investigations have been made: (a) Determination of the notch-toughness characteristics of eight high-yield strength plate steels by Charpy and Navy Tear tests; (b) determination of the reproducibility of Charpy test as affected by variations in machining of notches, testing machine techniques, etc., and (c) determination of the effects of pickling on mechanical properties; and the determination of the effects of Lanceramp (Misch metal) on high-tensile (as rolled) steel plate.

REPORTS:

(1) Mat. Lab. Reports, Projects 5012-1 to 5012-8, 5012-10, 5012-11, 5012-12, 5012-13, and 5012-6A.

SURVEY NO: A.3.16

PROJECT NO: NS 011-083 TASK/CONTRACT/W.O. NO: C-3266 and 4B(10)-966904

TITLE: (Development of High Strength Steels for Pressure Hulls and Other Applications) Mechanical Properties of High Strength Steels.

TASK SECURITY CLASSIFICATION. U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1947 COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Studies were made on the ranges and variations in the tensile and impact properties of nine low alloy steels, on the effects of normalizing and normalizing and drawing of eight low alloy steels, and on the strength properties due to solution and subsequent precipitation hardening.

REPORTS:

(1) "Investigation of Properties of High Yield, Notch Tough Structural Steel," by R. B. Niederberger and M. R. Gross, EES Reports C-3266A to C-3266-I, covering period of 3 December 1947 to 29 May 1950.

(2) "Investigation of Properties of High Yield, Notch Tough Structural Steel," by M. R. Gross and W. J. Greenert, EES Report 4B(10)966904, 24 November 1952.

SURVEY NO: A.3.17

PROJECT NO: NS 011-083 TASK/CONTRACT/W.O. NO: NObs-47302 and NObs-50088

TITLE: (Development of High Strength Steels for Pressure Hulls and Other Applications) Direct Explosion Tests.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1948 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Metallurgical Res. & Dev. Co., Washington, D. C.

PRINCIPAL INVESTIGATOR: G. S. Mikhalapov and W. A. Snelling

DESCRIPTION: Direct explosion tests, in which known charges were exploded in contact with high-strength steel plates at various temperatures, were conducted to determine the capacities of high-yield strength steels to absorb energy of an explosive nature.

REPORTS:

(1) "Direct Explosion High Energy Loading Method of Testing Structural Steel," by G. S. Mikhalapov, Welding J. 29:109-s, March 1950.

SURVEY NO: A.3.18

PROJECT NO: NS 013-120 TASK/CONTRACT/W.O. NO: P.O. 30029/56

TITLE: (Steel for High Temperature Steam Propulsion Systems) Piping and Tubes for Steam Systems.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1944 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests to determine physical properties, such as tensile, creep, stress rupture, and fatigue properties, have been made on a variety of steels.

REPORTS:

(1) Test C-2694 - Carbon Molybdenum Steel Tubing
(2) Test 4C066711 - Carbon Steel Tubing
(3) Test C-2069 - Chromium-Molybdenum Steel Tubing
(4) "Elevated Temperature Properties of a Cr-Mo-V Piping Steel," EES Report 040038D2, 23 September 1953
(5) Test 4F(d1)101717 of 2 July 1951
(6) Test B - 2668
(7) Test B-2668B of 10 September 1942
(8) Test B-2668C of 16 June 1943
(9) Test B-2668D of 10 June 1949
(10) Test 4A(5)066711 of 3 August 1951
(11) Test C-3583
(12) Test 4G066711 of 21 February 1952
(13) Test 6A-066886 (Superseded by 060075)

SURVEY NO: A.3.19

PROJECT NO: NS 013-120 TASK/CONTRACT/W.O. NO: P.O. 30029/56

TITLE: (Steel for High-Temperature Steam Propulsion Systems) Ferritic and Pearlitic Steels for Turbine Rotor Forgings.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1944 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Forging steels of Cr-Ni-Mo-V, Cr-Mo-V, Ni-Mo, Mo-V, and five Cr-1/2 Mo were investigated for 1050° F service. Various heat treatments were explored to develop high tensile strength properties in heavy sections without liquid quenching. Specimens were tested for tensile, creep, stress-rupture, fatigue, and impact properties.

REPORTS:

(1) C-1689, 15 December 1944
(2) C-1689-B, 7 August 1947
(3) C-1689-C, 3 May 1948
(4) C-1689-D, 5 May 1949
(5) 4B(5) 066711, 12 April 1951

SURVEY NO: A.3.20

PROJECT NO: NS 013-120 TASK/CONTRACT/W.O. NO: P.O. 10752/55

TITLE: (Steel for High-Temperature Steam Propulsion Systems) Steam Turbine Blade Material.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1944 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION:

Part (a) - Cypritic Steel Test 4F(F1)101717.

Information was obtained on microstructure, hardness, Strauss intergranular corrosion resistance, tensile properties, fatigue properties, stress rupture at 850° F, resistance to salt spray pitting, and wet steam erosion.

Part (b) - Modified 12 percent Chromium Turbine Blade Steel (Test 040038).

Tests were conducted to evaluate the heat treating characteristics, the damping capacity, and the tensile, creep, and rupture properties at 1000° F and 1100° F of Type 422 steel.

Part (c) - General Electric Moly-Ascoloy Blade Material.

Tests are underway to determine tension, creep, and rupture properties at 1000° F and 1100° F.

REPORTS:

(1) Tech. Report 4F(F1)101717, 7 November 1951
(2) EES Test Reports 4B(1)066711 through 4B(5)06671
(3) "Properties of Type 422 Modified 12 percent Chromium Steel," EES Test Report 040038B, 9 November 1953

SURVEY NO: A.3.21

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-130 & NObs-65917

TITLE: (Structural Design, Ship Structure Committee) Brittle Fracture Mechanics.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Brown University, Providence, R. I.

PRINCIPAL INVESTIGATOR: D. C. Drucker

DESCRIPTION: This task features the experimental study of brittle crack initiation and the development of an analytical description of crack propagation. An evaluation of the current knowledge of brittle fracture mechanics has been completed, and attempts are being made to establish experimentally the existence of a barrier to crack initiation. Tensile tests are being performed on specimens of ship steel containing punched notches and varying conditions of prestrains, residual stresses, temperatures, cyclic loads, and transient loads.

REPORTS:

(1) "An Evaluation of Current Knowledge of the Mechanics of Brittle Fracture," by D. C. Drucker, Interpretive Report, Serial No. SSC-69, 17 May 1954.

(2) "Rapid Propagation of a Crack in a Brittle Material," by M. J. Schilhansl, First Progress Report, Serial No. SSC-87.

SURVEY NO: A.3.22

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-137 & NObs-65790

TITLE: (Structural Design, Ship Structure Committee) Brittle Fracture Mechanics.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Univ. of Ill., Urbana, Ill.

PRINCIPAL INVESTIGATOR: N. M. Newmark

DESCRIPTION: Experimental work has started. Rapidly moving cracks will be introduced into wide tensile specimens of ship steel; the crack speed, relaxation of stress, etc., will be studied.

SURVEY NO: A.3.23

PROJECT NO: NS 011 043 TASK/CONTRACT/W.O. NO: SR-106

TITLE: (Performance Standards for Materials, Ship Structure Committee) Properties of Steel from Fractured Ships.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1943 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: M. L. Williams

DESCRIPTION: Fractured plates removed from welded ships have been examined by using Charpy V-notch tests, tensile tests, chemical composition determinations, and metallographic methods.

REPORTS:

(1) "Analysis of Brittle Behavior in Ship Plates," by M. L. Williams, Fifth Prog. Report, Serial No. NBS-5, 7 February 1955.

(2) "Examination and Test of Fractured Steel Plates Removed from Welded Ships," by M. L. Williams, Fourth Prog. Report, Serial No. NBS-4, 2 April 1953.

(3) "Investigation of Fractured Steel Plates Removed from Welded Ships," by M. L. Williams (and others), Progress Summary, Serial No. NBS-3, 1 June 1951.

(4) "Investigation and Test of Fractured Steel Plates Removed from Welded Ships," by M. L. Williams (and others), Progress Reports, Serial No. NBS-2, 22 September 1949 and Serial No. NBS-1, 25 February 1949.

SURVEY NO: A.3.24

PROJECT NO: NS 011-043 TASK/CONTRACT/W.O. NO: SR-116 and NObs-50148

TITLE: (Performance Standards for Materials, Ship Structure Committee) Monograph on Behavior of Engineering Structures.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: National Academy of Science, Committee on Ship Steel, Washington, D. C.

PRINCIPAL INVESTIGATOR: E. R. Parker

DESCRIPTION: A summary of present day knowledge of brittle behavior of metals and the manifestation of brittle behavior in engineering structures is presented by a monograph.

SURVEY NO: A.3.25

PROJECT NO: NS 021-201 TASK/CONTRACT/W.O. NO: SR-120 and NObs-2369

TITLE: (Fabrication Techniques, Ship Structure Committee) Direct Explosion Test.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Metallurgical Res. & Dev. Co., Washington, D. C.

PRINCIPAL INVESTIGATOR: G. S. Mikhalapov

DESCRIPTION: The performance of killed, semikilled, and rimmed ship steel; and the effects of welding technique, preparation, and electrode on the performance of plates containing weld beads, have been studied by using direct explosion tests.

REPORTS:

(1) "The Evaluation of Notch Sensitivity of Mild Steel Ship Plate by Direct Explosion Test," by G. S. Mikhalapov, Final Report, Serial No. SSC-43, 15 March 1951.

(2) "Evaluation of Ship Welding Procedures by Direct Explosion Testing," by G. S. Mikhalapov, Final Report, Serial No. SSC-46, 31 August 1951.

(3) "Investigation of Performance of Semikilled Carbon Steel ABS Class B and Rimmed Steel ABS Class A Under Direct Explosion Test," by G. S. Mikhalapov and W. A. Snelling, Final Report, Serial No. SSC-76, July 1954.

SURVEY NO: A.3.26

PROJECT NO: NS 021-201 TASK/CONTRACT/W.O. NO: SR-124 and P.O. 10863/53

TITLE: (Fabrication Technique, Ship Structure Committee) Explosion Bulge Test.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D.C.

PRINCIPAL INVESTIGATOR: W. S. Pellini

DESCRIPTION: Crack initiation and propagation characteristics of ship steels and weldments have been determined in 20-in. square specimens of ship plate, some containing butt welds, by subjecting the plates to explosive impact. Explosion bulge tests and drop-weight tests have been performed on steel from failed ships. These tests have been conducted in order to relate the results to service performance.

REPORTS:

(1) "Crack Starter Tests of Ship Fracture and Project Steels," by P. P. Puzak, M. E. Schuster, and W. S. Pellini, Final Report, Part I, Serial No. SSC-77, 18 June 1954.

(2) "Investigation of the Performance of Weldments and Prime Plate of ABS-B Steel," by W. S. Pellini and E. W. Eschbacher, Final Report, Part II, Serial No. SSC-78, 18 June 1954.

SURVEY NO: A.3.27

PROJECT NO: NS 021-201 TASK/CONTRACT/W.O. NO: SR-134 and NObs-65789

TITLE: (Fabrication Technique, Ship Structure Committee) Crack Arrestors.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Univ. of Ill., Urbana, Ill.

PRINCIPAL INVESTIGATOR: N. M. Newmark

DESCRIPTION: Rapidly running brittle cracks will be introduced into 6-ft wide tensile specimens of ship steel. The specimens will contain in the path of the cracks various configurations such as notch tough weld beads, notch tough weld overlays, strakes of notch tough plating, doubler straps of notch tough material, etc., to arrest the cracks. The evaluation of the effectiveness of these configurations will be based on the results of tests on specimens containing riveted arrestors of the types currently in use.

SURVEY NO: A.3.28

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: RS-111 and NObs-50303

TITLE: (Improvement of Materials, Ship Structure Committee) Transition Temperatures in Nonferrous Metals.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Case Inst. of Tech., Cleveland, Ohio

PRINCIPAL INVESTIGATOR: W. M. Baldwin, Jr.

DESCRIPTION: The nature of the transition temperature was determined by studies conducted on nonferrous metals such as single crystals of zinc. Tests were conducted in tension with temperature, stress ratio, and orientation as variables.

A three-dimensional plot relating ductility, testing temperature, and specimen orientation, was developed.

REPORTS:

(1) "Low Temperature Embrittlement Mechanics Deduced from Zinc Single Crystal Fracture Studies," by P. H. Morton and W. M. Baldwin, Jr., First Prog. Report, Serial No. SSC-58, 1 May 1953.

(2) "Low Temperature Embrittlement Mechanics Deduced from Zinc Single Crystal Fracture Studies," by R. Treon, Jr., and W. M. Baldwin, Jr., Second Prog. Report, Serial No. SSC-85, and Final Report, Serial No. SSC-92.

(3) "Low Temperature Embrittlement Mechanics Deduced from Zinc Single Crystals Fracture Studies," by P. H. Morton, R. Treon, Jr., and W. M. Baldwin, Jr., J. Mech. and Phys. of Solids 2:177 (1954).

SURVEY NO: A.3.29

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-109 and NObs-50062

TITLE: (Improvement of Materials, Ship Structure Committee) Binary Iron Alloys.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Univ. of Pa., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: R. M. Brick

DESCRIPTION: Tensile and Charpy tests were performed on alloys of pure iron with 0.02 to 0.5% carbon.

REPORTS:

(1) "The Low Temperature Properties of Relatively High Purity Iron-Carbon Alloys," by R. L. Smith, R. V. Fostini, and R. M. Brick, First Prog. Report, Serial No. SSC-52, 29 August 1952.

(2) "Effects of Grain Size and Carbon Content on the Low Temperature Tensile Properties of Highly Pure Fe-C Alloys," by R. M. Brick, G. Spangler, and R. L. Smith, Second Prog. Report, Serial No. SSC-81, 28 May 1954.

(3) "Mechanical Properties of High Purity Iron-Carbon Alloys at Low Temperatures," by G. J. London, G. Spangler, and R. M. Brick, Third Prog. Report, Serial No. SSC-93 (to be published).

(4) "Mechanical Properties of High Purity Iron-Carbon Alloys at Low Temperatures," by R. M. Brick, Final Report, Serial No. SSC-94 (to be published).

SURVEY NO: A.3.30

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-110 & NObs-53239

TITLE: (Improvement of Metals, Ship Structure Committee) Steel Making.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Battelle Memorial Inst., Cleveland, Ohio

PRINCIPAL INVESTIGATOR: F. W. Boulger

DESCRIPTION: The keyhole Charpy test, Navy tear test, and standard tensile test, in conjunction with grain size and metallographic examination, were used to study the effects of variation in melting practice in steels prepared and rolled commercially, prepared and rolled in the laboratory, and prepared commercially and rolled in the laboratory.

REPORTS:

(1) First Prog. Report, Serial No. SSC-49, 27 June 1952.
(2) Second Prog. Report, Serial No. SSC-53, 28 November 1952.
(3) Third Prog. Report, Serial No. SSC-71, 15 March 1954.
(4) Fourth Prog. Report, Serial No. SSC-82, 28 October 1954.
(5) Fifth Prog. Report, Serial No. SSC-83, 7 February 1955.
(6) Sixth Prog. Report, Serial No. SSC-88 (to be published).
(7) Seventh Prog. Report, Serial No. SSC-89 (to be published).
(8) Eighth Prog. Report, Serial No. SSC-90 (to be published).
(9) Final Report, Serial No. SSC-91 (in preparation).

SURVEY NO: A.3.31

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-122 and NObs-55577

TITLE: (Improvement of Materials, Ship Structure Committee) Electron and Optical Microscopy.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Stevens Inst. of Tech., Hoboken, N. J.

PRINCIPAL INVESTIGATOR: A. Revere

DESCRIPTION: Fractured surfaces and microstructure were studied as an aid to the understanding of the micromechanism of fracture.

REPORTS:

(1) "A Study of Fractured Surfaces of Ship Plate Steels Using the Electron Microscope," by A. Revere and R. Jaccodine, Final Report, Serial No. SSC-74.

SURVEY NO: A.3.32

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-123 and P.O. 10722/54

TITLE: (Improvement of Materials, Ship Structure Committee) Electron and Optical Microscopy.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: A. R. Allison

DESCRIPTION: Fractured surfaces and microstructures were studied as an aid to the understanding of the micromechanism of fracture. Fractured areas of Project Steels A (tear test transition temperature, TTTT of 70° F) and C (TTTT of 135° F) were replicated and studied. In addition, numerous views were taken of polished and etched surfaces of assorted ship steel. Included in this assortment were Project Steels A and C, silicon and aluminum killed steels, and sections of ship plates which varied, primarily in TTTT over a range from 70° F to more than 120° F.

REPORTS:

(1) "Report of Investigation of Electron Microscopy Techniques in Improvement of Materials for Ship Structure Committee." Mat. Lab. Proj. 5507, Prog. Report No. 1, 14 May 1953.

SURVEY NO: A.3.33

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-125 and P.O. 86701/54

TITLE: (Improvement of Materials, Ship Structure Committee) Survey of ABS Steels.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: N. Kahn

DESCRIPTION: Steels presently being supplied under ABS specifications for ship construction were evaluated by conducting surveys of the notch toughness and of other properties of medium steel ship plate. Tests conducted include static tension, Charpy and tear tests. The results of the survey will be analyzed to determine the extent to which present day ship plate steels have been improved relative to World War II steels.

REPORTS:

(1) "Report on Investigation on the Properties of Currently Produced ABS Ship Plate Steel," by E. A. Imbembo, and J. J. Gabriel, Ship Structure Committee Project SR-125, Mat. Lab. Proj. 4936-91, Prog. Report 1, 10 March 1954.

(2) "Report of Notch-Toughness Properties of ABS Ship Plate Steels," by N. A. Kahn, E. A. Imbembo, and J. J. Gabriel, Ship Structure Committee Project SR-125, Mat. Lab. Proj. 4936-91, Prog. Report 2, 19 January 1955.

SURVEY NO: A.3.34

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-133 & NObs-53239

TITLE: (Improvement of Materials, Ship Structure Committee) Texturally Notch Tough Steel.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Battelle Memorial Inst., Cleveland, Ohio

PRINCIPAL INVESTIGATOR: F. W. Boulger

DESCRIPTION: Studies were made to determine means of improving the notch toughness of shipbuilding steel through alterations in texture rather than chemical composition.

A literature survey was conducted to determine the feasibility of using nonisotropic materials in order to increase notch toughness at low temperatures.

REPORTS:

(1) "An Appraisal of the Properties and Methods of Production of Laminated or Composite Ship Steel Plate," by the Committee on Ship Steel, NAS-NRC, Serial No. SSC-84.

SURVEY NO: A.3.35

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-135

TITLE: (Improvement of Materials, Ship Structure Committee) Steel Interpretive Report.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: National Academy of Sciences, Committee on Ship Steel, Washington, D. C.

PRINCIPAL INVESTIGATOR: C. Williams and W. J. Harris, Jr.

DESCRIPTION: An interpretive report summarizing the present position with regard to notch toughness of ship steels is being prepared. This report will consider the technical and economic factors and their relation to peacetime and war emergency production.

SURVEY NO: A.3.36

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-136 and NObs-65918

TITLE: (Improvement of Materials, Ship Structure Committee) Metallurgical Structure.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: M. Cohen

DESCRIPTION: Studies are being conducted to determine the influence of processing variables such as rolling, heat treatment, etc., on the notch toughness characteristics of ship steel. Two ship plate steels: one a rimmed steel of known susceptibility to brittle fracture at comparatively high temperatures, and the other a steel meeting current specifications for ABS class B, have been subjected to a variety of heat treatments designed to alter the grain size and the distribution of carbides. The Charpy V-notch and tensile properties of these specimens will be related to observed microstructural changes. Detailed studies of the micromechanism of fracture in Charpy specimens have been started.

SURVEY NO: A.3.37

PROJECT NO: NS 011-078 TASK/CONTRACT/W.O. NO: SR-139

TITLE: (Improvement of Materials, Ship Structure Committee) Mill Survey of Ship Steel.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D.C.

PRINCIPAL INVESTIGATOR: M. L. Williams

DESCRIPTION: To determine the properties of precisely identified ship plate samples obtained at the mill in order to permit development of appropriate sampling techniques for the various grades of ship steel and to permit correlation of physical properties with chemical composition and processing variables, samples of ABS Class B and Class C steels will be used to establish the variations within the ingot for a few heats and between these heats. Once this information is established, the broad sampling program involving many heats will be set up. Tests to be performed include standard tensile, coupon tensile, Charpy V-notch, ferrite grain size, a full plate thickness notch toughness test, and detailed chemical analysis.

SURVEY NO: A.3.38

PROJECT NO: NS 011-084 TASK/CONTRACT/W.O. NO: P.O. 10726/54

TITLE: (Notch Tough Steel) Effects of Manufacturing and Fabricating Operations on Ship Plate.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1943 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: N. A. Kahn

DESCRIPTION: This task was concerned with determining whether or not the notch-toughness properties of 1-1/4-in. thick high-tensile steel plate would be adversely affected by a cold forming to a 9-ft radius, simulating the fabrication of plate for ship hulls; and determining the effects of various degrees of hot rolling of a thick medium steel plate rerolled to a final thickness of 3/4 in. in order to establish, if possible, a means of enhancing the notch toughness by special rolling techniques.

REPORTS:

(1) "Effects of Cold Forming on the Notch-Toughness Properties of High Tensile Steel Plate," by E. A. Imbembo and J. J. Gabriel, Mat. Lab. Proj. 5109C-1, 16 April 1953.

(2) "Notch-Sensitivity Characteristics and Other Properties of Medium Steel Plate Utilized by University of Pittsburgh on Contract NObs-54500," by E. A. Imbembo and A. L. Chick, Mat. Lab. Proj. 4936-89, 31 August 1953.

SURVEY NO: A.3.39

PROJECT NO: NS 011-084 TASK/CONTRACT/W.O. NO: P.O. 10726/54

TITLE: (Notch Tough Steel) Survey of Properties of Medium, High-Tensile, and Special-Treatment Steel.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1943 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: N. A. Kahn

DESCRIPTION: A survey to determine and compare notch-toughness properties was made for the following steels: 1/2-in. thick medium steel plate, as produced by ten steel mills to the requirements of BuShips Spec. 48S5 (7/15/43) and ABS Rules 1944; 1/2-in., 5/8-in., and 3/4-in. thick medium steel plate as produced by two mills to the requirements of MIL-S-16113 for plates of 7/8-in. thickness and over; Navy high tensile steel plate; and special treatment steel.

REPORTS:

Mat. Lab. Reports on Projects: 4728, 4728-23, 4936-1 through 4936-11, 4936-13 through 4936-78, 4936-80 through 4936-85, 4936-90 through 4936-93, 5012-9, 5255, 5109A-1 through 5109A-233, 5109B-1 through 5109B-34, 5109C-1 through 5109C-43, 4109D-1, 5109E-1 through 5109-E-3, and 5109F-1.

SURVEY NO: A.3.40

PROJECT NO: NS 011-084 TASK/CONTRACT/W.O. NO: P.O. 10726/54

TITLE: (Notch Tough Steel) Development of the Navy Tear Test for Evaluating Notch-Toughness of Ship Plate Steel.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1943 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: N. A. Kahn

DESCRIPTION: A notch-sensitivity test, utilizing a specimen which is ruptured by tearing and which is capable of sharply defining the temperature corresponding to the change from the ductile to the brittle mode of fracture in ship plate, has been developed.

REPORTS:

(1) "Development of a Tear Test for Evaluating Susceptibility of Ships Plate to Cleavage Fracture," Mat. Lab. Proj. 4936, 26 November 1946.

(2) "Effects of Variations in the Geometry of the Tear Test Specimen on the Energy-Absorption and Notch-Sensitivity Characteristics of High Yield, Notch-Tough, Ship Plate Steel," Mat. Lab. Proj. 5152, Prog. Report 1, 2 November 1950.

SURVEY NO: A.3.41

PROJECT NO: NS 011-084 TASK/CONTRACT/W.O. NO: 5208 & P.O. 10726/54

TITLE: (Notch Tough Steel) Investigation of Cracked Plating Removed from Ships in Service.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1943 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 343

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: N. A. Kahn

DESCRIPTION: This task is concerned with investigations of the notch-sensitivity characteristics and other properties of failed or questionable plate steels removed from vessels in service.

REPORTS:
Mat. Lab. Reports on Projects 5208-1 through 5208-7.

SURVEY NO: A.3.42

PROJECT NO: 548-03-001 TASK/CONTRACT/W.O. NO: TTI-5

TITLE: (Armor for Vehicles) Evaluation of Nonmetal and Nonferrous Armor for Vehicles.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: Detroit Arsenal

CONTRACTOR OR LABORATORY: Detroit Arsenal, Detroit, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The following have been evaluated: a nylon fabric, laminated plastics, and titanium metal.

REPORTS:

(1) "Ballistic Shock Test of the Experimental Titanium Alloy T55 ONTOS Vehicle Superstructure," ORDMX-ECM-1, 5 July 1954.

SURVEY NO: A.3.43

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: P.O. 10714/55

TITLE: (Development of Shock Design Methods) Optimum Bolt Design.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D.C.

PRINCIPAL INVESTIGATOR: H. M. Forkois

DESCRIPTION: The experimental work planned for bolts of hot and cold rolled mild steel and of high tensile strength steel, has been essentially completed. The two reports listed below describe the portion of the work that has been completed, and a report giving the results and conclusions of the experimental work is being prepared.

REPORTS:

(1) NRL Interim Ltr Report 3853-36A of 24 February 1950 to BuShips, Code 370.

(2) "Properties of Bolts Under Shock Loading," by H. M. Forkois, R. W. Conrad, and I. Vigness, Proc. Soc. Ex. Stress Analysis, 10:165, December 1952.

SURVEY NO: A.3.44

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: P.O. 10757/55

TITLE: (Development of Shock Design Methods) Shock Strength of Materials.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D.C.

PRINCIPAL INVESTIGATOR: I. Vigness

DESCRIPTION: A determination was made of the relative shock resistance of sand-cast aluminum alloys and the variables important in establishing their relative standings. Additional work on sand-cast materials including grey iron, nodular iron, and mild steel has been conducted. A study is being made to determine the shock resistance of these additional materials, and to develop apparatus for evaluating relative shock resistance.

The apparatus and instrumentation for dynamic testing have been improved for applications with rapid loadings in the elastic range.

An investigation concerning the effect of stress concentration on the dynamic yield point of mild steel has been started.

The effects of dynamic loading and temperature on the yield strength of zirconium have been studied and reported.

Experimental data pertaining to the effect of small amounts of plastic deformation have been analyzed and will form the basis of a future report.

REPORTS:

(1) "Resistance of Cast Aluminum Alloys to Mechanical Shock-First Partial Report," NRL Report F-3381, 10 November 1948.

(2) "Resistance of Materials to Mechanical Shock," NRL Report 3828, 13 July 1951.

(3) "Delayed-Yield Time Effect in Mild Steel Under Oscillatory Axial Loads," NRL Report 4312, 22 March 1954.

(4) "Effects of Dynamic Loading and Temperature on Yield Strength of Zirconium," NRL Memorandum Report No. 236 (Confidential), December 1953.

SURVEY NO: A.3.45

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: P.O. 10726/54

TITLE: (Development of Shock Design Methods) Dynamic Properties of Nodular Cast Iron.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The dynamic properties of nodular cast iron were determined by tests made on an 1800-ft lb AMSLER impact test machine. Also, steel and cast iron specimens have been tested on the Charpy impact machine.

SURVEY NO: A.3.46

PROJECT NO: NR 631-020 TASK/CONTRACT/W.O. NO: F01-02

TITLE: Shock Strength of Materials

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1957

DIRECTING AGENCY: Naval Research Laboratory, Code 6250

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: I. Vigness

DESCRIPTION: The objective is to determine the physical properties of selected structural materials when subjected to severe shock of a type probable under combat conditions.

The approach is to subject selected specimens to shock test on Navy high impact shock machines and conduct bending and uniform compression tests in which specimens are broken during 1 to 20,000 cycles of strain. The yield points and the stress-strain levels have been determined for tensile and compression specimens when subjected to shock loads typical of those experienced by Navy equipment, and the strength and other properties of rotating beams when subjected to transverse loads of variable and controllable amplitude have been determined. A machine to load specimens so as to eliminate the oscillatory stress set up in the specimen by previous testing has been designed and constructed.

REPORTS:

(1) "Shock Strength of Materials," Report of NRL Progress, December 1954.

(2) "Rotating Beam Deflection Studies," presented to the Society of Experimental Stress Analysis (First International Instrument Congress), Philadelphia, Pa., September 1954.

(3) "The Effect of Axial Dynamic Loads on Mechanical Properties of Certain Steels," by R. C. Smith, NRL Report 4468.

(4) "Shock Strength of Materials," by R. C. Smith and N. Rendler, Report of NRL Progress, September 1953.

SURVEY NO: A.3.47

PROJECT NO: NO 413-127 TASK/CONTRACT/W.O. NO: P.O. 45759

TITLE: (Armor, Special Applications) Blast Resistant Armor.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1949 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ordnance

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Mechanics Div., Washington 25, D. C.

PRINCIPAL INVESTIGATOR: P. P. Puzak

DESCRIPTION: Initial work on armor to resist blast from anti-ship missiles of high capacity (charge/weight ratio) has been conducted by NRL. This work is applicable for evaluating welds by shock loading.

The tear action of blast on armor is being considered by a modified Navy tear test. A reproducible test has been evolved which measures the work of ductile fracture propagation in the metal.

REPORTS:

(1) NRL Report 3790, 24 January 1951.
(2) NRL Report 4034, September 1952.
(3) NPG Report 1324, 12 January 1955.
(4) NPG Report 1388, 24 January 1955.
(5) NPG Report 1384, 15 June 1955.

SURVEY NO: A.3.48

PROJECT NO: 548-03-001 TASK/CONTRACT/W.O. NO: TTI-5

TITLE: (Armor for Vehicles) Special Armor Evaluation.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: Detroit Arsenal

CONTRACTOR OR LABORATORY: Detroit Arsenal, Detroit, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Since the mild steel castings (Class 2, Spec. QQ-S-681) used for torsion bar housings did not afford sufficient ballistic protection (resistance to blast and penetration), comparative tests in processing (machine-ability) and ballistics were conducted using Class 2, Class 4C2 armor. As a result, a Grade II cast armor (241 to 293 BHN) was evolved. This armor possessed adequate shock properties as well as good machine-ability.

Other special areas of ordnance-vehicle armor which were evaluated are: airgrilles in WWII tanks and 1/2-in. and 5/8-in. wrought armor materials used in tank applications.

REPORTS:

(1) "Comparison of the Protection Afforded by Cast Armor Air Grilles for M46, T43, and T41 Tanks Against Various Types of Ballistic Attack," AD 1148, 9 January 1953.

(2) "Comparison of the Performance of the Heli-Coil Method of Tapping to the Normal Method of Tapping Holes in Armor When Ballistically Shock Tested at Various Velocity Levels," AD 1156, 21 October 1952.

(3) "Reports on Tests to Determine the Ballistic Performance of Various Thicknesses of Rolled Homogeneous Armor at Moderate and High Obliquities," AD 1149, 24 June 1952.

(4) "Comparison of the Protection Afforded by Rolled and Welded Armor Air Grilles for the T48 Tank with Case Armored Air Grilles for T48 Against Various Types of Ballistic Attack," AD 1158, 14 January 1953.

(5) "Investigation of the Comparative Performance of Three Types of Cast Steel for Use in Suspension Support Castings when Subjected to Various Types of Ballistic Attack," AD 1163, 16 April 1953.

SURVEY NO: A.3.49

PROJECT NO: 1347 TASK/CONTRACT/W.O. NO: 13702 and AF 33(600)-2437

TITLE: (Structural Testing at Elevated Temperatures) Structural Testing Criteria.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Univ. of Mich., Ann Arbor, Mich.

PRINCIPAL INVESTIGATOR: H. F. Allen

DESCRIPTION: Tests are being conducted on a series of identical aluminum alloy specimens at room temperature and at 700° F. These include a series of steady load-tests at constant temperatures, and a series of repeated load reversals at elevated temperatures. The test work is approximately 40% complete.

REPORTS:

(1) "A Study of Stress Analysis and Structural Testing Procedures Applicable to Aircraft Structures at Elevated Temperatures," by H. F. Allen, M. A. Brull, and W. J. Wilkie, Univ. of Mich. Report No. 1888-1-F (Unclassified), January 1954.

SURVEY NO: A.3.50

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: NOas 52-1073-c

TITLE: (Experimental Structures and Structural Design Criteria) Use of Silver Chloride as a Means of Studying Fatigue Damage.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Battelle Memorial Inst., Columbus, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An investigation was made to determine if silver chloride test specimens are capable of exhibiting fatigue behavior and if they can be used to study the nature of fatigue damage in structural metals and alloys.

REPORTS:

(1) "Utilization of Silver Chloride to Study the Basic Nature of Fatigue Damage," by W. S. Hyler, R. R. Spencer, and H. J. Grover, Battelle Memorial Institute Report, 28 May 1954.

SURVEY NO: A.3.51

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: P.O. 10710/54

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Antisubmarine Type Hulls) Physical Properties of Steel.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: W. J. Sette

DESCRIPTION: An investigation is underway to determine the effects of strain rates on the yield strength of MS, HTS, HY 80, and STS steels. Specimens of these steels are being tested in a tension testing machine to determine if the yield strengths will approach the static yield of STS steel. If this is confirmed, an attempt will be made to explain the phenomena.

SURVEY NO: A.3.52

PROJECT NO: NA 581-146 TASK/CONTRACT/W.O. NO: NOas-54370

TITLE: (High Temperature and Structural Metallic Materials) Study of the Effects of Interstitials on the Impact Strength of Titanium.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AE-41)

CONTRACTOR OR LABORATORY: Mallory-Sharon Titanium Corporation, Niles, Ohio

PRINCIPAL INVESTIGATOR: L. S. Busch

DESCRIPTION: The study of the effects of structure and interstitials on the impact strength of several titanium alloys is continuing. Alloys will be compared using sponge of varying hardness, and controlled amounts of oxygen and nitrogen will be added to the melts.

REPORTS:

Copies of reports may be obtained from the Bureau of Aeronautics (AE-41).

SURVEY NO: A,3,53

PROJECT NO: NA 581-146 TASK/CONTRACT/W.O. NO: NOas 55-318 & NOas 54-254-c

TITLE: (High Temperature and Structural Metallic Materials) Chromium Base Alloys.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AE-41)

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Recent test results on chromium base alloys containing approximately 50% chromium indicate substantially improved long-time creep-rupture properties approaching temperatures of 1800° F. Ductility is still somewhat low, but this material shows the possibility of being usable. The role of nitrogen as an inhibitor in the formation of the embrittling phase is being investigated.

REPORTS:

Copies of reports may be obtained from BuAer (AE-41).

SURVEY NO: A.3.54

PROJECT NO: NR 631-030 TASK/CONTRACT/W.O. NO: F01-03

TITLE: Study of Fracture Strength.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1957

DIRECTING AGENCY: Naval Research Laboratory, Code 6210

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: G. R. Irwin

DESCRIPTION: The objectives are the precise formulation of (1) the micromechanism of brittle behavior of solid bodies, (2) the micromechanism of brittle fracture, (3) the fracture instability of large structures which have sufficient stored elastic energy to fail catastrophically, and (4) the generalization of the condition for instability.

Fast shear fracture tests in torsion are being conducted on contract at the University of Illinois. Bend tests are being conducted on contract at the University of North Carolina.

REPORTS:

(1) "Energy Release Rates During Fracturing of Perforated Plates," by M. W. Brossman and J. A. Kies, NRL Memo Report No. 370, November 1954.

(2) "Photoelastic Stress Analysis for an Edge Crack in a Tensile Field," by D. Post, SESA Proc. 12:99 (1954).

(3) "Methods for Determining the Energy for Fracture Propagation in Plates," by J. A. Kies and H. L. Smith, Am. Phys. Soc. Bull., January 29, 1954.

SURVEY NO: A.3.55

PROJECT NO: NR 035-153 TASK/CONTRACT/W.O. NO: N7onr-46801

TITLE: (Structural Mechanics) Dynamics of Materials.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1948 COMPLETION DATE: 1950

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 439

CONTRACTOR OR LABORATORY: Lessells and Associates, Boston, Mass.

PRINCIPAL INVESTIGATOR: J. M. Lessells

DESCRIPTION: This investigation was conducted in order to establish a rational correlation for metals with respect to true stress-strain characteristics, values of internal friction, and variations in cycles of pure axial stress; and to analyze critically the data obtained so as to derive a more satisfactory theory of the mechanism of fatigue failure. The study included the development of an electromagnetic resonant axial fatigue testing machine, capable of speeds approaching 1000 cps and of maintaining constant amplitudes under any desired condition of speed and temperature. Work on this development was transferred to NRL, Washington 25, D. C.

REPORTS:

(1) "Theory of the Fatigue of Metals," by F. H. Fowler, Jr., Tech. Report No. 1, 28 May 1948.

(2) "Numerical Study of Factors in the Stress Concentration Theory as Applied to the Hysteresis and Fatigue of Metals," by P. R. Schepler, Tech. Report No. 2, 15 December 1948.

(3) "Analysis of a Three Degree of Freedom Seismic System and its Application to a High-Frequency Fatigue Machine," by I. H. Stockel, Tech. Report No. 3, 14 March 1950.

(4) "Design, Construction and Partial Proof Testing of High-Frequency Direct-Stress Fatigue-Damping Machine," by P. R. Schelper, and W. E. Nicholson, Tech. Report No. 4, 14 March 1950.

SURVEY NO: A.3.56

PROJECT NO: 1368 TASK/CONTRACT/W.O. NO: 13602 & AF 33(616)-327

TITLE: (Construction Techniques and Application of New Materials) Design Investigation for Aircraft and/or Missile Fuselage.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Aerophysics Dev. Corp., Pacific Palisades, Cal.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The aim of this task is to develop design information in order to meet the structural requirements of future air weapons. The full evaluation of all usable structural materials, and/or combinations of materials will be carefully made by both theoretical studies and data used by structural designers. New design philosophies will be analyzed and evaluated and the results presented.

SURVEY NO: A.3.57

PROJECT NO: NR 633-010 TASK/CONTRACT/W.O. NO: F03-01

TITLE: Vibro Analysis of Materials.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: Continuing

DIRECTING AGENCY: Naval Research Laboratory, Code 6250

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: I. Vigness

DESCRIPTION: Certain basic physical parameters of materials have been determined in the field of ultrasonics by measurements made of the attenuation of high frequency vibration in single crystals of pure lead and lead plus 0.12% Cadmium at 3 Mc to 30 Mc. Pulse generators and amplifiers to be used to extend the ultrasonic frequency range to 50 Mc with pulse durations between 1 μ sec and 20 μ sec, have been constructed.

REPORTS:

(1) Report of NRL Progress, February, June, and December 1954; May and July 1950.

SURVEY NO: A.3.58

PROJECT NO: NR 064-361 TASK/CONTRACT/W.O. NO: N8onr-66207

TITLE: (Structural Mechanics and Vibrations) Determination of Damping Capacity and Dynamic Modulus of Elasticity of Materials and Structural Units.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Minn., Minneapolis, Minn.

PRINCIPAL INVESTIGATOR: B. J. Lazan

DESCRIPTION: This investigation is seeking to establish for materials and a few elemental structures, the interrelationship between internal friction (or damping) and fatigue by considering the nonlinear effects thereon of variations in the dynamic modulus of elasticity and in the frequency, magnitude, and history of the applied stress. Data obtained experimentally in this study are being analyzed to determine the effects of (1) a varying dynamic modulus of elasticity on the redistribution of stress under fatigue conditions and (2) a varying modulus and varying stress distribution on fatigue strength. Three different types of fatigue stressing (axial, reversed flexure, and rotational bending) are being analyzed and experimentally checked with mild steel and aluminum in the form of solid and hollow specimens of circular cross section.

REPORTS:

(1) "The Effects of Stress Magnitude and Stress History on the Damping Elasticity, and Fatigue Properties of Metallic Materials," by B. J. Lazan and L. J. Demer, September 1953.

SURVEY NO: A.3.59

PROJECT NO: NR 064 369 TASK/CONTRACT/W.O. NO: N7onr-32911

TITLE: (Structural Mechanics and Vibrations) Dynamic Properties of Plastics and Rubber-like Materials.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1951 COMPLETION DATE: 1952

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Ill. Inst. of Tech., Chicago, Ill.

PRINCIPAL INVESTIGATOR: E. G. Volterra

DESCRIPTION: Previous research has indicated that the dynamic stress strain relationship for plastic and rubber-like materials can be expressed by a general formula which takes into account the whole strain history of the materials and which would probably express such relationships for mild steel and certain other metallic materials. The purpose of this task was to study further the dynamic stress strain relationship of plastic materials through an experimental determination of the actual behavior of these materials under impact loading, and through the extension of the analysis to include certain metals.

REPORTS:

(1) "Dynamic Properties of Plastics and Rubber-like Materials," by R. A. Eubanks, D. Muster, and E. G. Volterra, Tech. Report No. 1.

(2) "A Rotating-Drum Camera for Recording Impact Loading Deformations" (Abstract), by D. Muster and E. G. Volterra.

SURVEY NO: A.3.60

PROJECT NO: NR 064-411 TASK/CONTRACT/W.O. NO: Nonr-591(05)

TITLE: (Structural Mechanics and Vibrations) The Dynamic Properties of Materials.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Rensselaer Polytechnic Inst., Troy, N. Y.

PRINCIPAL INVESTIGATOR: E. G. Volterra

DESCRIPTION: An experimental determination of the dynamic properties of materials at high rates of strain and at elevated temperatures is being made, and the information being obtained is being formulated into analytical procedures which, by taking into account such additional factors as strain history, will accurately predict such properties.

REPORTS:

(1) "A One-Dimensional Theory of Wave Propagation in Elastic Rods Based on the Assumption of Constrained Elasticity," by E. G. Volterra, Tech. Report No. 1.

(2) "The Equations of Motion for Curved Bars in Three-Dimensional Constrained Elasticity," by E. G. Volterra, Tech. Report No. 2.

SURVEY NO: A.3.61

PROJECT NO: NR 330-003 TASK/CONTRACT/W.O. NO: N6ori-08301

TITLE: (Organic and Fibrous Materials) Dynamic Properties of Rubber-Like Materials.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1946 COMPLETION DATE: 3/31/56

DIRECTING AGENCY: Office of Naval Research, Organic Mat. Br., Code 424

CONTRACTOR OR LABORATORY: Univ. of Notre Dame, Notre Dame, Ind.

PRINCIPAL INVESTIGATOR: R. L. Anthony

DESCRIPTION: The kinetic theory of rubber-like elasticity is being extended to cover dynamic as well as static behavior. Experimental investigations include precision-equilibrium tension and shear stress-strain curves as a function of temperature; low frequency vibration of rubbers over a temperature range from 100°C down to liquid nitrogen temperature; ultrasonic vibration of rubbers and rubber solutions over the same temperature range.

REPORTS:

(1) "Ultrasonic Studies of Polymethyl Methacrylate," by J. L. Melcher and A. A. Petrauskas, 1952.

(2) "Stress Temperature Studies of Transitions in Rubbers," by R. S. White and R. L. Anthony.

(3) "Nuclear Magnetic Resonance Study of Transition in Polymers," by L. V. Holroyd, R. S. Codrington, B. A. Mrowca, and E. Guth.

SURVEY NO: A.3.62

PROJECT NO: NR 330-026 TASK/CONTRACT/W.O. NO: Nonr-401(09)

TITLE: (Organic and Fibrous Materials) Dynamic Properties of Plastics and Elastomers.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Organic Mat. Br., Code 424

CONTRACTOR OR LABORATORY: Cornell Univ., Dept. of Physics, Ithaca, N. Y.

PRINCIPAL INVESTIGATOR: H. S. Sack and D. Weigand

DESCRIPTION: To study the variation of the elastic modulus and elastic losses as a function of frequency and temperature in plastics and elastomers at the phase transition points of these materials.

SURVEY NO: A.3.63

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Research on the Properties of Constructional Metals as a Function of Temperature and Strain Rate in Torsion.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: ---

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center

CONTRACTOR OR LABORATORY: Syracuse Univ., Syracuse, N. Y.

PRINCIPAL INVESTIGATOR: G. Sachs

DESCRIPTION: To determine the structural properties of several materials under torsional loading and under a tension-tension stress system with loading rate and temperature variables, and to compare the results obtained under the two bi-axial stress systems.

REPORTS:
Final report due December 1955.

SURVEY NO: A.3.64

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Research and the Investigation of Fatigue Properties of Aircraft Missile, and Powerplant Structural Materials.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: ---

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center

CONTRACTOR OR LABORATORY: Univ. of Minn., Minneapolis, Minn.

PRINCIPAL INVESTIGATOR: B. J. Lazan

DESCRIPTION: The investigation of damping, elasticity, creep, stress-rupture, fatigue, and related properties of aircraft, missile, and propulsion structural materials at normal and elevated temperatures. Work will be done to develop and improve methods of establishing these properties under laboratory and service simulated conditions, and the development of a theory of the mechanism of fatigue. This work is continued in accordance with Contract AF33(038) 20840. See 3446-73498.

REPORTS:

(1) "Strength, Damping, and Elasticity of Materials under Increasing Reversed Stress with Reference to Accelerated Fatigue Testing," WADC TR 55-225.

(2) "Fatigue Crack Detection Methods," WADC TR 55-86.

(3) "Fatigue Crack Detection Methods, Part 2," WADC TR 55-86.

(4) "Analysis of Slip Damping with Reference to Turbine Blade Vibration," WADC TR 55-232.

(5) "Preliminary Investigation of the Emanation from Cold-Worked Metals," WADC TR 55-200.

SURVEY NO: A.3.65

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Statistical Fatigue Problems.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: ---

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center

CONTRACTOR OR LABORATORY: Forest Products Lab., Madison, Wis.

PRINCIPAL INVESTIGATOR: K. H. Boller

DESCRIPTION: Investigation of the use of statistical methods for the analysis of fatigue data and the problem of defining the S-N curve at any point along its length.

REPORTS:
Final Report due October 1955.

SURVEY NO: A.3.66

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: **Materials Fatigue Problems.**

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: ---

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center

CONTRACTOR OR LABORATORY: Curtiss-Wright Corp., Prop. Div., Caldwell, N. J.

PRINCIPAL INVESTIGATOR: F. B. Stulen

DESCRIPTION: To conduct a fatigue test program using statistical methods for the purpose of furnishing designers with safer and more efficient methods and data for propeller and rotor blades.

REPORTS:

(1) "Investigation of Materials Fatigue Problems Applicable to Propeller Design," WADC TR 54-531.

SURVEY NO: A.3.67

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Developing a Method of Predicting Fatigue Damage in Aircraft Materials.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: ---

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: B. L. Wilson

DESCRIPTION: To investigate the accuracy and possibility of determining or predicting fatigue damage of titanium alloys and steel.

SURVEY NO: A.3,68

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM 2409

TITLE: (Structural Development and Test) Investigation of the Directional Strength Properties of Fiberglas.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1943 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Investigations have been made of Fiberglas to determine its directional strength properties, to evaluate its mechanical properties, to determine the most promising types of laminates, and to provide design data for use in sandwich construction utilizing Fiberglas facings.

REPORTS:

(1) "Theoretical Investigation of the Directional Strength Properties of Laminated Plastics Part I."

(2) "Empirical Investigation of the Directional Strength Properties of Fiberglas Laminates Part II."

(3) "Correlation of Theoretical and Empirical Investigations of the Directional Strength Properties of Fiberglas Laminates Part III."

(4) "Shear Tests of Fiberglas Laminated Flat Panels with Clamped Edges."

(5) "Pure Compression and Pure Torsion Tests of Fiberglas Laminated Cylinders."

SURVEY NO: A.3.69

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS 2411

TITLE: (Structural Development) Flexural Fatigue of Wing Beams.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1949 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Full scale wing beams were constructed by an aircraft manufacturer and tested at NBS under repeated flexural loads with emphasis on obtaining data for the high stress vs. low cycle end of the S-N curve.

SURVEY NO: A.3.70

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS-2412

TITLE: (Structural Development) Static and Fatigue Test of Riveted Joints.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1944 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The strength and efficiency of aluminum-alloy riveted joints was investigated by means of static and fatigue tests of various joint arrangements. Tests were conducted on riveted joints made from Alcad 75S-T, 24S-T and R301-T sheets. Design data on strengths, S-N curves, and notch sensitivity of such joints were obtained.

In order to extend the data into high load ranges, tests of additional riveted joints were made, and a final report was prepared.

SURVEY NO: A.3.71

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-213

TITLE: (Structural Development) Repeated-Load Tests of Forged 75S-T6 Aluminum Alloy Specimens with Protruding Lugs.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: S. Levy and D. Howard

DESCRIPTION: The fatigue life for specimens machined from forged 75S-T6 aluminum alloy and the effect of mild stress concentrations in the form of protruding lugs on the fatigue life, have been determined. All tests have been completed. These included tests to determine the effect of lug radius, lug height, and lug length over a cycle range from 300 to 150,000 cycles. The final report is now being written.

SURVEY NO: A.3.12

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-214

TITLE: (Structural Development) Determination of Limit Load Cycles to Failure Curves for Typical Aircraft Structures.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: S. Levy and D. M. Howard

DESCRIPTION: Investigations are being conducted to determine if there is a consistent relation between applied load and cycles-to-failure under repeated loads for simple aircraft structures, and what effect the inclusion of torsional loads has on the fatigue life of these structures.

Tests of seven box beam specimens under static and repeated bending loads have been completed, and tests of similar specimens under combined bending and torsional loads are currently being performed. Similar tests on D-Nose specimens will be performed in the near future thereby completing the testing requirements of this task.

SURVEY NO: A.3.73

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33031 & AF 33(616)-395

TITLE: (Rotor Blades) Fatigue Studies of Helicopter Components.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Battelle Memorial Inst., Columbus, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An engineering study has been made of the fatigue problems encountered in the components of helicopters. This study was initially planned to include a survey of all available data and literature on failures attributable to fatigue in helicopters; a survey of methods presently used to cope with fatigue; and an analysis of the collected data to determine the factors contributing to fatigue, to formulate design recommendations to alleviate failure, and to make a correlation of presently used theories (such as design, stress analysis, and prediction theories) with the results obtained from the data analysis.

SURVEY NO: A.3.74

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 33054 & AF 33(616)-29

TITLE: (Aircraft Propeller Blades) Propeller Fatigue Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Ohio State Univ., Columbus, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Work is being performed which will assist in the provision of basic information and data for more efficient use of metals in aircraft propellers and rotors.

SURVEY NO: A.3.75

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 33054 & AF 33(616)-151

TITLE: (Aircraft Propeller Blades) Propeller Fatigue Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Hamilton Standard Div., Windsor Locks, Conn.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will aid in the establishment of the fatigue properties of the materials used in aircraft propellers and rotors, of the effects of flight stresses in producing failure of these materials, and of the factors which cause vibratory flight stresses.

SURVEY NO: A.3.76

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 33054 & AF 33(616)-162

TITLE: (Aircraft Propeller Blades) Propeller Fatigue Studies

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: J. O. Stulen, Pittsburg, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will assist in the provision of basic information which is required for the more efficient use of metals in aircraft propellers and rotors.

SURVEY NO: A.3.77

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 73498 & AF 33(038)-20840

TITLE: (Aircraft Propeller Blades) Investigation of the Statistical Nature of Fatigue.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab., WCLBG

CONTRACTOR OR LABORATORY: Univ. of Minn., Minneapolis, Minn.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A number of different methods of accelerated fatigue testing have been proposed. This task is for the purpose of evaluating these proposed methods as to their accuracy and feasibility.

The PROT method of accelerated fatigue testing has been found to be the most promising of the various methods reported so far.

SURVEY NO: A.3.78

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 73497 & AF 33(616)-493

TITLE: (Aircraft Propeller Blades) Investigation of the Sfatistical Nature of Fatigue.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: W[redacted] Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Curtiss-Wright Corp., Prop. Div., Caldwell, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will attempt to develop the statistical approaches to fatigue analysis needed to obtain safe and efficient design methods for aircraft propellers and helicopter rotors. The first problem is one of obtaining data which are suitable for use with statistical methods. The second problem is to develop statistical methods which can be applied to fatigue problems.

SURVEY NO: A.3. 9

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 33054 & AF 33(606)-493

TITLE: (Aircraft Propeller Blades) Propeller Fatigue Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Curtiss-Wright Corp., Prop. Div., Caldwell, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Studies are being made to determine basic information for the fatigue properties of material used in aircraft propellers and rotors, for the effects of flight stresses in producing failure of these materials, and for the factors which cause vibratory flight stresses.

SURVEY NO: A.3.80

PROJECT NO: 3346 TASK/CONTRACT, W.O. NO: 33054 & AF 33(616)-2103

TITLE: (Aircraft Propeller Blades) Propeller Fatigue Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Battelle Memorial Inst., Columbus, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task is a part of a study which is aimed at the provision of the basic information required for the more efficient use of metals in aircraft propellers and rotors.

SURVEY NO: A.3.81

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 73499

TITLE: (Aircraft Propeller Blades) Effects of Size on Fatigue Strength.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab., WCLBG

CONTRACTOR OR LABORATORY: Wright Air Development Center, Propeller Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will provide the correlation between fatigue strength of small laboratory test specimens and the fatigue strength of full size parts. Tests of 2024T4 aluminum alloy in the unnotched condition have been completed.

SURVEY NO: A.4.1

PROJECT NO: 1-1361 TASK/CONTRACT/W.O. NO: 13449

TITLE: (Aerodynamic Loads) Rough Air Load Measurements.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Aircraft Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A study will be made of the problem of establishing methods for predicing the gust response of aircraft structures by defining a rational gust forcing function and by establishing a relatively simple method of predicting the aircraft response to the forcing function. The reliability of methods of analysis and representative gust forcing functions will be demonstrated by comparison of analytically predicted responses and flight test measurements of test aircraft. An alternate testing technique, that of using the wake of a large aircraft as a gust generator, shows some promise as a means of checking analytical response predictions. A limited number of flight hours (10) has been obtained by using this technique.

SURVEY NO: A.1.2

PROJECT NO: 1366 TASK/CONTRACT/W.O. NO: 70113

TITLE: (Exterior and Interior Aerodynamics) Interference Drag Reduction.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Aircraft Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is to formulate and investigate methods of designing aerodynamic configurations having a minimum of total drag. In particular, an understanding of propulsive-jet interference drag will be obtained, methods for alleviating shock induced separation will be explored, and design criteria for minimizing wing-body interference drag will be established. A contract is in the process of being negotiated on this task.

SURVEY NO: A.4.3

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13582 and AF 33(616)-371

TITLE: (Structural Design Criteria) Guided Missile Structural Design Criteria.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: North Amer. Aviation, Inc., Los Angeles, Cal.

PRINCIPAL INVESTIGATOR: I. J. Hart

DESCRIPTION: This task covers a study of existing structural design criteria for guided missiles. Research has been completed and the final technical report is being prepared for publication.

SURVEY NO: A.4.4

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13737 and AF 33(616)-2254

TITLE: (Aircraft Structural Design Criteria) Dynamic Load Studies.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Univ. of Dayton, Dayton, Ohio

PRINCIPAL INVESTIGATOR: C. Peckham

DESCRIPTION: This contract calls for the analysis of the parameters that govern initial impact on landing gears. Further plans include analyses of data relative to landing impact loads on wings, fuselage, nacelles, and tail structures. The data to be used were obtained from work accomplished under task No. 13637 of this project.

SURVEY NO: A.4.5

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13579 and AF 33(038)-7267 and AF 33(616)-2425

TITLE: (Aircraft Structural Design Criteria) Structural Design Studies.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: R. Bisplinghoff

DESCRIPTION: Contract AF 33(038)-7267 of this task covers the investigation of the effects of aeroelasticity on aircraft loading. This contract has been completed.

Contract AF 33(616)-2425 is for the study of load spectrum, life cycle concepts of structural design criteria. This contract is approximately 15% completed.

REPORTS:

(1) Twenty WADC T.R's have been published on the subject of this task.

SURVEY NO: A.4.6

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13454

TITLE: (Aeroelasticity, Vibration, and Flutter) Theoretical Prediction of Supersonic Aeroelastic Effects.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Wright Air Development Center, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task is expected to yield qualitative information about the nature and probable occurrence of aeroelastic problems such as wing divergence and control surface reversal in supersonic aircraft and missiles, and to provide designers with improved methods for predicting supersonic aeroelastic phenomena. A survey of the state of the art of conducting supersonic aeroelastic analysis has been completed and a new method based on aerodynamic influence coefficients is being investigated.

REPORTS:

(1) "Aileron Reversal Research of Straight and Swept Wings at High Subsonic Speeds," WADC Tech. Report No. 52-231 (Unclassified), September 1952.

(2) "Structural Influence Coefficients of the XF 92 Delta Wing," WADC MR WCLSY 4595-7-2 (Unclassified), 4 September 1951.

SURVEY NO: A.4.7

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13475 & AF 33(600)-6013 and AF 33(616)-2541

TITLE: (Aeroelasticity, Vibration, and Flutter) Studies of the Interaction of Servomechanisms Used in Aircraft Controls.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Northrop Aircraft, Inc., Hawthorne, Cal. and Dynalysis Development Labs., Inc., Los Angeles, Cal.

PRINCIPAL INVESTIGATOR: D. T. McRuer and W. E. Hinds

DESCRIPTION: The objectives of this task are an engineering appraisal of the combined servo-flutter problem, its importance and probable occurrence, and the development of suitable techniques for testing and analyzing servo-systems for the flutter possibilities. Theoretical methods of analysis have been developed by Northrop Aircraft Inc. and a technical report covering this phase of the work has been distributed to the Aircraft Industry. Dynalysis Development Labs, Inc. is now evaluating the importance of the coupled servo-flutter problem. Analyses employing variation of parameters are being made to define important characteristics, and tests are being conducted to define methods for experimental determination of important dynamic and flutter parameters.

REPORTS:

(1) "The Influence of Servomechanisms on the Flutter of Servo-controlled Aircraft," AF TR 6287 (Unclassified), March 1954.

SURVEY NO: A.4.8

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 70411 & AF 33(616)-294

TITLE: (Aeroelasticity, Vibration, and Flutter) Vibration Characteristics of Delta Wings.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Carnegie Inst. of Tech., Pittsburgh, Pa.

PRINCIPAL INVESTIGATOR: P. Gustafson

DESCRIPTION: The purpose of this task is to provide accurate and simplified methods for predicting the elastic and dynamic behavior of delta wings from given structural and/or design data. A simplified method of analyzing plate-like structures which makes use of experimentally determined mode shapes and frequencies of a simplified geometrically similar plate is being investigated. Results obtained to date indicate the first two natural frequencies and mode shapes of a 45 degree delta plate are in good agreement with geometrically similar aircraft wings.

SURVEY NO: A.4.9

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 70424 & AF 33(616)-294

TITLE: (Aeroelasticity, Vibration, and Flutter) Structural Vibration Effects of Concentrated Loads.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Carnegie Inst. of Tech., Pittsburgh, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task has provided simple formula and/or data for estimating changes in the vibration characteristics of environments in which equipment is to be mounted, caused by the mounted equipment, so that realistic design and test specifications may be set up for the equipment.

SURVEY NO: A.4.10

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 70426 & AF 33(616)-2416

TITLE: (Aeroelasticity, Vibration, and Flutter) Application of Stochastic Processes to Aircraft Structural Design.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Ohio State Univ., Columbus, Ohio

PRINCIPAL INVESTIGATOR: H. B. Mann

DESCRIPTION: The objective of this task is to ascertain the applicability of stochastic processes to structural design problems arising in the development of aircraft and missiles. The technical problems involved are the investigation of the application of stochastic processes for the evaluation of armament, for the evaluation of the effects of vibration on strength of structures, propellers, etc., for the study of fatigue and breaking strength of materials, and for the study of nuclear phenomena and particle collisions as they effect aircraft and missiles structures.

SURVEY NO: A.4.11

PROJECT NO: 3066 TASK/CONTRACT/W.O. NO: 30225

TITLE: (Gas Turbine Technology) Transmission Vibration Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Power Plant Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Power Plant Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: F. R. Goldammer

DESCRIPTION: This task was initiated to investigate vibration in the power trains of helicopters and convertiplanes. Work has been concentrated on torsional vibration in systems assumed to consist of lumped parameters. Power trains have been studied using mathematical methods, electrical analogs, differential analyzers, and the results of flight tests.

SURVEY NO: A.4.12

PROJECT NO: 3066 TASK/CONTRACT/W.O. NO: 70503

TITLE: (Gas Turbine Technology) Oil Whip Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: 1957

DIRECTING AGENCY: Wright Air Development Center, Power Plant Lab.

CONTRACTOR OR LABORATORY: Rensselaer Polytechnic Inst., Troy, N. Y.

PRINCIPAL INVESTIGATOR: J. F. Lewis

DESCRIPTION: Speeds of rotating elements in full film lubricated bearings are constantly being increased. In conjunction with this increased speed, a phenomenon occurs called "oil film whirl" which is dependent upon the elastic properties of the shaft and the hydrodynamic properties of the oil film. An unstable region exists at speeds above twice the critical speeds of rotor-bearing combinations, therefore necessitating a means for determining design criteria that will broaden the margin of operation free of disturbances in super critical speed ranges.

REPORTS:

(1) WADC TR 54-188
(2) ASME - 54 LUB 4

SURVEY NO: A.4.13

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 33039 and AF 33(616)-20

TITLE: (Aircraft Propeller Blades) Dynamics Investigation on Propeller Blades.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: United Aircraft Corp., Hamilton Standard Division, Windsor Locks, Conn.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task is undertaken to develop a background in basic dynamics, vibration, and advanced mathematics that will permit the analytical study of the dynamic characteristics of propeller blades. The characteristics are, fundamentally, the first mode bending resonance and the single degree-of-freedom torsional flutter which occur within the operating range of the propeller design. Studies of whirl test data are being conducted. These data are supplied by the Propeller Lab., WADC.

SURVEY NO: A.4.14

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 70408 & AF 33(616)-294

TITLE: (Aircraft Propeller Blades) Calculation of Propeller Blade Vibration Frequencies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Carnegie Inst. of Tech., Pittsburgh, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task undertook the development of a practical method for the calculation of the natural vibration modes of a rotating, flexible propeller blade when the centrifugal field, built-in twist, and the effect of blade root stiffness were taken into consideration.

One approach used was to employ a modification of the Stodola process of successive approximations to the deflection curve as expressed by a simplified form of the differential equation of motion of the blade. A second approach was based on use of the Green's function with assumed linear twist variation.

SURVEY NO: A.4.15

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33027 & AF 33(616)-238

TITLE: (Rotor Blades) Rotor Blade Elasticity Study.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Kellett Aircraft Corp., Camden, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A theoretical study has been conducted on the aeroelastic properties of helicopter rotor blades. The dynamic theory of an elastic rotor blade executing bending-torsion vibrations under the action of mechanical and aerodynamic vibratory forces has been developed.

SURVEY NO: A.4.16

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 33048, AF 33(600)-22677, and AF 33(616)-2124

TITLE: (Aircraft Propeller Blades) Propeller Blade Structures Investigation.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Ohio State Univ., Columbus, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Work is being performed which will assist in the establishment of the design criteria required for structurally safe blades. Contract AF 33(600)-22677 has been completed and a final technical report has been prepared.

SURVEY NO: A.4.17

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: 1238

TITLE: (Ordnance Basic Research) A Second Order Partial Differential Equation Relating to Vibrating Membranes.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Picatinny Arsenal

CONTRACTOR OR LABORATORY: Univ. of S. C., Columbia 1, S. C.

PRINCIPAL INVESTIGATOR: T. Fort

DESCRIPTION: Scope: The contractor will investigate one or more of the following problems in the theory of vibrating membranes relating to a differential equation which describes the displacement of a particle on a loaded elastic net: (1) Multiple roots of the characteristic equation; (2) Boundary conditions over certain nonrectangular regions; (3) Passing to the limiting differential equation; and (4) A generalization of the above differential equation and the associated boundary value and limit problems.

SURVEY NO: A.4.18

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: 223 & DA-36-061-ORD-277

TITLE: (Ordnance Basic Research) Mathematical Analysis of Electrical and Mechanical Systems.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Ordnance Research

CONTRACTOR OR LABORATORY: Carnegie Inst. of Tech., Pittsburgh 13, Pa.

PRINCIPAL INVESTIGATOR: A. E. Heins and R. F. Duffin

DESCRIPTION: Progress (1 Dec. 1953 - 1 June 1954) A technical report has been prepared generalizing and simplifying a previous one concerned with a generalization of the Schwartz principle of reflection for harmonic functions (No. 6). A new report has been prepared, presenting a new approach to the analysis of electrical and mechanical systems having a large amount of friction, and extending the classical methods of Rayleigh, Ritz, and Courant for the conservative case. Other reports in preparation include a discussion of a power series inversion of the Leontief matrix, and a paper concerning two-point boundary value problems for differential equations in which an analytical expression is found defining functions which satisfy the boundary conditions, but do not exceed the actual solution. A study of the forced vibrations of continuous beams and composite systems is nearing completion.

REPORTS:

(1) "Water Waves Over a Channel of Infinite Depth," by T. R. Greene and A. E. Heins, 9 May 1952 (Carnegie Inst. of Tech., Dept. of Math.).

(2) "The Coupling of Half Planes," by A. E. Heins and H. Feshbach, 22 July 1952 (Carnegie Inst. of Tech., Dept. of Math.).

(4) "On Finding the Characteristic Equation of a Square Matrix," by E. Saibel and W. J. Berger, in Mathematical Tables and Aids to Computation, Vol. 7, pp. 228-239 (1953).

(5) "On the Inversion of Continuant Matrices," by W. J. Berger and E. Saibel, Frank. Inst. J. 256:205, September 1953.

(6) "Continuation of Biharmonic Functions by Reflections," by R. J. Duffin, 17 March 1953 (Carnegie Inst. of Tech., Dept. of Math.).

