AD-748 100

FATIGUE AND FRACTURE OF AIRCRAFT STRUCTURES AND MATERIALS

A DDC BIBLIOGRAPHY

DDC-TAS-72-51

SEPTEMBER 1972

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DEFENSE DOCUMENTATION CENTER
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UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author)

DEFENSE DOCUMENTATION CENTER
Cameron Station
Alexandria, Virginia 22314

2a. REPORT SECURITY CLASSIFICATION: Unclassified

2b. GROUP:

3 REPORT TITLE

FATIGUE AND FRACTURE OF AIRCRAFT STRUCTURES AND MATERIALS

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Bibliography (December 1956 - February 1972)

5 AUTHOR(S) (First name, middle initial, last name)

6 REPORT DATE	7a. TOTAL NO OF PAGES	7b. NO. OF REFS
September 1972	292	205

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO	DDC-TAS-72-51
c	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d.	AD-748 100

10 DISTRIBUTION STATEMENT

Approved for public release; distribution unlimited.

11 SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
Supersedes AD-866 900	

13 ABSTRACT

This bibliography is a selection of unclassified references on Fatigue and Fracture of Aircraft Structures and Materials.

References are sequenced numerically within each of the following categories: I. General and Miscellaneous Reports, II. Instrumentation, III. Sonic Fatigue, IV. Materials, V. Airplane Panels, VI. Wings, VII. Fuselages, VIII. Landing Gear and IX. Mechanical Fasteners.

Corporate Author-Monitoring Agency, Subject, Title, Report Number and AD Number Indexes are included.

1A

DD FORM 1 NOV 68 1473

UNCLASSIFIED

Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
*Airframes						
*Bibliographies						
*Fatigue(Mechanics)						
*Fracture(Mechanics)						
Materials						
Sonic Fatigue						
Cracks						
Crack Propagation						
Aluminum Alloys						
Titanium Alloys						
Steel						
Composite Materials						
Mechanical Fasteners						
Instrumentation						
Non-Destructive Testing						
Corrosion						
Hydrogen Embrittlement						
Airplane Panels						
Loading(Mechanics)						
Metal Coatings						
Structural Parts						
Structural Properties						
Wings						
Fuselages						
Landing Gear						
Aircraft						

AD-748 100

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A DDC BIBLIOGRAPHY

DDC-TAS-72-51

December 1956 - February 1972

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F O R E W O R D

This bibliography is a compilation of references on *Fatigue and Fracture of Aircraft Structures and Materials.*

References are sequenced numerically within each of the following categories: I. General and Miscellaneous Reports, II. Instrumentation, III. Sonic Fatigue, IV. Materials, V. Airplane Panels, VI. Wings, VII. Fuselages, VIII. Landing Gear and IX. Mechanical Fasteners.

Entries were selected from the Defense Documentation Center's collection covering the period January 1953 through May 1972. This volume is a revision and update of the unlimited references to the earlier bibliography, AD-866 900.

Corporate Author-Monitoring Agency, Subject, Title, Report Number and AD Number Indexes are included.

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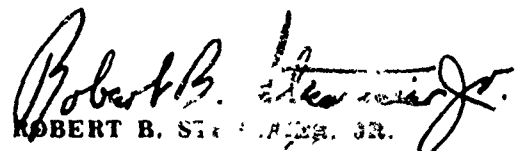

ROBERT B. STE[illegible], JR.
Administrator
Defense Documentation Center

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I.

GENERAL AND MISCELLANEOUS REPORTS

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-255 752
AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO FLIGHT CONTROL LAB

MANEUVER LOAD DATA FROM C-130 AIRCRAFT (U)

MAR 61 1V PHILLIPS,LAWRENCE;

UNCLASSIFIED REPORT

DESCRIPTORS: *TRANSPORT PLANES, DESIGN, FATIGUE (MECHANICS), FLIGHT TESTING, LOAD DISTRIBUTION, MANEUVERABILITY, STRUCTURES (U)
IDENTIFIERS: C-130 AIRCRAFT (U)

FLIGHT DYNAMICS LAB., WRIGHT AIR DEVELOPMENT DIV., WRIGHT-PATTERSON AIR FORCE BASE, OHIO. MANEUVER LOAD DATA FROM C-130 AIRCRAFT, BY LAWRENCE PHILLIPS. REPT. FOR STRUCTURAL DESIGN CRITERIA. MAR 61, 17P. INCL. ILLUS. TABLES. (PROJ. 1367) (WADD TN 61-44)UNCLASSIFIED REPORT DESCRIPTORS: MANEUVERABILITY, *TRANSPORT PLANES, FLIGHT TESTING, STRUCTURES, LOAD DISTRIBUTION, FATIGUE (MECHANICS), DESIGN. OPEN-ENDED TERMS: C-130. STRUCTURAL FLIGHT LOAD DATA ARE PRESENTED FROM C-130A AND B AIRCRAFT PERFORMING NORMAL OPERATIONS AND ANALYSES OF THE DATA. THIS INFORMATION IS INTENDED FOR USE IN DETERMINING DESIGN CRITERIA FOR FUTURE FLIGHT VEHICLES AND IN ESTIMATING THE EFFECT OF THESE MISSIONS ON A STRUCTURE OF THIS TYPE IN TERMS OF STRUCTURAL FATIGUE AND ESTIMATED LIFE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDHL1

AD-258 024
COLUMBIA UNIV NEW YORK

REDUCTION OF THE ENDURANCE LIMIT AS A RESULT OF STRESS INTERACTION IN FATIGUE (U)

FEB 61 22P HELLER,ROBERT A.;
CONTRACT: AF33 616 7042
PROJ: AF-7351
MONITOR: WADD TR-60-752

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT FOR 1 FEB-31 JUL 60 ON METALLIC MATERIALS.

DESCRIPTORS: *FATIGUE (MECHANICS), AIRCRAFT, AIRFRAMES, ALUMINUM ALLOYS, DESIGN, EQUATIONS, LOAD DISTRIBUTION, MATERIALS, MATHEMATICAL ANALYSIS, MECHANICAL PROPERTIES, PLASTICITY, STEEL, STRESSES, STRUCTURES, TEST EQUIPMENT, TESTS, THEORY (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-254 827
STANFORD UNIV CALIF APPLIED MATHEMATICS AND STATISTICS LABS

ON MODELS FOR THE PROBABILITY OF FATIGUE FAILURE OF A STRUCTURE (U)

APR 59 IV PARZEN,EMANUEL;
REPT. NO. TR45
CONTRACT: N60NR25140

UNCLASSIFIED REPORT

DESCRIPTORS: •FATIGUE (MECHANICS), •STRUCTURES, AIRFRAMES, DESIGN, MATERIALS, PROBABILITY, STATISTICAL ANALYSIS (U)

THE PAPER REPRESENTS AN ATTEMPT BY A PERSON TRAINED IN PROBABILITY THEORY TO SURVEY SOME OF THE PROBLEMS INVOLVED IN EVALUATING STRUCTURAL SAFETY. A REVIEW IS PRESENTED OF THE PROBABILISTIC CONSIDERATIONS INVOLVED IN EVALUATING THE STRENGTH OF MATERIALS, AND THE CONSTRUCTION OF SO CALLED S-N CURVES. A PROBABILISTIC MODEL FOR THE LIFE BEFORE FATIGUE FAILURE OF A STRUCTURE IS DEVELOPED. (AUTHOR) (U)

, C REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-264 140
OFFICE OF NAVAL RESEARCH WASHINGTON D C

SYMPOSIUM PROCEEDINGS STRUCTURAL DYNAMICS OF HIGH SPEED FLIGHT, LOS ANGELES, CALIFORNIA - APRIL 24, 25, 26, 1961. (U)

61 746P
REPT. NO. ONR-ACR-62-VOL-1

UNCLASSIFIED REPORT

DESCRIPTORS: *AERODYNAMIC CHARACTERISTICS ,*AIRPLANES , *DELTA WINGS ,*FLUTTER ,*GUIDED MISSILES ,*NOISE , *STRUCTURAL SHELLS ,*SYMPOSIA ,AERODYNAMIC HEATING , AIRCRAFT ,AIRFOILS ,AIRPLANE PANELS ,CONTROL SYSTEMS , DYNAMICS ,ELASTICITY ,FATIGUE(MECHANICS) ,HIGH-TEMPERATURE RESEARCH ,HYPERSONIC CHARACTERISTICS , INERTIAL GUIDANCE ,LIQUID ROCKET PROPELLANTS ,LOAD DISTRIBUTION ,MODEL TESTS ,PROPELLANT TANKS ,ROCKET MOTOR NOISE ,SATELLITES(ARTIFICIAL) ,SPACECRAFT , SUPERSONIC FLOW ,TESTS ,TRACKS(AERODYNAMICS) ,VIBRATION ,WIND TUNNEL MODELS ,WINGS (M)

CONTENTS: CONCEPTS FOR AEROELASTIC SYSTEM APPROXIMATIONS; STATIC AERODYNAMICS FOR FLUTTER ANALYSES; FLUTTER AT HIGH MACH NUMBERS; AN INDICIAL FLUTTER ANALYSIS FOR HYPERSONIC DELTA WINGS; A THEORY FOR AEROELASTIC STUDIES OF DELTA LIFTING SURFACES; FLUTTER OF FLAT PANELS IN A LOW SUPERSONIC FLOW; FLUTTER OF RECTANGULAR PANELS; MODEL FLIGHT TESTING ON HIGH-SPEED TRACKS; LIQUID BEHAVIOR IN ROCKET PROPELLANT TANKS; DYNAMICS OF LP VEHICLES; AERO-INERTIAL CONTROL SYSTEM; DYNAMIC LOADS OF MISSILE CONFIGURATIONS; WIND LOADS ON A VERTICALLY RISING VEHICLE; RANDOM GUST AND TAXI RESPONSE CALCULATIONS FOR DELTA WING AIRCRAFT; BLAST-LOADING ON AIRFOILS; STALL BUFFETING LOADS; A METHOD FOR ANALYZING HEATED WINGS; DEFORMATIONAL RESPONSE OF HEATED WING STRUCTURES; THERMAL STIFFNESS; ACOUSTIC FATIGUE TESTS FOR ELEVATED TEMPERATURES STRUCTURAL DESIGN; STRUCTURAL VIBRATION IN SPACE VEHICLES; STRUCTURAL RESPONSE IN NOISE INPUTS; CAPTIVE MISSILE RESPONSE TO RANDOM PRESSURES; STRUCTURAL RESPONSE TO THE NOISE INPUT OF THE SATURN ENGINES; THE ENVIRONMENTAL VIBRATION PROBLEM. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-265 795
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

AVIATION REVIEW (SELECTED ARTICLES) (U)

IV

UNCLASSIFIED REPORT

DESCRIPTORS: •COMMERCIAL PLANES, •TRANSPORT PLANES, AIRPLANES, DESIGN, ECONOMICS, FATIGUE (MECHANICS), HYDRAULIC SYSTEMS, TECHNOLOGICAL INTELLIGENCE, TRANSLATIONS, VIBRATION (U)
IDENTIFIERS: CZECHOSLOVAKIA, USSR (U)

CONTENTS: FATIGUE OF SUPPORTING STRUCTURES OF TRANSPORT AIRCRAFT BREAK IN PIPE LINE OF AN AIRCRAFT HYDRAULIC SYSTEM BY THE EFFECT OF VIBRATION THE AN-24 AIRCRAFT (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-270 123
LOCKHEED AIRCRAFT CORP BURBANK CALIF

INVESTIGATION OF THE REPRESENTATION OF AIRCRAFT SERVICE LOADINGS INFATIGUE TESTS (U)

JAN 62 305P MCCULLOCH,A.J.;MELCON,M.A.;

REPT. NO. TR61 435
CONTRACT: AF33 616 6575
MONITOR: ASD TR61 4 5

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRCRAFT, *FATIGUE (MECHANICS), *LOAD DISTRIBUTION, ANALYSIS, ARMY AIRCRAFT, EFFECTIVENESS, FLIGHT, GUST LOADS, LOADING, MANEUVERABILITY, RELIABILITY, STATISTICAL ANALYSIS, TEST METHODS, TESTS (U)

AN INVESTIGATION WAS CARRIED OUT OF THE EFFECTIVENESS IN FATIGUE TESTS OF PRACTICAL REPRESENTATIONS OF AIRCRAFT SERVICE LOADINGS. THE INVESTIGATION REQUIRED THE DEVELOPMENT OF TEST APPARATUS CAPABLE OF APPLYING TYPICAL RANDOM LOADING HISTORIES. USING THIS EQUIPMENT RANDOM GUST LOADINGS, MILITARY MANEUVER LOADINGS, GROUND LOADINGS, AND COMPOSITES OF FLIGHT AND GROUND LOADINGS WERE APPLIED. THE RESULTS OBTAINED WERE USED TO EVALUATE THE ADEQUACY OF ORDERED, CYCLIC LOADING REPRESENTATIONS OF THE RANDOM LOADINGS. THE EVALUATIONS INDICATE THAT SPECTRA OF CYCLIC LOADINGS BASED ON SIMPLE MEAN CROSSING PEAK COUNTS OF SERVICE LOADING RECORDS CAN BE DIRECTLY EMPLOYED IN TESTS IN WHICH THE MAXIMUM VALUES OF APPLIED STRESS ARE MODERATELY HIGH. IN TESTS WHERE LOWER PEAK STRESSES ARE GENERATED, THE TEST LIVES MAY PROVIDE AN UNCONSERVATIVE ESTIMATE OF SERVICE LIFE. THE RESULTS OBTAINED IN COMPOSITE LOADING TESTS INDICATE THAT THE CUMULATIVE EFFECT OF FLIGHT LOADINGS, GROUND LOADINGS, AND GROUND TO AIR TRANSITIONS IS NONLINEAR. HOWEVER, IN ONE SET OF TESTS REPRESENTING THE SERVICE CONDITIONS IN THE WING ROOT REGION OF CONVENTIONAL TRANSPORT AIRCRAFT, ADEQUATE SIMULATIONS OF THE EFFECT OF COMPOSITE RANDOM LOADINGS WERE OBTAINED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-287 546
NATIONAL BUREAU OF STANDARDS WASHINGTON D C

PROGRAMMED MANEUVER-SPECTRUM FATIGUE TESTS OF AIRCRAFT BEAM SPECIMENS (U)

MAY 62 IV MORDFIN,LEONARD;HALSEY,NIXON;
REPT. NO. 7472

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRFRAMES, *ALUMINUM ALLOYS, *BEAMS (ELECTROMAGNETIC), *BEAMS (STRUCTURAL), *FATIGUE (MECHANICS), AIRCRAFT, DEFORMATION, FAILURE (MECHANICS), LOADING, STRESSES, TEST EQUIPMENT, TEST METHODS (U)

THE BENDING FATIGUE PROPERTIES OF A GROUP OF 7075-T6 AL ALLOY BEAM SPECIMENS WERE FOUND TO BE SIMILAR TO THOSE OF TYPICAL AIRCRAFT STRUCTURES. TEST RESULTS WARRANT THE FOLLOWING CONCLUSIONS REGARDING THE CONSTANT-LOAD-AMPLITUDE FATIGUE PROPERTIES OF THE BEAM SPECIMENS. STATIC PRESTRESSING AT 100 PCT LIM LOAD IMPROVED THE FATIGUE LIFE OF THE SPECIMENS AT FATIGUE LOAD LEVELS OF 60 PCT LIM LOAD OR LESS, PROVIDED THAT THE PRELOAD WAS APPLIED IN THE SAME DIRECTION AS THE SUBSEQUENT FATIGUE LOADS. PERIODIC SINGLE OVERSTRESSING AT 100 PCT LIM LOAD AFFECTED THE FATIGUE PROPERTIES IN THE SAME WAY AS PRESTRESSING DID, ONLY MORE SO. PERIODIC REPEATED UNDERSTRESSING AT 25 PCT LIM LOAD PRODUCED NO SIGNIFICANT CHANGES IN THE FATIGUE LIFE UNDER FATIGUE LODS APPLIED IN THE SAME DIRECTION AS THE UNDERSTRESSING. THERE WERE INDICATIONS THAT POSITIVE LOAD LEVELS BELOW A CERTAIN CUTOFF POINT IN THE SPECTRUM DID NOT INTRODUCE SIGNIFICANT FATIGUE DAMAGE. THE SPECTRUM CUTOFF CONCEPT APPLIES ONLY TO POSITIVE LOAD LEVELS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-299 490
LIBRARY OF CONGRESS WASHINGTON D C AEROSPACE TECHNOLOGY DIV

FATIGUE STRENGTH IN AIRCRAFT BUILDING (STRUCTURES) (U)

DEC 62 IV LAPINSKI,ZDZISLAW;

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRFRAMES, FATIGUE (MECHANICS), LIFE EXPECTANCY, LOAD DISTRIBUTION, LOADING (MECHANICS), MATHEMATICAL ANALYSIS, STRESSES (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-403 365
CORNELL AERONAUTICAL LAB INC BUFFALO N Y

THE EFFECTS OF ATMOSPHERIC TURBULENCE UPON FLIGHT AT LOW ALTITUDE AND HIGH SPEED, (U)

OCT 61 IV BREUHAUS,W.O.;
REPT. NO. FDM325

UNCLASSIFIED REPORT

DESCRIPTORS: •JET FIGHTERS, •JET BOMBERS, LOW ALTITUDE, TURBULENCE, NAVAL AIRCRAFT, ATTACK BOMBERS, AERODYNAMIC CHARACTERISTICS, GUSTS, GUST LOADS, FATIGUE (MECHANICS), TERRAIN AVOIDANCE, TRANSONIC CHARACTERISTICS. (U)
IDENTIFIERS: A-6 AIRCRAFT, GUST ALLEVIATION. (U)

CONTENTS: AIRCRAFT PERFORMANCE REQUIREMENTS FOR LOW ALTITUDE FLIGHT THE RESPONSE OF AN AIRCRAFT TO ATMOSPHERIC TURBULENCE PROBABILITY OF ENCOUNTERING TURBULENCE AT LOW ALTITUDES VARIATION OF TURBULENCE EXPECTANCY EFFECT OF TURBULENCE-INDUCED MOTIONS UPON THE CREW SYNTHESIS OF PRECEDING SECTIONS GUST ALLEVIATION AND LOAD ALLEVIATION STRUCTURAL FATIGUE (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-403 508
OHIO STATE UNIV COLUMBUS

ASPECTS OF RELIABILITY UNDER CONDITIONS OF ELEVATED TEMPERATURE CREEP AND FATIGUE. (U)

DESCRIPTIVE NOTE: SUMMARY REPT. 1 FEB-1 OCT 62, MAR 63 39P FREUDENTHAL,A.M.;
CONTRACT: AF33 616 6288
PROJ: /351
TASK: 735106
MONITOR: ASD TDR63 267

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON METALLIC MATERIALS.

DESCRIPTORS: *AIRFRAMES, GUIDED MISSILES, STRUCTURES, RELIABILITY, AVIATION SAFETY, SAFETY, MATHEMATICAL PREDICTION, EQUATIONS, DYNAMICS, LOADING (MECHANICS), AERODYNAMIC LOADING, LIFE EXPECTANCY, AEROELASTICITY, AEROTHERMOELASTICITY, CREEP, FATIGUE (MECHANICS), SUPERSONIC FLIGHT, SUPERSONIC PLANES. (U)

THE SOLUTION OF THE PROBLEM OF ATTAINING ADEQUATE SAFETY AND RELIABILITY IN SUPERSONIC AIRCRAFT STRUCTURES OPERATING UNDER CONDITIONS UNDER WHICH THE DAMAGING EFFECTS OF CYCLE SENSITIVITY (FATIGUE) AND TIME-SENSITIVITY (CREEP) OF THE STRUCTURAL MATERIAL COMBINE IN GRADUALLY REDUCING THE RESISTANCE OF THE STRUCTURE REQUIRES THE DEVELOPMENT OF SIMPLIFIED PROCEDURES FOR THE EVALUATION OF THE COMBINED DAMAGE ACCUMULATION, WHICH EMBODY BOTH THE PHYSICAL AND PROBABILISTIC ASPECTS OF DESIGN. THE PRESENT REPORT ATTEMPTS TO DEVELOP THE BASIS FOR AN APPROACH TO THE SOLUTION OF THIS PROBLEM, FOR WHICH NO ADEQUATE EXPERIMENTAL INFORMATION EXISTS AT PRESENT. ONE OF ITS PURPOSES IS TO PROVIDE THE GUIDELINES FOR THE PLANNING OF TESTS AND EXPERIMENTS, THE RESULTS OF WHICH WOULD BE RELEVANT FOR STRUCTURAL DESIGN. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-416 640
RAND CORP SANTA MONICA CALIF

REVIEW AND ANALYSIS OF CUMULATIVE-FATIQUE-DAMAGE THEORIES. (U)

AUG 63 82P KAECHELE,LLOYD ;
REPT. NO. MEMO. RM3650PR
CONTRACT: AF49 638 700

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRCRAFT, *FATIQUE(MECHANICS), STRUCTURAL PARTS, AIRFRAMES, DESIGN, STRESSES, ANALYSIS, MATHEMATICAL ANALYSIS, THEORY (U)
IDENTIFIERS: 1963, MINER'S THEORY, VALLURI'S THEORY, GROVER'S THEORY, CORTEN-LOOLAN THEORY, FRUEDENTHAL-HELLER THEORY, STANLEY'S THEORY. (U)

THIS MEMORANDUM CONTAINS THE RESU A STUDY OF CUMULATIVE FATIGUE DAMAGE. IT SHOWS THAT THERE ARE CERTAIN KEY ASSUMPTIONS WHICH CAN BE IDENTI FIED IN CURRENT THEORIES. THESE ASSUMPTIONS DETERMINE GENERAL TRENDS IN THE STRUCTURAL WEIGHT REQUIRED TO PROVIDE A SATISFACTORY FATIGUE LIFE WHEN A PARTICULAR THEORY IS USED FOR FATIGUE-PREVENTIVE DESIGN OF A FLIGHT STRUCTURE. THE KEY ASSUITTIONS HAVE TO DO WITH THE WAY FATIGUE DAMAGE IS ASSUMED TO OCCUR AT DIFFERENT STRESS AMPLITUDES WHEN THEY ARE APPLIED ALONE AND WHEN THEY ARE MIXED WITH OTHER STRESS AMPLI TUDES (AS IS THE CASE IN AIRCRAFT).
(AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-416 784
NORTHROP AIRCRAFT INC HAWTHORNE CALIF

INVESTIGATION OF A METHOD FOR THE PREDICTION OF VIBRATORY RESPONSE AND STRESS IN TYPICAL FLIGHT VEHICLE STRUCTURE. (U)

AUG 63 309P WHITE,R.W.;ELDRED,K.E.; ROBERTS,W.H.;

CONTRACT: AF 33(616)-8219
PROJ: 1370
TASK: 137009
MONITOR: ASD TDR62 801

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, VIBRATION), STRUCTURES, STRESSES,TTEST METHODS, TEST FACILITIES, MODELS (SIMULATION), DESIGN, CONSTRUCTION, MODEL TESTS, SONIC FATIGUE, FAILURE (MECHANICS), SCALE, RELIABILITY. (U)
IDENTIFIERS: 1963, SNARK. (U)

THE PREDICTION OF THE VIBRATORY RESPONSE OF A COMPLEX STRUCTURE SUCH AS AN AIRCRAFT FUSELAGE OR MISSILE TO A RANDOM EXTERNAL FORCING FUNCTION WAS THE PRIMARY TASK OF THIS PROJECT. PREVIOUS ATTACKS ON THE PROBLEM HAVE SHOWN IT IS NOT POSLBBLE TO ESTIMATE VIBRATORY RESPONSE WITH USEABLE ACCURACIES. LOCAL AND REMOTE ACCEPTANCE, TRANSMISSION THROUGH STRUCTURE AND TO SUBSTRUC TURE, WHICH ARE ALL THREE DIMENSIONAL PHENOMENA, AND RANDOMNESS ARE A FEW OF THE COMPLEXITIES IN VOLVED. THE TIMELINESS AND IMPORTANCE OFF THE STUDY IS DUE TO ITS CONCERN WITH STRUCTURAL IN TEGRITY AND RELIABILITY. THE VARIOUS NEEDS FOR BETTER HANDLING OF NEW PHENOMENA IN STRUCTURAL DYNAMICS ARE GIVEN. PREVIOUS STUDIES HAVE INDI CATED THAT PRIORITY SHOULD GO TO EXPERIMENTAL STUDIES, IN PARTICULAR THE DYNAMICALLY SIMILAR STRUCTURAL MODEL. THE CONCEPT IS PRESENTED ALONG WITH A DEMONSTRATION WHICH INCLUDES DESIGN, CONSTRUCTION, AND TEST OF SUCH A MODEL. THE EXPERIMENTAL TOOL UNDER STUDY WILL PROVIDE A RELIABILITY-BY-DESIGN APPROACH WHICH SHORTENS THE DESIGN PERIOD BY PROVIDING DESIGN INPUTS EARLY IN THE DEVELOPMENT OF A NEW SYSTEM. THE MODELS WILL BE ESPECIALLY USEFUL IN SPACE BOOSTER PROJECTS WHERE DIFFERENT PAYLOADS ARE SUBSTITUTED. SUB STUDIES IN SUPPORT OF MODELING WERE CONDUCTED. IMPROVED MODEL LAWS AND CONSTRUCTION TECHNIQUES WERE DEVELOPED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-431 826
AERONAUTICAL RESEARCH INST OF SWEDEN STOCKHOLM

ANALYSIS OF THE PROBABILITY OF COLLAPSE OF A FAILSAFE AIRCRAFT STRUCTURE CONSISTING OF PARALLEL ELEMENTS. (U)

DESCRIPTIVE NOTE: FINAL REPT.
FEB 64 59P
REPT. NO. HU-961
CONTRACT: AF61 052 573
PROJ: AF-1467
TASK: 140704
MONITOR: RTD TDR-63-4210

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPRINT ON STRUCTURAL ANALYSIS METHODS.

