

# Third Pacific Area Meeting Papers

*Symposium on*

## FATIGUE OF AIRCRAFT STRUCTURES



Published by the  
AMERICAN SOCIETY FOR TESTING MATERIALS  
1916 Race St., Philadelphia 3, Pa.

*ASTM Special Technical Publication No. 274*

# SYMPOSIUM ON FATIGUE OF AIRCRAFT STRUCTURES

---

Presented at the  
THIRD PACIFIC AREA NATIONAL MEETING  
AMERICAN SOCIETY FOR TESTING MATERIALS  
San Francisco, Calif., October 14-15, 1959



Reg. U.S. Pat. Off.

---

*ASTM Special Technical Publication No. 274*

---

Price \$4.00; to Members \$3.20

Published by the  
AMERICAN SOCIETY FOR TESTING MATERIALS  
1916 Race St., Philadelphia 3, Pa.

---

©BY AMERICAN SOCIETY FOR TESTING MATERIALS 1960  
Library of Congress Catalog Card Number: 60-12252

---

Printed in Baltimore, Md.  
June, 1960

## CONTENTS

---

|   | PAGE |
|---|------|
| Introduction—H. F. Hardrath.....  | 1    |
| Quantitative and Systematic Attack on Fatigue—E. T. Haire.....  | 3    |
| Discussion.....   | 28   |
| Development of Fatigue Loading Spectra for Testing Aircraft Components and Structures—A. J. McCulloch.....            | 30   |
| A Method for Sonic Fatigue Testing—R. H. Vreeland.....  | 58   |
| Discussion.....   | 64   |
| Low-Cycle Fatigue Strength of Pressurized Components—J. Padlog and I. Rattinger.....                                  | 65   |
| Discussion.....   | 77   |
| Development Fatigue Testing of a Large Helicopter Rotor Blade—A. A. Lischer..   | 79   |
| Discussion.....   | 98   |
| Production Methods of Cold Working Joints Subjected to Fretting for Improvement of Fatigue Strength—K. T. Waters..... | 99   |
| A Method for Predicting the Rate of Fatigue-Crack Propagation—A. J. McEvily, Jr., and W. Illg.....                    | 112  |
| An Observation Concerning the Cycle Ratio in Cumulative Damage—H. J. Grover..   | 120  |
| Variable-Amplitude Fatigue Tests of Aluminum-Alloy Specimens—H. F. Hardrath and E. C. Naumann.....                    | 125  |
| Discussion.....   | 138  |

---

NOTE.—The Society is not responsible, as a body, for the statements  
and opinions advanced in this publication.

---

## FOREWORD

---

The papers in this Symposium on Fatigue of Aircraft Structures were presented during three sessions held on October 14 and October 15, 1959, at the Third Pacific Area National Meeting of the Society, San Francisco, Calif. The symposium was sponsored by Subcommittee V on Aircraft Structural Fatigue Problems of ASTM Committee E-9 on Fatigue.

At the first session, R. E. Peterson, Westinghouse Electric Corp., was presiding officer and Symposium Chairman H. F. Hardrath, National Advisory Committee for Aeronautics, acted as technical chairman; at the second session H. D. Moran, Aerospace Industries Association of America, was presiding officer and F. M. Howell, Aluminum Company of America, was technical chairman; and at the third session F. T. Wood, Jr., Douglas Aircraft Co., was presiding officer and C. R. Smith, Convair, was technical chairman.



3 9151 00048796 3

ERIALS.\*SYM.ON

042 40 46 48 49 50 51 53 54

PLEASE  
DO NOT REMOVE  
THIS CARD  
EXCEPT TO RECORD LOAN

MARTIN

629.1341  
A512sf

DATE DUE

JAN 4 1962

JAN 1 1 1963

JAN 7 1964

MAR 29 1962

MAR 6 1969

JAN 18 1994

DEC 04 1996

MAY 30 2001

**T**HIS PUBLICATION is one of many issued by the American Society for Testing Materials in connection with its work of promoting knowledge of the properties of materials and developing standard specifications and tests for materials. Much of the data result from the voluntary contributions of many of the country's leading technical authorities from industry, scientific agencies, and government.

Over the years the Society has published many technical symposiums, reports, and special books. These may consist of a series of technical papers, reports by the ASTM technical committees, or compilations of data developed in special Society groups with many organizations cooperating. A list of ASTM publications and information on the work of the Society will be furnished on request.