(9) "Asymptotic Expansion of Double Fourier Transforms," by R. J. Duffin and D. H. Shaffer, 27 April 1953 (Carnegie Inst. of Tech., Dept. of Math.).

(11) "Formulae Relating Some Equivalent Networks," by R. J. Duffin and E. Keitzer, 1 October 1953 (Carnegie Inst. of Tech., Dept. of Math., Tech. Report No. 11).

(12) "A Minimax Theory for Overdamped Networks," by R. J. Duffin, 22 February 1954 (Carnegie Inst. of Tech., Dept. of Math., Tech. Report No. 12).

(13) "Continuation of Biharmonic Functions by Reflection II," by R. J. Duffin, 27 February 1954 (Carnegie Inst. of Tech., Dept. of Math., Tech. Report No. 13).

(14) "On Gravity Waves," by A. E. Heins, in the Proc. of Fourth Symposium in Applied Mechanics, pp. 75-86 (McGraw-Hill: New York, 1953).

SURVEY NO: A.4.19

PROJECT NO: NR 064-183 TASK/CONTRACT/W.O. NO: N6ori 07106

TITLE: (Structural Mechanics and Vibrations) Numerical Methods of Analysis of Structural and Machine Elements and Assemblies.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Ill., Urbana, Ill.

PRINCIPAL INVESTIGATOR: N. M. Newmark

DESCRIPTION: This work includes studies of the accuracy, convergence, and stability of iteration, relaxation, and step-by-step procedures; work on the development of methods for the analysis of the steady-state response and the determination of the natural frequencies of flexural vibration of continuous frames; studies of the behavior of simple elasto-plastic structures to impulsive loads, such as those arising from bomb blast and earth tremors; the development of numerical procedures for the calculation of the lateral and torsional buckling loads of beams and columns; studies of uniformly loaded two-way rectangular slabs on flexible girders, and skewed slabs supported on a series of parallel and simply supported flexible girders subjected to concentrated wheel loads; the development of simplified procedures for the analysis of shell structures; solution of problems of heat flow and of thermal stress distribution; and consideration of three-dimensional problems of elasticity.

REPORTS:

(1) "A Review of Numerical Integration Methods for Dynamic Response of Structures," by T. P. Tung and N. M. Newmark, March 1954.

(2) "A Simple Approximation for the Fundamental Frequencies of Two Span and Three Span Continuous Beams," by A. S. Veletsos and N. M. Newmark, February 1954.

(3) "Tables of Deflection and Moment Coefficients for Steady Vibrations of Uniform Bars," by A. S. Veletsos and N. M. Newmark, May 1954.

SURVEY NO: A.4.20

PROJECT NO: NR 064-033 TASK/CONTRACT/W.O. NO: N6ori-15401

TITLE: (Structural Mechanics and Vibrations) Effects of Transient Disturbances on Structures.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1946 COMPLETION DATE: 1953

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Stanford Univ., Stanford, Cal.

PRINCIPAL INVESTIGATOR: L. S. Jacobson

DESCRIPTION: The effects of transient disturbances on structures was investigated theoretically and by model experiments. The models were designed to show distortion similitude with respect to real structures, but not to show stress similitude. Transient disturbances such as were required to similate earthquake motion, air blast, and sudden dislocation equivalent to the failure of one or more structural members, were used in the model tests.

REPORTS:

(1) "Summary of Structural Dynamics Research at Stanford," by L. S. Jacobsen, Tech. Rpt. No. 19.

(2) "Further Development and Tests of a Collapsible Elastoplastic Deformation Model," by L. S. Jacobsen, Tech. Rpt. No. 18.

(3) "Development of a Deformation Model of a Building for the Study of Blast Load Effects," by L. S. Jacobsen and R. S. Ayre, Tech. Rpt. No. 17.

(4) "A Comparative Study of Pulse and Step-Type Loads on a Simple Vibratory System," by R. S. Ayre, Tech. Rpt. No. 16.

(5) "Transverse Vibration of Multispan Continuous Beams Under the Action of a Moving Alternating Force, by R. S. Ayre, R. Warrick, and L. S. Jacobsen, Tech. Rpt. No. 15, 5 September 1951.

(6) "Response of a Yielding Vibratory System to Transient Forcing Functions," by L. S. Jacobsen, R. S. Ayre and S. Aisawa, Tech. Rpt. No. 14, 20 August 1951.

(7) "On a General Method of Solving Second Order Differential Equations by Phase-Plane Displacements," by L. S. Jacobsen, Tech. Rpt. No. 13.

(8) "Transverse Vibrations of One- and Two-Span Beams Under the Action of a Moving Combined Load Consisting of a Spring-Borne Mass and an Alternating Force," by L. S. Jacobsen, R. S. Ayre, and R. Warrick, Tech. Rpt. No. 12, 31 March 1951.

SURVEY NO: A.4.21

PROJECT NO: NR 064-150 TASK/CONTRACT/W.O. NO: N6onr-27107

TITLE: (Structural Mechanics and Vibrations) Flexural Impact Tests of Rolled Welded Beams.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1947 COMPLETION DATE: (Terminated) 1953

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Columbia Univ., New York, N. Y.

PRINCIPAL INVESTIGATOR: W. J. Krefeld

DESCRIPTION: This task was concerned with the structural strength of butt-welded splices in large beams at various temperatures under both static and impact loadings. The objectives included the determination of (1) the relative behavior under the two methods of loading; (2) differences in transition temperatures as affected by the type of steel; (3) methods of straining and variations in treatments of weldments; and (4) relations between the performance of the beams and specimen criteria.

REPORTS:

(1) "An Investigation of the Behavior of Butt-Welded Structural Beams Under Static and Dynamic Loads at Low Temperatures," by W. J. Krefeld, Tech. Rpt. No. 1, 1 April 1948.

(2) "Transition Temperatures of Structural Steel Beams with Butt-Welded Splices," by G. B. Anderson and W. J. Krefeld.

SURVEY NO: A.4.22

PROJECT NO: NR 064-200 TASK/CONTRACT/W.O. NO: NAonr-31-48

TITLE: (Structural Mechanics and Vibrations) Dynamic Response of Semi-Monocoque Structures.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1947 COMPLETION DATE: 1951

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: A. Ramberg

DESCRIPTION: The purpose of this task was fourfold: (1) To develop simplified methods of analysis of the dynamic response of monocoque structures with cut-out and sweep-back, using Castigliano's theorem; (2) to check experimentally the validity of the extended analysis developed under (1) by the application of dynamic torsion and bending loads to simplified monocoque boxes with large cut-outs; (3) to investigate theoretically the effects of the addition of large concentrated masses on the dynamic responses of flexible structures, and to develop practical methods of analysis to account for such effects; (4) to check experimentally the over-all validity of the analytical procedures developed in (1) and (3) above, under the combined conditions of cut-outs and concentrated masses.

REPORTS:

(1) "The Calculation and Measurement of the Natural Frequencies and Associated Mode Shapes of a Box with a D-Nose," by F. C. Smith, and D. M. Howard, Tech. Report No. 1, 30 March 1949.

(2) "Experimental Determination of Influence Coefficients for a Monocoque Structure," by P. R. Weaver, W. D. Kroll, and W. A. Garland, Tech. Report No. 2, May 1949.

(3) "Influence Coefficients of a Single-Cell Monocoque Box Beam Having a Full Bay Cut-Out," by W. D. Kroll, P. R. Weaver, and W. A. Garland, Tech. Report No. 3, 19 June 1950.

(4) "The Effects of the Addition of a Concentrated Mass on the Dynamic Behavior of a Flexible Structure," by J. B. Woodson, Tech. Report No. 4, June 1950.

(5) "The Calculation and Measurement of the Natural Frequencies and Associated Mode Shapes of a Box Beam with a D-Nose and with Large Discontinuities," by F. C. Smith, D. M. Howard, and I. Smith, Tech. Report No. 5, 27 July 1950.

(6) "The Calculation and Measurement of the Natural Frequencies and Associated Modes Shapes of an Aluminum Alloy Box-Beam Having Large Discontinuities," by F. C. Smith and D. M. Howard, Tech. Report No. 6, 4 August 1950.

(7) "Influence Coefficients of a Two-Cell Box Beam Having a Full Bay Cut-Out," by W. A. Garland, W. D. Kroll, and P. R. Weaver, Tech. Report No. 7, February 1951.

SURVEY NO: A.4.23

PROJECT NO: NR 064-259 TASK/CONTRACT/W.O. NO: N5ori 07833

TITLE: (Structural Mechanics and Vibrations) Response of Structures to Shock and Impact Forces.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1948 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: R. L. Bisplinghoff

DESCRIPTION: Studies are being made to determine the response of simple deformable structures to shock waves in the shock tube. Response of structures in both elastic and plastic ranges are included in the investigation. An analytical and experimental program of investigation to determine the thermal stresses in a structure is being carried out on a built-up box-type structure with shear webs on the outer edges and in the interior of the box. Heat is applied to the external faces and temperatures and stresses are measured at various points in the structure. The results for both stress and temperature are being compared with analytical results.

REPORTS:

(1) "A Study of the Structural Dampling of a Built-up Beam With Riveted Joints, in Bending," by T. H. Pian, Tech. Report No. 25-14.

SURVEY NO: A.4.24

PROJECT NO: NR 041-148 TASK/CONTRACT/W.O. NO: N7onr 43906

TITLE: (Applied Mathematics) Forced Nonlinear Systems.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mathematics Br., Code 432

CONTRACTOR OR LABORATORY: Univ. of Notre Dame, Notre Dame, Ind.

PRINCIPAL INVESTIGATOR: E. DeVogelaere and J. P. LaSalle

DESCRIPTION: Attention is being directed toward the mathematical theory of oscillations of forced nonlinear systems. An effort will be made to bring together two diverging approaches to the problem: (1) the accumulation of theorems of great generality by nonconstructive methods and (2) the detailed exhaustive study of special cases by constructive methods. A complete quantitative analysis will be made of a second order differential equation with a forcing term, either an equation of Duffing's type or Van de Pol's equation. Investigation will include examinations of the regions in which solutions tend to a stable subharmonic of order three rather than to the fundamental solution. Study will be made of the possible appearance of different types of solutions (periodic, recurrent, or wandering motions) in the same region.

SURVEY NO: A.4.25

PROJECT NO: TASK/CONTRACT/W.O. NO: TB2-1241

TITLE: (Atomic Weapons Effects) Drag Characteristics of Various Shapes.

TASK SECURITY CLASSIFICATION: C-RD SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Ballistics Res. Labs., Aberdeen, Md.

PRINCIPAL INVESTIGATOR: J. J. Meszaros

DESCRIPTION: To study the drag forces on various simple idealized and structural shapes when subjected to air blast shock loading from nuclear detonations and to correlate the data obtained with scale model tests in the shock tube.

To study the dynamic response of structural members when subjected to air blast shock loading from both nuclear and high explosive detonations.

REPORTS:

(1) "Transient Drag Characteristics of Spherical Model, Operation TEAPOT, Project 1.14a," ITR 1114, by Meszaros, Reisler, and Burden.

SURVEY NO: A.4.26

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TB2-1241

TITLE: (Atomic Weapons Effects) Response of Structures

TASK SECURITY CLASSIFICATION: C-RD SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1956

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistic Res. Labs.

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Ballistics Res. Labs., Aberdeen, Md., Naval Training Station, Bainbridge, Md.
PRINCIPAL INVESTIGATOR: J. J. Meszaros

DESCRIPTION: To study and obtain measurements on the dynamic response of full scale structures when subjected to air blast shock loading resulting from the detonation of nuclear weapons.

REPORTS:

(1) "Structures Instrumentation, Operation TEAPOT," WT1107, by P. H. Lorrain.

(2) "Structures Instrumentation, Operation Upshot-Knothole," WT 738, by J. J. Meszaros and J. I. Randall.

SURVEY NO: A.4.27

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TB3-0112j

TITLE: (Research in Terminal Ballistics) Reaction of Simple Structures to Air Blast Loading.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: Continuing

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistic Res. Labs.

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Terminal Ballistics Lab., Aberdeen, Md.

PRINCIPAL INVESTIGATOR: W. E. Baker, F. J. Allen, and A. J. Hoffman

DESCRIPTION: A variety of analytical and experimental work is underway on the elastic and plastic reaction of structural elements to transient load. Current work includes analytical predictions of the elastic-plastic response of beams to air blast loads and the effects of internal and external damping on elastic response of beams. Experimental work includes measurements of the permanent deformations of beams and circular plates subjected to air blast and measurements of the effects of air and internal damping on beam vibrations.

REPORTS:

(1) "A Plastic-Rigid Theory of the Response of Beams to Air Blast Loading," by F. J. Allen and F. Rally, BRL Memo Report 811, July 1954.

(2) "An Elastic-Plastic Theory of the Response of Cantilevers to Air Blast Loading, by F. J. Allen, BRL M 886, April 1955.

(3) "Elastic Response of Simple Structures to Pulse Loading," by P. D. Flynn, BRL Memo Report 525, November 1950.

(4) "The Shapes of Circular and Square Membranes under Air Blast Loading," by W. E. Baker and A. J. Hoffman, BRL M 556, August 1951.

(5) "Initial Accelerations of Simple Structures under Blast Loading," by W. E. Baker and J. Detlef, BRL Memo 583, November 1951.

(6) "Dynamic Response of Thin Beams to Air Blast," by R. G. Locklin and S. N. Mills, Jr., BRL Report 787, September 1951.

SURVEY NO: A.4.28

PROJECT NO: TASK/CONTRACT/W.O. NO: TB3-0112j

TITLE: (Research in Terminal Ballistics) Basic Air Blast Research.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistic Res. Labs.

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Ballistic Res. Labs., Aberdeen, Md.

PRINCIPAL INVESTIGATOR: C. N. Kingery

DESCRIPTION: To study the dynamic response of scale models of various configurations of structural beams and components when subjected to air shock loading. This study is being conducted in the shock tube and results will be correlated, if possible, to full scale test exposures on nuclear detonations.

SURVEY NO: A.4.29

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-211

TITLE: (Structural Development) Dynamic Response of Arresting Hook to Deck Impact.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Terminated 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The problem of determining the dynamic response of an arresting hook to deck impact, was formulated in suitable mathematical terms. The mass distribution for a typical hook was made, including the computation of influence coefficients and the choice of the necessary simplifying assumptions.

SURVEY NO: A.4.30

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-219

TITLE: (Structural Development) Investigation of the Free-Flight Engagement Problem for Naval Aircraft.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The analysis of airplane responses and the resulting landing gear loads have been set up on the NBS computer, SEAC, for free-flight-arresting engagements. A parametric study is being made for a typical airplane. A wide range of sinking speeds and airplane attitudes will be investigated. Solutions are being obtained.

SURVEY NO: A.4.31

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-220

TITLE: (Structural Development) Calculation of Influence Coefficients for Low-Aspect-Ratio Wings.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The purpose of this task is the development of an analytical method of computing influence coefficients of low-aspect-ratio wings, and the comparison of measured coefficients of an existing wing with the calculated coefficients of that wing. Levy's method of calculating influence coefficients has been applied to a model swept wing and the deflections compared with measured values. The results show rather poor agreement between experiment and theory.

REPORTS:

(1) NBS Report No. 3655

SURVEY NO: A.4.32

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-2410

TITLE: (Structural Development) Dynamic Tests on Structural Models.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To develop and verify methods of calculating stresses and accelerations in aircraft models during landing and other transient loading conditions, drop tests of structural models representing landing conditions with wheel spin-up were performed at NBS. Dynamic analyses of a typical test were made by an application of Houbolt's method. Serious discrepancies between the test and analytical results were encountered and no satisfactory explanation could be made.

SURVEY NO: A,4,33

PROJECT NO: NA 811-008 TASK/CONTRACT/W.O. NO: NOas 52-182

TITLE: (Study, Development, and Utilization of Structural Instrumentation) Development of Structural Design Criteria for Aircraft Structures Subjected to Gun Blast.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Biot and Arnold

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An elastic analysis of an orthotropic cylindrical shell composed of rings, stringers, and skin was made. The equations of motion of the system were derived. The response of this system to a suddenly applied load was determined analytically and the theory applied to the analysis of a Lancaster fuselage for which experimental data were available.

SURVEY NO: A.4.34

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: N7onr-39416

TITLE: (Experimental Structures and Structural Design Criteria) Testing and Study of the Ultimate Energy Absorption and Failing Characteristics of Basic Structural Units.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Purdue Research Foundation, Lafayette, Ind.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests have been conducted to obtain basic information regarding the crash safety design of airplane structures by an experimental determination of the ultimate dynamic energy absorption characteristics and manner of failure of test specimens typical of aircraft structures.

REPORTS:

(1) "The Experimental Testing and Study of the Ultimate Dynamic Energy Absorption and Failing Characteristics of Fundamental Structural Units," PRF Report No. S-54-2, December 1954.

SURVEY NO: A.4.35

PROJECT NO: NA 813-012 TASK/CONTRACT/W.O. NO: NOas 55-322

TITLE: (Aeroelastic and Structural Dynamics Research) Aeroelastic Stability of Helicopter Rotors.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: R. Bisplinghoff

DESCRIPTION: To investigate the aeroelastic stability of helicopter blades, with particular emphasis on low-damped oscillations in the transition regime. Equations of motion of a flexible helicopter blade will be derived and solved for particular cases as a check on wind tunnel model experimentation.

SURVEY NO: A.4.36

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOas 51-183C

TITLE: (Aircraft Structural Loads Development) A Parametric Investigation of Gust Loads on Rigid Airplanes in Two Degrees of Freedom.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A parametric study was made to show the effects of geometric and aerodynamic airplane characteristics on aircraft response to gusts. The Whirlwind-I high-speed digital computer was used. The airplanes were considered free to pitch and translate in response to a sharp-edged gust for a wide range of airplane parameters.

REPORTS:

(1) "A Parametric Investigation of Gust Loads on Rigid Airplanes in Two Degrees of Freedom," MIT Report, 6 October 1952.

SURVEY NO: A.4.37

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOas 52-1102-c

TITLE: (Aircraft Structural Loads Development) Effects of Wing Twist on the Response of an Airplane Subjected to a Sharp-Edged Gust.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Reed Research, Inc., Washington 7, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An analytical investigation was made in order to determine the effects of wing twist on the response of idealized straight-wing airplane at subsonic speeds when subjected to a sharp-edged gust. The airplane was assumed to have the degrees of freedom of wing twist and vertical motion, with wing twist proportional to vertical acceleration.

REPORTS:

(1) "Effects of Wing Twist on the Response of an Airplane Subjected to a Sharp-Edged Gust," Reed Research, Inc. Report, 17 October 1952.

SURVEY NO: A.4.38

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOas 53-318-C

TITLE: (Aircraft Structural Loads Development) Study of Dynamic Response of Flexible Rotor Blades Under Arbitrary External Loads.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Kaman Aircraft Corp., Bloomfield, Conn.

PRINCIPAL INVESTIGATOR: A. Kossar

DESCRIPTION: The study includes the determination of equations of motion of a typical rotor blade considering the effects of blade flexibility, shaft pitching, coupling between blades, and unsteady aerodynamic forces. Analytic studies of blade response have been made. The effects of inflow variations and other unsteady aerodynamic effects are being investigated in wind tunnel tests wherein atmospheric turbulence and abrupt control inputs are simulated.

SURVEY NO: A.4.39

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: P.O. 10712/54

TITLE: (Development of Shock Design Methods) Establishment of Interim Shock Design Levels for Naval Ships by Review and Analysis of Available Shock Data.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: R. D. Ruggles

DESCRIPTION: A survey of shock on naval vessels has been completed. The results are given in terms of shock design factors with sample calculations.

REPORTS:

(1) "Measurement of Shock Motions on Certain Naval Vessels," DTMB Report C-53 (Confidential), December 1951.

(2) DTMB Report C-589 (Secret), November 1953.

(3) "An Application of Shock Design Factors in Increasing the Shock Strength of Shipboard Machinery," by R. D. Ruggles, Secret paper published with papers presented at the Sixth Conference on Progress in Underwater Explosion Research.

(4) DTMB Letter C-S60/Shock Serial 01356 (Confidential), December 1953.

(5) "Preliminary Report on Underwater Explosion Tests Against Wooden Hull Minesweeper, EX-YMS 319," DTMB Report C-637 (Confidential), June 1950.

SURVEY NO: A.4.40

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: P.O. 10739/55

TITLE: (Development of Shock Design Methods) Feasibility of Development of a Rational Shock Design Method.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: P. D. Ruggles

DESCRIPTION: A critical review of the various simplified methods presently employed in the design of shock resistant equipment and an investigation of the various factors which must be considered in the application of a truly rational method of shock design of shipboard equipment, have been made. Design procedures have been suggested. Confirmation of these procedures is being sought by analyses of the responses of simplified structures tested during shock trials and also by tests conducted in the laboratory.

Reports are being prepared which give a graphical method for analyzing the response of nonlinear systems, a method for estimating the error in the approximate solution of a nonlinear differential equation, and a scheme for computing the characteristic values of a matrix of all the natural frequencies of a system with "n" degrees-of-freedom.

REPORTS:

(1) "The Interaction Between Shock-Mounted Equipment and Its Supporting Structure Under a Step-Function Excitation," DTMB Report 566 (Restricted), September 1947.

(2) "Response of Systems with a Single Degree of Freedom to Shipboard Shock Motions," DTMB Report 567 (Confidential), October 1947.

(3) DTMB Letter 6-S60/Shock Series 0326 (Confidential), April 1955.

SURVEY NO: A.4.41

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: P.O. 10750/55

TITLE: (Development of Shock Design Methods) Statistical Study.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A statistical study of bolt data obtained during shock tests of machinery and equipment is being made. Attempts will be made to relate shock design factors with weight and density of equipment, percent elongation, bolt length, height of hammer drop, and others.

SURVEY NO: A.4.42

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: 62F02-05

TITLE: (Development of Shock Design Methods) Feasibility of Development of a Rational Shock Design Method.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Naval Research Laboratory (Code 6260), Washington 25, D. C.

PRINCIPAL INVESTIGATOR: R. E. Blake

DESCRIPTION: A review has been made of the various simplified methods presently employed in the design of shock resistant equipment and the following factors which should be considered in the application of a rational method of shock design have been or are being investigated:

1. Tests have been conducted to evaluate the dynamic yield stress as compared to the static yield stress.
2. A series of tests has been made in an attempt to experimentally demonstrate that simple structures subjected to dynamic loading may fail due to stresses considerably higher than those conducted for static loading.
3. Several theoretical studies have been made in order to find the parameters necessary in determining the severity of shock at a given location on a structure.
4. Data on the SS 428 underwater explosion test are being studied to determine what knowledge would have been required to have predicted the measured shock stresses.

REPORTS:

(1) "Dynamics of Linear Elastic Structures," NRL Report 4420, 7 October 1954.

SURVEY NO: A.4.43

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: 62F02-05 & P.O. 10753/54

TITLE: (Development of Shock Design Methods) Establishment of Interim Shock Design Levels for Naval Ships by Review and Analysis of Available Shock Data.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Naval Research Laboratory (Code 6260), Washington 25, D. C.

PRINCIPAL INVESTIGATOR: R. E. Blake

DESCRIPTION: Interim shock design levels have been established for naval ships by analyses of available shock data. These data have been converted to shock spectra and the spectra have been compared with the spectra available from laboratory tests on the H. I. Shock Machines.

American war damage reports have been studied and strength calculations are being made. An interim shock design method has been developed for submarine equipment.

REPORTS:

(1) "Comparison of British Submarine Shock Spectra and MWSM Shock Spectra," NRL Report 3970 (Secret), 5 June 1952.

(2) NRL Report F-3302, 21 June 1948.

(3) NRL Letter Report C-6262-193A/54 REB:eb (Confidential), 14 May 1954.

SURVEY NO: A.4.44

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-118 & NObs-50250

TITLE: (Structural Design, Ship Structure Committee) Cracking in Simple Structural Geometries.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Swarthmore College, Swarthmore, Pa.

PRINCIPAL INVESTIGATOR: S. T. Carpenter

DESCRIPTION: To determine the relative proclivity towards cracking of certain simple geometries with and without welds, tensile tests were performed on 3/4-in. thick by 12-in. wide specimens of ship steel containing notches of various geometries produced by a jeweler's hack saw cut or by flame cutting. Also tests were performed on details simulating longitudinal and bilge keel terminations and geometry at the junction of fashion plate and shear strake; tests on 3-in. wide by 3/4-in. thick tensile specimens having edges prepared by machining, shearing, flame cutting and grinding, and edges with superimposed arc strikes; tests at 0° F of the effects of various types of fastenings on cleavage fracture; and tests of tensile specimens containing welded pads separated by various distances.

REPORTS:

(1) "Cracking of Simple Structural Geometries: The Effects of Edge Notch Geometry on Flat Steel Plates," by S. T. Carpenter and R. F. Linsenmeyer, First Prog. Report, Serial No. SSC-51, 12 May 1952.

(2) "Cracking of Simple Structural Geometries: Investigation of Welded Ship Details," by S. T. Carpenter and R. F. Linsenmyer, Second Prog. Report, Serial No. SSC-57, 1 June 1953.

(3) "Cracking of Simple Structural Geometries: Effects of Edge Preparation," by S. T. Carpenter and R. F. Linsenmeyer, Final Report, Serial No. SSC, 31 January 1955.

SURVEY NO: A.4.45

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-132 & NObs-50148

TITLE: (Structural Design, Ship Structure Committee) Warped Plating.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Columbia Univ., New York, N. Y.

PRINCIPAL INVESTIGATOR: H. Bleich

DESCRIPTION: The analytical evaluation of the influence of warped plating on structural performance, with emphasis on brittle fracture, has been completed. Analytical work may be extended to cover in more detail the local effects of panel buckling.

REPORTS:

(1) "Notes on the Influence of Unfair Plating on Ship Failures by Brittle Fracture," by H. H. Bleich, Serial No. SSC-96.

SURVEY NO: A.4.46

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: NObs-66850

TITLE: (Strength of Ship Structures) Shock Resistance of Shipboard Foundations.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Univ. of Ill., Urbana, Ill.

PRINCIPAL INVESTIGATOR: N. M. Newmark

DESCRIPTION: Simple methods for design of foundations subject to shock loadings are to be developed. More uniform procedures are needed to reduce the danger that vital equipments on ships, especially submarines, will be rendered inoperative by near-miss underwater explosions. Reports of full-scale trials, proposed design criteria, and shock-testing machine data are being studied.

SURVEY NO: A.4.47

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10712/54 and P.O. 10739/55

TITLE: (Vibration and Dynamics of Ships' Structures and Machinery) Solution of Special Vibration Problems.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: R. T. McGoldrick

DESCRIPTION: Under this task the theory of ship vibration has been extended with the aim of eventually being in a position to predict, in the design stage, the frequencies of the principal normal modes of vibration of the hull, and the longitudinal and torsional vibration of the propulsion system. Procedures have been evolved for carrying out the necessary calculations either by means of a digital sequence calculator or by means of an electrical analog. In order to improve the reliability of these methods, it is necessary to obtain correlations between calculated and experimental values of vessels of varied types. The following reports denote developments in the theoretical approach and the recent calculations which have been made for the purpose of correlation.

REPORTS:

(1) "A Theoretical Approach to the Problem of Critical Whirling Speeds of Shaft-Disk Systems," by N. H. Jasper, DTMB Report 827, December 1954.

(2) "A Design Approach to the Problem of Critical Whirling Speeds of Shaft-Disk Systems," by N. H. Jasper, DTMB Report 890, December 1954.

(3) "Comparison Between Theoretically and Experimentally Determined Natural Frequencies and Modes of Vibration of Ships," by R. T. McGoldrick, DTMB Report 906, August 1954.

(4) "Calculation of Normal Modes and Natural Frequencies of Ship Hulls by Means of the Electrical Analog," by E. Kapiloff, DTMB Report 742, July 1954.

(5) "Calculation of Torsional Critical Speeds of Electrically Driven Propulsion Systems with Flexibly Mounted Planetary Reduction Gears," DTMB Report 927, June 1955.

SURVEY NO: A.4.48

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10726/54 and P.O. 10714/55

TITLE: (Vibration and Dynamics of Ships' Structures and Machinery) Investigation of the Nature and Relative Importance of Dynamic Stresses in Internal Combustion Engines.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Correlation of data is being made to determine the major contributing factors and their relation to torsional vibration. Investigations have been made of bending fatigue strength of new and used crankshafts, of fatigue properties of crankshafts when subjected to salvage procedures, and of the fatigue properties of chromium-plated crankshafts.

REPORTS:

(1) Progress Report No. 9, Mat. Lab., Project 4986-1, 4 August 1953.

(2) Progress Report No. 1, Mat. Lab., Project 4986-5, 3 March 1953.

(3) Progress Report No. 1, Mat. Lab., Project 4986-9, 9 March 1954.

(4) "Design of Experimental Procedure for Fatigue Studies of Crankshafts on Statistical Procedures," Progress Report No. 3, Mat. Lab., Project 4986.

(5) "Development of Automatic Stress Control for Resonance Type Crankshaft Torsional Fatigue Machines," Final Report, Mat. Lab., Project 4986-1.

(6) "Bending Fatigue Characteristics of Used Crankshafts," Progress Report No. 2, Mat. Lab., Project 4986-5.

(7) "Torsional Fatigue Characteristics of Undercut G. M. 6-71 Crankshaft," Progress Report No. 2, Mat. Lab., Project 4986-7.

SURVEY NO: A,4.49

PROJECT NO: NR 360-002 TASK/CONTRACT/W.O. NO: Nonr 266(08)

TITLE: (Structural Effects of Blast Loading) Dynamic Strength and Behavior of Submarine Hulls in Underwater Explosions.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: ---

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Columbia Univ., New York, N. Y.

PRINCIPAL INVESTIGATOR: H. Bleich

DESCRIPTION: The purpose of this task is to establish a rational theoretical analysis for use in designing for strength in submarine pressure hulls under the types of loadings to be expected from underwater explosions.

REPORTS:

(1) "Vibration Analysis of Elasto-Plastic Structures with Application to Impulsive Motion," by H. H. Bleich and M. G. Salvadori, Tech. Report No. 1 (Confidential).

(2) "Response of An Elastic Cylindrical Shell to a Transverse Step Shock Wave," by R. D. Mindlin and H. H. Bleich, Tech. Report No. 3.

(3) "Elasto-Plastic Whipping and Knifing of Submarine Hulls Under Dynamic Forces," by M. L. Barron and F. DiMaggio, Tech. Report No. 4.

(4) "Effects of Non-Equally Distributed Mass and Stiffness on the Vibrations of Circular Rings," by M. L. Barron and H. H. Bleich, Tech. Report No. 5.

(5) "A Strain Energy Expression for Thin Cylindrical Shells," by H. H. Bleich and F. DiMaggio, Tech. Report No. 6, J. Appl. Mech. 20:448, September 1953.

(6) Tech. Report No. 7 (Confidential).

(7) Tech. Report No. 8 (Confidential).

(8) Tech. Report No. 9.

SURVEY NO: A.4.50

PROJECT NO: NR 360-004 TASK/CONTRACT/W.O. NO: Nobs-55889

TITLE: (Structural Effects of Blast Loading) Development of Scaling Relations and Numerical Procedures for Predicting the Explosive Strength of Submarine Structure.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: ---

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Ill., Urbana, Ill.

PRINCIPAL INVESTIGATOR: N. M. Newmark

DESCRIPTION: This task was established in order to provide for an experimental and theoretical study of the practical limitations in the use of small-scale models for investigating underwater blast loadings; to provide for the development of numerical methods of analysis of structural responses to explosive loadings which are suitable for solutions on the ILLIAC high-speed electronic digital computer at the Univ. of Ill.; and to determine, to a minor extent, the magnitude of the blast forces involved.

REPORTS:

(1) "A Pressure Tank for Dynamic Testing of a Cylindrical Shell," by J. M. Massard, Tech. Report No. 1.

SURVEY NO: A.4.51

PROJECT NO: NR 360-001 TASK/CONTRACT/W.O. NO: Nonr 267(00)

TITLE: (Structural Effects of Blast Loading) Blast Effects on Submarine Structures.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: ---

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Polytechnic Inst. of Brooklyn, Brooklyn, N.Y.

PRINCIPAL INVESTIGATOR: N. J. Hoff

DESCRIPTION: This task was established in order to develop an accurate method for determining the response of and the stress distribution in shell-type structures when subjected to dynamic loadings. The plan of study calls for emphasis to be given to the elastic response of submerged submarine structures under explosive loadings, and for solutions to predict the failure of submarine structures when exposed to underwater explosion.

REPORTS:

(1) "Dynamic Analysis of the Buckling of Laterally Loaded Flat Arches," by N. J. Hoff and V. G. Bruce, Tech. Report No. 1.

(2) "Observations of Oil Canning Buckling in Circular Cylindrical Shells," by A. Chwick, J. C. Pascal and F. S. Shaw, Tech. Report No. 232.

SURVEY NO: A.4.52

PROJECT NO: NR 360-003 TASK/CONTRACT/W.O. NO: N7 onr 35810

TITLE: (Structural Effects of Blast Loading) Plastic Analysis of Structural Effects of Underwater Explosion.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: ---

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Brown Univ., Providence, R. I.

PRINCIPAL INVESTIGATOR: W. Prager

DESCRIPTION: The purpose of this task is to develop from considerations of plastic action, and for application to the over-all submarine structure, its components, cutouts and fittings, and methods of analyses which will make possible the prediction of the collapse strength of specific submarine structures under conditions of underwater explosive loading.

REPORTS:

(1) "Plastic Deformation in Beams Under Symmetric Dynamic Loads," by J. A. Seiler and P. S. Symonds, Tech. Report No. 13.

(2) "The Yield Load of a Uniform Slab With a Circular Cutout Reinforced by a Bevelled Ring," by E. Levin and P. G. Hodge, Jr., Tech. Report No. 14.

(3) "Impact of Finite Beams of Ductile Metal," by P. S. Symonds and F. A. Leth, Tech. Report No. 20.

(4) "Yield Loads of Slabs with Reinforced Cutouts," by P. G. Hodge, Jr., Tech. Report No. 22.

(5) "On Symmetric Reinforcements of Circular Cutouts," by E. Levin, Tech. Report No. 17.

SURVEY NO: A.4.53

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: P.O. 10742/55

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Antisubmarine Type Hulls) Welding Techniques and Joining Methods.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, UERD, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: E. Elsarelli

DESCRIPTION: Joint performance of welded STS and HY80 steels is being investigated. This program has two phases, the first of which involves open-ended cylinders fabricated from 1-in. thick material, will be utilized for investigating the effects of aging on the cracking of the deposited weld metal, grade 260 electrode. The cylinders will be allowed to age for 6 weeks prior to explosive testing. The second phase, which employs cylinders of 1/2-in. material, is for the purpose of providing data for correlation with the joint efficiency of similar joints in the bulkheads of caisson "Y," the half-scale model of the CVA 59 side protective system. A program to proof-test machine stud-welding techniques was carried out in order to provide a comparison between machine and hand welded studs to the dynamic forces of an explosion.

REPORTS:

(1) "Joint Performance of Special Treatment Steel under Explosive Loading," UERD Report No. F-9-53 (Confidential).

SURVEY NO: A.4.54

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: P.O. 10742/55

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Antisubmarine Type Hulls) Bodily Response Studies.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, UERD, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: A. H. Keil

DESCRIPTION: An effort is being made to determine the most valid method for analyzing the structural strength of a ship when it is subjected to whipping induced by an underwater explosion. At the present time this project is in the preliminary stage which involves a survey of pertinent literature.

SURVEY NO: A.4.55

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: P.O. 10742/55

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Antisubmarine Type Hulls) Afterflow and Reloading.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, UERD, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: H. M. Schauer

DESCRIPTION: Afterflow and reloading have been studied both theoretically and experimentally. Instrumented tests of 4-1/2-ft by 7-ft panels (A-plates) have been conducted to determine time histories of structural responses.

REPORTS:

(1) "Preliminary Commentaries on Plastic Deformation of Rectangular Plates Under Dynamic Loading," by A. H. Keil, UERD, Report 1-47 (Confidential).

(2) "Additional Commentaries on Plastic Deformation of Rectangular Plates Under Dynamic Loading," by A. H. Keil, UERD, Report No. 2-48 (Confidential).

(3) "Afterflow and Reloading," by H. M. Schauer, UERD, Report No. 17-49 (Confidential), November 1949.

SURVEY NO: A.4.56

PROJECT NO: NA 820-182 TASK/CONTRACT/W.O. NO: NOas 54-217-C

TITLE: (Hydrodynamic Investigations) Resistance of Hull and Hydroski Aircraft.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-31)

CONTRACTOR OR LABORATORY: Stevens Institute of Technology, Hoboken, N.J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Approximate methods were found for computing resistance of hull and hydroski aircraft over wide ranges of getaway speed and gross weight. Similarly, approximate methods were found for expressing the impact characteristics as functions of the various major parameters. The final report is being edited.

SURVEY NO: A.4.57

PROJECT NO: NR 632-080 TASK/CONTRACT/W.O. NO: F02-08

TITLE: Dynamic Behavior of Structures

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1957 (Estimated)

DIRECTING AGENCY: Naval Research Laboratory (Code 6260)

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: J. P. Walsh

DESCRIPTION: The objective is to provide a more rational basis for shock and vibration tests of structures and to provide a more flexible test machine for studies in dynamics. The approach is to define the magnitude of the errors made as a result of the current practice of ig oring the dynamic interaction of equipments and supporting structures. The magnitude of the errors will be defined by the measurement of the mechanical impedances of several typical equipments and their foundation structures.

The accomplishments thus far are: Preliminary analyses have been made, and theoretical studies of the general equations for the response of structures to dynamic loads have been made in order to examine the effects of changes in part of the structure upon the over-all response. A method has been worked out for predicting the natural frequencies of combined structures from mechanical impedance measurements of the component parts.

A preliminary design of a dynamic load machine, which features a high frequency response to 500 cps with high force outputs, is being considered for development.

SURVEY NO: A.4.58

PROJECT NO: NR 632-090 TASK/CONTRACT/W.O. NO: F02-09

TITLE: Design of Reactors Against Shock

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1955 COMPLETION DATE: 1958 (Estimated)

DIRECTING AGENCY: Naval Research Laboratory (Code 6260)

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: J. P. Walsh

DESCRIPTION: The objective is to assist a government contractor (WAPD) in the design of naval reactors to resist shock due to underwater explosions.

The approach is to collaborate with the contractor in conducting shock tests on the submarine SS428 with certain components of the WAPD reactor mounted in the submarine, and also to collaborate in shock tests on the 1/4-scale model of the SSN NAUTILUS.

Accomplishments include completion of the shock tests, and as a result of these tests a new method of design for shock resistance has been proposed by NRL. Using the new method calculations have been made to predict the shock stresses at four critical points on the internal structure of the reactor of the SS428, and at nine points on the Guppy STR. These calculations will be compared with measured stresses taken from the shock test data. This comparison will indicate the accuracy of the new design method.

SURVEY NO: A.4.59

PROJECT NO: NA 581-029 TASK/CONTRACT/W.O. NO: NRL AE 4200

TITLE: (Research and Development of Materials) Methods of Analysis of Package Cushions Under Rotational Conditions.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AE-41)

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: I. Vigness

DESCRIPTION: A mathematical treatment of the two-dimensional dynamics of package cushioning has been made to allow reasonably correct calculations of cushion displacement forces transmitted to packaged objects, to facilitate more efficient packaging design.

Tables and graphs will be prepared from the general mathematical equations by use of a "REAC" computer.

REPORTS:

(1) Copies of reports may be obtained from BuAer (AE-4).

SURVEY NO: A.4.60

PROJECT NO: NO 363-419 TASK/CONTRACT/W.O. NO: NPG-B-3d-439-2-55

TITLE: (Ballistic Computations) Rigid Body Theory.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ordnance

CONTRACTOR OR LABORATORY: Naval Post Graduate School, Monterey, Cal.

PRINCIPAL INVESTIGATOR: Dr. Cohen

DESCRIPTION: Equations of motion for both bodies of revolution (projectile, spinner rockets) and fin stabilized missiles (bomb, rockets, etc.) acted upon by linear and nonlinear static and dynamic force and moment systems are set up for machine calculation at NPGS. The detailed 6 degree of freedom free flight performance of weapon "A" and the 6-in. test vehicle have been calculated, and calculations are under way on low drag bombs and 20 mm.

DEVELOPMENT

SURVEY NOS:

B.1.1 through B.1.35
B.2.1 through B.2.48
B.3.1 through B.3.67
B.4.1 through B.4.20
B.5.1 through B.5.88

SURVEY. NO: B.1.1

PROJECT NO: 1347 TASK/CONTRACT/W.O. NO: 13697 and AF 33(600)-25740

TITLE: (Structural Testing at Elevated Temperatures) Rapid Loading Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Harper Engineering Co., Dallas, Tex.

PRINCIPAL INVESTIGATOR: J. Farrell

DESCRIPTION: Rapid loading equipment to be used in elevated temperature tests is being developed. The more important technical problems include the controlled application of external loads for a short period of time under extreme temperatures, the programming of these loads with respect to time, and the remote recording of acceleration and deflection time histories during such load applications. The work is 95 percent complete.

SURVEY NO: B.1.2

PROJECT NO: 1369 TASK/CONTRACT/W.O. NO: 13529

TITLE: (Alighting Gear Components) Study and Test for Establishing Spin-up Criteria for Drop Testing Shock Struts.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Aircraft Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR:

DESCRIPTION: This task covers the work involved in the establishment of drop-test criteria and the keeping of such criteria up to date as well as providing for tests which simulate actual landing conditions. Drop tests are being conducted, using various materials for the surface on which the tire is dropped, to determine the best floor plate to use to simulate most nearly the effect of runways in spin-up.

SURVEY NO: B.1.3

PROJECT NO: 1369 TASK/CONTRACT/W.O. NO: 13530

TITLE: (Alighting Gear Components) Simulated Wing Lift Mechanism for Drop Test Machine

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Aircraft Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests conducted by the NACA indicate that wing lift mechanisms, rather than a simulation by reduced mass, may be required for drop testing shock struts. This task provides for the fabrication of such a device and the conduct of additional tests to investigate the application of wing lift mechanisms in drop tests. Data will be obtained which can be utilized to establish more rational drop test criteria.

SURVEY NO: B.1.4

PROJECT NO: 1369 TASK/CONTRACT/W.O. NO: 70505 and AF 33(616)-2202

TITLE: (Alighting Gear Components) Landing Gear Dynamics of High Speed Ground Operation of Aircraft.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Bendix Aviation Corp., Bendix Products Div., South Bend, Ind.

PRINCIPAL INVESTIGATOR: J. Edman

DESCRIPTION: This task covers work and study intended to provide an exact correlation between laboratory experiments and actual aircraft experience, as pertains to nose wheel shimmy and landing gear vibration. Analog studies of fighter, bomber, and cargo aircraft have been completed.

SURVEY NO: B.1.5

PROJECT NO: 3066 TASK/CONTRACT/W.O. NO: 7051

TITLE: (Gas Turbine Technology) High Frequency Vibration of Turbine Blades.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Power Plant Lab.

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: R. W. Gretter

DESCRIPTION: This task is concerned with the development of a laboratory method of producing fatigue failures of turbine blades in the range of 10,000 cps to 30,000 cps.

REPORTS:

(1) "Research Investigation of Magnetostrictive Techniques for Obtaining High Frequency Vibrations," WADC TR 54-382

SURVEY NO: B.1.6

PROJECT NO: 4526 TASK/CONTRACT/W.O. NO: 45153G and 45293 and AF 630-35-2903

TITLE: (Electronic Design and Applied Techniques) Shock and Vibration Simulator for Dynamic Modes of Transportation, Vehicular Techniques for Mobile Ground Electronics Equipment Systems.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Rome Air Development Center, Griffiss Air Force Base, Rome, N. Y.

CONTRACTOR OR LABORATORY: American Machine and Foundary Co., Brooklyn 20, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: It is the purpose of this task to investigate the feasibility and possible development of a testing machine which will reproduce dynamic modes encountered in the field and in transportation. The machine will be required to excite the equipment under test in the three major axes.

SURVEY NO: B.1.7

PROJECT NO: --- TASK/CONTRACT/W.O. NO: DAI-49-186-502-ORD(P)-210

TITLE: Research and Development on an Improved Vibrator for Testing Electron Tubes.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Diamond Ordnance Fuze Lab., Washington 25, D. C.

CONTRACTOR OR LABORATORY: Atlantic Research Corp., Alexandria, Va.

PRINCIPAL INVESTIGATOR: W. P. Barnes, Jr.

DESCRIPTION: Investigate turbulent fluid and magnetostrictive drive vibrators capable of vibrating 15 grams at 100 g over frequency range of 1000 cps to 10,000 cps.

The turbulent fluid vibrator inherently generates a noise spectrum which can be made essentially constant over the specified frequency spectrum. It is suspected that considerable noise energy also exists above this frequency.

The magnetostrictive vibrator is driven from a continuously variable frequency source. Ideally for maximum acceleration, the resonant frequency of the magnetostrictive element should be changed as excitation frequency is changed. It is felt that this vibrator is capable of producing 100 g vibrations at frequencies well above 10 kc.

REPORTS:

(1) Progress Report No. 1, 22 September 1954
(2) Progress Report No. 2, 15 November 1954
(3) Progress Report No. 3, 15 February 1955
(4) Progress Report No. 4, 15 May 1955

SURVEY NO: B.1.8

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Methods for Increasing Useful Range of Vibration Exciters.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Lab.

PRINCIPAL INVESTIGATOR: Mr. Reznek

DESCRIPTION: In many applications the mass to be vibrated exceeds the deadweight deflection limits of the exciter. The use of suitable supports for this weight permits vibration of larger masses with a reasonably high acceleration within the force output capabilities of the exciter. The following types of support are being investigated for various applications: (1) Resonant beams, (2) forced takeoff systems, and (3) exciter table support systems.

SURVEY NO: B.1.9

PROJECT NO: 4148 TASK/CONTRACT/W.O. NO: 41772 and AF 33(616)-2188

TITLE: (Airborne Radar Seeker and Fire Control Techniques) Shock and Vibration Design Criteria for Guided Missiles.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1956

DIRECTING AGENCY: Wright Air Development Center, Aircraft Radiation Lab.

CONTRACTOR OR LABORATORY: Barry Controls, Inc., Watertown, Mass.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The task established laboratory test methods and procedures which simulate the service conditions relative to vibration, shock and acceleration for airborne equipment and components used in guided missiles.

REPORTS:

(1) "Establishing Vibration and Shock Tests for Missile Electronic Equipment," Barry Report No. 230-C, Contract No. AF 33(616)-2188, AD-46382.

(2) "Establishment of Shock and Vibration Tests for Guided Missile Equipment and Components," Barry Report No. 230-A, AD-30355.

(3) "Establishing Vibration and Shock Tests for Missile Electronic Equipment," Barry Report No. 230-B, AD-41393.

SURVEY NO: B.1.10

PROJECT NO: 0601-20-3591 TASK/CONTRACT/W.O. NO: ---

TITLE: Missile Noise II

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D.C.

PRINCIPAL INVESTIGATOR: S. Edelman

DESCRIPTION: The basic objective of this project is to assist DOFL engineers to determine the effects of vibration on missiles in flight. The tasks include:

1. Development of barium titanate stack shakers to apply sinusoidal accelerations of 10g or better over the frequency range of 1.5 kc to 11 kc for loads of the order of 10 lb and to apply high sinusoidal accelerations to loads of the order of 50 lb or more over frequency ranges between 1 kc and 40 kc.

2. Design, construct, and calibrate suitable accelerometers for various special purposes, calibrate telemetering systems, and analyze telemetered vibration data.

Plans for future work include continued development of vibration exciters for high frequencies and heavy loads, development of a laboratory standard accelerometer, and improvement of calibration methods.

REPORTS:

(1) "Some Developments in Vibration Measurement," by S. Edelman, E. Jones, and E. R. Smith, J. Acous. Soc. of Am. 27:728, July 1955.

(2) "Self Noise of Projectiles," by S. Edelman, E. Jones, E. R. Smith, B. D. Simmons, and R. C. Braunberg, NBS Report 3465, July 1954.

SURVEY NO: B.1.11

PROJECT NO: 6905 TASK/CONTRACT/W.O. NO: 69051

TITLE: (Experimental Track Development) Aerodynamic Track Test Techniques.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Air Force Flight Test Center

CONTRACTOR OR LABORATORY: J. B. Rea Co., Inc., Los Angeles, California

PRINCIPAL INVESTIGATOR: LT Y. Hiroshige, Air Force Flight Test Center, Edwards Air Force Base, California.

DESCRIPTION: The objective of this task is to obtain knowledge of the dynamic characteristics of a high speed test track and the performance characteristics of different test vehicles.

Testing methods and instrumentation techniques are being studied and developed whereby the effects of track-induced vibration and aerodynamic interaction on test specimens can be eliminated or minimized.

REPORTS:

(1) "Theoretical Investigation of Sled Vibration Problems During Testing and Braking Periods," J. B. Rea Co., Inc., Los Angeles, Cal., under technical direction of LT Y. Hiroshige, AFFTC.

(2) "Development of Shock Isolation Systems for High Speed Track Research Testing," AFFTC Technical Report.

SURVEY NO: B.1.12

PROJECT NO: NA 710-070 TASK/CONTRACT/W.O. NO: TED NAM SI-203

TITLE: (Development of Arresting Gear Components) Development of Methods to Reduce Vibrating Loads.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (SI-2)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Studies have been completed for the design of a high speed sled which will be used to simulate aircraft landings in the 150 to 200 knot speed range. Developments under this task have increased the allowable engaging speed of arresting gear by approximately 30 percent.

REPORTS:

(1) NAMC Test Reports issued under Contract TED NAM SI-203.

SURVEY NO: B.1.13

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: NOas 51-160-f

TITLE: (Experimental Structures and Structural Design Criteria) Investigation of Structural Feasibility of an All-Metal Helicopter Rotor Blade with an Internal Pulse-Jet Power Plant.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Hiller Helicopter Co., Palo Alto, Calif.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To determine the feasibility of a rotor blade with an internal pulse-jet power plant (from material, structural, and performance standpoints), static and performance tests of the blade mounted on whirl-test stands were conducted.

REPORTS:

(1) "Revised Load Determination and Stress Analysis of Hiller Power Blade," Hiller Report No. 210.42, 5 January 1952.

(2) "Report of Static Test of Hiller Power Blade," Hiller Report No. 261.5, 16 June 1952.

(3) "Static Test of Hiller Power Blade," Hiller Report No. 261.51, 24 October 1952.

(4) "Instrumentation and Performance Report, Hiller Power Blade," Hiller Report No. 261.9, 16 January 1953.

(5) "Power Blade Whirl Stand Analysis," Hiller Report No. 240.43, 7 January 1953.

SURVEY NO: B.1.14

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 224

TITLE: (Structural Development and Test) Study of Size Effect in Sheet-Stringer Panels.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1948 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To obtain information as to the validity of nondimensional plate-stringer data which are currently in common use by aircraft designers, twelve large-size plate-stringer panels (having dimensions of approximately 12-ft by 6-ft with 6-in. depth stringers) and twelve quarter-scale sheet stringer panels have been tested to failure. The final report is being prepared.

SURVEY NO: B.1.15

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 225

TITLE: (Structural Development and Test) Investigation of Wing-Lift-Simulation Techniques and Landing Design Requirements.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests were made which yielded a comparative evaluation of the various methods of simulating wing lift during laboratory drop tests.

REPORTS:

(1) "Development of Wing-Lift Simulation Equipment and Methods for Drop Tests," Naval Air Experimental Station Report No. ASL NAM DE 225, 4 April 1952.

SURVEY NO: B.1.16

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 225.1

TITLE: (Structural Development and Test) Extended Investigation of the General Problem of Spin-Up and Spring-Back Loads.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: During drop test of a SB2C-5 to develop and evaluate drop-test techniques, a peculiar condition of resonance of the main landing gear was observed. To study this condition, drop tests were conducted at the critical spin-up speeds. These have been completed and are being analyzed for final reporting.

SURVEY NO: B.1.17

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 231

TITLE: (Structural Development and Test) Installation, Evaluation, and Modification of the 250,000 Pound Repeat-Load Testing Machine.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The repeat-load testing machine is to be used in the evaluation of aircraft structural components. Work has been initiated on the installation of a new hydraulic power plant, and a new load measurement and control system. Upon completion of these installations, acceptance tests will be conducted and a final report prepared.

SURVEY NO: B.1.18

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 242.2

TITLE: (Structural Development and Test) Extended Correlation of Drop Test and Landing Test Data.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Drop tests have been made in order to investigate and determine improved methods for simulation of actual landing conditions in airplane drop te[illegible]. Difficulties were experienced in correlating loads recorded during actual landings with those during drop tests. Additional drop tests were made to determine the reasons for the different results. The final report on this project is being published.

SURVEY NO: B.1.10

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 254.1

TITLE: (Structural Development and Test) Development and Construction of Blast-Load Simulating Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A pressure chamber has been constructed, which is suitable for blast-pressure tests of representative aircraft-skin panels. The blast chamber has been tested and calibrated for use in other projects, also.

REPORTS:

(1) "Development and Construction of Blast Load Simulation Chamber" (Confidential), NAMC Report No. ASL NAM AD-254.1, 9 November 1954.

SURVEY NO: B.1.19

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 254.1

TITLE: (Structural Development and Test) Development and Construction of Blast-Load Simulating Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A pressure chamber has been constructed, which is suitable for blast-pressure tests of representative aircraft-skin panels. The blast chamber has been tested and calibrated for use in other projects, also.

REPORTS:

(1) "Development and Construction of Blast Load Simulation Chamber" (Confidential), NAMC Report No. ASL NAM AD-254.1, 9 November 1954.

SURVEY NO: B.1.20

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2115

TITLE: (Structural Development and Test) Jig Drop Tests of F8F-2 Instrumented Landing Gear.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To determine the extent to which jig-drop tests impose loads and stresses representative of airplane drop test and to investigate means of improving the correlation between tests and landings, one of the instrumented gears used in tests under Contract TED NAM AD-242.2, is to be drop tested. The results will be correlated with the data from the previous tests.

SURVEY NO: B.1.21

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-217

TITLE: (Structural Development) Development of a Vibration Simulator.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Engineering Mech. Group, Washington, D. C.

PRINCIPAL INVESTIGATOR: P. Weaver

DESCRIPTION: A vibration simulator was developed, which is capable of reproducing in the laboratory a vibration sequence that has been recorded in actual operation of aircraft or equipment. The simulator consists of a magnetic tape recorder and reproducer, a high fidelity audio frequency amplifier, and an electrodynamic shaker and associated power supply. Evaluation tests indicate that complete waveforms can be reproduced within ±8 percent from 10 cps to 250 cps.

REPORTS:

(1) "A Vibration Simulator," NBS Report No. 1, BUAER TED NBS DE-217.

SURVEY NO: B.1.22

PROJECT NO: NS 621-083 TASK/CONTRACT/W.O. NO: P.O. 30029/56

TITLE: (Propulsion and Auxiliary Steam Turbine Improvement) Shock Test of Small Steam Turbine.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task is to provide for shock testing a small steam turbine to ascertain its ruggedness and ability to withstand shock. The Engineering Experiment Station will be asked to submit comments on such a test and an estimate of its cost.

SURVEY NO: B.1.23

PROJECT NO: NS 711-105 TASK/CONTRACT/W.O. NO: P.O. 10775/53

TITLE: (Investigation and Analysis of Shipboard Shock) Establishment of Shock Design Loads and Investigation and Development of Laboratory Shock Simulating Devices.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Portsmouth Naval Shipyard, Portsmouth, N.H.

PRINCIPAL INVESTIGATOR: E. C. Taylor

DESCRIPTION: **A machine to produce pressure transients in a limited volume, equivalent to underwater explosion transients of magnitude sufficient to cause submarine hull splitting was developed by BuShips and Portsmouth Naval Shipyard. Arrangement of machine is shown on BuShips drawing S8700-985944. Machine was constructed and has been in service at Portsmouth. It has obviated need for underwater explosion tests on hull fittings designed for new construction submarines. Sea valves for nuclear submarines were tested on this machine and the Electric Boat Division is constructing a duplicate for future use.**

SURVEY NO: B.1.24

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: P.O. 10750/55

TITLE: (Development of Shock Simulating Devices) Characteristics of Class H.I. Shock Machine for Medium Weight Equipment Under Heavy Loads.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The experimental part of the investigation to determine the characteristics of the shock motion of the Class H.I shock machine for medium weight equipment under loads exceeding those specified in MIL-S-901 and ranging from 5000 lb to 9000 lb, has been completed.

A final report including the velocity changes, the shock spectra, and the frequencies of the mounting arrangements for the various loads, will be submitted.

SURVEY NO: B.1.25

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: ---

TITLE: (Development of Shock Simulating Devices) Design and Construction of a Rough-Road, Wheeled-Vehicle Simulator.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: (Unassigned)

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: NRL Report, Ref (1) below, describes the results of a Mobile Equipment Shock Study performed under BuShips problem No. S-1544 and presents a preliminary design of a proposed rough-road, wheeled-vehicle simulator.

REPORTS:

(1) "Vehicular Shock and Vibration Test Machine," NRL Ltr Report 6253-304A/54, August 1954.

SURVEY NO: B.1.26

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: P.O. 10739/55
P.O. 30012/56

TITLE: (Development of Shock Simulating Devices) Shock Machines.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to calibrate and compare characteristics of the H.I. lightweight machine at the Material Laboratory with similar machines set up at various other military laboratories and commercial establishments.

REPORTS:

(1) Progress Report No. 1, Mat. Lab. Report 941:AS:nt S41/L5 Number 5270-4, 27 December 1954.

SURVEY NO: B.1.27

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: P.O. 10726/54

TITLE: (Development of Shock Simulating Devices) Characteristics of Navy Class H.I. Shock Machines for Lightweight Equipment

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The required instrumentation and the associated test rigs have been assembled to investigate the characteristics of the shock motions of the two Class H.I. shock machines installed at the Material Laboratory for lightweight equipment. A simple method of determining the performance of these machines has been established. This method is being employed to investigate reported differences between the lightweight shock machine of a private manufacturer and those at the MATLAB. The preliminary findings are reported in Reference (2).

REPORTS:

(1) "Report of Investigation of Characteristics of H.I. Shock Machines for Lightweight Equipment," Mat. Lab. Report Lab. Project 5270, Progress Report 1, NS 711-109, 5 August 1952.

(2) Progress Report No. 1, Mat. Lab. Report 941:AS:nt S41/L5 Number 5270-4, 27 December 1954.

SURVEY NO: B.1.28

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: NObs 66495

TITLE: (Development of Shock Simulating Devices) Preliminary Design of Heavy Weight Shock Machine.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Power Generators, Inc.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A list of the various methods of obtaining the desired shock motion and the ensuing design features of the components of the heavy-weight machine are given in Reference (2), below.

REPORTS:

(1) "Report on British 15-Ton Shock Test Machine," PGI Report No. 1414, 25 April 1955.

(2) "Tabulation of Basic Shock Test Machine Mechanisms, Revision No. 1," PGI Report No. Ltr. 2608, 2 May 1955.

SURVEY NO: B.1.29

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: P.O. 10739/55

TITLE: (Development of Shock Simulating Devices) Design of Heavy-Weight Shock Machine as Based on Review of Shock Data from Surface Vessels.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: H. Rich

DESCRIPTION: On the basis of a review of U. S. and British data on shock on surface vessels, shock motion requirements for a heavy-weight shock machine are given in Reference (1), below.

REPORTS:

(1) DTMB Ltr S-60/Shock Ser S-00144, 9 November 1954.

SURVEY NO: B.1.30

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: P.O. 10753/54

TITLE: (Development of Shock Simulating Devices) Characteristics of Navy Class H.I. Shock Machines.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: R. W. Conrad

DESCRIPTION: To determine the shock characteristics of the Navy Class H.I. shock machines; establish performance standards for these machines; and, if possible, recommend modifications necessary to simulate service conditions more closely, the following work has been done: Drawings for standardized methods of mounting test loads and specifications for instruments for measurement of performance of these machines have been completed.

The collection of data required for the determination of the shock characteristics of the lightweight and the medium-weight shock machines has been completed, and reports have been issued.

REPORTS:

(1) NRL Interim Report 3850-328a/50 RWC, 31 October 1950.
(2) NRL Interim Report 3853-323/50 GWD, 31 January 1951.
(3) NRL Interim Report 3850-56/51 RWC, 22 March 1951.
(4) "Characteristics of the Lightweight High-Impact Shock Machine," by R. W. Conrad, NRL Report No. 3922, 23 January 1952.
(5) "Damage Resulting from Laboratory Vibration and High-Impact Shock Tests," NRL Report 4179, September 1953 (NAVSHIPS Report 900, 185).

SURVEY NO: B.1.31

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: P.O. 10757/55

TITLE: (Development of Shock Simulating Devices) Design of Heavy-Weight Shock Machine as Based on Review of Submarine Shock Data.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Code 6260, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: R. E. Blake

DESCRIPTION: Data obtained from the British in connection with full-scale tests on submarines have been analyzed. This analysis and the analysis of data from the SS428 underwater explosion tests have led to the issuance of Reference (1) which outlines considerations for the design of a heavy-weight shock machine.

A second report is being prepared which outlines velocity-time curves to be produced by this machine and introduces statistical considerations to be employed in the testing of various classes of equipment.

REPORTS:

(1) "Design Criteria for a Shock Testing Machine for Heavy-Weight Submarine Equipment," NRL Memo. Report 254 (Confidential), January 1954.

SURVEY NO: B.1.32

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10700/54 and P.O. 10750/55

TITLE: (Vibration and Dynamics of Ship's Structures and Machinery) Solution of Special Vibration Problems.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The Engineering Experiment Station has been authorized to install and use the vibration machine presently under development at the Material Laboratory, under Material Laboratory Project 5633.

The EES has been authorized to conduct an investigation aimed at the correlation of the vibration limits and unbalance tolerances given in MIL-STD-167(SHIPS).

SURVEY NO: B.1.33

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10714/55 and P.O. 10726/54

TITLE: (Vibration and Dynamics of Ship's Structures and Machinery) Solution of Special Vibration Problems.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Material Laboratory Project 5633 has been established to develop the design and promote the construction of a machine to be used in the evaluation of the characteristics of torsional vibration dampers.

REPORTS:

(1) Mat. Lab. Progress Report No. 1 on Project 5633.

SURVEY NO: B.1.34

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: P.O. 824/47

TITLE: (Investigation of Aircraft Carrier Structure) Flight Deck Test of the USS FRANKLIN D. ROOSEVELT (CVB-42).

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1948 COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, Portsmouth, Virginia

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Flight deck tests on the CVB-42 were conducted in order to obtain data upon which to establish methods for closer design of structures peculiar to aircraft carriers; to establish methods for quickly and closely assessing the ability of existing ships to carry heavier aircraft; and to determine the required strengthening measures to improve that ability.

REPORTS:

(1) CVB 42 Test Data, Submitted by NAVSHIPYDNOR Letter CVB42/CV/S11 (1-251), 29 April 1948.

SURVEY NO: B.1.35

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TT 696

TITLE: Laboratory Simulation of Vibration Conditions Existing During Vehicle Track and Cross-Country Operations.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Detroit Arsenal

CONTRACTOR OR LABORATORY: Detroit Arsenal, Center Line, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION:

1. Develop equipment for laboratory simulation of vibration conditions existing during track and cross-country operation.
2. Objective will be accomplished by the play-back of tape recordings made during actual runs, through a suitable amplifier driving an electrodynamic shaker unit.
3. Phase I of this project will be to develop an experimental unit of 10 g capacity, applying vibrations in one dimension only, and the determination of response characteristics of this model.

REPORTS:

(1) Progress Report on LWO 9252 to Chief, Research Office; Attention: J. G. Brooks by Mr. Floyd Fair, Control Systems Section, Instrument-Electrical Lab., 24 June 1954.

SURVEY NO: B.2.1

PROJECT NO: 1364 TASK/CONTRACT/W.O. NO: 70515 and AF 33(038)-12752

TITLE: (Flight Control Technical Requirements) Nonlinearization Study.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Wright Air Development Center, Flight Control Lab.

CONTRACTOR OR LABORATORY: Mo. Research Lab., Inc., St. Louis, Mo.

PRINCIPAL INVESTIGATOR: J. Hexem

DESCRIPTION: Various types of nonlinear damping were investigated to discover their effects on position and velocity servomechanisms. As an experimental device, a plan position indicator and its antenna system were used. A final report should be available.

SURVEY NO: B.2.2

PROJECT NO: 1364 TASK/CONTRACT/W.O. NO: 70513 and AF 33(038)-12753

TITLE: (Flight Control Technical Requirements) Nonlinear Yaw Damper.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Flight Control Lab.

CONTRACTOR OR LABORATORY: Cornell Aeronautical Lab., Inc., Buffalo 21, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The application of nonlinear damping techniques to artificial stability and control devices has been investigated. A nonlinear yaw damper installed in an F-86E aircraft was used for this research. Flight tests are almost complete.

REPORTS:

(1) "Reduction of Oscillatory Tracking Errors of the F-80A Airplane During a High Altitude Attack Maneuver byEmploying Synthetic Yaw Damping," by D. W. Rhoads, CAL Report No. TB-495-F-14, 26 December 1951.

SURVEY NO: B.2.3

PROJECT NO: 1364 TASK/CONTRACT/W.O. NO: 70516 and AF 33(038)-22893

TITLE: (Flight Control Technical Requirements) Nonlinear Analysis and Control Techniques.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Flight Control Lab.

CONTRACTOR OR LABORATORY: Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A theoretical and experimental research investigation is being made into the application of nonlinear analysis and control techniques to problems associated with automatic control systems in order to improve their performance. An adaptive acceleration limited closed loop system used as a filter has been developed. It has been used in ILS and fire control systems. At the present time the nonlinearities of flare-out computers when used with rate gyro autopilots are being investigated.