DESCRIPTORS: (*AIRCRAFT, FATIGUE (MECHANICS)), (*STRUCTURES, FATIGUE (MECHANICS), PROBABILITY, FRACTURE (MECHANICS), LOADING (MECHANICS), LIFE EXPECTANCY, MAINTENANCE, MEDRY, GUST LOADS, NUMERICAL METHODS + PROCEDURES, AIRFRAMES (U)
IDENTIFIERS: 1964 (U)

A STUDY IS MADE OF THE PROBABILITY OF COLLAPSE OF A FAIL-SAFE STRUCTURE, CONSISTING OF A NUMBER OF PARALLEL MEMBERS, SUBJECTED TO A RANDOM LOAD SPECTRUM. IN THE INDIVIDUAL MEMBERS A FATIGUE CRACK FIRST INITIATED AND FAILURE OF THE MEMBERS OCCURS DUE TO A HEAVY LOAD ON THE WEAKENED MEMBERS. THE PROBABILITY OF ELEMENT FAILURE IS OBTAINED BY A COMBINATION OF THE PROBABILITIES OF CRACK INITIATION AND OF MEETING A LOAD EXCEEDING THE RESIDUAL STRENGTH OF THE MEMBER. THE PROBABILITY OF CONSECUTIVE ELEMENT FAILURES IS DEDUCED FROM THE PROBABILITY OF FAILURE OF THE INDIVIDUAL MEMBERS. COLLAPSE OCCURS WHEN ALL MEMBERS ARE BROKEN, OR, IN PRACTICE, AFTER A CRITICAL NUMBER OF ELEMENT FAILURES. THE PROBABILITY OF COLLAPSE OF THE ASSEMBLY DURING THE WHOLE SERVICE LIFE IS THE SUM OF THE PROBABILITIES OF ALL THE INSPECTION INTERVALS. A NUMERICAL PROCEDURE FOR CALCULATING THE PROBABILITY OF COLLAPSE WAS DEVELOPED AND EVALUATIONS WERE MADE FOR AN ASSEMBLY OF SIX IDENTICAL, PARALLEL MEMBERS. DIAGRAMS OF THE PROBABILITY OF COLLAPSE P VERSUS THE SERVICE LIFE TIME T ARE PLOTTED FOR VARIOUS LENGTHS OF REGULAR INSPECTION INTERVALS, ASSUMING DIFFERENT VALUES OF THE CRACK INITIATION AND STRENGTH REDUCTION PARAMETERS INTRODUCED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-605 325
OKLAHOMA UNIV RESEARCH INST NORMAN

ENGINEERING SURVEY OF AIRCRAFT STRUCTURAL FAILURES CAUSED BY CORROSION, FATIGUE, AND ABRASION. (U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 10 JUN 63-31 JAN 64,

JUL 64 iV NORDBY,GENE ;CRISMAN,W. C. ;
CONTRACT: DA44 177AMC98T
TASK: 1D121401A14203
MONITOR: TRECOM , TR64 36

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*AIRFRAMES, FAILURE (MECHANICS)), AIRCRAFT, HELICOPTERS, CORROSION, FATIGUE (MECHANICS), ABRASIVES, EROSION, BONDED JOINTS, METALS, ROTOR BLADES (ROTARY WINGS), HONEYCOMB CORES (U)

A SURVEY OF ARMY AIRCRAFT STRUCTURAL FAILURES CAUSED BY CORROSION, FATIGUE, AND ABRASION WAS MADE TO DEFINE CRITICAL AREAS OF FUTURE STRUCTURAL RESEARCH. THE PRIMARY SOURCE OF DATA WAS THE ARMY FAILURE REPORTS, 'EQUIPMENT IMPROVEMENT RECOMMENDATION'. BECAUSE OF THE GREAT NUMBER OF REPORTS AVAILABLE, A SAMPLING WAS MADE CONSISTING OF BASIC AIRFRAME FAILURES ON FOUR HELICOPTERS AND TWO FIXED-WING AIRCRAFT FOR THE PERIOD 1 JANUARY 1963 TO 31 AUGUST 1963. THE REPORTS WERE ANALYZED INDIVIDUALLY, AND THE DATA WERE CONSOLIDATED. ANALYSIS OF ALL DATA REVEALED FOUR SIGNIFICANT PROBLEM AREAS: (1) CORROSION AND FATIGUE OF PRIMARY AIRFRAME STRUCTURE; (2) SEPARATION OF METAL BONDED JOINTS ON ROTOR BLADES; (3) EROSION OF ROTOR BLADE LEADING EDGES; AND (4) SUSTAINING ROTOR BLADE BALANCE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-610 482
NORTHROP CORP HAWTHORNE CALIF NORAIR DIV

EMPIRICAL CORRELATION OF EXCITATION ENVIRONMENT AND STRUCTURAL PARAMETERS WITH FLIGHT VEHICLE VIBRATION RESPONSE. (U)

DESCRIPTIVE NOTE: REPT. FOR MAY 62-JUL 64,
DEC 64 140P WHITE,R. W. ;BOZICH,D. J. ;
ELDRED,K. M. ;
REPT. NO. NOR-64-226
CONTRACT: AF33 657 8218
PROJ: 1370
TASK: 137005
MONITOR: AFFDL TR64 160

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*STRUCTURAL PARTS, VIBRATION), (*VIBRATION, CORRELATION TECHNIQUES), (*AIRCRAFT, VIBRATION), (*AEROSPACE CRAFT, VIBRATION), FLIGHT, DYNAMICS, CONTROL SYSTEMS, MATHEMATICAL PREDICTION, FORCE (MECHANICS), FATIGUE (MECHANICS), LOADING (MECHANICS), ACCELERATION, OSCILLATION, EXCITATION, ACOUSTIC PROPERTIES, AERODYNAMIC CHARACTERISTICS, ENGINES AND MOTORS, NOISE, EQUATIONS, DESIGN, NUMERICAL ANALYSIS, MODELS (SIMULATIONS) (U)

THE DESIGN OF FATIGUE RESISTANT STRUCTURES FOR HIGH SPEED AIRCRAFT AND AEROSPACE VEHICLES DEPENDS LARGELY ON THE PREDICTION OF REALISTIC ACOUSTIC, FLUCTUATING AERODYNAMIC, AND ENGINE VIBRATION ENVIRONMENTS AND ON THE ESTIMATION OF THE ATTENDANT VIBRATION LEVELS OF STRUCTURAL COMPONENTS AND ATTACHED EQUIPMENT. THE PRACTICAL ENGINEERING LIMITATIONS ON THE MATHEMATICAL AND NUMERICAL ANALYSES REQUIRED TO TREAT SUCH STRUCTURES RIGOROUSLY BY CLASSICAL DYNAMICS NECESSITATE STUDIES OF ALTERNATE, APPROXIMATE METHODS. IN THE REPORT, A DEFINITIVE STATEMENT IS PRESENTED OF THE EMPIRICAL APPROACH FOR DETERMINING CORRELATIONS BETWEEN THE EXCITATION ENVIRONMENT AND THE VIBRATION RESPONSE OF TYPICAL FLIGHT VEHICLE STRUCTURES BY MEANS OF STATISTICAL ANALYSES OF MEASURED VIBRATION DATA. THE VARIOUS ASPECTS OF THE VIBRATION PREDICTION PROBLEM AND THE GENERAL PHILOSOPHY MOTIVATING RESEARCH IN THE AREA OF EMPIRICAL CORRELATION ARE DISCUSSED. SPECIFIC TREATMENT IS GIVEN TO THE EFFECTS OF BANDWIDTH, MODAL DENSITY, AND SURFACE PRESSURE SPACECORRELATION ON THE CROSSCORRELATION OF ENERGY TRANSMITTED. (U)

UNCLASSIFIED /ZOML1

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMLI

AD-611 414
COLUMBIA UNIV NEW YORK INST FOR THE STUDY OF FATIGUE AND RELIABILITY

SECOND SEMINAR ON FATIGUE AND FATIGUE DESIGN. (U)

JUN 64 99P BRANGER,J. ;
REPT. NO. TR-5
CONTRACT: NONR26691
PROJ: NR064 470

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

REPRODUCTIONS WILL BE MADE IN BLACK AND WHITE ONLY.

DESCRIPTORS: (*SYMPOSIA, FATIGUE (MECHANICS)), (*FATIGUE (MECHANICS), AIRCRAFT), (*TEST FACILITIES, AIRCRAFT), LOADING (MECHANICS), TEST METHODS, TESTS, TEST EQUIPMENT, SIMULATORS, SAFETY, LIFE EXPECTANCY, AIRFRAMES, STRUCTURES, SWITZERLAND (U)

THIS SEMINAR WAS ORGANIZED TO TAKE ADVANTAGE OF THE PRESENCE IN THE UNITED STATES OF MR. J. BRANGER, CHIEF ENGINEER OF FLUGWERK EMMEN, THE SWISS GOVERNMENT'S AIRCRAFT ESTABLISHMENT. THE REPORT CONCERNS FATIGUE OF AIRCRAFT, A FULL-SCALE FATIGUE TESTING FACILITY WITH FATIGUE HISTORY SIMULATOR, AND RESULTS OBTAINED WITH RESPECT TO RELIABILITY IN FATIGUE OF FULL-SCALE AIRCRAFT STRUCTURES. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-615 654
COLUMBIA UNIV NEW YORK

THE STRUCTURAL RELIABILITY OF AIRFRAMES, (U)

DEC 64 94P FREUDENTHAL,A. M. ;PAYNE,A. O. ;

CONTRACT: AF33 616 7042
PROJ: AF-7351
TASK: 735106
MONITOR: AFML TR-64-401

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, FAILURE (MECHANICS), (*FAILURE (MECHANICS), AIRFRAMES), RELIABILITY, STRUCTURAL PARTS, AERODYNAMIC LOADING, GUST LOADS, THUNDERSTORMS, TURBULENCE, STRENGTH, MATHEMATICAL ANALYSIS, FATIGUE (MECHANICS), TRANSPORT PLANES, COMMERCIAL PLANES, BOMBERS, FIGHTERS (U)

THE THEORY OF RELIABILITY ESTIMATION DEVELOPED IN PREVIOUS REPORTS (WADD TR61-53, ML-TDR-64-300) HAS BEEN APPLIED TO THREE TYPES OF AIRCRAFT, A CIVILIAN TRANSPORT, A HEAVY BOMBER AND A FIGHTER DESIGNED BY CURRENT PROCEDURES, FOR WHICH OPERATIONAL RECORDS, MULTIPLE STRUCTURAL TESTS AND RECORDS OF SERVICE EXPERIENCE ARE AVAILABLE. FAILURE RATES FOR CRITICAL ULTIMATE LOAD CONDITIONS HAVE BEEN EVALUATED ON THE BASIS OF DATA OBTAINED FROM VARIOUS SOURCES AND COMPARED WITH SERVICE EXPERIENCE. LIVES ASSOCIATED WITH EQUAL RISK OF ULTIMATE LOAD FAILURE AND FATIGUE FAILURE (OR INITIAL STRUCTURAL FATIGUE DAMAGE) HAVE ALSO BEEN COMPUTED. THE OBTAINED NUMERICAL VALUES WHICH REFLECT CURRENT DESIGN PRACTICES CAN SERVE AS THE BASIS FOR A RATIONAL COMPARATIVE RELIABILITY ANALYSIS OF NEW DESIGNS INVOLVING NEW MATERIALS AND DIFFERENT DESIGN CRITERIA AND MISSIONS PSECTRA AND PROFILES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-619 075
COLUMBIA UNIV NEW YORK INST FOR THE STUDY OF FATIGUE AND RELIABILITY

FIRST SEMINAR ON FATIGUE AND FATIGUE DESIGN. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
DEC 63 175P FREUDENTHAL,A. M. ;WEIBULL,W. ;
PAYNE,A. O. ;
REPT. NO. TR-2
CONTRACT: NONR26691
PROJ: NR064 470

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-611 414.

DESCRIPTORS: (•SYMPOSIA, FATIGUE(MECHANICS)), (•FATIGUE(MECHANICS), AIRCRAFT), FRACTURE(MECHANICS), SHEETS, RELIABILITY, STRUCTURES, AIRFRAMES, WELDS, PRESSURE VESSELS, STRESSES, WINGS, ALUMINUM ALLOYS, STEEL, LIFE EXPECTANCY, MATHEMATICAL ANALYSIS, LOADING(MECHANICS), SAFETY (U)

CONTENTS: FATIGUE MECHANISMS AND FATIGUE DAMAGE ACCUMULATION, BY A. M. FREUDENTHAL; FATIGUE CRACK PROPAGATION IN SHEET SPECIMENS, BY W. WEIBULL; FATIGUE DESIGN AND RELIABILITY, BY A. M. FREUDENTHAL; ANALYSIS OF FATIGUE TEST RESULTS, BY W. WEIBULL; FATIGUE OF STRUCTURES, BY A. O. PAYNE. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMLI

AD-631 350 1/3 12/1
AERONAUTICAL RESEARCH INST OF SWEDEN STOCKHOLM

DEVELOPMENT OF STATISTICAL METHODS FOR DESIGNING AIRCRAFT WITH RESPECT TO FATIGUE. (U)

DESCRIPTIVE NOTE: TECHNICAL NOTE,
SEP 61 4P LUNDBERG,BO K. O. ;EGGWERTZ, SIGGE ;
CONTRACT: AF 61(052)-431,

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRCRAFT, DESIGN), (*STATISTICAL ANALYSIS, FATIGUE(MECHANICS)), STRUCTURAL PARTS, FRACTURE(MECHANICS) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-031 351 1/3 12/1 14/4
AERONAUTICAL RESEARCH INST OF SWEDEN STOCKHOLM

INSPECTION PERIODS DETERMINED FROM DATA OF CRACK DEVELOPMENT AND STRENGTH REDUCTION OF AN AIRCRAFT STRUCTURE USING STATISTICAL METHODS FOR DESIGNING AIRCRAFT WITH RESPECT TO FATIGUE. (U)

DESCRIPTIVE NOTE: TECHNICAL NOTE,
JUN 61 29P EGGWERTZ,SIGGE ;
REPT. NO. TN-1,
CONTRACT: AF 61(052)-431,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED FOR PRESENTATION AT THE ICAF-AGARD FATIGUE SYMPOSIUM IN PARIS- MAY 16-18, 1961.

DESCRIPTORS: (*AIRCRAFT, DESIGN), (*STATISTICAL ANALYSIS, FATIGUE(MECHANICS)), STRUCTURAL PARTS, LIFE EXPECTANCY, FRACTURE(MECHANICS) (U)

REGULAR INSPECTIONS OF AN AIRCRAFT STRUCTURE MIGHT FORM A VERY EFFECTIVE MEANS OF PROVIDING AN ADEQUATE SAFETY LEVEL WHEN THE INSPECTION PERIODS ARE DETERMINED BY STATISTICAL ANALYSIS. IF IT IS ASSUMED THAT A CRACK OF A CERTAIN MINIMUM LENGTH, IS ALWAYS DETECTED AT THE INSPECTIONS, IT IS POSSIBLE TO CALCULATE THE PROBABILITY OF COLLAPSE OF THE STRUCTURE FOR ANY INSPECTION PERIOD AND LIMIT LIFE OF THE STRUCTURE, PROVIDED THE LOAD SPECTRUM, THE TIME TO CRITICAL-CRACK INITATION, AS WELL AS THE CRACK PROPAGATION AND THE CORRESPONDING REDUCTION OF THE ULTIMATE STRENGTH, ARE KNOWN FROM EXPERIMENTAL INVESTIGATIONS. USING SUCH DATA AVAILABLE IN THE LITERATURE, NUMERICAL EVALUATIONS HAVE BEEN MADE, ASSUMING VARIOUS STRESS LEVELS AND INSPECTION PERIODS. FROM THE RESULTS, THE APPROPRIATE INSPECTION PERIODS ARE DETERMINED AND COMPARED WITH THE CRACK PROPAGATION TIME TO FINAL FAILURE. THE APPROXIMATIONS INTRODUCED IN THE STATISTICAL ANALYSIS, ARE DISCUSSED, AND SUGGESTIONS ARE MADE FOR FUTURE THEORETICAL AND EXPERIMENTAL INVESTIGATIONS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-634 780 14/4 1/3 12/4
BOEING SCIENTIFIC RESEARCH LABS SEATTLE WASH MATHEMATICS RESEARCH LAB

SOME STATISTICAL ASPECTS OF THE DETERMINATION OF A SAFE LIFE FROM FATIGUE DATA, (U)

APR 66 26P SAUNDERS, SAM C. ;
REPT. NO. D1-82-0515,MATHEMATICAL NOTE-455
MONITOR: IDEP 347.40.00.00-C6-06

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*FAILURE(MECHANICS), PROBABILITY), OPERATIONS RESEARCH, LIFE EXPECTANCY, RELIABILITY, FATIGUE(MECHANICS), AIRCRAFT, STRUCTURAL PARTS (U)

THE PROBABILITY THAT WITHIN A FUTURE LARGE SECOND SAMPLE NO FAILURES WILL OCCUR BEFORE THE EXPIRATION OF A SAFE SERVICE LIFE ESTIMATED FROM A SMALL FIRST SAMPLE AND THE PROBABILITY THAT THE PROPORTION OF ALL FUTURE OBSERVATIONS FAILING BEFORE THE ESTIMATED SAFE SERVICE LIFE IS SMALLER THAN A GIVEN PROPORTION, ARE THE TWO MEASURES OF SAFETY THAT WE ADOPT HERE. ASSUMING THE LOGARITHM OF THE FATIGUE LIFE IS NORMAL WITH KNOWN VARIANCE, WE DERIVE FORMULAE FOR THESE MEASURES OF SAFETY. SETTING THE SAFE LIFE AS SOME FRACTION OF THE MEAN ESTIMATED BY THE FIRST SAMPLE, WE THEN COMPARE THE INFLUENCE OF OTHER PARAMETERS ON THESE MEASURES OF SAFETY. FROM THIS ASSUMPTION IT IS SHOWN THAT ONE HAS VIRTUALLY AS HIGH AN ASSURANCE OF SAFETY, MEASURED BY THE FIRST CRITERION, WHEN USING ONLY THE MINIMUM OF THE FIRST SAMPLE, AS ONE DOES BY USING ALL THE OBSERVATIONS IN THE FIRST SAMPLE. IF ONE USES THE STANDARD SECOND CRITERION, NAMELY, THE CONFIDENCE LEVEL OF A LOWER TOLERANCE BOUND, AS A MEASURE SUCH AN ADVANTAGE IS NOT RETAINED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-642 978 1/3
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

A METHOD OF FATIGUE LIFE PREDICTION USING DATA OBTAINED UNDER RANDOM LOADING CONDITIONS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JAN 66 47P KIRKBY,W. T. ;EDWARDS,P. R. ;
REPT. NO. TR-66023

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRCRAFT, FATIGUE(MECHANICS)), LOADING(MECHANICS), LIFE EXPECTANCY, AERODYNAMIC LOADING, STRUCTURAL PARTS, DESIGN, STRESSES, GREAT BRITAIN (U)

PRELIMINARY TESIS WERE MADE TO INVESTIGATE A METHOD OF FATIGUE LIFE PREDICTION IN WHICH FATIGUE DATA OBTAINED UNDER A SIMPLE FORM OF RANDOM LOADING ARE SUBSTITUTED FOR THE DATA HITHERTO OBTAINED UNDER SINUSOIDAL TEST CONDITIONS. THE RESULTS OF THIS WORK SHOW A SIGNIFICANT INCREASE IN THE ACCURACY OF PREDICTION, BUT IT IS EVIDENT THAT FURTHER ALLOWANCE FOR LOAD INTERACTION EFFECTS IS NECESSARY, IF GREATER ACCURACY IS TO BE OBTAINED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-658 524 1/3
ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT PARIS (FRANCE)

CONTROL OF FLEXIBLE AIRCRAFT DYNAMIC RESPONSE. (U)

66 56P DAVIS,H. MAX ;SWAIM,ROBERT L. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED. PRESENTED AT THE AGARD SPECIALISTS MEETING ON STABILITY AND CONTROL, 20-23 SEPTEMBER 1966, CAMBRIDGE, ENGLAND.

DESCRIPTORS: (*AIRCRAFT, DYNAMICS), (*GUST LOADS, CONTROL SYSTEMS), AEROELASTICITY, RESPONSE, FLIGHT TESTING, FATIGUE(MECHANICS), STABILITY, DESIGN (U)

LOCAL ACCELERATIONS AND AIRFRAME LOADING DUE TO BOTH RIGID BODY AND STRUCTURAL DYNAMICS CONCERN PILOTS AND DESIGNERS OF AIRCRAFT. GUST RESPONSE ADVERSELY EFFECTS SYSTEM MISSION EFFECTIVENESS BY DEGRADING STRUCTURAL FATIGUE LIFE, CREW AND PASSENGER COMFORT, HANDLING QUALITIES, AND WEAPON DELIVERY ACCURACY. AIRCRAFT TRENDS AND DEVELOPMENTS THAT HAVE PRECIPITATED THIS PROBLEM AREA ARE DISCUSSED. VARIOUS CONTROL SYSTEM PHILOSOPHIES AND TECHNIQUES, BOTH ACTIVE AND PASSIVE, THAT HAVE BEEN PROPOSED AND INVESTIGATED AS A MEANS FOR CONTROLLING STRUCTURAL DYNAMIC RESPONSE ARE DISCUSSED. THE USE OF SUITABLY LOCATED, SIZED, AND PHASED CONTROL FORCE INPUTS CAN GREATLY INCREASE THE CLOSED-LOOP DAMPING RATIOS OF THE LOWER FREQUENCY STRUCTURAL MODES, ALLEVIATING THE ABOVE PROBLEMS. SUCH STRUCTURAL DYNAMIC RESPONSE CONTROL SYSTEMS MUST BE COMPATIBLE WITH OTHER SUB-SYSTEMS SUCH AS TERRAIN FOLLOWING AND RIGID BODY STABILITY AUGMENTATION. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-660 529 1/3 20/11
BATTELLE MEMORIAL INST COLUMBUS OHIO

FATIGUE OF AIRCRAFT STRUCTURES, (U)

66 354P GROVER,HORACE J. ;
MONITOR: NAVAIR 01-1A-13

UNCLASSIFIED REPORT
AVAILABILITY: HARD COPY AVAILABLE FROM SUPERINTENDENT OF DOCUMENTS, GPO, WASHINGTON, D. C., 20402, $1.25.

DESCRIPTORS: (*AIRFRAMES, FATIGUE(MECHANICS)), STRESSES, CRACK PROPAGATION, DAMAGE, CORROSION, MECHANICAL FASTENERS, JOINTS, TESTS, BEARINGS, GEARS, LOADING(MECHANICS), STRUCTURAL PROPERTIES (U)

CONTENTS: THE NATURE OF FATIGUE; FATIGUE TESTING; NOMENCLATURE AND CONVENTIONS; STRESS CONCENTRATIONS; CRACK PROPAGATION AND RESIDUAL STRENGTH BACKGROUND; CUMULATIVE DAMAGE; LOW-CYCLE FATIGUE; EFFECTS OF TEMPERATURE ON FATIGUE; CORROSION AND FRETTING; ACOUSTICAL FATIGUE; FACTORS IN THE FATIGUE BEHAVIOR OF COMPONENTS; FATIGUE BEHAVIOR OF FASTENERS AND OF MECHANICALLY FASTENED JOINTS; THE FATIGUE BEHAVIOR OF WELDED JOINTS AND OF ADHESIVE-BONDED JOINTS; BEARINGS, GEARS, AND MONOLITHIC COMPONENTS; THE FATIGUE BEHAVIOR OF BUILT-UP STRUCTURES BEAM SPECIMENS; THE AIRFRAME AND ITS ENVIRONMENT; LOADS AND ENVIRONMENT; STRUCTURAL RESPONSE, DESIGN AND ANALYSIS; STRUCTURAL RESPONSE, FULL-SCALE TESTING; CONSIDERATIONS DURING SERVICE. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-661 989 1/2 1/3 13/12
ADVISORY GROUP FOR AERONAUTICAL RESEARCH AND DEVELOPMENT
PARIS (FRANCE)

THE PROBLEM OF STRUCTURAL SAFETY WITH PARTICULAR REFERENCE TO SAFETY REQUIREMENTS, (U)

NOV 57 27P EBNER,H. ;
REPT. NO. AGARD-150

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED. PRESENTED AT THE MEETING OF THE STRUCTURES AND MATERIALS PANEL (6TH), HELD IN PARIS (FRANCE), 4-8 NOV 57.