SURVEY NO: B.2.4

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13580 and AF 33(616)-2094

TITLE: (Aircraft Structural Design Criteria) Study of Gust Problems.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Fluidyne Engineering Corp., Minneapolis, Minn.

PRINCIPAL INVESTIGATOR: A. L. Jones

DESCRIPTION: This contract covers an investigation to determine the most effective device (aerodynamic flow control) for use as a gust alleviator. This investigation has been completed and wind tunnel tests to obtain aerodynamic data on wing-installed gust alleviating devices are approximately 15 percent complete.

SURVEY NO: B.2.5

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13464 and AF 18(600)-156

TITLE: (Aeroelasticity, Vibration, and Flutter) Damper Applications to Aircraft Structures.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Headquarters, Air Research and Development Command

CONTRACTOR OR LABORATORY: Univ. of Mich., Ann Arbor, Mich.

PRINCIPAL INVESTIGATOR: R. N. Hamme

DESCRIPTION: This task involves an investigation of a solution to the problem of vibration and noise in the frequency range from 40 cps to 500 cps for aircraft skin coverings by means of specially designed dynamic dampers. Work accomplished to date shows that a lightweight dynamic type damper is effective in reducing vibration and noise from resonant structural panels.

REPORTS:

(1) "Properties of Tuned Vibration Dampers," TR No. 52-328, (UNCLASSIFIED), October 1952.

SURVEY NO: B.2.6

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33032 and AF 33(600)-29488

TITLE: (Rotor Blades) Rotor Blade Tip Damper Investigation

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Hiller Helicopter Co., Palo Alto, Cal.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task consists of the analysis, design, and testing of a rotor blade tip damper that will provide a means of reducing rotor blade flapwise bending stresses, particularly those stresses due to response of the blade at a natural frequency lying near, or at, an harmonic of the rotor speed. A study and dynamic analysis is to be conducted to determine the effect of the damper on blade stresses.

SURVEY NO: B.2.7

PROJECT NO: 9-38-13-006 TASK/CONTRACT/W.O. NO: NOas 54-890-c

TITLE: (Helicopter Vibration Reduction) Fabrication and Flight Test of Rotor Hub with Cocked Hinges.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Air Research and Development Command

CONTRACTOR OR LABORATORY: Kellett Aircraft Corp., Camden, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An attempt will be made to reduce vibration in the rotor systems of helicopters. The immediate objective is to fabricate and flight test a rotor hub with cocked hinges and compare its vibration characteristics with those of an unmodified rotor system. To date, data required to complete the theoretical applications of this subtask have been assembled.

SURVEY NO: B.2.8

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41744 and AF 33(600)-26448

TITLE: (Improved Electronic Components) Improved Center Flange Vibration Mounts.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: K. W. Johnson & Co., Inc., Dayton, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The development of an isolator of the center flange type that will operate over a temperature range of -65°C to +200°C and will provide adequate vibration protection for instrument panels and other airborne equipment with a minimum of replacement maintenance.

REPORTS:

(1) "Development of Center Flange Mount," Contract AF 33(600)-26448, Reports 26448-1, -2, and -3A.

SURVEY NO: B.2.9

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: AF 33(038)-17734

TITLE: (Improved Electronic Equipments) Shock and Vibration Isolation for Electronic Tubes.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: 1953

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: American Phenolic Corp., Chicago, Ill.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The complete shock and vibration isolation of receiving-type electronic tubes was investigated under this task.

SURVEY NO: B.2.10

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41744

TITLE: (Improved Electronic Equipments) Improved Flange Vibration Mounts

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: ---

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is to develop an isolator of the center flange type for protection of electronic equipment. An isolator that is not susceptible to drift and is capable of long life under adverse climatic conditions is to be provided by this task.

SURVEY NO: B.2.11

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41605 and AF 33(600)-20237

TITLE: (Improved Electronic Components) Heavy Type Isolators

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: U. S. Rubber Company, New York, N. Y.

PRINCIPAL INVESTIGATOR: Mr. Hile

DESCRIPTION: The objective of this task is the development of reliable heavy-type isolators in the load range from 20 lb to 100 lb that will attenuate shock and be effective in vibration protection over a temperature range of -65°C to +200°C.

REPORTS:

(1) "Development of Isolators for Heavy Airborne Electronic Equipment," WADC Technical Report 55-248 on Contract AF 33(600)-20237, The U. S. Rubber Co.

SURVEY NO: B.2.12

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41606 and AF 33(600)-23113

TITLE: (Improved Electronic Equipments) Shock Absorber Links for Airborne Electronic Equipments.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: The Barry Corp., Watertown, Mass.

PRINCIPAL INVESTIGATOR: C. E. Crede

DESCRIPTION: This device retains electronic and other equipment installed in military aircraft and prevents such equipment from becoming a missile. This measure is intended to protect personnel from injury due to equipment wrenched loose during crash conditions. The various elements of the device are described, and an analysis is presented of an extendable element with energy absorption capacity.

REPORTS:

(1) "Crash-Shock-Absorber Link for Airborne Equipment," WADC Tech. Report 54-154, Contract No. AF 33(600)-23113.

SURVEY NO: B.2.13

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41573

TITLE: (Improved Electronic Components) Vibration-Acceleration Mounts for Equipments in Guided Missiles.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1958

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: Undetermined

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This program will develop a series of acceleration mounts that will operate over a wide temperature range (-65°C to 200°C) and adequately protect electronic equipments that are carried in guided missiles against high acceleration and vibration. No such item is available at the present time.

SURVEY NO: B.2.14

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41527 and AF 33(600)-29383

TITLE: (Improved Electronic Components) Vibration Mounts for Jet Aircraft

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Electronics Components Lab.

CONTRACTOR OR LABORATORY: The Barry Corp., Watertown, Mass.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is to develop a series of vibration shock mounts in the load range of 1 lb to 40 lb for protection of equipment from high frequency vibration and alternate shock over a temperature range from -65°C to +200°C.

REPORTS:

(1) "Vibration Mount Development for High Speed Aircraft," Interim Report Nos. 1 and 2.

(2) Barry Reports 251A and 251B.

SURVEY NO: B.2.15

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41608 and AF 33(600)-23106

TITLE: (Improved Electronic Equipments) Stabilizers for Airborne Equipments.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: The Barry Corp., Watertown, Mass.

PRINCIPAL INVESTIGATOR: C. E. Crede

DESCRIPTION: The objective is to develop stabilizers for use with vibration mounted equipment having a high geometric configuration. Installation space is to be reduced and protection of equipment is to be increased through the result of the use of these stabilizers in new type aircraft and missiles.

REPORTS:

(1) "Development of Shock and Vibration Isolators for Airborne Electronic Equipment," Barry Corp. Memo. Report No. MCREE 49-21.

(2) "Stabilizer for Airborne Equipments," WADC Tech. Report 54-366.

SURVEY NO: B.2.16

PROJECT NO: 4157 TASK/CONTRACT/W.O. NO: ---

TITLE: Vibration and Shock Criteria

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1948 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center (RDTDRG)

CONTRACTOR OR LABORATORY: Wright Air Development Center, Electronics Components Lab., WPAFB, Ohio.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Vibration and shock design criteria are being worked out for aircraft electronic equipments to provide design techniques and devices that will permit these equipments to operate with optimum protection.

A method of analyzing vibration waveforms such that the transient type is separated from the steady-state, has been worked out; and accelerated shock and vibration tests to simulate the fatigue effect encountered during the life of equipments have been established.

Three successful shock and vibration isolators have been developed. These will withstand 30 g shocks of 11 ms duration. Also, development work on a center-flange type isolator and on mounts for heavy equipment, exceeding 100 lb, is in the final design stage.

REPORTS:

(1) Technical Requirement No. 109, 18 November 1954.
(2) Project Development Directive No. 0009, 30 July 1954.

SURVEY NO: B.2.17

PROJECT NO: 5046 TASK/CONTRACT/W.O. NO: 50171 and AF 33(600)-22987

TITLE: (Dynamic Mounts for Aircraft Guns) M-3, Caliber .50 Gun.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Armament Lab.

CONTRACTOR OR LABORATORY: Emerson Electric Mfg. Co., St. Louis, Mo.

PRINCIPAL INVESTIGATOR: J. S. Sheehan

DESCRIPTION: A soft recoil system for the caliber .50 M-3 gun has been developed. Tests will be conducted to determine if it can be accepted as a standard Air Force item.

REPORTS:

(1) Emerson Electric Mfg. Co., "Final Engineering Report on Caliber .50 Gun Adapter," by F. Krachmalnick and J. S. Sheehan, 27 June 1952.

SURVEY NO: B.2.18

PROJECT NO: 5046 TASK/CONTRACT/W.O. NO: 50172 and AF 18(600)-49

TITLE: (Dynamic Mounts for Aircraft Guns) Investigation of Dynamic Gun Mounts.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Armament Lab.

CONTRACTOR OR LABORATORY: Univ. of Cincinnati, Cincinnati, Ohio.

PRINCIPAL INVESTIGATOR: C. A. Ludeke

DESCRIPTION: Presently, the Univ. of Cincinnati is conducting research on several new methods of dynamic mounting for new guns on which standard mounting practices may not be applicable.

REPORTS:

(1) University of Cincinnati, "An Electromechanical Analogue for the Basic Aircraft Machine Gun Caliber .50," by C. A. Ludeke, 1 July 1950.

(2) University of Cincinnati, "Characteristics of the Spring Mounted Basic Aircraft Machine Gun Caliber .50 M-3," by C. A. Ludeke, 1 June 1951.

(3) "Dynamic Recoil Balancer," by R. R. Walton, Final Report, 10 January 1953.

SURVEY NO: B.2.17

PROJECT NO: 6215 TASK/CONTRACT/W.O. NO: ---

TITLE: Airborne Vibration Test

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Wright Air Development Center

CONTRACTOR OR LABORATORY: Wright Air Development Center, WCLRE-6, Bldg. 56, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: J. W. McCormick

DESCRIPTION: An airborne vibration test to determine the effects of mass weight on the attenuation of aircraft vibrations as concerned with photographic equipment.

REPORTS:

(1) Engineering Test Memorandum, 12 October 1954, as reported by Lt. C. Meyer.

SURVEY NO: B.2.20

PROJECT NO: NL-440-052-3 TASK/CONTRACT/W.O. NO: ADC-EL-44041

TITLE: (Development and Test of Airborne Communication Equipment) - Flight Investigation of the Effects of Catapult Launching and Arrested Landing on AN/ARC-27 Vibration Mount.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (EL-441, EL-442)

CONTRACTOR OR LABORATORY: Naval Air Test Center, Patuxent River, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Two complete sets of Barry isolators for AN/ARC-27 are being tested at the NATC. The tests are approximately 75 percent complete.

SURVEY NO: B.2.21

PROJECT NO: NA 543-026 TASK/CONTRACT/W.O. NO: TED NAM AE-6321

TITLE: **Crash Injury Due to Vertical Forces; Investigation to Determine Elimination of.**

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Indefinite

DIRECTING AGENCY: Bureau of Aeronautics (AE-63)

CONTRACTOR OR LABORATORY: Aeronautical Medical Equipment Lab., Mech. Equipt. Design Div., NAMC, Phila., Pa.

PRINCIPAL INVESTIGATOR: E. Schwartz

DESCRIPTION: **The objective of this project is to determine the most suitable energy absorption material for use at flight and/or ditching stations for prevention of injury to flight personnel due to high vertical forces.**

SURVEY NO: B.2.22

PROJECT NO: NA 710-070 TASK/CONTRACT/W.O. NO: TED MTC SI-2201

TITLE: (Development of Arresting Gear Components) Development of Methods to Reduce Vibratory Loads.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (SI-2)

CONTRACTOR OR LABORATORY: Naval Air Missile Test Center, Point Mugu, Cal.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task covers development of vibratory wave damping equipment to reduce vibratory loads in the Mark 4 arresting gear. Development has been completed. Evaluation tests will be conducted by NAMTC.

REPORTS:

(1) NAMTC Reports issued under TED MTC SI-2201

SURVEY NO: B.2.23

PROJECT NO: NA 710-070 TASK/CONTRACT/W.O. NO: NOas 52-323

TITLE: (Development of Arresting Gear Componen s) Development of Methods to Reduce Vibratory Loads.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Aeronautics (SI-2)

CONTRACTOR OR LABORATORY: Okla. A & M College, Stillwater, Okla.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A study of the vibratory wave phenomena in the arresting wires of aircraft arresting gear, and development of a vibratory wave-damping device suitable for use with the Mark 5 arresting engine have been completed. Experimental units of the damping device are being fabricated. These units will be evaluated by NAMATCEN.

REPORTS:

(1) Okla. A & M Reports issued under Contract NOas 52-323.

SURVEY NO: B.2.24

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 274.1

TITLE: (Structural Development and Test) Model F9F-5 Airplane Drop Tests on Rubber Mats.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To evaluate possible means of eliminating or reducing the severity and frequency of tire bottoming during carrier landings, drop tests with an F9F-5 airplane were made on pneumatic rubber or fabric mats with various characteristics. Drop tests were also made on non-pneumatic rubber mats and on a 1-in thick "Ensolite" material covered with 1/2-in and 1-in rubber. The effects of strut-orifice enlargement, simulating the wear that occurs during operation, were likewise determined by drop tests.

SURVEY NO: B.2.25

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: NOas 55-254-c

TITLE: (Experimental Structures and Structural Design Criteria) Development of Modification for Prewitt Model 36 Rotor Blades for Investigation of Reduction of Vibration Level when Installed on HUP Helicopter.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Prewitt Aircraft Co., Clifton Heights, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Attempts are being made to develop modifications to the PAC Model 36 rotor blade which will reduce the vibration level on the HUP helicopter to equal or better that obtained with wooden blades installed. Laboratory static and dynamic tests are to be performed on one modified blade and nine blades will be modified for use in a whirl and flight test program at the ASL, NAMC.

SURVEY NO: B.2.26

PROJECT NO: NR 212-002 TASK/CONTRACT/W.O. NO: N6 oni 11910

TITLE: Variation of Lateral and Directional Stability of Aircraft with Automatic Control.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1950 COMPLETION DATE: 1952

DIRECTING AGENCY: Office of Naval Research, Air Br., Code 461

CONTRACTOR OR LABORATORY: Cornell Aeronautical Lab., Buffalo, N. Y.

PRINCIPAL INVESTIGATOR: W. F. Milliken

DESCRIPTION: The type of aircraft motion known as "dutch roll" was investigated, and automatic damping devices to control the unfavorable oscillations were installed on an airplane and tested. An automatic yaw control and an automatic roll control were cross-coupled so as to enable the pilot to vary the derivatives of motion or any combination of them.

REPORTS:

(1) "A Flight Investigation of Acceptable Roll to Yaw Ratio of the Dutch Roll, and Acceptable Spiral Divergence," CAL Report No. TB-574-F-6, 12 February 1952.

(2) Other Reports: No. TB 574-F-1
No. TB 574-F-2
No. TB 574-F-3
No. TB 574-F-4
No. TB 574-F-5
No. TB 405-F-1
No. TB 405-F-3
No. TB 405-F-4
No. TB 405-F-5

SURVEY NO: B.2.27

PROJECT NO: NR 064-397 TASK/CONTRACT/W.O. NO: Nonr 591(01)

TITLE: Acceleration Type Vibration Damper

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Rensselaer Polytechnic Inst., Troy, N. Y.

PRINCIPAL INVESTIGATOR: P. Leiber

DESCRIPTION: The original object of this investigation was to determine, quantitatively, the basic relationships involved in the solid-particle variety of the acceleration-type vibration damper, and to evolve therefrom usable procedures for designing such a device for various applications; but when, in the experimental portion of this study, it was discovered that a damper of this type in which a liquid (mercury) was substituted for the solid particles performed with substantially equal effectiveness and without the objectionable noise, the major effort under this task was concentrated on the liquid type, even though the theory which was based on the motion of discrete masses does not apply. The effectiveness of a model of this mercury type damper in suppressing the vibrations of a submarine periscope, will be evaluated.

REPORTS:

(1) "Experimental Results on the Acceleration Damper," by P. Lieber and F. Tripp, Tech. Report No. AE 5401.

(2) "Further Considerations on the Theory of the Acceleration Damper," by C. Grubin and P. Lieber, Tech. Report AE 54021.

SURVEY NO: B.2.28

PROJECT NO: NS 674-100 TASK/CONTRACT/W.O. NO: ---

TITLE: Development and Testing of Plastic Shock Mounts for Electrical Fixtures and Fittings.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1956

DIRECTING AGENCY: Bureau of Ships, Code 560

CONTRACTOR OR LABORATORY: Portsmouth Naval Shipyard, Portsmouth, N.H.

PRINCIPAL INVESTIGATOR: Codes 255D and 380

DESCRIPTION: Shock mounts of molded plastic material to be developed as substitutes for standard sheet metal mounts shown on BuShips drawing 9000-S6202-73772. Material used thus far has been molded glass melamine general, which has relatively high mechanical strength and resistance to vibration and shock. Mounts in nine different thicknesses are being or have been prepared. Results of investigation on one size have revealed several desirable characteristics of the plastic mounts, although the problem of electrical grounding of fixtures as a result of nonconducting materials of which the mounts are made has presented itself.

SURVEY NO: B.2.29

PROJECT NO: NS 713-017 TASK/CONTRACT/W.O. NO: NObs-61737

TITLE: (Resilient Mountings) Development of a Line-Type Low Frequency Mounting.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: The Barry Corp., Watertown, Mass.

PRINCIPAL INVESTIGATOR: C. Crede and R. Pinkham

DESCRIPTION: The mounting to be developed is of the line (rail) type. It is to have a loading capacity of 250 lb/in and a natural frequency of 5 cps. Preliminary design mounting samples in 8- and 16-in lengths were submitted to EES in May 1954 for evaluation. Because of severe drift, the samples will be reworked and resubmitted for evaluation.

REPORTS:

(1) Barry Report No. 227B, Contract NObs-61737 of 18 May 1954; Interim Engineering Report on Development of Line Type Resilient Mountings in Accordance with BUSHIPS contract Specification SHIPS-M-1115.

SURVEY NO: B.2.30

PROJECT NO: NS 713-017 TASK/CONTRACT/W.O. NO: P.O. 10742/55

TITLE: (Resilient Mountings) Sound Isolation Mountings and Guides for Selection of Resilient Mountings.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: F. Vane and A. Sykes

DESCRIPTION: In the investigation of the phenomena of sound transmission in various materials, the following work has been performed:

(a) The theoretical and experimental investigation of the characteristics of simple type mountings, mounting materials, and other phenomena related to noise isolation, are continuing. An apparatus for measuring transmissibility has been constructed, and investigations relative to wave effects in isolation mountings have been conducted on helical springs and simplified rubber mountings loaded in compression and shear.

(b) The theoretical work on Mare Island apparatus for measuring noise transmission through rubber stock has been completed.

(c) A displacement transducer has been designed but not constructed.

(d) A report of noise transmission through "helical springs" is about 60 percent complete.

(e) The theoretical work and required calculations have been completed for a "Mounting Effectiveness Theory" report; however, actual progress in the preparation of the formal report has not yet started.

(f) A "Phase Meter" report describing the phase measuring equipment developed for isolation studies has been prepared.

(g) The point mechanical impedance of a uniform free beam has been computed theoretically. It is anticipated that these results can be utilized in the "Effectiveness Theory."

(h) A simple laboratory method of comparing mounts and mounting materials using "Effectiveness" as a criterion, has been developed.

A manual, to be used as a guide in selecting resilient mountings, has been prepared.

REPORTS:

(1) "A Guide for the Selection and Application of Resilient Mountings to Items of Shipboard Equipment," DTMB Report No. 880 (preliminary), August 1954.

SURVEY NO: B.2.31

PROJECT NO: NS 713-017 TASK/CONTRACT/W.O. NO: P.O. 10022/55

TITLE: (Resilient Mountings) Evaluation of Rubber Stock and Resilient Materials.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Mare Island Naval Shipyard, Rubber Lab. Vallejo, Cal.

PRINCIPAL INVESTIGATOR: R. Morris and James

DESCRIPTION: Basic information on the properties of vulcanizates have been obtained and various rubber stocks and manufacturing procedures have been developed for shock mount application. Also, several rubber stocks and mountings developed by other laboratories have been evaluated.

REPORTS: (Mare Island Rubber Laboratory Reports)

(1) "Evaluation of No. 1200N Portsmouth Bonded Spool Type Mounting made from Rubber Laboratory Stock N-34-1, Type D," Report No. 9-55, 27 January 1954.

(2) "Study of the Suitability of Two Nonmagnetic Metals for Use in BST and EES Mountings," Report No. 93-4, 29 January 1954.

(3) "Load Deflection and Natural Frequency Behavior of A6L Mountings for Project Squaw," Report No. 9-62, 15 February 1954.

(4) "Evaluation of EES Type B7S Mountings Manufactured by the Rubber Laboratory," Report No. 9-64, 13 September 1954.

(5) "Comparison of Properties of Mounting Stock No. N-32 and No. 21-76S," Report No. 9-53, 19 October 1954.

(6) "Comparison of Dynamic Properties of B7S Mountings Tested by Mare Island Rubber Laboratory and by EES," Report No. 9-65, 25 October 1954.

(7) Report No. 9-61, 24 January 1955.

(8) Report No. 9-63, 29 January 1955.

(9) Report No. 93-6, 3 February 1955.

(10) Report No. 93-5, 18 February 1955.

SURVEY NO: B.2.32

PROJECT NO: NS 713-017 TASK/CONTRACT/W.O. NO: P.O. 10017/55

TITLE: (Resilient Mountings) Mountings for Submarine Use.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Portsmouth Naval Shipyard, Portsmouth, N.H.

PRINCIPAL INVESTIGATOR: Mr. Landsman and Mr. Downs.

DESCRIPTION: Development of the Portsmouth Bonded SpoolType, 15 cps, (BST) Mountings covering a load range from 50 lb to 2000 lb has been completed. These mountings are now procured by the Submarine Supply Office, Phila., Pa., under Spec. MIL-M-17191A and Std. Drawing 5000-S1112-F-1385777.

Test No. T-188, which designates several BST mounting installations aboard the USS TANG, was established in January 1951 to accumulate data on the service life of BST mountings for correlation with laboratory test data. Some of these mountings were removed from the ship in 1953 for laboratory evaluation. Test No. T-188 Supplement 2, dated 8 December 1954 provides details for the evaluation of these mountings.

SURVEY NO: B.2.33

PROJECT NO: NS 713-017 TASK/CONTRACT/W.O. NO: P.O. 10752/55
P.O. 86702/55

TITLE: (Resilient Mountings) Performance Characteristics of Resilient Mountings.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1946 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: J. Vallillo and P. Shovestul

DESCRIPTION: The following resilient mountings have been completely or partially evaluated:

(1) Portsmouth unbonded-spool type
(2) Portsmouth bonded-spool type
(3) Admirality Research Lab. type
(4) Mare Island Naval Rubber Lab. Shock Mounting
(5) U. S. Rubber Co. three-angle safety type
(6) Lord Mfg. Co. Type Nos. 204P60, 204P100, 283P155, 279P220, and 283PD533 mountings.
(7) Waugh Equipment Co. Type WTC-1-SV-16-25 mounting.
(8) Korfunds Co. Elastic Rib Pads.

Close cooperation between EES and Mare Island Rubber Laboratory has resulted in the development of the following mountings covered by specification MIL-M-17508(SHIPS) and BuShips Mechanical Standard Drawing 500-S1112-F-1385778.

IDENTIFICATION	LOAD RATING (lb)	NAT. FREQ. (cps)
(1) EES Type B7S	100 to 450	6 to 9.5
(2) EES Type A6M	400 to 900	1 to 6
(3) EES Type A6M	700 to 2000	1 to 6

EES and Mare Island Rubber Laboratory are presently engaged in the development of small, low-frequency mountings to cover the load range for 150 lb downward.

REPORTS:

(1) EES Ltr Report NP/L5/J15(754A) to BuShips, Test 050095F, 17 February 1954.
(2) EES Report 050163, 15 March 1954.
(3) EES Ltr Report NP/L5/J15(754A) to BuShips, Test 050094B, 23 March 1954
(4) EES Report 050084A, 26 April 1954.
(5) EES Report 050094C, 21 August 1954.
(6) EES Ltr Report NP/L5/J15(754A) to BuShips, Test 050177A, 21 June 1954.
(7) EES Report 050095G, September 1954.

(8) EES Ltr Report NP/L5/J17-2(754A) to BuShips, Test 050147A, 9 September 1954.
(9) EES Ltr Report NP/L5/J15(754A) to BuShips, Test 050177B, 14 September 1954.
(10) EES Report 050094E, 11 October 1954.
(11) EES, Spcl. Ltr Report NP/L5/J15(754A) to BuShips, Test 050147B, 11 October 1954.
(12) EES Report 050094D, 18 October 1954.

SURVEY NO: B.2.34

PROJECT NO: NS 713-219 TASK/CONTRACT/W.O. NO: P.O. 10733/55

TITLE: (Structure-Borne Noise Investigation) Investigation and Development of Electromechanical Vibration suppressors.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Navy Electronics Laboratory, San Diego 52, Cal.

PRINCIPAL INVESTIGATOR: F. N. D. Kurie

DESCRIPTION: Theoretical analysis of the problems involved are underway, and construction of model types of a vibration suppressor was started in August 1954.

SURVEY NO: B.2.35

PROJECT NO: 506-06-005 TASK/CONTRACT/W.O. NO: TM3-3201

TITLE: (Fuze, Guided Missile) Shock and Vibration Analysis

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Diamond Ordnance Fuze Lab.

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Lab., Washington, D. C.

PRINCIPAL INVESTIGATOR: W. E. Hull

DESCRIPTION: Shock and vibration analysis to design an electronic package that is able to withstand the handling, shipping, storage, launching, and flight environments experienced by the fuze during normal and abnormal life. This work was grouped as follows:

1. Transportation vibration.
2. Shipboard environments, including catapults, arrested landings, and other aircraft maneuvers.
3. Captive flight maneuvers, including take-offs, banking, landing, and other aircraft maneuvers.
4. Flight tests, including launch and other maneuvers through target intercepts.
5. Rough handling, including drops, frequent impacts, and other environments under which the fuze may still be expected to operate.

The above environments involve accelerations up to 25 g over a frequency range of 30 cps to 2000 cps for continuous periods up to 4 hr, and shocks up to 200 g for a time duration of 0.008 sec to 0.020 sec.

SURVEY NO: B.2.36

PROJECT NO: 506-06-025 TASK/CONTRACT/W.O. NO: TA3-3106A

TITLE: (Fuze, Guided Missile) Vibration and Shock Test.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: ---

DIRECTING AGENCY: Diamond Ordnance Fuze Lab.

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Laboratories, Washington, D. C.

PRINCIPAL INVESTIGATOR: R. Butterworth and K. Woodward

DESCRIPTION: The development of components and electronic packaging techniques capable of meeting the following shock and vibration characteristics applicable to the BOMARC missile:

a. Shock - 30 g of 10 msec duration by methods outlined in MIL-S-4456(USAF).

b. Vibration - 0.20 in double amplitude from 20 cps to 31 cps
±10 g from 31 cps to 500 cps.

Vibration tests are conducted on components and complete fuze assemblies.

SURVEY NO: B.2.37

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Measurement of Vibration Damping Effect of Several Materials.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs., Washington, D. C.

PRINCIPAL INVESTIGATOR: R. Barclay

DESCRIPTION: The damping effect of air, Freon-12, Kanamite, and phenolic microballons (dry granular materials), and silicone oil was investigated using a number of small cantilever beams as the vibrating system. The frequency range covered was 128 cps to 680 cps. It was found that air and Freon-12 produced little damping thus showing that the high density of Freon-12 was ineffective in damping. The damping of the other materials was low but still of practical help in reducing the amplitude at resonance.

SURVEY NO: B.2.38

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: General Mechanical Development of Methods for Packaging Electronic Fuzes.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs., Washington, D. C.

PRINCIPAL INVESTIGATOR: R. Warren

DESCRIPTION: A general development program to investigate, design, and build prototypes and test packages, consisting of structure and electronics. Structures under investigation fall in two categories:

1. Rigid structures, lowest resonant frequency above 500 cps, 1000 cps, or 2000 cps, depending on application.
   a. Cast aluminum structures
   b. Molded plastic structures
   c. Potted components
   d. Aluminum mesh tube holders
2. Non rigid structures, lowest resonant frequency below 500 cps and well damped; Q is less than 2.
   a. Fillers for more conventional packages
      (1) Oils
      (2) Hollow ceramic spheres
      (3) Hollow plastic balls
   b. Structures of damping materials
      (1) Foamed plastics
      (2) Laminated metal and plastics

The vibration tests of prototypes are sine wave tests from 20 cps to 2000 cps, and 20 g to 40 g acceleration.

The shock tests of prototypes have a rise time less than 0.002 sec, and a hold time greater than 0.010 sec at g levels of 40 to 200.

SURVEY NO: B.2.39

PROJECT NO: 548-03-001 TASK/CONTRACT/W.O. NO: TT1-5

TITLE: (Armor for Vehicles) Land Mine Investigations.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: C

[redacted]1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: Detroit Arsenal

CONTRACTOR OR LABORATORY: Detroit Arsenal, Center Line, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A study was instituted to determine the floor plate thickness required to stop or resist blast from a 20-lb mine. World War II armor of varying hardness and material produced to specification 57-115-11 w/a 2 were tested. During 1954, tests have been continued against plates of various thickness, tank floors integrally cast with the tank hull, and composite floor plates of steel banded with energy absorbing materials.

REPORTS:

(1) "To Determine the Minimum Armor Requirements in Floor Plates of Military Vehicles Necessary to Defeat the M6(T6E1) Antitank Mine Under Battlefield Conditions," AD1116, 31 May 1949.

SURVEY NO: B.2.40

PROJECT NO: 548-12-001 TASK/CONTRACT/W.O. NO: TT1-19B, LWO 7841

TITLE: Vibration in Light Tank, T41E1

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1952

DIRECTING AGENCY: Detroit Arsenal

CONTRACTOR OR LABORATORY: Detroit Arsenal, Center Line, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Numerous variations of a standard vehicle were tested with only minor improvement in any case. Therefore, the changes made were not fundamental enough to result in the required lessening of vibration. Tank tracks, as presently employed, make vibration reduction a most difficult problem. A basic study of track vibration characteristics should be undertaken as a first step toward eliminating or, at least, greatly reducing disturbance from this source. Any critical component of the vehicle should be designed, whenever possible, with a resonant frequency outside the vehicle frequency pattern throughout the operating speed range.

REPORTS:

(1) Report No. 3287

SURVEY NO: B.2.41

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TT1-718/01

TITLE: Evaluation of Reduced Thickness Tires for Medium Tank Roadwheels.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: D & PS, Aberdeen Proving Ground, Md.

PRINCIPAL INVESTIGATOR: D. A. J. Misioria

DESCRIPTION: Influence of reduced thickness of rubber on tank roadwheels on vehicle vibration. Vibration test to be run incident to other engineering and endurance tests of tires of 3/4-in, 1-in, 1-1/2-in thickness of rubber.

SURVEY NO: B.2.42

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TT1-718A/01

TITLE: Evaluation of Cured-on Rubber Tires of Reduced Thickness for Medium Tank Roadwheels.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Automotive Engineering Lab. Div., Aberdeen Proving Ground, Md.

PRINCIPAL INVESTIGATOR: R. Leithiser

DESCRIPTION: To determine the influence on vehicle vibration caused by reducing roadwheel tire thickness. Measurements to be taken on 3/4-in, 1-in, and 1-1/2-in thick tires with pickups mounted on the No. 1 and No. 3 roadwheel arm hubs.

SURVEY NO: B.2.43

PROJECT NO: 8-98-01-001 TASK/CONTRACT/W.O. NO: DA-44-009eng-2316

TITLE: Air and Amphibious Transportation of Engineer Material.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: Indefinite

DIRECTING AGENCY: Office, Chief of Engineers, Engr. & Dev. Div., MO, OCE

CONTRACTOR OR LABORATORY: Engineering Research and Development Lab., Packaging Development Br., Ft Belvoir, Va.

PRINCIPAL INVESTIGATOR: K. M. Carr

DESCRIPTION: To investigate the necessity for modification or redesign of engineer material and to test and establish methods and standards for handling and shipping engineer material by air transport and amphibious craft. Resulting methods and standards to meet the current and changing requirements of air and amphibious transportation as pertains to weight, bulk, dimensions, tie-down, lashing, shock, vibration, and shock resulting from air drop where applicable.

REPORTS:

(1) "Air and Amphibious Transportation of Engineer Material," ERDL Report No. 1388, December 1954.

(2) "Organization of Corps of Engineer Equipment for Air Movement, Part I," A. E. Blomquist and Associates, July 1955.

SURVEY NO: B.2.44

PROJECT NO: 3-54-02-022 TASK/CONTRACT/W.O. NO: 2232B

TITLE: Nonlinear Spring Shock Mounts

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: Continuing

DIRECTING AGENCY: Signal Corps Electronics Labs.

CONTRACTOR OR LABORATORY: Signal Corps Electronics Laboratories, Components Div., Ft. Monmouth, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is to develop a family of shock mounts that will be superior to the existing rubber types of shock mounts in protecting components, assemblies, and end items of electronic equipment against shock and vibration during handling, transportation, and field maneuvers.

Samples of commercially available shock mounts which use a nonlinear metallic spring as the resilient element have been obtained, but evaluation studies have not, as yet, been initiated.

SURVEY NO: B.2.45

PROJECT NO: 3-54-02-024 TASK/CONTRACT/W.O. NO: 2232D

TITLE: Viscous and Friction Damped Shock Mounts.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1958

DIRECTING AGENCY: Signal Corps Electronics Labs.

CONTRACTOR OR LABORATORY: Signal Corps Electronics Laboratories, Components Div., Ft. Monmouth, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is to develop a family of viscous and friction damped rubber shock mounts for heavy electronic equipment.

Samples of rubber shock mounts which incorporate damping means have been procured and an evaluation program has been planned.

SURVEY NO: B.2.46

PROJECT NO: 3-54-02-023 TASK/CONTRACT/W.O. NO: 2232C

TITLE: Low Temperature Rubber Shock Mounts.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1958

DIRECTING AGENCY: Signal Corps Electronics Labs.

CONTRACTOR OR LABORATORY: Signal Corps Electronics Laboratories, Components Div., Ft. Monmouth, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is to provide a rubber-type shock mount that will operate without appreciably changing in characteristics at temperatures as low as -70°F. A study is being made of available engineering data and investigations are being conducted on existing shock mounts subjected to low temperatures in order to determine the most suitable approach for improving the low temperature characteristics.

SURVEY NO: B.2.47

PROJECT NO: 8-91-12-103 TASK/CONTRACT/W.O. NO: ---

TITLE: Packaging Shock and Vibration Research

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: Indefinite

DIRECTING AGENCY: Corps of Engineers, Engr. Res. & Dev. Div., MO, OCE.

CONTRACTOR OR LABORATORY: Engineering Research and Development Labs., Packaging Development Br., Ft Belvoir, Va.

PRINCIPAL INVESTIGATOR: H. C. Pusey

DESCRIPTION: This project will result in development of shock and vibration data for use in experimental and analytical applications and the establishment of a foundation upon which scientific solutions of packaging and packing problems can be based.

REPORTS:

(1) "Simplified Method of Selection and Designing Package Cushioning Materials," Forest Products Lab. Report No. 2031, April 1955.

(2) "Studies and Design of Shock Recording System," Reed Research, Inc., Contract No. DA-44-009 eng 1725, 21 December 1953.

(3) "A Survey of Instrumentation Applicable to Packaging Research," Battelle Memorial Institute, Contract No. DA-44-009 eng 823, 31 May 1955.

(4) "Transportation Shock and Vibration Studies" (final and supplemental reports), Univ. of Fla., Contract No. DA-44-009 eng 460, 25 February 1952.

SURVEY NO: B.2.48

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Evaluation of Cushioning Materials.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: ---

DATE APPROVED: --- COMPLETION DATE: 1956

DIRECTING AGENCY: Wright Air Development Center

CONTRACTOR OR LABORATORY: Forest Products Lab., Madison, Wis.

PRINCIPAL INVESTIGATOR: R. H. Jones

DESCRIPTION: A dynamic and static evaluation of cushioning materials. Energy absorption characteristics are determined statically by a compression test and compared with the same factors obtained dynamically. Dynamic tests are in their initial phase at this time.

REPORTS:

(1) "Calculating Cushion Thickness by Analysis of Stress Strain Curves," WADC TR 53-334.

(2) "The Selection of Cushion Area in the Design of Package Cushioning," WADC TR 53-43.

(3) "A Technique for the Design of Glass Fiber Package Cushioning," WADC TR 53-58.

(4) "The Design of Reclaimed Latex Foam Package Cushioning," WADC TR 53-132.

SURVEY NO: B.3.1

PROJECT NO: 1364 TASK/CONTRACT/W.O. NO: 70831 and AF 33(038)-22184

TITLE: (Flight Control Technical Requirements) Transonic Control

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Flight Control Lab.

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: H. G. Stever

DESCRIPTION: The problems of the control of a military aircraft (airframe, autopilot and fire control system) in the transonic region, are being studied. Theoretical and experimental investigations will be made on the aerodynamic, aeroelastic, stability, control, and fire control computations, with reference to performance for military missions.

SURVEY NO: B.3.2

PROJECT NO: 1368 TASK/CONTRACT/W.O. NO: 13738 and AF 33(616)-485

TITLE: (Construction Techniques and Application of New Materials) Titanium Structures Development.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1956

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Boeing Aircraft Co., Seattle, Wash.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This contract covers design, fabrication and installation of a number of structural titanium forgings on present or future production aircraft. Fabrication and static, fatigue, creep, and elevated temperature tests are still in progress on three different titanium engine-mount forgings for the B-47.

SURVEY NO: B.3.3

PROJECT NO: 1368 TASK/CONTRACT/W.O. NO: 13738 and AF 33(038)-2182

TITLE: (Construction Techniques and Application of New Materials) Titanium Structures Development.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Consolidated Vultee Aircraft Corp., Fort Worth, Tex.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Titanium alloy jet-pod structural components have been static, dynamic, and service tested. The final report is being published.

SURVEY NO: B.3.4

PROJECT NO: 1368 TASK/CONTRACT/W.O. NO: 13434 and AF 33(038)-22456

TITLE: (Construction Techniques and Application of New Materials) Edge Attachment Development for Transparent Installations.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Swedlow Plastics Co., Los Angeles, Calif.

PRINCIPAL INVESTIGATOR: Mr. Liggett

DESCRIPTION: This task covers an investigation of existing edge attachments and their relations to failures in aircraft transparent installations. Present materials, used to fabricate the edge attachments, cause cracking of the transparent materials due to the differences of moduli of elasticity.

REPORTS:

(1) "Tensile and Tensile-Fatigue Properties of Transparent-Enclosure Attachments for Aircraft," WADC TR 53-106 (Unclassified), April 1953.

(2) "Study of the Design of Attachments for Transparent Plastic Enclosures for High Speed Pressurized Aircraft," Preliminary Report, (Confidential).

SURVEY NO: B.3.5

PROJECT NO: 1368 TASK/CONTRACT/W.O. NO: 13595

TITLE: (Construction Techniques and Application of New Materials) Plastic Wing Design.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Cancelled

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: WADC, Aircraft Lab., Wright Patterson Air Force Base, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The work involved in this task is the fabrication and flight-testing of experimental glass-fiber, reinforced, sandwich-type outer-wing panels to provide data and information for application to future aircraft and missile structures.

REPORTS:

(1) "Development of AMC AT-60 Glass Outer Wing Panel," AAF Tech Report No. 5576, (Unclassified).

SURVEY NO: B.3.6

PROJECT NO: 1369 TASK/CONTRACT/W.O. NO: 13527 and AF 33(616)-212

TITLE: (Alighting Gear Components) Internal Shock Absorber.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Bendix Aviation Corp., Bendix Product Div., South Bend, Ind.

PRINCIPAL INVESTIGATOR: R. W. Smith

DESCRIPTION: This task covers development of a shock strut which is housed completely within the wheel envelope. This design offers a weight-saving simplified installation, better performance and easier maintenance in the field. A solid rubber-tired wheel, size 30x8, was constructed with internal shock absorbers and laboratory, taxi, and flight tested. Instrumented comparison tests were made on this wheel with 34x9.9 pneumatic tires by using the standard B-25 landing gear.

Other pneumatic-tire wheels with internal shock struts were fabricated, laboratory tested, and airplane tested.

SURVEY NO: 3.3.7

PROJECT NO: 1369 TASK/CONTRACT/W.O. NO: 70523

TITLE: (Alighting Gear Components) Differentially Controlled Twin-Wheel Landing Gear.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Mechanics Research Br., (WCRRN), WPAFB, Ohio

PRINCIPAL INVESTIGATOR: C. L. Morrison

DESCRIPTION: The objective of this task is to investigate the dynamics of ground handling of aircraft in order to devise a more effective method of controlling the speed and direction of the aircraft while it is in contact with the ground. Primarily to investigate the principle of steering by differentially braking on a twin-wheel nose gear, which would eliminate the need for transmitting steering torque through the scissors link bearings and into the fuselage, allow braking on all wheels of the aircraft, eliminate steering cylinders and provide directional stability. Shimmy-free operation may become possible without the presently used hydraulic shimmy damper.

REPORTS:

Bi-monthly reports beginning Oct. 1954 and continuing into 1955 on the in-house effort are being made as the program progresses, a final report will be made upon completion of the program.

SURVEY NO: B.3.8

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13456 and AF 33(616)-2532

TITLE: (Aeroelasticity, Vibration and Flutter) Correlation of Vibratory Characteristics of Aircraft Structures with Incidence of Fatigue Failures.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: ARDC, Headquarters

CONTRACTOR OR LABORATORY: Cook Electric Co., Inland Testing Labs., Chicago, Ill.

PRINCIPAL INVESTIGATOR: H. G. White

DESCRIPTION: The object of this subtask is to determine the effects of alternating pressure loading in terms of vibration amplitude level, and to correlate the amplitude level of vibration with incidence of fatigue failures in typical aircraft fuselage structures. At the present time typical fuselage structural panels have been designed and the problem of simulation of the applied pressures resolved.

SURVEY NO: B.3.9

PROJECT NO: 1370 TASK/CONTRACT/W.O. NO: 13468 and AF 33(616)-2127

TITLE: (Aeroelasticity, Vibration, and Flutter) Vibrations and Mechanical Instabilities of Convertiplanes.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Air Research and Development Command, Headquarters

CONTRACTOR OR LABORATORY: Transcendental Aircraft Co., New Castle, Del.

PRINCIPAL INVESTIGATOR: W. E. Cobey

DESCRIPTION: The object of this task is to provide data and to establish analytical procedures for controlling or eliminating rotor induced vibrations and mechanical instabilities in convertiplanes. A contract under this task covers tests of small convertiplanes to evaluate a proposed technique for prevention of mechanical instabilities. Work to date has established that ground vibration tests are adequate to detect latent conditions which may lead to mechanical instabilities.

SURVEY NO: B.3.10

PROJECT NO: 3340 TASK/CONTRACT/W.O. NO: 33024 and AF 33(600)-6473

TITLE: (Rotor Aerodynamics) High-Tip Speed Rotor Flight Tests.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Bell Aircraft Corp., Fort Worth, Tex.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task consists of the design, fabrication, and flight testing of a high-tip speed rotor. The design shall include a study of the centrifugal force, chordwise natural frequency, mass balance, and structural characteristics of the blades. Flight-test results will be compared with analytical predictions and with results of tests on conventional rotors.

SURVEY NO: B.3.11

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33010 and AF 33(616)-260

TITLE: (Rotor Blades) Steel Blade Variation Investigation.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Prewitt Aircraft Co., Clifton Heights, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Under this task additional development was accomplished on steel blades of the types being developed for the H-25 and H-16 helicopters. This development is applicable to articulated rotor blades in general. Variations in materials and structural methods were studied, tested, and evaluated.

REPORTS:

(1) "Stress Analysis of Variations in Bonded Steel Blades," PAC Report 60-93-1, (Unclassified), 31 October 1952.

(2) "Bending and Compression Tests on Various Blade Aft Section Structures," PAC Report 60-95-1, (Unclassified), 9 March 1953.

SURVEY NO: B.3.12

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33011 and AF 33(600)-23141

TITLE: (Rotor Blades) Metal Teetering Rotor Blades.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Bell Aircraft Corp., Helicopter Div., Fort Worth, Tex.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will develop an all-metal blade suitable for use on the H-13 and H-23 helicopters. This development will be applicable to teetering-type rotors in general. The first set of blades has been developed and delivered to WADC for whirl tests. The remaining blades required by this contract are in various stages of assembly. Fatigue-testing of the blades is being started. Flight tests are to be performed.

SURVEY NO: B.3.13

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33012 and AF (600)-22753

TITLE: (Rotor Blades) Brazed Steel Blades.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Parsons Corp., Aircraft Div., Traverse City, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A study has been made of the brazing process as applicable to rotor-blade fabrication with special emphasis placed on exposure to alternating stresses. Blades of promising designs utilizing brazed steel construction have been fabricated. The fatigue tests on these blades have been completed.

REPORTS:

(1) "Review of Literature Relating to Fatigue Strengths and Discussions of Potential Endurance Limits of Silver Alloy Bonds," Parsons Industries Report M-234-5, (Unclassified), 2 April 1953.

SURVEY NO: B.3.14

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33014 and AF 33(616)-269

TITLE: (Rotor Blades) Aluminum Blade Variation Investigation.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Bell Aircraft Corp., Helicopter Div., Fort Worth, Tex.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will further develop aluminum blades of the type presently under development for the Bell convertiplane. Optimum variations in materials and structural methods are being determined by studies, tests, and evaluations. Material and adhesive investigations have been completed. Three blades have been fabricated and are undergoing structural test

SURVEY NO: B.3.15

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33015 and AF 33(616)-385

TITLE: (Rotor Blades) Extruded Aluminum Rotor Blades.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Terminated 1954

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Jacobs Aircraft Engine Co., Pottstown, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The purpose of this task is the study of the extrusion process in general as applicable to rotor blade fabrication. Design studies, whirl, and flight tests will be made on an extruded aluminum blade.

REPORTS:

(1) "Bibliography on Aluminum Extrusions," Jacobs Aircraft Engine Company Report 104-B-02, (Unclassified) 28 April 1953.

(2) "Preliminary Analysis-Extruded Rotor Blades," Jacobs Aircraft Engine Company Report 104-B-03, (Unclassified), 27 April 1953.

(3) "Extrusion Process Applied to Rotor Blade Fabrication, Part I, General Investigation of Extrusion Process," Jacobs Aircraft Engine Company Report 104-B-01, (Unclassified), 26 June 1953.

SURVEY NO: B.3.16

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33029 and AF 33(616)-328

TITLE: (Rotor Blades) Study of Adhesives in Rotor Blade Fabrication.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Prewitt Aircraft Co., Clifton Heights, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A study was made of the application of adhesives in laminated metal rotor blade structures. Test specimens were fabricated and tested under static and fatigue loadings. This work has been reported in preliminary form. The data are being prepared in WADC Technical Report form for release to industry.

SURVEY NO: B.3.17

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33078 and AF 33(600)-28125

TITLE: (Rotor Blades) Reinforced Plastic Blade Development.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Piasecki Helicopter Corp., Morton, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will be accomplished by a design study to compare reinforced plastic characteristics against requirements for a rotor blade. Blade samples will be fabricated and static and fatigue tests will be conducted. Pending satisfactory completion of this work, blades for whirl and flight tests will be fabricated.

SURVEY NO: B.3.18

PROJECT NO: 3342 TASK/CONTRACT/W.O. NO: 30227

TITLE: (Rotor Hubs) Helicopter Transmission Vibration Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: WADC, Power Plant Laboratory, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Under this task, causes of destructive vibrations in transmission systems are being investigated and methods are being evolved to eliminate transmission failures resulting from these vibrations. Progress has been made in the study of the theoretical behavior of various helicopter and convertiplane transmission systems. Existing and potential transmission systems are being studied by means of mechanical and electrical analogies and by mathematical computation.

SURVEY NO: B.3.19

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 33048 and AF 33(616)250

TITLE: (Aircraft Propeller Blades) Propeller Blade Structures Investigation

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Cornell Aeronautical Laboratory, Buffalo, N.Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Work under this task will establish design criteria required for structurally safe blades and will present a balance between aerodynamic considerations and structural requirements. It will include the necessary prototype testing to confirm these criteria.

Tests on the first model propeller are approximately 85 percent completed.

Fatigue data have recently been obtained on 91 full-scale blades (making a total of 112 to date) which had been gouged to simulate environmental damage and vibrated to failure. The relative merit of the different types of structures has been evaluated.

SURVEY NO: B.3.20

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: W33-038-ac-14847

TITLE: (Improved Electronic Equipments) D. C. Relay.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: June 1946 COMPLETION DATE: June 1949

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Laboratory

CONTRACTOR OR LABORATORY: Struthers-Dunn, Inc., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: Mr. Packard

DESCRIPTION: A SPDT, dc, 26.5 volt relay (hermetically sealed and resistant to vibration, shock, and extreme temperatures) was developed under this task. This device weighs approximately 2-oz and occupies 1.2 cu in of space.

REPORTS:

(1) Memorandum Report MCREE 49-34

SURVEY NO: B,3,21

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41569 and AF 33(038)-1405

TITLE: (Improved Electronic Equipments) Miniature Hermetically Sealed, 2, 3, and 4 Pole-400 cycle Relay.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: Struthers-Dunn, Inc., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: Mr. Packard

DESCRIPTION: The objective is to develop a 400 cycle relay, hermetically sealed, small size, lightweight, and capable of withstanding extreme service conditions. This device is for use in high-speed aircraft and missiles where reduced malfunctioning due to shock is required.

SURVEY NO: B.3.22

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41577 and AF 33(038)-8947

TITLE: (Improved Electronic Components) Sensitive Double Pole Double Throw DC Relay.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: Struthers-Dunn, Inc., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: Mr. Packard

DESCRIPTION: The object is to develop a miniature, hermetically sealed hard vacuum-sensitive relay. This relay will provide for applications where extreme shock and vibration requirements are met in high-speed aircraft and guided missiles.

SURVEY NO: B.3.23

PROJECT NO: 4155 TASK/CONTRACT/W.O. NO: 41579 and AF 33(038)-15486

TITLE: (Improved Electronic Components) Double Pole Double Throw Hermetically Sealed Miniature DC Ratchet Relay.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Electronic Components Lab.

CONTRACTOR OR LABORATORY: Struthers-Dunn, Inc., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: Mr. Packard

DESCRIPTION: The object is to develop a miniature, ratchet-type hermetically sealed relay capable of contact continuity even though energizing voltage is discontinued. The results of this development will provide light weight relays, of less than 3-oz, operating from 26.5 volts dc supply under conditions of excessive vibration and shock in high-speed aircraft and missiles.

SURVEY NO: B.3.24

PROJECT NO: 4526 TASK/CONTRACT/W.O. NO: 45153A, AF 30(602)-96, AF 30(602)-913

TITLE: (Electronic Design and Applied Techniques) Electronic Chassis Design for Dynamic Loads.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Sept. 1955

DIRECTING AGENCY: Rome Air De .lopment Center

CONTRACTOR OR LABORATORY: Carnegie Institute of Technology, Pittsburgh, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is to develop a method for the design of electronic chassis subjected to shock and vibration. The task will provide the Air Force with a method for the design of electronic chassis which, when subjected to dynamic loads, will reduce the amount of acceptance testing required to meet shock and vibration specifications.

REPORTS:

(1) Mechanical Design of Electronic C ssis, Part III, Apr. 1955.
(2) Mechanical Design of Electronic Chassis, Part II, Dec. 1954.
(3) Mechanical Design of Electronic Chassis, Part I, Nov. 1953.

SURVEY NO: B.3.25

PROJECT NO: NE 111-605 TASK/CONTRACT/W.O. NO: NObsr-39183

TITLE: (Magnetron Development and Investigation) Ruggedized 2j51 Electron Tube.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1947 COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 816

CONTRACTOR OR LABORATORY: Raytheon Mfg. Company, Waltham 54, Mass.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task involved the development of a ruggedized, high-power, long-life magnetron. A ruggedized version of the 2j51 magnetron capable of operating at 10 g continuous shock; capable of withstanding 800 g shock for short durations, and having a minimum life expectancy of 5,000 hr, was developed and sample tubes were manufactured.

REPORTS:

Progress Reports 1 through 44 for period 1 August 1947 to 1 August 1951.

SURVEY NO: B.3.26

PROJECT NO: NE 110-231 TASK/CONTRACT/W.O. NO: NO bsr-49199

TITLE: (Electron Tube Reliability) Cathode Ruggedization.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 816

CONTRACTOR OR LABORATORY: Superior Tube Co., Norristown, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This investigation is aimed at making a stronger cathode for more reliable tubes. This is to be obtained by searching for new materials or alloys and by improving physical design. Deflection measurements are continuing in order to determine the difference between theoretical and experimental behavior in an analysis of the deflection strength of tubing.

REPORTS:
Monthly progress reports are available.

SURVEY NO: B.3.27

PROJECT NO: 3-19-03-023 TASK/CONTRACT/W.O. NO: DA36-039SC-5554

TITLE: (Planar Type Tubes) Rugged R-F Pencil Type Pulsed Power Output Tubes.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1951 COMPLETION DATE: May 1953

DIRECTING AGENCY: Signal Corps Engineer Laboratories

CONTRACTOR OR LABORATORY: RCA Laboratory, Camden, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tubes developed under this task are to be constructed so as to withstand extreme shocks and torques. Investigations were made on grid-disc design, filament-lead design, and glass problems. A new tube was developed which permits locking the grid disc tightly without spring compliance. This tube can be thrown to the floor violently several times without damage. Modifications of this tube resulted in Type 5794 cavity construction. The 5794 version of the rugged pencil tube has been completed and tested.

REPORTS:

RCA Final Report on Contract DA36-039 sc-5554 for the period from May 1951 to May 1953.

SURVEY NO: B.3.28

PROJECT NO: 3-19-03-023 TASK/CONTRACT/W.O. NO: T322-C and DA36-039sc-42689

TITLE: (Planar Type Tubes) Ruggedized Pencil Tube and Cavity Combination.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: February 1955

DIRECTING AGENCY: Signal Corps Engineering Laboratories

CONTRACTOR OR LABORATORY: Radio Corp. of America, Harrison, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Work is continuing on design and development of a grid and plate modulated S-band pulsed cavity and tube combination possessing a high degree of stability under shock, vibration, and temperature changes. Experimental units tested to date have met electrical and thermal requirements, but some difficulties have been experienced in reaching the high acceleration (10,000 g) specification.

REPORTS:

Quarterly Reports Nos. 3, 4, 5 and 6 on contract DA 36-039 sc-42689.

SURVEY NO: B.3.29

PROJECT NO: NL 430-013 TASK/CONTRACT/W.O. NO: PTR-EL-46009

TITLE: (Test and Evaluation of ASW Devices) MAD Detecting Head.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: Continuing

SPONSORING AGENCY: Bureau of Aeronautics (EL-46)

CONTRACTOR OR LABORATORY: Naval Air Test Center, Patuxent River, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task involves simulated carrier tests to obtain the magnitudes, durations, and frequencies of shocks experienced by the detecting head during catapult shots and arrested landings. Also, the progressive extent of any visible mechanical failure, or damage is to be determined by periodic examinations of the detecting head during the simulated carrier operations.

SURVEY NO: B.3.30

PROJECT NO: NL 490-148 TASK/CONTRACT/W.O. NO: ADC-EL-41032

TITLE: (Development and Test at Naval Air Development Center) Reliability Investigation.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (EL-41)

CONTRACTOR OR LABORATORY: U. S. Naval Air Development Center, Johnsville, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This is a reliability investigation composed of two parts: The first part provides for the evaluation of the stress-to-failure test principle outlined in NADEVCEN Report No. NADC-EL-5467. The second part is an investigation of the validity of environmental criteria called out in current specifications for electronic and electrical equipments, and includes a study of the methods used for obtaining that criteria.

REPORTS:

Interim engineering reports, if available, are obtainable from Aer-EL-41; and final reports, if available, from Aer-TD-4.

SURVEY NO: B.3.31

PROJECT NO: NA 543-026 TASK/CONTRACT/W.O. NO: TED NAM AE-6311

TITLE: (Escape from High Performance Aircraft) Mechanism for, Development and Test of.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1/25/46 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AE-63)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Medical Equipment Lab., Mech. Equipment Design Div., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: W. Law

DESCRIPTION: To develop systems for pilots' escape from high-performance aircraft. To determine whether these systems will exceed the physiological limits of human subjects. To develop, test, and evaluate emergency escape ejection seats and seat components and the effects of such equipment on the resultant dynamic responses in the system. To develop catapult-cartridge configurations which will provide safe escape for various aircraft configurations.

REPORTS:

(1) "Pilots' Escape from High Performance Aircraft - Interim Report on Live Ejection from Aircraft in Flight at Lakehurst, New Jersey on 30 Oct. 1946," Report TED NAM 256005, 16 Dec. 1946.

(2) "Evaluation of a Face Curtain and Arm Rests for Use on Ejection Seats," Report TED NAM 256005, Report No. 4 of 5 Mar. 1947.

(3) "Effect of Temperature on the Performance of the Martin-Baker Multiple Charge Ejection Seat Catapult," Report TED NAM 256005, Report No. 3 of 14 Mar. 1947.

(4) "Pilot Ejection Seat - Separation of Personnel - Catapult Tubes - Flame and Blast Effects - Resulting from - Investigation of," Report TED NAM 256005, XG-T-115 of 30 Apr. 1949.

(5) "Pilot Ejection Catapult Cartridges - Tests of Experimental Propellants; results of," Report TED NAM 256005, XG-T-124 of 21 Sept. 1949.

SURVEY NO: B.3.32

PROJECT NO: NA 543-026 TASK/CONTRACT/W.O. NO: D 15206 and E 15260

TITLE: (Escape from High Performance Aircraft) Development and Test of Ejection Seats and Capsules.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1/5/51 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AE-63)

CONTRACTOR OR LABORATORY: U. S. Naval Air Material Center, Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task covers development, test and/or evaluation of emergency escape means from high performance aircraft.

An evaluation program for NAMATCEN Type X-2 and X-3 ejection seats has been conducted including dynamic drop tests, static tests, and ground ejections in a net. The results of these tests were evaluated and a report will be completed in the near future.

Ejection tower tests of the 35-inch stroke catapult system for the Douglas A4D ejection seat has been completed and the results are being evaluated.

Other tests and evaluations which have been made include catapult system tests, new catapult firing-head evaluation tests, water-impact and stability tests, sled tests, and flight tests.

REPORTS:

Copies of reports are available at BuAer (AE-63)

SURVEY NO: B.3.33

PROJECT NO: NA 543-030 TASK/CONTRACT/W.O. NO: N7 onr 39416

TITLE: (Crash Safety Investigation and Related Equipment) Investigation of Absorption Characteristics of Aircraft Structural Members Under Dynamic Loads.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 3/17/52 COMPLETION DATE: Inactive

DIRECTING AGENCY: Bureau of Aeronautics (AE-63)

CONTRACTOR OR LABORATORY: Purdue University, Lafayette, Ind.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task was established in order to ascertain ways and means of reducing the hazard to occupants in airplane crashes through research on the structural design of aircraft. The crashworthiness of various items of aircraft equipment, carry-through and basic structures were determined by dynamic load tests.

SURVEY NO: B.3.34

PROJECT NO: NA 543-026 TASK/CONTRACT/W.O. NO: TED NAMAE-6315

TITLE: (Escape from High Performance Aircraft) Development of Improved Pilot Restraint Devices which Incorporate Reduction of Lateral Movement.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 7/17/51 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AE-63)

CONTRACTOR OR LABORATORY: U. S. Naval Air Material Center, Aeronautical Medical Equipment Lab., Philadelphia 12, Pa.

PRINCIPAL INVESTIGATOR: R. Fonash

DESCRIPTION: To investigate the dynamic and physiological effects of those forces tending to cause lateral movement of seated airmen during crash landings. To develop basic data upon which to base preliminary designs of an improved restraint system which introduces lateral restraint. To fabricate and/or test new designs of improved systems which provide for forward and lateral restraint.

SURVEY NO: B.3.35

PROJECT NO: NA 581-146 TASK/CONTRACT/W.O. NO: NOas 51-408-f

TITLE: (High Temperature and Structural Metallic Materials) Development, Fabrication and Test of Titanium Nose Gear Shock Strut Cylinder for P2V-4 Airplane.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 2/51 COMPLETION DATE: 1/56

DIRECTING AGENCY: Bureau of Aeronautics (AE-41)

CONTRACTOR OR LABORATORY: Menasco Mfg. Co., Burbank, Calif.

PRINCIPAL INVESTIGATOR: J. I. Hamilton

DESCRIPTION: In order to reveal and to solve, in so far as practicable, the problems to be encountered in the manufacture of large titanium aircraft components, typical aircraft-landing-gear, shock strut cylinders are being designed, manufactured and tested. This program is supplemented by an additional contract for development of the original forging billets. 3% aluminum - 5% chromium titanium alloy has been selected on the basis of properties obtained as the material to be used. Data are being collected on all phases of the manufacture of such components including forging, heat treatment, properties obtained, surface hardening, machining, and final test performances. The standard aircraft drop tests are being used to evaluate the suitability of the aircraft components.

SURVEY NO: B.3.36

PROJECT NO: NA 820-182 TASK/CONTRACT/W.O. NO: NOas 54-537-c

TITLE: (Hydrodynamic Investigations) Characteristics of Seaplane Alighting Gears.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: March 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-31)

CONTRACTOR OR LABORATORY: Stevens Institute of Technology, Hoboken, N.J

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Reduction of data from the testing of a dynamic model of the DR-77 seaplane has been completed. Tests of hydrodynamic resistance throughout the takeoff range, takeoff stability, and landing impact were made with the following configurations: a planing tail hull, a 40° deadrise vee-step hull, a 30° deadrise hull with combination hydrofoil-skis, and a 40° deadrise hull with lowered keel forebody. The final report is being prepared.

SURVEY NO: B.3.37

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 247.1

TITLE: (Structural Development and Test) Evaluation of Structural Failure of Model AD-4N Airplane Wing.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 9/3/53

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: U. S. Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A correlation was made of the structural failure of the wing of the subject airplane with the failures of the wing panels tested under repeat-load conditions in task TED NAM DE 247.

REPORTS:

(1) ASL report No. ASL NAM DE-247.1, "Evaluation of Structural Failures of Model AD-4N Airplane Wings," dated 3 September 1953.

SURVEY NO: B.3.38

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 247.2

TITLE: (Structural Development and Test) Development of Modification to the AD Wing Structure to Increase Fatigue Life.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: March 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: U. S. Naval Air Material Center, Aeronautical Structures Laboratory, Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Modifications to the wing structures of AD aircraft are to be developed which will extend the fatigue life of these aircraft to the maximum practicable extent. Test specimens are being obtained, test jigs are being designed and built, and modified fittings for certain areas of the wing have been obtained for installation in the test articles.

SURVEY NO: B.3.39

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 281

TITLE: (Structural Development and Test) Repeat Load Tests on Model F8F Airplane Wings.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 11/20/52

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: U. S. Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests were conducted to determine the fatigue life of an F8F airplane wing for various load levels. A satisfactory modification of the wing structure was developed to increase the fatigue life of the wing.

REPORTS:

"Repeat Load Tests of Model F8F Airplane," ASL Report No. ASL NAM DE-281, 20 Nov. 1952.

SURVEY NO: B.3.40

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: NOa(s) 10929

TITLE: (Experimental Structures and Structural Design Criteria) Development of Prewitt All-Metal Rotor Blade.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 2/6/52

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Prewitt Aircraft Co., Clifton Heights, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Static and fatigue tests were conducted on the rotor blades constructed under Contract NOa(s) 9054 by the Piasecki Helicopter Corporation.

REPORTS:

(1) "Stress Analysis of HUP Experimental and Production Rotor Blades for Increased Damper Load," Prewitt Aircraft Company Report No. 32-93-3, 26 June 1951.

(2) "Final Corrected Data, Model 32 Rotor Blade for Piasecki HUP-2 Helicopter," Prewitt Aircraft Company Report No. 32-103-2, Revision A, 6 Feb. 1952.

(3) "Stress Analysis of Supernumerary Retention of Inboard End of HUP Metal Rotor Blade," Prewitt Aircraft Company Report No. 36-93-2, 27 June 1951.

SURVEY NO: B.3.41

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: NOas 52-030-c

TITLE: (Experimental Structures and Structural Design Criteria) Adhesive Bonded Metal Panels.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 4/15/54

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: The Glenn L. Martin Co., Baltimore 3, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To determine the practicability of utilizing adhesive-bonded, all-metal sandwich construction in the fabrication of primary structures for piloted aircraft, the performance characteristics of panels of various types were compared. The panels tested were for possible application to primary wing structures. The performance characteristics were determined by compression and bending-fatigue tests.

REPORTS:

"Adhesive-Bonded Panels as Primary Wing Structures," The Glenn L. Martin Company Engineering Report No. 5747, 15 Apr. 1954.

SURVEY NO: B.3.43

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOas 51-806-c

TITLE: (Aircraft Structural Loads Development) Analytical Investigatio to Determine the Effects of Blast Loading on Naval Aircraft.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Massachusetts Institute of Technology, Cambridge, Mass.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Methods of analysis for the determination of blast-loading effects were developed and applied in calculating the effects of blast loading on certain heavy aircraft.