DESCRIPTORS: (*AVIATION SAFETY, STANDARDS), (*AIRCRAFT, DESIGN), REVIEWS, LAW, GUST LOADS, FATIGUE(MECHANICS), DAMAGE, AIRFRAMES, STATISTICAL ANALYSIS (U)

THE MAIN TOPIC OF THE REPORT IS THE HISTORICAL DEVELOPMENT OF THE SAFETY CONCEPT IN AIRCRAFT DESIGN. THE METHODS BY WHICH THE PRESCRIBED DEGREES OF SAFETY IN VARIOUS NATIONAL REGULATIONS HAVE BEEN ARRIVED AT ARE DISCUSSED AND COMPARISONS ARE MADE BETWEEN THE SAFETY FACTORS LAID DOWN IN AMERICAN, BRITISH, FRENCH AND GERMAN AIRWORTHINESS REGULATIONS. OTHER SUBJECTS DEALT WITH ARE THE RELATIVELY NEW STATISTICAL CONCEPT OF SAFETY, GUST LOADS, FATIGUE, AND CUMULATIVE DAMAGE IN FATIGUE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-663 783 11/6 13/5
ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT
PARIS (FRANCE)

THE INFLUENCE OF FRETTING ON FATIGUE, (U)

APR 67 42P HARRIS,W. J. ;
REPT. NO. AGARD ADVISORY-8

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED. PRESENTED AT THE MEETING OF THE STRUCTURES AND MATERIALS PANEL OF AGARD (24TH), APRIL 17-26, 1967, UNIONE INDUSTRIALE, TURIN, ITALY.

DESCRIPTORS: (•FATIGUE(MECHANICS), •CORROSION), (•METAL JOINTS, FATIGUE(MECHANICS)), EROSION, CORROSION INHIBITION, INTERACTIONS, SURFACES, DEGRADATION, MICROSTRUCTURE, COATINGS, AIRCRAFT, ALUMINUM ALLOYS, MOLYBDENUM COMPOUNDS, SULFIDES, EPOXY PLASTICS (U)
IDENTIFIERS: FRETTING (U)

THE INTRUSION OF FRETTING FATIGUE IN THE FIELD OF FLIGHT STRUCTURES HAS BEEN RESPONSIBLE, IN MANY CASES, FOR THE HIGH STRENGTH REDUCTION FACTORS, OF 10 OR MORE, COMMONLY ENCOUNTERED. CONSEQUENTLY, A PRIMARY OBJECTIVE OF THE REPORT WAS TO CONSIDER THE EVIDENCE TO SUPPORT THE CLAIM THAT FRETTING MUST BE RANKED IN IMPORTANCE WITH GEOMETRIC STRESS CONCENTRATION AND THE LIKE, WHEN CONSIDERING THE FATIGUE BEHAVIOUR OF STRUCTURES. THUS, MEAN STRUCTURES CURVES, CRACK PROPAGATION AND NON-PROPAGATING CRACKS AND SOME FUNDAMENTAL FRETTING FATIGUE RESEARCHES HAVE BEEN DESCRIBED AND INTERPRETED WITH THE ELUCIDATION OF THE FRETTING FATIGUE MECHANISM IN MIND. A SURVEY OF CERTAIN ANTI-FRET TECHNIQUES HAS BEEN INCLUDED NOT ONLY TO EMPHASIZE THE GAINS TO BE MADE IN TERMS OF STRUCTURAL EFFICIENCY BUT TO JUSTIFY THE MAIN THESIS THAT PRIMARILY, THE FRETTING FATIGUE MECHANISM IS CONTROLLED BY THE STRESS FIELDS GENERATED BY THE CONTACT OF TWO SURFACE TOPOGRAPHIES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-667 144 1/3 14/4
FEDERAL AVIATION AGENCY WASHINGTON D C FLIGHT STANDARDS SERVICE

FACTORS OF SAFETY AND FAIL SAFE STRENGTH CRITERIA. (U)

NOV 66 9P MCNAIR,WILLIAM J. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED FOR PRESENTATION AT THE FAA MAINTENANCE SYMPOSIUM 'CONTINUED RELIABILITY OF TRANSPORT TYPE AIRCRAFT STRUCTURE,' WASHINGTON, D. C., 2-4 NOV 1966.

DESCRIPTORS: (*COMMERCIAL PLANES, FATIGUE(MECHANICS)), (*TRANSPORT PLANES, FATIGUE(MECHANICS)), CIVIL AVIATION, AVIATION SAFETY, STANDARDS, MECHANICAL PROPERTIES, MAINTENANCE, RELIABILITY, LOADING(MECHANICS), SYMPOSIA (U)
IDENTIFIERS: FEDERAL AVIATION REGULATIONS, FAIL-SAFE STRENGTH (U)

THE PAPER BRIEFLY TRACES THE ORIGIN AND USE OF THE TERM 'FATIGUE' IN CIVIL AVIATION. SECTIONS OF THE CURRENT FEDERAL AVIATION REGULATIONS PERTAINING TO FACTORS OF SAFETY AND FAIL SAFE STRENGTH CRITERIA FOR FIXED WING TRANSPORT AIRCRAFT ARE BRIEFLY REVIEWED. EMPHASIS IS ALSO FOCUSED ON THE IMPORTANCE OF ADEQUATE MAINTENANCE INSPECTION INTERVALS AND PROCEDURES FOR AIRCRAFT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-667 149 1/3 14/4
BOEING CO RENTON WASH COMMERCIAL AIRPLANE DIV

STATE OF THE ART IN DESIGN AND TESTING TO ENSURE CONTINUED AIRCRAFT STRUCTURAL INTEGRITY. (U)

68 14P LARSEN,A. C. ;WATSON,R. E. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED FOR PRESENTATION AT THE FAA MAINTENANCE SYMPOSIUM 'CONTINUED RELIABILITY OF TRANSPORT TYPE AIRCRAFT STRUCTURE', WASHINGTON, D. C., 2-4 NOV 66.

DESCRIPTORS: (*COMMERCIAL PLANES, STRUCTURAL PROPERTIES), (*AIRFRAMES, STATE-OF-THE-ART REVIEWS), TRANSPORT PLANES, DESIGN, LOAD DISTRIBUTION, JET PLANES, STRUCTURAL PARTS, TEST METHODS, CORROSION INHIBITION, FATIGUE(MECHANICS), BONDING, AIRPLANE PANELS, STEEL, ALUMINUM ALLOYS, TITANIUM ALLOYS, FRACTOGRAPHY, RELIABILITY (U)
IDENTIFIERS: COMPREHENSIVE OPTION STIFFNESS METHOD ORGANIZATION SYSTEM, COMPUTER ANALYSIS (U)

THE PAPER REVIEWS RECENT ADVANCEMENTS IN THE DESIGN AND TESTING OF MODERN COMMERCIAL JET AIRCRAFT STRUCTURES AS VIEWED BY AN AMERICAN MANUFACTURER. ADVANCEMENTS ARE CONTINUALLY BEING MADE IN STRUCTURAL CRITERIA, METHODS OF ANALYSIS, MATERIALS AND PROCESSES, STRUCTURAL TESTING, AND THE USE OF FLEET EXPERIENCE. EACH OF THESE AREAS IS DISCUSSED AND EXAMPLES ARE PRESENTED TO SHOW HOW THESE ADVANCEMENTS ARE EMPLOYED TO ENSURE CONTINUED STRUCTURAL INTEGRITY OF AIRCRAFT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-667 150 1/3 14/4
BRITISH AIRCRAFT CORP (OPERATING) LTD WEYBRIDGE (ENGLAND)
WEYBRIDGE DIV

THE STATE OF THE ART IN DESIGN AND TESTING CONCEPTS TO ENSURE STRUCTURAL INTEGRITY, (U)

NOV 66 13P JAMES,D. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED FOR PRESENTATION AT FAA MAINTENANCE SYMPOSIUM 'CONTINUED RELIABILITY OF TRANSPORT-TYPE AIRCRAFT STRUCTURE,' WASHINGTON, D. C., 2-4 NOV 1966.

DESCRIPTORS: (*TRANSPORT PLANES, RELIABILITY), (*COMMERCIAL PLANES, RELIABILITY), MAINTENANCE, MAINTAINABILITY, STATE-OF-THE-ART REVIEWS, DESIGN, AIRFRAMES, SONIC FATIGUE, TEST METHODS, SYMPOSIA, CORROSION, TURBULENCE, LOADING(MECHANICS), VIBRATION, GREAT BRITAIN, CIVIL AVIATION (U)
IDENTIFIERS: SMALL PLANES, PRIVATE PLANES (U)

A PRESENTATION OF THE BRITISH AIRCRAFT CORPORATION APPROACH TO THE PROBLEMS OF MAINTAINING A HIGH STANDARD OF STRUCTURAL INTEGRITY IS PRESENTED. THE DISCUSSION IS RESTRICTED TO THOSE TOPICS WHICH IT IS THOUGHT WILL BE OF INTEREST TO THOSE RESPONSIBLE FOR AIRCRAFT MAINTENANCE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-667 151 1/3 14/4
DOUGLAS AIRCRAFT CO INC LONG BEACH CALIF AIRCRAFT DIV

THE EFFECTS OF TIME IN SERVICE ON STRUCTURAL INTEGRITY OF OLDER TRANSPORT AIRCRAFT, (U)

66 12P LUKE,R. H. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED FOR PRESENTATION AT THE FAA MAINTENANCE SYMPOSIUM 'CONTINUED RELIABILITY OF TRANSPORT TYPE AIRCRAFT STRUCTURE,' WASHINGTON, D. C., 2-4 NOV 1966.

DESCRIPTORS: (*TRANSPORT PLANES, RELIABILITY), (*COMMERCIAL PLANES, RELIABILITY), MAINTENANCE, LIFE EXPECTANCY, AIRFRAMES, FATIGUE(MECHANICS), WEAR RESISTANCE, TIME, DAMAGE, ECONOMICS, CIVIL AVIATION (U)
IDENTIFIERS: SMALL PLANES, PRIVATE PLANES (U)

ALTHOUGH THERE IS A CONNECTION BETWEEN TIME IN SERVICE AND FATIGUE EFFECTS, IT IS NOT A CLEAR-CUT, STRAIGHT-LINE TYPE OF RELATIONSHIP. THE EFFECT OF FLIGHT TIME ON STRUCTURAL INTEGRITY IS GREATLY MODIFIED BY OPERATING CONDITIONS, PILOT TECHNIQUE, AND THE QUALITY OF MAINTENANCE AND INSPECTION. OF THESE FACTORS, MAINTENANCE AND INSPECTION IS PROBABLY THE MOST IMPORTANT. EXPERIENCE SHOWS THAT FATIGUE DAMAGE DOES TEND TO INCREASE WITH TIME IN SERVICE, BUT PROPER INSPECTION AND MAINTENANCE, WHICH BECOME MORE IMPORTANT AS THE AIRPLANE AGES, WILL FIND THESE CONDITIONS AND CORRECT THEM BEFORE SERIOUS DAMAGE IS CREATED. THE ACTUAL SERVICE LIFE OF THE AIRPLANE IS USUALLY DETERMINED BY AN ECONOMIC FACTOR RATHER THAN A WEAROUT FACTOR. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMLI

AD-660 941 1/3
NATIONAL AERONAUTICAL ESTABLISHMENT OTTAWA (ONTARIO)

LOW ALTITUDE FLIGHT LOAD SPECTRA FOR LIGHT AIRCRAFT. (U)

DEC 67 38P SEWELL,R. T. ;
REPT. NO. NAE-LR-495
MONITOR: NRC 10002

UNCLASSIFIED REPORT

DESCRIPTORS: (*JET TRAINING PLANES, FATIGUE(MECHANICS)), TERRAIN AVOIDANCE, LOW ALTITUDE, AERODYNAMIC LOADING, LIFE EXPECTANCY, PILOTS, TOLERANCES(PHYSIOLOGY), FLIGHT TESTING, GUST LOADS, AIRFRAMES, ATMOSPHERIC MOTION, CANADA (U)
IDENTIFIERS: AERO COMMANDER 680E AIRCRAFT, PIPER PA-23-250 AZTEC C AIRCRAFT, SABRE 5 AIRCRAFT, T-33 AIRCRAFT, LIGHT AIRCRAFT (U)

AN ANALYSIS IS PRESENTED OF MORE THAN 1,300 HOURS FLIGHT LOADS RECORDS OBTAINED FROM LIGHT AIRCRAFT ENGAGED IN LOW ALTITUDE TERRAIN-FOLLOWING OPERATIONS. IT IS SHOWN THAT CONTINUOUS OPERATION IN THE AVERAGE LOW ALTITUDE ENVIRONMENT REDUCES THE ESTIMATED FATIGUE LIFE BY A FACTOR OF 15 TO 1 WHEN COMPARED WITH THE NORMAL OPERATING ENVIRONMENT, AND IN THE LIMITING CONDITION IMPOSED BY PILOT TOLERANCE THIS FACTOR IS INCREASED TO 90 TO 1. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-673 424 1/5 20/11 1/3
LOCKHEED-CALIFORNIA CO BURBANK

THE DEVELOPMENT OF DYNAMIC TAXI DESIGN PROCEDURES. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JUN 68 398P WIGNOT,J. E. ;DURUP,P. C. ;GAMON,M. A. ;GINSBURG,T. A. ;ORTASSE, R. ;
CONTRACT: FA-67-WA-1682
MONITOR: FAA-ADS 68-11

UNCLASSIFIED REPORT

DESCRIPTORS: (*RUNWAYS, LOADING(MECHANICS)), TAXIING, STANDARDS, FATIGUE(MECHANICS), DESIGN, SURFACE ROUGHNESS, POWER SPECTRA, DYNAMICS, COMPUTER PROGRAMS, TAKE-OFF, DIGITAL COMPUTERS, NUMERICAL METHODS AND PROCEDURES, AIRCRAFT LANDINGS, LANDING GEAR (U)
IDENTIFIERS: DESIGN CRITERIA, GRAPHS(CHARTS) (U)

FOUR FORMS OF DYNAMIC TAXI DESIGN PROCEDURES WERE DEVELOPED THAT CONSIDER THE THREE DIMENSIONAL CHARACTER OF THE RUNWAY/TAXIWAY SURFACE ENVIRONMENT. THESE PROCEDURES ALONG WITH THEIR POTENTIAL CRITERIA THAT WERE ADAPTED TO ENSURE STRUCTURAL INTEGRITY, MAY BE CATEGORIZED AS ARBITRARY, DISCRETE, DETERMINISTIC, AND STATISTICAL. THEY DIFFER IN THE ASSUMED MODEL OF THE TAXI ENVIRONMENT. ALSO INCLUDED IS A DISCUSSION OF PARAMETER VARIATIONS, PROCEDURES FOR USE OF THE CRITERIA, PROCEDURE FOR THE UPDATING OF THE METHODS AND A COMPLETE DIGITAL COMPUTER PROGRAM FOR USE IN TAXI ANALYSES, AND FOR UPDATING THE CRITERIA. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMLI

AD-680 400 1/3
KAMAN AIRCRAFT BLOOMFIELD CONN

EVALUATION OF HELICOPTER FLIGHT SPECTRUM DATA. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
OCT 68 119P PORTERFIELD,JOHN D. ;
MALONEY,PAUL F. ;
REPT. NO. R-739
CONTRACT: DAAJ02-67-C-0055
PROJ: DA-1-F-162204-A-146
TASK: 1-F-162204-A-14601
MONITOR: USAAVLABS TR-68-68

UNCLASSIFIED REPORT

DESCRIPTORS: (*HELICOPTERS, LOADING(MECHANICS)), (*AERODYNAMIC LOADING, HELICOPTERS), TRANSPORT PLANES, FATIGUE(MECHANICS), LIFE EXPECTANCY, WEIGHT, TAKE-OFF, CLIMBING, LEVEL FLIGHT, FLIGHT SPEEDS, DESCENT, AIRCRAFT LANDINGS, FREQUENCY, STATISTICAL DISTRIBUTIONS, FLIGHT TESTING, MISSION PROFILES, SIMULATION (U)
IDENTIFIERS: H-1 AIRCRAFT, H-47 AIRCRAFT, H-54 AIRCRAFT, UH-1B AIRCRAFT, CH-47A AIRCRAFT, CH-54A AIRCRAFT (U)

THE REPORT EVALUATES HELICOPTER FLIGHT SPECTRUM DATA PREVIOUSLY RECORDED AND PUBLISHED IN OTHER REPORTS, WITH EMPHASIS ON THE UH-1B UTILITY, CH-47A CARGO, AND CH-54A LOAD LIFTING HELICOPTERS AS USED IN THE ARMY ENVIRONMENT. A LIMITED STATISTICAL ANALYSIS OF THE DATA IS PRESENTED FOR THOSE PARAMETERS FOR WHICH SUFFICIENT DATA WERE AVAILABLE. THE REPORT INCLUDES A COMPARISON OF THE FLIGHT-MEASURED DATA WITH THE SPECTRUM APPEARING IN APPENDIX A OF CIVIL AERONAUTICS MANUAL 6, AND WITH THE ASSUMED FATIGUE SUBSTANTIATION SPECTRUM, WHERE THIS WAS AVAILABLE. DISCUSSION AND EVALUATION OF THE SPECTRUM VARIATIONS THAT DO OCCUR, PARTICULARLY AS THEY MIGHT AFFECT COMPONENT FATIGUE LIVES, ARE ALSO INCLUDED. A METHOD FOR DERIVING AN OPERATIONAL SPECTRUM FOR THE CLASSES OF HELICOPTERS EVALUATED IS PRESENTED ALONG WITH DISCUSSION OF SOME OF THE CONSIDERATIONS AND JUDGMENT WHICH PLAY A PART IN THE ESTABLISHMENT OF A RATIONAL, CONSERVATIVE SPECTRUM FOR THE CRITICAL COMPONENTS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-693 621 20/11 1/3
MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MECHANICAL ENGINEERING

RANDOM VIBRATION STUDIES. (U)

DESCRIPTIVE NOTE: FINAL SCIENTIFIC REPT. 1 NOV 63-30 OCT 68,
JUL 69 10P KARNOPP,DEAN C. ;
CONTRACT: AF 49(638)-1314
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR 69-1906TR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-693 620.

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PROPERTIES), VIBRATION, HYSTERESIS, FATIGUE(MECHANICS), REVIEWS (U)

DURING THE CONTRACT PERIOD, RESEARCH WAS CONCENTRATED IN THE FOLLOWING FOUR AREAS: NONLINEAR AND, PARTICULARLY, HYSTERETIC SYSTEM RESPONSE TO STOCHASTIC INPUTS; FATIGUE AND FIRST PASSAGE FAILURE PREDICTION; ANALYSIS OF COUPLED STRUCTURES; AND THE APPLICATION OF AUTOMATIC CONTROL PRINCIPLES TO THE REDUCTION OF STRUCTURAL VIBRATION. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-697 506 1/3 1/2
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

SINGLE IMPACT STUDIES OF RAIN EROSION. PART I. PRELIMINARY EVALUATION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
APR 69 38P FYALL,A. A. ;SMITH,P. ;
REPT. NO. RAE-TR-69066

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, *EROSION), (*RAINDROPS, EROSION), SUPERSONIC FLIGHT, IMPACT SHOCK, SHOCK RESISTANCE, WATER IMPINGEMENT, FLOW SEPARATION, SURFACE PROPERTIES, STRESSES, DEFORMATION, CRACKS, CRATERING, SHOCK WAVES, HIGH ALTITUDE, ALL-WEATHER AVIATION, ACRYLIC RESINS, GUIDED MISSILES, EXPERIMENTAL DESIGN, GREAT BRITAIN (U)
IDENTIFIERS: *WATER EROSION, RADIAL FLOW (U)

TECHNIQUES OF HIGH SPEED PHOTOGRAPHY, PHOTOMICROGRAPHY AND PROFILOMETRY HAVE BEEN APPLIED TO THE STUDY OF SINGLE IMPACTS OF WATERDROPS WITH FAST-MOVING SURFACES. VARIOUS FEATURES OF THE COLLISION PROCESS ARE DESCRIBED INCLUDING PRESSURE BUILD-UP, RADIAL VELOCITY, FLOW SEPARATION AND OBLIQUITY OF SURFACE. INTERPRETATIONS ARE GIVEN OF THE DAMAGE SITES AND OF THEIR POSSIBLE CORRELATION WITH MULTIPLE IMPACT EROSION. PHOTOELASTIC STUDIES OF IMPACT INDICATE THAT PRE-STRESSING OF THE TARGET SURFACE MAY OCCUR BEFORE COLLISION AND THE IMPLICATIONS OF THIS PHENOMENON FOR HIGH ALTITUDE FLIGHT ARE DISCUSSED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-701 415 13/13 20/11
COLUMBIA UNIV NEW YORK DEPT OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

FATIGUE MECHANISMS, FATIGUE PERFORMANCE AND STRUCTURAL INTEGRITY. (U)

DESCRIPTIVE NOTE: FINAL REPT. MAR 63-SEP 69,
DEC 69 34P FREUDENTHAL,A. M.
CONTRACT: NONR-266(91)
PROJ: NR-064-470, NR-064-446

UNCLASSIFIED REPORT

DESCRIPTORS: (*STRUCTURAL PARTS, *FATIGUE(MECHANICS)), RELIABILITY, AIRFRAMES, BRIDGES, SPACECRAFT, CRACKS, CRACK PROPAGATION, LOADING(MECHANICS), SHEAR STRESSES, MICROSTRUCTURE (U)

THE WORK OF THE INSTITUTE WAS CONCENTRATED IN THREE PRINCIPAL AREAS: METAL PHYSICS AND MICROMECHANISMS OF FATIGUE; EXPERIMENTAL AND THEORETICAL SOLID MECHANICS; EXPERIMENTAL AND THEORETICAL STRUCTURAL INTEGRITY AND RELIABILITY. THE PRINCIPAL ACCOMPLISHMENTS OF RESEARCH WORKERS OF THE INSTITUTE IN THESE THREE AREAS ARE OUTLINED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-702 789 7/4 6/16
RAND CORP SANTA MONICA CALIF

CHEMICAL EQUILIBRIUM PROBLEMS WITH UNBOUNDED CONSTRAINT SETS, (U)

FEB 70 26P BIGELOW,JAMES H. ;DEHAVEN, JAMES C. ;SHAPIRO,NORMAN Z. ;
REPT. NO. RM-5952-PR
CONTRACT: F44620-67-C-0045

UNCLASSIFIED REPORT

DESCRIPTORS: (*CHEMICAL EQUILIBRIUM, *PHYSIOLOGY), (*CONTROLLED ATMOSPHERES, CHEMICAL EQUILIBRIUM), CARBON DIOXIDE, MATHEMATICAL MODELS, PROGRAMMING(COMPUTERS), BIOCHEMISTRY, LIFE SUPPORT (U)
IDENTIFIERS: RAND PROJECT (U)

AN INVESTIGATION OF THE USE OF MATHEMATICAL MODELS TO EXPLORE THE CHEMICAL ASPECTS OF PHYSIOLOGICAL SYSTEMS; THIS DEALS WITH THE THEORETICAL AND COMPUTATIONAL ASPECTS OF UNDERSTANDING THE CHEMISTRY OF HUMAN PHYSIOLOGICAL FUNCTION. THE QUESTION OF EXISTENCE OF SOLUTIONS TO PROBLEMS HAVING UNBOUNDED CONSTRAINT SETS IS INVESTIGATED BY RELATING THEIR EXISTENCE (OR NONEXISTENCE) TO A PROPERTY OF A SOLUTION TO AN AUXILIARY CHEMICAL EQUILIBRIUM PROBLEM WITH A BOUNDED CONSTRAINT SET. AN EXAMPLE SYSTEM IS SELECTED CONSISTING OF GASES IN CONTACT WITH AN AQUEOUS BUFFER SOLUTION AT A UNIFORM TOTAL HYDROSTATIC PRESSURE AND TEMPERATURE. THE NUMERICAL PROBLEM OF DETERMINING THE AMOUNT OF CO2 TO BE ADDED TO ACHIEVE A SPECIFIED PARTIAL PRESSURE OF CO2 IN THE GAS PHASE, AND ITS EFFECTS ON THE COMPOSITION OF THE TOTAL SYSTEM, IS SOLVED BY USING A PROCEDURE SUGGESTED BY THE CONCEPT OF UNBOUNDED CONSTRAINT SETS. FINDINGS MAY APPLY TO DESIGN OF ARTIFICIAL LIFE-SUPPORT SYSTEMS NEEDED IN EXTRATERRESTRIAL ENVIRONMENTS RELATED TO AIR FORCE MISSIONS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-709 686 13/13 20/11
POLYTECHNIC INST OF BROOKLYN N Y DEPT OF AEROSPACE ENGINEERING AND APPLIED MECHANICS

INVESTIGATION OF PLATES AND SHELLS UNDER EXTERNAL LOADING AND ELEVATED TEMPERATURES, (U)

MAR 70 20P KEMPNER,JOSEPH J

REPT. NO. PIBAL-70-10
CONTRACT: F44620-69-C-0072
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR 70-0834TR

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, LOADING(MECHANICS)), CYLINDRICAL BODIES, STRUCTURAL SHELLS, METAL PLATES, LAMINATES, ELASTICITY, CREEP, BENDING, BUCKLING(MECHANICS), COMPRESSIVE PROPERTIES (U)

THE STUDIES BRIEFLY DESCRIBED IN THIS REPORT STEM FROM CONTINUING INVESTIGATIONS OF PLATES AND SHELLS UNDER EXTERNAL LOADING AND ELEVATED TEMPERATURES, AND INCLUDE PROBLEMS OF SPECIAL INTEREST TO DESIGNERS OF MISSILES AND AIRCRAFT. CHAPTER 1 DISCUSSES THE ANALYSIS OF THE BUCKLING AND POSTBUCKLING OF NONCIRCULAR (OVAL) CYLINDRICAL SHELLS AND RELATED EXPERIMENTAL INVESTIGATIONS, THE EFFECTS OF BOUNDARY CONDITIONS, AND THE APPLICATION OF EXACT FINITE DEFORMATION THEORY OF THREE-DIMENSIONAL ELASTICITY TO THE STABILITY PROBLEM OF THICK-WALLED CYLINDERS. CHAPTER 2 DESCRIBES INVESTIGATIONS OF STRESS CONCENTRATION PROBLEMS FOR SPHERICAL SHELLS. CHAPTER 3 DISCUSSES INVESTIGATIONS OF THE EFFECTS OF CREEP IN PLATE AND SHELL STRUCTURES. CHAPTER 4 REFERS TO RECENT WORK ON WAVE PROPAGATION IN LAYERED SHELLS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-705 040 13/6
SOUTHWEST RESEARCH INST SAN ANTONIO TEX

PROCEEDINGS OF THE SYMPOSIUM ON NONDESTRUCTIVE EVALUATION OF COMPONENTS AND MATERIALS IN AEROSPACE, WEAPONS SYSTEMS AND NUCLEAR APPLICATIONS (7TH) HELD AT SAN ANTONIO, TEXAS, ON APRIL 23-25, 1969. (U)

69 454P

UNCLASSIFIED REPORT
AVAILABILITY: PAPER COPY AVAILABLE FROM WESTERN PERIODICALS CO., 13000 RAYMER ST., NORTH HOLLYWOOD, CALIF. 91605 $25.00.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING, INC., SAN ANTONIO, TEX., SOUTH TEXAS SECTION.