SURVEY NO: B.3.44

PROJECT NO: NT 003-008(a) TASK/CONTRACT/W.O. NO: ---

TITLE: (Droppable Airborne Packaging for Free-Fall into Water) Container.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Supplies and Accounts

CONTRACTOR OR LABORATORY: U. S. Naval Supply Research and Development Facility, Bayonne, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An expendable, lightweight device was designed and constructed, which will provide expeditious means of delivering critical supplies of small weight and volume by air drop to submarines and surface ships at sea. This device utilizes an air retarding element in conjunction with a penetration nose to decrease the magnitude of the water impact shock to a safe operating level. It was designed for a maximum gross weight of 60-lb, a maximum aircraft launching air speed of 120 knots, and an optimum drop altitude of 500 ft.

REPORTS:

"Aerial Delivery Container," Engineering Report No. 2.9011 Subproject NT003-008(a), 15 June 1954.

SURVEY NO: B.3.45

PROJECT NO: NS 126-008 TASK/CONTRACT/W.O. NO: PR 548-747 and P.O. 01791/52

TITLE: Development and Test of Plumbing Fixtures and Associated Equipment.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 12/10/48 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 548

CONTRACTOR OR LABORATORY: U. S. Naval Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Fixtures and fittings and other equipments incorporating lightness, strength, corrosion resistance, economical consumption of water, and resistance to high-impact shock are being developed and tested. The following reports describe the work that has been accomplished under this project.

REPORTS:

(1) "Plumbing Fixtures, Water Saver Faucet Co., Chicago, Ill.," EES Report C-3872, 18 Aug. 1950.

(2) "Sea Water Corrosion Tests of Monel Metal Urinals, Monel and 70:30 Copper-Nickel Water Closets, and Slean Naval Flush Valves," EES Report 4A(2)066735, 17 Nov. 1950.

(3) "Shower Heads of Various Manufacturers," EES Report C-3962, 19 Dec. 1950.

(4) EES Report 3C240002, 7 Nov. 1951.

(5) EES Report 3H240002, 30 Nov. 1951.

(6) EES Report 3H966797, 21 Mar. 1951.

(7) EES Report 4B966797, 14 Feb. 1951.

(8) EES Report 4C240002, 16 July 1951.

(9) EES Report 5C066735, 16 Apr. 1951.

(10) "Instantaneous Hot Water Heaters," EES Report 3G966797, 28 Feb. 1952.

(11) "Scraper Type Strainers," EES Report 3L966797, 14 Nov. 1952.

(12) "Closet Seats," EES Report 3M966797, 2 Sept. 1952.

(13) "Flush Valves," EES Report 030026, 7 Jan. 1953.

(14) "Flush Valves," EES Report 030034, 4 Dec. 1952.

(15) "Plastic Plumbing Fixtures," EES Report 030031, 8 Sept. 1953.

(16) "Plastic Water Closet Seats," EES Report 030053B, 18 Nov. 1953.

(17) "Sarco Co. Exhibitor," EES Report 050068, 10 June 1954.

(18) "Dole Flow Control Valves," EES Report 030140, 5 Jan. 1955.

SURVEY NO: B.3.46

PROJECT NO: NS 128-021 TASK/CONTRACT/W.O. NO: P.O. 30C02/56

TITLE: Development and Test of Piping Accessories and Pipe Fittings for Shipboard Use.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 548

CONTRACTOR OR LABORATORY: U. S. Naval Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Piping accessories and pipe fittings which are considered to have application either in present or modified design to fulfill the needs of the naval service are being tested. The requirements of these accessories and fittings are reduced space and weight; economy of operation, installation and maintenance; satisfactory operation when inclined and when subjected to shock and vibration as encountered on board ship.

REPORTS:

(1) "Pipe Hangers, Evaluation of," EES 030099, 27 Jan. 1955.
(2) "Traps, Steam, High Capacity Design for DE-Superheater at 600 and 1200 psi Qualification," EES 030156, 25 Mar. 1955.
(3) "Pipe Hangers, Constant Supports," EES 030167, 18 Mar. 1955.
(4) "Traps, Inverted Bucket," EES 03193, 24 May 1955.
(5) "Expansion Joints, Pipe, Synthetic Rubber Retardant," EES 030215, 1 Apr. 1955.
(6) "Preliminary on Laboratory Procedures," EES 050036, 27 Aug. 1953.
(7) NP/L5/S48(732D) Test 030014, EES ltr Report, 3 Feb. 1954.
(8) "Zellear Joint Test," EES Report No. 030014B, 26 July 1954.

SURVEY NO: B.3.47

PROJECT NO: NS 130-001 TASK/CONTRACT/W.O. NO: P.O. 01761/51

TITLE: (Air Conditioning Development and Improvement of Systems, Equipments, and Components) Testing and Modification of Humidistat.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 12/29/51

DIRECTING AGENCY: Bureau of Ships, 549

CONTRACTOR OR LABORATORY: U. S. Naval Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A standard commercial type humidistat was tested and modified in order to improve its high shock characteristics.

REPORTS:

EES Report 5B101761, 29 Dec. 1951.

SURVEY NO: B.3.48

PROJECT NO: NS 130-001 TASK/CONTRACT/W.O. NO: P.O. 01762/51

TITLE: (Air Conditioning Development and Improvement of Systems, Equipments, and Components) Shock Tests.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 3/18/48 COMPLETION DATE: 6/18/51

DIRECTING AGENCY: Bureau of Ships, Code 549

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Materials Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An investigation of the performance and shock characteristics of a 32 g steam regulator with type "R" thermostat has been completed.

REPORTS:

Mat. Lab. Report 4799-8B, 18 July 1951.

SURVEY NO: B.3.49

PROJECT NO: NS 130-001 TASK/CONTRACT/W.O. NO: NObs-56118

TITLE: (Air Conditioning Development and Improvement of Systems, Equipments, and Components) Development and Evaluation of New Design of Unit Cooler.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Ships, Code 549

CONTRACTOR OR LABORATORY: Marlo Coil Co., St. Louis 10, Mo.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An improved type unit cooler was designed and tested. The characteristics of the cooler make it particularly desirable for shipboard installation as it has a compact arrangement, low noise, and good resistance to high-impact shock.

SURVEY NO: B.3.50

PROJECT NO: NS 621-083 TASK/CONTRACT/W.O. NO: P.O. 10751/55

TITLE: (Propulsion and Auxiliary Steam Turbine Improvement) Turbine Blade Investigation and Tests.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 451

CONTRACTOR OR LABORATORY: U. S. Naval Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task is for the purpose of investigating, testing, and evaluating turbine blades which are cast, fabricated, or machined from the most promising materials.

The following tests have been performed:

Test 4A966776 (formerly Test C-3992): Creep, tensile, and fatigue tests were performed on a chromized coated blade.

Test 4D066876: In an effort to increase the fatigue resistance of turbine buckets, type S60-B-50877-2725, critical root section areas were shot peened and vibratory fatigue tested. Redesigned buckets were later received and similarly tested.

REPORTS:

(1) EES Report 4D066876.
(2) EES Report 4D(2)066876.
(3) EES Report C-3992, 4 May 1950.

SURVEY NO: B.3.51

PROJECT NO: NS 687-017 TASK/CONTRACT/W.O. NO: NObs-45435 and NObs-62284

TITLE: (Interior Communications and Fire Control Power Systems and Components) Automatic Bus Transfer Equipment.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 565

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y. and Westinghouse Electric Co., Pittsburgh, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task covers the development of new and improved automatic bus transfer equipment capable of automatically switching two or three main power supplies with a minimum of time delay. This equipment is to be extremely shock-proof and vibration resistant.

A 600 amp, 450 volt TPTT-ABT equipment has been developed and accepted for Naval shipboard use. The switch is HI-shock proof, vibration resistant, and has a short circuit current rating of 22000 amp rms (4 cycles). Also, 600 amp, 450 volt, 3-way transfer switches manufactured under NObs-62284 are being delivered and installed on new aircraft carriers.

REPORTS:

Material Laboratory Final Report 4805-7.

SURVEY NO: B.3.52

PROJECT NO: NS 687-017 TASK/CONTRACT/W.O. NO: NObs-46801 NObs-46496 and NObs-47228

TITLE: (Interior Communication and Fire Control Power Systems and Components) Fuzes and Fuze Holders.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Ships, Code 565

CONTRACTOR OR LABORATORY: Bussman Mfg. Co., St. Louis 7, Mo. and New York Naval Shipyard, Material Laboratory, New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Double and single fuzeholders have been developed under contract NObs-46801. These fuzeholders are suitable for current ratings up to 30 amp at 120 volts. Also a fuzeholder has been developed under this contract for 1-1/2-in. by 13/32-in. fuzes with ratings up to 30 amp, 450 volts. These fuzeholders are fire- and arc-resistant and suitable for use under conditions of high-impact shock and vibration.

A fuze, dimensions 1-1/4-in. by 1/4-in. with rating up to 30 amp was developed under NObs-46496. This fuze met the contract requirements of HI shock and high short circuit interruption (25,000 amp).

A 1-1/4-in. by 1/4-in. fuze with a time delay feature, and rating up to 1 amp was developed under NObs-47228.

REPORTS:

(1) Material Laboratory Reports:
No. 4330-110, 23 May 1949
No. 4330-110A, 3 Apr. 1950
No. 4330-111, 29 July 1949
No. 5245-2, 21 Sept. 1950
No. 5241-A, 26 Sept. 1951

SURVEY NO: B.3.53

PROJECT NO: NS 687-017 TASK/CONTRACT/W.O. NO: NObs-54671

TITLE: (Interior Communication and Fire Control Power Systems and Components) Automatic Bus Transfer Equipment.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 565

CONTRACTOR OR LABORATORY: Arrow-Hart and Hegeman Electric Co., Hartford 6, Conn.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The 100 amp, 450 volt TPDT ABT equipment has been developed and accepted for naval service. This equipment is HI shock and vibration proof, and has a short circuit rating of 15,000 amps, rms (1/2 cycle). Tests have been conducted at the Material Laboratory, New York Naval Shipyard.

REPORTS:

Material Laboratory Final Test Report, Project 5545-3.

SURVEY NO: B.3.54

PROJECT NO: NS 687-017 TASK/CONTRACT/W.O. NO: NObs-55567

TITLE: (Interior Communication and Fire Control Power Systems and Components) Automatic Bus Transfer Equipment.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 565

CONTRACTOR OR LABORATORY: Arrow-Hart and Hegeman Electric Company, Hartford 6, Conn.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The 50 amp and 100 amp, 120 volt and 450 volt, 2-way, shock-proof, vibration-resistant transfer equipments have been developed and tested by the Material Laboratory, New York Naval Shipyard.

REPORTS:

Material Laboratory Final Test Report 5545-3.

SURVEY NO: B.3.55

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: P.O. 10742/55

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Anti-Submarine Type Hulls) Tests of Riveted and Welded Connections for Two Types of Aluminum Alloy.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, UERD, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: W. P. Wise

DESCRIPTION: Rectangular plates 5-ft x 7-ft and open-ended cylinders fabricated from aluminum alloys Nos. 54 and 56 were explosive tested to determine the relative merits of various connections.

REPORTS:

(1) UERD Report No. F-40-53, AL-T Program, Part II (Confidential).

(2) UERD Report No. F-41-53, AL-A Program, Part III (Confidential).

SURVEY NO: B.3.56

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10709/54 and P.O. 10743/55

TITLE: (Strength of Ship Structure) Transverse Framing Design Criteria.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 11/18/47 COMPLETION DATE: Suspended

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: E. E. Johnson

DESCRIPTION: The purpose of this task was to develop improved methods of designing transverse framing based on data obtained from model tests, analyses, and full-scale measurements, as required. Some work was done with steel and plastic models of frames. Strains and distortions of the CL-108 frames due to underwater explosions, were measured. Strains in the framing of the USS CHARLES R. WARE at sea and in drydock, were measured.

REFERENCES:

(1) "The Measurement and Control of Keel Block Loads During Drydocking Tests of the USS CHARLES R. WARE (DD865)," TMB Report C-174, August 1949.

(2) "Measurement of Behavior of Transverse Framing on the Hull CL-108 During Underbottom Explosion Attack," TMB Report C-184, Feb. 1950.

SURVEY NO: B.3.57

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: N7 onr-39303

TITLE: (Ship Structure) Ultimate Strength of Welded Continuous Frames and their Components.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 6/15/48 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Lehigh University, Bethlehem, Pa.

PRINCIPAL INVESTIGATOR: Lynn S. Beedle

DESCRIPTION: This task is concerned with the development, by test and analysis, of practical design procedures to make use of the additional carrying capacity of statically indeterminate steel frames beyond the elastic limit. A large number of full-scale tests of columns, welded frames, and continuous beams and corner connections have been made.

REPORTS:

(1) "Column Strength Under Combined Bending and Thrust," Report No. 6, Dec. 1952.

(2) "An Evaluation of Plastic Analysis as Applied to Structural Design," Report No. 8, Sept. 1952.

(3) "Plastic Strength and Deflections of Continuous Beams," Report No. 9, November 1952.

(4) "Plastic Deformation of WF Beam Columns," Report No. 10, July 1953.

(5) "Contribution to the Problem of Ultimate Carrying Capacity of Simple and Continuous Beams of Structural Steel and Timber," Report N, Oct. 1951.

(6) "The Moment-Curvature Relation for Wide Flange Sections," Report P, Sept. 1952.

(7) "Inelastic Local Buckling of Wide Flange Sections," Report Q, May 1952.

(8) "Moment Rotation Characteristics of Beam Columns," Report R, Nov. 1952.

(9) "Compression Tests on Short Steel Columns of Rectangular Cross-Section," Report S, June 1953.

(10) "Buckling of Steel Angles in the Plastic Range," Report T, Aug. 1953.

(11) "Collapse Strength of a Welded Single Bay Frame," Report U, Aug. 1953.

(12) "A Vertical Displacement Method for Determining the Stability of Beam Columns Above the Elastic Limit," Report V, Mar. 1954.

(13) Summary Report, Report Z, August 1954.

(14) Rules of Practice in Plastic Design, Interim Report 26, Aug. 1954.

SURVEY NO: B.3.58

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: P.O. 824/47

TITLE: (Investigation of Aircraft Carrier Structures) Flight Deck Test of the CVB-42.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 4/29/48

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This test was conducted at Norfolk between 18 March and 6 April 1948. It was a joint test with Taylor Model Basin.

From previous actual landing tests on the CVB-42 conducted in October 1946, it was found that equivalent static loads could be used to duplicate the landing loads. A loading carriage, consisting of four water ballast tanks (with a total capacity of 100,000 lb) mounted on a frame work fitted with an actual F7F landing gear, was used to apply loads to the deck structures.

Typical areas of the flight deck were selected and the structures in the way of these areas were instrumented with strain and deflection gages to determine structural behavior under the applied static loads.

REPORTS:

CVB-42 Test Data, Submitted by NAVSHIPYDNOR Letter CVB-42/CV/S11(1-251), 29 April 1948.

SURVEY NO: B.3.59

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: NObs-4[illegible]94

TITLE: (Investigation of Aircraft Carrier Structures) Analysis of CVB-42 Flight Decks.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 2/28/52

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Westcott Engineering Co., Chicago, Ill.

PRINCIPAL INVESTIGATOR: N. M. Newmark

DESCRIPTION: This analysis was made in order to determine design principles relating to flight decks. The ability of existing aircraft carrier structures to carry new developments in catapults, arresting, and handling gears becomes more and more in doubt, with the use of heavier aircraft.

REPORTS:

(1) "Analysis of Aircraft Carrier Steel Flight Decks for BuShips," (Restricted), Index No. NS 731-021, Sept. 1949, by Westcott Engineering Co.

SURVEY NO: B.3.60

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: P.O. 01778/51

TITLE: (Investigation of Aircraft Carrier Structures) Test of Flight and Hangar Decks on USS SAIPAN (CVL-48).

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: --- COMPLETION DATE: 1/24/51

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The flight and hangar decks of the USS SAIPAN (CVL-48) were tested to determine the maximum aircraft wheel loads that could be carried safely.

REPORTS:

CVL-48 Test Data, Submitted by NAVSHIPYDNOR Letter CVL 48/S11(2) (251), 24 Jan. 1951.

SURVEY NO: B.3.61

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: P.O. 71707/48

TITLE: (Investigation of Aircraft Carrier Structures) Test of Wood Flight Deck on USS WRIGHT (CVL-49).

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 9/8/49

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This test was conducted jointly by David Taylor Model Basin and Norfolk Naval Shipyard. Equivalent static loads were used to represent landing loads. A carriage consisting of four water ballast tanks (with a total capacity of 100,000 lb) mounted on a frame work fitted with an actual F7F landing gear, was used to apply loads to the deck structure.

REPORTS:

CVL-49 Test Data, NAVSHIPYDNOR Letter CVL 49/S11(2) (251), 8 Sept. 1949.

SURVEY NO: B.3.62

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: P.O. 10708/54

TITLE: (Investigation of Aircraft Carrier Structures) Strength Investigation.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: E. E. Johnson

DESCRIPTION: Under this task the following work has been performed:

(1) Samples of flight-deck planking of the CVL-49 were tested to obtain information needed in the analysis of CVL-49 flight deck data.

(2) Drop tests were conducted on the flight deck of the USS HANCOCK (CVA-19) at Puget Sound Naval Shipyard. Tests were made with a weighted A3D-1 landing gear (large-load, large-tire contact areas), and with an F2H-3 landing gear (average-load, small-tire contact areas) to determine the fundamental relationship between dynamic and static loading and the feasibility of landing the A3D-1 aircraft on the CVA class carrier. Data are being analyzed in preparation of the final report.

REPORTS:

"Bending Compression and Shear Tests of Three Samples of Flight Deck Planking," TBM Report 736, Oct. 1950.

SURVEY NO: B.3.63

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: NObs 50658

TITLE: (Investigation of Aircraft Carrier Structures) Analysis of USS WRIGHT (CVL-49) Flight Deck Test Data.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: --- COMPLETION DATE: June 1952

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Westcott Engineering Co., Chicago, Ill.

PRINCIPAL INVESTIGATOR: N. M. Newmark

DESCRIPTION: This task produced a procedure for design of wood-surfaced flight decks. Scantlings determined by this procedure were found to be more uniform in strength than those determined by the procedure previously used.

REPORTS:

"Analysis of Aircraft Carrier Wood-Surfaced Flight Decks," in 4 Volumes (Restricted), N. M. Newmark, Westcott Engineering Co., June 1952.

(a) Design Recommendations
(b) Appendix A - Reduced Strain and Deflection Data
(c) Appendix B, Part I - Rearranged Bi-Monthly Reports
(d) Appendix B, Part II - Figures and Tables

SURVEY NO: B.3.64

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: NObs 55507

TITLE: (Investigation of Aircraft Carrier Structures) Ultimate Strength of Flight Decks.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: University of Illinois, Urbana, Ill.

PRINCIPAL INVESTIGATOR: H. L. Cox

DESCRIPTION: Half-scale models of a deck similar to that of the MIDWAY have been tested by the use of static loads simulating aircraft wheel loads. In all, six representative deck specimens with varying proportions of stiffened panels and longitudinal scantlings have been tested. The six specimens even after yielding in the longitudinals, did not collapse after failure of structural details. A comparison of loads applied to the structures showed a considerable margin of strength between the yield and failure points.

REPORTS:

"Behavior of Plate-Beam Construction Beyond the Elastic Range," H. L. Cox, University of Illinois, August 1953.

SURVEY NO: B.3.65

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: Allot. 30, 323/56

TITLE: (Investigation of Aircraft Carrier Structures) Structural Test of Steam Catapult Brake Structure.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: E. E. Johnson

DESCRIPTION: The problem of the steam catapult brake structure for runaway or no load shots is being investigated. Shots with various steam receiver pressures and end speeds will be made. To date instrumentation has been completed. Tests will be conducted in which structural strains and corresponding steam pressures and end speeds will be recorded. Recommendations will be formulated as to the safe maximum brake piston end speed for existing structures.

SURVEY NO: B.3.66

PROJECT NO: 7-91-03-015A TASK/CONTRACT/W.O. NO: ---

TITLE: Research and Evaluation of Containers and Establishment of Test Methods, Design Techniques, and Performance Standards.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Quartermaster Food and Container Institute, Chicago 9, Ill.

PRINCIPAL INVESTIGATOR: Earl C. Myers and Edward F. Williams

DESCRIPTION: Project is divided into (1) Investigation, review and development of test methodology, testing devices and testing conditions for containers and components, (2) Establishment of performance standards, (3) Evaluation of containers and components, (4) Study of new structural principles and design techniques for containers, (5) Research on packages, components and systems.

All shock and vibration analysis is carried out in Part 1. Work phases of Part 1 lists six specific problems in shock and vibration involving acceleration, time, velocity, deflection and characteristics of impact surfaces. This study is in the field of basic research into causes of damage to containers and lading.

SURVEY NO: B.3.67

PROJECT NO: 8-07-06-105 TASK/CONTRACT/W.O. NO: ---

TITLE: **Field Fortifications**

TASK SECURITY CLASSIFICATION: **U** SHEET SECURITY CLASSIFICATION: **U**

DATE APPROVED: 2/2/54 COMPLETION DATE: **Continuing**

DIRECTING AGENCY: **Corps of Engineers, Research and Development Laboratories, Engr. Res. and Dev. Div., Fort Belvoir, Va.**

CONTRACTOR OR LABORATORY: **Engineer Res. and Dev. Labs., Obstacles, Demolitions, and Emplacements Br., Fort Belvoir, Va.**

PRINCIPAL INVESTIGATOR: **Richard M. Flynn**

DESCRIPTION: **This task is related to the development and design of Field Fortification Emplacements. It utilizes standard commercial accelerometers and cathode ray oscillographs for measuring the react on of timber structures to explosive shocks. The shock and vibration portion of this problem is subsidiary to the major problem of structure design.**

SURVEY NO: B.4.1

PROJECT NO: 1-1361 TASK/CONTRACT/W.O. NO: 13625 and AF 33(616)-345

TITLE: (Aerodynamic Loads) Investigation of Nacelle and External Store Shapes for Supersonic Speeds.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: D. Ross

DESCRIPTION: This task covers a series of wind tunnel tests of external store shapes, at supersonic speeds, to determine the aerodynamic forces at various altitudes and at different Mach numbers. The objective is to develop minimum drag to volume for external store configurations suitable for carriage in the transonic as well as the supersonic speed range on various aircraft configurations. Work to date has indicated that modifications to the present Air Force standard store shapes would result in good drag characteristics.

REPORTS:

(1) "Investigation of External Store Shapes for Supersonic Speeds," WADC Tech. Report No. 53-397.

SURVEY NO: B.4.2

PROJECT NO: 3341 TASK/CONTRACT/W.O. NO: 33079 and AF 33(038)-8907

TITLE: (Rotor Blades) Flight Test of XH-17 Helicopter.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Hughes Aircraft Co., Culver City, Cal.

PRINCIPAL INVESTIGATOR: H. Hirsch

DESCRIPTION: This task is directed toward reduction of the XH-17 blade stresses by design modification and by the correlation of model flight test data with wind tunnel model test data, previously accumulated. The design modification has been accomplished and the flight test conducted.

REPORTS:
The final report is yet to be submitted, as of 13 April 1955.

SURVEY NO: B.4.3

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM 2466

TITLE: (Structural Development and Test) Free-Fall Models of XF8F-1 Airplane; Their Design, Construction, and Test.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1944 COMPLETION DATE: 1950

DIRECTING AGENCY: Bureau of Aeronautics, (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Free-fall models of aircraft have been developed for obtaining aerodynamic and structural load data at transonic speeds. The necessary equipment and test techniques required to control these models automatically through a programmed series of maneuvers at high speeds, and the required data collecting equipment were developed under this task.

REPORTS:

(1) "Basic Design and Development of Automatic Control System for Free-Fall Models of the F8F-1 Airplane," NAMC Report TED NAM 2466, Part VI (Confidential), 4 August 1948.

(2) "F8F-1 Airplane; Free-Fall Models; Flight Test of Model No. 7," NAMC Report ASLNAM 2466, Part VII (Restricted), 10 August 1950.

(3) "F8F-1 Airplane; Free-Fall Models; NAES Telemetering Instrumentation for Model No. 7," NAMC Report ASLNAM 2466, Part VIII (Restricted), 19 October 1950.

SURVEY NO: B.4.4

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOas 52-332-c

TITLE: (Aircraft Structural Loads Development) Development of a Constant Force Seaplane Hull-Bottom.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: November 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Colorado A. and M. College, Fort Collins, Colo.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Specific constant-force hull bottoms were developed and their characteristics determined by drop tests of models.

REPORTS:

"Development of a Constant-Force Bottom Contour for Seaplane Hulls," Colorado A. and M. Report No. 54EFS31, November 1954.

SURVEY NO: B.4.5

PROJECT NO: NA 820-182 TASK/CONTRACT/W.O. NO: NOa(s)10915

TITLE: (Hydrodynamic Investigation) Seaplane Tank Tests of a Planing-Tail Type Hull and a Long Afterbody Type Hull.

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: ---

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Aeronautics (AD-31)

CONTRACTOR OR LABORATORY: The Glenn L. Martin Co., Baltimore 3, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A 1/10-scale powered model of an ASW type airplane was tested in the seaplane test tank at the NACA Langley Aeronautical Lab. Tests were made of a rounded keel forebody and a normal vee hull bottom for purposes of comparing landing impact loads in both smooth and rough water.

REPORTS:

(1) "A Hydrodynamic Evaluation of the Long Afterbody Hull Type," GLMC Report ER-3995 (Confidential), 6 November 1950.

(2) "Hydrodynamic Directional Stability Study of Long Afterbody Hull Forms," GLMC Report ER-3994 (Confidential), 6 November 1950.

SURVEY NO: B.4.6

PROJECT NO: NA 820-182 TASK/CONTRACT/W.O. NO: NOas 54-899-c

TITLE: (Hydrodynamic Investigations) Model Tests of Wheel-Hydroski.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-31)

CONTRACTOR OR LABORATORY: All American Engineering Co., Wilmington, Del.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Model tests of several landing gears will be made. The test equipment will be mounted on a high speed surface boat. Hydrodynamic characteristics, effects of wheel protrusion and gap between wheel and ski, and effects upon ski impact loads of flexible ski mountings will be determined. Planing tests will first be made to evaluate testing techniques. Drop tests will be conducted to determine the effects of a flexible strut mounting over the given range of parameters.

REPORTS:

(1) "Hydrodynamic Loads Data and Performance Characteristics Studies," AAE Report N-189 (Confidential), November 1954.

SURVEY NO: B.4.7

PROJECT NO: NR 061-091 TASK/CONTRACT/W.O. NO: Allot 38152

TITLE: (Aeromechanics) Hypervelocity, Aerophysical Phenomena.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: U. S. Naval Ordnance Laboratory, White Oak, Md.

PRINCIPAL INVESTIGATOR: Z. Slawsky and E. Winkler

DESCRIPTION: For the simulation of high-speed flight conditions, a shock tube wind tunnel is being utilized, wherein the high-temperature gas behind the shock wave is expanded through the nozzle to hypersonic velocities. Instrumentation includes an ultra high-speed camera for the observation of flow about models placed in the nozzle test section, and a microwave interferometer for studies of shock behavior in the shock tube. Investigations emphasize high-temperature gas phenomena such as dissociation, ionization, and luminosity as they actually occur in hypersonic flow about the models.

SURVEY NO: B.4.8

PROJECT NO: NR 064-407 TASK/CONTRACT/W.O. NO: Nonr 1228(01)

TITLE: (Structural Mechanics and Vibrations) Photoelasticity and Photoplasticity.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Northwestern Univ., Evanston, Ill.

PRINCIPAL INVESTIGATOR: M. Hetenyi

DESCRIPTION: This investigation includes: (1) photoelastic analysis of dynamic stresses in structural elements, (2) photoplastic analysis of stress distributions accompanying yield phenomena in materials, (3) analysis of the effect of temperature differences on stress patterns in photoelastic models, and (4) analysis of the effect of surface shear loading.

The theoretical values of various stress distribution problems are being compared with experimental results. In the plasticity phase of this research, tests are being carried out to obtain the stress distribution around a plastic enclave. In addition, the effect of temperature differences on elastic moduli and stress-optical constants of photoelastic materials are being examined. Surface damage is being observed in specimens subjected to simultaneous normal and tangential loads.

SURVEY NO: B.4.9

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TB3-0112j(S.T.)

TITLE: Research in Air Shock Phenomena.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Ballistic Research Labs., Aberdeen Proving Ground, Md.

PRINCIPAL INVESTIGATOR: W. E. Curtis

DESCRIPTION: To carry out basic experimental and theoretical investigations into the air shock waves from shock tubes to simulate high explosives and nuclear detonations with emphasis on the shock and blast loading on full-size and scale-model buildings; structural members and materials; and related items; viz., trucks, jeeps, pipe lines, guns and the like, principally to predict full-scale effects for use on AFSWP or AEC field tests.

REPORTS:

(1) "Shock Tube Tests of Air Intake Closure Unit," BRL TN 856.
(2) "Shock Tube Tests of Model Communal Shelters," BRL TN 857.
(3) "Comparison of Air Shock Loading on 3-Dimensional Scaled and Full Sized Structures," BRL TN 929.
(4) "Shock Tube Tests of Glazing Materials," BRL Memo. Report 626.
(5) "Shielding Effect of Walls," BRL TN 582.

SURVEY NO: B.4.10

PROJECT NO: R-354-30-1 TASK/CONTRACT/W.O. NO: AF 18(600)-669

TITLE: Computer Research, Analysis of Aeroelastic Problems by Electrical Analogies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 12/1/54

DIRECTING AGENCY: Headquarters, Air Research and Development Command, Office of Scientific Research

CONTRACTOR OR LABORATORY: Cal. Inst. of Tech., Pasadena, Cal.

PRINCIPAL INVESTIGATOR: G. D. McCann

DESCRIPTION: Fundamental mathematical techniques in the field of computation as applied to obtaining answers to structural vibration and aeroelasticity problems by means of electrical analogies, have been developed. The following problems are included in this research: (1) The effect of finite difference approximations on the dynamic vibrations of beams which represent individual elements of airframes, (2) vibration of weakly coupled systems without damping, and (3) flutter studies.

SURVEY NO: B.4.11

PROJECT NO: NS 712-077 TASK/CONTRACT/W.O. NO: P.O 01781/52

TITLE: U. S. Navy Training Film on Shipboard Vibration.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Codes 371 and 258

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: Mr. Dashefsky

DESCRIPTION: This task produced a film and complementary manual for educating technical, design, and engineering personnel, not specialized in the field of vibration, to recognize the necessity for considering the vibration characteristics of shipboard elements with respect to specific equipments, and its effect on the over-all shipboard installation.

Four films have been produced under contract, and distributed to all Naval Shipyards for use in training and informing designers, engineers, shipbuilders, and ship operating and repair personnel in the fundamentals and solutions of shipboard vibration problems.

REPORTS:

(1) Material Laboratory Project 5246, Final Report, NS 712-077, 30 September 1953.

SURVEY NO: B.4.12

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10739/55

TITLE: (Vibrations and Dynamics of Ship's Structures and Machinery) Development of Electrical Analog Computer for Solution of Vibration, Dynamic Structure, and Related Problems.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: R. T. McGoldrick

DESCRIPTION: A network analyzer has been developed for the specific purpose of carrying out various calculations required to predict the vibration characteristics of ship hulls, the longitudinal and torsional vibration of propulsion systems, and the whirling vibrations of propeller shafts.

A circuit analogous to the mechanical system is set up in the analyzer and excited by an oscillator. A graph is obtained which indicates immediately the critical frequencies of the mechanical system.

Additional work under this task includes the following:

(1) Tests have been made to evaluate a scanning circuit which has been developed to display the normal-mode patterns of a vibratory system on a cathode-ray screen.

(2) A prototype model of a "geometric interpretation" unit has been completed.

(3) A high-speed cathode-ray photoelectric curve follower and a function control unit have been installed in the "geometric interpretation" unit.

(4) A simulated depth indicator and additional adders, subtractors, and differentiators have been completed.

(5) During the past year two six-channel balancing units were designed and installed in the geometric interpretation unit; also, two function multipliers (utilizing these balancing units), and a self-contained amplifier and balancer have been developed.

REPORTS:

(1) "Calculation of Normal Modes and Natural Frequencies of Ship Hulls by Means of the Electrical Analog," by E. Kapiloff, DTMB Report 742, July 1954.

SURVEY NO: B.4.13

PROJECT NO: NS 715-069 TASK/CONTRACT/W.O. NO: ---

TITLE: (Hydromechanics of Amphibious Vessels) LST, SBF-119

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 420

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Various hull designs were tested to improve the propulsive efficiency and the vibration characteristics of an LST having a top speed of 15 knots. Final reports are in preparation.

SURVEY NO: B.4.14

PROJECT NO: NS 715-084 TASK/CONTRACT/W.O. NO: P.O. 10744/55

TITLE: (Hydromechanics of Submarines) Design SSN-I(SSN-571)

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 420

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: J. Posner

DESCRIPTION: Model tests to estimate resistance and determine performance characteristics of this design have been completed. The final report covering the results of resistance and propulsion tests is in preparation. In addition, various stabilizer modifications have been tested and analyzed in an effort to provide solutions for potential vibration problems.

SURVEY NO: B.4.15

PROJECT NO: NS 724-007 TASK/CONTRACT/W.O. NO: P.O. 10021/54

TITLE: (Underwater Explosion Tests) Scaled Protection Forms.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task entails the construction and explosion testing of structures designed to give protection against underwater explosions to the larger types of naval vessels.

REPORTS:

(1) "Development and Application of Design Principles for Side Protective Systems for Large Ships," BuShips Report No. 1954-1 (Confidential).

SURVEY NO: B.4.16

PROJECT NO: NS 724-012 TASK/CONTRACT/W.O. NO: P.O. 10011/55

TITLE: Resistance of Submarines to Underwater Explosion Damage

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1949 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, UERD, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: A. H. Keil

DESCRIPTION: Tests have been made against a number of models with structures or test conditions varied systematically. Some models were greatly simplified and to a small scale, whereas others were more exact reproductions. Extensive instrumentation was used. Analytical studies of the results of these tests lead to some understanding of damage mechanism.

REPORTS:

(1) "Explosive Testing of Submarine Pressure Hull Framing, Sector 18-D," by G. J. Vogler, UERD Report 5-55 (Confidential).

(2) "SS 428 Underwater Explosion Tests, Local Response Analysis," by H. M. Schauer, UERD Report 4-55 (Confidential).

(3) "SS 428 Underwater Explosion Tests 1952, Structural Damage," by W. P. Wise, UERD Report 3-55 (Confidential).

(4) "Interaction of a Spherical Acoustic Wave with a Beam of Circular Cross Section," by W. W. Nurray, UERD Report 1-55 (Confidential).

(5) "Explosive Testing of Submarine Pressure Hull Framing, Part I, Sectors SS-18A and SS-18C," by G. J. Vogler, UERD Report 20-54 (Confidential).

SURVEY NO: B.4.17

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-121 and NObs-54509

TITLE: (Structural Design, Ship Structure Committee) Superstructures.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Reed Research, Inc., Washington, D. C.

PRINCIPAL INVESTIGATOR: L. Crawford

DESCRIPTION: Model experiments have been conducted to determine the contribution of the deck-house to the over-all strength of ships' hulls and the influence of various material characteristics and design features on the performance of the composite structure. The experimental data will be used to verify a basic design theory.

REPORTS:

(1) "A Study of Structural Action of Superstructures on Ships," by H. Bleich, Preliminary Study, Serial No. SSC-48, 21 December 1951.

(2) "Model Tests on Hull-Deck House Interaction," by L. Crawford and W. J. Ruby, Reed Research Inc., Final Report, Serial No. SSC-67, 17 January 1955.

(3) "Discussion of J. Vasta to Research Under the Ship Structural Committee," by E. A. Wright, F. Jonassen, and H. G. Acker, Presented at 1952 annual meeting of the Society of Naval Architects and Marine Engineers.

SURVEY NO: B.4.18

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10743/55

TITLE: (Investigation of Strength of Ship Structure to Achieve Optimum Performance of Surface Vessels) Design of Oiler Longitudinal.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: J. S. Brock

DESCRIPTION: An investigation of stress concentrations in the vicinity of stress raisers in the longitudinal connection of a Navy oiler were made by photoelastic model tests. The task has been completed as originally planned, but plans have been extended to include a second model designed to simulate the type of oiler longitudinal which failed in service. This model has been tested to determine the feasibility of using photoelastic techniques to determine the ultimate strength of full-scale structures.

REPORTS:

(1) "Stresses in a Photoelastic Model of a Bottom Longitudinal Connection at a Bulkhead in Navy Oilers," DTMB Report 851, February 1953.

SURVEY NO: B.4.19

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: NObs 66670

TITLE: (Strength of Ship Structures) Test of Deck House Expansion Joints.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Reed Research Inc., Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Model tests are to be made to determine the effects of expansion on stresses in ship hulls and superstructures.

SURVEY NO: B.4.20

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: NObs-55507

TITLE: (Investigation of Aircraft Carrier Structures) Ultimate Strength of Flight Decks.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Univ. of Ill., Urbana, Ill.

PRINCIPAL INVESTIGATOR: H. L. Cox

DESCRIPTION: Half-scale models of a deck similar to that of the MIDWAY have been tested by use of static loads simulating aircraft wheel loads. In all, six representative deck specimens with varying proportions of stiffened panels and longitudinal scantlings have been tested. A final report is being prepared.

REPORTS:

(1) "Behavior of Plate-Beam Construction Beyond the Elastic Range," by H. L. Cox, University of Illinois, Technical Report, August 1953.

SURVEY NO: B.5.1

PROJECT NO: 1347 TASK/CONTRACT/W.O. NO: 13700 and AF 33(600)-25761

TITLE: (Structural Testing at Elevated Temperatures) Instrumentation Research.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 9 Sept. 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Laboratories

CONTRACTOR OR LABORATORY: Shoup Engineering Company, Chicago, Ill.

PRINCIPAL INVESTIGATOR: J. C. Smeltzer

DESCRIPTION: The purpose of this task is three-fold: (1) The development of strain gages capable of operating at temperatures of 1000°F for time periods of 5 hours, having strain ranges of ±0.01 in/in and capable of being bonded to the aircraft structure; (2) the development of multi-channel recording instruments; and (3) the investigation of the problems of reducing recorded data to true stress.

To date, the work done has been directed toward the development of a 300-channel thermocouple-recorder. This instrument is in the development stage.

SURVEY NO: B.5.2

PROJECT NO: 1-1361 TASK/CONTRACT/W.O. NO: 13626

TITLE: (Aerodynamic Loads) Flight Investigation of Aerodynamic Forces on External Stores.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: WADC, Aircraft Lab., Wright Patterson Air Force Base, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Flight test will be accomplished to develop a means for measuring the in flight aerodynamic forces on external stores, and to determine these forces for a variety of aircraft-store combinations. Those data will be used in determining optimum external store configurations and for design of store suspensions.

SURVEY NO: B.5.3

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13451 and AF 33(616)-2503

TITLE: (Aircraft Structural Design Criteria) Runway Roughness Evaluation.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Laboratory

CONTRACTOR OR LABORATORY: Midwest Research Institute, Kansas City, Mo.

PRINCIPAL INVESTIGATOR: P. D. Wickersham

DESCRIPTION: A method of evaluating runway roughness has been determined, and roughness measuring instruments have been designed. The construction of the instruments is about 90 percent completed.

SURVEY NO: B.5.4

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13452

TITLE: (Aircraft Structural Design Criteria) Strain Gage Interaction Resolver.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: WADC, Aircraft Lab., Wright Patterson Air Force Base, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A pilot model of a computer to measure the three components of landing gear loads has been fabricated and tested. Modifications are being considered.

SURVEY NO: B.5.5

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13580 and AF 33(616)-334

TITLE: (Aircraft Structural Design Criteria) Study of Gust Problems.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Franklin Institute, Philadelphia 3, Pa.

PRINCIPAL INVESTIGATOR: R. Coleman

DESCRIPTION: This contract covers a study of means of pre-sensing gust for gust alleviation purposes. A final report has been prepared.

SURVEY NO: B.5.6

PROJECT NO: 1367 — TASK/CONTRACT/W.O. NO: 13639 AF 33(038)-29246 AF 33(600)-9799

TITLE: (Aircraft Structural Design Criteria) Instrumentation and Data Reduction Equipment Development.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Willys-Overland Motors, Inc., Toledo, Ohio

PRINCIPAL INVESTIGATOR: D. Bench

DESCRIPTION: The end product of this contract will be equipment. The objective is to improve data collection systems (recorders) and the development of equipment for decoding and reducing data after they have been recorded.

SURVEY NO: B.5.7

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13639 and AF 33(038)-11528

TITLE: (Aircraft Structural Design Criteria) Instrumentation and Data Reduction Equipment Development.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Webster-Chicago, Chicago, Ill.

PRINCIPAL INVESTIGATOR: H. Schenk

DESCRIPTION: The end product of this contract will be equipment. The objective is to improve data collection systems (recorders) and the development of equipment for decoding and reducing data after they have been collected.

SURVEY NO: B.5.8

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13639 and AF 33(600)-15375

TITLE: (Aircraft Structural Design Criteria) Instrumentation and Data Reduction Equipment Development.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Radiation, Inc., Melbourne, Fla.

PRINCIPAL INVESTIGATOR: G. Shaw

DESCRIPTION: The end product of this contract will be equipment. The objective is to improve data collection systems (recorders) and the development of equipment for decoding and reducing data after they have been collected.

SURVEY NO: B.5.9

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13639 and AF 33(600)-26613

TITLE: (Aircraft Structural Design Criteria) Instrumentation and Data Reduction Equipment Development.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Laboratory

CONTRACTOR OR LABORATORY: Shoup Electric Co., Chicago, Ill.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The end product of this task will be equipment. The objective is to improve data collection systems (recorders) and the development of equipment for decoding and reducing data after they have been collected.

SURVEY NO: B.5.10

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13639 and AF 33(600)-22562

TITLE: (Aircraft Structural Design Criteria) Instrumentation and Data Reduction Equipment Development.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Royal Electric Co., Jamestown, Ohio

PRINCIPAL INVESTIGATOR: C. Waggoner

DESCRIPTION: The end product of this contract will be equipment. The objective is to improve data collection systems (recorders) and the development of equipment for decoding and reducing data after they have been collected.

SURVEY NO: B.5.11

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13639 and AF 33(616)-2309

TITLE: (Aircraft Structural Design Criteria) Instrumentation and Data Reduction Equipment Development.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: J. B. Rea Co., Inc., Los Angeles, Calif.

PRINCIPAL INVESTIGATOR: M. L. Fisher

DESCRIPTION: The end product of this contract will be equipment. The objective is to improve data collection systems (recorders) and the development of equipment for decoding and reducing data after they have been collected.

SURVEY NO: B.5.12

PROJECT NO: 1373 TASK/CONTRACT/W.O. NO: 13682 and AF 33(038)-16281

TITLE: (Flight Instruments) Acceleration Instruments.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Bendix Aviation Corp., Eclipse Pioneer Div., Teterboro, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This covers the development and manufacture of pointer accelerometers. Three accelerometers are to be manufactured, natural frequency 20 cps, damping at 0.6 critical. An improved type of damping element will be used.

SURVEY NO: B.5.13

PROJECT NO: 3066 TASK/CONTRACT/W.O. NO: 30225

TITLE: (Gas Turbine Technology) Development of Aircraft Engine Test Instrumentation Systems and Components.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Power Plant Lab.

CONTRACTOR OR LABORATORY: Farrand Optical Co., New York, N. Y.

PRINCIPAL INVESTIGATOR: Irving Brenholt

DESCRIPTION: Development contract AF 33(616)-2980 was written under the above project to develop a device that will observe and measure the vibratory displacement of blades in an axial flow compressor of a gas turbine engine while the engine is in normal operation.

SURVEY NO: B.5.14

PROJECT NO: NA 581-029 TASK/CONTRACT/W.O. NO: F03-25 and TED NRL AE 4201

TITLE: (Research and Development of Materials) Development of Packaging Reed Gage.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AE-41)

CONTRACTOR OR LABORATORY: Naval Research Lab., Washington 25, D. C.

PRINCIPAL INVESTIGATOR: I. Vigness

DESCRIPTION: Work has been in progress on the construction of a self-recording shock level gage for use in connection with packaging and shipment. The gage is to operate on the "reed" principle, the maximum shock being indicated by the extent of "reed" breakage. These gages will be manufactured and tested to determine their ability to provide statistical type data on package shock history.

REPORTS:

Copies of reports may be obtained from BuAer (AE-41)

SURVEY NO: B.5.15

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM 2425

TITLE: (Structural Development and Test) Evaluation and/or Development of Structural Flight Test Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Work under this task consisted of evaluation and development of structural test instrumentation necessary for the flight testing of aircraft.

REPORTS:

"Evaluation of Statham Pressure Transmitter, Type P6-10G-950, Serial No. 189," Report No. ASL NAM 2425, Part XVII, 28 Dec. 1950.

SURVEY NO: B.5.16

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM 2425.7

TITLE: (Structural Development and Test) Development of Statistical Type Landing Analyzer.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: One unit of the landing analyzer equipment was constructed by the William Miller Corp., Pasadena, Calif. Evaluation tests were performed under this task and the analyzer was transferred to the NATESTCEN for flight-test purposes. This instrument is capable of recording the three principal linear accelerations and the pitching velocity of an airplane during landing.

REPORTS:

"Miller Landing Analyzer," Report No. ASL NAM 2425.7, 16 Jan. 1951.

SURVEY NO: B.5.17

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM 2425.8

TITLE: (Structural Development and Test) Evaluation of Hand-Held Vibration Recorders.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1950

DIRECTING AGENCY: Bureau of Aeronautics (AD-22).

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Commercially available hand-held vibration recorders were evaluated in order to determine their suitability for use in recording the cockpit vibration levels of aircraft.

REPORTS:

- (1) "Askania, General Electric, and Westinghouse Vibrographs; Evaluation of," Report No. ASL NAM 2425.8, 21 November 1950.

SURVEY NO: B.5.18

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM 2471

TITLE: (Structural Development and Test) Development of NAES Strain-Gage Telemetering Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1944 COMPLETION DATE: 1948

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This NAES strain-gage telemetering equipment and associated instrumentation, which employs the sub-carrier principal of telemetering for the transmission of six channels of intelligence, was developed under this subtask.

SURVEY NO: B.5.19

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 226

TITLE: (Structural Development and Test) Development and/or Procurement, Testing and Evaluation of Flight Test Instrumentation for High Mach Number Flight Testing.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1948 COMPLETION DATE: Cancelled

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A survey was made on high Mach number instrumentation problems. This task was cancelled and the detail work objectives were assigned to tasks TED NAM DE 226.1 and 226.2.

SURVEY NO: B.5.20

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 245

TITLE: (Structural Development and Test) Facilities for Telemetering Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Facilities were established under this task for the maintenance, adaptation, calibration and utilization of the AN/AKT-10 and AN/UKR-5 telemetering equipment in piloted aircraft.

REPORTS:

"Telemetering Instrumentation of Model AD Airplane for Atomic Weapons Tests," Report ASL NAM AD-260, Part III.

SURVEY NO: B.5.21

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 248

TITLE: (Structural Development and Test) Evaluation of MIT and Calidyne Miniature Vacuum Tube Accelerometers.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1950 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: These vacuum tube accelerometers have very high current and voltage sensitivities as compared with strain gage accelerometers of comparable natural frequencies. These pickups, however, have a non-linear electrical output versus acceleration characteristics, although for vibratory accelerations a linear relationship was found to exist between peak-to-peak acceleration and peak-to-peak output.

REPORTS:

"Evaluation of MIT and Calidyne Vacuum Tube Accelerometers," Report No. ASL NAM DE 248, 18 July 1951.

SURVEY NO: B.5.22

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 249

TITLE: (Structural Development and Test) Development and Evaluation of Calibration Techniques for Structural Flight Load Measurements.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1950 COMPLETION DATE: (Terminated) 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Studies relating to the general theory of calibration techniques for structural flight load measurements have been made. This task has been terminated and further work assigned to TED NAM DE 249.1 and 249.2.

SURVEY NO: B.5.23

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 249.1

TITLE: (Structural Development and Test) General Theory and Techniques of Calibration for Structural Flight Load Measurements.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Strain gage measurement techniques that are applicable for structural flight load measurement have been evaluated.

REPORTS:

"Structural Flight Load Measurements, Calibration for, General Theory, and Techniques," Report No. ASL NAM 249.1, 13 June 1951.

SURVEY NO: B.5.24

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 250.1

TITLE: (Structural Development and Test) Procurement and Evaluation of the NACA Miniature Pressure Pickup.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The performance characteristics of the NACA miniature pressure pickup was established under this task.

REPORTS:

"Evaluation of the NACA Miniature Pressure Pickup, Model 48," Report No. ASL NAM 250.1, 24 Jan. 1952.

SURVEY NO: B.5.25

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 250.2

TITLE: (Structural Development and Test) Modification and Evaluation of a VGTA Recorder for Obtaining Statistical Data.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: One VGTA recorder was modified to record intermittently when predetermined values of airspeed and acceleration are reached.

REPORTS:

Repo t No. ASL NAM DE 250.2, 11 Oct. 1951.

SURVEY NO: B.5.26

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 250.3

TITLE: (Structural Development and Test) Evaluation and Service Testing of NBS Limit Load Gage.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Laboratory, flight, and field service tests have been conducted on the NBS Limit Load Gage to determine the suitability of this gage for service use.

REPORTS:

"Laboratory and Flight Test Evaluation of NBS Limit Load Gage," Report ASL NAM DE 250.3, Part I.

"Field Service Test of the NBS Limit Load Gage," Report ASL NAM DE 250.3, Part II.

SURVEY NO: B.5.27

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 250.5

TITLE: (Structural Development and Test) Evaluation and Construction of NAES Temperature Controlled Strain Gage Accelerometer.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Six NAES Type D-5-350 strain gage cantilever beam accelerometers were fabricated with heating elements built into the accelerometer cases to provide automatic temperature control. Temperature control jackets for these accelerometers were tested. These were designed for the purpose of maintaining reasonably constant temperatures in the accelerometers. Also evaluation tests were conducted on the accelerometers enclosed in the jackets.

REPORTS:

(1) "Design and Evaluation of the NAES Type D-5-350 Temperature Controlled Accelerometer," Report ASL NAM AD-250.5, Part I.

(2) "Evaluation of the General Electric Company Temperature Controlled Accelerometer Jacket," Report ASL NAM AD-250.5, Part II.

SURVEY NO: B.5.28

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 250.7

TITLE: (Structural Development and Test) Development of Prototype Model of a Visual Airspeed Acceleration Indicator.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A prototype model of a visual airspeed-acceleration indicator that will display both airspeed and acceleration information in comparison with the boundary conditions of the applicable airplane restriction limits, has been developed. This instrument will display the V-n diagram in polar coordinates. A pointer is provided for indication of airspeed.

REPORTS:

"A Prototype Visual Airspeed-Acceleration Indicator," Report No. ASL NAM AD-250.7.

SURVEY NO: B.5.29

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 226.1

TITLE: (Structural Development and Test) Study of Instrumentation Requirements for Structural Flight Testing of Aircraft at High Mach Numbers.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Laboratory, Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The performance characteristics of instruments required for research flight tests occurring between Mach numbers 0 to 3, altitudes 0 to 100,000 ft, and temperatures +65° to +1000°F, have been determined.

SURVEY NO: B.5.30

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 226.2

TITLE: (Structural Development and Test) Procurement, Test and Evaluation of Commercially Available Flight-Test Instrumentation.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The instruments whose characteristics appeared to comply with the requirements determined under task TED NAM AD-226.1, were procured, tested, and evaluated for use in high-Mach-number flight test.

REPORTS:

(1) "Laboratory Evaluation of Statham Pressure Transducer Model P69," Report No. ASL NAM AD-226.2, Part I.

(2) "Ruge-de-Forest Stikon Resistance Thermometer Elements," Report No. ASL NAM AD-226.2, Part II.

(3) "Evaluation of Sorensen Voltage Regulator D-100-S," Report No. ASL NAM AD-226.2, Part III.

(4) "Temperature Altitude Tests of Century Model 409 Oscillograph," Report No. ASL NAM AD-226.2, Part IV.

SURVEY NO: B.5.31

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 245.1

TITLE: (Structural Development and Test) Airborne and Ground Station Calibrators for AN/AKT-10, AN/UKR-5 Telemetering Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Calibrators and calibration techniques that are applicable for calibrating the AN/AKT-10, AN/UKR-5 telemetering system have been developed and evaluated.

REPORTS:

"Development and Evaluation of a Six Channel Potentiometer Calibrator, and Three-point Frequency Calibrator for Telemeter Equipment Type AN/AKT-10, AN/UKR-5," Report ASL NAM AD-245.1, Part I.

SURVEY NO: B.5.32

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 249.2

TITLE: (Structural Development and Test) Development and Evaluation of Load-Calibration Techniques for Aircraft Landing-Gear and Carry-Through Structures.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Methods and techniques for obtaining accurately the dynamic loads applied to landing gears were determined during laboratory drop tests. Load calibration techniques for landing gears and carry-through structures were developed.

REPORTS:

"Structural Flight Load Measurements, Calibration for - General Theory and Techniques," Report No. ASL NAM DE-249.2 Part I, 22 May 1951.

"Development and Evaluation of Load Calibration Techniques for Aircraft Landing Gear and Carry-Through Structures," Report No. ASL NAM AD-249.2, Part II, Oct. 8, 1954.

SURVEY NO: B.5.33

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 250.13

TITLE: (Structural Development and Test) Modification of Statistical Flight-Load Recorders for Task TED NAM AD-2104.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The equipment developed under task TED NAM AD-250.9 was modified so as to extend the recording time to 30-hours.

SURVEY NO: B.5.34

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 250.6

TITLE: (Structural Development and Test) Design and Construction of NAES Strain-Gage Accelerometers.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Twelve 5 g - 12 cps, twelve 40 g - 100 cps, and six 10 g - 12 cps beam-type bonded strain-gage accelerometers have been designed and constructed. Twelve 100 g - 200 cps accelerometers are in the various stages of manufacture, and twelve 3 g - 12 cps and twelve 8 g - 35 cps accelerometers are in the various design stages. The manufacture of these accelerometers will complete the work of this task.

SURVEY NO: B.5.35

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 250.8

TITLE: (Structural Development and Test) Development and Evaluation of Pressure-Distribution Display and Recording Equipment for Flight-Test Data.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Terminated

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Equipment to obtain, display, and record pressure-distribution information, has been developed. This system is capable of sampling strain-gage output data from 18 separate channels at a rate up to 1000 cps per channel. The data samples are then displayed simultaneously on an oscilloscope screen and photographed.

REPORTS:

"Development and Evaluation of Pressure Distribution Display and Recording Equipment," Report No. ASL NAM AD-250.8, Part I, 13 Mar. 1953.

SURVEY NO: B.5.36

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 250.9

TITLE: (Structural Development and Test) Procurement and Adaptation of Oscillograph Equipment for Recording Statistical Flight-Load Data.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Six miniature oscillographs were modified so as to record airspeed, acceleration, altitude, and control position for extended periods of time when used with appropriate pickups. Evaluation tests were made.

REPORTS:

"NAES Statistical Flight Recording System--Development and Evaluation," Report No. ASL NAM AD-250.9, Part I.

SURVEY NO: B.5.37

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 260

TITLE: (Structural Development and Test) Instrumentation of Model AD-2 Airplane for Blast Test.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: One each of Model AD-2 and Model XBT2D-1 airplanes was equipped under this task with structural instrumentation, recording and telemetering equipment in accordance with the requirements of the test program of Project TED NAM AD 260.2.

REPORTS:

(1) "Instrumentation of Model AD-2 airplane, BUNO 122363, for Blast Tests; Calibration of the AD-2 Airplane Wing for Flight Load Measurements," Report No. ASL NAM AD-260, Part I.

(2) "Instrumentation of Model AD-2 Airplane for Blast Tests; Load Calibration of the Horizontal Stabilizer of the AD-2 Airplane, BUNO 122363, and Load Calibration of the Wing and Horizontal Stabilizer of the XBT2D-1 Airplane, BUNO 09103," Report No. ASL NAM AD-260, Part II.

(3) "Telemetering Instrumentation of Model AD Airplane for Atomic Weapons Tests," Report No. ASL NAM AD 260, Part III.

SURVEY NO: B.5.38

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 262

TITLE: (Structural Development and Test) Acceptance, Maintenance, and Distribution of Structural-Test Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics, (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The task was established for the acceptance, maintenance, and distribution of structural-test equipment to naval activities and contractors.

SURVEY NO: B.5.39

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 265

TITLE: (Structural Development and Test) Study of the Application of Automatic-Data-Reduction Methods to Structural Problems.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A study has been made of the application of automatic-data-reduction methods to type of work being done by the ASL of NAMATCEN and the Flight Test Division of NATENSTCEN.

REPORTS:

"Study of the Application of Automatic-Data-Reduction Methods to Structural Problems," Report No. ASL NAM AD-265, Part I, 22 July 1954.

SURVEY NO: B.5.40

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 265.1

TITLE: (Structural Development and Test) Procurement and Adaptation of Automatic-Data-Reduction Equipment.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Contracts have been established for an integrated data-reduction system consisting of a record reader, digital converter, data tabulator, plotting board, and associated IBM units for use particularly with oscillographic records. All units have been delivered to the ASL.

SURVEY NO: B.5.41

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 275.2

TITLE: (Structural Development and Test) Instrumentation of Struts of Hydro-Skis for Modified Model JRF-5 Airplane.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An airplane Model JRF-5, which had been modified with a twin-ski alighting-gear installation underwent hydrodynamic evaluation at the NAMATCEN. This evaluation included a smooth-water phase and a rough-water phase. This task provided for the appropriate instrumentation of the hydro-ski struts.

SURVEY NO: B.5.42

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 291

TITLE: (Structural Development and Test) Procurement, Adaptation and Evaluation of Multi-Channel Strain Gage Recorder.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This recorder will sample the output of 100 strain-gage channels and store the data on a magnetic drum. Provisions are also provided for 100 temperature-sensing channels. This equipment will have a maximum sampling rate of approximately 300 points per second and will record in digital form at the same time.

SURVEY NO: B.5.43

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 298.1

TITLE: (Structural Development and Test) Development and/or Procurement of High-Temperature Strain Gages.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Adequate high-temperature strain gages are needed for structural testing at temperatures up to 1600°F. An extensive investigation has been made of available strain gages and techniques. Two commercially available high-temperature strain gages are being evaluated and other types are being investigated for possible evaluation. Construction has been started on a facility to calibrate high-temperature strain gages.

SURVEY NO: B.5.44

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 2107

TITLE: (Structural Development and Test) Evaluation of the General Mills Flight Recorder.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The General Mills instrument records airspeed, acceleration, and altitude on a roll of aluminum foil by embossing a time history trace of each channel with a total recording time of approximately 300 hr. Laboratory and flight evaluation tests have been completed.

SURVEY NO: B.5.45

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 2112

TITLE: (Structural Development and Test) Study of Strain Gage Transducer Reliability.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Since transducers, such as pressure pickups and accelerometers, will be required to operate over long durations without attention when installed for measuring loads during long periods of operation of service aircraft, their reliability for this condition must be established. This is a new project; no progress to report.

SURVEY NO: B.5.46

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 2114

TITLE: (Structural Development and Test) Acceptance Test and Inspection of W. L. Maxson Corporation Statistical Accelerometer.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Performance of acceptance tests are underway.

SURVEY NO: B.5.47

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 2117

TITLE: (Structural Development and Test) Survey of Flight Accelerations.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Installations are being prepared for statistical accelerometers to be used to obtain data of the frequency with which aircraft experience certain vertical flight accelerations.

SURVEY NO: B.5.48

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS DE 210

TITLE: (Structural Development) Development, Test and/or Evaluation of Acceleration, Vibration and Strain Pickups.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A limit-load strain indicator gage was developed under this task. This gage provides a means of detecting and indicating mechanically the occurrence of successive loads on the structural member to which it is attached. Twenty of these gages were procured. Calibration and service tests were made.

A pilot model and an improved version of a statistical counting accelerometer were developed and service tested. Work on this instrument was transferred to task TED NBS DE 210.1.

The Hastings maximum-recording accelerometer was evaluated by comparison under flight conditions with the Flader and the Statham 10 g accelerometers.

REPORTS:

(1) "A Limit Load Gage," NBS Progress Report No. 25 (BUAER TED NBS DE 210).

(2) "A Statistical Accelerometer," TED NBS DE 210, NBS Progress Report No. 26, 22 Jan. 1952.

(3) "Comparison Under Flight Conditions of Hastings Maximum Recording Accelerometer with Flader and Statham 10 g Accelerometers," NBS Report No. 1B108, 28 Dec. 1951.

SURVEY NO: B.5.49

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD 210.1

TITLE: (Structural Development) Development of Statistical Accelerometer Methods.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A statistical accelerometer capable of recording in several adjustable acceleration levels, has been developed. It embodies four acceleration sensing switches and the associated counters.

SURVEY NO: B.5.50

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS DE 212

TITLE: (Structural Development) Development of an Airplane Crash Accelerometer.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An accelerometer to obtain data on the energy absorption characteristics of aircraft structures was developed. The accelerometer works on the principle of a mass forcing a small steel ball into a flat monel disk. The range of the accelerometer is from 10 to 50 g, and the weight is approximately two lb.

REPORTS:

"Indentation Type Accelerometer," NBS Report No. 1866, Aug. 1952.

SURVEY NO: B.5.51

PROJECT NO: NA 811-008 TASK/CONTRACT/W.O. NO: NOas 52-1127

TITLE: (Study, Development, and Utilization of Structural Instrumentation) Development of a Fatigue Life Gage.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Cornell Aeronautical Lab., Buffalo, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A fatigue-life gage which has several elements, each having a different but known fatigue life, has been developed. As the fatigue life of an individual element of the gage is exceeded, the element breaks and produces either a visual or an electrical indication of the failure.

REPORTS:

"Design and Development of a Fatigue-Life Gage for Metals," CAL Report No. IG-842-M-13, 26 Dec. 1954.

SURVEY NO: B.5.52

PROJECT NO: NE 140-311 TASK/CONTRACT/W.O. NO: P.O. 10764/54

TITLE: (Noise and Vibration Instruments) Vibration Calibrator.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 851

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An electronic distance measuring system has been developed for the determination of vibration amplitudes at frequencies between 20 cps and 10,000 cps. The amplitude range is 0.01-in. to 0.000001-in. single amplitude.

REPORTS:

NBS Final Report No. 2112, 15 Dec. 1952.

SURVEY NO: B.5.53

PROJECT NO: NE 140-311 TASK/CONTRACT/W.O. NO: ---

TITLE: (Noise and Vibration Instruments) Bearing Wear Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1957

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 851

CONTRACTOR OR LABORATORY: Battelle Memorial Institute, Columbus, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A preliminary analysis of the problem has been made resulting in a proposal to undertake development of an electronic method for detection of oil film breakdown.

SURVEY NO: B.5.54

PROJECT NO: NE 140-311 TASK/CONTRACT/W.O. NO: ---

TITLE: (Noise and Vibration Instruments) Vibration Balancing Equipment.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 851

CONTRACTOR OR LABORATORY: BuShips, Electronics Division, Code 851, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The Bureau has analyzed balancing problems which could be handled most efficiently and at a saving in cost through application of previously developed instrumentation techniques or modification of available equipment. It has been determined that improvements in micro-balancing can be effected with advanced electronic vibration detecting devices.

SURVEY NO: B.5.55

PROJECT NO: NE 140-326 TASK/CONTRACT/W.O. NO: P.O. 10734/52

TITLE: (Industrial Electronic Equipment) Machinery Load Tests.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 851

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Electronic equipment for the measurement of dynamometer and water-brake loads in propulsion machinery will be provided by utilizing a slightly yielding compliance element which will be instrumented with a mutual inductance type of distance transducer.

SURVEY NO: B.5.56

PROJECT NO: NE 140-326 TASK/CONTRACT/W.O. NO: ---

TITLE: (Industrial Electronic Equipment) Instrument Standardization Studies.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Electronics Division, Code 851

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The mutual inductance electronic micrometer has been developed for measuring small distances. Work is continuing to provide standardization of major equipment units.

SURVEY NO: B.5.57

PROJECT NO: NE 140-326 TASK/CONTRACT/W.O. NO: P.O. 10739/55

TITLE: (Industrial Electronic Equipment) High-Speed Torsionmeter.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1957

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 851

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: C. W. Scott

DESCRIPTION: A full-scale test model of a variable reluctance torsionmeter, which maintains an accuracy of 1/2 percent, has been completed. This model has been reproduced with the required dimensions and torsional strength for operation on a 1000 hp, 10,000 rpm test stand.

REPORTS:

"High Speed Torquemeter for Turbine Shafts," David Taylor Model Basin, Washington, D. C.

SURVEY NO: B.5.58

PROJECT NO: NE 140-326 TASK/CONTRACT/W.O. NO: ---

TITLE: (Industrial Electronic Equipment) Coupling Vibrations.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Inactive

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 851

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The instrumentation to detect and measure vibrations of flexible couplings in propulsion shafting has been provided by utilizing a previously developed mutual-inductance micrometer technique.

SURVEY NO: B.5.59

PROJECT NO: NE 140-326 TASK/CONTRACT/W.O. NO: ---

TITLE: (Industrial Electronic Equipment) High-Speed Strain-Gage Measurements.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 851

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will lead to measurement of stresses occurring in high-speed, rotating machinery, particularly in gear teeth for the calculation of strain deformation under heavy loads and the resultant alteration of uniform tooth loading.

Progress to date has been limited to an analysis of strain-gage miniaturization requirements, and the application of previously developed inductive "slip ring" devices.

SURVEY NO: B.5.60

PROJECT NO: NL 490-148 TASK/CONTRACT/W.O. NO: TED ADC-EL-41032

TITLE: (NADEVCEN, Development and Test) Reliability Investigation of Electronic Equipment.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: Bureau of Aeronautics (EL-9)

CONTRACTOR OR LABORATORY: Vitro Laboratory, West Orange, N. J.