DESCRIPTORS: (*NON-DESTRUCTIVE TESTING, SYMPOSIA), LASERS, PHOTOELASTICITY, CRACK PROPAGATION, ULTRASONIC RADIATION, FATIGUE(MECHANICS), PENETRATION, MAGNETIC RESONANCE, WELDS, COMPOSITE MATERIALS, PRESSURE VESSELS, RADIOGRAPHY, NEUTRON ACTIVATION, ELECTRONIC EQUIPMENT, SPACECRAFT, AIRFRAMES (U)
IDENTIFIERS: PENETRANTS, HOLOGRAPHY (U)

THE DOCUMENT IS COMPRISED OF REPRODUCTION OF THE 45 PAPERS WHICH WERE PRESENTED AT THE SYMPOSIUM. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-707 884 1/3
AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

AIR FORCE AIRCRAFT STRUCTURAL INTEGRITY PROGRAM: AIRPLANE REQUIREMENTS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAY 70 51P WELLS,HAROLD M. , JR.;
KING,TROY T. ;
REPT. NO. ASD-TR-66-57
PROJ: AF-913H
TASK: 97826

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SUPERSEDES REPORT DATED JAN 68, AD-826 492.

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PROPERTIES), BOMBERS, TRANSPORT PLANES, FIGHTERS, TRAINING PLANES, MILITARY REQUIREMENTS, FLUTTER, SONIC FATIGUE, LOADING(MECHANICS) (U)
IDENTIFIERS: DESIGN CRITERIA (U)

THE REPORT SUMMARIZES REQUIREMENTS FOR THE AIRPLANE PORTION OF THE AIRCRAFT STRUCTURAL INTEGRITY PROGRAM BASED UPON THE RESULTS OF EXPERIENCE AND EVENTS SINCE THE INCEPTION OF THE PROGRAM IN 1958. IT SUPPLEMENTS THE DETAILED STRUCTURAL SPECIFICATIONS FOR AIR FORCE AIRPLANES AND UPDATES AERONAUTICAL SYSTEMS DIVISION TECHNICAL REPORT 66-57, DATED JANUARY 1968. APPLICABLE MILITARY SPECIFICATIONS ARE REFERENCED THROUGHOUT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-706 327 1/3 20/11
TORONTO UNIV (ONTARIO) INST FOR AEROSPACE STUDIES

SIMULATION OF RANDOM LOAD FATIGUE IN LABORATORY TESTING. (U)

MAR 70 121P RAVISHANKAR,T. J. ;
REPT. NO. UTIAS-REVIEW-29

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, FATIGUE(MECHANICS)), SIMULATION, AERODYNAMIC LOADING, GUST LOADS, TURBULENCE, COUNTING METHODS, POWER SPECTRA, PROBABILITY DENSITY FUNCTIONS, CRACKS, NUMERICAL ANALYSIS (U)

THE METHODS USED IN LABORATORY SIMULATION OF RANDOM SERVICE LOAD CONDITIONS, THAT LEAD IN PRACTICE TO FATIGUE FAILURE E.G. AIRCRAFT STRUCTURES, ARE REVIEWED. FIRST, THE INTER-RELATION OF THE ATMOSPHERIC TURBULENCE WITH THE RESULTING LOADS ON THE AIRCRAFT ARE DISCUSSED. THEN FOLLOWS AN ANALYSIS AND INTERPRETATION OF SERVICE LOAD HISTORIES AND A REVIEW AND COMPARISON OF THE METHODS IN USE FOR SIMULATING SERVICE LOAD SPECTRA OF ARBITRARY AND RANDOM LOAD SEQUENCES. BOTH RANDOM LOADING, USING DISCRETE LOAD LEVELS OR ANALOGOUS RANDOM PROCESS TESTING, ARE DISCUSSED. FULL SCALE TESTING IS ALSO REVIEWED. IN APPENDICES, STATIONARY RANDOM PROCESSES AND FEWER SPECTRAL DENSITY FUNCTIONS AN EVALUATION OF PROBABILITY DISTRIBUTIONS OF RMS GUST VELOCITIES AND SOME DAMAGE THEORIES ARE PRESENTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-711 259 1/3
ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT
PARIS (FRANCE)

FATIGUE LOAD MONITORING OF MILITARY AIRCRAFT. (U)

DESCRIPTIVE NOTE: ADVISORY REPT.
AUG 70 8P
REPT. NO. AGARD-AR-28-70

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED.

DESCRIPTORS: (*AIRFRAMES, *LOADING(MECHANICS)), (*FATIGUE(MECHANICS), MONITORS), JET FIGHTERS, JET BOMBERS, LANDING GEAR, AERODYNAMIC CONTROL SURFACES (U)

CONTENTS: CURRENT PRACTICES AND PHILOSOPHIES IN MONITORING THE LOADS EXPERIENCED BY AIRCRAFT; MEASUREMENT AND ANALYSIS TECHNIQUES; AND PROBLEMS AND NEEDS. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-717 150 20/11 1/3 9/2
AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB OHIO

CRACKS, A FORTRAN IV DIGITAL COMPUTER PROGRAM FOR CRACK PROPAGATION ANALYSIS. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. JUL 69-MAR 70,
OCT 70 59P ENGLE,ROBERT M. , JR;
REPT. NO. AFFDL-TR-70-107
PROJ: AF-1467
TASK: 146704

UNCLASSIFIED REPORT

DESCRIPTORS: (*CRACK PROPAGATION, COMPUTER PROGRAMS), (*AIRFRAMES, IMPACT TESTS), LOADING(MECHANICS), STRESSES, NUMERICAL ANALYSIS, FRACTURE(MECHANICS) (U)
IDENTIFIERS: CRACK COMPUTER PROGRAM, FORTRAN 4 PROGRAMMING LANGUAGE, FORTRAN (U)

THE REPORT PRESENTS A DETAILED DESCRIPTION OF A COMPUTER PROGRAM FOR ANALYZING CRACK PROPAGATION IN CYCLIC LOADED STRUCTURES. THE PROGRAM HAS THE OPTION OF USING RELATIONSHIPS DERIVED BY FORMAN OR BY PARIS FOR CRACK GROWTH. PROVISIONS ARE MADE FOR BOTH SURFACE FLAWS AND 'THROUGH CRACKS' AS WELL AS THE TRANSITION FROM THE FORMER TO THE LATTER. THE PROGRAM UTILIZES A BLOCK LOADING CONCEPT WHEREIN THE LOAD IS APPLIED FOR A GIVEN NUMBER OF CYCLES RATHER THAN APPLIED FROM ONE CYCLE NUMBER TO ANOTHER CYCLE NUMBER. ADDITIONAL FEATURES OF THE PROGRAM ARE: VARIABLE PRINT INTERVAL, VARIABLE INTEGRATION INTERVAL, AND OPTIONAL FORMATS FOR LOADS INPUT. DETAILED INPUT INSTRUCTIONS AND AN ILLUSTRATIVE PROBLEM ARE PRESENTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-717 181 20/11 1/3 9/2
CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF THE AEROSPACE AND MECHANICAL ENGINEERING SCIENCES

A KOITER-TYPE METHOD FOR FINITE ELEMENT ANALYSIS OF NONLINEAR STRUCTURAL BEHAVIOR. VOLUME II. USER'S MANUAL FOR PROGRAM BEHAVE. (U)

DESCRIPTIVE NOTE: FINAL REPT. 17 OCT 69-17 OCT 70, NOV 70 108P HAFTKA,R. T. ;MALLETT,R. H. ;NACHBAR,W. ;
CONTRACT: F33615-69-C-1899
PROJ: AF-1467
TASK: 146701
MONITOR: AFFDL TR-70-130-VOL-2

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PROPERTIES), (*STRESSES, *COMPUTER PROGRAMS), INSTRUCTION MANUALS, LOADING(MECHANICS), BUCKLING(MECHANICS), STABILITY (U)
IDENTIFIERS: FORTRAN, BEHAVE COMPUTER PROGRAM, FORTRAN 4 PROGRAMMING LANGUAGE, FINITE ELEMENT ANALYSIS, STRUCTURAL ANALYSIS (U)

THE REPORT CONTAINS THE DESCRIPTION OF THE FORTRAN LANGUAGE PROGRAM BEHAVE THAT WAS USED TO OBTAIN THE NUMERICAL RESULTS FOR THE EXAMPLE PROBLEMS THAT ARE PRESENTED AND DISCUSSED IN VOLUME I. PROGRAM BEHAVE IS DESIGNED FOR THE ANALYSIS OF THE STRUCTURAL BEHAVIOR OF RIGIDLY JOINTED PLANAR FRAMES. THE FINITE ELEMENT USED FOR THE ANALYSIS IS THE 'STABILITY' ELEMENT DESCRIBED IN SECTION IV OF VOLUME I. BEHAVE CAN PERFORM A LINEAR STABILITY ANALYSIS, A MODIFIED STRUCTURE METHOD ANALYSIS, A DIRECT NONLINEAR ANALYSIS, AND COMBINATION OF THE ABOVE ANALYSES. THIS VOLUME CONSISTS OF THREE PARTS: A USER'S GUIDE; A PROGRAMMER'S MANUAL; AND A LISTING OF THE PROGRAM AND SUBROUTINES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-717 283 20/11 1/3
BOEING SCIENTIFIC RESEARCH LABS SEATTLE WASH MATHEMATICAL AND INFORMATION SCIENCES LAB

A REVIEW OF MINER'S RULE AND SUBSEQUENT GENERALIZATIONS FOR CALCULATING EXPECTED FATIGUE LIFE. (U)

DEC 70 19P SAUNDERS,SAM C. ;
REPT. NO. D1-82-1019, 45

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REVISION OF PAPER PRESENTED AT THE AIR FORCE CONFERENCE ON FATIGUE AND FRACTURE OF AIRCRAFT STRUCTURE AND MATERIALS, HELD AT MIAMI BEACH, FLA., ON 15-16 DEC 69.

DESCRIPTORS: (*FATIGUE(MECHANICS), MATHEMATICAL MODELS), (*AIRFRAMES, FATIGUE(MECHANICS)), LIFE EXPECTANCY, LOADING(MECHANICS), DAMAGE ASSESSMENT, STOCHASTIC PROCESSES (U)
IDENTIFIERS: MINER RULE, MINER-PALMGREN RULE (U)

THE PAPER RE-EXAMINES THE PHYSICAL ASSUMPTIONS WHICH WERE MADE BY THE ORIGINATORS OF THE MINER-PALGREN RULE FOR THE CALCULATION OF FATIGUE LIFE AND CITES PUBLICATIONS WHICH SHOW THAT THESE ASSUMPTIONS, CALLED THE LINEAR CUMULATIVE DAMAGE HYPOTHESES, ARE CONTRARY TO OUR PRESENT KNOWLEDGE ABOUT ACTUAL FATIGUE BEHAVIOR. HOWEVER, WORK IS ALSO DISCUSSED WHICH PROVIDES EVIDENCE THAT MINER'S RULE IS BETTER ON THE AVERAGE IN ENGINEERING APPLICATIONS THAN ANY OTHER RULE FOR FATIGUE LIFE WHICH HAS BEEN ADVANCED. THE RECENT TECHNICAL PAPERS WHICH RESOLVE THIS SUPPOSED CONTRADICTION ARE REFERENCED AND THE IMPLICATIONS OF THEIR RESULTS EXPLAINED IN FULL DETAIL. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-717 740 20/11 1/3
CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF THE AEROSPACE AND MECHANICAL ENGINEERING SCIENCES

A KOITER-TYPE METHOD FOR FINITE ELEMENT ANALYSIS OF NONLINEAR STRUCTURAL BEHAVIOR. VOLUME 1. THE MODIFIED STRUCTURE METHOD. (U)

DESCRIPTIVE NOTE: FINAL REPT. 17 OCT 69-17 OCT 70, NOV 70 258P HAFTKA,R. T. ;MALLETT,R. H. ;NACHBAR,W. ;
CONTRACT: F33615-69-C-1899
PROJ: AF-1467
TASK: 146701
MONITOR: AFFDL TR-70-130-VOL-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 2, AD-717 181.

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PROPERTIES), (*STRUCTURAL PARTS, LOADING(MECHANICS)), BUCKLING(MECHANICS), STABILITY, MATHEMATICAL MODELS, ELASTICITY, PLASTICITY (U)
IDENTIFIERS: FINITE ELEMENT ANALYSIS, STRUCTURAL ANALYSIS, DEGREES OF FREEDOM, KOITER METHOD (U)

KOITER'S METHOD FOR THE ASYMPTOTIC ANALYSIS OF POST-BUCKLING BEHAVIOR IS REFORMULTED IN FINITE ELEMENT NOTATION FOR APPLICATION TO STRUCTURES IDEALIZED BY FINITE ELEMENT MODELS. KOITER'S METHOD IS HEREIN ADAPTED TO A GENERAL CLASS OF STRUCTURES EXHIBITING THE COMMON SNAP-THROUGH (LIMIT POINT) TYPE OF BUCKLING. THIS IS REFERRED TO AS THE MODIFIED STRUCTURE METHOD. IT IS ACCOMPLISHED BY MODIFICATION OF THE ACTUAL ENERGY FUNCTIONAL TO CREATE A HYPOTHETICAL MODIFIED STRUCTURE HAVING A STRICTLY LINEAR PRE-BUCKLING PATH ALONG WHICH BUCKLING MUST BE OF THE BIFURCATION TYPE. THE ANALYSIS OF THE ACTUAL STRUCTURE IS THEN ACCOMPLISHED BY APPLICATION OF KOITER'S METHOD THROUGH CONSIDERATION OF THE ACTUAL STRUCTURE AS AN IMPERFECT VERSION OF THE MODIFIED STRUCTURE. THE EFFECTS OF PRE-BUCKLING NONLINEARITY ARE APPROXIMATED ASYMPTOTICALLY. THE USE OF THE MODIFIED STRUCTURE METHOD IN CONJUNCTION WITH DIRECT METHODS OF NONLINEAR ANALYSIS IS EXAMINED. A HIGHLY ACCURATE FINITE ELEMENT REPRESENTATION IS EMPLOYED IN PRESENTING A COMPREHENSIVE NUMERICAL EVALUATION OF THE MODIFIED STRUCTURE METHOD OF ANALYSIS ON THE BASIS OF A NUMBER OF PLANAR FRAME PROBLEMS. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-718 386 14/2 14/5
MICHIGAN UNIV ANN ARBOR INST OF SCIENCE AND TECHNOLOGY

INVESTIGATION OF HOLOGRAPHIC TESTING TECHNIQUES. (U)

DESCRIPTIVE NOTE: SEMIANNUAL REPT. NO. 4, 1 JUN-27 NOV 70,
FEB 71 74P LEITH,EMMETT N. ;VEST, CHARLES M. ;
REPT. NO. 2420-21-P
CONTRACT: DAAG46-69-C-0017, ARPA ORDER-1245

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO SEMIANNUAL REPT. NO. 2, AD-705 228.

DESCRIPTORS: (*STEREOSCOPIC PHOTOGRAPHY, LASERS), (*NON-DESTRUCTIVE TESTING, PHOTOELASTICITY), INTERFEROMETERS, AIRPLANE PANELS, SURFACE PROPERTIES, DISTORTION, ALUMINUM, PHOTOGRAPHIC TECHNIQUES, HONEYCOMB CORES (U)
IDENTIFIERS: *HOLOGRAPHY, ACOUSTIC HOLOGRAPHY, INTERFEROMETRIC HOLOGRAPHY, MULTIPLE WAVELENGTH HOLOGRAPHY, COMPUTERIZED SIMULATION, WAVE EQUATIONS (U)

THE REPORT DISCUSSES HOLOGRAPHIC SCHEMES FOR THE DETECTION OF FLAWS IN HONEYCOMB PANELS AND ALSO DESCRIBES THE DEVELOPMENT OF A METHOD OF REDUCING THE SENSITIVITY OF HOLOGRAPHIC INTERFEROMETRY OF TRANSPARENT OBJECTS. AN INTERFEROMETRIC SCHEME FOR DETERMINING THE SURFACE ROUGHNESS OF FLAT OBJECTS IS PRESENTED, AND A PLANNED APPLICATION OF THE TECHNIQUE TO CURVED OBJECTS IS DISCUSSED. RECENT ADVANCES IN MULTIPLE-FREQUENCY HOLOGRAPHIC CONTOURING ARE DESCRIBED, AND A COMPARISON OF HOLOGRAPHIC AND SHADOW-MOIRE CONTOURING SCHEMES IS PRESENTED. A COMPUTER SIMULATION OF ACOUSTICAL HOLOGRAPHY AND ITS USE FOR REDUCTION OF ABERRATION ARE ALSO DISCUSSED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMLI

AD-717 756 1/3 20/11
AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB OHIO

PROCEEDINGS OF THE AIR FORCE CONFERENCE ON FATIGUE AND FRACTURE OF AIRCRAFT STRUCTURES AND MATERIALS, HELD AT MIAMI BEACH, FLA., 15-16 DECEMBER 1969. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
SEP 70 875P
RLPT. NO. AFFDL-TR-70-144

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, *SYMPOSIA), FATIGUE(MECHANICS), FRACTURE(MECHANICS), CRACK PROPAGATION, LIFE EXPECTANCY, STRESSES, LOADING(MECHANICS) (U)

THE DOCUMENT IS COMPRISED OF PAPERS PRESENTED AT THE AIR FORCE CONFERENCE ON FATIGUE OF AIRCRAFT STRUCTURES AND MATERIALS, SPONSORED BY THE AIR FORCE FLIGHT DYNAMICS LABORATORY (AFFDL) AND THE AIR FORCE MATERIALS LABORATORY (AFML), AIR FORCE SYSTEMS COMMAND. THE PURPOSE OF THE CONFERENCE WAS TO DISCUSS TECHNOLOGICAL ADVANCEMENTS IN FATIGUE AND FRACTURE THEORY. THE CONFERENCE WAS COMPRISED OF TEN TECHNICAL SESSIONS (INCLUDING TWO PANEL DISCUSSIONS) ENTITLED 'THE ROLE OF MATERIALS IN STRUCTURES'; 'FUNDAMENTALS I + II'; 'CRITERIA'; 'FRACTURE I + II'; 'PHENOMENA I + II'; 'ANALYSIS'; 'DESIGN AND SERVICE EXPERIENCE'. A TOTAL OF FIFTY-SIX TECHNICAL PAPERS WERE PRESENTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-719 757 20/11 20/12 1/3
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

AN APPLICATION OF FRACTURE CONCEPTS TO THE PREDICTION OF CRITICAL LENGTH OF FATIGUE CRACKS. PART I. A REVIEW OF PERTINENT ASPECTS OF FRACTURE - DEVELOPMENT OF RELEVANT CONCEPTS OF LINEAR ELASTIC FRACTURE MECHANICS). (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. JUN 69-JUN 70,
JAN 71 79P DAVIS,SIDNEY O. ;
REPT. NO. AFML-TR-70-202-PT-1
PROJ: AF-7351
TASK: 735108

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: MASTERS THESIS.

DESCRIPTORS: (*FRACTURE(MECHANICS), REVIEWS), (*AIRFRAMES, FRACTURE(MECHANICS)), CRACK PROPAGATION, STRAIN(MECHANICS), STRESSES, FATIGUE(MECHANICS), PLASTICITY, LOADING(MECHANICS), ROCKET CASES, AEROSPACE CRAFT, ALUMINUM ALLOYS, GLASS, ELASTICITY, MATHEMATICAL ANALYSIS, REVIEWS, THESES (U)
IDENTIFIERS: GRIFFITH CRACKS (U)

THE PURPOSE OF THIS REPORT IS TO SYNTHESIZE TECHNOLOGICAL CONCEPTS OF FRACTURE BY MAKING A HISTORICAL REVIEW OF THE LITERATURE FROM 1913 UP TO THE PRESENT TIME. THE PERTINENT ASPECTS OF FRACTURE AND THE DEVELOPMENT OF RELEVANT CONCEPTS OF LINEAR ELASTIC FRACTURE MECHANICS DERIVATIVES WERE DELINEATED AND SUMMARIZED FOR THE PREDICTION OF THE CRITICAL LENGTH OF FATIGUE CRACKS. THE PERTINENT ASPECTS OF FRACTURE CONSISTED OF THE SYNTHESIS OF INGLISS, GRIFFITH, OROWAN, IRWIN, AND WESTERGAARD'S RELEVANT THEORETICAL CONCEPTS. IT ALSO DELINEATES BOYLE'S ANALYTICAL AND EXPERIMENTAL RESULTS OF THE WESTERGAARD-IRWIN THEORETICAL COMPLIANCE OF THROUGH-THE-THICKNESS CENTRALLY CRACKED PLATE AND SHEET FOR THE DETERMINATION OF PLANE-STRAIN AND PLANE-STRESS FRACTURE TOUGHNESS STRESS-INTENSITY PARAMETER OF HIGH STRENGTH ALLOYS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMLI

AD-723 111 1/3 14/4
AERONAUTICAL RESEARCH INST OF SWEDEN STOCKHOLM

STUDY OF INSPECTION INTERVALS FOR FAIL-SAFE STRUCTURES. (U)

70 S/P EGGWERTZ,SIGGE ;LINDSJO,
GORAN ;
REPT. NO. FFA-123

UNCLASSIFIED REPORT

DESCRIPTORS: (*MAINTENANCE, VISUAL INSPECTION), (*AIRFRAMES, DEGRADATION), LIFE EXPECTANCY, FATIGUE(MECHANICS), FAILURE(MECHANICS), CRACKS, CRACK PROPAGATION, PREDICTIONS, STOCHASTIC PROCESSES, MONTE CARLO METHOD, SWEDEN (U)
IDENTIFIERS: FAIL SAFE STRUCTURES, SCHEDULED MAINTENANCE, UNSCHEDULED MAINTENANCE (U)

BASED ON A METHOD OF EVALUATING THE RELIABILITY OF FAIL-SAFE STRUCTURES, DEVELOPED EARLIER AT FFA, A THEORETICAL INVESTIGATION, APPLICABLE TO AN AIRCRAFT WING, HAS BEEN MADE OF THE INFLUENCE OF THE LENGTH OF INSPECTION INTERVALS WHICH ARE BOTH CONSTANT AND VARYING. AN OPTIMUM STUDY SHOWS THAT THE LEAST NUMBER OF REGULAR INSPECTIONS DURING THE SERVICE LIFE IS OBTAINED BY MAKING ESPECIALLY THE FIRST INTERVAL CONSIDERABLY LONGER THAN THE FOLLOWING ONES. THIS RESULT PRESUPPOSES THAT ALL FATIGUE CRACKS OCCURRING MAY BE STATISTICALLY ANTICIPATED. UNSCHEDULED INSPECTIONS, RANDOMLY DISTRIBUTED IN TIME, DECREASE THE RISK OF TOTAL FAILURE BUT ARE SHOWN TO BE MUCH LESS EFFECTIVE THAN REGULAR INSPECTIONS. THIS IS ALSO DEMONSTRATED IN A NUMERICAL EXAMPLE ASSUMING CYCLIC INSPECTION ON A FLEET OF 100 AIRCRAFT WITH A SAMPLING RATIO OF 0.25 FOR THE REGULAR INSPECTIONS AND FURTHER EXTRA RANDOM INSPECTIONS. IT IS CONCLUDED THAT UNSCHEDULED INSPECTIONS SHOULD NOT BE CARRIED OUT, UNLESS A COMPLETELY UNEXPECTED CRACK HAS BEEN FOUND, WHICH WILL MAINLY HAPPEN DURING THE FIRST PART OF THE SERVICE LIFE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-723 317 1/3
BATTELLE MEMORIAL INST COLUMBUS OHIO DEFENSE METALS INFORMATION CENTER

CONCEPTS IN FAIL-SAFE DESIGN OF AIRCRAFT STRUCTURES. (U)

MAR 71 25P BROEK,DAVID ;
REPT. NO. DMIC-MEMO-252
CONTRACT: F33615-71-C-1067

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, DESIGN), FAILURE(MECHANICS), CRACK PROPAGATION, FATIGUE(MECHANICS), STRESSES, LOADING(MECHANICS) (U)
IDENTIFIERS: *FAIL SAFE DESIGN (U)

IN ORDER TO OBTAIN AN APPRAISAL OF THE STATE OF THE ART OF FAIL-SAFE DESIGN, THE AUTHOR MADE AN INVESTORY OF FAIL-SAFE DESIGN METHODS APPLIED BY VARIOUS AEROSPACE COMPANIES AND OF RESEARCH WORK RELEVANT TO THE ENGINEERING APPROACH OF FATIGUE-CRACK PROPAGATION AND RESIDUAL STRENGTH. THIS MEMORANDUM IS BASED ON INFORMATION FROM DISCUSSIONS WITH PERSONNEL OF SEVERAL COMPANIES AND RESEARCH LABORATORIES, WITH THE MAIN EMPHASIS ON PLANE STRESS AND TRANSITIONAL FRACTURE BEHAVIOR. THE MEMORANDUM PRESENTS A BRIEF DESCRIPTION OF THE GENERAL APPROACH TO THE FAIL-SAFE PROBLEM, AN ANALYSIS OF SEVERAL OF THE EXISTING METHODS THAT USE THIS APPROACH, INCLUDING THEIR SHORTCOMINGS, AND A SUMMARY OF THE DATA REQUIRED FOR A GOOD FAIL-SAFE DESIGN. A SPECIFIC APPROACH PROPOSED FOR THE PRESENTATION IN MIL-HDBK-5 OF DATA PERTINENT TO THE FAIL-SAFE DESIGN CONCEPT IS EVALUATED IN TERMS OF ITS APPLICABILITY TO THAT CONCEPT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-724 475 20/11
CHESAPEAKE COLL WYE MILLS MD

PROCEEDINGS OF MECHANICAL FAILURES PREVENTION GROUP (11TH) HELD AT WILLIAMSBURG, VIRGINIA, ON 7-8 APR 70. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
APR 71 48P SAWYER,W. T. ;
CONTRACT: N00014-69-C-0108
PROJ: NR-249-015
MONITOR: MPPG 5

UNCLASSIFIED REPORT

DESCRIPTORS: (*FATIGUE(MECHANICS), SYMPOSIA), CRACKS, CRACK PROPAGATION, PRESSURE VESSELS, AIRFRAMES, ANTIFRICTION BEARINGS, COMPOSITE MATERIALS, NON-DESTRUCTIVE TESTING, FRACTURE(MECHANICS) (U)
IDENTIFIERS: FRACTURE MECHANICS, ACOUSTIC EMISSION (U)

THE DOCUMENT COVERS DISCUSSIONS BY A GROUP OF TECHNICAL SPECIALISTS OF THE TOPIC 'MECHANICAL FATIGUE AS A CRITICAL FAILURE MECHANISM.' SIXTEEN PREPARED TALKS ON THE SUBJECT ARE SUMMARIZED AND THE ENSUING AUDIENCE DISCUSSIONS REPORTED. A TECHNICAL SUMMARY OF THE COMPLETE PROCEEDINGS IS INCLUDED. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-725 028 20/11 20/12 1/3
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

AN APPLICATION OF FRACTURE CONCEPTS TO THE PREDICTION OF CRITICAL LENGTH OF FATIGUE CRACKS. PART II. A REVIEW OF PERTINENT ASPECTS OF FRACTURE (THEORETICAL AND ANALYTICAL ASPECTS OF FATIGUE OF METALS). (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. JUN 69-JUN 70,
APR 71 113P DAVIS,SIDNEY O. ;
REPT. NO. AFML-TR-70-202-PT-2
PROJ: AF-7351
TASK: 735108

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: MASTER'S THESIS. SEE ALSO PART 1, AD-719 757.