PRINCIPAL INVESTIGATOR: W. Hohenner

DESCRIPTION: It is intended to develop a device to observe, measure, and record vibrations. The technical requirements are as follows:

(1) Range of vibrations 5 to 3000 cps,
(2) Amplitudes 0.250 to 0.001 in. double amplitude,
(3) Field of view without optical magnification 2 x 2 in. with optical magnification 0.25 x 0.25 in.,
(4) Distance from observed object greater than 2 in.

Emphasis has been put on the ability to introduce controlled signals into the vibration analyzer in order to compensate for vibration contributed solely by the structural part or parts supporting the spring-mass system under observation. It is hoped to recognize the vibrational deflection of a spring mass system with respect to its fixed point independent of the fact that the fixed point might vibrate too. The corrective signal can be derived from a pickup, attached to or influenced by the fixed point or by selecting a proper signal from a suitable source, e.g., a signal generator.

SURVEY NO: B.5.61

PROJECT NO: NR 011-701 TASK/CONTRACT/W.O. NO: NA onr 21-48

TITLE: (Instrumentation) Research

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1947 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Physics Br., Code 421

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: W. A. Wildhack

DESCRIPTION: A wide variety of investigative activities in the field of instrumentation is being pursued. A preliminary version of a "multi-dimensional" classification system for instrumentation information is being evaluated in order to determine its suitability as a reference center for the Office of Basic Instrumentation (OBI) at NBS. Meanwhile an increasing number of military agencies are availing themselves of the existing OBI reference service for assistance with instrumentation problems.

REPORTS:

(1) NBS Report No. 3130, Mar. 1953
(2) " " " 3192, May 1954
(3) " " " 3235, " "
(4) " " " 3258, " "
(5) " " " 3261, " "
(6) " " " 3276, " "
(7) " " " 2381, June 1954
(8) " " " 3299, " "
(9) " " " 3301, " "
(10) " " " 3271, July 1954
(11) " " " 3619, Aug. 1954
(12) " " " 3620, " "
(13) " " " 3339, Sept. 1954

SURVEY NO: B.5.62

PROJECT NO: NR 011-705 TASK/CONTRACT/W.O. NO: N5ori 07882

TITLE: (Instrumentation) Elements of Electrical Instrumentation.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Physics Br., Code 421

CONTRACTOR OR LABORATORY: Massachusetts Institute of Technology, Cambridge, Mass.

PRINCIPAL INVESTIGATOR: K. S. Lion

DESCRIPTION: The field of electrical instrumentation is being surveyed to obtain materials for publishing a series of comprehensive technical reports covering the various elements of electrical instrumentation. The first of these reports, "Mathematically Operating Elements (Analog Methods)," has already been published and has been enthusiastically received. These reports should be adaptable for use as training manuals for Navy technical personnel.

REPORTS:

"Elements of Instrumentation: I - Mathematically Operating Elements (Analog Methods)," K. S. Lions, Massachusetts Institute of Technology Technical Report No. 2, Laboratory of Applied Biophysics.

SURVEY NO: B.5.63

PROJECT NO: NR 064-331 TASK/CONTRACT/W.O. NO: N5ori 07847

TITLE: (Structural Mechanics and Vibrations) Gages for Measurement of Internal Stresses and Strains of Materials.

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1950 COMPLETION DATE: 1951

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Massachusetts Institute of Technology, Cambridge, Mass.

PRINCIPAL INVESTIGATOR: R. J. Hansen

DESCRIPTION: This research was performed in order to develop a suitable gage for measurements of internal strains and stresses in materials subjected to static and transient conditions of loading. A literature survey was made of existing methods and techniques for measurements of stresses and strains, both surface and interior, of engineering materials; a suitable internal strain gage was developed.

REPORTS:

"Internal Stress Gages for Cementitious Materials," Y. C. Yoh, M. J. Holley, and R. J. Hansen, Final Report, July 1951.

SURVEY NO: B.5.64

PROJECT NO: NR 633-020 TASK/CONTRACT/W.O. NO: 703-02

TITLE: Studies of Shock Propagation, Vibration, and Instrumentation.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: Continuing

DIRECTING AGENCY: Naval Research Lab., Code 6250

CONTRACTOR OR LABORATORY: Naval Research Lab., Washington 25, D. C.

PRINCIPAL INVESTIGATOR: I. Vigness

DESCRIPTION: The objective is to obtain an understanding of the nature and damaging effects of mechanical shock transients and to develop such instrumentation as is required.

Work has been completed on the nature of and the propagation of transverse waves in beams and plates.

A number of accelerometers of new types have been constructed and calibrated. Associated RC and LC filters have been built so as to extend measurements down to essentially zero frequency.

A study has been made to determine the nature of the damage caused to equipment during shock and vibration testing.

REPORTS:

"Designing of Resistance to Shock and Vibration," Kenneth E. Woodward and Harold M. Forkois, Part I, Electrical Manufacturing, July 1954, pp. 86-89; Part II, Electrical Manufacturing, Aug. 1954, pp. 131-135.

NRL Progress Report, December 1954.

SURVEY NO: B.5.65

PROJECT NO: NS 621-058 TASK/CONTRACT/W.O. NO: P.O. 01818/51

TITLE: (Instruments, Nonelectronic, for Shipboard Use) Vibration of Cantilever-Type Thermocouple Wells.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Ships, Code 548

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: B. I. Shapiro and W. H. Day

DESCRIPTION: The vibration of cantilever-type thermocouple wells when installed in machinery and subjected to high velocities, were investigated during [illegible] Trials. Stress amplitudes set up by vibration were found to be [illegible] for some wells; but the stresses required to establish design criteria were considered to be outside the scope of this task, hence the tests were discontinued.

REPORTS:

"Vibration Characteristics of Thermocouple Wells," B. I. Shapiro and W. H. Day, NBTL Interim Report No. 1, Test I-44, 1 Aug. 1952.

SURVEY NO: B.5.66

PROJECT NO: NS 621-058 TASK/CONTRACT/W.O. NO: ---

TITLE: (Instruments, Nonelectronic, for Shipboard Use) Shock-Resistive Pressure Gages.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: June 1955

DIRECTING AGENCY: Bureau of Ships, Code 548

CONTRACTOR OR LABORATORY: Westinghouse Electric Corp., Pittsburgh, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Shock-resistive pressure gages were designed, produced, and tested. These gages were made similarly to the Navy standard pressure gage except for modifications that were required in order that these instruments resist high-impact shock in accordance with MIL Spec. MIL-S-901.

REPORTS:

"Shock Resistant Pressure Gages," Westinghouse Electric Corporation, Letter Report, 29 June 1955.

SURVEY NO: B.5.67

PROJECT NO: NS 631-021 TASK/CONTRACT/W.O. NO: P.O. 66743/49

TITLE: (Gears, Reduction, Application Test of High-Speed Torsional Measuring Equipment) Test of Torque Meters.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1944 COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task includes the application of the Baldwin-Southwark strain-gage equipment for measuring torque and the testing of an electronic torque meter built by the Federal Telecommunication Laboratories, Inc.

The Federal Telecommunications torque-meter was tested for several hundred hours by using it as an input load meter incident to measuring the horsepower loss of reduction gears. The meter was operated successfully and consistently to 25,000 lb/in at 2140 rpm.

REPORTS:

Naval Boiler and Turbine Laboratory, Interim Report T-21, 27 June 1949.

SURVEY NO: B.5.68

PROJECT NO: NS 631-021 TASK/CONTRACT/W.O. NO: P.O. 66743/49

TITLE: (Gears, Reduction, Application Test of High-Speed Torsional Measuring Equipment) Development of Strain Gages and Cements for Operation at 1200 Degrees F.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1944 COMPLETION DATE: Cancelled 1953

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., Buffalo, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An investigation was started, for improvement of strain gages and bonding cements. Existing strain gages and cements did not withstand some laboratory test conditions. Several samples of bonding cements were procured for test purposes. Other government agencies were consulted to obtain information on certain problems involved.

SURVEY NO: B.5.69

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10743/55

TITLE: (Strength of Ship Structures) Measurement of Wave Forces on Bow Structures and Strains in Ships At Sea.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1948 COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: N. H. Jasper

DESCRIPTION: Instruments have been installed on the USCGC CASCO, USCGC CASTLE ROCK, USS FESSENDEN, USS BASILONE, USS CORAL SEA, and the USS GOPHER MARINER. Data have been analyzed and are presented in published DTMB Reports and in DTMB Reports 813 and 774, now being prepared for publication.

REPORTS:

(1) "Statistical Approach to the Longitudinal Strength Design of Ships," Journal of Soc. of Naval Engineers, Aug. 1950.

(2) "The TMB Strain Cycle and Counter - An Instrument for the Statistical Determination of the Strain History of Structures," Soc. for Exp. Stress Analysis, Spring Meeting 1951.

(3) "A Statistical Approach to the Measurements and Analyses of Experimental Data," Journal of Society of Naval Engineers, Aug. 1951.

(4) "The TMB Automatic Ships Motion Recorder," TMB Report 777, Oct. 1951.

(5) "Study of the Strains and Motions of the USCGC CASCO at Sea," TMB Report 781, May 1953.

SURVEY NO: B.5.70

PROJECT NO: NS 711-111 TASK/CONTRACT/W.O. NO: F03-04

TITLE: (Underwater Explosion Shock Test) Instrumentation

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Inactive

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Naval Research Lab., Washington 25, D. C.

PRINCIPAL INVESTIGATOR: J. P. Walsh

DESCRIPTION: The object of this task is to investigate, develop, and procure the shock instrumentation required for the measurement and analysis of shipboard shock data.

The following instrumentation has been developed: an electronic reed gage using velocity time records, circuits for recording strain gage signals with frequency response from 0 to 10 kc, a 35mm camera, and amplifiers to be used with a compact 5-channel cathode-ray oscilloscope.

A 35-ft instrumentation trailer has been outfitted for recording shock and vibration. This equipment was used on the SS428 and the GUPPY SIR experiments.

REPORTS:

Information concerning reports issued under this task may be obtained from BuShips, Code 371.

SURVEY NO: B.5.71

PROJECT NO: NS 711-111 TASK/CONTRACT/W.O. NO: ---

TITLE: (Underwater Explosion Shock Test) Instrumentation.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: E. T. Habib

DESCRIPTION: To improve the methods of measurement and analysis of shipboard shock data a number of instruments have been developed, and studies have been made to determine the velocity-measurement suitability of highly damped mechanical accelerometers and large barium titanate accelerometers when both incorporate integrating circuits.

REPORTS:

(1) "Response of Systems with a Single-Degree-of-Freedom to Shipboard Shock Motion," TMB Report 567 (Confidential), Oct. 1947.

(2) "Experimental Determination of the Suitability of Crystal Accelerometers for Shock Measurements," TMB Report R-246 May 1944.

(3) "Experimental and Theoretical Investigations of the Mass Plug Accelerometer," TMB Report R-267 March 1946.

(4) "Experimental Investigation of the Type-2 Multi-Frequency Reed Gage for Recording Shock Motions," TMB Report 603 Sept. 1949.

(5) "A Theoretical Study of the Multi-Frequency Reed Gage for Measuring Shock Motion," TMB Report 613 July 1949.

(6) "Design of a Multi-Frequency Reed-Type Shock Gage with an Inertia-Operated Trigger," TMB Report 654 May 1949.

(7) "A Low Frequency Electronic Integrator," TMB Report 725 February 1951

SURVEY NO: B.5.72

PROJECT NO: NS 711-112 TASK/CONTRACT/W.O. NO: P.O. 10712/54

TITLE: (Development of Shock Simulating Devices) Calibration and Test of Shock Measuring Instruments.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: H. Rich

DESCRIPTION: Eight velocity meters, four types of accelerometers and two types of multi-frequency reed gages have been evaluated. The instruments were subjected to the transient motions produced in a test structure by the explosion of charges of tetryl. Tests were also made where charges were exploded underwater beneath an instrumented test structure. Eight reed gages, a displacement gage, a velocity meter, and various accelerometers, have been evaluated by using the underwater explosion tests.

To provide means of testing and calibrating gages for measuring shock motions, a ballistic pendulum has been designed and installed. Also a light-weight shock machine and an electro-magnetic vibration exciter are being procured.

REPORTS:

"Evaluation of Selected Shock Instruments," TMB Report 720, Feb. 1951.

SURVEY NO: B.5.73

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10714/55

TITLE: (Vibration and Dynamics of Ship's Structures and Machinery) Procurement, Development, Evaluation, and Calibration of Vibration and Dynamic-Stress Measuring Instruments.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Procurement, calibration, and evaluation of available commercial vibration and dynamic-stress measuring equipments as well as development of equipments, are being conducted under this task.

SURVEY NO: B.5.74

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10739/55

TITLE: (Vibration and Dynamics of Ship's Structures and Machinery) Procurement, Development, Evaluation, and Calibration of Vibration and Dynamic Stress Measuring Instruments.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: F. F. Vane

DESCRIPTION: Many commercial instruments have been acquired and tested, in addition to those designed and constructed at DTMB. Also machines for calibrating vibration instruments have been developed and several have been purchased.

SURVEY NO: B.5.75

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Study of Systems for Measuring Acceleration and Calibrating Accelerometers.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs., Washington, D. C.

PRINCIPAL INVESTIGATOR: Ira Smith and William Garland

DESCRIPTION: A study of various systems and equipments for measuring and recording acceleration. The following specific items are being investigated:

(1) Means for obtaining accurate ac voltages from a few microvolts to several volts for use as basic calibration standards,

(2) Means for recording the above voltage,

(3) Means for rapid spectrum analysis of complex outputs from accelerometers,

(4) For the purpose of calibrating accelerometers, evaluation of the following:

- (a) Chatter accelerometers,
- (b) Displacement probes,
- (c) Interferometer method,
- (d) Reciprocity method,
- (e) Velocity coil,
- (f) Secondary standards.

SURVEY NO: B.5.76

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Protection of Transducers, Principally Accelerometers, from Harmful Environments.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs., Washington, D. C.

PRINCIPAL INVESTIGATOR: Cecil George and Ben Reznek

DESCRIPTION: The purpose of this investigation is to obtain accelerometers for use in vibration testing over a temperature range of -100°F to +225°F. The phases of the problem being investigated are as follows:

(1) A study of the output of several typical accelerometers under varying temperature conditions,

(2) A study of commercially available means of counteracting the effects of rapidly varying temperatures on accelerometers,

(3) An investigation of means to provide a uniform temperature for accelerometers in an environment chamber. The following means are being considered:

(a) Ammonia gas as a coolant,
(b) Water jacketing,
(c) Thin layer of high velocity air.

SURVEY NO: B.5.77

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: **Development of T-3 Type Accelerometers Designed to Fit in T-3 Tube Clips.**

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: **Diamond Ordnance Fuze Labs., Washington, D. C.**

PRINCIPAL INVESTIGATOR: **Ben Reznek and Ira Smith**

DESCRIPTION: **The subminiature electron tube is one of the major sources of microphonics in the fuze circuits during vibration. To investigate the acceleration of tubes during vibration in the fuze, accelerometers are being developed with the following characteristics and purposes:**

(1) Same dimensions as a T-3 electron tube,

(2) Approximately the same weight, 4 grams, as a T-3 electron tube,

(3) Low noise level,

(4) Large longitudinal and low transverse response,

(5) A type for measuring axial acceleration in addition to the type used to measure transverse acceleration.

SURVEY NO: B.5.78

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Development and Investigation of Systems and Components for Obtaining in Flight Environmental Information for Guided Missile Fuzes.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: March 1955 COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs., Washington, D. C.

PRINCIPAL INVESTIGATOR: J. Vineski

DESCRIPTION: A general development program is underway to secure reliable in flight environmental data. This may consist of procurement of commercial equipment or design and construction of prototype equipment for laboratory and field evaluation. Items under investigation are:

(1) Transducers (mechanical or thermal to electric),
    (a) Piezoelectric,
    (b) Variable resistance,
    (c) Variable capacitance;
(2) Matching amplifiers,
    (a) Vacuum tube,
    (b) Transistor;
(3) Subcarriers,
    (a) Integral with transducer,
    (b) Commercial;
(4) Telemeter transmitters, commercial,
(5) In-flight recorders, commercial.

Vibration tests of sample: Sine wave tests 20 to 2700 cps, 20 to 40 g acceleration. Non-sinusoidal wave tests to 5000 cps.

Shock tests of samples: Rise time less than 0.002 sec, hold time greater than 0.010 sec at g levels of 40 to 280. A variety of waveslopes are employed to cover frequency range.

SURVEY NO: B.5.79

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TED MTC GM-5210

TITLE: Development of Simulation Techniques and Facilities for Testing Guided Missile Components and Systems.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Naval Air Missile Test Center, Point Mugu, Calif.

PRINCIPAL INVESTIGATOR: F. J. Holley and E. E. O'Connell

DESCRIPTION: Development of techniques for using tape recorders, spectrum analyzers, graphic-level and cathode-ray oscillographs in reduction of shock and vibration data. Also development of statistical analyzers to permit the making of histograms showing vibration-load amplitude distribution versus time, and the number of repetitions of vibration-load-per-unit time for various arbitrarily chosen levels of load.

REPORTS:

(1) "Instrumentation for Recording and Analyzing Mechanical Vibration," T. A. Solferino, Component Test Department Memo. Report No. 50-53, 1953.

SURVEY NO: B.5.80

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TED MTC GM-5210

TITLE: Development of Simulation Techniques and Facilities for Testing Guided Missile Components and Systems.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Naval Air Missile Test Center, Point Mugu, Calif.

PRINCIPAL INVESTIGATOR: D. J. Heron and E. E. O'Connell

DESCRIPTION: This task features the development of an omni-directional accelerometer consisting of hollow, and spherical-mating, brass masses with barium titanate encased in an outer, hollow, spherical, mating-metal case. A low-noise, coaxial cable connects to the central mass and to the case.

SURVEY NO: B.5.81

PROJECT NO: 503-06-011 TASK/CONTRACT/W.O. NO: DA-04-495-ORD-565

TITLE: (Instrumentation, Equipment and Test Facilities for Missiles) Analogue Digital Converter.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: APG, Ballistics Research Labs.

CONTRACTOR OR LABORATORY: J. B. Rhea Company, Inc., Santa Monica, Calif.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task covered the design and development of a high-speed (conversion rate of 1000 per second) analogue digital converter to be used to accomplish digital processing of FM/FM telemetered data and other analogue data.

SURVEY NO: B.5.82

PROJECT NO: 503-06-011 TASK/CONTRACT/W.O. NO: DA-23-072-ORD-715

TITLE: (Instrumentation, Equipment and Test Facilities for Missiles) Data Reduction and Processing Devices.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: APG, Ballistics Research Labs.

CONTRACTOR OR LABORATORY: University of Denver, Denver, Colo.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task covered a study of data reduction and processing devices and the application of television scanning and other similar techniques to the automatic or semi-automatic processing of data.

SURVEY NO: B.5.83

PROJECT NO: 503-06-011 TASK/CONTRACT/W.O. NO: DA-36-034-ORD-1126

TITLE: (Instrumentation, Equipment and Test Facilities for Missiles) Improved Air-Blast and Piezo-Electric Velocity Gages.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistics Research Labs.

CONTRACTOR OR LABORATORY: Atlantic Research Corp., Alexandria, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task was established to provide for the design and development of improved air-blast and piezo-electric velocity gages.

SURVEY NO: B.5.84

PROJECT NO: 503-06-011 TASK/CONTRACT/W.O. NO: DA-36-034-ORD-1451

TITLE: (Instrumentation, Equipment and Test Facilities for Missiles) Development of FM/FM-PWM/FM Telemetry Receiver.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: June 1955

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistics Research Labs.

CONTRACTOR OR LABORATORY: National Electric Machine Shops, Inc., Clark Instrument Div., Silver Spring, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task was established in order to provide for research, design, and development of a special narrow-band, low-noise, FM/FM-PWM/FM telemetry receiver which would meet the rapidly changing demands in the science of telemetry for the crowding of more channels and hence more data-producing equipment into the available radio spectrum.

SURVEY NO: B.5.85

PROJECT NO: 0601-30-3596 TASK/CONTRACT/W.O. NO: ---

TITLE: Accelerometer Calibration

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: Seymour Edelman

DESCRIPTION: The objective is to set up and evaluate various optical interferometric systems for measurement of vibration including direct counting of fringes and photoelectric scaling of motion of multiple reflection fringes with stroboscopic illumination. We already have facilities for direct microscopic measurement viewed by stroboscopic light and for measurement of vibration amplitude by disappearance of interference fringes at particular displacement amplitudes.

Plans for the future include continued improvement of our stroboscopic interferometer and further application of fringe counting by photoelectric means to extend the frequency range to much higher frequencies and to extend the dynamic range to larger as well as to smaller displacement amplitudes.

REPORTS:

NBS Report 4264, p. 35.

SURVEY NO: B.5.86

PROJECT NO: 0604-20-0635 TASK/CONTRACT/W.O. NO: ---

TITLE: Calibration Standards for Vibration Pickups.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: R. R. Bouche

DESCRIPTION: The objective is to develop vibration standards for the calibration of displacement, velocity, and acceleration vibration pickups. It has been determined that the reciprocity method of measurement can be applied to commercial electro-dynamic transducers to provide an absolute vibration standard. The reciprocity method was successfully applied to several electrodynamic vibration pickup calibrators. These calibrators, when calibrated by the reciprocity method, proved satisfactory as vibration standards within limited frequency ranges.

Plans for future work include the following:

(1) Conduct evaluation tests on electrodynamic vibration pickup calibrators now in use in the Engineering Mechanics Section.

(2) Improve the design of the calibrators to make them suitable for absolute vibration standards between the frequency range of 10 cps to somewhat above 2000 cps.

(3) Explore the possibility of using mechanical vibrators as standards below 10 cps.

(4) Develop suitable methods for the calibration of vibration pickups.

REPORTS:

(1) "The Reciprocity Calibration of MB Vibration-Pickup Calibrator No. 342," R. R. Bouche and S. Levy, National Bureau of Standards Report No. 3979, March 10, 1955.

(2) "The Reciprocity Calibration of a Vibration-Pickup Calibrator," John C. Camm, National Bureau of Standards Report 2651.

SURVEY NO: B.5.87

PROJECT NO: 3-54-02-025 TASK/CONTRACT/W.O. NO: ---

TITLE: Shock and Vibration Measuring Instruments.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: Continuing

DIRECTING AGENCY: Signal Corps Engineering Labs.

CONTRACTOR OR LABORATORY: Signal Corps Engineering Labs., Components Div., Fort Monmouth, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Significant advances in instrumentation have been accomplished with the development of barium-titanate accelerometers under contract with the Glenco Corp., and the development of a multi-channel magnetic tape recorder and reproducer, Model S-3037, under contract with the Ampex Electric Corp.

Three magnet recording accelerometers and the associated reproducing equipment have been built by Ampex.

Commercial instruments have been combined to form an experimental model of a system for the statistical analysis of vibration records.

REPORTS:

(1) Final Report, Contract No. DA36-039 SC-4279, Ampex Electric Corporation, Redwood City, Calif.

(2) "Analysis of Vibrations Recorded with Ampex Model S-3037," SCEL Technical Memorandum No. M-1521, 2 Aug. 1954.

SURVEY NO: B.5.88

PROJECT NO: --- TASK/CONTRACT/W.O. NO: 50304231-11-00501

TITLE: Development of a Radiographic Technique to Obtain a Stroboradiograph of Internal Moving Mechanisms.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1957

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Detroit Arsenal, Center Line, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Stroboradiography is the result of the adaptation of the rapid pulsating characteristic of the 15 mev, General Electric Betatron located at the Detroit Arsenal. Synchronizing supplements to the betatron allow internal viewing of rotating or reciprocating mechanisms under dynamic stress. This is presently accomplished through a photographing medium. Unwanted internal vibration of the exposed mechanism appears as a blurred image on the radiographic plate. Thus far three engines have been stroboradiographed: a 2 hp utility engine, a standard jeep engine, and a 17 hp motor generator. Further investigation and development of the stroboradiographic examination technique is still continuing. The project is being conducted as an Industrial Mobilization Program.

TEST AND EVALUATION

SURVEY NOS:

C.1.1 through C.1.82
C.2.1 through C.2.64
C.3.1 through C.3.30

SURVEY NO: C.1.1

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13636 and AF33(600)5148

TITLE: (Aircraft Structural Design Criteria) Gust Loads and Gust Alleviator Investigations.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Boeing Airplane Co., Wichita, Kans.

PRINCIPAL INVESTIGATOR: E. J. Sullivan

DESCRIPTION: Low-altitude gust tests on a B-47 aircraft are being conducted, and the data are being analyzed.

SURVEY NO: C.1.2

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13450

TITLE: (Aircraft Structural Design Criteria) Dynamic Load Measurements on Bicycle Landing Gear Equipped Aircraft.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: WADC, Aircraft Lab., Wright-Patterson Air Force Base, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The results of this work will be reported in two WADC Technical Reports: "B-47 Landing Tests" and "B-47 Taxi Tests".

SURVEY NO: C.1.4

PROJECT NO: 506-06-018 TASK/CONTRACT/W.O. NO: TA3-3204

TITLE: (Fuze, Guided Missile, VT T3009) Vibration Test.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Diamond Ordnance Fuze Labs

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs, Washington, D. C.

PRINCIPAL INVESTIGATOR: R. R. Palmsano

DESCRIPTION: Vibration tests were made in order to measure structural response of fuze package when vibrated at known frequencies and amplitudes. The vibration spectrum of the fuze package was determined by monitoring several points on the structure. Also, fuze prototype and acceptance tests were made.

Vibration tests involved input frequencies ranging from 30 to 1200 cps with accelerations up to 10 g. Shock tests involved peak accelerations of 110 g, and a duration of 6 milliseconds at the 30 g level.

SURVEY NO: C.1.3

PROJECT NO: 506-06-004 TASK/CONTRACT/W.O. NO: TA3-3102

TITLE: (Fuze, Guided Missile, VT T3001) Test and Analysis.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Diamond Ordnance Fuze Labs

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs, Washington, D. C.

PRINCIPAL INVESTIGATOR: R. Barclay and J. Vineski

DESCRIPTION: Shock and vibration tests and analysis were made in order to develop and evaluate the ability of the electronic package to withstand the handling, shipping, storage, launching, and flight environment experienced during fuze life. The work was grouped as follows:

1. Transportation environments, including shocks and abnormal handling.
2. Shipboard environments, including storage and shocks,
3. Launch and flight environment, including shocks and vibrations. The above environments involve accelerations up to 25 g over a frequency range of 30-2000 cps, over periods up to 4 hr, and shock up to 200 g for a time duration of .028 to .020 sec.

SURVEY NO: C.1.5

PROJECT NO: 506-06-016 TASK/CONTRACT/W.O. NO: TA3-3304

TITLE: (Fuze, Guided Missile, VT T-3008) Vibration Tests.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Diamond Ordnance Fuze Labs

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs, Washington, D. C.

PRINCIPAL INVESTIGATOR: J. F. Wagner

DESCRIPTION: The purpose of the vibration tests is to simulate flight conditions of the missile, and thus determine if the fuze structure is adequate and if the electronic components will function properly in flight. A prototype fuze is vibrated at 15 g from 50 to 500 cps in three planes. Flight units are vibrated at 3 g from 50 to 500 cps in the axial plane. Various other tests are made to determine ruggedness of individual components. The vibration tests will aid in determining the specifications that the fuze will have to meet.

SURVEY NO: C.1.6

PROJECT NO: TASK/CONTRACT/W.O.-NO: TA 2-8110

TITLE: (Fuze, Guided Missile, VT T-3015) Tests.

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: ---

DIRECTING AGENCY: Diamond Ordnance Fuze Labs

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Labs, Washington, D. C.

PRINCIPAL INVESTIGATOR: Benjamin F. Willis

DESCRIPTION: Vibration tests and analysis were made to determine the adequacy of fuze structure and electronic assembly. Also, prototype and acceptance tests were made on completed fuzes.

230-083 TASK/CONTRACT/W.O. NO: NO a(s)55-320

Engine Component Research) Investigation of the Tran-
aracteristics of Supersonic Diffusers.

ASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

1955 COMPLETION DATE: 1956

': Bureau of Aeronautics (PP-22)

ABORATORY: University of Southern California, Los
Angeles, Calif.
TIGATOR: C. L. Dailey

o determine the effect of the supersonic diffuser on
system stability, supersonic wind tunnel tests are
ut to obtain the transient response characteristics of
ler simulated flight conditions.

O a(s)10690

ion Stress Surveys
r on JRM-2 Air-
r on XP5M-1 Airplane
SIFICATION: U

1950

ght-Patterson Ai.

de to ascertain re-
ial and unsafe in-
s were required.

ss Investigation
Blades (16 ft, 8 in.),
M-2 Airplane,"

SURVEY NO: C.1.9

PROJECT NO: NA 340-131 TASK/CONTRACT/W.O. NO: NOa(s)10690

TITLE: (Aircraft Propeller Testing) Propeller Vibration Stress Surveys of Curtiss C644S-B300/830-21C4-0 and C644S-A/1016-3C4-18 Propellers on JRM Airplane.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1950

DIRECTING AGENCY: Bureau of Aeronautics (PP-33)

CONTRACTOR OR LABORATORY: WADC, Propeller Lab, Wright-Patterson Air Force Base, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A flight vibration stress survey was made to ascertain reliable airplane propeller combination, prevent marginal and unsafe installation, and establish such operating restrictions as were required.

REPORTS:

(1) "Curtiss Electric Propeller Blade Vibration Stress Investigation on Model C644S-A26 Propeller, Design 1016-3C4-18, Blades (16 ft, 8 in.), WAC #R3350-8 Engine (Geared 0.4375), Martin JRM-1 Airplane," Report C2143.

(2) "Curtiss Electric Propeller Blade Vibration Stress Investigation on Model C644S-B300 Propeller, Design 830-21C4-0, Blades (15 ft, 2 in.), WAC R3350-8 Engine (Geared 0.4375), Martin JRM Airplane," Report C2162.

SURVEY NO: C.1.10

PROJECT NO: NA 340-131 TASK/CONTRACT/W.O. NO: NOas 51-057-c

TITLE: (Aircraft Propeller Testing) Propeller Vibration Stress Surveys of Curtiss C44S-A/1016-3C4-18 and C644S-B314/830-21C4-0 Propellers on JRM-2 Airplane.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1950

DIRECTING AGENCY: Bureau of Aeronautics (PP-33)

CONTRACTOR OR LABORATORY: WADC, Propeller Lab., Wright-Patterson Air Force Base, Ohio

PRINCIPAL INVESTIGATOR:

DESCRIPTION: Flight vibration stress surveys were made to ascertain reliable airplane propeller combination, prevent marginal and unsafe installation, and establish such operating restrictions as were required.

REPORTS:

(1) "Curtiss Electric Propeller Blade Vibration Stress Investigation on Model C644S-B314 Propeller, Design 830-21C4-0, Blades (15 ft, 2 in.), P. and W. R4360-4 Engine (Geared 0.425), Martin JRM-2 Airplane," Report C-2301.

SURVEY NO: C.1.11

PROJECT NO: NA 340-130 TASK/CONTRACT/W.O. NO: NO as 51-330-f

TITLE: (Subsonic Propeller Development) Flight Vibration and Stress Survey of Curtiss Airplane Propeller, Model C5132S-A.

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Aeronautics (PP-33)

CONTRACTOR OR LABORATORY: Grumman Aircraft Engineering Corporation, Bethpage, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A flight vibration stress survey and a brief performance test of the Curtiss Model C5132S-A airplane propeller were made with the propeller installed on an XS2F-1 airplane.

REPORTS:

"Final Design Report of Model C5132S-A Propeller and Control Equipment For Grumman XS2F-1 Airplane", Curtiss Report No. C-2376.

SURVEY NO: C.1.12

PROJECT NO: NA 340-131 TASK/CONTRACT/W.O. NO: NOas 51-114-c

TITLE: (Airplane Propeller Testing) Propeller Vibration Stress Survey of Aeroproducts AD8664FN-67/F40 Propeller on XT40-A-6 Engine

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (PP-33)

CONTRACTOR OR LABORATORY: North American Aviation, Inc., Los Angeles 45, Calif.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A vibration stress survey was conducted on the Aeroproducts 6-bladed dual rotation propeller with F40 blades, 15-ft diameter. An Allison XT40-A-6 engine was used. The survey showed stress satisfactory for unlimited and unrestricted operation on the XA2J test stand, below 4000 hp. Above 4000 hp, stresses at two positions on the blades were marginal for continuous operation.

REPORTS:

"Vibratory Stress Survey of the Aeroproducts AD8664FN-67B Propeller Assembly on the XA2J Test Stand Mock-up," Report ER No. 489, 15 Jan. 1952

SURVEY NO: C.1.13

PROJECT NO: NA 340-130 TASK/CONTRACT/W.O. NO: NOas 52-1118

TITLE: (Subsonic Propeller Development) Aerodynamic Study of Dual-Rotation Propellers for Advanced Power Ratings

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (PP-33)

CONTRACTOR OR LABORATORY: Aeroproducts Operations, Dayton 1, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Experience obtained with the six-blade dual rotation propellers on A2D and R3Y type aircraft indicated unexpected vibratory stress phenomena and other characteristics peculiar to these propeller installations, which justified an extension of this task to include a study of the 1XP rotatory stresses and side forces.

SURVEY NO: C.1.14

PROJECT NO: NA 340-131 TASK/CONTRACT/W.O. NO: NOas 53-646

TITLE: (Airplane Propeller Testing) Propeller Vibration Stress Survey of Hamilton 8-Bladed, Dual-Rotation, A8260L80/2K14 Propeller on Allison T40 Engine

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (PR-33)

CONTRACTOR OR LABORATORY: Naval Air Experimental Station, Aeronautical Engineering Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A vibration stress survey of the Hamilton Standard 8-bladed dual rotation propeller on an Allison YT40-A-6 engine, has been completed.

REPORTS:

"Vibration Stress Measurements on an A8260L80 Propeller with 2K14A3-3AB and -5AB Blades on an Allison YT40-A-6 Turbine installed on an AEL Torque Stand," Report HS-1183 (Hamilton Standard), June 1954.

SURVEY NO: C.1.15

PROJECT NO: NA 340-131 TASK/CONTRACT/W.O. NO: NO as 54-361

TITLE: (Airplane Propeller Testing) Propeller Vibration Stress Survey of Aeroproducts A634-133/F40k, 3-Bladed Propeller on AD Airplane

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: April 1954

DIRECTING AGENCY: Bureau of Aeronautics (PP-33)

CONTRACTOR OR LABORATORY: Naval Air Station, Patuxent River, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A vibration stress survey of the Aeroproducts A634-133/F40k, 3-bladed, 13-ft. 6-in. diameter propeller on an AD airplane has been completed. Blade stresses were found to be relatively low. The propeller was returned to Aeroproducts for use in the development of a similar propeller with integral ball-bearing-race blade retention.

REPORTS:

"Vibratory Stress Survey of Aeroproducts A634-133 Propeller Assembly on the AD-4 Airplane (Ground and Flight)," Report ER-666 (Aeroproducts), April 1954

SURVEY NO: C.1.16

PROJECT NO: NA 581-146 TASK/CONTRACT/W.O. NO: NO as 51-408

TITLE: (High Temperature and Structural Metallic Materials) Development of Titanium Alloy Landing Gear for P2V-4 Airplane

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AE-41)

CONTRACTOR OR LABORATORY: Menasco Mfg. Co., Burbank, Calif.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Titanium-alloy, landing-gear shock strut cylinders for the model P2V-4 airplane, are being developed. The shock struts have been die forged and are now being machined. These will be assembled in an operating gear for qualification tests including drop tests and fatigue tests.

REPORTS:

Copies of reports may be obtained from the Bureau of Aeronautics, (AE-4)

SURVEY NO: C.1.17

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 215

TITLE: (Structural Development and Test) Static and Dynamic Tests of Model F2H-1 Airplane

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A complete program of static and drop tests was conducted on the Model F2H-1 airplane.

REPORTS:

"Test Loads for the Static Tests of Model F2H-1 Airplane," ASL NAM DE 215, Part I, 23 Jan. 1952

"Static Tests of the Model F2H-1 Airplane", ASL NAM DE 215, Part II, 12 May 1952

"Symmetrical Drop Tests of Reinforced Model F2H-1 Airplane", ASL NAM DE 215, Part III, 7 Dec. 1950.

"Symmetrical Drop Tests of Reinforced Model F2H-1 Airplane, Instrumentation for", ASL NAM DE 215, Part IV, of Nov. 5, 1951.

SURVEY NO: C.1.18

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 256

TITLE: (Structural Development and Test) Structural Test of a Model J-34 Engine Under Crash Loads

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests were conducted for the general purpose of evaluating the strength of the J-34 engine and attachments to withstand crash loads. Two engines were used in these tests, one for static tests and one for drop tests. Load levels were carried to approximately 40 g, simulating crash conditions.

SURVEY NO: C.1.19

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 257

TITLE: (Structural Development and Test) Repeat Load Test on the F2H-2 Nose Wheel Landing Gear

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests were conducted for the purpose of obtaining information on the characteristics of the nose-wheel landing gear of the F2H-2, when subjected to repeated severe landings. A report describing the tests and summarizing the results was prepared, but no distribution was made.

SURVEY NO: C.1.20

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: AED NAM DE 274

TITLE: (Structural Development and Test) Structural Test on Model F9F-5 Airplane

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: Cancelled

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task initially involved the conduct of static tests for catapulting conditions, drop tests in the rolled attitude, and failure-load drop tests in the critical symmetrical condition.

The static tests were completed. The drop tests were cancelled.

SURVEY NO: C.1.21

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-251

TITLE: (Structural Development and Test) Drop Test on Large Aircraft

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Terminated

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Drop tests have been made to determine the strength of the P2V-4 airplane for landing impact and other drop-test problems peculiar to large multi-engine aircraft. These tests covered all critical design conditions, and the differences between results of the drop tests and the actual loadings has been investigated. A final report is being prepared.

SURVEY NO: C.1.22

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-252.3

TITLE: (Structural Development and Test) Investigation of Flight Test Performance Characteristics of NAES Remote-Control Equipment

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A series of flight tests were conducted using the NAES Remote-Control Equipment to determine the maneuvering and stabilization performance characteristics under high-speed flight conditions. The longitudinal and lateral dynamic responses of the airplane, autopilot, and airplane-autopilot combination were determined. Dynamic response data were measured over a Mach number range of 0.22 to 0.70. Theoretical methods of airplane-autopilot stability analysis were verified by an application of the data recorded in these tests.

REPORTS:

"Investigation of Flight-Test Performance Characteristics of the Naval Air Experimental Station Remote-Control Equipment in a High Speed Jet Aircraft", Report No. ASL NAM AD-252.3, 24 Sept. 1954.

SURVEY NO: C.1.23

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-259

TITLE: (Structural Development and Test) Static and Dynamic Tests of Model HRS-1 Helicopter

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR:

DESCRIPTION: An essentially complete program of static and drop tests was conducted on the Model HRS-1 Helicopter.

REPORTS:

(1) "Failing Load Drop Test of the Model HRS-1 Helicopter and Evaluation of the Reinforced Tail Cone and the HRS-2 Nose Gear," NAMATCEN Report No. ASL NAM AD-259, Part IV

SURVEY NO: C.1.24

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 279

TITLE: (Structural Development and Test) Repeat-Load Tests on F9F Aircraft Outer-Wing Panels

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To determine the capabilities of the outboard portion of the F9F outer-wing panels to withstand repeated applications of loads at several different load levels, a total of twelve outer-wing panels were repeat-load tested. Ten were non-production understrength panels, and two were standard production panels. A portion of the S-N curve was developed for both types of wing panels, from the results of these tests.

The final report is being prepared.

SURVEY NO: C.1.25

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-283

TITLE: (Structural Development and Test) Repeat-Load Tests of SNJ Main Landing Gear

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR:

DESCRIPTION: Tests were conducted to evaluate the structural capabilities of modified main landing gears of the SNJ airplane to withstand repeated loads. Due to the inability to obtain failure of the test specimen, under laboratory test, that duplicated the type and location of failure which occurred under service conditions, this task was terminated.

SURVEY NO: C.1.26

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-289

TITLE: (Structural Development and Test) Determination of the Shock Absorption Characteristics of a 20 by 20-ft Section of Flexible Deck

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To determine the general loads and shock absorption characteristics of a 20-by 20-ft section of flexible deck furnished by the Goodyear Tire and Rubber Company, and to correlate the test results with analytical methods, drop tests were conducted with ballasted semi-cylinders. The data relating to the loads and behavior were recorded. After approximately 100 drops, the deck section ruptured during a drop at a contact sinking speed of 20-ft per second. Further tests were not conducted.

REPORTS:

"Determination of Shock Absorption Characteristics of a 20 by 20-ft Section of Flexible Deck", NAMATCEN Report No. ASL NAM AD-289, (Confidential), 11 Aug. 1954

SURVEY NO: C.1.27

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 292

TITLE: (Structural Development and Test) Model F9F-6 Airplane, Free Flight Engagement Drop Tests

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Rotational drop tests of an F9F-6 airplane were conducted. These tests simulated the free flight landing engagements aboard a carrier.

REPORTS:

"Free Flight Engagement Drop Tests," NAMATCEN Report No. ASL NAM AD-292

SURVEY NO: C.1.28

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: FED NAM AD 294

TITLE: (Structural Development and Test) Repeat-Load Tests on Model F2H-2 Airplane Outer Wing Panels

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests were conducted to determine the capabilities of the wing panels on the Model F2H-2 airplane to withstand repeated loads at several different load levels. Failures in the center wing sections of the first two specimens, under 100 percent load condition, necessitated a change in the objective to include the entire wing structure. Additional tests will be performed in order to develop the high-load-level portion of the S-N curve and to develop and test modifications to the structure if determined necessary or desirable.

SURVEY NO: C.1.29

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-296

TITLE: (Structural Development and Test) Model XHR2S-1 Helicopter, Static and Dynamic Tests

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Static and drop tests have been made on an XHR2S-1 helicopter airframe. In view of the forthcoming modifications on the landing gear, drop tests have been curtailed. Further testing will be required after modifications.

SURVEY NO: C.1.30

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 299

TITLE: (Structural Development and Test) Repeat Load Test on Model FH-1 Outer Wing Panels

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Repeat-load tests of Model FH-1 airplane outer-wing panels are to be conducted in order to develop a portion of the S-N fatigue curve for this structural component, and to investigate the effects of cumulative damage resulting from the application of a spectrum of repeated loads.

SURVEY NO: C.1.31

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2101

TITLE: (Structural Development and Test) Model XHSS-1 Helicopter, Static and Dynamic Tests

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics, (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: All static and repeat load tests (except static tests of the cargo sling and rescue hoist for the HUS version) have been completed. Test of the cargo sling and rescue hoist will be conducted during the drop-test program.

SURVEY NO: C.1.32

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2102

TITLE: (Structural Development and Test) XHSL-1 Helicopter Drop-Test Program

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: In order to clear the subject helicopter for structural demonstration, the basic weight drop tests were conducted on an expedited basis. The remainder of the drop-test program will be run after completion of the control system tests under task TED NAM AD-2102.1.

SURVEY NO: C.1.33

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2102.1

TITLE: (Structural Development and Test) XHSL-1 Helicopter, Static and Repeat-Load Test Program

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Control system repeat-load tests to substantiate the strength of the redesigned control system and to determine the failure strength of the fuselage, are in progress.

SURVEY NO: C.I.34

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 2408

TITLE: (Structural Development and Test) Whirl and Flight Tests of PAC Titanium Skin Rotor Blades

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Instrumented flight and whirl tests are being conducted to determine the flight vibration characteristics and obtain a strain survey of the Prewitt titanium skin rotor blade, particularly in the 0-40 knot flight range when installed in a HUP helicopter. Sets of instrumented flight and whirl test blades have been calibrated, and the whirl test set has been installed on a tied-down helicopter. Blade strain surveys are currently being performed following which whirl tests under critical stress conditions will be performed for 50 hr. Flight tests will then be conducted for a period of time not to exceed 5 hr. Similar flight tests will be performed using the Prewitt Model 36 stainless steel blades and a comparison of the vibration characteristics with those for the titanium skin blade, will be made.

SURVEY NO: C.1.35

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 2108.1

TITLE: (Structural Development and Test) Flight Evaluation Tests of Self-Tuning Vibration Damper

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Two Lord Mfg. Co. vibration absorbers will be flight tested to ascertain their effectiveness in reducing vibration inherent in the metal-bladed HUP-2 helicopter.

SURVEY NO: C.1.36

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2150

TITLE: (Structural Development and Test) Evaluation of Strength of AD Wings for Explosive Bolt Bomb Ejector Loads

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR:

DESCRIPTION: Since little test data exists for the response of aircraft structures to extremely short-time impulses of large magnitude, tests are being conducted to evaluate the strength of AD-type wings for explosive bolt bomb ejector loads.

SURVEY NO: C.1.37

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2121

TITLE: (Structural Development and Test) Whirl and Flight Evaluation Tests for Prewitt Aircraft Company Model 110 Rotor Blades

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia 12, Pa.

PRINCIPAL INVESTIGATOR: G. Borod

DESCRIPTION: The work involved in this task is to determine, by tied-down whirl tests, the structural adequacy of the Prewitt Aircraft Co. model-110 rotor blade and to compare its flight vibration characteristics with those of the stainless steel and service type (wood) rotor blades as installed on the HUP helicopter.

SURVEY NO: C.1.38

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: N383s-13070

TITLE: (Aircraft Structural Loads Development) Frequency Response Test with ZP2K Airship

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Goodyear Aircraft Corp., Akron 15, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A ZP2K airship has been instrumented and flight tested to determine the frequency response characteristics.

REPORTS:

"Flight Tests to Determine the Frequency Response of a Type ZSG-2 Airship", GAC Report No. GER 6268, 22 Oct. 1954

SURVEY NO: C.1.39

PROJECT NO: NA 820-182 TASK/CONTRACT/W.O. NO: NOas 51-113-c

TITLE: (Hydrodynamic Investigations) Test of Lift Devices and Investigation of Wake Characteristics

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-31)

CONTRACTOR OR LABORATORY: Stevens Institute of Technology, Hoboken, N.J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task involves a two-phase program: Phase I, a sea-plane-tank test of various auxiliary lift devices to improve the lift and drag characteristics of hydroski alighting gear; Phase II, n investigation of the wake characteristics of the forebodies of typical sea-plane designs in order to explain the yawing instabilities of sea-plane hulls.

A model of the DR-77 has been tested for landing impacts in smooth water and in waves.

REPORTS:

(1) "Wake Characteristics of the Forebody of a Seaplane Hull in Yaw", P. Kaplan, Conf. (Confidential), SIT Report ETT No. 467, June 1953.

(2) "Hydrodynamic Characteristics of Various Configurations of a High-Speed, Medium-Sized Seaplane Determined from Model Basic Tests", R. E. Prowse, (Confidential), Report No. 527, April 1954.

SURVEY NO: C.1.40

PROJECT NO: NE 091-105 TASK/CONTRACT/W.O. NO: ---

TITLE: Electronic Tubes

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 816

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This project is concerned with research necessary for development of better cathode surfaces of rugged types of tubes; and the measurement techniques and facilities necessary for the proper assessment of electron tubes under universal conditions of operation or new design. The task which is concerned with the ruggedization of tubes, requires the application of environmental shock and vibration tests. The available testing equipments of this Laboratory are used in accordance with the specific requirements of each problem.

SURVEY NO: C.1.41

PROJECT NO: NE 111-271 TASK/CONTRACT/W.O. NO: ---

TITLE: (Miniature Components Testing) Connectors

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 817

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to develop a method for solderless wrapped connectors. One phase of this task is to subject the equipment to shock and vibration conditions in accordance with MIL-S-901 and MIL-E-16366B (mod), respectively.

SURVEY NO: C.1.42

PROJECT NO: NE 111-271 TASK/CONTRACT/W.O. NO: ---

TITLE: (Miniature Component Testing) Evaluation

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 817

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to evaluate the Burndy "Crumpet" type cable connectors. One phase of this task is to subject the equipment to vibration according to MIL-E-16[illegible]6B (mod).

SURVEY NO: C.1.43

PROJECT NO: NE 111-271 TASK/CONTRACT/W.O. NO: ---

TITLE: (Miniature Component Testing) Specification Development

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 817

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to evaluate for specification development, rack, and panel connectors. One phase of this task is to subject the equipment to shock and vibration conditions in accordance with MIL-S-901 and Navy 40-T-9 specifications.

SURVEY NO: C.1.44

PROJECT NO: NE 130-711 TASK/CONTRACT/W.O. NO: P.O. 80002/56

TITLE: (Servo-Mechanism Systems) Magnetic Amplifier

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 818

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is research and development of magnetic amplifier servo-mechanism systems. One phase of this task is to subject the equipment to vibration conditions in accordance with MIL-std-167 and shock in accordance with MIL-S-901.

REPORTS:

(1) Progress Report No. 3, Material Laboratory Project 5243-2.16, 4 Feb. 1954

(2) Progress Report No. 5, Material Laboratory Project 5243-2.16, 29 Aug. 1955

SURVEY NO: C.1.45

PROJECT NO: NE 130-711 TASK/CONTRACT/W.O. NO: P.O. 80002/56

TITLE: (Servo-Mechanism Systems) Packaged Systems

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 818

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Laboratory, New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is research and development of packaged servo-mechanism systems. A phase of this task is to subject the equipment to simulated vibration conditions in accordance with MIL-Std-167 and shock in accordance with MIL-S-901.

REPORTS:

Progress Report No. 1, June 23, 1952 through Progress Report No. 5, Materials Laboratory Project No. 5243.2-10, 17 May 1954

SURVEY NO: C.1.46

PROJECT NO: NL 430-013 TASK/CONTRACT/W.O. NO: PTR-EL-46010

TITLE: (Test and Evaluation of ASW Devices) Suspension for AN/SSQ-20 Sonobuoy

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (EL-46)

CONTRACTOR OR LABORATORY: Naval Air Test Center, Patuxent River, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task provides for mounting the AN/SSQ-20 on its suspension and for making repeated catapult launchings and arrested landings to prove the suitability of the suspension system.

SURVEY NO: C.1.47

PROJECT NO: NR 633-050 TASK/CONTRACT/W.O. NO: F03-05

TITLE: Structural Shock and Vibration

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: Continuing

DIRECTING AGENCY: Naval Research Lab., Code 6260

CONTRACTOR OR LABORATORY: Naval Research Lab., Washington 25, D. C.

PRINCIPAL INVESTIGATOR: J. P. Walsh

DESCRIPTION: The objective is to determine the nature of and measure the magnitude of dynamic forces acting on military structures and to develop instrumentation to adequately measure these forces.

The approach is to improve present instrumentation and methods of analysis and, by application of these improved instruments and methods, obtain better descriptions of the dynamic forces. Field testing of an improved diaphragm pressure gage using a strain gage as the sensing element has been completed.

The vibration data obtained from the static firing and flight of a VIKING 9 rocket have been analyzed assuming random frequency vibration rather than steady state.

REPORTS:

"Vibration in the VIKING 9 Rocket," M. W. Oleson and C. B. Cunningham, Rocket Research Report No. 4440, Dec. 1954.

SURVEY NO: C.1.48

PROJECT NO: NS 064-002 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: Deck Coverings

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 345C

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: Mr. Berg

DESCRIPTION: In simulating a shipboard shock, with a H.1 lightweight shock machine, the adhesive qualities of deck coverings are checked in accordance with specification MIL-S-901.

REPORTS:

(1) Supplementary Report, Lab Project 5133-26, 4 May 1955
(2) Supplementary Report, Lab Project 5133-52, 4 May 1955

SURVEY NO: C.1.49

PROJECT NO: NS 121-008 TASK/CONTRACT/W.O. NO: ---

TITLE: Development and Test of Plastic Piping, Fittings and Components for Shipboard Use

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 548

CONTRACTOR OR LABORATORY: Portsmouth Naval Shipyard, Portsmouth, N.H.

PRINCIPAL INVESTIGATOR: Charles J. Chwalek

DESCRIPTION: ---

REPORTS:

(1) "Plastic Tubing for Battery Cooling System Boltaron and Marvinol 64015," T-395

(2) "Boltaron 6200-10 Plastic Tubing," T-395 S1 Part 1

(3) "Geon 8700 Plastic Pipe," T-395 S1 Part 2

(4) "Geon 8700 Plastic Pipe, Scotchcast, Mureco and Goodrich Cements," T-395 Sup. 2

(5) "PVC Pipe and Fittings, Shock Test of Pipe and Adhesives," T-395 Sup. 3

SURVEY NO: C.1,50

PROJECT NO: NS 121-006 TASK/CONTRACT/W.O. NO: P.O. 10751/55

TITLE: (Development and Test of Plastic Pipes, Fittings, and Other Piping Components for Shipboard Use) Plastic Tanks

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 548

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is the development of specifications for plastic tanks. One phase of this task is to subject the equipment to simulated vibration conditions in accordance with specification MIL-Std-167.

REPORTS:

(1) NYML Report 5394-1, 17 July 1952
(2) NYML "Plastic Tanks", Report 5394-3, 24 February 1953

SURVEY NO: C.1.51

PROJECT NO: NS 130-001 TASK/CONTRACT/W.O. NO: P.O. 01761/51

TITLE: (Air Conditioning, Development and Improvement of Systems, Equipments, and Components) Shock Test

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Ships, Code 549

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The U.S. Air Conditioning Co.'s standard fan C3A4X5CW, developed under contract NObs-11539 has been shock tested.

REPORTS:

EES Test Report 5A101761, 29 Dec. 1951

SURVEY NO: C.1.52

PROJECT NO: NS 130-001 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: (Air Conditioning Development and Improvement of Systems, Equipment and Components) Ventilation Ducts

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1944 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 549

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is the development of ventilation ducts of new designs or materials. One phase of this task is to subject the equipment to simulated vibration conditions in accordance with MIL-Std-167 and simulated shock in accordance with MIL-S-901.

REPORTS:

"Investigation of Performance Characteristics of Air Distribution Terminals," M. Belkin, Material Laboratory Report 5455, Progress Report 2, 8 March 1954

SURVEY NO: C.1.53

PROJECT NO: NS 672-100 TASK/CONTRACT/W.O. NO: P.O. 66011/56

TITLE: Development of Cable, Cord and Wire

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560L

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to evaluate the ideal industries No. 410 crimp connector sleeves. One phase of this task is to subject the equipment to vibration in accordance with specification MIL-E-16366B (mod).

SURVEY NO: C.1.54

PROJECT NO: NS 672-100 TASK/CONTRACT/W.O. NO: ---

TITLE: Development of Cable, Cord and Wire

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560L

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to evaluate the H. B. Sherman crimp connectors. One phase of this task is to subject the equipment to vibration in accordance with specification MIL-E-16366B (mod).

SURVEY NO: C.1.55

PROJECT NO: NS 672-100 TASK/CONTRACT/W.O. NO: ---

TITLE: Development of Cable, Cord and Wire

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560L

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to evaluate the Aircraft Marine products crimp connectors. One phase of this task is to subject the equipment to vibration in accordance with Specification MIL-E-16366B (mod).

SURVEY NO: C.1.56

PROJECT NO: NS 672-100 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: Development of Cable, Cord and Wire

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560L

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to provide an improved method of installing watertight connections. One phase of this task is to subject the equipment to vibration in accordance with Specification MIL-E-16366-B (mod).

SURVEY NO: C.1.57

PROJECT NO: NSS 672-100 TASK/CONTRACT/W.O. NO: ---

TITLE: Development of Cable, Cord and Wire

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560L

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to develop suitable methods for splicing MDGL cables. One phase of this task is to subject the equipment to shock and vibration conditions in accordance with MIL-S-901 and Navy 40-T-9.

SURVEY NO: C.1.58

PROJECT NO: NS 672-200 TASK/CONTRACT/W.O. NO: ---

TITLE: Electrical Fittings, Enclosures, and Wiring Appliances

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560W

CONTRACTOR OR LABORATORY: Portsmouth Naval Shipyard, Portsmouth, N.H.

PRINCIPAL INVESTIGATOR: Victor J. Martin

DESCRIPTION: Hydraulic shock tests simulating the effect of underwater explosion have been made on a number of devices for installation in a submarine hull or outboard of the pressure hull.

REPORTS:

(1) "Pressureproof Hull Fitting," T-513
(2) "Pressureproof Hull Fitting with Internal Packing for AN/BQR-2 and AN/BQR-4," T-524
(3) "Hull Fittings and P. P. Cable," T-539
(4) "Roylyn Cable Connector," T-540

SURVEY NO: C.1.59

PROJECT NO: NS 672-200 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: Electrical Fittings, Enclosures and Wiring Apparatus

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560W

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to study methods for improving casualty power systems. One phase of this task is to subject the equipment to shock and vibration conditions in accordance with MIL-S-901 and Navy 40-T-9.

SURVEY NO: C.1.60

PROJECT NO: NS 672-200 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: Electrical Fittings, Enclosures, and Wiring Appliances

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 560W

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is the evaluation of stuffing tube sealants. One phase of this task is to check the effectiveness under condition of shipboard vibration as required by the vibration specification MIL-STD-167.

SURVEY NO: C.1.61

PROJECT NO: NS 672-200 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: Electrical Fittings, Enclosures and Wiring Apparatus

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560W

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to develop suitable methods of passing cables through bulkheads and weather decks. One phase of this task is to subject the equipment to shock and vibration conditions in accordance with MIL-S-901 and Navy 40-T-9.

SURVEY NO: C.1.62

PROJECT NO: NS 673-200 TASK/CONTRACT/W.O. NO: ---

TITLE: Shipboard Electrical Systems, including Switchboards, Panels, Switchgear and Components

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

[redacted] APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The purpose of this task is to develop suitable methods for joining aluminum to copper busbars. One phase of the task is to subject the equipment to shock and vibration conditions in accordance with MIL-S-901 and Navy 40-T-9.

SURVEY NO: C.1.63

PROJECT NO: NS 673-200 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: Shipboard Electrical Systems Including Switchboard, Panels, Switchgear and Components

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to develop suitable methods for terminating aluminum cables. One phase of this task is to subject the equipment to shock and vibration conditions in accordance with MIL-S-901 and Navy 40-T-9.

SURVEY NO: C.1.64

PROJECT NO: NS 673-200 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: Shipboard Electrical Systems Including Switchboards, Panels, Switchgear, and Components

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR:

DESCRIPTION: A task of this project is to develop suitable methods for joining aluminum to aluminum busbars. One phase of this task is to subject the equipment to shock and vibration conditions in accordance with MIL-S-901 and Navy 40-T-9.

SURVEY NO: C.1.65

PROJECT NO: NS 678-054 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: Magnetic Amplifiers, Development, Test and Evaluation

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1948 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 560E

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task is concerned with research and development of magnetic amplifiers. One phase of the task is to subject the equipment to simulated vibration conditions in accordance with MIL-Std-167 and shock in accordance with MIL-S-901.

SURVEY NO: C.1.66

PROJECT NO: NS 681-138 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: (Interior Communication, Fire Control Alarm, and Signaling Systems) Gas Detectors

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 565

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is the development of gas detectors. One phase of this task is to subject the equipment to simulated vibration conditions in accordance with MIL-I-983 and simulated shock in accord with MIL-S-901.

REPORTS:

Lab. Project 4517-13, Material Laboratory Report, Apr. 1954

SURVEY NO: C.1.67

PROJECT NO: NS 687-017 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: (Interior Communication and Fire Control Systems and Components) Connection Boxes

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 565

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR:

DESCRIPTION: A task of this project is to evaluate taper-pin connectors and terminal blocks. One phase of this task is to subject the equipment to vibration in accordance with MIL-E-16366 B (mod).

SURVEY NO: C.1.68

PROJECT NO: NS 688-028 TASK/CONTRACT/W.O. NO: ---

TITLE: (Evaluation and Qualification Testing of Interior Communication and Fire Control Equipment) Gas Detectors

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: BuShips, Code 565

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is the development of gas detectors. One phase of this task is to subject the equipment to simulated vibration conditions in accordance with MIL-I-983 and simulated shock in accordance with MIL-S-901.

SURVEY NO: C.1.69

PROJECT NO: NS 691-032 TASK/CONTRACT/W.O. NO: ---

TITLE: Stabilizer Sets

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 565

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is the evaluation of stabilizer data sets. One phase of this task is to check effectiveness under environmental conditions for vibration and shock in accordance with MIL-I-983.

SURVEY NO: C.1.70

PROJECT NO: NS 713-210 TASK/CONTRACT/W.O. NO: P.O. 30012/56

TITLE: (Airborne Noise Reduction in Ships' Compartments) Selection and Application of Materials

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 31 Jan. 1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is to develop suitable coatings for bulkheads and to provide adequate sound absorption qualities as well as necessary structural properties. One phase of this task is to evaluate the resistance of these materials to simulated shipboard shock conditions in accordance with MIL-S-901. Another phase is to subject standard panels, coated with the material under investigation, to an endurance test by means of a Calidyne electro-dynamic vibration machine. In the course of the vibration test, the logarithmetric-decrement of the machine is determined.

SURVEY NO: C.1.71

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 01816/52

TITLE: (Investigation of Strength of Ship Structures to Achieve Optimum Performance of Surface Vessels) DMS-23, Measurement of Mast Stresses and Motions

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1950 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: N. H. Jasper

DESCRIPTION: Strains and motions of the mast and revised rigging on the USS MACOMB (DMS-23) were measured during structural firing trials. In addition strains were measured in a main-deck longitudinal and in the starboard-gunwhale strake amidships.

REPORTS:

"Structural Test of DMS-23 Pole Mast and Rigging During Depth-Charge Firing", TMB (Restricted), Report C-415, June 1951

SURVEY NO: C.1.72

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10743/55

TITLE: (Investigation of Strength of Ship Structure to Achieve Optimum Performance of Surface Vessels) Strain Measurements on a T-2 Tanker

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: N.H. Jasper

DESCRIPTION: This task involves the full-scale strain and motion measurements on a T-2 tanker to determine the hull bending moments experienced under operating conditions. These data are to be compared with design conditions as well as model tests being conducted by the Stevens Institute of Technology. Measurements of stresses amidships and pitching and heaving accelerations have been completed.

REPORTS:

"Preliminary Report of Strains and Motions of the ESSO ASHEVILLE for the period 24 Aug. 1952 through 31 July 1953," TMB Report 875, N.H. Jasper, Oct. 1953

"Service Stresses and Motions of the ESSO ASHEVILLE, a T-2 Tanker, Including a Statistical Analysis of Experimental Data," N. H. Jasper, TMB Report 960, Sept. 1955.

SURVEY NO: C.1.73

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10743/55

TITLE: (Investigation of Strength of Ship Structures to Achieve Optimum Performance of Surface Vessels) CLC-1, Foremast Response to Shock and Vibration

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: N. H. Jasper

DESCRIPTION: The natural frequency of the unstayed foremast on the CLC-1 was determined. Strains were measured during the vessel's operations.

SURVEY NO: C.1.74

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: P.O. 30023/56

TITLE: (Investigation of Aircraft Carrier Structures) Structural Test of Steam Catapult Brake Structure

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: Ralph B. Allnutt

DESCRIPTION: The problem of the steam catapult brake structure for runaway or no-load shots is being investigated. Shots with various stream receiver pressures and end speeds will be made. To date, the instrumentation installation has been completed.

REPORTS:

"Strength Tests of the Steam Catapult Retardation Structure on USS TICONDEROGA, CVA 14," Louis A. Becker and Ralph B. Allnutt,(Confidential), TMB Report No. C748

SURVEY NO: C.1.75

PROJECT NO: NSM 677-058 TASK/CONTRACT/W.O. NO: P.O. 10719-RON55.51

TITLE: (Testing of Electronic Batteries and Components) Hydrogen Gas Detector

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560S

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Materials Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A task of this project is the development of hydrogen gas detectors. One phase of this task is to subject the equipment to simulated vibration conditions in accordance with MIL-I-983 and simulated shock conditions in accordance with MIL-S-901.

REPORTS:

(1) Progress Report 1, Material Laboratory Project 4517-6, 31 Oct. 1951

(2) Progress Report 2, Material Laboratory Project 4517-6, 2 Apr. 1952

(3) Progress Report 3, Material Laboratory Project 4517-6, 9 Oct. 1952

(4) Final Report, Material Laboratory Project 4517-6, 11 May 1953

SURVEY NO: C.1.76

PROJECT NO: NSS 127-001 TASK/CONTRACT/W.O. NO: - -

TITLE: Development and Test of Metallic and Non-Metallic Hose and Hose Couplings

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: - -

DIRECTING AGENCY: Bureau of Ships, Code 548

CONTRACTOR OR LABORATORY: Portsmouth Naval Shipyard, Portsmouth, N.H.

PRINCIPAL INVESTIGATOR: Leonard L. Murray

DESCRIPTION: Tests are being conducted on the Aeroquip Corporation 4-in. hose assembly including vibration and hydraulic shock to determine suitability for naval service.

SURVEY NO: C.1.77

PROJECT NO: TASK/CONTRACT/W.O. NO: T0SS-11-A

TITLE: C-3 Alternator in B-45-A5 Aircraft

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Wright Air Development Center, (WCLES-3), WPAFB, Ohio

PRINCIPAL INVESTIGATOR: Virgil C. McIntosh

DESCRIPTION: The purpose of this task was to determine whether or not vibration is the cause of excessive brush chippage on C-3 alternators installed in B-45-A5 aircraft.

REPORTS:

"Flight Vibration Test of C-3 Alternator in B-45-A5 Aircraft," Technical Note WADC-TN-55-345, 22 July 1955

SURVEY NO: C.1.78

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TED ADC-EL-582-33

TITLE: Design Approval Evaluation of AN/APQ-51 Radar

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Naval Air Development Center, Johnsville, Pa.

PRINCIPAL INVESTIGATOR: H. Grider

DESCRIPTION: Vibration test phase included test at 55-500 cps. Work of interest concerns mounting jig design and photo recording of local-amplitude characteristics using an orthogonal grid between camera and equipment under test.

SURVEY NO: C.1.79

PROJECT NO: --- TASK/CONTRACT/W.O. NO: IT2-639/A

TITLE: Vibration Study of Experimental Fuel Tank for the Howitzer, 105mm, SP, T98E1

WORK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1955

SPONSORING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Automotive Engineering Laboratory Div., Instrument Application Br., Aberdeen, Md.
PRINCIPAL INVESTIGATOR: R. Leithiser

DESCRIPTION: The task evaluates an experimental fuel tank utilizing new shock mounts. Measurements of vibrations are to be made at various stages of endurance testing with fuel levels from full to empty.

SURVEY NO: C.1.80

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TT1-19S/01

TITLE: Decrease Control Shock Absorbers for M47 Tank

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, D and PS, Aberdeen, Md.

PRINCIPAL INVESTIGATOR: R. F. Wilkie

DESCRIPTION: A jury estimate was made of the riding characteristics of an M47 Tank with experimental shock absorbers. An endurance test of the experimental shock absorbers is to be performed.

SURVEY NO: C.1.81

PROJECT NO: --- TASK/CONTRACT/W.O. NO: A-12

TITLE: Shock Test of Power Package Mounts of Howitzer, 8-in., SP T108

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Automotive Engineering Laboratory Div., Instrument Application Br., Aberdeen, Md.
PRINCIPAL INVESTIGATOR: D. Thomas

DESCRIPTION: An investigation was made of the force reactions at the engine and transmission mounts during a firing program for four gun elevations with spade conditions varied. Accelerometers were mounted in the vertical and longitudinal planes near the engine mounts (right and left sides), transmission mounts (right and left sides), and on the vehicle hull.

SURVEY NO: C.1.82

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TT3-664A/01

TITLE: Ride Quality Test of Semitrailer, 6 Ton, 4W, XM 140E1

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Automotive Engineering Laboratory Div., Instrument Application Br., Aberdeen, Md.
PRINCIPAL INVESTIGATOR: R. Leithiser

DESCRIPTION: Tests were conducted with accelerometers mounted in three planes in the center of the trailer on a centerline between the tandem axles, to determine ride quality characteristics of the trailer with experimental axles.

SURVEY NO: C.2.1

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TB 2-1241

TITLE: Response of Drag Type Targets to Nuclear Weapons

TASK SECURITY CLASSIFICATION: S-RD SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Ballistic Res. Labs., Aberdeen, Md.

PRINCIPAL INVESTIGATOR: E. J. Bryant and N. H. Ethridge

DESCRIPTION: This work is being performed in order to determine the response and damage of drag-type targets subjected to shock waves from nuclear detonations. The analysis of this work includes the correlation of the response and damage of these targets with the basic blast phenomenology. Targets include ordnance materiel such as trucks, tanks, and guns and also quartermaster materiel such as drums, pipe lines, and the like.

REPORTS:

(1) "Response of Drag Type Equipment Targets in Precursor Zone; Operation Teapot," by E. J. Bryant, N. H. Ethridge, and Lt. M. R. Johnson, AFSWP ITR-1123

(2) "Statistical Estimation of Damage to Ordnance Equipment Exposed to Nuclear Blasts," E. J. Bryant, N. H. Ethridge, and Lt. J. McCoy, AFSWP WT-733

SURVEY NO: C.2.2

PROJECT NO: 506-06-004 TASK/CONTRACT/W.O. NO: TA 3-3102

TITLE: (Fuze, Guided Missile, VT T3001) Shock and Vibration Analysis

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Diamond Ordnance Fuze Laboratories

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Laboratories, Washington, D. C.

PRINCIPAL INVESTIGATOR: R. Barclay and J. Vineski

DESCRIPTION: Shock and Vibration analyses were made to evaluate and improve the prototype fuze. These involved analyses of the supporting structure, components, component holders, and the complete prototype. Preparation was made for vibration acceptance tests for certain components. The work was grouped as follows:

1. Shock and vibration analyses of fuze subassemblies
2. Shock and vibration sensitivities of certain components
3. Analyses of component attachments and supports including resonances and natural frequencies
4. Preparation of acceptance testing procedures for certain fuze devices.

The above analyses involved accelerations up to 15 g with a frequency range of 30 cps to 2000 cps and shocks up to 200 g with a time duration of 0.008 sec. to 0.012 sec.

REPORTS:

(1) "Evaluation and Development of the T3001E4 and T3001E5 Safety and Arming Systems," by J. Vineski, DOFL Report No. TR-113, 16 August 1954.

(2) "Investigation of 'G' Weight Latch Mechanism of the R-C Safety and Arming Device for Fuze T3001," by R. G. Barclay, DOFL Report No. R40-54-6, 5 October 1954.

(3) "Drop Tests Made on the T3001 Fuze in its Shipping Container," by J. C. Smith, Ordnance Electronics Division, National Bureau of Standards, Report No. 17-103, 18 November 1952.

(4) "Acceptance Testing Procedures of T3001E3 S and A Device," by H. V. Menapace and J. E. Vineski, DOFL Report No. TR-26, 16 December 1953.

SURVEY NO: C.2.3

PROJECT NO: 506-06-001 TASK/CONTRACT/W.O. NO: TA3-3103

TITLE: (Fuzes, Guided Missile, VT T3000) Vibration Acceptance and Type Tests

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Diamond Ordnance Fuze Laboratories

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Laboratories, Washington, D. C.

PRINCIPAL INVESTIGATOR: J. Vinecki

DESCRIPTION: Vibration acceptance and type tests of E3 and E4 fuze electronic assemblies are conducted by applying 10 g input acceleration through the frequency range of 20 cps to 500 cps while monitoring fuze electrical functions. Resonant frequencies of support structures, various fuze components, and multiplication factor at the supports are determined.

SURVEY NO: C.2.4

PROJECT NO: --- TASK/CONTRACT/W.O. NO: Tzb11-8.20

TITLE: XR-85 Rocket Base Fuze, Test of

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: U. S. Naval Proving Ground, Dahlgren, Virginia

PRINCIPAL INVESTIGATOR: F. W. Kasdorf

DESCRIPTION: The energy source for the XR-85 fuze is a magnetic impact generator (MIG). An investigation of the effects of motor vibration on the MIG has been conducted. A 50-ft high rope test stand was used for this investigation. A 5-in. rocket with an inert head was hoisted between two poles located 120 ft apart. It was held in place when fired by four Manila ropes secured to heavy weights on the ground. The head contained an accelerometer, MIG reed switch, and cathode follower. Leads were run from this equipment in the head to recording equipment in a nearby shelter.

REPORTS:

(1) NAVPROV Ltr OBE:LSP:mim A11/2b11-8 Ser 51008 (Confidential) 24 March 1955.

(2) NAVPROV Ltr OBE:LSP:mim A11/2b11-8 Ser 51564 (Confidential) 6 June 1955.

SURVEY NO: C.2.5

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Safety and Arming Mechanisms for Guided Missile Fuzes

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Diamond Ordnance Fuze Laboratories, Washington, D. C.

PRINCIPAL INVESTIGATOR: P. O. Drury, Jr.

DESCRIPTION: The purpose of the tests was to ascertain the effects of shock and vibration on safety and arming mechanisms for use with VT Fuzes on guided missiles.

Specifications called for tests from 2 cps to 1000 cps at 10 g to 20 g acceleration. The testing interval consisted of approximately 90 min in each plane with special emphasis to resonant points. The mechanisms were also subjected to transportation vibration tests according to MIL-STD-303.

In addition, the mechanisms were subjected to shock tests of 200 g for a duration of 6 msec to 10 msec. Barry Shock Machines were used for these tests as well as jolt machines and drop towers for MIL-STD-300 and MIL-STD-302, respectively.

REPORTS:

DOFL Report TR-213, 18 August 1955
DOFL Report TR-198, 20 July 1955
DOFL Report TR-191, 10 July 1955
NBS Report 17-259, dtd 25 September 1953
NBS Report 17-227, dtd 6 July 1953.

SURVEY NO: C.2.6

PROJECT NO: 1364 TASK/CONTRACT/W.O. NO: 70501 and AF 33(038)-20629

TITLE: (Flight Control Technical Requirements) Research in Artificial Stability and Control

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Flight Control Lab.

CONTRACTOR OR LABORATORY: Cornell Aeronautical Lab., Buffalo 21, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To obtain actual flight data on the optimum and minimum flyable longitudinal stability and control characteristics for fighter and bomber aircraft, two aircraft (a TB-26 light bomber and an F-94 jet fighter) are being used.

Flight tests have been completed and a technical report is being prepared.

SURVEY NO: C.2.7

PROJECT NO: 1366 TASK/CONTRACT/W.O. NO: 70109

TITLE: (Exterior and Interior Aerodynamics) Shock Wave Boundary Layer Interaction and Control

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Aircraft Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Various vortex generator and flow deflector configurations have been tested to determine the effects of shock waves on aircraft (such as F-84 and F-94 flying in the transonic and supersonic ranges of flight) and to alleviate some of the adverse effects of these shock waves. The flight-test phase of this task has been completed and the final report is being prepared. The remaining part of this work which constitutes the photographing of the shock wave system around a supersonic body, has not been completed. This task is being consolidated with tasks 70113 and 70180.

SURVEY #: C.2.8

PROJECT NO: 1367 TASK/CONTRACT NO: 13638

TITLE: (Structural Design Criteria) Maneuvering Flight Loads

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Cancelled 1954

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Aircraft Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task was performed in order to obtain information concerning the flight loads on major structural components on high performance aircraft. The measurements of these loads were necessary to validate or correct present theoretical computations upon which structural designs of aircraft are based.

REPORTS:

(1) "Flight Load Data from Operational F86-A Aircraft," M. R. WCNSE-3-4515-12-15, (Confidential), 5 January 1952

(2) "Flight Load Data from F80 Aircraft to the Air Training Command," TN WCLS 53-3 (Confidential) 1 April 1953.

SURVEY NO: C.2.9

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM 2431

TITLE: (Structural Development and Test) Development of Remote Control Flight Test Techniques

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1950

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A series of flight tests, using a Model F6F-5 airplane, were conducted in order to compare flight data obtained by using pilot control and direct recording means with similar data obtained by using remote control and telemetering equipment.

REPORTS:

(1) "Development of Remote Control Flight Test Techniques, Part II, 30° Dive Tests using NAES Automatic Control Equipment," NAMC Report No. TED NAM 2431 (Restricted), 4 May 1950

(2) "...Part III, Comparison of Programmed Autopilot with Manual Control in F6F-5 Aircraft Dive Tests," NAMC Report No. ASL NAM 2431 (Restricted), 13 July 1950

(3) "...Part IV, NAES Type 1B Telemetering Instrumentation of Model F6F-5 Airplane," NAMC Report No. ASL NAM 2431 (Restricted), 13 September 1950

(4) "...Part V, F6F-5 Nolo Flight Test Program," NAMC Report No. ASL NAM 2431 (Restricted), 20 September 1950

SURVEY NO: C.2.10

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 238

TITLE: (Structural Development and Test) Measurement of Motions and Loads Imposed on Landing Gear on Model ZPK Airship during Carrier Landing

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1949 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Data were obtained upon which design criteria may be based for providing adequate strength in Model ZPK Airships for landing and handling such aircraft aboard aircraft carriers during representative sea and weather conditions.

REPORTS:

(1) "Measurement of Motions and Loads Imposed on Landing Gear of Model ZPK Airship During Carrier Landing and Handling," NAMC Report No. ASL NAM DE 238 (Restricted), 28 March 1951.

SURVEY NO: C.2.11

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 247

TITLE: (Structural Development and Test) Repeat-Load Test on Wings for the Model AD-2Q Airplane

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1950 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To evaluate the effect of repeat loads on typical aircraft wing structures and specifically to obtain data to assist in predicting the service life of the Model AD-2Q wings, tests were conducted on seven outer-wing panels and on the lower-hinge fittings of the wing center-section.

REPORTS:

(1) "Repeat-Load Tests of Model AD Wing Outer Panels," ASL Report No. ASL NAM DE 247, 6 January 1953.

SURVEY NO: C.2.12

PROJECT NO: NA 810-150 TASK/CONTRACT/A.O. NO: TED NAM DE 253

TITLE: (Structural Development and Test) Repeat Load Test Program

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Preliminary studies were made to establish the feasibility of conducting repeated-load tests of complete aircraft and aircraft components. As a result of these studies, drop tests were made on the Model F6U-1 landing gear to investigate the service life of aircraft landing gears, and to obtain data for use in the preparation of landing gear design specifications.

REPORTS:

(1) Letter Report DIR, NAEXPERIMENTALSTA Ltr XT-13-FGN:bg VF6U1/F1(1142), 15 December 1953.

SURVEY NO: C.2.13

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 263

TITLE: (Structural Development and Test) Vibration and Static Test of Control-Surface Balance Weights

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests were conducted to determine the static and fatigue strengths of several control-surface balance-weight installation, in order to provide design and specification information.

REPORTS:

(1) "Vibration and Static Test of Control Surface Balance Weights," ASL Report No. ASL NAM DE 263, 6 October 1952.

SURVEY NO: C.2.14

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM DE 271

TITLE: (Structural Development and Test) Investigation of Damage from Exploding Tires

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests were conducted to investigate the structural damage to aircraft in flight due to the explosion of a landing gear tire while the landing gear is in the retracted position.

REPORTS:

(1) "Investigation of Damage from Exploding Tires of F9F and A9F Airplanes," ASL Report No. ASL NAM DE 271, 17 June 1952.

SURVEY NO: C.2.15

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 260.2

TITLE: (Structural Development and Test) Drone Test Program for Model AD-2 Airplane

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To verify experimentally the predicted safe regions for an AD-2 airplane in the vicinity of an atomic explosion and to provide data which will permit the improvement of methods for determining the effects of atomic weapons on aircraft structures, two Model AD airplanes (which had been instrumented to record normal accelerations, wing and tail loads, and skin temperatures) were operated in close proximity to the atomic explosions of Operation UPSHOT/KNOTHOLE.

The data recorded in these tests are being analyzed. Results will be published as an AFSWP report.

SURVEY NO: C.2.16

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD 290

TITLE: (Structural Development and Test) Repeat Load Tests of F7U-1 Airplane

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To determine the capabilities of aircraft wing structures, which utilize sandwich panel construction, to withstand repeated applications of loads at several different load levels, tests are to be conducted. No work, other than planning, has been accomplished on this task.

SURVEY NO: C.2.17

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2111

TITLE: (Structural Development and Test) Quantitative Determination of the Effects of Blast on Heated Aluminum-Alloy Skin Panels

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: Mr. Rudnick

DESCRIPTION: Aluminum alloy and various sandwich skin panels are to be subjected to blast pressures up to approximately 20 psi while heated to temperatures from room temperature to 400°F. Strain measurements will be made at room temperature and at 200°F. Damage criteria will be determined for the various structural configurations as a function of blast pressure and temperature.

SURVEY NO: C.2.18

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: NOas 52-1131-c

TITLE: (Experimental Structures and Structural Design Criteria) Development of Titanium Skin Rotor Blades for HUP-2 Helicopter

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Prewitt Aircraft Co., Clifton Heights, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Design and theoretical vibration studies were made for all-metal rotor blades having titanium-alloy skin, for the HUP-2 Helicopter. Several blades were fabricated and tested. The evaluation program included design, laboratory bench, whirl, and flight tests.

REPORTS:

(1) "Stress Analysis of Prewitt Model 50 Rotor Blade," PAC Report No. 50-93-1, 26 September 1952.

(2) "Confirmation of Airload Bending Moments Used in PAC Report No. 50-93-1," PAC Report No. 50-93-2, 16 December 1952.

(3) "Test Program for the Titanium Skin Metal HUP-2 Rotor Blades," PAC Report No. 50-90-3, 26 August 1953.

(4) "Final Report of Proof and Fatigue Testing of Prewitt Model 50 Titanium Rotor Blade," PAC Report No. 50-95-1, 23 November 1953.

(5) "Effects of Blade Twist and Tip Weights on Steady Bending Moments of Model 50 Rotor Blade," PAC Report No. SMR-1, 26 October 1953.

(6) "Application of Stress Models to Rotor Blade Design Analysis," PAC Report No. 38-93-2, 9 March 1954.

(7) "Summary of Free-Beam Fatigue Tests of Standard and Two Honeycomb Sandwich 13-Inch Chord Blades," PAC Report No. 62-95-2, 1 April 1954.

SURVEY NO: C.2.19

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: TED NACA AD-210

TITLE: (Aircraft Structural Loads Development) Helicopter Loads Research

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Advisory Committee on Aeronautics, Langley Field, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is to obtain flight test data which will permit the development of improved rational procedures for determining helicopter flight and landing loads. An HRS-1 helicopter was transferred to NACA, Langley Field, Va. in February 1953. The research program is being wholly administered by NACA.

SURVEY NO: C.2.20

PROJECT NO: NA 820-184 TASK/CONTRACT/W.O. NO: NOas 54-890-c

TITLE: (Flight Investigation, Stability and Control) Tandem Helicopter Structure

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-32)

CONTRACTOR OR LABORATORY: Kellett Aircraft Corp., Camden, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task provides for a study of the effects of the application of wings and the effects of cocked lag and flapping hinges on tandem helicopter structure, performance, flying qualities, and vibration characteristics. Flight investigations have been completed.

SURVEY NO: C.2.21

PROJECT NO: NM 001-106 TASK/CONTRACT/W.O. NO: NM 001-097(502)

TITLE: (Aviation Safety, Escape and Rescue) Measurement of Accelerative Forces on Bodies in Aircraft Accidents

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Medicine and Surgery, Aviation Medical Br. (714)

CONTRACTOR OR LABORATORY: Management and Marketing Research Corp., Los Angeles, Cal.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task provides for taking advantage of crashes occurring in drone aircraft by instrumentation of dummies and animals to realistically measure crash forces.

SURVEY NO: C.2.22

PROJECT NO: 1318 TASK/CONTRACT/W.O. NO: 13444 and AF 33(616)-2808

TITLE: (Fastening Devices) Bolts and Nuts for Critical Applications

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Asch Equipment Co., Dayton, Ohio

PRINCIPAL INVESTIGATOR: A. Asch

DESCRIPTION: This contract covers testing almost all sizes of standard aircraft screws and bolts to determine their torque-tension relationships. Most of the test samples have been procured and testing will be started soon.

Work is planned in Fiscal Year 1956 to determine the tensile fatigue life for high strength, high tensile internal and external wrenching bolts used in aircraft structural applications.

SURVEY NO: C.2.23

PROJECT NO: 1318 TASK/CONTRACT/W.U. NO: 13443 and AF 33(616)-2827

TITLE: (Fastening Devices) Quick Acting Fasteners

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Sam Tour and Co., New York, N. Y.

PRINCIPAL INVESTIGATOR: S. Battaglia

DESCRIPTION: Tests will be conducted to provide data on the fatigue life of quick acting rotary fasteners. The fasteners will be tested under various mounting conditions with several types of mounting materials.

SURVEY NO: C.2.24

PROJECT NO: NT 003-008(a) TASK/CONTRACT/W.O. NO: ---

TITLE: (Droppable Airborne Packaging for Free Fall into Water)
Full Scale Air Drop

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Supplies and Accounts

CONTRACTOR OR LABORATORY: U. S. Naval Supply Research and Development Facility, Bayonne, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Two full-scale air drops were conducted in which a total of 63 containers were dropped. The air speed and altitude of the launching aircraft at the time of each container drop were approximately 125 knots and 500 ft, respectively. These tests were considered successful in that 80 percent of the containers assumed the proper attitude during descent and the damage to the contents was not considered to be excessive. Each container was loaded with: (a) one light bulb, (b) one radio tube, (c) one bottle of catchup, (d) one No. 2 can of beans, and 4-in. by 4-in. by 4-in. wooden blocks to fill the remaining container volume. The items with the exception of the blocks and beans, were wrapped in two layers of corrugated paperboard and taped. The weights of the loaded test containers varied, but the maximum weight was 65 lb. The container weight for approximately 60 percent of the containers was about 55 lb.

Limited instrumentation revealed that a few of the containers upon impact with the water encountered fairly high shock values.

SURVEY NO: C.2.25

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TG T-46-M

TITLE: AS-428/APS-42 Radar Antenna Assembly in KC-97 Aircraft

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Wright Air Development Center, WCLES-3, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: Lt. R. D. Hook

DESCRIPTION: The purpose of this task was to determine the flight vibration environment of the antenna assembly as installed in the nose section of a Type KC-97 aircraft.

REPORTS:

"Flight Vibration Survey of AS-428-APS-42 Radar Antenna Assembly in KC-97 Aircraft," Tech. Memo. Report WCLE-55-67, 13 June 1955.

SURVEY NO: C.2.26

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TG T-01-P

TITLE: ARC/21X Radio Installation in B-36 Type Aircraft

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Wright Air Development Center, WCLES-3, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: C. E. Thomas

DESCRIPTION: The purpose of this task was to determine the in-flight vibration environment of the ARC/21X transmitter and power supply as installed in B-36 type aircraft and to ascertain whether or not it would be advantageous from a vibration standpoint to relocate the units.

REPORTS:

"Flight Vibration Survey of ARC/21X Radio Installation in B-36 Type Aircraft," Tech. Memo. Report WCLE-55-30, 4 April 1955.

SURVEY NO: C.2.27

PROJECT NO: --- TASK/CONTRACT/W.O. NO: 11115

TITLE: (Operational and Physical Investigations of Aircraft Environmental Protection) Flight Survey of F-86-D Aircraft, S. N. 50-464

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Wright Air Development Center, Directorate of Laboratories

CONTRACTOR OR LABORATORY: Wright Air Development Center, WCLES-3, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: C. E. Thomas

DESCRIPTION: The purpose of this task was to determine the in-flight vibration environment existing in F-86D type aircraft.

REPORTS:

"Flight Vibration Survey of F-86D Aircraft S. N. 50-464," Tech. Note WADC-TN-55-590, 7 October 1955.

SURVEY NO: C.2.28

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TG T49M-100A

TITLE: **Instrument Panel of B-47B Aircraft, Serial No. 51-2046A**

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: **Wright Air Development Center, WCLES-3, WPAFB, Ohio**

PRINCIPAL INVESTIGATOR: **C. E. Thomas**

DESCRIPTION: **The purpose of this task was to determine the conditions of in-flight vibration existing on the pilot's instrument panel, particularly in the vicinity of the exhaust temperature indicators.**

REPORTS:

"Flight Vibration Survey on Instrument Panel of B-47B Aircraft, Serial No. 51-2046A," Tech. Note WADC-TN-55-504, 12 September 1955.

SURVEY NO: C.2.29

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: P.O. 01741/52

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Testing DeLaval, Falk and Farrel-Birmingham 2nd Reduction Gears, and W. E. Corp. First Reduction Low Pressure Pinions

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U.S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Torque testing of WGT-type destroyer escort gears at NBTL is part of an extensive program concerning design and manufacture of marine propulsion equipment, having as its immediate object the acquisition of data affording a basis for the production of lighter and more compact naval reduction gears.

In these tests, destroyer escort reduction gears were installed on a test stand. The gears were connected in a front-to-front torque test arrangement. Loads were applied by torquing the quill shaft of the port low pressure first reduction gears and second reduction pinion. The gears were rotated by a steam turbine equipped with a torque meter. The gears were run at predetermined loads for periods of 50 hr to 100 hr. Gears were inspected before starting increased loads.

REPORTS:

(1) NBTL Report No. T-5:
Part I, 10 April 1947
Part II, 1 September 1947
Part III, 15 June 1950
Part IV, 30 January 1951

SURVEY NO: C.2.30

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: NBTL Test T-30-II

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Test of G. E. 50,000 SHP Planetary Gear

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: ---

REPORTS:

(1) "General Electric Company 50,000 SHP Planetary Gear for EDD-828," NBTL Report No. T-30-II, 24 September 1952.

SURVEY NO: C.2.31

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: P.O. 10711/55

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Testing of Nitrided 2nd Reduction Pinions and Bull Gear Made by Farrel-Birmingham Co., Inc.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests will be conducted during 1955.

SURVEY NO: C.2.32

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: P.O. 10711/55

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Testing of Carburized 2nd Reduction Pinions and Bull Gear Made by Westinghouse Electric Corp.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Testing will start during 1955.

SURVEY NO: C.2.33

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: P.O. 10711/55

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Testing of Carburized First Reduction Pinions and Gears Made by Western Gear Works

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Testing will start during 1955.

SURVEY NO: C.2.34

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: P.O. 10711/55

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Testing of Carburized First Reduction Pinions and Gears Made by Brad Foote Gear Works

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Testing will start during 1955.

SURVEY NO: C.2.35

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: P.O. 10711/55

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Testing of DD 692 Class Single Helical Carburized and Nitrided Gears

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Single helical carburized and nitrided elements are being procured for the DD 692 test arrangement.

SURVEY NO: C.2.36

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: NBTL Test T-64

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Test of Nitrided Nickel-Chrome-Moly. Steel H.S.L.P. Pinion and Gear, Made by Farrel-Birmingham Company

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This gear was tested up to 45,000 SHP when scoring of gear elements occurred. It was considered that the hardness of the elements was not high enough and that further testing should be done with new elements nitrided to give a hardness of 500 Brinell, minimum. New elements will be obtained through contracts NObs-66566 and testing will be continued.

SURVEY NO: C.2.37

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: NBTL Test T-66

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Testing of Crown Shaved 2nd Reduction Pinions and Straight Shaved Bull Gear Made by Westinghouse Electric Corp.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests will be started during 1955.

SURVEY NO: C.2.38

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: NBTL Test T-78

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Test of AISI, 1045 Steel, First Reduction L. P. Pinion and Gear, Manufactured by Western Gear Works

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests are underway, gears have been operated about 20 hr at 150 percent full load.

SURVEY NO: C.2.39

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: NBTL Test T-81

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Test of AISI H.P.H.S. Steel Pinion and Gear Manufactured by Falk Corporation

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: These gears, made by Falk Corporation, were pinion lapped with special dummy to give end relief on teeth. They have been operated about 20 hr at 150 percent full load. Tests will be continued.

SURVEY NO: C.2.40

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: NBTL Test T-82

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Test of AISI 4340 H.P.H.S. Steel Pinion and Gear, Hobbed, Shot Peened and Shaved, Made by DeLaval

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Tests were conducted to provide data for production of lighter and more compact naval reduction gears. Tests on these gears were conducted to 350 percent of rated load for 50 hr. Under this load two teeth were broken on the pinion gear. Tests will be continued when a replacement pinion is obtained.

SURVEY NO: C.2.41

PROJECT NO: NS 631-016 TASK/CONTRACT/W.O. NO: NBTL Test T-30-III

TITLE: (Torque Testing of DD and DE Main Propulsion Gears) Test of Farrel-Birmingham 50,000 SHP Planetary Gear

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 541

CONTRACTOR OR LABORATORY: Naval Boiler and Turbine Lab., U. S. Naval Base, Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This gear has been tested up to 40,000 H.P. load. It is planned to continue testing to rated load and speed.

REPORTS:

(1) NBTL Report No. T-30-III, 31 August 1954.

SURVEY NO: C.2.42

PROJECT NO: NS 671-100 TASK/CONTRACT/W.O. NO: P.O. 10828/53
Allot. 10002/53

TITLE: (Electric Motors, Motor Generator Sets and Components) Test and Evaluation of Special Development Rotating Electrical Equipment and Associated Controls

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 560H

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Several manufacturers have been awarded contracts to develop special rotating electrical equipments and the associated controls (such as motors, generators, motor generators, etc., incorporating the latest developments in insulation, bearings, variable speed couplings, etc.) to endeavor to obtain improved performance, reliability, and life of these types of equipments for shipboard use. Noise, shock and vibration tests and evaluations of these newly developed equipments have been conducted to determine their suitability for the purpose intended.

REPORTS:

(1) EES Report 5A391, 1 July 1949.
(2) EES Report 5B391, 1 September 1949.
(3) EES Report 5A899, 14 Oct 1949.
(4) EES Report 5A066027, 27 July 1949.
(5) EES Report 5B066027, 28 June 1949.
(6) EES Report 5C966849, 15 March 1951.
(7) EES Report 5D966849, 5 April 1951.
(8) EES Report 6ZX1603.
(9) EES Report 810021A, 1 March 1954.

SURVEY NO: C.2.43

PROJECT NO: NS 676-021 TASK/CONTRACT/W.O. NO: P.O. 10719/55

TITLE: (Test and Evaluation of Submarine Electrical Equipment) Test of Submarine Rotating and Control Equipment

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: May 1947 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 560

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Material Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Developmental units of the following types of equipments have been subjected to shock tests to insure that they will sustain the rigid war-time operation required for submarine equipments: fuses, circuit breakers, controllers, starting resistors, circuit-limiting devices, voltage and frequency regulators for M-G sets, etc.

REPORTS:

(1) Mat. Lab. Report on Project 5258-24, 25 June 1954
(2) " " " 5256-9, 15 January 1954
(3) " " " 5258-26, 17 March 1953
(4) " " " 5258-18A, 4 May 1953
(5) " " " 5256-5, 10 July 1953
(6) " " " 5256-4A, 20 July 1953
(7) " " " 5258-23, 26 June 1952
(8) " " " 5479-1, 11 July 1952
(9) " " " 5179-3, 16 September 1952
(10) " " " 5258-25, 17 September 1952

SURVEY NO: C.2.44

PROJECT NO: NS 711-111 TASK/CONTRACT/W.O. NO: ---

TITLE: (Underwater Explosion Shock Tests) Test on SS-428

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Norfolk Naval Shipyard, Portsmouth, Va.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: During 1952 and 1953, the SS-428 was prepared for underwater explosion test. Norfolk Naval Shipyard conducted the tests. At the conclusion of the tests some items of equipment were removed and inspected for damage.

REPORTS:

(1) "Full-Scale Underwater Explosion Tests on SS-428 (ULUA); General Survey of Principal Equipment Shock Damage," BuShips Report 371-S-14 (Confidential), November 1952.

(2) "Full-Scale Underwater Explosion Tests on SS-428 (ULUA), 1953; Equipment Shock Damage, Final Test Series," BuShips Report 371-S-23 (Confidential), July 1954.

SURVEY NO: C.2.45

PROJECT NO: NS 711-111 TASK/CONTRACT/W.O. NO: P.O. 10753/54

TITLE: (Underwater Explosion Shock Tests) Shock Measurements

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Shock measurements have been obtained on the following ASW ships: the DDR-807, DD-866, DMS-23, and DMS-20; and on a number of submarines.

REPORTS:

(1) NRL Report F-3404 (Confidential), 17 January 1949.
(2) NRL Report F-3417 (Confidential), 15 February 1949.
(3) NRL Report F-3454 (Confidential), 22 April 1949.
(4) NRL Ltr Report C-3883-203A/50 (Confidential), June 1950.
(5) NRL Ltr Report C-3833-334/50 CBS-LVD, September 1950.
(6) NRL Ltr Report C-3861-190A/51 RWS-MJC (Confidential), June 1951.
(7) NRL Memo Report 21, 14 May 1952.
(8) NRL Report 4292 (Confidential), 2 March 1954.
(9) NRL Report 4325 (Confidential), 23 March 1954.
(10) NRL Report 4338 (Confidential), 26 April 1954.
(11) NRL Report 4405 (Confidential), 31 August 1954.
(12) NRL Report 4450 (Confidential), 12 November 1954.
(13) NRL Report 4443 (Confidential), 17 November 1954.

SURVEY NO: C.2.46

PROJECT NO: NS 711-111 TASK/CONTRACT/W.O. NO: P.O. 10739/55

TITLE: (Underwater Explosion Shock Tests) Instrumentation

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: During Operation WIGWAM, the hull response and shock motion of submarine and surface targets produced by an atomic weapon were measured. The targets were instrumented with velocity meters, accelerometers, reed gages, and displacement gages.

REPORTS:

(1) "Hull Response Shock Measurements," AFSWP Report IRT 1072 (Secret) May 1955.

SURVEY NO: C.2.47

PROJECT NO: NS 711-111 TASK/CONTRACT/W.O. NO: P.O. 10739/55

TITLE: (Underwater Explosion Shock Tests) Full Scale Tests

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task calls for the preparation, planning, and conduct of full-scale shock tests on the principal combatant ships, and the conduct of limited shock measurements during structural depth-charge tests on a selected number of ASW vessels.

REPORTS:

(1) "Shock Data Obtained During Depth Charge Structural Firing Trials"

Part I, USS COWELL (DD547), TMB Report C508 (Confidential), June 1952,

Part II, USS OWEN (DD536), TMB Report C533 (Confidential), April 1955,

Part III, USS STURTEVANT (DE239), TMB Report C550 (Confidential), Aug. 1954,

Part V, USS WATTS (DD567), TMB Report C552 (Confidential), May 1955.

(2) "Preliminary Report in Underwater Explosion Tests Against a Wooden Hull Minesweeper, ex-YMS 319," TMB Report C637 (Confidential), June 1954.

(3) "Analysis of Results of Shock Test on NIAGARA (APA87)," TMB Report C-242 (Confidential), January 1953.

SURVEY NO: C.2.48

PROJECT NO: NS 724-014 TASK/CONTRACT/W.O. NO: P.O. 10710/54

TITLE: (Relationship Between Underwater Explosive Loading and Structural Response of Anti-Submarine Type-Hulls) Explosive Testing of Wooden Hulls

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 423

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C

PRINCIPAL INVESTIGATOR: H. L. Rich

DESCRIPTION: Three full-scale shock test series have been run against wood hulls to determine their resistance to explosive loading. Series 1 was conducted against the AMCU-12, Series 2 against three wooden barges, and Series 3 against the ex-YMS 319.

REPORTS:

(1) "Preliminary Report on Underwater Explosion Tests Against a Wooden Hull Minesweeper, ex-YMS 319," by H. L. Rich, R. D. Ruggles, and C. M. Atchinson, TMB Report No. C637 (Confidential), June 1954.

(2) "Underwater Explosion Tests Against Wooden Hull Vessel AMCU-12," by J. Guidotti and H. R. Jordan, BuShips Report No. 1954-3 (Confidential), NavShips 250-423-23, April 1954.

(3) "Explosive Resistance of Wooden Barges," by J. Guidotti and H. R. Jordan, (Confidential). Presented at Sixth Symposium on Progr in Underwater Explosion Research, 2-4 November 1953.

SURVEY NO: C.2.49

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10743/55

TITLE: (Investigation of Strength of Ship Structure to Achieve Optimum Performance of Surface Vessels) Transverse Framing Design Criteria

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: E. E. Johnson

DESCRIPTION: The work includes two distinct phases: the identification of the magnitude and distribution of the service loads acting on a frame, and the investigation of the elastic behavior of framing with any given condition of loading. Some work has been done with steel and plastic models of frames. Strains and distortions of frames in CL-108 due to underwater explosions were measured. Strains in framing of the DD 865 at sea and in drydock were measured.

REPORTS:

(1) "The Measurement and Control of Keel Block Loads During Drydocking Tests of the USS CHARLES R. WARE (DD 865)," TMB Report C-174, August 1949.

(2) "Measurement of Behavior of Transverse Framing on the Hulk CL-108, During Underbottom Explosion Attack," TMB Report C-184, February 1950.

SURVEY NO: C.2.50

PROJECT NO: NS 731-040 TASK/CONTRACT/W.O. NO: P.O. 30023/56

TITLE: (Investigation of Aircraft Carrier Structures) Carrier Strength Investigation

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Flight deck drop tests have been made on the USS HANCOCK (CVA-19) to determine the fundamental relationship between dynamic and static loadings of flight deck structures and the feasibility of landing the A3D-1 aircraft on the CVA-19 class carrier. The test data are being analyzed in preparation for a final report and design recommendations.

SURVEY NO: C.2.51

PROJECT NO: NL 430-013 TASK/CONTRACT/W.O. NO: PTR-EL-46006

TITLE: (Test and Evaluation of ASW Devices) Sonobuoy Trials

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (EL-46)

CONTRACTOR OR LABORATORY: Naval Air Test Center, Patuxent River, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task provides for testing services to the BuAer, as required, for quality control drop tests and flight tests on developmental and production models of the AN/SSQ-2 sonobuoys. Drop tests are also conducted on new designs to uncover discrepancies and inherent weaknesses prior to production runs.

SURVEY NO: C.2.52

PROJECT NO: NE 110-231 TASK/CONTRACT/W.O. NO: NPO-3249

TITLE: (Electron Tube Reliability) Reliable Tubes

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Electronics Div., Code 816

CONTRACTOR OR LABORATORY: Cornell Univ., Ithaca, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task represents the Navy's interest in a Signal Corps contract with Cornell Univ. to maintain a tube laboratory and by inspections and tests determine causes for tube failures, and recommend improvements in designs and directions along which development projects may profitably be directed.

Over 50,000 tubes that have failed have been tested and analyzed, to date. Tube manufacturers have cooperated in the redesign of tubes and the adjustment of manufacturing operations to eliminate failures that were analyzed under this task.

SURVEY NO: C,2,53

PROJECT NO: --- TASK/CONTRACT/W.O. NO: IR 1003

TITLE: Correlation and Analysis of Vibration Test Procedures Used for Electron Tubes in Guided Missiles

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Wright Air Development Center (WCREG-2), WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task provides a program for a correlation test and the data analysis necessary for the establishment of a measurements type of vibration test procedure for electron tubes used in guided missiles.

SURVEY NO: C.2.54

PROJECT NO: --- TASK/CONTRACT/W.O. NO: IR 1000

TITLE: Electron Tube Mechanical Test Procedures

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Wright Air Development Center (WCREG-2), WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An investigation is being made which includes tests suitable for incorporation into Military Control Specifications as: (1) a degradation rate test of vibration fatigue and (2) a measurement test of noise output resulting from mechanical stimuli. The investigation will consider the conditions of cycled vibration as outlined in Equipment Specification MIL-E-5272A, Procedure No. 1.

SURVEY NO: C.2.55

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TG T-54-P

TITLE: Hammond Model 3000 Jet Transport Trailer

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Wright Air Development Center, WCLES-3, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: James C. Stelyn

DESCRIPTION: The purpose of this task was to determine the dynamic loads which may be imposed on the subject jet transport trailer and its cargo when towed over various types of test surfaces.

REPORTS:

"Mobility Test of Jet Transport Trailer, Hammond Model 3000," Technical Note WADC-TN-55-304, 8 July 1955

SURVEY NO: C.2.56

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TG T-54P

TITLE: Hammond Model 3000 Trailer with J57-P1 Jet Engine Load

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Wright Air Development Center, WCLES-3, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: James C. Stelyn

DESCRIPTION: The purpose of this task was to determine the accelerations imposed on the subject trailer and its jet engine load when transported by a flat-bed truck trailer over concrete and macadam roads and when subjected to drop tests.

REPORTS:

"Truck Transportation and Drop Tests of Hammond Model 3000 Trailer with J57-P1 Jet Engine Load," Technical Note WADC-TN-55-424, 19 Aug. 1955

SURVEY NO: C.2.57

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TTI-198/A

TITLE: Vibration Comparison Test of Standard and Modified Armoured Infantry Vehicle, T73

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Automotive Engineering Lab., Div., Instrument Application Branch, Aberdeen, Md.
PRINCIPAL INVESTIGATOR: W. Aschenbeck

DESCRIPTION: Vibration pickups were located on each side of the No. 1 and No. 3 road wheel arm hub, on the floor of the driver's compartment, and on the floor, walls, seats, and roof of the crew compartment, to determine the effectiveness of modification to the AIV T73.

SURVEY NO: C.2.58

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TR1-1053

TITLE: Comparison of Ride Quality of the Standard Shock Absorbers and the Houdaille-Hershey Friction Type Snubbers and Firing Shock and Vibration Test on Fire Control Components of Skysweeper Mount, 76mm Gun, T69

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Automotive Engineering Lab., Div., Instrument Application Branch, Aberdeen, Md.

PRINCIPAL INVESTIGATOR: R. Leithiser

DESCRIPTION: Fifteen accelerometers mounted in the vertical, longitudinal, and lateral planes were used for recording data during a road test and a firing program to compare ride-quality characteristics of the standard shock absorbers and friction snubbers, and to determine the shock and vibration on fire-control components.

SURVEY NO: C.2.60

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: (Evaluation of Modified AAFCS M33 Equipment Rack Mountings During Railroad Switching Operations)

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Aberdeen, Md.

PRINCIPAL INVESTIGATOR: A. Wolski

DESCRIPTION: The trailer tested was subjected to impact shocks caused by railroad humping. Accelerometer recordings in the vertical, lateral, and longitudinal directions were taken on both the flatcar and the AAFCS M33 radar trailer.

REPORTS:
A technical Report is being prepared.

SURVEY NO: C.2.61

PROJECT NO: --- TASK/CONTRACT/W.O. NO: TR1-1044

TITLE: Phase I - 70 mm Rocket Program

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Aberdeen, Md.

PRINCIPAL INVESTIGATOR: A. Wolski

DESCRIPTION: A Skysweeper weapon with a 70-mm, T110E3 launcher in place of the 75-mm gun is being fired to determine the effect of high rates of fire on the computer, radar, and power controls. Blast measurements are being taken about the radar scanner. High-speed photographs are being taken of the radar scanner and radar console to record motion relative to the upper carriage.

REPORTS:

The detailed report was published by Arma Research Foundation.

SURVEY NO: C.2.62

PROJECT NO: --- TASK/CONTRACT/W.O. NO:

TITLE: Connecting Rod Interchangeability of a Model AV 1790-5B Engine

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1953

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Detroit Arsenal, Center Line, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A 50-hour endurance test was conducted on a Model AV 1790-5B engine equipped with four heavy and eight light connecting rods. The test was completed with normal and similar wear on both light and heavy connecting rods and their associated parts. With light and heavy connecting rods the engine vibration at 2600 rpm full throttle attained a maximum amplitude of 0.0475 in. in the lateral direction and 0.0265 in. in the vertical direction. Vibration of the same engine, with heavy connecting rods installed throughout, attained a maximum amplitude of 0.0185 in. in the lateral direction at 2400 rpm full throttle and a maximum amplitude of 0.0265 in. in the vertical direction at 2600 rpm full throttle.

REPORTS:
Report No. 2324-7471

SURVEY NO: C.2.63

PROJECT NO: 548-12-001 TASK/CONTRACT/W.O. NO: TT1-19S/A

TITLE: Vibration Comparison of Armored Infantry Vehicles, Modified for Vibration and Noise Reduction

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1955

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Lab. of Development & Proof Services, Aberdeen, Md.
PRINCIPAL INVESTIGATOR: D. A. J. Misioria

DESCRIPTION: A comparison of vibration and noise reduction was made between a standard armored infantry vehicle (T73), and a like vehicle which incorporated rubber-cushion sprocket hubs, crowned-rubber track support rollers, crowned-rubber, rear-track idler assembly, and sound-absorption panels in the crew compartment.

SURVEY NO: C.2.64

PROJECT NO: 545-07-028 TASK/CONTRACT/W.O. NO: TT2-782

TITLE: (New Tanks, Medium and Heavy Gun) Dynamic Impact Test of Tank, Medium, T40

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Detroit Arsenal

CONTRACTOR OR LABORATORY: Detroit Arsenal, Climatic Lab, Centerline, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The test consisted of driving subject vehicle into a concrete abutment to obtain impact data on rigid-mounted front idler's spindles. The vehicle was driven by a cable-link remote control unit, and was instrumented to record the g-load (horizontal and vertical) in the driver's compartment, and the speed of the vehicle at the moment of impact.

SURVEY NO: C.3.1

PROJECT NO: 1111 TASK/CONTRACT/W.O. NO: ---

TITLE: (Operational and Physical Investigations of Aircraft Environmental Protection) Accumulation of Shock, Vibration, and Acceleration Data.

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Directorate of Laboratories

CONTRACTOR OR LABORATORY: Wright Air Development Center, WPAFB, Ohio

PRINCIPAL INVESTIGATOR: R. K. Hankey

DESCRIPTION: The purpose of this project is to accumulate shock, vibration, and acceleration data to be used in establishing test procedures and general criteria for guided missiles.

SURVEY NO: C.3.2

PROJECT NO: 1111. TASK/CONTRACT/W.O. NO: ---

TITLE: (Operational and Physical Investigations of Aircraft Environmental Protection) Analysis of Vibration Test Data

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Directorate of Laboratories

CONTRACTOR OR LABORATORY: Wright Air Development Center (WCLDE and WCLES-3) WPAFB, Ohio

PRINCIPAL INVESTIGATOR: W. A. Scholl and N. Granick

DESCRIPTION: The purpose of this project is to review vibration test reports covering vibration tests accomplished by and for this Center during the past seven years. These reports will be reviewed and data catalogued on IBM cards.

REPORTS:

Monthly letter progress reports have been submitted, in addition the final report will be presented in 1955.

SURVEY NO: C.3.3

PROJECT NO: 1-1361 TASK/CONTRACT/W.O. NO: 13624

TITLE: (Aerodynamic Loads) Preliminary Investigations

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Aircraft Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task covers preliminary theoretical and experimental investigations pertaining to the aerodynamic loads on aircraft and their components such as external stores, speed brakes, and other protuberances. Investigations to date have resulted in the initiation of specific tasks and the correlation of available information on external stores, and the effects of various installations on the flight characteristics of Air Force aircraft.

REPORT:

(1) "Einziehbaser Hallstaner Fist-Banderschirm, Berecht No. 217," ATI 18907.

(2) "Dynamic Loads on Wings with Tip Weights During Landing, Taxiing and Take-Off." Memo. Report TSEAC - 45128 - 2 - 15.

SURVEY NO: C.3.4

PROJECT NO: 1364 TASK/CONTRACT/W.O. NO: 04801 and AF 33(600)-23374

TITLE: (Flight Control Technical Requirements) Flight Research on Fighter Tracking

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Flight Control Lab

CONTRACTOR OR LABORATORY: Cook Research Lab., Skokie, Ill.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Flight research will be conducted to determine the influence of stability characteristics on tracking capabilities and the improvement in tracking accuracy realizeable by the addition of artificial stabilization. Power spectra of tracking errors and airplane dynamic response will be determined in order to establish the relationship of airplane dynamics to tracking performance.

REPORTS:

(1) "Data Report on Tracking Errors with F-86E Type Aircraft," by D. F. Graham and W. H. Ahrendt, WADC Memo Report No. WCT-52-7 (Confidential), 17 March 1952.

(2) "Effects of Airplane Operating Conditions and Dynamics on the Tracking Characteristics as Associated with Gunnery," by H. I. Abbott, NACA, ltr 24 October 1952.

(3) "F-86-E Tracking Characteristics," by H. R. Rice, NAA ltr 52C 10849, North American Aviation, Inc., 19 June 1952.

(4) "Analysis of Tracking Errors," by H. K. Weiss, Aberdeen Proving Ground, Maryland, R.R.L. Report No. 649 (Confidential), 11 September 1947.

SURVEY NO: C.3.5

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13580 and AF 33(038)-15422

TITLE: (Aircraft Structural Design Criteria) Study of Gust Problems

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Univ. of Minn., Minneapolis, Minn.

PRINCIPAL INVESTIGATOR: P. Leland

DESCRIPTION: This contract covers wind tunnel tests to check the development of unsteady lift for a small instantaneous change of angle of attack at high subsonic velocities. This information is required for a complete study of the response of an airplane to gust attack.

SURVEY NO: C.3.6

PROJECT NO: 1367 TASK/CONTRACT/W.O NO: 13581 and W 33(038)AC-18517

TITLE: (Aircraft Structural Design Criteria) Maneuvering Tail Load

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Completed

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Cornell Aeronautical Lab., Buffalo, N. Y.

PRINCIPAL INVESTIGATOR: R. Koegler

DESCRIPTION: This task covers a series of flight tests of maneuvering tail loads on an F-80 airplane and theoretical studies regarding these loads. This work has been completed and seven final reports have been submitted. An additional study of airplane motions and tail loads for three supersonic and three subsonic airplanes during a rolling pull-out maneuver is continuing under Contract AF(616)-2429.

REPORTS:

(1) "Flight Load Data from F-80 aircraft to the Air Training Command," TN WCLS 53-3 (Confidential), 1 April 1953.

SURVEY NO: C.3.7

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 13637 and AF 33(038)-3041

TITLE: (Aircraft Structural Design Criteria) Collection and Statistical Analysis of Flight Load Data

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Laboratory

CONTRACTOR OR LABORATORY: Univ. of Dayton, Dayton, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Flight load data from service aircraft are being collected and analyzed for use in the formulation and revision of structural design criteria for future aircraft and the establishment of flight limitations for present aircraft.

REPORTS:

(1) "Advanced Summary of Data Recorded on F-86-F Aircraft During Training Operations," Informal Report.

(2) "Preliminary Analysis of Recorded Data from Combat Operations," TN WCLS 53-59.

(3) "Advanced Summary of Combat Flight Load Data," TN WCLS 54-17.

SURVEY NO: C.3.8

PROJECT NO: 1385 TASK/CONTRACT/W.O. NO: 13734

TITLE: (Flight Control Elements) Dynamic Test and Analysis of Guided Missile Flight Control Components

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Flight Control Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center, Flight Control Lab., WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will provide the Air Force with the technical data to ascertain the capabilities of guided missile flight control components. It will provide the specifications and methods of evaluating components and subsystems for present and future missile programs, and will enable the Air Force to establish standard test equipments and test procedures to be used by contractors when testing flight control equipments. Static and dynamic tests will be performed to obtain the required technical data.

SURVEY NO: C.3.9

PROJECT NO: --- TASK/CONTRACT/W.O. NO: GM 3201.9

TITLE: Environmental Determination Program for SPARROW I, Phase B

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Naval Air Missile Test Center, Point Mugu, Cal.

PRINCIPAL INVESTIGATOR: R. A. Harmen

DESCRIPTION: The general purpose of the program is that of establishing realistic levels for the field environmental conditions which the SPARROW I missile will be expected to withstand. A series of three reports will be published. The first will give the levels of shock and vibration measured on the USS HANCOCK. The second will detail the Captive Flight Environment of the SPARROW I aboard the F3D-2M, and the last will present data taken during the powered and glide portions of missile flight.

SURVEY NO: C.3.10

PROJECT NO: 503-05-010 TASK/CONTRACT/W.O. NO: ---

TITLE: Vulnerability of Aircraft and Missiles

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1949 COMPLETION DATE: Continuing

DIRECTING AGENCY: Aberdeen Proving Ground, Ballistics Research Lab.

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Ballistics Resear Labs., Aberdeen, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A study to determine the distribution of skin thickness and impact angles over the regions of the B-29 and B-47 which are susceptible to internal blast damage, has been completed.

Internal blast firings against available jet fighter target aircraft have been completed.

Calculations of peak pressure on reflection of air shock from moving targets have been completed, and external blast tests against the F6F aircraft using 8-lb and 100-lb bare pentolite charges are under way, and an extensive series of explosive comparison tests using B-29 aircraft as targets has been undertaken.

REPORTS:

(1) "Peak Pressures in Reflection of Air Shock from Moving Targets," BRL 903, April 1954.

(2) "Damage to B-47 Aircraft by External Blast," BRLM 736.

(3) "Damage to B-47 Aircraft by Internal Blast," BRLM 747.

(4) "Estimate of the Internal Blast Vulnerability of the Russian MIG-15 Aircraft," BRLM 812, July 1954.

(5) "Vulnerability of the F-84, F-86, F-94, and F6U Jet Aircraft to Internal Blast," BRLM 848.

(6) "Blast Vulnerability for Criteria for Several Operational Jet Type Aircraft," BRLTN 870, February 1954.

(7) "Comparative Vulnerability of Magnesium and Aluminum Alloy Outer Wing Panels of T-6 and F9F Aircraft," BRLM 802.

(8) "Blast Vulnerability Criteria for F-100 and A4D Jet-Type Aircraft," BRLTN 930.

SURVEY NO: C.3.11

PROJECT NO: 3346 TASK/CONTRACT/W.O. NO: 33039 and AF 33(038)-22364

TITLE: (Aircraft Propeller Blades) Dynamic Investigation of Propeller Blades

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Propeller Lab.

CONTRACTOR OR LABORATORY: Curtis-Wright Corp. Propeller Div., Caldwell, N. J.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The propeller blades tested to date have been found to be susceptible to first mode bending resonance and single-degree-of-freedom torsional flutter within the operating ranges of the propellers. A test program for the systematic investigation of the dynamics of propeller blades has been initiated in order to develop a background in basic dynamics, vibration, and advanced mathematics that will facilitate the analytical study of propeller dynamics.

SURVEY NO: C.3.12

PROJECT NO: 4157 TASK/CONTRACT/W.O. NO: 41612 and AF 33(616)-223

TITLE: (Vibration and Shock Criteria) Vibration and Shock Design Criteria for Electronic Equipments

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, Electronic Equipments

CONTRACTOR OR LABORATORY: Armour Research Foundation, Chicago, Ill.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task is composed of a program to determine the points of mechanical and electrical failures of electrical components and equipments at resonance and above the resonant frequency, due to vibratory motion; to determine the location of resonant points and the amplitudes of vibration at resonance for structures such as chassis, holding brackets, etc.; and to determine the mechanical design levels of present electronic components and equipments relative to vibration and shock.

REPORTS:

"Evaluation of Mechanical Design Levels of Electronic Equipment Leading to Vibration and Shock Criteria" Armour Research Foundation Technical Phase Reports 1, 2, 3, 4, 5, 6, and 7. Final Report will be available in January 1956.

SURVEY NO: C.3.13

PROJECT NO: 4157 TASK/CONTRACT/W.O. NO: 41572

TITLE: (Vibration and Shock Criteria) Vibration and Shock Design Guide for Airborne Electronic Equipment

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1958

DIRECTING AGENCY: Wright Air Development Center, Electronics Components Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center (WCREM-3) WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will review, correlate, and evaluate methods and techniques for the design of electronic equipments to meet Air Force vibration and shock service conditions. This will include the reviewing of all data obtained from previous vibration and shock design criteria tasks and conducting any tests that may be necessary to validate the proposed design methods and techniques. The end product will be a design manual or guide which will aid the electronic engineer in the design of USAF airborne electronic equipment.

SURVEY NO: C.3.14

PROJECT NO: 4526 TASK/CONTRACT/W.O. NO: 45153B

TITLE: (Electronic Design and Applied Techniques) Shock and Vibration Isolators

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: Rome Air Development Center

CONTRACTOR OR LABORATORY: Rome Air Development Center, Griffiss Air Force Base, Rome, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is the evaluation of the various available types of shock mounts for ability to protect electronic equipments from shock and vibration. Also evaluate mounts with respect to the various climatic conditions which are encountered in the field. This task will provide the Air Force with a list of applications where the various types of shock mounts may be used with ground electronic equipments.

SURVEY NO: C.3.13

PROJECT NO: 4157 TASK/CONTRACT/W.O. NO: 41572

TITLE: (Vibration and Shock Criteria) Vibration and Shock Design Guide for Airborne Electronic Equipment

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1958

DIRECTING AGENCY: Wright Air Development Center, Electronics Components Lab.

CONTRACTOR OR LABORATORY: Wright Air Development Center (WCREM-3) WPAFB, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task will review, correlate, and evaluate methods and techniques for the design of electronic equipments to meet Air Force vibration and shock service conditions. This will include the reviewing of all data obtained from previous vibration and shock design criteria tasks and conducting any tests that may be necessary to validate the proposed design methods and techniques. The end product will be a design manual or guide which will aid the electronic engineer in the design of USAF airborne electronic equipment.

SURVEY NO: C.3.14

PROJECT NO: 4526 TASK/CONTRACT/W.O. NO: 45153B

TITLE: (Electronic Design and Applied Techniques) Shock and Vibration Isolators

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: Rome Air Development Center

CONTRACTOR OR LABORATORY: Rome Air Development Center, Griffiss Air Force Base, Rome, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The objective is the evaluation of the various available types of shock mounts for ability to protect electronic equipments from shock and vibration. Also evaluate mounts with respect to the various climatic conditions which are encountered in the field. This task will provide the Air Force with a list of applications where the various types of shock mounts may be used with ground electronic equipments.

SURVEY NO: C.3.15

PROJECT NO: NA 690-001-3 TASK/CONTRACT/W.O. NO: ADC-AR-45433

TITLE: (Development and Test of Store Suspension and Release Equipment) External Store Vibration Investigation

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 30 September 1956

DIRECTING AGENCY: Bureau of Aeronautics (AR-454)

CONTRACTOR OR LABORATORY: Naval Air Development Center, Johnsville, Pa.
Wright Air Development Center, Aircraft Armament Laboratory, WPAFB, Ohio
PRINCIPAL INVESTIGATOR: J. Hess

DESCRIPTION: Vibration criteria set forth in MIL-T-7743 are based on piston engine aircraft characteristics. Jet aircraft such as F3H, F4D, A4D, F9F-8, and F7U-3 will be investigated to determine best means of obtaining vibration criteria for jet aircraft. After initial study, flight tests will be conducted at NATC if appropriate.

SURVEY NO: C.3.16

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-210

TITLE: (Structural Development and Test) Statistical Survey of Aircraft Landings During Service Operations

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 15 March 1955

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: In order to obtain data suitable for statistical analysis of the magnitudes of parameters such as sinking speeds, forward speed, wing lift, deceleration, and landing attitude, aircraft landing contact conditions have been determined by photographic means. Extensive data have been obtained over the past several years. Additional data have been obtained on carrier landings for the latest types of airplanes.

REPORTS:

(1) "Analysis of Photographic Survey of Landings Aboard the USS ANTIETAM, 12-15 Jan. 1953," NAMATCEN ltr. Report No. ASL NAM AD-210.38.

SURVEY NO: C.3.17

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-258

TITLE: (Structural Development and Test) Study of Aircraft Structural Test Methods and Equipments

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A bibliography of structural testing literature is being revised and is to be forwarded to the Bureau of Aeronautics for reproduction and official distribution. Work under this task will be considered completed upon submittal of the revised bibliography.

SURVEY NO: C.3.18

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2104.1

TITLE: (Structural Development and Test) Survey of Flight Load Parameters in Service Aircraft

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: W. Langren

DESCRIPTION: To evaluate new flight-recording equipment and procedures and to obtain detailed statistical data on various flight parameters from service aircraft for the purpose of improving airplane flight-strength criteria, three components each of linear and angular accelerations are being recorded in four service aircraft. The data will be statistically analyzed in order to establish structural design criteria for aircraft on a more rational basis.

SURVEY NO: C.3.19

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2104.2

TITLE: (Structural Development and Test) Statistical Flight Loads Survey of Service Airships

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: W. Langen

DESCRIPTION: Nine flight load parameters are being measured on two service aircraft. The data will be statistically analyzed to aid in establishing aircraft structural design criteria on a more rational basis and to determine the gust response characteristics of typical aircraft.

SURVEY NO: C.3.20

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-2116

TITLE: (Structural Development and Test) Investigation of Airship Landing Gear Loads

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Phila., Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To determine the effective mass and obtain other data related to the strength criteria for airship landing tests, the ZPG-1 airship landing gears are being instrumented and calibrated for use in aircraft landing tests. Similar instrumented landing gears will be installed in service aircraft in the near future.

SURVEY NO: C.3.21

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOas 51-1043-C

TITLE: (Aircraft Structural Loads Development) Compilation of Statistical Data on Aircraft Sinking Speeds

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: The Glenn L. Martin Co., Baltimore, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task was performed in order to present, in one volume, the results of many statistical surveys of aircraft landing conditions pertinent to design of carrier and land based aircraft. Data on sinking speeds, horizontal speeds at throttle cut and at contact, wing lift, and other associated parameters are presented for various aircraft types and landing situations.

REPORTS:

(1) "Statistical Survey of Velocities and Accelerations for Field and Carrier Landings of Various Aircraft," The Glenn L. Martin Co. Engineering Report No. 4786.

REVIEW NO: C.3.22

PROJECT NO: NA 814-012 TASK/CONTRACT/W.O. NO: NOa(s) 11064, Amend. 14

TITLE: (Aircraft Structural Loads Development) Determination of Water Loads for Martin Model 270 Seaplane, From Flight and Drop Tests

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: The Glenn L. Martin Co., Baltimore, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The magnitude and distribution of impact water loads for a high length-beam ratio seaplane is being determined experimentally by the correlation of results from drop tests of a hull section with those from actual take-offs and landings. The Model 270 seaplane was instrumented for the measurements of water pressures, loads, accelerations, and stresses. Flight tests were conducted in representatively smooth-water conditions, and the data are being analyzed to determine the forcing functions and dynamic responses of the structure. The drop tests of the hull section have been completed and will be correlated with the flight test data.

C.3.23

PROJECT NO: NE 110-231 TASK/CONTRACT/W.U. NO bsr-64508

TITLE: (Electron Tube Reliability) Improved Tube Reliability

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: Continuing

INITIATING AGENCY: Bureau of Ships, Electronics Div., Code 816

CONTRACTOR OR LABORATORY: Aeronautical Radio, Inc., Washington, D.C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: Engineering and consulting services which are directed toward improving electron tube reliability in military equipment are supplied under this task. The task requires that life data be obtained on tubes in use in operating equipments of the Fleet, Army, and Air Force; that the nature or the cause of failures be determined; and that recommendations be made for the elimination of these causes of failure.

Many controlled and semicontrolled tests are being conducted to evaluate statistically the effects of such factors as maintenance practices, inspections, environments, and use of improved tubes.

SURVEY NO: C.3.24

PROJECT NO: NE 110-231 TASK/CONTRACT NO: Nonr-451

TITLE: (Electron Tube Reliability) Statistics of Life and Fatigue Testing

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Electronics Division, Code 816

CONTRACTOR OR LABORATORY: Wayne University, Detroit, Mich.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A mathematical statistical analysis was conducted for the purpose of devising better techniques for testing the reliability of electron tubes. Test procedures were developed. Tables were prepared, which indicate the expected saving in time due to using the test procedures developed under this task. Other tables of practical value were developed: One such table tells how to construct a test based on the results of the statistical analysis.

C.3.25

PROJECT NO: NE 140-326 TASK ORDER AUTHORIZATION NO: P.O. 10750/55

TITLE: (Industrial Electronic Equipment) Instrument Evaluation

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Electronics Division, Code 851

CONTRACTOR OR LABORATORY: Engineering Experiment Station, Annapolis, Md.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The evaluation procedures will include installations on machinery of an appropriate type while tests are being conducted at industrial laboratories. When test machinery is not available, simulated service conditions will be provided.

REPORTS:

(1) "Tests of Main Fuel Pumps of USS WILLIS A. LEE, DL-4," EES Letter Report of 14 October 1953.

SURVEY NO: C.3.26

PROJECT NO: NL 490-148 TASK/CONTRACT/W.O. NO: TED ADC-EL-41041

TITLE: (Development and Test) Shock and Vibration Requirements for Jet Aircraft

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (EL-9)

CONTRACTOR OR LABORATORY: Naval Air Development Center, Johnsville, Pa.

PRINCIPAL INVESTIGATOR: A. A. Cohen and J. N. Tait

DESCRIPTION: (1) Investigate and obtain data on the shock and vibration conditions existing in possible electronic equipment locations in various jet type aircraft operating under ground and flight conditions as specified in reference (b) of BUAER letter Aer-EL-4122/13, serial No. 55181008, of 27 June 1955.

(2) Formulate, for future specification design purposes, the recommended shock and vibration requirements for electronic equipment operating in jet aircraft.

SURVEY NO: C.3.27

PROJECT NO: NL 490-148 TASK/CONTRACT/W.O. NO: ADC-EL-549

TITLE: (Development and Test at Naval Air Development Center) Shock and Vibration Requirements

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Aeronautics (EL-41)

CONTRACTOR OR LABORATORY: Naval Air Development Center, Johnsville, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task was established to investigate the shock and vibration requirements to which electronic equipments should be built. The task was closed with a brief report which showed no conclusive results.

REPORTS: Final Report is available from Aer-TD-4.

SURVEY NO: C-3-28

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10714/55

TITLE: (Vibration and Dynamics of Ships' Structures and Machinery)
Vibration Field Tests, Surveys and Investigations

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: New York Naval Shipyard, Mat. Lab., New York, N. Y.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task covers field investigations of undesirable and damaging oscillatory motions which are produced in shipboard machinery, equipments and structures by the operation of the engines, machinery, propellers or by other forces in both existing vessels and vessels under construction.

Some of the more important investigations recently completed are covered by the following reports:

REPORTS:

MAT LAB NAVSHIPYD NYK Reports on the following:

(1) "Investigation of excessive vibration of the Mark 56 director and director platform on the DD 445 class destroyer," Lab. Project 4985-16.

(2) "Investigation of vibration of ship's structure and Mark 63 gun director on the LST 1162," Lab. Project 4985-19.

(3) "Investigation of longitudinal vibration of main propulsion machinery on USS NORTHHAMPTON (ECLC-1)," Lab. Project 4985-18.

(4) "Hull vibration survey on the USS AGGRESSIVE (AM 422)," Lab. Project 4985-20.

(5) "Hull and Local Vibration Surveys on the USS RANDOLPH (CVA 15)," Lab. Project 4985-23.

(6) "Investigation of Longitudinal and Torsional Vibration Characteristics of Port Main Propulsion Unit of the USS NAUTILUS (SSN 571), Progress Report 2," Lab. Project 4985-24.

(7) "Investigation of Gear Case Deflections on AM 423," Lab. Project 4985-27.

(8) "Vibration Generator Tests in Special Weapons Area, USS TICONDEROGA (CVA 14)," Lab. Project 4985-28.

(9) "Torsional Vibration Characteristics of the Main Propulsion Unit on the AMS 61," Lab. Project 5080-15.

(10) "Torsional Vibration Characteristics of the Main Propulsion Unit on the MSB 9," Lab. Project 5080-17.

(11) "Torsional Vibration Characteristics of the Main Propulsion and Generating Units on the USS BOLD (MSO 424)," Lab. Project 5080-18.

(12) "The Vibration Characteristics of a Submarine Propulsion Unit Isolated from the Hull by a Low-Frequency Mounting System on the USS SEA DOG (SS 401)," Lab. Project 5080-19.