DESCRIPTORS: (*FRACTURE(MECHANICS), REVIEWS), (*AIRFRAMES, FRACTURE(MECHANICS)), CRACK PROPAGATION, FATIGUE(MECHANICS), STRESSES, STRAIN(MECHANICS), LOADING(MECHANICS), PLASTICITY, ELASTICITY, ALUMINUM ALLOYS, CREEP, AEROSPACE CRAFT, ROCKET CASES, THESES (U)

THIS PART OF THE REPORT (VOLUME 2) PRESENTS A TECHNICAL DOCUMENTARY HISTORICAL REVIEW OF PERTINENT THEORETICAL AND ANALYTICAL ASPECTS OF FATIGUE FAILURE AND ITS RELATIONSHIP TO FRACTURE MECHANICS. THE REVIEW COVERS THE PERIOD 1829 TO 1970. FATIGUE FAILURE, I.E., FRACTURE WITHOUT GROSS PLASTIC DEFORMATION UNDER REPEATED APPLICATION OF STRESS BELOW THE PROPORTIONAL LIMIT, HAS BEEN RECOGNIZED FOR AT LEAST 138 YEARS. DESPITE NUMEROUS INVESTIGATIONS ON THE SUBJECT, THERE IS NO AVAILABLE THEORY FOR CORRELATING THE MANY VARIABLES AFFECTING FATIGUE FAILURE AND FOR SUCCESSFULLY PREDICTING FAILURE. THE APPLICATION OF LINEAR ELASTIC FRACTURE MECHANICS AND THE THERMODYNAMICS OF FRACTURE TO THE CRACK PROPAGATION FACET OF FATIGUE IS PROPOSED AS AN APPROACH TO THE PREDICTION OF CRITICAL LENGTHS OF STABLE FATIGUE CRACKING AND UNSTABLE FRACTURING BEFORE FAILURE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-727 345 20/1 1/3
NATIONAL AERONAUTICAL ESTABLISHMENT OTTAWA (ONTARIO)

EFFECTIVE SOURCE DISTRIBUTION IN A CHOKED SCREECH JET. (U)

MAY 71 43P LEE,D. H. K. ;WESTLEY,R.
;
REPT. NO. NAE-LR-548
MONITOR: NRC 12111

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, FATIGUE(MECHANICS)), (*JET ENGINE NOISE, AIRFRAMES), MATHEMATICAL ANALYSIS, MODEL TESTS, SUPERSONIC NOZZLES, TEST EQUIPMENT, SOURCES, NOISE GENERATORS, FEEDBACK, FLOW FIELDS, STATISTICAL DISTRIBUTIONS (U)
IDENTIFIERS: *SHOCK CELL NOISE, *CHOKED SCREECH JETS, SOUND PRESSURE (U)

USING EXPERIMENTAL MEASUREMENTS OF THE SOUND PRESSURE AND PHASE IN THE NEAR FIELD OF A CHOKED SCREECH JET, A METHOD IS PROPOSED FOR COMPUTING THE EFFECTIVE SOURCE POSITIONS, THEIR STRENGTHS AND PHASES. TWO MODELS ARE CONSIDERED. THE FIRST ASSUMES A DISTRIBUTION OF POINT SOURCES ALONG THE JET AXIS AND THE SECOND ASSUMES RING SOURCES ALONG THE JET BOUNDARY INSTEAD. A TECHNIQUE OF MINIMIZATION DUE TO POWELL IS USED AND A SOLUTION IS OBTAINED WHEN THE SUM OF SQUARES REACHES A MINIMUM. RESULTS FOR A CHOKED JET AT A SCREECH FREQUENCY OF 3170 C/S ARE PRESENTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-731 565 1/3 11/6 13/8
AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB OHIO

FRACTURE CONTROL PROCEDURES FOR AIRCRAFT STRUCTURAL INTEGRITY. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUL 71 86P WOOD,HOWARD A. ;
REPT. NO. AFFDL-TR-71-89
PROJ: AF-1467
TASK: 146704

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PRESENTED TO THE INTERNATIONAL COMMITTEE ON AERONAUTICAL FATIGUE HELD AT MIAMI BEACH, FLA., ON 13-14 MAY 71.

DESCRIPTORS: (*AIRFRAMES, FRACTURE(MECHANICS)), (*QUALITY CONTROL, AIRFRAMES), DEFECTS(MATERIALS), FAILURE(MECHANICS), CRACKS, LOADING(MECHANICS), STRESSES, STRAIN(MECHANICS), BRITTLENESS, ALUMINUM ALLOYS, TITANIUM ALLOYS, STEEL (U)
IDENTIFIERS: DESIGN CRITERIA, STRUCTURAL ANALYSIS (U)

THE REPORT REVIEWS THE APPLICATION OF APPLIED FRACTURE MECHANICS IN THE DESIGN, ANALYSIS AND QUALIFICATION OF AIRCRAFT STRUCTURAL SYSTEMS. RECENT SERVICE EXPERIENCES ARE CITED. CURRENT TRENDS IN HIGH STRENGTH MATERIALS APPLICATION ARE REVIEWED WITH PARTICULAR EMPHASIS ON THE MANNER IN WHICH FRACTURE TOUGHNESS AND STRUCTURAL EFFICIENCY MAY AFFECT THE MATERIAL SELECTION PROCESS. GENERAL FRACTURE CONTROL PROCEDURES ARE REVIEWED IN DEPTH WITH SPECIFIC REFERENCE TO THE IMPACT OF INSPECTABILITY, STRUCTURAL ARRANGEMENT AND MATERIAL ON PROPOSED ANALYSIS REQUIREMENTS FOR SAFE CRACK GROWTH. THE RELATIVE IMPACT ON ALLOWABLE DESIGN STRESS IS INDICATED BY EXAMPLE. DESIGN CRITERIA, MATERIAL AND ANALYSIS REQUIREMENTS FOR IMPLEMENTATION OF FRACTURE CONTROL PROCEDURES ARE REVIEWED TOGETHER WITH LIMITATION IN CURRENT AVAILABLE DATA TECHNIQUES. A SUMMARY OF ITEMS WHICH REQUIRE FURTHER STUDY AND ATTENTION IS PRESENTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-730 318 1/3 20/11
ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT
PARIS (FRANCE)

OPTIMALITY CRITERIA IN STRUCTURAL DESIGN. (U)

DEC 71 17P PRAGER,W. ;
REPT. NO. AGARD-R-589-71

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED.

DESCRIPTORS: (*SANDWICH CONSTRUCTION, OPTIMIZATION), (*AIRFRAMES, BEAMS(STRUCTURAL)), DESIGN, BENDING, LOADING(MECHANICS), DEFLECTION, BUCKLING(MECHANICS), NUMERICAL ANALYSIS (U)

THE REPORT IS CONCERNED WITH THE DERIVATION OF OPTIMALITY CONDITIONS FROM EXTREMUM PRINCIPLES OF STRUCTURAL THEORY, WITH SPECIAL EMPHASIS ON CONDITIONS FOR GLOBAL OPTIMALITY. AFTER A BRIEF INTRODUCTION (SECT. 1), OPTIMAL DESIGN OF SANDWICH STRUCTURES IS DISCUSSED FOR A SINGLE BEHAVIORAL CONSTRAINT (SECT. 2) OR MULTIPLE CONSTRAINTS (SECT. 3). STRUCTURAL ELEMENTS WITH SOLID SECTIONS ARE TREATED IN SECT. 4. A THREE-DIMENSIONAL PROBLEM THAT INCLUDES MANY PROBLEMS OF OPTIMAL STRUCTURAL DESIGN AS SPECIAL CASES IS INVESTIGATED IN SECT. 5. IN SECT. 6, THE OPTIMALITY CRITERIA DISCUSSED IN THE PRECEEDING SECTIONS ARE PRESENTED IN A UNIFIED WAY THAT FREQUENTLY SUGGESTS THE FORM OF OPTIMALITY CONDITIONS IN NEW SITUATIONS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-736 887 1/3 11/6
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

RATE OF FATIGUE CRACK PROPAGATION IN THE AIRFRAME STRUCTURE. (U)

NOV 71 14P BLAZEWICZ,WITOLD
REPT. NO. FTD-HC-23-1487-71

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF TECHNIKA LOTNICZA I ASTRONAUTYCZNA (POLAND) V25 N2 P10-13, 20 1970.

DESCRIPTORS: (*AIRFRAMES, FATIGUE(MECHANICS)), CRACK PROPAGATION, TRANSPORT PLANES, ALUMINUM ALLOYS, LOADING(MECHANICS), POLAND (U)
IDENTIFIERS: TRANSLATIONS (U)

A DESCRIPTION IS GIVEN OF A METHOD FOR CALCULATING THE FATIGUE STRENGTH OF AIRFRAME STRUCTURES WITH AN EXISTING CRACK. THE METHOD MAKES IT POSSIBLE TO DETERMINE THE DEPENDENCE OF CRACK LENGTH ON THE DURATION OF USAGE (NUMBER OF KILOMETERS COVERED IN FLIGHT OR THE NUMBER OF FLIGHT HOURS). THE TECHNIQUE WAS USED TO STUDY FATIGUE STRENGTH IN SAMPLES WITH AND WITHOUT STRAIN HARDENING, SHOWING THE INFLUENCE OF STRAIN HARDENING ON CRACK PROPAGATION PARAMETERS DURING VARIABLE AMPLITUDE LOADING (BASED ON LOAD SPECTRA FOR TRANSPORT AIRCRAFT). THE TEST DATA SHOW THE POSSIBILITY OF A SIGNIFICANT REDUCTION ON THE RATE OF CRACK PROPAGATION WITH THE AID OF PROPERLY CHOSEN STRAIN HARDENING. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-739 331 1/3
NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA

ARRESTED LANDING FATIGUE TEST OF MODEL C-2A AIRPLANE. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JUN 71 39P KAUTZ,EDWARD F. ;
REPT. NO. NADC-ST-7111
PROJ: A53-530/202/78U12-74-84

UNCLASSIFIED REPORT

DESCRIPTORS: (*TRANSPORT PLANES, LIFE EXPECTANCY), (*AIRFRAMES, FATIGUE(MECHANICS)), CARRIER LANDINGS, TESTS, NAVAL AIRCRAFT, STRESSES (U)
IDENTIFIERS: C-2 AIRCRAFT, C-2A AIRCRAFT, FATIGUE TESTS (U)

A LABORATORY FATIGUE TEST WAS PERFORMED ON A C-2A AIRFRAME TO DETERMINE WHETHER THE AIRFRAME COULD SUSTAIN THE EFFECTS OF 3000 ARRESTED LANDINGS. A TOTAL OF 6000 ARRESTED LANDING CYCLES WERE APPLIED TO THE AIRFRAME DURING THE TEST WITH NO STRUCTURAL FAILURES. WITH A TEST SCATTER FACTOR OF 2, THE 600 TEST CYCLES ARE EQUIVALENT TO 3000 SERVICE ARRESTED LANDINGS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-863 490 13/8 1/3
AUTOMATION INDUSTRIES INC BOULDER COLO RESEARCH DIV

DEVELOPMENT OF A THERMAL NONDESTRUCTIVE INSPECTION SYSTEM TO DETECT CORROSION IN AIRCRAFT STRUCTURES. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
OCT 69 28P ROBICHAUD,ROGER E. ;
REPT. NO. TR-69-55
CONTRACT: N00019-69-C-0018

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, NON-DESTRUCTIVE TESTING), (*NON-DESTRUCTIVE TESTING, CORROSION), INFRARED EQUIPMENT, PORTABLE, DEFECTS(MATERIALS) (U)

A PORTABLE THERMAL NONDESTRUCTIVE SYSTEM SUITABLE FOR INSPECTING LARGE STRUCTURES IN THE FIELD AND LABORATORY WAS DESIGNED, BUILT AND TESTED. THE SYSTEM HAS THE CAPABILITY OF DETECTING NEAR SURFACE MATERIAL AND STRUCTURAL DEFECTS SUCH AS VOIDS, DELAMINATIONS, UNBOUNDS, INCLUSIONS AND CORROSION. THE SYSTEM CONSISTS OF A HANDHELD SCANNING HEAD, OPERATOR'S CONTROL CONSOLE AND INTERCONNECTING CABLE. THE NECESSARY HARDWARE AND ELECTRONICS TO SEQUENTIALLY HEAT AND SCAN THE SURFACE TEMPERATURE OF A TEST MATERIAL ARE INCLUDED WITHIN THE HEAD. SIGNAL PROCESSING ELECTRONICS, DISPLAY OSCILLOSCOPE, RECORDER AND OPERATOR'S CONTROLS ARE ENCLOSED IN THE CONTROL CONSOLE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOML1

AD-880 680 1/3 1/2
DYNAMIC SCIENCE PHOENIX ARIZ AVSER FACILITY

ANALYSIS OF HELICOPTER STRUCTURAL CRASHWORTHINESS. VOLUME I. MATHEMATICAL SIMULATION AND EXPERIMENTAL VERIFICATION FOR HELICOPTER CRASHWORTHINESS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JAN 71 160P GATLIN,CLIFFORD I. ;GOEBEL,
DONALD E. ;LARSEN,STUART E. ;
REPT. NO. AVSER-1520-70-30
CONTRACT: DAAJ02-69-C-0030
PROJ: DA-1-F-162203-A-529
MONITOR: USAAVLABS TR-70-71A

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 2, AD-880 678.

DESCRIPTORS: (*HELICOPTERS, AIRFRAMES), (*AIRFRAMES, STRUCTURAL PROPERTIES), (*AVIATION SAFETY, HELICOPTERS), MATHEMATICAL MODELS, FAILURE(MECHANICS), AVIATION ACCIDENTS, IMPACT (U)
IDENTIFIERS: H-1 AIRCRAFT, UH-1D AIRCRAFT, UH-1H AIRCRAFT, *CRASHWORTHINESS (U)

THE REPORT DESCRIBES THE DEVELOPMENT OF A MATHEMATICAL MODEL THAT WILL SIMULATE THE RESPONSE OF A UH-1D/H HELICOPTER AIRFRAME TO VERTICAL CRASH LOADING AND THE FULL-SCALE CRASH TEST PERFORMED TO VERIFY THE VALIDITY OF THE MODEL. THE RESULTS OF THIS PROGRAM INDICATE THAT: THE STRUCTURAL WEAKNESS CONTRIBUTING TO MOST IMPACT INJURIES IN UH-1D/H HELICOPTER ACCIDENTS ARE LACK OF RESISTANCE TO FAILURE IN LATERAL ROLL-OVER AND LACK OF ENERGY-ABSORBING CAPABILITY TO REDUCE VERTICAL ACCELERATIONS; THE MATICAL MODEL IS CAPABLE OF ACCURATELY PREDICTING THE FLOOR AND ENGINE ACCELERATIONS AND DEFLECTIONS; IN ITS PRESENT FORM, THE MODEL DOES NOT ACCURATELY PREDICT THE TRANSMISSION ACCELERATIONS AND DEFLECTIONS. (AUTHOR) (U)

II.

INSTRUMENTATION

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZAML1

AD-295 469
BOLT BERANEK AND NEWMAN INC CAMBRIDGE MASS

STUDY OF A SONIC LOAD RECORDER (U)

NOV 62 IV BALL,JAY H.;DOELLING,NORMAN
REPT. NO. TDR62 165 VI
CONTRACT: AF33 616 7789
MONITOR: ASD TDR62 165 VI

UNCLASSIFIED REPORT

DESCRIPTORS: *ACOUSTIC DETECTORS, *ERRORS, *NOISE ANALYZERS, *ROCKET MOTOR NOISE, ACOUSTIC FILTERS, AIRCRAFT, AMPLITUDE MODULATION, DETECTION, FATIGUE (MECHANICS), FREQUENCY, JET ENGINE NOISE, JET ENGINES, JET PLANES, NOISE, POWER SUPPLIES, PROPAGATION, SONAR, SONAR RECEIVERS, SOUND, TEMPERATURE, TRANSDUCERS, VIBRATION (U)
IDENTIFIERS: B-47 AIRCRAFT, B-58 AIRCRAFT (U)

THE FEASIBILITY OF A COMPACT INSTRUMENT TO MEASURE THE ACCUMULATED ACOUSTIC EXPOSURE OF A FLIGHT VEHICLE IS CONSIDERED. THE OUTPUT DATA OF THE INSTRUMENT WILL AID THE ESTIMATION OF FATIGUE LIFE. A STUDY OF THE CONDITIONS AND PARAMETERS INVOLVED TOGETHER WITH GENERAL REQUIREMENTS OF THE INSTRUMENT IS PRESENTED. DESIGN CRITERIA ARE DISCUSSED SUCH AS TECHNIQUES FOR AMPLITUDE ANALYSIS, SAMPLING AND ACCUMULATION OF DATA IN A DIRECTLY READABLE AND USABLE FORM. A SPECIFIC DESIGN OF A BREADBOARD MODEL OF THE SONIC RECORDER IS GIVEN WITH TEST AND PERFORMANCE DATA UNDER LABORATORY CONDITIONS. A DISCUSSION OF THE EFFECTS OF TEMPERATURE, VIBRATION, AND POWER SUPPLY VARIATIONS IS ALSO INCLUDED. COMPLETE CIRCUIT DIAGRAMS ARE PROVIDED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZAML1

AD-403 507
BOLT BERANEK AND NEWMAN INC CAMBRIDGE MASS

STUDY OF A RESPONSE LOAD RECORDER. VOLUME II. (U)

DESCRIPTIVE NOTE: FINAL REPT. JAN-AUG 62,
MAR 63 105P SMITH,P.H.;STARR,E.A.;
DIETRICH,C.W.;NOISEUX,D.U.;
CONTRACT: AF33 616 7789
PROJ: 1370
TASK: 137005
MONITOR: ASD TDR62 165, VOL. 2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON DYNAMIC PROBLEMS IN FLIGHT VEHICLES.

DESCRIPTORS: *SONIC FATIGUE, STRUCTURES, AIR FRAMES, ACOUSTIC PROPERTIES, DYNAMICS, AIRBORNE, RESONANCE, STRAIN GAGES, NOISE ANALYZERS, LOADING (MECHANICS), NOISE, JET ENGINE NOISE, FATIGUE (MECHANICS), TRANSDUCERS, ELECTROACOUSTIC TRANSDUCERS, MATHEMATICAL PREDICTION, RECORDING SYSTEMS. (U)

A COMPACT INSTRUMENT TO MEASURE THE STRAIN HISTORY OF A POINT ON A RESONANT STRUCTURE OF A FLIGHT VEHICLE IS CONSIDERED. THE OUTPUT DATA FROM THE INSTRUMENT IS DESIGNED TO AID IN THE ESTIMATION OF ACOUSTIC FATIGUE DAMAGE. THE ABILITY OF A STRAIN GAGE TO PERFORM UNDER FATIGUE CONDITIONS IS EXAMINED. THE DESIGN OF CIRCUITRY TO MODIFY THE SONIC RECORDER DISCUSSED IN VOLUME I (AD-295 464) TO A RESPONSE RECORDER ARE DISCUSSED. PERFORMANCE DATA OF THE BREAD BOARDED RESPONSE RECORDER, TESTED WITH A RESONANT STRUCTURE, ARE GIVEN. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZAML1

AD-692 480 14/2
AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB OHIO

SCRATCH STRAIN GAGE EVALUATION. (U)

DESCRIPTIVE NOTE: SUMMARY REPT. OCT 68-JAN 69,
JUL 69 44P HAGLAGE,THEODORE L. ;WOOD,
HOWARD A. ;
REPT. NO. AFFDL-TR-69-25
PROJ: AF-1467
TASK: 146704

UNCLASSIFIED REPORT

DESCRIPTORS: (*STRAIN GAGES, SENSITIVITY), AIRFRAMES, MEASUREMENT, CORRELATION TECHNIQUES, FATIGUE(MECHANICS), STRAIN(MECHANICS) (U)

THE TEST RESULTS ON THE EVALUATION OF THE PREWITT SCRATCH STRAIN GAGE ARE PRESENTED IN THE REPORT. THE TEST PROGRAM WAS TWOFOLD: (1) OBSERVATION OF THE GAGE OPERATION UNDER VARIOUS STRAIN APPLICATIONS AND (2) INVESTIGATION OF STRAIN RECORDING SENSITIVITY AND MEASUREMENT. THE SCRATCH STRAIN GAGE AS TESTS INDICATED IS A FEASIBLE AND ACCURATE MEANS OF RECORDING STRAINS OF A CHARACTER AND MAGNITUDE EXPECTED TO BE FOUND IN A TYPICAL AIRCRAFT STRUCTURE. THE RECORDING SENSITIVITY IS CONTROLLED BY PROPER INSTALLATION TECHNIQUES AND GAGE LENGTH. FOR THE LABORATORY CONDITIONS REPORTED, THE MEASURED STRAINS WERE EQUIVALENT TO THE ELECTRICAL RESISTANCE GAGES WITHIN 100 MICRO STRAIN. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZAML1

AD-725 840 1/3
NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA

STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT. (U)

DESCRIPTIVE NOTE: SUMMARY REPT. 1 JAN 62-1 JAN 71,
MAY 71 107P DEFIORE,THOMAS A. ;
REPT. NO. NADC-ST-7108
PROJ: A53530/202/78012-74-84

UNCLASSIFIED REPORT

DESCRIPTORS: (*NAVAL AIRCRAFT, AERODYNAMIC LOADING), (*ACCELEROMETERS, STATISTICAL DATA), AIRFRAMES, FATIGUE(MECHANICS), LOAD DISTRIBUTION, TRAINING PLANES, JET FIGHTERS (U)

THE REPORT IS A SPECIALIZED SUMMARY OF NORMAL ACCELERATION DATA RECORDED BY COUNTING ACCELEROMETERS. DATA ARE SEPARATED BY CALENDAR TIME AND MISSION CATEGORY. ONLY DATA REPORTED IN THE COUNTING ACCELEROMETER PROGRAM ARE INCLUDED. (AUTHOR) (U)

III.