(13) "The Torsional Vibration of the Main Propulsion System on a 65-Foot U. S. Army Tug (ST 2098)," Lab. Project 5080-20.

SURVEY NO: C.3.29

PROJECT NO: NS 712-100 TASK/CONTRACT/W.O. NO: P.O. 10739/55

TITLE: (Vibration and Dynamics of Ships' Structures and Machinery) Vibration Field Tests, Surveys and Investigations'

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 371

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C

PRINCIPAL INVESTIGATOR: R. T. McGoldrick

DESCRIPTION: This task covers field investigations of undesirable and damaging oscillatory motions in shipboard machinery, equipment, and structures which are produced by the operation of the engines, machinery, propellers, and by other forces, in both existing vessels and new vessels under construction.

REPORTS:

(1) "Measurements of Motion and Thrust Variation of Main Propulsion System USS FRED T. BERRY (DDE 858)" by Q. R. Robinson, TMB Report 887, January 1954.

(2) "Vibration Generator Tests on the USS NORTHHAMPTON (ECLC-1)," by J. T. Bringham, TMB Report 895, February 1954.

(3) "Submarine Hull Vibration," by N. H. Jasper and S. B. Burwell TMB Report C-624 (Confidential), March 1954.

(4) "Vibration Generator Tests on LST-1156," by Q. R. Robinson, TMB Report 891, April 1954.

(5) "Vibration Generator Tests on the After Superstructures of Certain Vessels of the LST 1156 Class," by C. H. Kinsey, TMB Report 928, December 1954.

(6) "Vibration-Generator Tests of Main Thrust-Bearing Foundations on USS FORRESTAL (CBA 59)," by C. H. Kinsey, TMB Report 954, March 1955.

SURVEY NO: C.3.30

PROJECT NO: --- TASK/CONTRACT/W.O. NO: 29

TITLE: Noise and Vibration Measurements of Various Ordnance Items, Human Engineering

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1955 COMPLETION DATE: 1956

DIRECTING AGENCY: ---

CONTRACTOR OR LABORATORY: Aberdeen Proving Ground, Automotive Engr. Lab. Div., Instrument Application Br., Aberdeen, Md.

PRINCIPAL INVESTIGATOR: R. Leithiser

DESCRIPTION: A noise and vibration study is being conducted for the Human Engineering Laboratory. Vibrations are to be measured on various ordnance vehicles at fourteen locations under twelve test conditions of firing and vehicle operation.

ASSOCIATED STUDIES

SURVEY NOS:

D.1.1 through D.1.44
D.2.1 through D.2.7
D.3.1 through D.3.5

SURVEY NO: D.1.1

PROJECT NO: 1367 TASK/CONTRACT/W.O. NO: 70512 and AF 61(514)-422

TITLE: (Aircraft Structural Design Criteria) Balance Method of Structural Analysis

TASK SECURITY CLASSIFICATION: S SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: University of Rome, Rome, Italy

PRINCIPAL INVESTIGATOR: L. Broglio

DESCRIPTION: The objective is to provide an easily applied method of structural analysis which will reduce the time and personnel requirements to complete stress analyses of complicated structures. Technical Report No. 1 has been evaluated and Technical Report No. 2 is undergoing evaluation.

SURVEY NO: D 1.2

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: DA-04-495-ORD-160

TITLE: Mathematical Techniques of Stress-Strain Analysis

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1951 COMPLETION DATE: 1954

DIRECTING AGENCY: Watertown Arsenal

CONTRACTOR OR LABORATORY: Univ. of Utah, Dept. of Mathematics, Salt Lake City 1, Utah

PRINCIPAL INVESTIGATOR: C. J. Thorne

DESCRIPTION: This task covers the development of mathematical methods for the solution of boundary value problems which occur in the theory of elasticity, with special emphasis on transform methods and mathematical investigations to develop new and old transform properties.

REPORTS:

(1) "Normal Transforms," by L. I. Deverall, Studies in Applied Mathematics, No. 2, 18 October 1951.

(2) "Thin Rectangular Plates on Elastic Foundations," by H. J. Fletcher and C. J. Thorne, Studies in Applied Mathematics, No. 4, 1 February 1952.

(3) "The Determination of the Natural Frequencies of Special Beam Configurations," by L. C. Barrett and C. R. Wylie, Jr., Studies in Applied Mathematics, No. 5, 1 April 1952.

(4) "Thin Plates Under Combined Loads," by F. E. Maud and C. J. Thorne, Studies in Applied Mathematics, No. 7, 18 April 1952.

(5) "Sine and Cosine Transforms," by H. J. Fletcher and C. J. Thorne, Studies in Applied Mathematics, No. 8, 18 October 1952.

(6) "On the Summation of Trigonometric Series," by L. J. Deverall.

(7) "Boundary Value Problems Involving Generalized Orthogonality Conditions," by L. C. Barrett and C. R. Wylie, Jr., Studies in Applied Mathematics, No. 11, 15 May 1953.

(8) "Forced Vibration of Uniform and Tapered Beams with General Edge Conditions and Loads," by C. J. Thorne and Others, Studies in Applied Mathematics, No. 12, 1 January 1954.

(9) "Bending of Thin Rectangular Plates," by H. J. Fletcher and C. J. Thorne, Studies in Applied Mathematics, No. 13, 1 February 1954.

SURVEY NO: D.1.3

PROJECT NO: 599-01-004 TASK/CONTRACT/W.O. NO: DA-19-020-ORD-3172

TITLE: Static and Dynamic Tests on the Behaviour of Metal Parts in the Plastic Range

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1953 COMPLETION DATE: 1954

DIRECTING AGENCY: Watertown Arsenal

CONTRACTOR OR LABORATORY: Brown Univ., Providence 12, R. I.

PRINCIPAL INVESTIGATOR: D. C. Drucker

DESCRIPTION: Progress (30 October 1953 - 30 April 1954): Experiments have been planned as follows: (1) Tests on small-diameter steel plates with central bosses of several diameters, with application of central load and the edges uniformly supported: (2) tests on steel plates of uniform thickness and varying diameters, with application of central concentrated load and uniformly distributed pressure, the edges built on or simply supported; (3) an exploratory test program on simple space frames of small size; and (4) a number of tests on thin-walled cylindrical shells under a bond on a ring of pressure.

The series of tests with concentrated load on small-diameter simply supported steel plates with central heavy bosses of several diameters, and the series on small diameter plates of different thicknesses have been completed and technical reports have been published. A simplified theory which includes stresses and strains in the theory of the plate, has been developed.

REPORTS:

(1) "The Deflection of Plates in the Elastic-Plastic Range," by R. M. Haythornthwaite, Brown Univ., Div. of Engineering, Tech. Report No. 1, February 1954.

(2) "Combined Concentrated and Distributed Loads on Ideally-Plastic Circular Plates," by D. C. Drucker and H. G. Hopkins, Brown Univ., Div. of Engineering, Tech. Report No. 2, February 1954.

SURVEY NO: D.1.4

PROJECT NO: NR 041-045 TASK/CONTRACT/W.O. NO: N5 ori 07834

TITLE: (Applied Mathematics) Problems in Elasticity Related to the Behavior of Elastic Shells

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1948 COMPLETION DATE: 1956

DIRECTING AGENCY: Office of Naval Research, Mathematics Br., Code 43

CONTRACTOR OR LABORATORY: Mass. Inst. of Tech., Cambridge, Mass.

PRINCIPAL INVESTIGATOR: E. Reissner

DESCRIPTION: Studies are being conducted to clarify problems in the general theory of elasticity which arise in the analysis of thin-plate structures considered as curved surfaces endowed with the appropriate elastic properties. This work includes the derivation of small-deflection theories by constant linearization, classification and correct introduction of nonlinear effects of finite deflections, description of the behavior of cylindrical and spherical shells after buckling, and analysis of spherical domes to determine the range of validity of the linearized theory.

REPORTS:

(1) "On Axially Symmetric Bending of Nearly Cylindrical Shells of Revolution," by E. Reissner and R. A. Clark, Report No. 26, October 1954.

(2) "On Axi-Symmetrical Vibrations of Circular Plates of Uniform Thickness; Including the Effects of Transverse Shear Deformation and Rotatory Inertia," by E. Reissner, Acous. Soc. Am. J. 26:252, March 1954.

SURVEY NO: D.1.5

PROJECT NO: NR 041-143 TASK/CONTRACT/W.O. NO: NA onr 189-54

TITLE: (Applied Mathematics) Studies in Hydrodynamics and Elasticity

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1954 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mathematics Br., Code 432

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: R. F. Dressler

DESCRIPTION: Work in elasticity includes, investigation of the nonlinear "boundary-layer" effect in the bending of plates with free edges of arbitrary armature, a study of the mathematics in finite difference methods for an elastic plate in the form of a semi-infinite strip in order to find the most practical scheme for the computational analysis of edge stresses in plates, and a study of the biharmonic equation for stresses in helical springs are in progress.

REPORTS:

(1) "A Representation for Solution of Analytic Systems of Linear Differential Equations" (Manuscript), by H. A. Antosiewicz and M. Abramowitz.

(2) "On Helical Springs of Finite Thickness" (Manuscript), by P. Henrici.

SURVEY NO: D.1.6

PROJECT NO: NR 064-167 TASK/CONTRACT/W.O. NO: N6 onr 26303

(Structural Mechanics and Vibrations) Analysis of Submarine Structures

SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

COMPLETION DATE: 1956

DIRECTING AGENCY: ONR, Research Group, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Polytechnic Inst. of Brooklyn, Brooklyn, N.Y.

PRINCIPAL INVESTIGATOR: N. J. Hoff

DESCRIPTION: More accurate and practical procedures for calculating the strength of submarines are being sought. The following phases are being treated: (1) Analysis of frames with variable moments of inertia; (2) strain-energy analysis of the general instability of stiffened structures; (3) investigation of the large deflection theory; (4) investigation of the effects of inelastic behavior upon pressure; and (5) investigation of limit analysis as applied to reinforced shells.

REPORTS:

(1) "On the Investigation of the Instability of Reinforced Cylindrical Shells by Energy Methods," by S. R. Bodner and F. S. Shaw, Tech. Report No. 238.

(2) "Plastic Analysis of Cylindrical Shells," by P. G. Hodges, Jr., Tech. Report No. 242.

(3) "Linear Theories of Shells," by F. S. Shaw, Tech. Report No. 247.

(4) "Post Buckling Behavior of Circular Cylindrical Shells Under Hydrostatic Pressure," by Joseph Kemper, K. A. V. Pandalai, and S. A. Patel.

SURVEY NO: D.1.7

PROJECT NO: NR 064-212 TASK/CONTRACT/W.O. NO: N6 onr-27905

TITLE: (Structural Mechanics and Vibrations) Buckling Tests of Cylindrical Sandwich Panels

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1948 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: New York Univ., New York, N. Y.

PRINCIPAL INVESTIGATOR: F. K. Teichmann

DESCRIPTION: Experimental data were provided and used to evaluate the applicability of analysis of curved sandwich panels by the classical linear theory, and the von Karman-Tsien nonlinear large deflection theory for thin shells. A series of sandwich specimens of varying t/r ratios were used to determine the buckling characteristics of cylindrical shells in compression, bending, and torsion.

REPORTS:

(1) "Symmetrical Buckling of Sandwich Cylinders under Compressive End Loads," by G. Gerard, Tech. Report No. 1, June 1949.

(2) "Test of Thin Sandwich Cylinders Under Compressive End Loads, Part 1, with C. C. A. Cores," by F. K. Teichmann, Tech. Report No. 2, June 1949.

(3) "General Theory of Buckling of Sandwich Cylinders," by Chi-Teh Wang, Tech. Report No. 3, August 1949.

(4) "Linear Bending Theory of Isotropic Sandwich Plates," by G. Gerard, Tech. Report No. 4, June 1950.

(5) "A Study of an Analogous Model Giving the Nonlinear Characteristics in the Buckling Theory of Sandwich Cylinders," by C. T. Wang and G. V. Rao, Tech. Report No. 5 (Undated).

(6) Tech. Report No. 6, by G. Gerard and C. T. Wang (Undated).

(7) Tech. Report No. 7, by G. Gerard, November 1950.

(8) Tech. Report No. 8, by C. T. Wang and D. P. Sullivan, October 1951.

(9) Tech. Report No. 9, by G. Gerard, F. K. Teichmann, and G. G. Gould, July 1951.

(10) Tech. Report No. 10, by G. Gerard, October 1951.

(11) Tech. Report No. 11, by G. Gerard, (Undated).

(12) Tech. Report No. 12, by G. Gerard, (Undated).

SURVEY NO: D.1.8

PROJECT NO: NR 064-215 TASK/CONTRACT/W.O. NO: N onr 248(12)

TITLE: (Structural Mechanics and Vibrations) Dynamics of Structural Elements

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Johns Hopkins Univ., Baltimore, Md.

PRINCIPAL INVESTIGATOR: W. H. Hoppman

DESCRIPTION: In the study of the effects of impact loads on the stresses and deflections in structural elements, a very promising method has been developed for determining the elastic constants of orthotropic materials with specific application to stiffened plates. Extensive work has been done to apply this method, appropriately generalized, to the study of stiffened shells. Frequencies of vibrations have been both calculated and measured for two types of stiffened shells.

SURVEY NO: D.1.9

PROJECT NO: NR 064-228 TASK/CONTRACT/W.O. NO: N8 onr-52301

TITLE: (Structural Mechanics and Vibrations) Dynamic Modeling for Stress Similitude

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Santa Clara, Santa Clara, Cal.

PRINCIPAL INVESTIGATOR: R. M. Hermes

DESCRIPTION: This task was established in order to provide a rational basis for the design of model structures to be subject to dynamic stresses. Certain equations which were considered to express the scale effect relationship between a prismatic bar model and its prototype for conditions of dynamic loading and stress similitude, were verified experimentally and evaluated to establish their range of reliability. An analysis for the modeling of impulses on elastic beams was developed and the theory substantiated by tests. The analysis was extended so as to include an internal damping term in the equation of motion.

REPORTS:

(1) "Dynamic Modeling for Stress Similitude," by R. M. Hermes, Tech. Report No. 1.

SURVEY NO: D.1.10

PROJECT NO: NR 064-240 TASK/CONTRACT/W.O. NO: N6 onr 25111

TITLE: (Structural Mechanics and Vibrations) Plastic Action

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Stanford Univ., Stanford, Cal.

PRINCIPAL INVESTIGATOR: A. Phillips

DESCRIPTION: In an investigation of plastic action, rotation tests in which a thin-walled tube was subjected to uniaxial tension until sufficiently deep in the plastic region and then rotated while the magnitude of the principal stresses remained constant, has shown that for isotropic tubes the incremental theories of plasticity are correct.

REPORTS:

(1) A. Phillips, Final Report, 31 August 1954.

(2) "Combined Stress Tests in Plasticity," by A. Phillips and L. Kaechele, Technical Report No. 19.

SURVEY NO: D.1.11

PROJECT NO: NR 064-241 TASK/CONTRACT/W.O. NO: N6 onr-25112

TITLE: (Structural Mechanics and Vibrations) Stability, Stress Analysis, and Wave Propagation

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1948 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Research Group, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Stanford Univ., Stanford, Cal.

PRINCIPAL INVESTIGATOR: J. N. Goodier

DESCRIPTION: Studies are going forward on elastic stability, elastic waves, and vibrations. The analysis and testing of the tension, torsion, and flexure of slender pretwisted bars will soon be brought to a definite stage, permitting investigation of the associated technically significant vibration problems. The elementary approximate theory will be extended to treat the torsional motions of a bar of noncircular section. Problems concerned with plate flexure covering the statical theory of Reissner and the dynamical theory of Mindlin will also be undertaken.

REPORTS:

(1) "Transmission of Tension from a Bar to Plate," by J. N. Goodier and C. S. Hsu, Tech. Report No. 16.

(2) "Free Periodic Motion of Thin Elastic Rings in Plane Stress," by W. E. Jahsman, Tech. Report No. 17.

(3) "Displacement and Stress Discontinuities in Rings," by J. N. Goodier and J. C. Wilhoit, Tech. Report No. 18.

SURVEY NO: D.1.12

PROJECT NO: NR 064-258 TASK/CONTRACT/W.O. NO: N6 onr-25113

TITLE: (Structural Mechanics and Vibrations) The Mechanics of Cross-Stiffened Steel Plates

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: --- COMPLETION DATE: 1950

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Stanford Univ., Stanford, Cal.

PRINCIPAL INVESTIGATOR: F. F. Peterson and J. N. Goodier

DESCRIPTION: This task was performed in order to check experimentally the validity of the design curves developed by H. A. Schade for cross-stiffened plating under uniform bending load (see, Soc. Naval Arch. Marine Engs, Trans. 49:154 (1941). Schade had developed an approximation for strain in and deflection of orthogonally stiffened plates as a special case of the orthotropic plate. This investigation determined the degree of validity of Schade's approximation by strain gage method on plates constructed by ordinary manufacturing techniques and from commercially available materials.

REPORTS:

(1) "Orthogonally Stiffened Steel Plates," Final Report, by F. F. Peterson, E. S. Johnson, and E. N. Jacobs.

SURVEY NO: D.1.13

PROJECT NO: NR 064-298 TASK/CONTRACT/W.O. NO: N6 onr 26308

TITLE: (Structural Mechanics and Vibrations) Structural Dynamic Buckling and Stress Distribution Analysis

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1948 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Polytechnic Inst. of Brooklyn, Brooklyn, N.Y.

PRINCIPAL INVESTIGATOR: N. J. Hoff

DESCRIPTION: New and improved methods of analyzing the stresses, the deflections, and stability characteristics of a variety of important types of structures are to be developed and checked experimentally. Emphasis is placed on correlating the results with critical loads determined by classical concepts and the maximum loads observed in buckling tests carried out on commercial testing machines.

A major portion of the work on dynamics of column buckling is being completed.

SURVEY NO: D.1.14

PROJECT NO: NR 064-302 TASK/CONTRACT/W.O. NO: N7 onr 32906

TITLE: (Structural Mechanics and Vibrations) State of Stress in Thick Plates

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1949 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Ill. Inst. of Tech., Chicago, Ill.

PRINCIPAL INVESTIGATOR: E. Sternberg

DESCRIPTION: An analytical study is being made of the three-dimensional state of stress around holes and indentations in elastic plates of arbitrary thickness having simple and complicated loading conditions, and more general approximate methods for dealing with three-dimensional stress concentration problems are being obtained.

REPORTS:

(1) "On the Concept of Concentrated Loads and an Extension of the Uniqueness Theorem in Linear Theory of Elasticity," by E. Sternberg and R. A. Eubanks, June 1954.

SURVEY NO: D.1.15

PROJECT NO: NR 064-332 TASK/CONTRACT/W.O. NO: NA onr-95-50

TITLE: (Structural Mechanics and Vibrations) Investigation of Shear Stress-Strain Curves for Sheet Material

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1950 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: W. Ramberg

DESCRIPTION: This task provided for the refining and perfecting of the method of determining shear stress-strain curves for sheet and plate material in which a flat rectangular-shaped specimen of the material is twisted by equal and opposite pairs of transverse forces applied at its diagonally opposite corners. Theoretical estimates were made of the errors in this method due to transverse shear at the corners, to the drop in stress near the edges of the plate, and to the effect of membrane stresses for large deflections of the plate. These estimates were checked experimentally by comparing them with measured stress-strain curves for specimens made of widely used materials.

SURVEY NO: D.1.16

PROJECT NO: NR 064-336 TASK/CONTRACT/W.O. NO: N7 onr-39209

TITLE: (Structural Mechanics and Vibrations) Transverse Impacts on Plates with Internal Damping

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1950 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Ill. Inst. of Tech., Chicago, Ill.

PRINCIPAL INVESTIGATOR: A. C. Eringen

DESCRIPTION: The dynamic deflections, stresses, and vibrations produced by dynamic loads on structural components, were investigated. The problem of a rectangular viscoelastic plate with simply supported edge conditions and a central and normal impact load, was treated. Consideration was given to other types of plate problems with different boundary conditions; such as rectangular plates clamped on all edges, rectangular plates clamped on two opposite edges, circular plates under impact loading, and circular plates on elastic foundations.

REPORTS:

(1) "Impact on Elastic Beams" by A. C. Eringen, Tech. Report No. 1.

(2) "Transverse Impact on Beams and Plates with Arbitrary Edge Conditions," by A. C. Eringen, Tech. Report No. 2.

(3) "Nonlinear Oscillations of Viscoelastic Plates," by A. C. Eringen, Tech. Report No. 3.

(4) "The Finite Sturm-Louville Transform," by A. C. Eringen, Tech. Report No. 4.

(5) "Transverse Impact on Plates," by A. C. Eringen, Tech. Report.

SURVEY NO: D.1.17

PROJECT NO: NR 064-345 TASK/CONTRACT/W.O. NO: N7 onr 39303

TITLE: (Structural Mechanics and Vibrations) Ultimate Strength of Welded Structures and Their Components

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1948 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Lehigh Univ., Bethlehem, Pa.

PRINCIPAL INVESTIGATOR: L. S. Beedle

DESCRIPTION: The plastic behavior of beams, columns, welded connections and frames are being studied experimentally; and design methods are being developed which take into account the limiting effects of local plastic instability, the favorable and unfavorable effects of welding, and the increase in ultimate strength of the structure due to local stress relief by plastic yielding.

REPORTS:

(1) "A Virtual Displacement Method for Determining Stability of Beam Columns Above the Elastic Limit," by R. L. Ketter, Tech. Report No. 5.

(2) "Rules of Practice in Plastic Design," by B. G. Johnston and L. S. Beedle, Tech. Report No. 26.

SURVEY NO: D.1.18

PROJECT NO: NR 064-357 TASK/CONTRACT/W.O. NO: N onr 423(00)

TITLE: (Structural Mechanics and Vibrations) Effects of Warping Restraint in Dynamic and Aeroelastic Problems

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Purdue Univ., Lafayette, Ind.

PRINCIPAL INVESTIGATOR: H. Lo

DESCRIPTION: The effect of warping restraint on the equation of torsion for idealized airplane wing structures and the related dynamic and aeroelastic problems are being studied. The program of investigation includes three phases: (1) untapered beams of double symmetrical cross-sections, (2) tapered beams of arbitrary cross-sections, and (3) thick-skin constructions where the skin takes bending as well as tension and compression. An approximate theory is being sought in which a single equation of torsion is to be derived for tapered and untapered beams of arbitrary cross-sections under distributed torque. This equation is to be incorporated with the aerodynamic and inertia forces in the dynamic and aeroelastic calculations.

SURVEY NO: D.1.19

PROJECT NO: NR 064-358 TASK/CONTRACT/W.O. NO: N7 onr-45009

TITLE: (Structural Mechanics and Vibrations) Effects of Surface Shear Loadings

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1951 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Northwestern Univ., Evanston, Ill.

PRINCIPAL INVESTIGATOR: M. Hetenyi

DESCRIPTION: An investigation was made of stress distribution due to surface-shear loadings and the effect of such loadings on the mechanical deterioration and fracture of solids. The investigation consisted of two parts (a) the influence of surface shear in the development of stress concentrations due to holes, fillets, and notches; and (b) the analysis of stress distributions in contacting bodies subjected to simultaneous normal and tangental loads. Theoretical values of various stress concentrations were compared with experimental results.

REPORTS:

(1) "Investigation on the Effects of Surface-Shear Loadings," by M. Hetenyi, Interim Report.

(2) "The Effects of Surface-Shear Loadings," by M. Hetenyi.

SURVEY NO: D.1.20

PROJECT NO: NR 064-372 TASK/CONTRACT/W.O. NO: N6 onr-07134

TITLE: (Structural Mechanics and Vibrations) Strength of Connections in Reinforced Concrete Structures

TASK SECURITY CLASSIFICATION: R SHEET SECURITY CLASSIFICATION: R

DATE APPROVED: 1951 COMPLETION DATE: 1954

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. Of Illinois, Urbana, Ill.

PRINCIPAL INVESTIGATOR: N. M. Newmark

DESCRIPTION: This task was established in order to determine the strength of connections in reinforced concrete structures and the deformations resulting from heavy air blast loadings, and to develop useful rational methods of analytically predicting such deformations.

Test methods and fixtures were developed and a number of butt-welded and fillet-welded joints of structural steel were tested for static and fatigue strength.

REPORTS:

(1) "An Investigation of the Load Deformation Characteristics of Reinforced Concrete Beams Up to the Point of Failure," by C. P. Siess and N. M. Newmark.

(2) "Review of Research on Ultimate Strength on Reinforced Concrete Members," by C. P. Siess.

SURVEY NO: D.I.C.

PROJECT NO: NR 064-388 TASK/CONTRACT/W.O. NO: N onr 266(09)

TITLE: (Structural Mechanics and Vibrations) Photoelasticity, Mechanics of Granular Media, and Elastic Vibrations

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1956

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Columbia Univ., New York, N. Y.

PRINCIPAL INVESTIGATOR: R. D. Mindlin

DESCRIPTION: A study is being made of various basic problems in photoelasticity, viscoelasticity, mechanics of granular media, and vibration of elastic plates and bars. In developing the mechanics of granular media, investigations include a determination of the fundamental mechanism of the action between grains and the establishment of laws of wave propagation. The wave propagation phase includes investigation of: (1) surface waves, (2) reflection and refraction phenomena, and (3) propagation of waves in a layer or in layers.

REPORTS:

(1) "Axially Symmetric Flexural Vibrations of a Circular Disk," by R. D. Mindlin and H. Deresiewicz, Tech. Report No. 11.

(2) "Thickness Shear and Flexural Vibrations of a Circular Disk," by R. D. Mindlin and H. Deresiewicz, Tech. Report No. 12.

(3) "Application of Green's Method in Deriving Approximate Theories of Elasticity," by G. Herrmann, Tech. Report No. 13.

(4) "The Photoelastic Determination of Stress on Transverse Planes of Symmetry for the General Axi-Symmetric Case," by E. A. Fox, Tech. Report. No. 15.

(5) "Residual Stress in Glass Spheres," by L. Rongved, Tech. Report No. 16.

SURVEY NO: D.1.22

PROJECT NO: NR 064-389 TASK/CONTRACT/W.O. NO: N onr 674(00)

TITLE: (Structural Mechanics and Vibrations) Elasticity Studies

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1952 COMPLETION DATE: 1956

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Fla., Gainesville, Fla.

PRINCIPAL INVESTIGATOR: C. B. Smith

DESCRIPTION: The stress distribution in the vicinity of holes is being sought for both orthotropic and isotropic materials, and also the stresses developed in laminated structures due to loading and the internally produced stresses, such as moisture stresses in wood or thermal stresses in metals, are being studied.

REPORTS:

"Plane Strain in Laminated Orthotropic Structures," by C. B. Smith and R. G. Blake, February 1954.

SURVEY NO: D.1.23

PROJECT NO: NR 064-390 TASK/CONTRACT/W.O. NO: N onr 566(00)

TITLE: (Structural Mechanics and Vibrations) Anticlastic Bending of Structural Elements

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1951 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Rensselaer Polytechnic Inst., Troy, N. Y.

PRINCIPAL INVESTIGATOR: G. H. Lee

DESCRIPTION: A theoretical and an experimental investigation has been made of the anticlastic bending of elastic structural elements. The effect of structural element size and elastic constants on the restraining of anticlastic bending was considered. Curvature measurements were taken of structural elements under loading.

The results of the approximate theory concerned with elastic plates and bars of rectangular cross-section (loaded in pure bending parallel to one of the two principal axes of the cross-section) were compared with data obtained from tests using a pneumatic micrometer developed under this contract. It was possible to explore the contours of a surface area of approximately 1 in. by 1-1/2 in. to elevation differences of less than 0.00001 in.

SURVEY NO: D.1.24

PROJECT NO: NR 064-410 TASK/CONTRACT/W.O. NO: N onr 1100(02)

TITLE: (Structural Mechanics and Vibrations) Transverse Impacts on Plates with Internal Damping

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Purdue Univ., Lafayette, Ind.

PRINCIPAL INVESTIGATOR: A. C. Eringen

DESCRIPTION: In an investigation of the dynamic deflections, stresses, and vibrations produced by dynamic loads on structural components, the problem of a rectangular viscoelastic plate with simple supported edge conditions and a central and normal impact load, is being treated. Consideration will be given to other types of plate problems with different boundary conditions, such as rectangular plates clamped on all edges; rectangular plates clamped on two opposite edges, the other two edges free; circular plates under impact loading; circular plates on elastic foundations; and infinitely long rectangular plates on elastic foundations. All cases include the effect of internal damping.

REPORTS:

(1) "A Transform Technique for Boundary Value Problems Fourth Order Partial Differential Equations," by A. C. Eringen, December 1954.

SURVEY NO: D.1.25

PROJECT NO: NR 064-406 TASK/CONTRACT/W.O. NO: N7onr 35801

TITLE: (Structural Mechanics and Vibrations) Nonlinear Continuum Mechanics

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1947 COMPLETION DATE: 1957

DIRECTING AGENCY: Office of Naval Research, Research Group, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Brown Univ., Providence, R. I.

PRINCIPAL INVESTIGATOR: W. Prager

DESCRIPTION: The field of nonlinear continuum mechanics is being developed by: (a) subjecting recently formulated plastic-rigid analyses to experimental investigations, (b) extension of such methods of analyses to particular problems, and (c) further development of the theoretical basis for the plasticity theory.

Underway concurrently with a theoretical investigation of the interaction phenomena and an analytical investigation of the over-all dynamic behavior of a complete submarine considered as a rigid beam, is a study of the dynamic elastic-plastic behavior of the elemental bars, beams, plates, and shells used in submarine construction.

REPORTS:

(1) "On Limiting States of Equilibrium," by W. Prager, Tech. Report No. 117.

SURVEY NO: D.1.26

PROJECT NO: NR 064-408 TASK/CONTRACT/W.O. NO: Nonr 1224(01)

TITLE: (Structural Mechanics and Vibrations) Static and Dynamic Problems in the Elastic and Plastic Ranges

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1953 COMPLETION DATE: 1956

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. Of Mich., Ann Arbor, Mich.

PRINCIPAL INVESTIGATOR: P. M. Naghdi

DESCRIPTION: The objective is to develop practical solutions for a series of selected problems involving the elastic-plastic bending of plates and shells of revolution with large deflections, and certain other static and dynamic problems in the elastic and plastic ranges. In the problems involving plastic action, both the theory of deformation and the theory of flow are being utilized in the solutions as a check of their relative validity.

SURVEY NO: D.1.27

PROJECT NO: NR 064-413 TASK/CONTRACT/W.O. NO: N6ori 07153

TITLE: (Structural Mechanics and Vibrations) Buckling of Cylindrical Shells

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Univ. of Ill., Urbana, Ill.

PRINCIPAL INVESTIGATOR: H. L. Langhaar

DESCRIPTION: The purpose of this investigation is to determine the strength of submarine-type hulls, with emphasis on the analysis of circular shells under hydrostatic loading including the effect of axial loads, various possible modes of failure, and development of improved criteria for shell design and later considering the reinforcement frames.

An energy analysis of the snap-through type of buckling of cylindrical shells subjected to hydrostatic pressure is being established.

REPORTS:

(1) "Snap-Through of Cylindrical Shells under the Action of External Pressure," by H. L. Langhaar and A. P. Boresi, Tech. Report No. 502.

SURVEY NO: D.1.28

PROJECT NO: NR 064-415 TASK/CONTRACT/W.O. NO: N onr 609(12)

TITLE: (Structural Mechanics and Vibrations) Stress-Strain Relationships in Plastic Flow of Materials

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1955

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Yale Univ., New Haven, Conn.

PRINCIPAL INVESTIGATOR: A. Phillips

DESCRIPTION: In this investigation, thin-walled tubes of pure copper and pure aluminum will be subjected to combined tension, torsion, and internal pressure. By utilizing various stress ratios and loading sequences, substantial strains and large rotations will be introduced. Precise measurements will be made to provide data for judging existing theories.

SURVEY NO: D.1.29

PROJECT NO: NR 064-416 TASK/CONTRACT/W.O. NO: N onr 839(11)

TITLE: (Structural Mechanics and Vibrations) Plastic Analysis of Structures

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1954 COMPLETION DATE: 1956

DIRECTING AGENCY: Office of Naval Research, Mechanics Br., Code 438

CONTRACTOR OR LABORATORY: Polytechnic Inst. of Brooklyn, Brooklyn, N.Y.

PRINCIPAL INVESTIGATOR: P. G. Hodge

DESCRIPTION: An attempt will be made to establish general theorems for the upper and lower bounds in uniqueness of limit theory solutions. The limitations of using beam theory for analyzing structures having wide reinforcements around cutouts will be investigated. The theoretical results will be extended in order to include limit design analyses for plane slabs. Consideration will also be given to solving problems of cutouts in cylindrical and other rotational symmetrical shells.

SURVEY NO: D.1,30

PROJECT NO: NR 651-010 TASK/CONTRACT/W.U. NO: B01-01

TITLE: Theoretical Mechanics

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASS N: U

DATE APPROVED: 1948 COMPLETION DATE: 1957

INSPECTING AGENCY: Naval Research Laboratory

CONTRACTOR OR LABORATORY: Naval Research Laboratory, Washington 25, D. C.

PRINCIPAL INVESTIGATOR: H. M. Trent

DESCRIPTION: The objective of this project is to study, develop, and aid in the use of mathematical methods applicable to the strength of solids, the physics of rupture of solids, and the dynamics of complex structures. These studies are closely allied with experimental investigations which are designed to test the theoretical studies.

Several theoretical investigations are always in progress. At the present time two expository works are being pursued: one on nonlinear elasticity and the other on nonlinear continuum theories.

SURVEY NO: D.1.31

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-103

TITLE: (Structural Design, Ship Structure Committee) Design Details

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: W. R. Campbell

DESCRIPTION: To determine the influence of design on the strength and the ductility of structural components of ships, elastic stress studies (at room temperature followed by tensile tests at 0°F) have been conducted on steel specimens which simulate structural details of ships, such as the intersection between a bottom longitudinal and a transverse bulkhead, and the intersection between a longitudinal corrugated bulkhead and a transverse corrugated bulkhead, both as found in welded tankers.

REPORTS:

(1) "Stress Studies of Welded Ship Structure Specimens," by W. R. Campbell, Welding J. 30:68-s, February 1951.

(2) "Stress Studies of Bulkhead Intersections for Welded Tankers," by W. R. Campbell, L. K. Irwin and R. C. Duncan, Welding J. 31:68-s, February 1952.

(3) "Tensile Tests of Large Specimens Representing the Intersection of a Bottom Longitudinal with a Transverse Bulkhead in Welded Tankers," by L. K. Irwin and W. R. Campbell, Final Report, Ship Structure Committee, Serial No. SSC-68, 18 January 1954.

SURVEY NO: D.1.32

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-113 and NObs-47613

TITLE: (Structural Design, Ship Structure Committee) Measurement of Initial Stresses

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Princeton Univ., Princeton, N. J.

PRINCIPAL INVESTIGATOR: E. W. Suppiger

DESCRIPTION: To develop a less destructive method for the determination of the direction and magnitude of the stress at any location on a structure, electric wire resistance strain gages were attached around the location at which stresses were to be evaluated and then a hole was drilled at this location: changes in gage readings indicated the initial stress. The effects of the diameter of the holes and of various methods of drilling the holes were investigated as well as the effects of varying the distance from the edge of the hole to the strain gage.

REPORTS:

(1) "The Determination of Initial Stresses and Results of Tests on Steel Plates," by E. W. Suppiger, Welding J. 30:91-s, February 1951.

SURVEY NO: D.1.33

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-115 and NO bs-50148

TITLE: (Structural Design, Ship Structure Committee) Residual Stress Monograph

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: National Academy of Science, Committee on Residual Stress, Washington, D. C.

PRINCIPAL INVESTIGATOR: W. R. Osgood

DESCRIPTION: To provide a critical summary of knowledge concerning residual stresses and their role in the failure of welded structures, a monograph summarizing and assessing the present state of knowledge on the effects of residual stresses upon the performance of various kinds of structures, has been made.

REPORT:

(1) "Residual Stresses in Metals and Metal Construction," edited by W. R. Osgood, Reinhold Publishing Corporation, 1954.

SURVEY NO: D.1.34

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-117

TITLE: (Structural Design, Ship Structure Committee) Recommended Hatch Corner Design

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1952

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Ships Structure Subcommittee

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To establish principles for the structural design of hatch corners in welded steel vessels, the existing laboratory test data and service performance records on hatch corner designs were reviewed and recommended hatch corner designs promulgated.

REPORT:

(1) "Considerations of Welded Hatch Corner Design," Ships Structure Committee Report, Serial No. SSC-37, 1 October 1952.

SURVEY NO: D.I 35

PROJECT NO: NS 731-034 TASK/CONTRACT/W.O. NO: SR-119 and NO bs-50238

TITLE: (Structural Design, Ship Structure Committee) Reinforcement of Openings

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1955

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Univ. of Wash., Seattle, Wash.

PRINCIPAL INVESTIGATOR: R. A. Hechtman

DESCRIPTION: To determine the relative merits of arc-welded doublers, face plates and insert plates with regard to the elastic stress distribution, energy absorption in the plastic range, and cracking temperatures, these reinforcements have been investigated for centrally located openings in plain carbon structural steel plates loaded in tension.

REPORTS:

(1) "Welded Reinforcement of Openings in Structural Steel Members," by D. Vasarhelyi and R. A. Hechtman, First Progress Report, Ship Structure Committee, Serial No. SSC-39, 15 December 1951.

(2) "Welded Reinforcement of Openings in Structural Steel Members: A Determination of Strain Energy Distribution and True Stresses in the Plastic Range in Plates with Openings," by D. Vasarhelyi and R. A. Hechtman, Second Progress Report, Ship Structure Committee, Serial No. SSC-50, 10 March 1952.

(3) "Welded Reinforcement of Openings in Structural Steel Members," by D. Vasarhelyi and R. A. Hechtman, Third Progress Report, Ship Structure Committee, Serial No. SSC-55, 30 June 1953.

(4) "Welded Reinforcement of Openings in Structural Steel Members: Cleavage Fracture and Plastic Flow in Structural Steel Plates with Openings," by D. Vasarhelyi, R. A. Hechtman, and Y. T. Yoshimi, Fourth Progress Report, Ship Structure Committee, Serial No. SSC-56, 1 March 1954.

(5) "Welded Reinforcement of Openings in Structural Steel Members," by D. Vasarhelyi and R. A. Hechtman, Welding J. 30:182-s, April 1951, and 31:169-s, April 1952.

(6) "Welded Reinforcement of Openings in Structural Steel Tension Members," by D. Vasarhelyi and R. A. Hechtman, Final Report, Ship Structure Committee, Serial No. SSC-75.

SURVEY NO: D.1.36

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10743/55

TITLE: (Investigation of Strength of Ship Structure to Achieve Optimum Performance of Surface Vessels) Stress Fields in Bulkheads

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1948 COMPLETION DATE: Suspended

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: E. E. Johnson

DESCRIPTION: Design information was to be obtained for bulkheads supporting vertical loads. A simple plastic model was constructed with a uniform tapered stiffener and tests were conducted. No report was written.

SURVEY NO: D.1.37

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 01816/52

TITLE: (Investigation of Strength of Ship Structure to Achieve Optimum Performance of Surface Vessels) Stress Around Side Openings in Aircraft Carriers

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1949 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: E. E. Johnson

DESCRIPTION: Tests to determine the stress concentrations around a variety of openings have been completed on a scaled steel model using the SR-4 strain gage technique. The stress concentrations around the periphery of the opening were measured under shear and bending loads for the following parameters:

(a) Variation in shape of the ends of the opening,
(b) Use of reinforcing face plates, and
(c) Use of reinforcing insert plates in the vicinity of the opening.

REPORTS:

(1) "Effect of Contours, Face Plates, and Reinforcing Insert Plates on Stress Concentrations Around Large Openings in Ship Sides, as Determined from Tests of a 1/40-scale Steel Model of An Aircraft Carrier," TMB Report C-327 (Confidential), March 1951.

SURVEY NO: D.1.38

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10743/55

TITLE: (Investigation of Strength of Ship Structure to Achieve Optimum Performance of Surface Vessels) Stress Concentrations in Plates with Internal Discontinuities

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1948 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: J. S. Brock

DESCRIPTION: Guides for design of stiffened plate structures with internal discontinuities such as openings, openings with reinforcement, and local thickening, are to be worked out by photoelastic tests and analyses. Two steel models have been constructed and tested with varying reinforced rings. Analytical solutions have been made for stresses around square holes with rounded corners in tension, compression, and shear fields, and also for stresses around two adjacent circular holes in a tension field. These solutions have been verified experimentally.

SURVEY NO: D.1.39

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: P.O. 10743/55

TITLE: (Investigation of Strength of Ship Structure to Achieve Optimum Performance of Surface Vessels) Design Criteria for Stiffened Plating in Compression

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: [redacted] COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Washington 7, D.C.

PRINCIPAL INVESTIGATOR: E. E. Johnson

DESCRIPTION: The adequacy of design rules for stiffened panels in compression, as given by Dr. F. Bleich (NS 731-010), has been checked. Thirty-five model panels were tested.

REPORTS:

(1) "A Determination of the Critical Load of a Column or Stiffened Panel in Compression by the Vibration Method," TMB Report 800, February 1952.

(2) "Transition Characteristics of Prestrained, Notched Steel Specimens in Tension," TMB Report 767, January 1952.

SURVEY NO: D.1.40

PROJECT NO: NS 731-037 TASK/CONTRACT/W.O. NO: ITL Phil. Test 3107-B and P.O. 10795/53

TITLE: (Investigation of Strength of Ship Structure to Achieve Optimum Performance of Surface Vessels) Aluminum Riveted Assemblies

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1950 COMPLETION DATE: Completed

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Philadelphia Naval Shipyard, Phila., Pa.

PRINCIPAL INVESTIGATOR: C. J. Reber

DESCRIPTION: A transfer method of punching rivet holes in aluminum alloy has been claimed to be superior to the current method of drilling and reaming. Tensile specimens were fabricated from plates prepared by transfer punching and tested in comparison with specimens prepared in the usual manner.

REPORTS:

(1) ITL Report No. 3107-B, BuShips Library No. 47,872.

SURVEY NO: D.1.41

PROJECT NO: NS 731-038 TASK/CONTRACT/W.O. NO: P.O. 01816/52

TITLE: (Submarine Structures) Shells

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1950 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: David Taylor Model Basin, Struct. Mech. Branch, Washington 7, D. C.

PRINCIPAL INVESTIGATOR: E. Wenk

DESCRIPTION: A bibliography and a catalog of experimental data have been assembled, and existing theory and test results have been reviewed. Model tests and theoretical studies relating to the elastic stability of shells, stress analysis of stiffened cylindrical shells, general instability of stiffened cylinders, and stress analysis of conical-cylinder intersections are being made. Exact theories are being extended to include effects of eccentricities, shell vibrations, and elastic instability of conical shells, and large sudden deflection buckling.

REPORTS:

TMB Reports: C-354, November 1951
C-481, November 1951
C-428, August 1951
826, March 1951
C-445, February 1953
C-439, February 1953
822, May 1953
C-440

SURVEY NO: D.1.42

PROJECT NO: NS 731-038 TASK/CONTRACT/W.O. NO: N6-onr-263

TITLE: (Submarine Structures) General Theories for the Analysis of Submarine Structures

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1950 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 440

CONTRACTOR OR LABORATORY: Brooklyn Polytechnic Inst., Brooklyn, N. Y.

PRINCIPAL INVESTIGATOR: N. J. Hoff

DESCRIPTION: A critical survey was made of previous work on the transverse strength of submarine structures. A strain energy solution was obtained for the buckling load under hydrostatic pressure of a circular cylindrical shell reinforced by evenly spaced circular rings. The effects of eccentricities on the buckling strength of shells was investigated. The entire theory derived by von Sanden and Gunther for stress distribution in stiffened cylindrical shells was redeveloped to include the effect of axial compression. An analysis of limit loading, based on similar work by Schischka but including the effect of axial loading, has been completed. A theory for predicting the simultaneous buckling of frames and shells was developed for the first time (Report 189). A design method consisting of a first basic design cycle followed by a second design cycle which takes secondary effects into account, has been developed; and work has begun on the analysis of circular cylindrical shells reinforced with rings of nonuniform moment of inertia.

REPORTS:

PIBAL Reports No's: 167, April 1950
169, June 1950
171, April 1950
171A, June 1951
171B, June 1951
172, August 1950
177, November 1950
182, February 1951
189, September 1951
190, September 1951
202, July 1952
209, October 1952
210, December 1952
212, December 1952
246,
256.

SURVEY NO: D.1.43

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Research on Cumulative Damage in Fatigue of Riveted Aluminum Alloy Joints

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1955

DIRECTING AGENCY: Wright Air Development Center, WCRTP

CONTRACTOR OR LABORATORY: National Aeronautical Research Institute (NLL), Amsterdam, Holland

PRINCIPAL INVESTIGATOR: F. J. Plantema

DESCRIPTION: To determine whether the at present widely used cumulative damage hypothesis, that at failure the sum of the cycle-ratios equals one, is correct; and if not, in which way the cycle-ratio is influenced by the sequency of the stress levels. The investigation is to be conducted on riveted joints rather than on simple specimens.

SURVEY NO: D.1.44

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-202

TITLE: (Structural Development) Panels for Carrying Large Edge Loads

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: 1954

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D.C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: An investigation has been conducted on double-skin panels to determine the effects of stringer dimensions, sheet thickness, and panel length on the ultimate compressive load; and to determine the tensile efficiency of the panels.

REPORTS:

(1) "Tests of High Edge Load Panels," by P. R. Weaver and W. E. Smull, NBS Report 3355, 14 June 1954.

SURVEY NO: D.2.1

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Research on the Fatigue Properties at Elevated Temperatures of Glass Fiber Laminated Plastics

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: April 1955

DIRECTING AGENCY: Wright Air Development Center, WCRTP

CONTRACTOR OR LABORATORY: Forest Products Lab., Madison, Wis.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: The object of this contract is to investigate the fatigue properties of glass-fiber-base plastic laminates, now being used or considered for use in aircraft and powerplant structural applications in which fatigue is a factor. Special consideration to be given to heat-resistant plastic laminates at elevated temperatures.

REPORTS:

Final Report due October 1955.

SURVEY NO: D.2.2

PROJECT NO: --- TASK/CONTRACT/W.O. NO: ---

TITLE: Tensile Properties of Aircraft Structural Metals

TASK SECURITY CLASSIFICATION: --- SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: November 1955

DIRECTING AGENCY: Wright Air Development Center, WCRTP

CONTRACTOR OR LABORATORY: Southern Research Institute, Birmingham, Ala.

PRINCIPAL INVESTIGATOR: J. R. Kattus

DESCRIPTION: Conduct an investigation of the tensile properties of aircraft structural metals after very rapid heating at various elevated temperatures, and at various elevated temperatures and various rates of loading.

REPORTS:

"Tensile Properties of Aircraft Structural Metals at Various Rates of Loading After Rapid Heating," WADC TR 55-199

SURVEY NO: D.2.3

PROJECT NO: 1347 TASK/CONTRACT/W.O. NO: 70131 and AF 33(616)-2788

TITLE: (Structural Testing at Elevated Temperatures) Structural Testing Simulation

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Wright Air Development Center, Aircraft Lab.

CONTRACTOR OR LABORATORY: Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

PRINCIPAL INVESTIGATOR: Nicholas Hoff

DESCRIPTION: The objective of this task is to conduct research on methods of simulating aerodynamic heating and loading which can be incorporated in large scale testing facilities. The contractor has surveyed the various types of heating units which could possibly reproduce the effects of aerodynamic heating on vehicles operated at extreme speeds, and has proceeded to construct an induction heater for this purpose.

REPORTS:

(1) "On the Theory of Strong Electro Magnetic Waves in Massive Iron," W. MacLean, PIBAL Report No. 206, Sept. 1952.

(2) "Bibliography on Thermal Elasticity," W. I. Berks, and A. Chwick, PIBAL Report No. 216, Jan. 1953.

(3) "Temperature Distribution and Thermal Stresses in a Model of a Supersonic Wing," F. V. Pohle, and H. Oliver, PIBAL Report No. 221, April 1953.

SURVEY NO: D.2.4

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-223

TITLE: (Structural Development) Development of Methods for the Calibration and Evaluation of High-Temperature Strain Gages

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: --- COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task was established to aid in the development of the high-temperature strain gage being performed under TED NBS AD-221.

SURVEY NO: D.2.5

PROJECT NO: NA 810-150 TASK/CONTRACT/W.O. NO: TED NAM AD-298.3

TITLE: (Structural Development and Test) Development and/or Procurement of Equipment for Measuring Structural Loads and Deflections at Elevated Temperatures

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: --- COMPLETION DATE: ---

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Naval Air Material Center, Aeronautical Structures Lab., Philadelphia, Pa.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A cantilever strain-gage transducer has been designed for use as a deflection indicator, and suitability of wires and methods of attachment of wires between test specimens and transducers as well as a push-rod system for transmitting deflection indications have been investigated. A prototype transducer has been made and satisfactorily tested. Also, a potentiometer-type transducer is being investigated. Pressure pickups have been procured for use as load indicators.

SURVEY NO: D.2.6

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS DE 209

TITLE: (Structural Development) Development of Instrumentation for Structural Tests Under Nonuniform Heating

TASK SECURITY CLASSIFICATION: C SHEET SECURITY CLASSIFICATION: C

DATE APPROVED: 1944 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A high-temperature optical strain gage capable of measuring changes in strain over a range of 0.024 in. at temperatures as high as 1200°F, has been developed. Stellite is used for all primary parts of the gage. The principle of operation is similar to that of the Tuckerman Optical Strain Gage. The gage is to be used for determining, during laboratory tests of aircraft structures, the relative magnitude of the strains induced at a point in the structure by thermal expansion and by externally applied loads.

SURVEY NO: D.2.7

PROJECT NO: NA 810-151 TASK/CONTRACT/W.O. NO: TED NBS AD-221

TITLE: (Structural Development) Development of a High-Temperature Strain Gage

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: National Bureau of Standards, Washington, D. C.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: A high-temperature wire-resistance strain gage which will be suitable for aircraft structural test, is to be developed. Investigations will be made to determine suitable materials for the gage element, ceramics for gage assembly and mounting, and fabrication techniques for the gage. Development has been hindered by lack of suitable calibration and evaluation facilities. The development of such facilities has been established under task TED NBS AD-223.

SURVEY NO: D.3.1

PROJECT NO: NA 812-008 TASK/CONTRACT/W.O. NO: NOas 51-1002

TITLE: (Experimental Structures and Structural Design Criteria) Test of Structural Elements Assembled by Flash Welding

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Aeronautics (AD-22)

CONTRACTOR OR LABORATORY: Chance Vought Aircraft, Dallas, Tex.

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: To obtain structural design data, static and repeat load tests were conducted on tubular elements assembled by flash welding.

The load-carrying ability of 4130 steel tubes having flash-welded joints, heat treated after welding to the 180,000 psi level, was evaluated and compared to that of unwelded 4130 steel tubes, heat treated to the same strength level. Static tension, repeated tension, static bending, repeated bending, static combined tension and bending, and repeated combined tension and bending tests were used in this evaluation.

REPORTS:

"Investigation of the Strength of Flash-Welded Steel Tubing," Chance Vought Aircraft Report No. 8241, 31 Mar. 1953.

SURVEY NO: D.3.2

PROJECT NO: NS 011-067 TASK/CONTRACT/W.O. NO: SR-99 and NObs-45470

TITLE: (Fabrication Techniques, Ship Structure Committee) Exploration of Welds

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1947 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Case Institute of Technology, Cleveland, Ohio

PRINCIPAL INVESTIGATOR: W. M. Baldwin, Jr.

DESCRIPTION: The objective of this task involved a determination of the relative toughness throughout welded joints fabricated by various techniques, and a determination of reasons for brittle zones in or near welds. Eccentric notch tensile tests and Charpy V-Notch tests were used to determine the properties of various zones in and adjacent to E6010 six-pass weldments in 3/4-in. ship plate. Samples of the plate material were then subjected to isothermal heat treatments, followed by different cooling rates, and the material properties evaluated by using the notch tensile and Charpy tests previously mentioned.

REPORTS:

(1) First Progress Report, Ship Structure Committee, Serial No. SSC-24, 10 May 1949

(2) Second Progress Report, Ship Structure Committee, Serial No. SSC-34, 28 Nov. 1949

(3) Third Progress Report, Ship Structure Committee, Serial No. SSC-54, 14 Oct. 1952

(4) Fourth Progress Report, Ship Structure Committee, Serial No. SSC-60, 30 Oct. 1953

(5) Fifth Progress Report, Ship Structure Committee, Serial No. SSC-61, 30 Oct. 1953

(6) Final Report, Ship Structure Committee, Serial No. SSC-64, 6 Nov. 1953

SURVEY NO: D.3.3

PROJECT NO: NS 011-067 TASK/CONTRACT/W.O. NO: SR-100 and NObs-48015

TITLE: (Fabrication Techniques, Ship Structure Committee) Materials and Fabrication

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1947 COMPLETION DATE: 1951

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Battelle Memorial Institute, Columbus, Ohio

PRINCIPAL INVESTIGATOR: ---

DESCRIPTION: This task had as its objective the selection or development of a test which will determine the toughness of welded structures, and the determination of fabrication techniques which will yield tough welded structures.

Results of tests using a variety of notched specimens indicated that the welded Kinzel specimen is best capable of duplicating transition temperatures of full-scale hatch corners. Tests on the effect of preheat on behavior of welded Kinzel specimens of two steels indicated that 400°F and 500°F preheats have little more beneficial effect than 250°F preheat. A survey of the underbead cracking tendencies of ship-quality steels was made.

REPORTS:

(1) Ship Structure Committee Reports: SSC-23, 30 Mar. 1949; SSC-33, 15 Nov. 1949; SSC-36, 20 Dec. 1950; SSC-37; SSC-40, 1 Oct. 1951; and SSC-41, 1 Oct. 1951

(2) "Evaluation of Tests for Steels for Welded Structures," Welding Research Supplement, 195s, April 1950

SURVEY NO: D.3.4

PROJECT NO: NS 011-067 TASK/CONTRACT/W.O. NO: SR-127 and NObs-50148

TITLE: (Fabrication Technique, Ship Structure Committee) Flaw Detection

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: 1953

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Battelle Memorial Institute, Columbus, Ohio

PRINCIPAL INVESTIGATOR: S. A. Wenk

DESCRIPTION: The means of non-destructive flaw detection now in use, or under development, have been reviewed in order to provide the background for decisions regarding the initiation of a program to develop more economical flaw detection devices for use in the inspection of hull welds in ships.

REPORTS:

"The Present Status of Non-Destructive Testing Methods for Inspection of Welded Joints in Ship Structures," R. J. Krieger, S. A. Wenk, and R. C. MacMaster, Special Report, Ship Structure Committee, Serial No. SSC-72, 5 Oct. 1953

SURVEY NO: D.3.5

PROJECT NO: NS 021-201 TASK/CONTRACT/W.O. NO: SR-131 and NObs-61748

TITLE: (Fabrication Technique, Ship Structure Committee) Flaw Evaluation

TASK SECURITY CLASSIFICATION: U SHEET SECURITY CLASSIFICATION: U

DATE APPROVED: 1952 COMPLETION DATE: Continuing

DIRECTING AGENCY: Bureau of Ships, Code 442

CONTRACTOR OR LABORATORY: Battelle Memorial Institute, Columbus, Ohio

PRINCIPAL INVESTIGATOR: P. J. Rieppel

DESCRIPTION: The effect of weld flaws on structural performance of butt welded plates will be determined for 2-ft diameter spherically dished panels which will be welded into an opening of a large alloy steel sphere. Variables to be studied will include base metal, welding electrodes, and poor welding techniques. Study is underway to determine the influence of residual stresses, cyclic loads, transient loads, etc., on specimen performance.

SHOCK AND VIBRATION SURVEY

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SHOCK AND VIBRATION SURVEY
PART II
INDEX OF SHOCK AND VIBRATION TEST EQUIPMENT IN GOVERNMENT ESTABLISHMENTS

SHOCK AND VIBRATION SURVEY

PART II

INDEX OF SHOCK AND VIBRATION TEST FACILITIES IN GOVERNMENT ESTABLISHMENTS

INTRODUCTION

The lists of shock and vibration test facilities which follow have been compiled to aid the engineer in selecting the correct machine to excite the loads he wishes to reproduce. At present these lists are concerned only with equipment in Government establishments. It has been suggested the uncommon facilities existing in contractors' plants and available for test to other defense activities should also be listed. This information will be included in a later edition if future developments warrant it.

ORGANIZATION

For ease of compilation and of reference, the material has been assembled in two lists. The first shows alphabetically the government establishments with the type and number of equipments available. Each establishment is numbered and the number is used for 'location' reference in List Two.

List Two again is alphabetically arranged for each type of machine. It shows equipment capabilities and locations. Quite often the actual capabilities of machines are subject to argument. Therefore, the performances listed should be used only as a guide. Further information should be sought from the establishments concerned or from the manufacturers.

ADDITIONS AND CORRECTIONS

While a considerable effort has been made to obtain comprehensive and up-to-date information, the editors realize that there must be many omissions and errors. It is hoped that users of these lists will check the entries with which they are familiar and inform the Centralizing Activity for Shock and Vibration of needed corrections for inclusion in future editions.