SONIC FATIGUE

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-258 591
SOUTHAMPTON UNIV (ENGLAND)

EXPERIMENTAL STUDY OF THE RANDOM VIBRATIONS OF AN AIRCRAFT STRUCTURE EXCITED BY JET NOISE (U)

IV CLARKSON,B.L.;FORD,R.D.;

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRFRAMES, *JET ENGINE NOISE, *VIBRATION, AIRCRAFT, AIRPLANE PANELS, ANALYSIS, FATIGUE (MECHANICS), MATHEMATICAL ANALYSIS, RESONANCE, STRESSES, TESTS, THEORY (U)

RECORDINGS HAVE BEEN MADE OF THE STRAINS INDUCED IN A FULL SCALE REAR FUSELAGE TEST STRUCTURE OF THE CARAVELLE AIR-LINER WHEN ONE JET ENGINE IS RUNNING AT MAXIMUM TAKE-OFF THRUST. THE ANALYSIS HAS BEEN CONCENTRATED ON THE STRAINS IN THE CENTERS OF PANELS. CORRELATION MEASUREMENTS INDICATE THAT THE LARGER PANEL STRAINS OCCUR ABOVE 500 C. WITH THE FRAMES ACTING AS BOUNDARIES. THE MAIN RESONANCE PEAK IN EACH PANEL HAS BEEN IDENTIFIED WITH THE FUNDAMENTAL STRINGER-TWISTING MODE BUT THE MODE-SHAPES FOR THE TWO SMALLER PEAKS HAVE NOT BEEN COMPLETELY DETERMINED. AN ATTEMPT HAS BEEN MADE TO CALCULATE THE PANEL RESONANT FREQUENCIES THEORETICALLY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-256 689
DOUGLAS AIRCRAFT CO INC EL SEGUNDO CALIF

SONIC FATIGUE DAMPING SYSTEM DEVELOPMENT (U)

JUL 60 IV SMILLIE,D.G.;
REPT. NO. ES 29926
CONTRACT; NOAS60 6072

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRFRAMES, *CANTILEVER BEAMS, *DAMPING, *ELASTOMERS, *RUBBER COATINGS, *VIBRATION, *VIBRATION ISOLATERS, ABSORPTION, ADHESION, AIRPLANE PANELS, ALUMINUM ALLOYS, COATINGS, ELASTICITY, FATIGUE (MECHANICS), INSTRUMENTATION, JET ACOUSTIC OSCILLATIONS, MATERIALS, PLASTIC COATINGS, POLYMERS, SHEETS, SOUND, STRAIN GAGES, TEMPERATURE, TEST FACILITIES, TEST METHODS, VISCOSITY (U)

A LITRATURE SEARCH WAS MADE TO SURVEY COMMERCIALLY AVAILABLE DAMPING AND ADHESIVE MATERIALS AND TO DETERMINE THE PHYSICAL PROPERTIES OF THOSE MATERIALS WHICH REDUCE RESONANT-STRES . DAMPING RATIS OF 108 UNCOATED STRIP SPECIMENS HAVE BEEN MEAURED AND RECORDED. A LOAD-STRESS CURVE HAS BEEN PLOTTED FOR 30 UNCOATEDL-NER ADHESION TEST SPECIMENS. THIRTY VISCOELASTIC MATERIALS HAVE BEEN ACQUIRED. COUPONS OF THESE MIALS HAVE BEEN PREPARED FOR PEEL STRENGTH AND ENVIRONMENTAL TESTS. INVESTIGATION OF THE HIGH-TEMPERATURE STRAIN GAUGE TECHNIQUES REQUIRED FOR THE PROGRAM HAS BEEN INITIATED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-266 374
MINNESOTA UNIV MINNEAPOLIS

WADC-UNIVERSITY OF MINNESOTA CONFERENCE ON ACOUSTICAL FATIGUE (U)

MAR 61 494P TRAPP ,W. J. ;FORNEY,D. M. , JR;

CONTRACT: AF33 616 5426
PROJ: AF-7360
MONITOR: WADC TR-59-676

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PAPERS AND SEMINAR MATERIAL PRESENTED AT THE CONFERENCE HELD AT BEECHER'S RESORT, ANNANDALE, MINN., 29 SEP-2 OCT 59.

DESCRIPTORS: *ACOUSTICS, *FATIGUE (MECHANICS), *SYMPOSIA, AIRFRAMES, BOUNDARY LAYER, DAMPING, DESIGN, GAS FLOW, JET ENGINE NOISE, JOINTS, MATERIALS, MECHANICS, NOISE, PRESSURE, STRUCTURES, TURBULENCE, VIBRATION (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-263 260
NATIONAL ENGINEERING SCIENCE CO PASADENA CALIF

ASPECTS OF THE RESPONSE OF STRUCTURES SUBJECT TO SONIC FATIGUE. (U)

DESCRIPTIVE NOTE: REPT. FOR MAY 60-MAR 61, ON DYNAMIC PROBLEMS IN FLIGHT VEHICLES,
JUL 61 43P SCHJELDERUP ,HASSEL C. ;
GALEF,ARNOLD E. ;
CONTRACT: AF33(616)7341
PROJ: 13456
MONITOR: WADD TR-61-187

UNCLASSIFIED REPORT

DESCRIPTORS: *ACOUSTICS ,*AIRFRAMES ,AIRPLANES , DEFORMATION ,FATIGUE(MECHANICS) ,GUIDED MISSILES ,JET ENGINE NOISE ,LIFE EXPECTANCY ,MATHEMATICAL ANALYSIS , MEASUREMENT ,NOISE ,NOMOGRAPHS ,PROBABILITY ,ROCKET MOTOR NOISE ,ROCKETS ,SATELLITES(ARTIFICIAL) ,SONIC FATIGUE ,SPACE PROBES ,STRESSES ,TESTS (M)

THE STRESS IN AIRCRAFT STRUCTURE RESULTING FROM MULTI-MODE RESPONSE TO SONIC EXCITATION IN RESOLVED INTO AN ALTERNATING STRESS COMPONENT SUPERIMPOSED UPON A SLOWLY VARYING MEAN STRESS COMPONENT. IT IS THEN FOUND THAT THE PROBABILITY DISTRIBUTION OF THOSE COMPONENTS IS NEARLY INDEPENDENT OF THE NUMBER OF MODES PARTICIPATING IN THE RESPONSE. THIS FINDING COULD HAVE CONSIDERABLE APPLICATION IN SIMPLIFYING FATIGUE ANALYSIS AND TESTING IF IT MAY BE SHOWN THAT THE MEAN STRESS COMPONENT HAS ONLY LOW ORDER EFFECTS UPON FATIGUE LIFE. SOME OF THE POSSIBLE APPLICATIONS ARE PRESENTED. A TEST PROGRAM FOR ESTABLISHING THE SIGNIFICANCE OF THE MEAN STRESS COMPONENT IS OUTLINED. (UTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-269 187
BOLT BERANEK AND NEWMAN INC CAMBRIDGE MASS

SONIC FATIGUE RESISTANCE OF STRUCTURAL DESIGNS (U)

OCT 61 IV DYER,IRA;SMITH,PRESTON W. JR.;
CONTRACT: AF33 616 6340
MONITOR: ASD TR61 262

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRPLANE PANELS, *FATIGUE (MECHANICS), *NOISE, ACOUSTICS, AIRFRAMES, DEFORMATION, DYNAMICS, MATHEMATICAL ANALYSIS, MEASUREMENT, RIVETED JOINTS, SANDWICH PANELS, SOUND, STRESSES (U)

RESEARCH ON SOUND-INDUCED FATIGUE OF FLIGHT VEHICLE PANELS IS DESCRIBED. PRIMARY EMPHASIS IS PLACED ON THE PROBLEMS OF PANEL RESPONSE AND PANEL STRAIN CONCENTRATION; SECONDARY MPHASIS IS PLACED ON E CQUISI ION OF FATIGUE DATA. SEVERAL PANEL DESIGNS W RE CONSID RED, INCLU ING BOTH IDEALIZED PANELS AND PANELS OF MORE PRACTICAL DESIGN. P ROCEDURES FOR THE IMPROVEMENT OF SONIC FATIGUE RESISTANCE, AND FOR HE TESTING OF PANEL ITH IREN SOUN SOURC S HAVE BEEN DERIVED FROM THE STUDY. T EOR IC L D/OR EXPERIMENTAL STUDIES ARE PRESENTED ON LIN AR RESPONSE, ANGLE-OF-INCI ENC FF CT , SANDWICH CONSTRUCTION, STRAIN CONCENTRATIONS IN SUB TRUCTURES, NONLINEAR RESPONSE, FATIGUE OF NOTCHED PANELS, AND FATIGUE AT RIVET LINES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-272 210
LOCKHEED AIRCRAFT CORP BURBANK CALIF

A STUDY OF THE CHARACTERISTICS OF MODERN ENGINE NOISE AND THE RESPONSE CHARACTERISTICS OF STRUCTURES (U)

DEC 61 1V COX,R.J.;PARRY,H.J.;CLOUGH,J.;
CONTRACT: AF33 616 5546
MONITOR: ASD TR6U 220

UNCLASSIFIED REPORT

DESCRIPTORS: *ARMY, *JET ENGINE NOISE, *JET PLANE NOISE, *LOGISTICS, *MAINTENANCE, *ORDNANCE, ACOUSTICS, AIRFRAMES, DYNAMICS, FATIGUE (MECHANICS), MATHEMATICAL ANALYSIS, MATHEMATICAL PREDICTION, MEASUREMENT, NOISE, PRESSURE, SOUND, STRUCTURES, TEST METHODS, TESTS (U)
IDENTIFIERS: J-79 ENGINES (U)

JET ENGINE NOISE A THE RESPONSE OF STRUCTURES TO THAT NOISE W RE STU IED. THE NEAR SOUND FIELD CHARACTERISTICS OF A JET ENGINE OPERATING ON THE GROUND AT BUTH MILITARY AND AFT RBUR ER HRU R MEASURED. SOUN PRESSURE LEVELS WERE OBTAINED IN THE NEAR FIELD AND WITHIN THE JET WAKE. PRESSURE LEVELS AND CROSS-CORRELATION COEFFICIENTS WERE OBTAINED IN NEAR FIELD AND WITHIN E JET WAKE. PRESSURE LEVELS AND CROSS-CORRELATION COEFFICIENTS WERE ORTAINED AT TWO LOCATIONS IN THE NOISE FIELD FOR THE FREE FIELD, A RIGID BOUNDARY AND A FLEXIBLE BOUNDARY. SEVERAL PANELS, REPRESENTATIVE OF TYPICAL AIRFRAME STRUCTURE, WERE SUBJECTED TO T IS JET ENGINE NOISE ENVIRUNMENT. STRUCTURAL RESPONSE IN TERMS OF STRAIN ND ACCELERATIONS WAS MEASURED AND ANALYZED. THESE PANELS WERE ALSO SUBJECTED TO DISCRETE FREQUENCY EXCITATION TO DETERMINE BASIC RESPONSE PARAMETERS. AN ANALYTICAL METHOD FOR THE PREDICTION OF RESPONSE OF COMPLEX STRUCTURES IN AN ACTUAL JET NOISE ENVIRONMENT WAS DEVELOPED. PREDICTED AND MEASURED RESPONSES WERE COMPARED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-277 186
AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

STUDY IN THE USE OF STRUCTURAL MODELS FOR SONIC FATIGUE (U)

APR 62 1V GRAY,CORY L.;
REPT. NO. TR61 547
CONTRACT: AF33 616 7030
MONITOR: ASD TR61 547

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRFRAMES, *JET ENGINE NOISE, *STRUCTURES, ACOUSTICS, AIRPLANE PANELS, DYNAMICS, FAILURE (MECHANICS), FATIGUE (MECHANICS), FEASIBILITY STUDIES, FREQUENCY, INSTRUMENTATION, MODEL TESTS, PRESSURE, RESONANCE, SONIC FATIGUE, SOUND, TEST EQUIPMENT, TEST FACILITIES, TEST METHODS, TESTS, THEORY, VIBRATION (U)

THE FEASIBILITY OF EMPLOYING REDUCED SCALE STRUCTURAL MODELS FOR SONIC FATIGUE TESTING WERE EXAMINED THEORETICALLY AND EXPERIMENTALLY. SCALING LAWS FOR STRUCTURE AND FOR JET NOISE SOURCES WERE PRESENTED AND THEORETICAL FATIGUE ASPECTS DISCUSSED. APPLICATION OF THE THEORY TO SIMPLE FLIGHT VEHICLE TYPE STRUCTURE WAS THEN INVESTIGATED. TWENTY-FIVE PANEL SPECIMENS IN THREE SCALES AND 18 FATIGUE COUPONS IN TWO SCALES WERE TESTED TO FAILURE WITH PROPORTIONATELY SCALED FORCING FUNCTIONS. THE RESULTS INDICATE THAT AN EMPIRICAL RELATIONSHIP BETWEEN SCALE FACTOR AND FATIGUE LIFE EXISTS, AND THAT FATIGUE MODELING TECHNIQUES ARE FEASIBLE AND PRACTICAL. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-278 665
GENERAL DYNAMICS/POMONA CALIF

SONIC FATIGUE TESTS OF THERMAL INSULATION PROTECTION SYSTEMS FOR MACH 3.0 TO 4.4 FLIGHT VEHICLES (U)

APR 62 IV RUSCIGNO,H.G.;
REPT. NO. 62 62
CONTRACT: NOAS59 6263

UNCLASSIFIED REPORT

DESCRIPTORS: ACOUSTIC INSULATION, AIRFRAMES, ALUMINUM, EFFECTIVENESS, INSULATING MATERIALS, LAMINATES, LIFE EXPECTANCY, SONIC FATIGUE, SOUND, STRESSES, SUPERSONIC FLOW, SUPERSONIC PLANES, SUPERSONIC TEST VEHICLES, TESTS (U)

THREE PANELS WERE EVALUATED FOR SONIC FATIGUE ONE WAS A BARE ALUMINUM PLATE, THE OTHER TWO WERE IDENTICAL EXCEPT FOR THE ADDITION OF A STITCHED LAMINATE INSULATION SYSTEM. IT WAS SHOWN THAT THE ADDITION OF STITCHED LAMINATE TO AN ALUMINUM STRUCTURE DID NOT SHORTEN THE SONIC FATIGUE LIFE, AND THE INSULATION SYSTEM WAS NOT VISIBLY DAMAGED BY SOUND LEVELS TO 170 DB AT THE FREQUENCY OF MAXIMUM STRAIN FOR THE PANEL. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-284 597
AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

ESTABLISHMENT OF THE APPROACH TO, AND DEVELOPMENT OF, INTERIM DESIGN CRITERIA FOR SONIC FATIGUE (U)

JUN 62 IV FITCH,G.E.;DUTKO,T.R.;
REPT. NO. TDR62 26
CONTRACT: AF33 616 7694
MONITOR: ASD TDR62 26

UNCLASSIFIED REPORT

DESCRIPTORS: •FATIGUE (MECHANICS), AIRCRAFT, AIRFRAMES, AIRPLANES, FAILURE (MECHANICS), FREQUENCY, GUIDED MISSILES, HELICOPTERS, JET BOMBERS, JET ENGINE NOISE, JET FIGHTERS, JET PLANES, LIFE EXPECTANCY, LOAD DISTRIBUTION, MATHEMATICAL ANALYSIS, NOISE, PRESSURE, RELIABILITY, ROCKET MOTOR NOISE, ROCKETS, SONIC FATIGUE, SOUND, STRESSES, STRUCTURES, TARGET DRONES, THEORY, TRANSPORT PLANES, VIBRATION (U)

DESIGN CRITERIA FOR SONIC FATIGUE.

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z8ML1

AD-284 886
SOUTHAMPTON UNIV (ENGLAND)

FURTHER ANAYLSIS OF THE RANDOM VIBRATIONS OF THE CARAVELLE TEST SECTION (U)

JUL 62 IV CLARKSON,B.L.;FORD,R.D.;
REPT. NO. TDR62 681
CONTRACT: AF61 052 332
MONITOR: ASD TDR62 681

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRFRAMES, *JET ENGINE NOISE, *METAL PLATES, *VIBRATION, ACOUSTICS, FATIGUE (MECHANICS) (U)

FURTHER TESTS WERE MADE ON THE CARAVELLE AIRCRAFT TEST SECTION. THE VIBRATIONS, INDUCED BY JETNOISE, OF A ROW OF EIGHT PANELS IN THE SIDE OF THE REAR FUSELAGE WERE ANALYZED AND IT WAS CONFIRMED THAT THE SKIN PANELS TEND TO VIBRATE IN FUNDAMENTAL MODES WITH ADJACENT PANELS OUT OF PHASE WITH EACH OTHER SO CAUSING THE INTERMEDIATE STRINGERS TO TWIST. DUE, PRESUMABLY, TO VARIATIONS IN THE PANEL SIZES, NO MORE THAN THREE PANELS WERE OBSERVED TO COUPLE IN SUCH A MODE. THE VIBRATIONS OF THE PANELS ON THE UPPER SURFACE OF THE OUTBOARD ELEVATOR WERE ALSO ANALYZED. IT WAS FOUND THAT THE RIBS ACT AS STIFF SUPPORTS BUT THE VIBRATIONS OF THE TWO PANELS BETWEEN ANY PAIR OF RIBS ARE COUPLED IN THE LOWER-FREQUENCY MODES. THE MODE SHAPES WERE NOT SATISFACTORILY DETERMINED OWING TO LACK OF SUFFICIENT STRAIN-GAUGES ON THE PANELS, BUT IT IS DEDUCED THAT THE STRESSES IN THE RIBS ARE CAUSED BY DIRECT INERTIA LOADING FROM THE SUPPORTED PANELS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-290 797
BOEING CO RENTON WASH

RESEARCH ON TECHNIQUES OF ESTABLISHING RANDOM TYPE FATIGUE CURVES FOR BROAD BAND SONIC LOADING (U)

OCT 62 1V FULLER,J.R.;
REPT. NO. TDR62 501
CONTRACT: AF33 616 8087
MONITOR: ASD TDR62 501

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRFRAMES, *FATIGUE (MECHANICS), *SOUND, *STATISTICAL ANALYSIS, *STRESSES, *STRUCTURES (U)

METHODS FOR ESTABLISHING FATIGUE CURVES FOR BROADBAND RANDOM LOADING WERE INVESTIGATED. SPECIFICALLY, THE GOAL WAS TO DEVELOP A RATIONAL METHOD FOR ESTIMATING FATIGUE LIFE ON THE BASIS OF THE RESULTS OF CAREFULLY DESIGNED AND CONDUCTED RANDOM LOAD FATIGUE EXPERIMENTS ON SIMPLE SPECIMENS. A PREVIOUSLY DEVELOPED CONCEPT FOR ESTIMATING THE EFFECTS OF STRESS INTERACTION ON FATIGUE LIFE UNDER PROGRAMMED VARIABLE AMPLITUDE CYCLIC LOADING WAS EXTENDED ON THE BASIS OF THE RANDOM LOAD FATIGUE LIFE TESTS AND THE EXPERIMENTAL STATISTICAL DATA REPORTED HEREIN. THE APPROACH WAS TO ABSORB THE TRENDS INDICATED BY THE RESULTS OF THIS EXPERIMENTAL PROGRAM, TOGETHER WITH THE RESULTS OF OTHER INVESTIGATIONS, INTO AN EXPRESSION INVOLVING THE CONSTANT CYCLE S-N RELATIONSHIP, THE ROOT-MEAN-SQUARE STRESS, AND OTHER SIMPLE PARAMETERS WHICH COULD BE DERIVED FROM THE RANDOM LOAD STRESS POWER SPECTRUM AND FROM THE APPROPRIATE STRESS FREQUENCY DISTRIBUTION. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-425 406
DOUGLAS AIRCRAFT CO INC LONG BEACH CALIF

STRUCTURAL DESIGN FOR ACOUSTIC FATIGUE. (U)

DESCRIPTIVE NOTE: REPT. FOR 11 JUNE 62-30 SEP 63.
OCT 63 119P
REPT. NO. LB31354
CONTRACT: AF33 657 8217
PROJ: 1370
TASK: 137001
MONITOR: ASD TDR63 820

UNCLASSIFIED REPORT

DESCRIPTORS: (*SONIC FATIGUE, JET PLANES), (*AERODYNAMIC CONTROL SURFACES, SONIC FATIGUE), (*JET ENGINE NOISE, FATIGUE (MECHANICS)), HONEYCOMB CORES, TEST FACILITIES, INSTRUMENTATION, STRESSES, BUCKLING (MECHANICS), DESIGN, TRAILING CONTROL SURFACES, STRUCTURES, AIRCRAFT, ALUMINUM ALLOYS, TITANIUM ALLOYS, SANDWICH CONSTRUCTION, NOISE GENERATORS, DAMAGE, AIRPLANE PANELS, STRUCTURAL PARTS, TAILS (AIRCRAFT), WINGS, LOADING (MECHANICS), STABILIZERS (HORIZONTAL TAIL SURFACE), AIR FRAMES (U)
IDENTIFIERS: 1963 (U)

RESULTS OF EITHER DISCRETELY OR RANDOMLY EXCITED STRUCTURAL ACOUSTIC TESTS ARE EXTENDED THROUGH AN ANALYTICAL APPROACH AND THESE RESULTS ARE PRESENTED AS DESIGN NOMOGRAPHS. THE SOURCE OF ACOUSTIC EXCITATION WAS CONSIDERED TO BE THE PROPULSION SYSTEM; THE STRUCTURE OF MAIN INTEREST WAS THE LIGHTER STRUCTURAL CONFIGURATION COMMON TO WING TRAILING EDGES, EMPENNAGE, OR FUSELAGE AFTERBODY. THESE STRUCTURAL COMPONENTS ARE MOST COMMONLY EXPOSED TO ACOUSTIC ENVIRONMENTS AND ARE SUCH THAT OTHER DESIGN CRITERIA ARE NOT CRITICAL. THE DESIGN RESULTS ARE PRESENTED AS A FUNCTION OF THE ALLOWABLE RANDOM FATIGUE LIFE OF THE MATERIAL. USE OF ELEVATED TEMPERATURE DATA FOR THIS FATIGUE LIFE WOULD ACCOUNT FOR THE DIRECT EFFECT ON THE MATERIAL OF ELEVATED TEMPERATURE. NO ATTEMPT WAS MADE TO ACCOUNT FOR THE OVER-ALL EFFECT OF ELEVATED TEMPERATURE; THIS DEPENDS SO GREATLY ON THE RESPONSE OF THE ADJOINING STRUCTURE THAT IT IS BEYOND THE SCOPE OF THIS STUDY. ADDITIONALLY, FOR A MAJORITY OF THE STRUCTURAL COMPONENTS UNDER STUDY THE DAMAGE OCCURS AT TAKEOFF WHEN TEMPERATURES ARE NOMINAL AND COMBINED EFFECTS ARE INSIGNIFICANT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-433 020
AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

COMPARISON OF APPROACHES FOR SONIC FATIGUE PREVENTION. (U)

SEP 63 31P COTE,MAURICE J. ;
MONITOR: ASD TDR63-704

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PRESENTED AT THE ASD 1963 SCIENCE AND ENGINEERING SYMPOSIUM, 16-19 SEP 1963, AT WRIGHT-PATTERSON AIR FORCE BASE, OHIO.

DESCRIPTORS: (*SONIC FATIGUE, LIFE EXPECTANCY), AIRFRAMES, TEST METHODS, JET PLANES, JET ENGINE NOISE, COUNTERMEASURES (U)
IDENTIFIERS: 1963 (U)

EXPLORATORY DEVELOPMENT ON SOUND-INDUCED FATIGUE OF FLIGHT VEHICLE STRUCTURES HAS BROUGHT ABOUT NUMEROUS AND VARIED APPROACHES FOR THE PREVENTION OF SONIC FATIGUE. THEY RANGE FROM PURELY THEORETICAL TECHNIQUES FOR DESIGNING THE STRUCTURES TO FULL SCALE PROOF TESTING OF A FLIGHT VEHICLE. A GENERALIZED APPROACH TO PREVENTION OF SONIC FATIGUE IS PRESENTED WHICH ENUMERATES THE NECESSARY STEPS NEEDED FOR THE REQUIRED PREDICTION OF FATIGUE LIFE. FIVE APPROACHES ARE SUMMARIZED WHERE TWO APPROACHES ARE PRIMARILY CONCERNED WITH DESIGNING THE INITIAL STRUCTURE WITH A SATISFACTORY FATIGUE LIFE. THE OTHER THREE APPROACHES ARE TO DETERMINE THE FATIGUE LIFE OF STRUCTURAL DESIGNS BY EXPERIMENTAL TESTS PREARRANGED TO BE REPRESENTATIVE OF THE TRUE ENVIRONMENTS. THE STRUCTURAL DESIGNS ARE MODIFIED AND IMPROVED TO MEET THE NECESSARY FATIGUE LIFE REQUIREMENTS, THUS PREVENTING SONIC FATIGUE DURING THEIR EXPECTED NORMAL SERVICE LIFE. THESE APPROACHES ARE COMPARED ON THE BASIS OF THEIR ASSUMPTIONS FOR TRUE ENVIRONMENT REPRESENTATION, VERIFICATION AND COMPLEXITY OF ANALYTICAL AND EXPERIMENTAL PROCEDURES AND RESULTS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-600 170
DOUGLAS AIRCRAFT CO INC LONG BEACH CALIF

SONIC FATIGUE DAMPING MATERIAL. (U)

DESCRIPTIVE NOTE: FINAL REPT.
SEP 63 79P MCGOWAN,P. R. ISNIDER,J. M. ;
REPT. NO. LB31451
CONTRACT: NOW-62-1071

UNCLASSIFIED REPORT

DESCRIPTORS: (*SONIC FATIGUE, INHIBITION), (*VIBRATION, DAMPING), (*ADHESIVES, STRESSES), ADHESION, GLASS, ALUMINUM, PIGMENTS, SULFIDES, EPOXY PLASTICS, NYLON, STRAIN (MECHANICS), CREEP, COMPOSITE MATERIALS, TESTS, AIRPLANE PANELS, SIMULATION, POLYMERS (U)

FOUR BASIC MATERIAL COMPOSITIONS WERE USED IN STUDIES OF VIBRATION DAMPING AND ADHESIVE STRESS REDUCTION FOR ALLEVIATION OF SONIC FATIGUE. VARIATIONS OF THESE FOUR COMPOSITIONS WERE PREPARED BY CHANGING THE RATIOS OF THE BASIC COMPONENTS AND BY THE ADDITION OF DIFFERENT PERCENTAGES OF GLASS OR ALUMINUM FLAKE PIGMENTS. TEST PANELS SIMULATING AIRCRAFT STRUCTURES WERE EXPOSED TO AN OVERALL SOUND LEVEL OF 158 DECIBELS IN A RANDOM NOISE GENERATOR. BEST PROTECTION AGAINST SONIC FATIGUE WAS OBTAINED BY ADHESIVE DAMPING IN AREAS OF STRUCTURAL ATTACHMENT. MEASUREMENTS OF STRESS REDUCTION IN ADHESION PANELS INSTRUMENTED WITH A STRAIN GAGE SHOWED GOOD RESULTS WITH MATERIALS COMPOUNDED WITH GLASS OR ALUMINUM FLAKE PIGMENTS. A POLYSULFIDE DISPERSION AND A NYLON-EPOXY COMPOSITION WERE USED AS THE BASE COMPOUNDS IN THESE TESTS. VIBRATION DAMPING TESTS WERE CONDUCTED WITH COATED VIBRATION STRIPS WITH STRAIN GAGES ATTACHED. AN ATTEMPT WAS MADE TO CORRELATE DYNAMIC PHYSICAL PROPERTIES OF THE DAMPING COMPOUNDS, SUCH AS CREEP AND RECOVERY, WITH DAMPING EFFICIENCY. LOSS MODULI VALUES WERE LOW FOR ALL MATERIALS TESTED BUT A VERY SIGNIFICANT INCREASE WAS OBTAINED BY THE ADDITION OF FLAKE PIGMENTS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-604 407
NORTHROP CORP HAWTHORNE CALIF NORAIR DIV

SIMULTANEOUS APPLICATION OF STATIC AND DYNAMIC LOADS ON SONIC FATIGUE TEST ARTICLES. (U)

DESCRIPTIVE NOTE: REPT. FOR JUN 62-JUN 63,
JUN 64 151P ROBERTS,W. H. ;WILHEM,D. P. ;
REPT. NO. NOR-63-196
CONTRACT: AF33 657 8759
PROJ: 4437
TASK: 443703
MONITOR: RTD , TDR63 4021

UNCLASSIFIED REPORT

DESCRIPTORS: (*LOADING (MECHANICS), SONIC FATIGUE), (*SONIC FATIGUE, TESTS), SIMULATION, ACOUSTICS, THERMAL STRESSES, SHOCK WAVES, FAILURE (MECHANICS), AIRCRAFT, SPACECRAFT, GUIDED MISSILES, DAMAGE, FLUID FLOW, STRESSES, EQUATIONS (U)

WITH THE EXISTENCE OF THE RTD SONIC TEST FACILITY, IT BECOMES NECESSARY TO INVESTIGATE THE REQUIREMENTS FOR RELIABILITY FATIGUE TESTING DURING THE SIMULATED APPLICATION OF STATIC, DYNAMIC, AND ACOUSTIC SERVICE LOADINGS. THE REPORT INCLUDES THE FINDINGS OF AN EXTENSIVE INVESTIGATION OF PREVIOUS COMBINED LOAD FAILURES, DOCUMENTS THE EXISTENCE OF SUCH FAILURES AND SUGGESTS POSSIBLE FUTURE PROBLEMS BASED ON AN INDUSTRY-WIDE SURVEY OF ACTUAL CASE HISTORIES. ANALYTICAL SUBSTANTIATION OF THE INCREASED PROBABILITY OF FAILURE AND THEORETICAL ACOUSTIC CONSIDERATIONS ARE PRESENTED TO INDICATE THAT COMBINED LOADS DO PRESENT A PARTICULAR PROBLEM AREA. THE SIMULATION OF STATIC, DYNAMIC, AND ACOUSTIC LOADS IS DISCUSSED IN TERMS OF GENERAL PRINCIPLES WHICH MUST BE TAKEN INTO CONSIDERATION, AND GENERAL TESTING METHODS APPLICABLE TO DIFFICULT AND COSTLY VEHICLE FATIGUE PROBLEMS. LIMITATIONS AND POSSIBLE FUTURE EXTENSIONS TO THE RTD SONIC TEST FACILITY ARE DISCUSSED AND RECOMMENDATIONS PRESENTED. SEVEN SPECIFIC TESTING ARRANGEMENTS WHICH HAVE BEEN DEVELOPED FOR COMBINED LOADS SIMULATION OF SEVERAL SELECTED CASES ARE DESCRIBED AND ILLUSTRATED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-635 808 20/11 14/2 20/1 1/3
IIT RESEARCH INST CHICAGO ILL

THEORETICAL AND EXPERIMENTAL MODEL INVESTIGATIONS OF SEMI-ANECHOIC AND SEMI-REVERBERANT ENVIRONMENTS AND THEIR APPLICATION TO THE RTD SONIC FATIGUE FACILITY. (U)

DESCRIPTIVE NOTE: FINAL REPT. 15 NOV 64-15 MAR 66.
APR 66 156P PERNET, DAVID F. ;HRUSKA,GALE R. ;
CONTRACT: AF 33(615)-2174,
PROJ: AF-4437,
TASK: 443701,
MONITOR: AFFDL TR-66-20

UNCLASSIFIED REPORT

DESCRIPTORS: (*SONIC FATIGUE, TEST FACILITIES), AIRFRAMES, FATIGUE(MECHANICS), ANECHOIC CHAMBERS, MODELS(SIMULATIONS), ACOUSTIC EQUIPMENT, NOISE, ENVIRONMENT (U)

A STUDY OF THE ACOUSTIC ENVIRONMENTS THAT COULD BE PRODUCED IN THE RTD SONIC FATIGUE FACILITY WAS MADE USING BOTH THEORETICAL METHODS AND EXPERIMENTAL MODELING TECHNIQUES. AN ANALYSIS IS PRESENTED WHICH ENABLES THE SEMI-ANECHOIC ENVIRONMENT TO BE DETERMINED AT ANY POSITION IN THE FACILITY. THIS ANALYSIS IS VERIFIED EXPERIMENTALLY. AN EXPERIMENTAL PROGRAM ALSO ENABLED THE SEMI-REVERBERANT ENVIRONMENT TO BE ESTABLISHED AND REVEALED THE PART PLAYED BY THE ABSORBING TREATMENT IN DETERMINING THIS ENVIRONMENT. EXPERIMENTAL PROGRAMS INVESTIGATED THE SOUND FIELDS ON STRUCTURES LOCATED IN THE FACILITY UNDER BOTH MODES OF OPERATION. A STUDY OF REFLECTOR DEVICES USED TO MODIFY ACOUSTIC ENVIRONMENTS WAS MADE AND ENABLED LIMITED PREDICTION OF THEIR EFFECTS. AN ANALYSIS OF CURRENT SERVICE NOISE FIELDS ON AIRCRAFT STRUCTURES ENABLED DETERMINATION OF VALUES OF THE MAJOR PARAMETERS OF THESE FIELDS TO BE DETERMINED FOR USE IN SIMULATION STUDIES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-646 283 1/3 20/4
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

PREDICTED VIBRATION AND ACOUSTIC ENVIRONMENTAL STUDY. (U)

OCT 64 31P
REPT. NO. 152
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-646 282.

DESCRIPTORS: (•VERTICAL TAKE-OFF PLANES, AEROELASTICITY), (•RESEARCH PLANES, AEROELASTICITY), VIBRATION, LIFT, FANS, PROPULSION, ACOUSTICS, FATIGUE(MECHANICS), FAILURE(MECHANICS), AIRPLANE PANELS, DESIGN (U)
IDENTIFIERS: V-5 AIRCRAFT (U)

THE ANALYSIS INDICATES THAT THE PROPOSED WING SKIN PANELS WILL NOT EXPERIENCE FATIGUE FAILURE AS A RESULT OF ACOUSTIC EXCITATION SUSTAINED DURING THE 250 HOUR DESIGN LIFE OF THE AIRCRAFT. THE VIBRATION ENVIRONMENT OF THE AIRCRAFT IS EXPECTED TO BE SIMILAR TO THAT OF OTHER JET AIRCRAFT OF COMPARABLE RATED THRUST. BASED ON THE ANTICIPATED VIBRATION LEVELS AND THE RELATIVELY SHORT DESIGN LIFE OF THE AIRCRAFT, COMPONENTS THAT MAY BE SUBJECTED TO SIGNIFICANT OSCILLATORY LOAD SHOULD BE INVESTIGATED FOR FATIGUE ON AN INDIVIDUAL BASIS BY THE DESIGN GROUP INVOLVED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-648 022 20/1 13/3 20/11
BOLT BERANEK AND NEWMAN INC CAMBRIDGE MASS

AERODYNAMIC NOISE SIMULATION IN SONIC FATIGUE FACILITY. (U)

DESCRIPTIVE NOTE: FINAL REPT., 15 JAN 64-31 MAR 65,
NOV 66 73P LYON,R. H. ;GORDON,C. G.
;STERN,R. ;MIENER,F. M. ;
REPT. NO. BBN-1349
CONTRACT: AF 33(615)-1290
PROJ: AF-4437
TASK: 443701
MONITOR: AFFDL TR-66-112

UNCLASSIFIED REPORT

DESCRIPTORS: (*AERODYNAMIC NOISE, SIMULATION),
(*TURBULENT BOUNDARY LAYER, AERODYNAMIC NOISE),
SONIC FATIGUE, JETS, WALLS,
PANELS(STRUCTURAL), POWER, INJECTION,
TRANSPORT PLANES, SUPERSONIC PLANES (U)

THE POSSIBILITY OF SIMULATING A TURBULENT BOUNDARY-LAYER NOISE ENVIRONMENT USING THE AIR-FLOW CAPABILITY OF THE RTD SONIC FATIGUE FACILITY IS INVESTIGATED. THE PHILOSOPHY IS ADOPTED THAT IT IS THE MECHANICAL POWER ABSORBED BY THE STRUCTURE FROM THE ENVIRONMENT THAT IS TO BE DUPLICATED. CALCULATIONS ARE DEVELOPED THAT ALLOW THE PREDICTION OF THE MECHANICAL POWER INJECTED INTO A STRUCTURE BY A TURBULENT BOUNDARY LAYER (TBL), AND BY A TURBULENT WALL-JET. THE POSSIBILITY OF REPLACING THE POWER INJECTED BY THE TBL BY USING TURBULENT WALL-JETS IMPINGING ON A STRUCTURAL MODEL OF A SECTION OF A SUPERSONIC TRANSPORT IS STUDIED. RESULTS INDICATE THAT HIGH-FREQUENCY EXCITATION (ABOVE 1KHZ) CAN BE ADEQUATELY SIMULATED, BUT THAT THE AIR-FLOW CAPABILITIES OF THE FACILITY WOULD BE EXCEEDED BY AN ATTEMPT TO EXCITE A STRUCTURE AS LARGE AS THE ONE CHOSEN BY A SET OF WALL-JETS AT LOWER FREQUENCIES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-658 846 1/3
SOUTHAMPTON UNIV (ENGLAND) INST OF SOUND AND VIBRATION RESEARCH

STRESSES IN SKIN PANELS SUBJECTED TO RANDOM ACOUSTIC LOADING. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUN 67 60P CLARKSON,BRIAN L. ;
CONTRACT: AF 61(052)-627
PROJ: AF-7351
MONITOR: AFML TR-67-199

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRPLANE PANELS, STRESSES), GREAT BRITAIN, LOADING(MECHANICS), JET PLANE NOISE, EXPERIMENTAL DATA, CONTROL SURFACES, FATIGUE(MECHANICS) (U)

THE REPORT SUMMARISES THE FULLY DOCUMENTED EXPERIMENTAL DATA WHICH IS AVAILABLE ON THE STRESSES INDUCED IN TYPICAL AIRCRAFT STRUCTURE BY JET NOISE AT TAKE OFF. THE EXPERIMENTAL VALUES ARE COMPARED WITH A DESIGN PROCEDURE BASED ON A SINGLE DEGREE OF FREEDOM ANALYSIS AND THE METHOD IS EXTENDED FOR APPLICATION TO CONTROL SURFACES AND TO INTEGRALLY STIFFENED SKIN PANELS. THE ESTIMATES ARE GENERALLY WITHIN A FACTOR OF TWO OF THE MEASURED VALUES. THE RELATIVELY NEW PHENOMENON OF SHOCK CELL NOISE IS INTRODUCED AND A TYPICAL RESULT FOR THE VARIATION OF R.M.S. STRESS DURING TAKE OFF AND CLIMB IS DISCUSSED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-662 597 1/3 21/5 20/1
SYSTEMS ENGINEERING GROUP WRIGHT-PATTERSON AFB OHIO

GROUND ACOUSTICAL SURVEY OF THE RB-57F AIRPLANE WITH TF-33-P-11A ENGINE, (U)

OCT 67 30P DREHER,JOHN F. ;WAFFORD, JOHN H. ;
REPT. NO. SEG-TR-67-26

UNCLASSIFIED REPORT

DESCRIPTORS: (*SONIC FATIGUE, REDUCTION), (*TURBOFAN ENGINES, ACOUSTIC PROPERTIES), JET BOMBERS, RECONNAISSANCE PLANES, AIRFRAMES, TAILS(AIRCRAFT), EXHAUST GASES, STABILIZERS(HORIZONTAL TAIL SURFACE) (U)
IDENTIFIERS: B-57 AIRCRAFT, TF-33 ENGINE (U)

ACOUSTICAL DATA MEASURED ON THE RB-57F AIRPLANE EMPENNAGE EXPOSED TO THE EXHAUST OF THE TF-33-P-11A ENGINE ARE PRESENTED IN TABULAR AND GRAPHICAL FORM. DATA ARE REDUCED IN OCTAVE AND 10-CPS BAND WIDTHS ALONG WITH OVERALL LEVELS. CONTOURS OF EQUAL ACOUSTICAL INTENSITY ARE TRANSPOSED ON A PLAN VIEW OF THE HORIZONTAL STABILIZER. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-663 662 1/3 20/1
BOEING SCIENTIFIC RESEARCH LABS SEATTLE WASH FLIGHT SCIENCES LAB

RESPONSE OF STRUCTURE TO THE PSEUDO-SOUND FIELD OF A JET (USING A COMBINED CONTINUUM AND FINITE ELEMENT METHOD) PART I. (U)

SEP 67 46P MAESTRELLO,L. ;GEDGE,M. R. ;REDDAWAY,A. R. F. ;
REPT. NO. D1-82-0652, 118

UNCLASSIFIED REPORT

DESCRIPTORS: (•AIRPLANE PANELS, •SONIC FATIGUE), VIBRATION, CONTINUUM MECHANICS, ACOUSTIC PROPERTIES, PRESSURE, RESPONSE, JETS, NOZZLE GAS FLOW, AERODYNAMIC NOISE, WAKE, TURBOJET ENGINES (U)

PREDICTION TECHNIQUES ARE APPLIED TO A TYPICAL AIRCRAFT PANEL MOUNTED ALONG, AND JUST OUTSIDE OF THE WAKE OF A MODEL JET. FROM MEASUREMENTS MADE, A FUNCTIONAL REPRESENTATION OF THE PSEUDO-SOUND WALL PRESSURE CORRELATION IS OBTAINED AND IS USED TO PREDICT THE RESPONSE CHARACTERISTICS OF THE PANEL. THE PREDICTED MEAN SQUARE RESPONSE IS IN FAIR AGREEMENT WITH THE MEASURED VALUES, BUT THE PREDICTED DISPLACEMENT SPECTRA ARE SOMEWHAT ERRONEOUS. HOWEVER, THIS WAS EXPECTED. THE UPPER FREQUENCY LIMIT OF THE FINITE ELEMENT TECHNIQUE IS RESTRICTED BY THE NUMBER OF ELEMENTS IN THE GRID SYSTEM, ABOVE WHICH RESPONSE PREDICTIONS INCUR EVER INCREASING ERROR IN BOTH FREQUENCY AND AMPLITUDE. HOWEVER, AT THESE HIGHER MODE NUMBERS THE CONTINUUM TECHNIQUE BECOMES INCREASINGLY MORE ACCURATE DUE TO THE DECREASING DEPENDENCE OF MODAL FREQUENCY AND SHAPE ON THE PANEL EDGE CONDITIONS. IT WAS DEDUCED THAT IN THE CASE OF A SIMPLE PANEL, EXCITED BY THE PRESSURE FIELD OF A FULL SCALE JET ENGINE ONLY THE POWER SPECTRUM IS REQUIRED TO PREDICT THE RESPONSE. HOWEVER, FOR A COMPLEX STRUCTURE, SPATIAL DECAY BECOMES RELEVANT AND MUST BE INCLUDED IN THE PRESSURE FIELD MODEL. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-667 146 1/3 14/4
GRUMMAN AIRCRAFT ENGINEERING CORP BETHPAGE N Y

STRUCTURAL INSPECTION PLANNING FOR BUSINESS EXECUTIVE AIRCRAFT. (U)

NOV 66 12P BRENNAN, JAMES E. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED FOR PRESENTATION AT THE FAA MAINTENANCE SYMPOSIUM 'CONTINUED RELIABILITY OF TRANSPORT TYPE AIRCRAFT STRUCTURE,' WASHINGTON, D. C., 2-4 NOV 1966.

DESCRIPTORS: (*JET TRANSPORT PLANES, MAINTENANCE), AIRFRAMES, CIVIL AVIATION, RELIABILITY, TURBOFAN ENGINES, DESIGN, SONIC FATIGUE, VISUAL INSPECTION, MAINTAINABILITY, MANAGEMENT PLANNING (U)
IDENTIFIERS: INSPECTION METHODS, GULFSTREAM 2 AIRCRAFT, PRIVATE PLANES, SMALL PLANES (U)

A BRIEF REVIEW IS GIVEN OF THE DESIGN AND TESTING CONCEPTS USED IN THE DEVELOPMENT OF THE TURBOFAN GULFSTREAM II. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-669 215 1/3 1/1 20/4 20/1
BOEING CO RENTON WASH COMMERCIAL AIRPLANE DIV

TEST RESULTS FROM THE BOUNDARY LAYER FACILITY - RESPONSE OF STRUCTURE TO THE PSEUDO-SOUND FIELD OF A JET (USING COMBINED CONTINUUM AND FINITE ELEMENT METHOD). (U)

JAN 68 49P MAESTRELLO,L. ;
REPT. NO. D6-9944-VOL-4

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 3, AD-669 217.

DESCRIPTORS: (*AIRPLANE PANELS, *AERODYNAMIC LOADING), JETS, WAKE, SOUND, ACOUSTIC PROPERTIES, RESPONSE, BOUNDARY LAYER, CONTINUUM MECHANICS, PRESSURE, SONIC FATIGUE, VIBRATION, MATHEMATICAL PREDICTION, AIRFRAMES (U)

THE RESPONSE OF A SIMPLE PANEL STRUCTURE TO A JET PSEUDO-SOUND FIELD IS INVESTIGATED AND A PREDICTION METHOD IS PRESENTED. THE MEAN SQUARE DISPLACEMENT IS APPROXIMATED QUITE CLOSELY BUT THE MODAL ENERGY DISTRIBUTION IS SHOWN TO BE MORE DEPENDENT ON AN ACCURATE PRESSURE FIELD MODEL BEING ASSUMED. IT IS ARGUED HOWEVER, THAT THE ACCURACY OF THE PREDICTION METHOD CAN ONLY IMPROVE WITH INCREASING JET DIAMETER, WITH THE RESULT THAT A FULL-SCALE SITUATION WOULD BE MORE FAVORABLE TO THIS COMBINED METHOD. THE USE OF A FINITE ELEMENT TECHNIQUE ENABLES COMPLEX STRUCTURES TO BE REPRESENTED MORE REALISTICALLY THAN WITH THE NORMAL MODE ASSUMPTION, ALTHOUGH THE LATTER IS SUFFICIENT AT THE HIGHER MODE NUMBERS, AND PROBABLY MORE ACCURATE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-669 217 1/3 1/1 20/4 20/1
BOEING CO RENTON WASH COMMERCIAL AIRPLANE DIV

TEST RESULTS FROM THE BOUNDARY LAYER FACILITY (THEORY AND EXPERIMENTAL COMPARISON). (U)

MAY 66 88P MAESTRELLO,L. ;
REPT. NO. D6-9944-VOL-3

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 4, AD-669 215.

DESCRIPTORS: (*AIRPLANE PANELS, AERODYNAMIC LOADING), ACOUSTIC PROPERTIES, PRESSURE, TURBULENT BOUNDARY LAYER, CORRELATION TECHNIQUES, WALLS, RESPONSE, AERODYNAMIC NOISE, VIBRATION, POWER SPECTRA, WIND TUNNEL MODELS, THEORY, SONIC FATIGUE (U)
IDENTIFIERS: SKIN(STRUCTURAL) (U)

THE PROBLEM OF ACOUSTIC RADIATION OF PANELS EXCITED BY RANDOM PRESSURE FLUCTUATION OF THE TURBULENT BOUNDARY LAYER WAS INVESTIGATED. THE MAIN PURPOSE OF THE PAPER IS TO SHOW BY USING A RELATIVELY SIMPLE FUNCTIONAL REPRESENTATION OF THE SPACE-TIME CORRELATION OF THE WALL PRESSURE FLUCTUATION, AND BY THE USE OF LYONS-DYER METHOD, THAT MOTION AND RADIATION INTENSITY OF A SIMPLY-SUPPORTED PANEL AGREE REASONABLY WELL WITH EXPERIMENTAL RESULTS. THE MOST STRIKING FEATURE OF THE EXCITATION MECHANISM IS THE SO-CALLED COINCIDENCE WHICH HAS PROFOUND EFFECTS ON THE RESPONSE OF THE STRUCTURE AND POWER RADIATIONS. IF, UNDER CERTAIN CONDITIONS, A MISMATCH OCCURS BETWEEN WAVE SPEEDS ON THE PANEL AND THE PRESSURE FIELD, PANEL DISPLACEMENT AND ACOUSTIC RADIATION SHOULD BE REDUCED. SUCH A MISMATCH IS CAUSED BY A TURBULENCE PRESSURE EDDY WHICH DECAYS FASTER THAN THE MODE'S WAVELENGTH ON THE STRUCTURE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZBML1

AD-865 731 1/3 1/4
AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB OHIO

THE PREDICTION OF INTERNAL VIBRATION LEVELS OF FLIGHT VEHICLE EQUIPMENTS USING STATISTICAL ENERGY METHODS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. JUN 65-OCT 67, JAN 70 71P SEVY,ROBERT A. (EARLS, DAVID L. ;
REPT. NO. AFFDL-TR-69-54
PROJ: AF-1309
TASK: 130904

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, VIBRATION), (*AIRCRAFT EQUIPMENT, MALFUNCTIONS), MATHEMATICAL PREDICTION, ENERGY, STATISTICAL ANALYSIS, SONIC FATIGUE (U)

IV.