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LIST ONE
INDEX OF SHOCK AND VIBRATION TEST FACILITIES IN GOVERNMENT ESTABLISHMENTS

GOVERNMENT ESTABLISHMENT	SHOCK TESTING MACHINES	MECHANICAL VIBRATION TESTING MACHINES	ELECTRODYNAMIC VIBRATION TESTING MACHINES	CENTRIFUGES	MATERIAL TESTING MACHINES
1. Aberdeen Proving Ground, (U.S. Army), Aberdeen Proving Ground, Md.	Vibrashock Corp. Accelerometer Calibrator Model 200 (1) Medium Impact Shock Machine (1) Navy Lt. Wt. HI Shock Machine (G.E. Built) (1)	Baldwin Lazan LA-1 Vibration Generator (1) Buck Engineering Co. 3-Mass Oscillator (1)	MB Mfg. Co. Models: C-1E (1) S3 (C3) (1) C-11 (1) C-25 (1) Westinghouse Vibrator Model HI (1)	Statham Rotary Accelerator (2) Shaevitz Rotary Accelerator, M6 Modified for 1000 g (1)	
2. Air Force Missile Test Center, Patrick AFB, Fla.					
3. Ames Aeronautical Laboratory, (NACA) Moffet Field, Mt. View, Calif.	Whaley Engineering Works Drop Tester (1)	All American Tool & Mfg. Co. Models: 100 HA (1) 100 VA (1)	MB Mfg. Co. Models: C-S-BT (2) C-6 (2) Rollin Co. Models: 35 (5) 35S (2)		
4. Boston Naval Shipyard, Boston, Mass.		Baldwin Lazan LA-1 Vibration Generator (1)	Calidyne Co. Model 1 (1) B.N.S. Model 1 (1) Massa Piezoelectric Vibration Exciter Model: M. 137 (1)		
5. Boulder Laboratories of National Bureau of Standards (Dept. of Commerce), Boulder, Colo.		NBS 60,000 lb Shaker* (1)	MB Mfg. Co. Models: C-25 (1) C-11 (1)	NBS Centrifuge* (1)	Avery Fatigue Testing Machine (1)

*Developed Locally

LIST ONE
INDEX OF SHOCK AND VIBRATION TEST FACILITIES IN GOVERNMENT ESTABLISHMENTS

GOVERNMENT ESTABLISHMENT	SHOCK TESTING MACHINES	MECHANICAL VIBRATION TESTING MACHINES	ELECTRODYNAMIC VIBRATION TESTING MACHINES	CENTRIFUGES	MATERIAL TESTING MACHINES
1. Aberdeen Proving Ground, (U.S. Army), Aberdeen Proving Ground, Md.	Vibrashock Corp. Accelerometer Calibrator Model 200 (1) Medium Impact Shock Machine (1) Navy Lt. Wt. HI Shock Machine (G.E. Built) (1)	Baldwin Lazan LA-1 Vibration Generator (1) Buck Engineering Co. 3-Mass Oscillator (1)	MB Mfg. Co. Models: C-1E (1) S3 (C3) (1) C-11 (1) C-25 (1) Westinghouse Vibrator Model HI (1)	Statham Rotary Accelerator (2) Shaevitz Rotary Accelerator, M6 Modified for 1000 g (1)	
2. Air Force Missile Test Center, Patrick AFB, Fla.					
3. Ames Aeronautical Laboratory, (NACA) Moffet Field, Mt. View, Calif.	Whaley Engineering Works Drop Tester (1)	All American Tool & Mfg. Co. Models: 100 HA (1) 100 VA (1)	MB Mfg. Co. Models: C-5-BT (2) C-6 (2) Rollin Co. Models: 35 (5) 35S (2)		
4. Boston Naval Shipyard, Boston, Mass.		Baldwin Lazan LA-1 Vibration Generator (1)	Calidyne Co. Model 1 (1) B.N.S. Model 1 (1) Massa Piezoelectric Vibration Exciter Model: M. 137 (1)		
5. Boulder Laboratories of National Bureau of Standards (Dept. of Commerce), Boulder, Colo.		NBS 60,000 lb Shaker* (1)	MB Mfg. Co. Models: C-25 (1) C-11 (1)	NBS Centrifuge* (1)	Avery Fatigue Testing Machine (1)

*Developed Locally

LIST ONE

INDEX OF SHOCK AND VIBRATION TEST FACILITIES IN GOVERNMENT ESTABLISHMENTS—Continued

GOVERNMENT ESTABLISHMENT	SHOCK TESTING MACHINES	MECHANICAL VIBRATION TESTING MACHINES	ELECTRODYNAMIC VIBRATION TESTING MACHINES	CENTRIFUGES	MATERIAL TESTING MACHINES
6. David Taylor Model Basin, Carderock, Md.	Ballistic Pendulum (1) Test Pond (Explosion) Test Pits (Explosion)	Sperry MIT Calibrator (1) Walter A. Johnson Model: VMJ-2HB (1) DTMB Vertical Vibration Table (1) DTMB Horizontal Vibration Table (1) Losenhausen Vibration Generators, 44,000 lb (1) " 440 lb (1) Baldwin Bernhard Mechanical Oscillator (1) Lazan LA-1 (1) DTMB 5000 lb Generator (1) Mk 1 Midget (1) 3 Mass 5000 lb (1) 40,000 lb (1) DTMB Portable Calibrator (1)	MB Mfg. Co. Models: C-10 (1) C-1D (1) DTMB Vibrating Bar (1) Calidyne Co. Model 6 (2) DTMB Mk 1 Vibration Generator (1)		
7. Detroit Arsenal (U.S. Army), 28251 Van Dyke Rd. Center Line, Mich.	Barry Corp, 150-400 VD (1)	Baldwin-Sonntag SF-10-U (1) SF-1-U (1) All American Tool & Mfg. Co. Models: 25 HA (1) 100 HA (1) 100 VA (1) 10 VA (1) L.A.B. Corp. Model: VUDM.100 (1)	Calidyne Co. Models: 6C (1) 1 (1)		Impact Testing Equip. Detar Tuts-1000 (1) Detar Fast Fracture (1) Charpy Impact (2) Plastic Impact Tester (1) Fatigue Testing Equip. Detar Tobi-2000 (1)
8. Diamond Ordnance Fuze Laboratories, Washington, D. C.	Barry Corp. Type 20VI (1) Anthony Mfg. Co. Shock Machine (Similar to JAN-S-44) Model A.167 (1) NRL Drop Table (1) DOFL Drop Table (1) NBS Gravity Drop Table (1)	Waugh-Johnson Model VMJ 2 HB (1) All American Tool & Mfg. Co. Models: 100 VA (2)** 100 HA (1)	MB Mfg. Co. Models: C25 (1) C25 HSP (1) C11 (3) C5H (2)** C7A (1) S-1 (1) Calidyne Co. Models: 6C (1) 44 (2) NBS Vibrators Various (12)	Spinco Centrifuge (for testing subminiature vacuum tubes) (1)	

9. Engineer Research and Development Laboratories, Fort Belvoir, Va.	Conbur Incline Impact Tester (1) Crane Swing Impact Tester (1) Full Scale Rail Car Hump Test (1) 14' Diam. Hexagonal Revolving Drum (1) 7' Diam. Hexagonal Revolving Drum (1)	Laboratory Package Tester, Type 1000 (1) All American Tool & Mfg. Co. Models: 100 VA (1) 100 HA (1)	MB Mfg. Co. Model: C 1 (1)	
10. Forest Products Laboratory (U.S. Dept. of Agriculture), Madison, Wis.	F.P.L. Pendulum Shock Tester (1)	Link Belt Vibration Machine (1)		Krous Fatigue Testing Equipments (3) Baldwin Izod Impact Testing Machine (1) Olsen Change-O-Matic Impact Tester (1) Toughness Testing Machines (Various) (3)
11. Frankford Arsenal (U.S. Army) Philadelphia, Pa.	JAN-S-44 (1) Barry 150-400 VD Medium Impact Shock Machine (1) N.E. Trawler Equip. Co. Drop Impact Tester (1) Navy Lt. Wt. HI Shock Machine (1) Navy Fixture Impact Testing Machine (1) Drop Hammer Shock Machine (1) Swinging Hammer Shock Machine (1) Drop Testers (Small Various) (18) "Jolt" Machine (1) "Jumble" Machine (1) Drop Tower, Gravity (1) Conbur Inclined Impact Tester (1)	L.A.B. Corp. Models: RVH-18-100 (1) RVH-24-200 (1) RVCGA-500-3 (1) RV 14 (2) All American Tool & Mfg. Co. Models: 10 VA (2) 100 VA (1) Baldwin Universal Vibrator (1) Belgium Roll Test Machine (1)	MB Mfg. Co. Models: C-25A (1) C-31 (1) C-5H (1) C-1 (1) C-25H (1) Calidyne Model 58 (1)	
12. Langley Aeronautical Laboratory, (NACA) Langley Field, Va., Hampton, Va.	LAL Drop Rig (1)	LAL Calibration Devices: Cantilever Beam (1) Torsion Pendulum (1) Gravity Pendulum (1) All American Tool & Mfg. Co. Model: 25HA (1) LAL Oscillating Table (1)	MB Mfg. Co. Models: C-2 (1) C-11-a (1)	

*Detar = Detroit Arsenal
**One at Blossom Point

LIST ONE

INDEX OF SHOCK AND VIBRATION TEST FACILITIES IN GOVERNMENT ESTABLISHMENTS—Continued

GOVERNMENT ESTABLISHMENT	SHOCK TESTING MACHINES	MECHANICAL VIBRATION TESTING MACHINES	ELECTRODYNAMIC VIBRATION TESTING MACHINES	CENTRIFUGES	MATERIAL TESTING MACHINES
13. Lewis Flight Propulsion Laboratory (NACA), Cleveland, Ohio		Waugh-Johnson Models: VMJ-4VC (1) VMJ-2HB (1)	MB Mfg. Co. Models: C-11a (1) S-3 (1) Westinghouse Type GS (1)		
14. Mare Island Naval Shipyard, Industrial Laboratory, Vallejo, Calif.	Navy Lt. Wt. HI Shock Machine (1)	Walter A. Johnson Type Ser. 6 (1) Baldwin Lazan LA 1 Vibration Generator (1)	MB Mfg. Co. Model C-1E (1)		
15. New York Naval Shipyard, Materials Laboratory, New York, N. Y.	MATLAB 250-lb Machine (1) Navy Lt. Wt. HI Shock Machine (2) NRL Electronic Devices HI Tester (2) MATLAB Gyro Shock Machines: (One vertical) (One horizontal) (2)	L.A.B. Corp. Models: RVH-30-300 (2) RV-3 (1) All American Tool & Mfg. Co. Models: 100 VA (3) 100 HLA (3) 10 VA (3) 10 HA (3) MATLAB Machine (1) Vibration Speciality (3) Waugh-Johnson Model AV Type B (2)* NRL Vibration Machine (2) MATLAB Leaf Spring Machine (1)	MB Mfg. Co. Model C-31 (2) Racon Elec. Co. (2) Calidyne Co. Models: 44 (1) 1 (1) 49A (1)		Extensive Material Testing Facilities
16. National Bureau of Standards, Washington, D. C.			NBS Shakers (Various) MB Mfg. Co. Models: C-31 (1) C-11 (1) Calidyne Co. Models: 51 (1) B44 (1)		

17. Naval Air Development Center, Johnsville, Pa.	Navy Lt. Wt. HI Shock Machine (1) Barry 150-400 VD Medium Impact Shock Machine (1) Experimental Shock Machines (3) JAN-S-44 (1) Barry Corp. Type 20 VI Shock Machine (1) NADC Medium Impact Shock Machine (1)	All American Tool & Mfg. Co. Models: 10 HA (1) 10 VA (1) 25H (1) 25 HA (1) Waugh-Johnson Models: VMJ-3CD (1) VMJ-2H (1) VMJ-3CC (1) L.A.B. Corp Models: RVCGA-500-3 (1) RVH-30-300 (1) VUDM-100 (1) Vibration Speciality and Amthor Vibration Machine (1)	MB Mfg. Co. Models: C1 (1) C5 (1) C5HC (1) C25AR (1) C25HT (1) C31 (1) S3(C3) (1) MB Pratt & Whitney (Whirl) (1) Westinghouse Model HI 500 (1)	Riehle Charpy Pendulum Impact Tester (1)
18. Naval Air Experiment Station, Naval Air Material Center, Philadelphia, Pa.	Conbur Incline Impact Tester (1) Barry 150VD Medium Impact Shock Machine (1) NAML Drop Test Equipment (1) Bounce Tower (1) MBA Ejection Seat Tower (1) HG-1 Catapult (1)	Vibration Speciality Vertical Vibration Machine (1) L.A.B. Corp. Models: VUDM 100 (2) Type 1000 (1) RVII (1) Link Belt "Slosh" Machine (1) Waugh-Johnson 4VC (1) Martin Calibrating Table (2)**	MB Mfg. Co. Models: C25 (1) C1 (2) Lockheed S1 Structural Vibrating Sys., 5 Shakers, 2 Control Cabinets (1) Calidyne MIT Structural Vibrating Sys., 24 Calidyne Shakers & Control System (1)	
19. U.S. Naval Aircraft Factory, Naval Air Material Center, Philadelphia, Pa.			MB Mfg. Co. Models: C5 (1) S3 (2)	
20. Naval Air Missile Test Center, Point Mugu, Calif.	Rectilinear Accelerator (1) 10' Drop Tester (1) Square Wave Drop Tester (1) Sine Wave Drop Tester (1)	L.A.B. Corp. Models: VUDM-100 (2) HF3-100 (1)	MB Mfg. Co. Models: C11 (1) C31 (1) C1 (1) C8 (1) Calidyne Co. Models: 44 (3) 58 (1) 48 (1) Rollin Co. Models: 35 (5) 35S (2)	10' Radius (1) 15' Radius (1)

*One climatized for 20-95% relative humidity And -70 to +95 C
**One modified for angular acceleration

LIST ONE

INDEX OF SHOCK AND VIBRATION TEST FACILITIES IN GOVERNMENT ESTABLISHMENTS—Continued

GOVERNMENT ESTABLISHMENT	SHOCK TESTING MACHINES	MECHANICAL VIBRATION TESTING MACHINES	ELECTRODYNAMIC VIBRATION TESTING MACHINES	CENTRIFUGES	MATERIAL TESTING MACHINES
21. Naval Boiler and Turbine Laboratory, Philadelphia, Pa.	Navy Lt. Wt. HI Shock Machine (1)				
22. U.S. Navy Central Torpedo Office, Newport, R. I.	JAN-S-44 Shock Machine (1) Navy Lt. Wt. HI Shock Machine (1)	All American Tool & Mfg. Co. Models: 100-HLA (1) 100-VA (1)	MB Mfg. Co. Models: C5H (1) C31 (1)		
23. U.S. Navy Electronics Laboratory, San Diego, Calif.	Navy Lt. Wt. HI Shock Machine GE Built (1) Navy Medium Wt. HI Shock Machine (Westinghouse) (1) Barry Corp. 1200 VD Shock Machine (1)	All American Tool & Mfg. Co. Models: 10 VA (1) 10 HA (1) Waugh-Johnson Models: VMJ-3C (1) VMJ-4VB (1) VMJ-2HC (1) Western Elec. Co.: 500-lb Shaker (1) Pitch & Roll Machine (1) L.A.B. Corp. Model: RVH-96-10,000 (1)	MB Mfg. Co. Models: C-11 (2) C5H (1) C25 (1)		
24. Naval Engineering Experiment Station, Annapolis, Md.	Navy Lt. Wt. HI Shock Machine (1) Navy Md. Wt. HI Shock Machine (1)	Waugh-Johnson Models: VMJ-2HB (1) VMJ-4VB (1) EES Vibration Machine No. 1 (1) No. 2 (1) No. 3 (1)	MB Mfg. Co. Models: C11 (1) C31-1 (1) SD (1) Westinghouse Models: HI (1) GS (1)		
25. Naval Gun Factory, Washington, D.C.	Navy Lt. Wt. HI Shock Machine (1) Waugh Laboratory Drop Tester (1)	N.G.F. Vibration Machine (1) L.A.B. Corp. Model: VUDM 500 (1) Vibration Speciality Vibration Machines (2) Waugh Lab. 45° angle Vibration Machine (1)	MB Mfg. Co. Models: C25 (1) C11 (1)	15' Diam. Morgan Smith (1)	Olsen Impact Tester, Izod & Charpy (1) Baldwin-Sonntag Impact Tester, Izod & Charpy (1)
26. Naval Ordnance Laboratory, Corona, Calif.	Jolt Machine (1) Jumble Machine (1) Forced Gravity Drop Table for small specimens (1) Free fall Drop Table for end drop of missile containers (1)	L.A.B. Corp. Model: RVCGA-500-3 (2)* Waugh-Johnson Models: VMJ-2HB (1) VMJ-4V (1) VMJ-3CC (1)	Calidyne Co. Models: 44 (2) 6C (1) MB Mfg. Co. Model: C5 (1)	Rotary Accelerator: A 24" (1) B 8" (1)	

27. Naval Ordnance Laboratory, White Oak, Md.	NOL Air Guns (6) NOL Drop Tester (10) Rough Handling Tester (1) Jumble Machine (1) Jolt Machine (1) Barry 2CVI Shock Machine (1) U.W.X. Machine (1) Water Entry Test Facility (1) Tumble Drum 7' (1)	NOL Reaction Vibration Machines: 1A (1) 1B (1) 2C (3) 5A (1) HCV (1) CTV (1) L.A.B. Corp. Models: VUDM 100S (1) Type 1000 (2)	Westinghouse HI (1)	NOL Rotary Accelerator (1) Angular Accelerator (1) 18" Radius Centrifuge (1) 3.25" Air Spinner (1) 1.5" Air Spinner (1) Eastman Kodak Spinner (1)	
28. Naval Ordnance Plant, Indianapolis, Ind.	JAN-S-44 Shock Machine (1) NOPI Gravity Drop Tester (1) Barry Corp. 150VD Shock Machine (1) Navy Lt. Wt. HI Shock Machine (1) NOPI Pendulum Shock Tester (1) NOPI Sand Box Drop Tester (1) Gaynes Eng. Co. Pkg. Drop Tester (1)	L.A.B. Corp. Models: RVH-24-100 (1) RVH-36-500 (1) All American Tool & Mfg. Co. Models: 100 HA (1) 100 VA (1) 25 HA (1) Waugh-Johnson Models: VMJ-2HC (1) VMJ-4VC (1) NOPI Package Shaker (1)	MB Mfg. Co. Models: C25HMCP (1) C1E (1) C31 (1) Calidyne Co. Model: 58 (1)	Statham Rotary Accelerator (1)	
29. Naval Ordnance Test Station, Inyokern, Calif. China Lake, Calif. and Pasadena Facility	Barry Corp. Model 150 VD (1) Drop Tower (1) NOTS (Pasadena) Gravity Drop Table (1) Jolt Machine (1) Jumble Machine (1) Pasadena Variable Angle Launcher (into fresh water) Vertical Drop Facility	Cal. Tech. Vibration Testers 3HP (1) 15HP (1) All American Tool & Mfg. Co. Models: 25H (2) Vibration Specialty (2) L.A.B. Package Tester Type 5000 (1) Pasadena Lab Corp. RVCG-A1000-4 (1)	MB Mfg. Co. Models: C-11 (1) C-25HB (1) B1 Calibrator (1) Calidyne Co. Models: 48 (1) 44 (2) Pasadena MB Mfg. Co. Model: C-11 Calidyne Co. Model: 58 (1)	Shaevitz Rotary Accelerator (1)	
30. Naval Proving Ground, Dahlgren, Va.	NPG Catapult (1)	Baldwin Lazan LA-1 Vibration Generator (1) L.A.B. Corp. Model: VUDM 500 (1) Naval Gun Factory Vibration Machine (1)	MB Mfg. Co. Model: C-1 (1)	NPG 8' Diam. (1)	Extensive Material Testing Facilities

*One climatized for environmental chambers.

LIST ONE

INDEX OF SHOCK AND VIBRATION TEST FACILITIES IN GOVERNMENT ESTABLISHMENTS—Continued .

GOVERNMENT ESTABLISHMENT	SHOCK TESTING MACHINES	MECHANICAL VIBRATION TESTING MACHINES	ELECTRODYNAMIC VIBRATION TESTING MACHINES	CENTRIFUGES	MATERIAL TESTING MACHINES
31. Naval Research Laboratory, Washington, D. C.	Navy Lt. Wt. HI Shock Machine (1) Navy Medium Wt. HI Shock Machine (1) Taft Pierce HI Shock Machine (1)	All American Tool & Mfg. Co. Models: 10 (1) 10 VA (1) 25 HA (1) 100 HA (1) 100 VA (1) NRL Reaction Vibration Machine (1) Western Electric 500 lb. Vibration Machine (1) 1000 lb. Vibration Machine (1) Waugh-Johnson VMJ 2HC (1) 4VC (1) NRL Shock, Vibration & Inclination Machine (1)	MB Mfg. Co. Model: C5H (1) Westinghouse Models: HI (1) GS (1) Resonating Bars: Variable Cross Section (1) Uniform Cross Section (1)	Whirling Arms (2+)	O. S. Peters Fatigue Testing Machines (R. R. Moore) (5) T. Olsen Impact Testing Machines (2) NPL Drop (840 ft lb) Impact Tester (1)
32. Naval Underwater Sound Laboratory, New London, Conn.	Navy Lt. Wt. HI Shock Machine (1) Navy Med. Wt. HI Shock Machine (1)	Waugh-Johnson Models: VMJ-2HB (1) VMJ-4VB (1) Western Electric 500 lb. Shaker (1) All American Tool & Mfg. Co. Models: 100 HA (1) 10 HA (1) 10 VA (1)	MB Mfg. Co. Model: C-1 (1)		
33. Portsmouth Naval Shipyard, Portsmouth, N. H.	P.N.S. Shock Machine (1) Navy Lt. Wt. HI Shock Machine (GE and NE Trawler Equipment Co.) (3)	All American Tool & Mfg. Co. Models: 100 HA (1) 100 VA (1) P.N.S. Vibration Machine (1)			
34. Puget Sound Naval Shipyard, Bremerton, Wash.	Navy Lt. Wt. HI Shock Machine (1)	Sperry MIT Vibration Calibrator $48 (1)	MB Mfg. Co. Model: C-1E (1)		
35. Quartermaster Food & Container Institute for the Armed Forces, 1819 W. Pershing Rd. Chicago, Ill.	Conbur Incline Impact Tester (1) Q.M. Drop Test Facilities (2)	Lab. Pkg. Tester Type 1000 (1) Link Belt Mechanical Vibration Machine (1)			

36. Redstone Arsenal Huntsville, Ala.		All American Tool & Mfg. Co. Model: 25 HA (4) L.A.B. Corp. Models: RVH-30-300 (1) VUDM 100 (1) Redstone Vibration Table (1) Baldwin Sonntag Vibration Generator Model: LA-1 (1)	MB Mfg. Co. Models: C5 (2) C11 (2) C25 (2) C25H (1) C5H (1) Calidyne Co. Models: 6 (2) 6C (4)		
37. Rome Air Development Center, Griffiss Air Force Base, Rome, N. Y.	Barry Corp. Models: 150 VD (1) 1200-3 VD (1) Shock Machines	L.A.B. Corp. Models: 1000 E (1) RVH-30-300 (1) RVH-24-100 (1) RVCG-A-500-3 (1)	MB Mfg. Co. Models: SD (1) C-11a (1) S-3 (1)		
38. Rossford Ordnance Depot, Toledo, Ohio	Conbur Incline Impact Tester (1) Drop Testers (2) Hexagonal Revolving Drums 14' diameter (1) 7' diameter (1)	L.A.B. Corp. Model: 10,000 (1)			
39. San Francisco Naval Shipyard, San Francisco, Calif.		EES(2) Design Portable Vibration Machine (1) Consolidated Engineering Corp. Calibrator (1)			
40. Signal Corps. Engineering Laboratories, Fort Monmouth, N. J.	Baldwin Southwark Ballistic Shock Machine (1) L.A.B. Corp. Pendulum Impact Tester (1) JAN-S-44 Shock Machine* (2) Barry Corp. Models: 150 VD (1) 20 VI (2) Shock Machines: NRL Type Shock Machine for electronic devices (1) Tumbling Machine, Random Drop (1)	L.A.B. Corp. Models: VUDM-100 (1) RVH-36-500 (1) RVCG-500-3 (1) RVH-72-2500 (1) RVH-24-300 (2) RVH-30-300 (1) Package Testers 1000 (3) 5000 (1)	MB Mfg. Co. Models: C-31-1 (2) S-3 (1) C-25M (2) C-5H (1) C-25H (1) SA-C (1) Calidyne Co. Models: 44 (2) 6C (2) 48 (1) 48C (1)	SCEL Wing Type Centrifuge (1) SCEL Spanner Rotor Type Centrifuge (1) Eastman Kodak Spanner (1) International Equip. Co. Model No. 2 (2)	
41. Transportation Research and Development Command, Fort Eustis, Va.					

*One machine modified for higher accelerations.

LIST ONE

INDEX OF SHOCK AND VIBRATION TEST FACILITIES IN GOVERNMENT ESTABLISHMENTS—Continued

GOVERNMENT ESTABLISHMENT	SHOCK TESTING MACHINES	MECHANICAL VIBRATION TESTING MACHINES	ELECTRODYNAMIC VIBRATION TESTING MACHINES	CENTRIFUGES	MATERIAL TESTING MACHINES
42. Watertown Arsenal, (U.S. Army), Watertown, Mass.			MB Mfg. Co. Model: C1 (1)		Charpy Impact Machine, Pendulum Type: Olsen Riehle Sonntag Mouton O.S. Peters Drop Hammer Type: Watertown Arsenal
43. White Sands Proving Ground, (U.S. Army), Alamogordo, N. M.	Barry Corp. Models: 150-400 VD (1) 1200 VD (1) 20 VI (1) Conbur Incline Impact Tester (1) Gulton Impact Pendulum Shock Machine Model AT-2 (1)	All American Tool & Mfg. Co. Models: 100 VA (2) 100 HA (1) L.A.B. Corp. Package Tester Model: 1000E (1)	MB Mfg. Co. Models: C5H (3) C25 (1) C100H (1) C-1 (1) Calidyne Co. Models: 48-A (1) 51-81-82 (1) 6C (1)	Genisco Models: A (1) B (1)	
44. Wright Air Development Center, (Air Force) Wright-Patterson Air Force Base, Dayton, Ohio	Barry Corp. Models: 150 VD (1) 150-400 VD (1) 20 VI (2) Shock Machines: JAN-S-44 Shock Machines (4) 2X Scale JAN-S-44 (1) Drop Test Tower (1) Navy Lt. Wt. HI Shock Machine (1) Taft Pierce No. 7 Shock Machine (1)	All American Tool & Mfg. Co. Models: 10 (2) 10 VA (1) 25 H (1) 100 VA (3) 100 HA (2) 100 HLA (2) 100 VLA (1) L.A.B. Corp. Models: RVCGA-500-3 (2) VUDM-500 (4) VUDM-100 (2) RVH-30-300 (3) LCS 25 (1) Waugh-Johnson Models: VMJ-4VC (1) VMJ-2HB (1) VMJ-2HC (1) Walter A. Johnson Model: 4-VB (1) Johnson Horizontal (1) Johnson Vertical (1) Krous Model 522 (1) Parker Appliance Co. (1)	Calidyne Co. Models: 6 (3) 6C (1) 6CT (1) 41 (1) 6T (1) 44 (3) 48 (2) 82 (1) MB Mfg. Co. Models: C-1 (6) S-A (4) S-3 (3) C-2 (1) C-5 (3) C-5H (1) S-6 (2)* C-7 (1) C-8 (1) C-11 (1) C-25 (3) C-25H (3) C-31 (2) C-31-1 (4) S-31 (1) S-31 (2)*	Genisco Model B (1) Hathaway Inst. Co. (1) Morgan Smith Co. 12' Diameter (1) 20' Radius (1) James Saunders Co., Instrument Centrifuge (1) Schaevitz Eng. Co. Model M6 (1) Statham Rotary Accelerator (1) United Aircraft Products, Inc. 8' Diameter Spin Table (1)	Schenk Fatigue Testing Machines (6) WADC RR Moore Fatigue Testing Machine (1) WADC Fatigue Testing Machine (1) WADC Fatigue Testing Electrodynamic Machines Baldwin Universal Fatigue Testing Machine S F I-U (1)

(Continued on next page)

44. (Continued) Wright Air Development Center, (Air Force) Wright-Patterson Air Force Base, Dayton, Ohio		Illinois Tool Works Model: 802 (1) Douglas Aircraft Co. (1) Graystone Engineering Co. (1) Western Gear Corp. (1) Paul Henry Co. Mod. 10 (1) Consolidated Engineering Corporation (1) WADC Design (4) Foot Bros. Gear and Machinery Corp. (1) Western Electric Co. (1) Sperry MIT Calibrator (1) Vibration Generator WADC Types A through N	Westinghouse HI (1) Westinghouse GS (1) MB Pratt and Whitney Accessory Vibrator (1) Rollin Model 35 (1) MB and Consolidated Vibrator (1)		

*With T57 control

LIST TWO - EQUIPMENT TYPES AND PERFORMANCE

SHOCK TESTING EQUIPMENT

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	RESPONSE	ACCELERATION (g)	TIME INTERVAL (sec)	MAX. SPECIMEN WT. (lb)	TABLE SIZE (in.)	DIRECTION OF MOTION	LOCATION*
Anthony Manufacturing Co., East Orange, N. J.								
Model No. A-167	Similar to JAN-S-44 Gravity Drop Table	Half Sine Wave	40-120	.01 -.005	4	3 x 6	Vertical	8
Barry Controls, Inc. Watertown, Mass.								
Type 150 VD	Gravity Drop Table (Sandpit)	Non-resilient	5-100	.0065-.032	150	36 x 36	Vertical	1. 18. 28. 29. 37. 40. 44
Type 150-400 VD	Gravity Drop Table (Sandpit)	Non-resilient	1-75	.0167-.083	400	30 x 30	Vertical	7. 11. 17. 43. 44
Type 20 VI	Gravity Drop Table			.002 -.030	20	16 Diam.	Vertical	8. 17. 27. 40. 43. 44
Type 1200 VD, Med. Impact Shock Machine	Gravity Drop Table		1-76	.0065-.032	1200	60 x 60	Vertical	23. 37. 43
Baldwin-Southwark Eddystone, Pa.								
Ballistic Shock Machine	Gravity Drop Hammer			.001 -.002	250	24 x 30 (Anvil)	Vertical and Horizontal	40
"Conbur" Ramp Small	Incline Impact Tester 10°		24 max.		1000	36 x 36	Horizontal on Impact	9, 11, 18. 35. 38. 43
David Taylor Model Basin, Carderock, Md.								
Impact Tester	Ballistic Pendulum 8" Diam. 48" Long							6
Explosion Test Facilities	Test Pits: Underground steel and concrete lined structures in which explosive charges may be fired; also underground instrument rooms. Pits may be capped with special structures to produce simulated shipboard shock motions.							6
	Test Pond: 180 ft across by 25 ft deep. Designed and equipped for conducting instrumented tests particularly on structural models and for underwater motion picture photography.							6

Diamond Ordnance Fuze Laboratory, Washington, D. C.								
Impact Tester	Rolling Ball & Inclined Plane		25-400	.001	4(oz.)	1 x 1	Horizontal	8
Shock Tube								8
Engineer Research & Development Laboratories (Army), Fort Belvoir, Va.								
Shock Test Facilities	Full Scale, Rail Car Hump Test							9
	Drop & Swing, Impact Testing Facilities							9
Forest Products Laboratories, U.S. Dept. of Agriculture Madison, Wis.								
Shock Tester	Pendulum Wt. Variable from 2.63-100 lb					12 x 15	Horizontal	10
Frankford Arsenal Philadelphia, Pa.								
Ballistic Impact Tester	10-1/2" Drop, Hammer		2000	<.001	500		Vertical	11
Drop Testers for Primer Sensitivity Testing	Percussion & Electrical				2(oz.)-1		Vertical	11
Swinging Hammer	3 ft Drop (Arc)							11
Drop Tower	Gravity				300	12 Diam	Vertical	11
Gaynes Engineering Co.								
Package Drop Tester	12-60" Drop				120	24 x 29.5		28
Gulton Manufacturing Co. Metuchen, N. J.								
Model AT-2	Ballistic Pendulum	Half Sine Wave	10-500	.001	1	2 Diam.	Horizontal	43

*Refers to numeral designations used in List One, Column 1

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

SHOCK TESTING EQUIPMENT—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	RESPONSE	ACCELERATION (g)	TIME INTERVAL (sec)	MAX SPECIMEN WT. (lb)	TABLE SIZE (in.)	DIRECTION OF MOTION	LOCATION
JAN-S-44	Gravity Drop Table	Half Sine Wave	5-200	.003-.030	20		Vertical	11. 17. 22. 28. 40. 44
Twice Scale JAN-S-44	Gravity Drop Table	Half Sine Wave	5-100	.003-.050	100		Vertical	44
Jumble Machine (Small)	Mil. Std. 351					5 x 11 x 16	Various	11. 26. 27. 29
(Large)	Mil. Std. 351		200		50	24 x 24 x 24	Various	
Jolt Machine	Mil Std. 350		200-275		50	4 x 10	Vertical	11. 26. 27. 29
Langley Aeronautical Laboratory, (NACA), Hampton, Va.								
Drop Rig	Gravity Drop Repeated	Repeats Pulse 2.5-12 cps	0-10		20	12 x 14	Vertical	11
L.A.B. Corp., Skaneateles, N. Y.								
Pendulum Tester	4' Gravity Drop				200	36 x 36	Horizontal	40
Materials Laboratory N. Y. Naval Shipyard, New York, N. Y.								
250' lb Shock Machine	Gravity Drop Hammer		200	.001	200	24 x 36	Horizontal	15
Gyro Shock Testing Machines	Gravity Drop Hammer		800	.002	1000	50 x 56	Vertical	15
			400	.002	1000	55 x 55	Horizontal	15
Navy: Light Weight High Impact Shock Machine	Gravity Swinging 400 lb Hammer	Complex Wave High Impact	10-1000	.010-.050	250	27 x 34	Horizontal and Vertical	1. 11. 14. 15. 17. 21. 22. 23. 24. 25. 28. 31. 32. 33. 34. 44
Medium Weight High Impact Shock Machine	Gravity Swinging 3000 lb Hammer	High Impact			4500	60 x 60	Vertical	23. 24. 31. 32
National Bureau of Standards, Washington, D. C.								
Impact Tester	Gravity Drop		20-300	.006-.020	30	6 x 6	Vertical	8

Naval Air Development Center, Johnsville, Pa.								
Medium Impact Shock Machine	Gravity Drop		65	.020-.080	400	24 x 24	Vertical	17
Experimental Shock Machine	Hydraulic	Controllable Shock Pulse	35	.005-.080	300	48 x 48	Vertical	17
Experimental Shock Machine	Gravity Drop		25	.030-.040	10,000	72 x 96	Vertical	17
Experimental Shock Machine	Gravity Drop		10	.030-.040	20,000	96 x 96	Vertical	17
Naval Air Experiment Station, Philadelphia, Pa.								
Bounce Tower	Drop on to Pneumatic Spring	Half Sine Wave Pulse	25-200	.02 -.12	200	24 x 24	Vertical	18
Drop Test Equipment	Gravity Drop			.02 -.45	15,000	30 x 60	Vertical	18
MBA Ejection Seat Tower	Pyrotechnic Charge	Trapezoidal Pulse	5-32	.2 -.15	400	17 x 17	20° from Vertical	18
H.G. 1 Catapult	Hydraulic Pneumatic	Square Wave	5-40	.11 -.32	1600	36 x 120	Horizontal	18
Naval Air Missile Test Center, Point Mugu, Calif.								
Rectilinear Accelerator			60		60		Horizontal	20
Drop Tester	10' Gravity Fall		10-1000	.001-.020	800		Vertical	20
Sine Wave Tester	Gravity Fall	Sine Wave	60-140	.008-.010	10		Vertical	20
Naval Ordnance Laboratory Corona, Cal.								
Drop Table for Small Specimens	Assisted Fall							20
Drop Table for Missile Containers	Gravity Drop							20

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

SHOCK TESTING EQUIPMENT—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	RESPONSE	ACCELERATION (g)	TIME INTERVAL (sec)	MAX. SPECIMEN WT. (lb)	TABLE SIZE (in.)	DIRECTION OF MOTION	LOCATION
Naval Ordnance Laboratory, White Oak, Md.								
Drop Tester	40' Gravity Fall		80,000				Vertical*	27
Drop Tester	10' Gravity Fall		50-600		150	22 Diam.	Vertical	27
Drop Tester	12" Gravity Fall		3000		20	8 x 8	Vertical	27
Short Duration Drop Tester	1"-12" Gravity Fall		25,000		2	1.25 Diam	Vertical	27
1200' Drop Tester	15" Air Gun		1000-10,000				Horizontal	27
Mk 7 Mod 0 100' Drop Tester	Assisted Fall	Can be Varied	500	.001 -.0025	25	8 x 8	Vertical	27
Square Wave Drop Tester	Gravity Fall	Square Wave	2-60	.0055-.045	20	9 x 9	Vertical	27, 20
Rough Handling Tester	Multiple Shocks		2-350			10 x 3.5	Various	27
Underwater Explosion Simulating Machine		Simulates shock wave and bubble pulse of underwater explosions. Equivalent 30' from 300-lb H.E.				12 Diam.		27
Water Entry Test Facility	Assisted Drop	Simulates shock pulse of water entry.					Vertical*	27

*Item may be positioned to vary orientation at impact.

SHOCK TESTING EQUIPMENT—AIR GUNS

MANUFACTURER AND/OR DESIGNER AND MODEL	BARREL LENGTH (ft.)	DIAMETER INSIDE (in.)	BORE AREA (Sq. in.)	BREECH CHAMBER VOLUME (Cu. in.)	BREECH CHAMBER PRESSURE Max (psi)	MUZZLE PRESSURE (psi)	FORCE ON PISTON Max (lb)	PISTON VELOCITY MAX (Ft. sec)	THEORETICAL ACCELERATION MAX SINGLE PHASE PISTON (g)	BUILD UP TO PEAK 'g' in mis.	LOCATION
Naval Ordnance Laboratory, White Oak, Md.											
Air Guns											
21" with two phase pistons	93.3	21	340	1.5 -10.5	1000	12-90	340,000	750	10 lb load 2100 100 lb load 1350 200 lb load 1000	1	27
16.3" with two phase pistons	40	16.3	208	2	600	0-90	125,000	380	10 lb load 1200 100 lb load 630 200 lb load 420	1 - 10	27
15" with two phase pistons	58	15	173	1.38 or 1.8	1000	0-90	174,000	450	10 lb load 2300 100 lb load 1000 200 lb load 650	1 - 10	27
5.6"	42	5.6	24.6	.2	3000	0-90	73,000	600	1 lb load 9700 5 lb load 6000 15 lb load 3400	.5 - 2.5	27
5"	95	5	19.6	.05- .15	15,000	0-300	290,000	750	1 lb load 45,000 2 lb load 39,000 5 lb load 27,000	.1 - .3	27
2"	53	2	3.15	.024	15,000	0-1000	44,000	750	.01 lb load 200,000 .1 lb load 145,000 .5 lb load 60,000	.1 - .25	27

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

SHOCK TESTING EQUIPMENT—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	RESPONSE	ACCELERATION (g)	TIME INTERVAL (sec)	MAX SPECIMEN WT. (lb)	TABLE SIZE (in)	DIRECTION OF MOTION	LOCATION
Naval Ordnance Plant, Indianapolis, Ind.								
Shock Test Facilities	NOPI Gravity Drop		100	.008 -.015	75	12 x 15	Vertical	28
	NOPI Pendulum		100	.005 -.030	125	24 x 24	Horizontal	28
	NOPI Sand Drop		0-35	.008	100	24 x 24	Vertical	28
Naval Ordnance Test Station, China Lake, Calif. and Pasadena Annex								
(C.L.) Drop Tower	70' Drop				200	8 x 8 For Inside Drop 16 x 16 For External Side Drop		29
(P) Shock Machine	Gravity Drop		10-300	.005 -.015	300	20 x 20	Vertical	29
(P) Variable Angle Launcher	22-1/2" and 32" tubes firing into fresh water. Diameter test item Min. 5" Max. 32". Launching angle between 0° - 40°. Launching velocity 100 ft/sec Min. 1500 ft/sec Max. with 100-lb missile.							29
(P) Vertical Drop Facility	Max. 150'				4000			29
Naval Research Laboratory, Washington, D. C.								
Shock Machine for Electronic Devices	Hammer		100-1000	.075	20	15 x 18	Horizontal	8, 15, 40
N. E. Trawler Equipment Co.								
Drop Impact Tester	Gravity Drop 18" Fall through 85° Arc.	Half Sine Wave	25-250	.001 -.0085	60	15 x 10	Vertical & Horizontal with Specimen Moving	11

Portsmouth Naval Shipyard, Portsmouth, N. H.								
Hydraulic Shock Machine	Gravity Drop of Hammer on Piston	Underwater Explosion Shock Pulse		.001 -.002		Internal: 8 Diam. x 20. External: Adaptor Plate for Hull Fittings		33
Quartermaster Food and Container Institute, Chicago, Ill.								
Drop Facility	75' Gravity Fall		Various	Various	80	30 x 30	Vertical	35
Drop Facility	90' Gravity Fall		Various	Various	4000	72 x 96	Vertical	35
Rossford Ordnance Depot Container Testing Laboratory, Toledo, Ohio								
Drop Tester	8'A Frame Drop		10-1200	.005 -.030	2000	10' Span	Vertical	36
Drop Tester	5' Drop Table		50-1000	.005 -.030	200	24 x 28	Vertical	38
Taft Pierce Woonsocket, Mass.								
No. 7	Gravity Drop Hammer	High Impact	1500	.0005-.0008	50	14 x 12	Horizontal	31, 44
Vibrashock Corporation Teterboro, N. J.								
Calibrator Model 200	Accelerometer Calibrator, Spring Supported Table		4-16		.5	2 x 2-1/4	Vertical	1
Whaley Engineering Works, Norfolk, Va.								
Shock Machine	Gravity Drop onto Spring, Freq. 2.3 & 13.7		0-12.5		50	12 x 18	Vertical	2
Waugh Laboratories, New York, N. Y.								
Drop Tester	Gravity Drop Table		1000		500	2 x 2	Multiple Drop	25

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

SHOCK TESTING EQUIPMENT—Continued								
MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	RESPONSE	ACCELERATION (g)	TIME INTERVAL (sec)	MAX SPECIMEN WT. (lb)	TABLE SIZE (in)	DIRECTION OF MOTION	LOCATION
Wright Air Development Center, Dayton, Ohio								
Drop Tower	Gravity Drop	High Impact	Up to 40		290		Vertical	44

MECHANICAL VIBRATION TESTING EQUIPMENT								
MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE OF DRIVE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX DOUBLE AMPLITUDE (in)	ACCELERATION MAX AT CAPACITY (g)	RATED TABLE CAPACITY (lb)	DIRECTION OF VIBRATION	LOCATION
All American Tool & Manufacturing Co. Skokie, Ill.								
Models: 10	Direct	6 x 6	10-60	0.125	23	10	Vertical	31. 44
10 VA	Direct	8 x 8	10-60 Manual 10-55 Auto Cycle	0.2	37	10	Vertical	7. 11. 15. 17. 23. 31. 32. 44
10 HA	Direct	7 x 12	10-60 Manual 10-55 Auto Cycle	0.2	37	10	Horizontal	15. 17. 23. 32
25 H	Direct	12 x 15	10-60 Manual	0.125	23	25	Horizontal	17. 29. 44
25 HA	Direct	12 x 15	10-60 Manual 10-55 Auto Cycle	0.125	23	25	Horizontal	7. 12. 17. 28. 31. 36
100 HL	Direct	15 x 18	10-60 Manual	0.125	23	100	Horizontal	
100 HLA	Direct	15 x 18	10-60 Manual 10-60 Auto Cycle	0.125	23	100	Horizontal	3. 7. 8. 9. 15. 22. 28. 31. 32. 33. 43. 44
100 V	Direct	15 x 18	10-60 Manual	0.125	23	100	Vertical	
100 VA	Direct	15 x 18	10-60 Manual 10-55 Auto Cycle	0.125	23	100	Vertical	3. 7. 8. 9. 11. 15. 22. 28. 31. 33. 43. 44
150 HLA-D	Direct	18 x 21	10-60 Manual and Auto	0.125	23	150	Horizontal	
150-VA-D	Direct	18 x 21	10-60 Manual and Auto	0.125	23	150 (All at 10g)	Vertical	

Baldwin Sonntag Greenwich, Conn. Models:								
SF-10-U	Resonance	8 x 8	30	.5	23	77	Vertical	7
SF-1-U	Resonance	5 x 5	30	.75	32	14	Vertical	7
Buck Engineering Company Freehold, N. J.	3-Mass Oscillator	60 Diam.	2 to 60	.2				1
California Institute of Technology (Design)								
3 HP	Direct	6-5/8 x 46	10 to 50	.063	8	200	Vertical	29
15 HP	Direct	12 x 95	21 to 44	.125	12	2000	Vertical	29
Consolidated Engineering Corporation, Pasadena, Calif.								
Calibrator	Direct		4-90 linear 8-180 torsional	.1 linear 3°.0 torsional	20	1		39, 44
David Taylor Model Basin Carderock, Md.								
TMB Vertical Vibration Table	Direct	18-1/2 x 19	0-33	.75	10	50	Vertical	6
TMB Horizontal Vibration Table	Direct	18 x 18-1/2	8-25	.75	15	75	Horizontal	6
TMB Portable Calibrator	Direct (Cam)	3 Diam.	2-32	.02	1	1		6
Douglas Aircraft Co. Santa Monica, Calif.								
Vibration Machine		6 x 14	0-2000	.150			Horizontal	44
Foot Brothers Gear and Machinery Corp. Chicago, Ill.								
Vibration Machine		4 x 4	0-25	.4	10	5	Horizontal	44
Frankford Arsenal								
Belgian Roll Test Machine		16 x 19	370 rpm (Constant)	.563			Vertical	11
Graystone Engineering Company								
Vibration Machine		77 x 108	1200-3600 cpm (vibration) 20 cpm (oscillation)					44

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

MECHANICAL VIBRATION TESTING EQUIPMENT—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE OF DRIVE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX DOUBLE AMPLITUDE (in)	ACCELERATION MAX AT CAPACITY (g)	RATED TABLE CAPACITY (lb)	DIRECTION OF VIBRATION	LOCATION
Illinois Tool Works Chicago, Ill.								
Model 802		3 x 5	30-40-60	.150			Horizontal	44
							Vertical	44
Johnson Vibration Testing Machines	Direct	16 sq in.	10-60	.0625	10		Horizontal	44
	Direct	16 sq in. (Approx.)	10-60	.0625	10			
Krous Testing Machine Company Columbus, Ohio								
Instrument Vibrator 522			5-50	.200		24	Circular motion in 45° plane, Adjustable	44
523			5-55 (With Auto Cycle)	.124		24	Circular motion in 45° plane, Adjustable	
L.A.B. Corporation Skaneateles, N. Y.								
RVH-18-50	Reaction	18 x 18	10-60 (With Auto Cycle)	.125	10	50	Horizontal and Vertical	
RVH-18-100	Reaction	18 x 18	10-60 (With Auto Cycle)	.125	10	100	Horizontal and Vertical	11
RVH-24-100	Reaction	24 x 24	10-60 (With Auto Cycle)	.125	10	100	Horizontal and Vertical	28, 37
RVH-24-200	Reaction	24 x 24	10-60 (With Auto Cycle)	.125	10	200	Horizontal and Vertical	11
RVH-24-300	Reaction	24 x 24	10-60 (With Auto Cycle)	.125	10	300	Horizontal and Vertical	40
RVH-30-200	Reaction	30 x 30	10-60 (With Auto Cycle)	.125	10	200	Horizontal and Vertical	
RVH-30-300	Reaction	30 x 30	10-60 (With Auto Cycle)	.125	10	300	Horizontal and Vertical	15, 17, 36, 37, 40, 44
RVH-36-300	Reaction	36 x 36	10-60 (With Auto Cycle)	.125	10	300	Horizontal and Vertical	

L. A. B. Corporation (Continued)								
RVH-36-500	Reaction	36 x 36	10-60 (With Auto Cycle)	.125	10	500	Horizontal and Vertical	28, 40
RVH-36-1000	Reaction	36 x 36	10-60 (With Auto Cycle)	.125	10	1000	Horizontal and Vertical	
RVH-72-1500	Reaction	72 x 72	10-60 (With Auto Cycle)	.125	10	1500	Horizontal and Vertical	
RVH-72-2000	Reaction	72 x 72	10-60 (With Auto Cycle)	.125	10	2000	Horizontal and Vertical	
RVH-72-2500	Reaction	72 x 72	10-60 (With Auto Cycle)	.125	10	2500	Horizontal and Vertical	40
RVH-96-10,000	Reaction	96 x 96	5-40 (With Auto Cycle)	.125	5	10,000	Horizontal, Vertical and Circular in Vertical plane	21
RVCGA-500-3	Mercury Reaction	36 x 36	5-60 (With Auto Cycle)	.403	10	500	Horizontal, Vertical and Circular in Vertical plane	11, 17, 29, 37, 39, 41
RVCGA-500-4	Mercury Reaction	43 x 43	5-60 (With Auto Cycle)	.303	10	500	Horizontal, Vertical and Circular in Vertical plane	
RVCGA-1000-3	Mercury Reaction	36 x 36	5-60 (With Auto Cycle)	.276	6.6	1000	Horizontal, Vertical and Circular in Vertical plane	
RVCGA-1000-4	Mercury Reaction	43 x 43	5-60 (With Auto Cycle	.217	6.6	1000	Horizontal, Vertical and Circular in Vertical plane	43
RVCGA-2500-3	Mercury Reaction	72 x 72	5-60 (With Auto Cycle)	.25	4.1	2500	Horizontal, Vertical and Circular in Vertical plane	
Package Testing Machines								
Type 400	Direct	36 x 42		1	1.25	600		
Type 1000	Direct	60 x 60		1	1.25	1000		9, 15, 27, 31, 35, 39, 41
Type 2000	Direct	60 x 96		1	1.25	2000		21, 25
Type 10,000	Direct	As required				10,000		45

For additional features designated by letters and numbers after the number see catalog

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

MECHANICAL VIBRATION TESTING EQUIPMENT—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE OF DRIVE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX DOUBLE AMPLITUDE (in)	ACCELERATION MAX AT CAPACITY (g)	RATED TABLE CAPACITY (lb)	DIRECTION OF VIBRATION	LOCATION
L.A.B. Corporation (Continued)								
Three Dimensional Motion Equipments								
VUDM-100	Direct	24 x 30	10-60 (Manual or Auto Cycle)	.5	10	100	3 Dimensional	7, 17, 18, 26, 27, 36, 40, 44
VUDM-500	Direct	36 x 48	10-60 (Manual or Auto Cycle)	.25 or .5	10	500	3 Dimensional	25, 30, 44
Miscellaneous Items								
RV 3	Reaction	24 x 40	10-60 (Manual or Auto Cycle)	.125	10	400	Horizontal or Vertical	15
Series RV12 50-300	Reaction		10-60 (Manual or Auto Cycle)	.125	10	50-300	Horizontal	
RV11	Direct	48 x 36	10-60	.125	2	1000	Vertical	18
RV14	Reaction	14 x 14	5-60 (Auto Cycle)		5	300	Vertical	
HF3-100			10-120	.125	10	100		20
Langley Aeronautical Laboratory (NACA) Hampton, Va.								
Mechanical Vibration Calibrators:								
Cantilever Beam		12 x 18	2-30		25	20	Vertical and Horizontal	12
Torsion Pendulum		9 Diam.	9-90	±30°	4000 r/sec^2		Horizontal plane	12
Gravity Pendulum		7 x 10	.25-4	10'-40'		20	Vertical plane	12
Oscillating Table	Direct	24 Diam.	0-10	7"			Horizontal plane	12
Link Belt Co. Chicago, Ill.								
Slosh Type Vibration Machines	Direct	84 x 72	0-50	.065	2	10,000	Vertical + 15 each Side of Vertical	18
	Direct	48 x 60	7	.375	.9	500		10, 35

Martin Sinusoidal Calibrating Table	Direct	2.5 x 5	4-45	1.00	20	1	Vertical	18
Sinusoidal Calibrating Table Modified for Angular Calibration	Direct	6 x 6	4-45	.10	920 r/sec^2	1	Vertical	18
Material Laboratory N. Y. Naval Shipyard New York, N. Y.								
Vibration Machine	Direct	48 x 48	1-60	.250	10	500	3 Directional	15
Leaf Spring	Direct	5 Diam.		.08	2-1/2	3	Horizontal	15
National Bureau of Standards, Boulder, Colo.								
Vibration Machine	Reaction	6 x 9-1/2 ft.	5-75	.070	5	12,000	Vertical or Horizontal	5
Naval Gun Factory, Washington, D. C.								
Vibration Machine	Reaction	48 x 60	5-50	.25	7.7	3000	Vertical	25. 30
Naval Engineering Experiment Station, Annapolis, Md.								
Vibration Machines EES 1	Direct	15 x 18	3-60	.5	<1	2000	Vertical	24
EES 2	Direct	15 x 15	3-60	.5	1.5	200	Vertical	24. 39
EES 3	Direct	60 x 60	3-60	.2	<1	4000	Vertical and Horizontal	24
Naval Ordnance Laboratory, White Oak, Md.								
NOL Type 1A	Reaction Single Eccentric	21 x 21	600-4500 cpm	.12	8	100	Vertical	27
1B	Reaction Single Eccentric	60 x 60	400-3000 cpm	.12	7	2000	Vertical	27
2C	Reaction Single Eccentric	33 x 40	400-3000 cpm	.08	5	500	Vertical	27

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

MECHANICAL VIBRATION TESTING EQUIPMENT—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE OF DRIVE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX DOUBLE AMPLITUDE (in)	ACCELERATION MAX AT CAPACITY (g)	RATED TABLE CAPACITY (lb)	DIRECTION OF VIBRATION	LOCATION
Naval Ordnance Laboratory (Continued)								
NOL Type 5A	Reaction Mercury	15 x 15	400-4200 cpm	.4	12	60	Vertical	27
HCV	Reaction Mercury	72 x 60	300-4800 cpm	.18	6	6000	Vertical	27
CTV	Reaction Mercury	32 x 40	600-4800 cpm	.3	5.5	2000	Vertical	27
Naval Ordnance Plant Indianapolis, Ind.								
Package Shaker	Eccentric Direct	60 x 60	125-375 rpm	1		1250	Vertical	28
Naval Research Laboratory, Washington, D. C.								
Vibration Machines	Reaction	60 x 60	5-35	.06	3	1000	Vertical or Horizontal	31
	Direct	72 x 72	0-35	0.375	10		Vertical, Horizontal, Pitch or Roll	31
	Direct	6 Diam.	10-60	0.20	10	10	Horizontal	15
Portsmouth Naval Shipyard, Portsmouth, N. H.								
Mechanical Vibration Machine	Direct		1-30	.25		100	Horizontal	33
Parker Appliance Co. Cleveland, Ohio		48 x 48	0-2000	.128			Circular	44
Paul Henry Company Los Angeles, Calif.								
Model 10		6 x 10	5-90	.5	20	10	Vertical	44

Redstone Arsenal, Huntsville, Alabama								
Vibration Table (Under Development)		Approx. 50 x 10'	1-1/2-45	1		30,000	Vertical	36
Sperry, Model MIT	Direct	3 Diam.	3-90 Linear 6-180 Torsional	1 (Linear) 3.5° Torsional	10 (Linear)	3 (Linear)	Vertical and Horizontal or Torsional	6. 34. 44
	Direct	4 Diam.			12.5 (Linear)	6 (Linear)	Vertical and Horizontal or Torsional	
Universal Vibrator Racine, Wis.	Direct	8 x 8	30	.125				11
Vibration Speciality Philadelphia, Pa.								
Vertical Model	Direct	24 x 36	5-50	.25	10	100	Vertical	18
Horizontal Model	Direct	24 x 36	5-50	.25	10	100	Horizontal	
Three Directional Models	Direct	12 x 24	5-60	.125	10	50	Tri-directional	1[illegible] 25
	Direct	12 x 24	5-60	.125	10	100	Tri-directional	15. 25
	Direct	26 x 15	0-38	.8	8	150	Tri-directional	29
	Direct	15 x 15	0-45	.8	12	25	Tri-directional	2[illegible]
Vibration Speciality and Amthor Brooklyn, N. Y.	Direct		0-55	.065	10	25	Circular at 45°	17
Walter A. Johnson								
Model 4VB	Direct	18 x 24	10-55	.0625	10	150	Vertical	44
VMJ-2HB	Direct	18 x 18-1/2	10-60	.0625	12	150	Horizontal	6
Type O Ser. 6	Direct	18 x 18-1/2	12-50	.062	16	100	Horizontal	14
Waugh Johnson Vibration Testing Machines								
VMJ-2H Type B	Direct	18 x 18-1/2	10-60	.125	12	150	Horizontal	8. 13. 24. 26 32. 44
2H Type C	Direct	18 x 18-1/2	16-100	.125	32	100	Horizontal	17. 23. 28. 31 44
4V Type B	Direct	18 x 24	10-60	.125	12.6	100	Vertical	13. 15. 18. 23 24. 26. 28. 31 32. 44
3C	Direct	24 x 24	5-60	.062	12	35	Circular Translatory Motion	17. 23. 26
3D	Direct	24 x 24	7-60	.062	12	100	Circular Translatory Motion	
Waugh Laboratories New York, N. Y.								
45° Vibration Machine	Direct	18 x 18	5-60	.25	10	25	45° Angle	25

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

MECHANICAL VIBRATION TESTING EQUIPMENT—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE OF DRIVE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX DOUBLE AMPLITUDE (in)	ACCELERATION MAX AT CAPACITY (g)	RATED TABLE CAPACITY (lb)	DIRECTION OF VIBRATION	LOCATION
Western Electric Co. New York, N. Y.								
100 lb Model	Direct	30 x 30	10-60	.5	10	100	Vertical, Horizontal or Circular	
500 lb Model	Direct	48 x 48	5-60 (Manual or Auto Cycle)	.260	10	500	Vertical, Horizontal or Circular	23. 31. 32. 44
Pitch and Roll Machine								23
Western Gear Corp. Lynwood, Calif.								
Vibration Machine		40 x 40	1-32	.9	4	1000	Vertical and Horizontal	44
Wright Air Development Center, Dayton, Ohio								
WADC Vibration Machines		74 x 102	700-2600 cpm	.032	3	2000	Primarily Vertical	44
		144 x 216	10-16			20,000	Rocking	44
		6 x 6	0-24		10	5	Vertical	44

MECHANICAL VIBRATION TESTING EQUIPMENT—VIBRATION GENERATORS

MANUFACTURER AND/OR DESIGNER OF MODEL	DRIVE	ALTERNATING FORCE (lb)	FREQUENCY RANGE (cpm)	WEIGHT	UNBALANCE (lb)	LOCATION
Baldwin Locomotive Works, Eddystone, Pa.						
Lazan LA1	Reaction	1600 ±4000 in-lb	3400	160		1. 4. 6. 14 30. 36
Waugh Bernhard OS 1	Reaction	1000 (rated) 4000 (max)	600 (rated) 1200 (max)	308		6
David Taylor Model Basin, Carderock, Md.						
5000 lb Vibration Generator	Reaction	5000 lb-ft (Rated) 9375 lb-ft (Rated) 20,000 lb-ft (Max for Short Periods) 37,500 lb-ft (Max for Short Periods)	1500	5600		6
DTMB Midget Vibration Generator	Reaction	25 Rated 100 Max for Short Periods	200-9400	12		6
DTMB 3 Mass 5000 lb	Reaction 3-mass	5000	100-2000			6
3 Mass 40,000 lb	Reaction 3-mass	40,000				6
Losenhausen Werke, Germany						
440 lb Vibration Generator	Reaction	440 (rated) 2000 (max)	300-3000	140		6
44,000 lb Vibration Generator	Reaction	44,000	54-480	4900		6
Wright Air Development Center, Dayton, Ohio						
Type A	Remote Mechanical Drive		3-60	34.3	.065	44
B	Remote Mechanical Drive		3-40	62.5	.367	44
C	Remote Mechanical Drive		3-25	56	.885	44
D	Remote Mechanical Drive		3-60	17.2	.037	44
E	Remote Mechanical Drive		3-50	108	.420	44
F	Remote Mechanical Drive		3-30	302	3.280	44
G	Remote Mechanical Drive		3-65	170	.375	44
H	Remote Mechanical Drive		3-60	275	.750	44
I	Remote Mechanical Drive		3-40	222	1.250	44
J	Remote Mechanical Drive		3-40	358	2	44
K	Remote Mechanical Drive		3-40	531	3	44
L	Remote Mechanical Drive		3-50	48	.187	44
M	Remote Mechanical Drive		3-50	256	1	44
N	Remote Mechanical Drive		3-25	646	10	44
O	Remote Mechanical Drive		3-20	556	16	44

Items mount on Aircraft Structures.

ELECTRODYNAMIC VIBRATION TESTING EQUIPMENT—VIBRATION EXCITERS

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE OF DRIVE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX DOUBLE AMPLITUDE (lb)	MAX ACCEL. NO LOAD (g)	RATED FORCE OUTPUT (lb)	WT. OF MOVING COMPONENTS (lb)	LOCATION
Boston Naval Shipyard Boston, Mass.								
Portable Vibration Exciter		2 x 2	20-15,000			2		4
Calidyne Company, Winchester, Mass.								
1	Osc. Amplifier	2-1/4	1/2-2000	.5	20	15	.72	4. 7. 15
6	Osc. Amplifier	Stud.	1/2-2000	.5	35	25	.66	6. 36. 44
6C	Osc. Amplifier	2	2-2000	1.	38	25	.67	7. 8. 26. 36. 40. 43. 44
6CT	Osc. Amplifier	2-1/4	2-500	1.	35	50	1.0	44
6T	Osc. Amplifier	1	2-700	1.		50	1.0	44
41	Var. Speed Alt.	9	1-500	1.		450	8.25	44
44	Var. Speed Alt.	9	5-2000	1.	54	600	11.2	8. 15. 20. 26. 29. 40. 44
44B	Osc. Amplifier	9	8-1500	1.	54	600	11.2	16
46C	Osc. Amplifier	2	50-5000			25		40
48	Var. Speed Alt.	19-1/2	5-500	1.	38	2500	65.5	20. 29. 40. 43
48A	Var. Speed Alt.	17-1/2	5-2000	.5	38	2500	65.5	43
48B	Var. Speed Alt.					3500		
49A	Osc. Amplifier	2-1/4	10-3000	.75		25	.75	15
5[illegible]	Osc. Amplifier	3	8-500	1.	25	72	2.5	16
51-81-82	Complex Wave	12-1/2	5-5000	.25	55	1250	22.5	43
58	Var. Speed Alt.	12-5/8	5-2000	.75	55	1250	22.5	11. 20. 28. 29
82	Var. Speed Alt.	24	5-2000	.5	42	12,500	348.	44
A88	Osc. Amplifier	4	5-3000	1.	37.3	100	2.68	
B88				3.		100		
David Taylor Model Basin Carderock, Md.								
Electrodynamic Vib. Generator Mk 1	Var. Speed Alt.		20-200	.5	100	150		6
Massa Model M-137	Piezoelectric	3-3/4	0-8000	.0005		.7		4
MB Manufacturing Company Inc., New Haven, Conn.								
B1 Calibrator	Osc. Amplifier	3	0-3000					29
SA	Osc. Amplifier	2	5-2000	.5	12	5	.5	40. 44
SD	Osc. Amplifier	Stud.	20-500	.5		10	.6	24. 37

MB Manufacturing Company, Inc. (Continued)								
C31	Osc. Amplifier	1-7/8	5-1000	.5		25	.6	11. 15. 16. 17. 20. 22 28. 44
C31-1, S31-1	Osc. Amplifier	1-7/8	5-1000	1.		25	.6	24. 40. 44
C1, S1	Osc. Amplifier	1-7/8	5-1000	.5	30	50	1.6, 1.8	1. 6. 8. 9. 11. 14. 17. 18 20. 23. 30. 32. 33. 42 43. 44
C11	Osc. Amplifier	3.	5-1000	.5		50	2.20	1. 5. 8. 12. 13. 16. 20 23. 24. 25. 29. 36. 37. 11. 44
C7	Osc. Amplifier	Special Tube Carriage	200-10,000	.025		1.20	.11	8. 44
C8	Osc. Amplifier	1	200-10,000	.025		1.20	.11	20. 44
C5	Var. Speed Alt. or Electronic Power Supply	8	2-500	1		250	11.5	3. 17. 19. 26. 36. 44
C5H	Var. Speed Alt. or Electronic Power Supply	8	2-2000	1		600	22.5	8. 11. 17. 22. 23. 31. 36 40. 43. 44
C25	Var. Speed Alt. or Electronic Power Supply	20	2-500	.5		3500	70	1. 5. 8. 11. 17. 18. 23 25. 36. 40. 43. 44
C25H	Var. Speed Alt. or Electronic Power Supply	16	2-2000	.5	35	9500	92	8. 11. 17. 28. 29. 36. 40 44
C100	Var. Speed Alt.	27	2-2000	.5		12,500	275	43
S3(C3)	Osc. Amplifier	9	3-500	1		200		1. 13. 18. 17. 37. 40. 44
C6, S6	Var. Speed Alt.	3.6	5-5000	1	57	200	3.0	3. 44
C2	Osc. Amplifier	1-7/8	5-500	.5	60	100	1.6	12
C10	Osc. Amplifier		5-10,000	1		1000		6
	NOTE: Rated output depends on methods of cooling and power sources. Actual outputs may be more or less than those given. For oil cooling this difference can be considerable.							
MB and Consolidated Calibrator		Stud.	60	.01	2	1	.2	44
MB Pratt and Whitney (Whirl) Accessory Vibrator	Var. Speed Alt.	24	5-250 8-400	.030		2000		17 44
Naval Research Laboratory Washington, D. C. Vibrating Bars	For description see "Accelerometer Calibration Technique" by Tyzzer and Hardy, Journal of the Acoustical Society of America, July 1950, Vol. 22, p. 454.							31
National Bureau of Standards, Washington, D. C. NBS Calibration Shaker	Osc. Amplifier	3-1/2-4	20-10,000	.005-.25	6.5-80			16
	This equipment has interchangeable armatures for various frequency ranges, thus giving different characteristics for calibration work.							

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

ELECTRODYNAMIC VIBRATION TESTING EQUIPMENT—VIBRATION EXCITERS—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE OF DRIVE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX DOUBLE AMPLITUDE (lb)	MAX ACCEL. NO LOAD (g)	RATED FORCE OUTPUT (lb)	WT. OF MOVING COMPONENTS (lb)	LOCATION
National Bureau of Standards (Continued)								
Barium Titanate Shakers	Osc. Amplifier	3/4-6	1000-40,000	10^{-5}	2-50			8. 16
	Several different equipments made at National Bureau of Standards.							
Racon Electric Corp.		1	30-10,000	0.250	10	30	.5	15
Rollin Company Los Angeles, Calif.								
Model 358			2-500	1-1/2	25	75	1.75	3. 20
35			2-500	.5		150	2.0	3. 20. 44
Westinghouse Corporation Pittsburgh, Pa.								
Model H1	Osc. Amplifier	Stud.	20-10,000	.0625	50	300		1. 17. 24. 27. 31. 44
GS	Osc. Amplifier	Stud.	20-1600	.125	250	26		13. 24. 31. 44

CENTRIFUGES

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	TABLE SIZE (in)	ACCELERATION RANGE (g)	TABLE CAPACITY (lb)	ROTATION FREQUENCY (rpm)	MAX. SIZE OF TEST LOAD (in)	MAX. ACCEL. AT TABLE CAPACITY (g)	LOCATION
Eastman Kodak	Spinner	3" Diam.	-25,000		30,000			27, 40
Genisco Model A* B*	24" Horizontal Arm 24" Horizontal Arm	8 x 8 8 x 8	.013-75 .013-120	25 45	340 420	8 cube 8 cube	48	43 43, 44
Hathaway Instrument Co.	Flat Table	50 Diam.	0-12	4 specimens, each of 15 lb.	300	12 cube	12	44
International Equipment Company No. 2	15" Diameter Table	1.5 Diam.	0-1000		3000			40
Morgan Smith Company Human Centrifuge Rotating Tables	20 ft Radius Arm 15' Diameter 12' Diameter	72 x 36 180 144	0-20 0-38	1000 2000 ** 6000 ** 1000 14,000 **	60 175 135	72 x 96 x 72 200 x 100 x 72	20 15 at 14,000 lbs.	44 25 44
National Bureau of Standards Boulder, Colo.	84" Radius Arms, Engine Drive		5	100				5
Naval Air Missile Test Center, Pt. Mugu, Calif. 10 foot	Duplex Pneumatic or Hydraulic		0-80	50			35	20
15 foot	Duplex Pneumatic or Hydraulic		0-200	100			100	20
Naval Ordnance Laboratory Corona, Calif. Rotary Accelerator A	19" to 24" Radius of Gyration			10			120	26
Rotary Accelerator B	8" Max. Radius of Gyration			1			500	26

*Has Optical Viewing System.
**Unbalanced and Balanced Loads.

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

CENTRIFUGES—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	TABLE SIZE (in)	ACCELERATION RANGE (g)	TABLE CAPACITY (lb)	ROTATION FREQUENCY (rpm)	MAX. SIZE OF TEST LOAD (in)	MAX. ACCEL. AT TABLE CAPACITY (g)	LOCATION
Naval Ordnance Laboratory White Oak, Md. Rotary Accelerator	9 ft Arm	12 Diam.	0-550	8	600 (max)	5 x 12 x 12		27
	20 ft Arm	29 Diam.	0-75	100	149	29 x 29 x 29		27
Naval Proving Ground, Dahlgren, Virginia	8 ft Diam. Rotating Table			600			30	30
Naval Research Laboratory, Washington, D. C. Whirling Arms At Chesapeake Bay Annex (Pulse Jet Resea. ch)	Radius 12.4-17.4 ft Power Driven			50	400 (at 50 lbs)			31
(Aerodynamic Instrumentation and Test)	Radius 25-50 ft Power Driven	Items are bolted to end of arms	0-1200	25 ft 10 lb 50 ft 3/4 lb	0-400			31
James Saunders Company Special Model	5-1/4" Radius Balanced Whirling Arm	26 x 26	0-100	{20 at 100g 100 at 20g}	0-250	26 x 26 x 18	100g 20 lbs 20g 100 lbs	44
Schaevitz Engineering Company Model M6	Dual Whirling Arm	3 x 3	0-500	1/2	0-2400	3 x 3 x 3	500	1, 44
Rotary Accelerator		24 Diam.	550	10	3-1250			29
Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey Wing Type Centrifuge	12 ft Diam.		0-2800		1150	2 Diam.		40
Rotor Type Spinner			0-2600		10,000	2 Diam.		40
Spinco Centrifuge Belmont, Calif. for Vacuum Tubes			90,000			6 subminiature tubes		8

Statham Development Co. Los Angeles, Calif. Rotary Accelerator	16" Dural Disc		.1-100 at 5" radius	1 to 1000 rpm, 5 to 200 rpm	0-1000	6 x 5 x 5		1, 26, 44
United Aircraft Products, Inc. Dayton, Ohio Special Model	8 ft Diam.	96 Diam.	0-56	200	0-200	48 x 48 x 48	56	44

MATERIAL TESTING EQUIPMENT

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX. DOUBLE AMPLITUDE (in)	FORCE OUTPUT (ft lbs)	MAX. SPECIMEN WEIGHT (lbs)	DIRECTION OF MOTION	LOCATION
Avery Fatigue Tester	Max. Static load 20 tons. Max. Superimposed load amplitude 20 ton.						Bending - compression or flexure	5
Baldwin Locomotive Works Sonntag Impact Tester	Charpy, Pendulum				240		Bending or Tension	25, 42
Universal Fatigue Testing Machine, S.F.U.								44
Detroit Arsenal Impact Tester TUTS-1000	20 ft Free Fall	80 Diam.				24,000	Vertical Arc 10' radius	7
Fast Fracture	Free Fall 0-9 ft	5 Span				25		7
Impact Tester	Charpy 5' 1" Free Fall	1.575 Span				3/32	Horizontal Arc	7
Plastics Impact Tester	28" Free Fall	5 Span				1/32	Vertical Arc	7
Fatigue Tester Model DETAR TOBF-2000	Direct Drive chuck (cam)		1/10-1	45°		300	Torsional	7
General Motors Hi-Cycle HCC-1	Direct Drive	1" Diam. Shaft	6-360	1°-20°			Torsional	6
Mouton Impact Tester	Charpy Pendulum				217		Bending or Tension	42
Impact Tester	Charpy Pendulum				2,200		Bending or Tension	42
T. Olsen Impact Tester	Izod & Charpy Swinging Hammer	.394 x .394 x 2.160			264		Horizontal	25, 31, 42

LIST TWO—EQUIPMENT TYPES AND PERFORMANCE—Continued

MANUFACTURER AND/OR DESIGNER AND MODEL	TYPE	TABLE SIZE (in)	FREQUENCY RANGE (cps)	MAX. DOUBLE AMPLITUDE (in)	FORCE OUTPUT (ft lbs)	MAX. SPECIMEN WEIGHT (lbs)	DIRECTION OF MOTION	LOCATION
MATERIAL TESTING EQUIPMENT—Continued								
O. S. Peters								
Impact Tester	Charpy, Pendulum				16		Bending or Tension	42
Fatigue Testing Machine			10,000 rpm					31
Riehle								
Impact Tester	Charpy, Pendulum				240		Bending or Tension	17, 42
Schenk (German Eqt.)								
Fatigue Tester			2200 cpm	.47			Horizontal	44
" "			3600 cpm	.22			"	44
" "			2800 cpm	.4			"	44
" "			2400 cpm	.43			"	44
" "			2000 cpm	.55			"	44
" "			2200 cpm	.47			"	44
Watertown Arsenal								
Watertown, Mass.								
Impact Tester	Charpy, Drop Weight				2,500		Bending	42
Wright Air Development Center, Dayton, Ohio								
Fatigue Tester								
R.R. Moore-Baldwin	Rotating beam		3600 cpm					44
Fatigue Tester			0-10,000 cpm					44