MATERIALS

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-263 765
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON D C

EFFECTS OF CHANGING STRESS AMPLITUDE ON THE RATE OF FATIGUE-CRACK PROPAGATION IN TWO ALUMINUM ALLOYS (U)

SEP 61 IV HUDSON,C. MICHAEL;HARDRATH,HERBERT F.;
REPT. NO. TN D 960

UNCLASSIFIED REPORT

DESCRIPTORS: *ALUMINUM ALLOYS, AIRFRAMES, DESIGN, FATIGUE (MECHANICS), FRACTURE (MECHANICS), LOAD DISTRIBUTION, MECHANICAL PROPERTIES, SHEETS, STRESSES, TENSILE PROPERTIES, TEST METHODS, TESTS (U)

A SERIES OF FATIGUE TESTS WITH SPECIMENS SUBJECTED TO CONSTANT-AMPLITUDE AND TWO-STEP AXIAL LOADS WERE CONDUCTED ON 12-IN. WIDE SHEET SPECIMENS OF 2024-T3 AND 7075-T6 ALUMINUM ALLOY TO STUDY THE EFFECTS OF A CHANGE IN STRESS LEVEL ON FATIGUE-CRACK PROPAGATION. COMPARISON OF THE RESULTS OF THE TESTS IN WHICH THE SPECIMENS WERE TESTED AT FIRST A HIGH AND THEN A LOW STRESS LEVEL WITH THOSE OF THE CONSTANT-STRESS-AMPLITUDE TESTS INDICATED THAT CRACK PROPAGATION WAS GENERALLY DELAYED AFTER THE TRANSITION TO THE LOWER STRESS LEVEL. IN THE TESTS IN WHICH THE SPECIMENS WERE TESTED AT FIRST A LOW AND THEN A HIGH STRESS LEVEL, CRACK PROPAGATION CONTINUED AT THE EXPECTED RATE AFTER THE CHANGE IN STRESS LEVELS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-265 035
RYAN AERONAUTICAL CO SAN DIEGO CALIF

HIGH ENERGY FORMING OF METALLIC SHEET MATERIALS (U)

FEB 61 44P ADAMS,D.S.;HARRISON,V.S.;ORR,J.P.;
REPT. NO. 61B072
CONTRACT: DA-04-495-ORD-1921
PROJ: ORD-T84-002F
MONITOR: WAL 624.5/1

UNCLASSIFIED REPORT

DESCRIPTORS: *EXPLOSIVE FORMING, *SHEETS, AIRFRAMES, ALUMINUM ALLOYS, CONFIGURATION, CYLINDRICAL BODIES, DIES, EXPLOSIVE MATERIALS, FATIGUE (MECHANICS), HEMISPHERICAL SHELLS, HIGH-PRESSURE RESEARCH, INSTRUMENTATION, MANUFACTURING METHODS, MATERIALS, MECHANICAL PROPERTIES, METALLURGICAL ANALYSIS, MICROSTRUCTURE, SPHERES, STAINLESS STEEL, STEEL, STRUCTURAL SHELLS, TENSILE PROPERTIES, TEST FACILITIES, TITANIUM ALLOYS, VANADIUM ALLOYS (U)

TESTS WERE CONDUCTED ON VARIOUS MATERIALS TO STUDY THEIR FORMABILITY AND METALLURGICAL CHARACTERISTICS RESULTING FROM EXPLOSIVE FORMING PROCESS. MATERIALS FORMED INTO VARIOUS CONFIGURATIONS INDICATED THAT THIS MANUFACTURING TECHNIQUE LENDS ITSELF TO THE FORMING OF PARTS HAVING INTRICATE SHAPES, AND IS PARTICULARLY ADAPTABLE FOR THE FABRICATION OF PARTS OF LARGE SIZE BEYOND NORMAL MACHINE CAPACITY. METALLURGICAL TESTS SHOW THAT THERE WAS NO DETRIMENTAL EFFECT TO THE MATERIAL AS A RESULT OF THIS FORMING PROCESS. INDICATIONS ARE THAT SOME MATERIALS MUST BE FORMED AT ELEVATED TEMPERATURES. CONSIDERATION OF THE CORRELATION BETWEEN INSTRUMENTATION TECHNIQUES AND LABORATORY ANALYSIS LEADS TO THE CONCLUSION THAT MECHANICAL PROPERTIES OF MATERIALS TESTED WERE IMPROVED BY THE EXTREME PRESSURES APPLIED BY EXPLOSIVE FORMING. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-265 482
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON D C

EFFECT OF STRAIN RATE ON MECHANICAL PROPERTIES OF WROUGHT SINTERED TUNGSTEN AT TEMPERATURES ABOVE 2500 F (U)

IV SIKORA,PAUL F.;HALL,ROBERT W.;

UNCLASSIFIED REPORT

DESCRIPTORS: *HIGH-TEMPERATURE RESEARCH, *TUNGSTEN, AIRFRAMES, CRYSTALLIZATION, DEFORMATION, FRACTURE (MECHANICS), HEAT TREATMENT, MECHANICAL PROPERTIES, MICROSTRUCTURE, PROCESSING, REFRACTORY MATERIALS, TENSILE PROPERTIES, TESTS, VELOCITY (U)

SPECIMENS OF WROUGHT SINTERED COMMERCIALLY PURE W WERE MADE FROM 1/8-IN. SWAGED RODS. ALL THE SPECIMENS WERE RECRYSTALLIZED AT 4050 F FOR 1 HR PRIOR TO TESTING AT TEMPERATURES FROM 2500 TO 4000 F AT VARIOUS STRAIN RATES FROM 0.002 TO 20 IN. PER IN. PER MINUTE. RESULTS SHOWED THAT, AT A CONSTANT TEMPERATURE, INCREASING THE STRAIN RATE INCREASED THE ULTIMATE TENSILE STRENGTH SIGNIFICANTLY. THE EFFECTS OF BOTH STRAIN RATE AND TEMPERATURE ON THE ULTIMATE TENSILE STRENGTH OF W MAY BE CORRELATED BY THE LINEUGHT SINTERED COMMERCIALLY PURE W WERE MADE FROM 1/8-IN. SWAGED RODS. ALL THE SPECIMENS WERE RECRYSTALLIZED AT 4050 F RR PARAMETER METHOD OF MANSON AND HAFERD AND MAY BE USED TO PREDICT THE ULTIMATE TENSILE STRENGTH AT HIGHER TEMPERATURES, 4500 AND 5000 F. AS PREVIOUSLY REPORTED, DUCTILITY, AS MEASURED BY REDUCTION OF AREA IN A TENSILE TEST, DECREASES WITH INCREASING TEMPERATURE ABOVE ABOUT 3000 F. INCREASING THE STRAIN RATE AT TEMPERATURES ABOVE 3000 F INCREASES THE DUCTILITY. FRACTURES ARE GENERALLY TRA SGRANULAR AT THE HIGHER STRAIN RATES AND INTERGRANULAR AT THE LOWER STRAIN RATES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-266 005
BATTELLE MEMORIAL INST COLUMBUS OHIO DEFENSE METALS INFORMATION CENTER

STRESS-CORROSION CRACKING OF HIGH-STRENGTH STAINLESS STEELS IN ATMOSPHERIC ENVIRONMENTS (U)

SEP 61 IV SLUNDER,C.J.;
REPT. NO. 158
CONTRACT: AF33 616 7747

UNCLASSIFIED REPORT

DESCRIPTORS: *AUSTENITE, *MARTENSITE, *STAINLESS STEEL, AIRFRAMES, ATMOSPHERE, CHEMICAL ANALYSIS, CORROSION, CORROSIVE GASES, CORROSIVE LIQUIDS, DEFORMATION, DISPERSION HARDENING, FRACTURE (MECHANICS), HEAT TREATMENT, MECHANICAL PROPERTIES, STRESSES, TENSILE PROPERTIES, TEST EQUIPMENT, TEST METHODS (U)

AVAILABLE INFORMATION ON THE STRESS-CORROSION CRACKING OF THE HIGH-STRENGTH STAINLESS STEELS WAS ASSEMBLED AND TABULATED ACCORDING TO ALLOY TYPE AND TO THE ENVIRONMENTS TO WHICH THEY WERE EXPOSED. THE STAINLESS STEELS INCLUDE THE COLDROLLED AUSTENITICS (USS 12 MOV) THE MARTENSITIC GRADES (17-4PH AND STAINLESS W) THE MARTENSITIC PRECIPITATION-HARDENABLE GRADES (17-7PH, PH 15-7 MO, AM 350 AND 355) AND THE SEMIAUSTENITIC PRECIPITATION HARDENABLE GRADES (AISI 301, 201, AND 202, USS TENELON, AND USS 17-5). EXPOSURES WERE IN THE MARINE ATMOSPHERE AT KURE BEACH, OUTDOORS AT SEVERAL SEMIINDUSTRIAL LOCATIONS, AND IN SEVERAL LABORATORY TEST ENVIRONMENTS. DATA ON THE CHEMICAL ANALYSES, HEAT TREATMENTS, AND MECHANICAL PROPERTIES OF THE TEST MATERIALS ARE INCLUDED. (AUTH) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-268 353
SYRACUSE UNIV N Y

PROCEEDINGS OF THE SEVENTH SAGAMORE ORDNANCE MATERIALS RESEARCH CONFERENCE. MECHANICAL AND METALLURGICAL BEHAVIOR OF SHEET MATERIALS, CONDUCTED AT SAGAMORE CONFERENCE CENTER, RAQUETTE LAKE, NEW YORK, AUGUST 16 TO 19, 1960 (U)

DEC 60 1V
CONTRACT: DA30 069ORD2566

UNCLASSIFIED REPORT

DESCRIPTORS: *FRACTURE (MECHANICS), *HEAT RESISTANT METALS + ALLOYS, *METALS, *SHEETS, *SYMPOSIA, AIRCRAFT, ALLOYS, DEFORMATION, HARDNESS, HEAT TREATMENT, MANUFACTURING METHODS, MECHANICAL PROPERTIES, METALLURGY, MICROSTRUCTURE, MODEL TESTS, PLASTICITY, PRESSURE VESSELS, PRODUCTION, ROCKET ASSISTED PROJECTILES, SHEAR STRESSES, SHIP HULLS, STAINLESS STEEL, STEEL, STRESSES, SUPERSONIC PLANES, TENSILE PROPERTIES, TEST METHODS, TESTS, TITANIUM ALLOYS, TRANSPORT PLANES (U)

CONTENTS: REQUIREMENTS OF HIGH STRENGTH SHEET MATERIALS MATERIALS, THEIR PROPERTIES AND CHARACTERISTICS EFFECTS OF FABRICATION VARIABLES FRACTURE, CRACK INITATION AND PROPAGATION MECHANICAL SCREENING TESTS MECHANICAL MODEL TESTING THE MATERIALS PROBLEMS OF THE SUPERSONIC TRANSPORT (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-269 346
ALUMINUM CO OF AMERICA CLEVELAND OHIO

MECHANICAL PROPERTIES OF 7075-T6 STEPPED EXTRUSIONS (U)

JUN 61 1V LYST,J.O.;
REPT. NO. 9 61 18

UNCLASSIFIED REPORT

DESCRIPTORS: *ALUMINUM ALLOYS, AIRFRAMES, EXTRUSION, FAILURE (MECHANICS), FATIGUE (MECHANICS), FRACTURE (MECHANICS), MECHANICAL PROPERTIES, SHEAR STRESSES, STRESSES, TENSILE PROPERTIES (U)

A STUDY WAS MADE TO DETERMINE THE FATIGUE STRENGTHS AND TENSILE PROPERTIES AT THE STEP AND IN ADJACENT PARTS OF THE LARGE AND SMALL ENDS OF 7075-T6 STEPPED EXTRUSIONS. THE TENSILE AND YIELD STRENGTHS ARE GENERALLY HIGHER FOR SPECIMENS TAKEN FROM THE SMALL END THAN THOSE FROM THE LARGE END; ALSO, THE TENSILE PROPERTIES OF SPECIMENS FROM ACROSS THE STEP ARE APPRECIABLY LOWER THAN THOSE TAKEN FROM EITHER THE LARGE OR SMALL END OF THE EXTRUSION. THE FATIGUE STRENGTHS, REGARDLESS OF LOCATION IN THE EXTRUSION, WERE AS GOOD AS OR BETTER THAN THOSE CONSIDERED TYPICAL FOR 7075-T6 PRODUCTS. THERE APPEARED TO BE NO SIGNIFICANT DIFFERENCE BETWEEN THE FATIGUE STRENGTHS OF SPECIMENS TAKEN FROM ACROSS THE STEP AND THOSE FROM EITHER THE LARGE OR SMALL END OF THE EXTRUSION. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-271 528
AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

THE EFFECT OF CADMIUM PLATING ON AIRCRAFT STEELS UNDER STRESS CONCENTRATION AT ELEVATED TEMPERATURES (U)

SEP 61 1V KENNEDY,E.M. JR.;
MONITOR: ASD TR6U 486

UNCLASSIFIED REPORT

DESCRIPTORS: *CADMIUM, *PLATING, *STEEL, AIRFRAMES, ALLOYS, AUSTENITE, BORATES, CADMIUM ALLOYS, CADMIUM COMPOUNDS, DIFFUSION, ELECTROPLATING, FATIGUE (MECHANICS), FLUORIDES, FRACTURE (MECHANICS), HEAT TREATMENT, IMPACT SHOCK, MECHANICAL PROPERTIES, MICROSTRUCTURE, NICKEL ALLOYS, PROCESSING, STRESSES, TENSILE PROPERTIES, TESTS, VAPOR PLATING (U)

A STUDY WAS CONDUCTED OF THE EFFECTS OF CD PLATING ON STRESSED STEELS AT ELEVATED TEMPERATURES. THE EXPERIMENTAL PROCEDURES INVOLVED SEVERAL TESTS CHARACTERIZED AS THE STRESS-RUPTURE, TENSILE, AND FATIGUE TESTS. MATERIALS STUDIED CONSISTED OF SEVERAL AIRCRAFT QUALITY SAE STEELS; NAMELY, 4340, 4130, 1095, 18-8, AND H-13 HOT WORK DIE STEELS. STRENGTH LEVELS FROM 180,000 TO 300,000 PSI, AS SUITABLE FOR THE SEVERAL STEELS, WERE EVALUATED FOR A VARIETY OF CONDITIONS OF STRESS CONCENTRATION. THE STEELS EXAMINED, EXCEPT THE AUSTENITIC STAINLESS STEELS, WERE SUSCEPTIBLE TO EMBRITTLEMENT BY CL PLATING AT ELEVATED TEMPERATURES. WITH DECREASING TEMPERATURES, THE NOTICEABLE EFFECT OF CD PLATING ON THE PROPERTIES OF STEELS WAS CORRESPONDINGLY DECREASED. ALL THE STEELS EXAMINED SHOWING AN EFFECT ON ONE PROPERTY, SHOWED SIMILAR EFFECTS ON THE OTHER PROPERTIES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-272 091
GENERAL DYNAMICS/FORT WORTH TEX

MATERIALS-SANDWICH, BRAZED PH 15-7MO STAINLESS STEEL, EVALUATION OF (U)

JAN 62 1V HILDEBRAND,J.F.;
REPT. NO. FGT 2730
CONTRACT: AF33 600 36200

UNCLASSIFIED REPORT

DESCRIPTORS: *HONEYCOMB CORES, *STAINLESS STEEL, AIRFRAMES, ALLOYS, BRAZING, DISPERSION HARDENING, FAILURE (MECHANICS), FATIGUE (MECHANICS), HEAT TREATMENT, MANUFACTURING METHODS, MOLYBDENUM ALLOYS, NACELLES, PROCESSING, SANDWICH PANELS, SILVER, TENSILE PROPERTIES, TORQUE (U)
IDENTIFIERS: J57-402 ENGINES (U)

A STUDY WAS MADE OF THE RESPONSE OF PH15-7 MO TO THE PHASES OF THE HEAT TREATMENT MAKING UP A BRAZING CYCLE FOR HONEYCOMB SANDWICH PANELS. THE AUSTENITE CONDITIONING TEMPERATURE WAS PREDETERMINED BY THE BRAZING ALLOY, STERLING AG PLUS 0.28 LI, WHICH BRAZES IN THE 1640 TO 1690 F RANGE. THE DATA INDICATED THAT SOME LOSS IN DUCTILITY WAS ASSOCIATED WITH SLOWER COOLING RATES. SATISFACTORY TENSILE PROPERTIES WERE OBTAINED BY REFRIGERATION AT -20 F FOR 60 MIN. AGING (PRECIPITATION HARDENING) RESPONSE WAS DETERMINED TO BE MOST SATISFACTORY AT 950 F FOR 60 MIN. THE TENSILE PROPERTIES RESULTING FROM THIS HEAT TREATMENT ARE REPORTED. THE THICKER GAGES, 0.020 TO 0.320 IN., HAD SOMEWHAT LOWER STRENGTHS AND HIGHER ELONGATION. THE CONVERSE WAS FOUND FOR THINNER GAGES, 0.016 TO 0.005 IN. THE TENSION-TENSION FATIGUE STRENGTH OF PH15-7 MO - RH950M COMPARED FAVORABLY WITH 17-7PH - TH1050. THE MECHANICAL PROPERTIES WERE DETERMINED FOR HONEYCOMB TEST PANELS BRAZED WITH PRODUCTION EQUIPMENT. THE AVERAGE RESULTS FOR THE 0.008 IN. GAGE SKIN PANELS WERE REPORTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-272 105
GENERAL DYNAMICS/FORT WORTH TEX

MATERIAL, 7079-T652 ALUMINUM ALLOY TENSILE AND FATIGUE PROPERTIES, DETERMINATION OF (U)

JAN 62 1V GHENA,P.F.;
REPT. NO. FGT 2607
CONTRACT: AF33 600 35200

UNCLASSIFIED REPORT

DESCRIPTORS: *ALUMINUM ALLOYS, AIRFRAMES, CHROMIUM ALLOYS, COPPER ALLOYS, DEFORMATION, FATIGUE (MECHANICS), FORGING, MAGNESIUM ALLOYS, MECHANICAL PROPERTIES, NON-DESTRUCTIVE TESTING, STRESSES, TENSILE PROPERTIES, ULTRASONIC RADIATION, ZINC ALLOYS (U)
IDENTIFIERS: AGI-402 ENGINES (U)

AN INVESTIGATION WAS MADE TO EVALUATE 7079-T652 AL ALLOY FOR USE IN HEAVY SECTION FORGINGS ON THE B-58. THE YIELD AND TENSILE STRENGTH EXCEEDED ALCOA GUARANTEED MINIMUMS BY 5 TO 10% AND THE ELONGATIONS WERE DOUBLE OR ALMOST DOUBLE. THE SHORT TRANSVERSE YIELD AND ULTIMATE TENSILE STRENGTHS AND ELONGATION OF A 6-IN. SECTION WERE SIMILAR TO THOSE OF A 4-IN. SECTION, BUT THE NOTCH TENSILE STRENGTH WAS LOWER IN THE THICKER SECTION. THE RATIO OF NOTCH TO STANDARD TENSILE STRENGTHS AVERAGED 0.81. THE ENDURANCE LIMIT STRESS FOR TEN MILLION WAS UNDER 4,300 PSI FOR THE LUG TYPE SPECIMENS USED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-272 258
GENERAL DYNAMICS/FORT WORTH TEX

MATERIAL - 7079-T651 ALUMINUM ALLOY - FATIGUE PROPERTIES - DETERMINATION OF (U)

JAN 62 IV GHENA,P.F.;
REPT. NO. FGT 2644
CONTRACT: AF33 657 7248

UNCLASSIFIED REPORT

DESCRIPTORS: *ALUMINUM ALLOYS, AIRFRAMES, ALLOYS, EXTRUSION, FAILURE (MECHANICS), FATIGUE (MECHANICS), LOAD DISTRIBUTION, METAL JOINTS, METAL PLATES (U)
IDENTIFIERS: A01-402 ENGINES (U)

FOUR FATIGUE SPECIMENS WERE PREPARED REPRESENTING EACH OF 3 BULKHEAD CONFIGURATIONS USED ON THE B-58. THE BULKHEAD SECTIONS TESTED CONSISTED OF AN EXTRUSION OF 7075-T6 AL ALLOY NUMBERED E-702402, AND 2 SECTIONS OF DIFFERENT FLANGE THICKNESS OF 7079-T651 AL ALLOY MACHINED FROM 4-1/2 IN THICK PLATE PURCHASED TO FMS-0108 SPECIFICATION. ALL 12 BULKHEAD SPECIMENS WERE ATTACHED TO LOAD PLATES THAT REPRESENTE TYPICAL INSTALLATION A D ESTS FOR FATIGUE SPECTRUM. ALL SPECIMENS WERE SUBJECTED TO THE 20 LAYERS OF SPECTRUM LOAD TWICE WITHOUT FAILURE. THE SPECIMENS WERE THEN TESTED AT THE FOURTH HIGHEST LOAD OF THE SPECTRUM TO FAILURE. THE EXTRUSION AVERAGED 270,000 A DITIONAL CYCLES, THE THIN FLANGED PLATE SPECIMEN AVERAGED 299,000 ADDITIONAL CYCLES, AND THE THICK FLANGED PLATE SPECIMEN AVERAGED 503,000 ADDITIONAL CYCLES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-272 259
GENERAL DYNAMICS/FORT WORTH TEX

MATERIAL - 7079-T651 ALUMINUM ALLOY SHORT TRANSVERSE FATIGUE PROPERTIES - DETERMINATION OF (U)

JAN 62 1V HILDEBRAND,J.F.;
REPT. NO. FGT 2338
CONTRACT: AF33 657 7248

UNCLASSIFIED REPORT

DESCRIPTORS: *ALUMINUM, AIRFRAMES, ALLOYS, ALUMINUM ALLOYS, FATIGUE (MECHANICS), FEASIBILITY STUDIES, METAL PLATES, SPECTROGRAPHIC ANALYSIS, TENSILE PROPERTIES, TESTS (U)

A 4-1/2-IN. THICK ALCOA PLATE WAS SECTIONED TO OBTAIN SHORT TRANSVERSE TENSILE AND FATIGUE SPECIMENS. THE LONGITUDINAL, LONG TRANSVERSE AND SHORT TRANSVERSE TENSILE PROPERTIES OF THE PLATE WERE OBTAINED AND FOUND TO EXCEED THE MINIMUM VALUES SPECIFIED BY FMS-J108 FOR 4.001 TO 4.500 IN. PLATE. BOTH THE UNNOTCHED, K SUB T EQUALS 1.1, AND NOTCHED K SUB T EQUALS 3.56 FATIGUE SPECIMENS WERE TESTED WITH A STRESS RATIO OF 0.1. A COMPLETE S/N CURVE WAS PREPARED FROM THE DATA OBTAINED FOR EACH TYPE SPECIMEN. THE ENDURANCE LIMIT OF THE UNNOTCHED CONDITION WAS AT 30,000 PSI OR ABOUT 43% OF THE SHORT TRANSVERSE ULTIMATE TENSILE STRENGTH WHILE FOR THE NOTCHED CONDITION IT WAS 10,000 PSI OR 14% OF THE SHORT TRANSVERSE ULTIMATE TENSILE STRENGTH. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-286 281
GENERAL DYNAMICS/FORT WORTH TEX

MATERIALS - 4340 STEEL - STRESS CORROSION AND EFFECTS OF BANDING LITERATURE SURVEY, PART I. STRESS CORROSION (U)

JUL 62 IV OWEN,H.P.;
REPT. NO. FGT 2957 P1
CONTRACT: AF 33(657)-7248, AF 33(600)-41891

UNCLASSIFIED REPORT

DESCRIPTORS: *CORROSION, *FRACTURE (MECHANICS), *STEEL, COATINGS, CORROSION INHIBITION, ELECTROPLATING, FAILURE (MECHANICS), GRAIN STRUCTURES (METALLURGY), HEAT TREATMENT, LANDING GEAR, PROCESSING, STRESSES, TEST METHODS, X-RAY DIFFRACTION ANALYSIS (U)
IDENTIFIERS: 4340 STEEL (U)

HIGH STRENGTH ALLOY STEELS, SUCH AS 4340 AND 4335 ARE SUSCEPTIBLE TO STRESS CORROSION CRACKING. IT IS GENERALLY AGREED BY AUTHORITIES ON THE SUBJECT THAT THE UNDERLYING CAUSE OF STRESS CORROSION CRACKING IS THE MARKED ELECTROCHEMICAL DIFFERENCE IN GRAIN BODIES AND GRAIN BOUNDARIES. THERE IS CONFLICTING OPINION ON HOW CORROSION AND STRESS (TENSILE) CAUSE THE PHENOMENON TO OCCUR. X-RAY DIFFRACTION APPEARS TO BE AN EXCELLENT NONDESTRUCTIVE TEST METHOD FOR DETERMINING STRESS CORROSION CRACKING SUSCEPTIBILITY OF MET L ALLOYS. INDICATIONS ARE THAT SHOT-PEENING FOLLOWED BY COATINGS (PAINTS OR PLATINGS) ANODIC TO THE SUBSTRATE TO BE PROTECTED IS AN ACCEPTABLE PROCEDURE FOR PROLONGING THE TIME BEFORE STRESS CORROSION CRACKING STARTS IN A SUSCEPTIBLE METAL ALLOY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-286 262
GENERAL DYNAMICS/FORT WORTH TEX

MATERIAL - MAG THORIUM HK31 - H24 SKINS ANDERSON PROCESS FORMED - EVALUATION OF (U)

OCT 62 IV KAARLELA,W.T.;
REPT. NO. FGT 1703
CONTRACT: AF 33(657)-7248, AF 33(038)-21250

UNCLASSIFIED REPORT

DESCRIPTORS: *ALLOYS, *MAGNESIUM ALLOYS, AIRPLANE PANELS, AIRPLANES, ELASTICITY, FRACTURE (MECHANICS), MATERIALS, SHEETS, TENSILE PROPERTIES, TESTS, THORIUM ALLOYS (U)

AN EVALUATION OF 3 SHEETS OF HK31 MG ALLOY COLD FORMED BY THE ANDERSON PROCESS SHOWED LARGE VARIATIONS IN THE TENSILE AND COMPRESSIVE YIELD STRENGTH BETWEEN THE LONGITUDINAL AND TRANSVERSE DIRECTIONS. CONTROL TESTS OF AS-RECEIVED SHEET DID NOT SHOW THESE LARGE VARIATIONS. THE MOST PROMINENT EFFECT OF THE ANDERSON PROCESS ON THE MECHANICAL PROPERTIES WAS IN THE LONGITUDINAL DIRECTION. THERE WERE REDUCTIONS OF UP TO 47% IN THE TENSILE YIELD STRENGTH AND 30% IN THE COMPRESSIVE YIELD STRENGTH. DECREASES OF THIS MAGNITUDE WERE PRESENT ON ALL 3 SHEETS AND IN BOTH THE SLIGHTLY AND APPRECIABLY WORKED AREAS. THE ONLY PROPERTIES WHICH SHOWED INCREASES WERE THE ULTIMATE TENSILE AND COMPRESSIVE YIELD STRENGTHS IN THE TRANSVERSE DIRECTION. THESE INCREASES VARIED IN THE 3 SHEETS. CRACKING WAS OBSERVED TO SOME DEGREE ON ALL SHEETS. THIS CRACKING IS THE RESULT OF EXCESSIVE COLD WORK ACTING ON STRESS RISERS CONSISTING OF INCLUSIONS AND SCRATCHES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-287 894
GENERAL DYNAMICS/FORT WORTH TEX

MATERIALS - SAE 4335 (MODIFIED) STEEL - 260,000 TO 280,000 PSI HEAT TREATMENT - DEVELOPMENT OF PROCESS CONTROL AND MECHANICAL PROPERTIES FOR (U)

JAN 58 IV JONES,R.L.;
REPT. NO. FGT 1659
CONTRACT: AF33 038 21260

UNCLASSIFIED REPORT

DESCRIPTORS: *STEEL, AIRFRAMES, ARC WELDING, CADMIUM, FATIGUE (MECHANICS), HEAT TREATMENT, MANUFACTURING METHODS, MECHANICAL PROPERTIES, PLATING, STRESSES, TESTS (U)

THE BEST HEAT TREATMENT FOR OPTIMUM COMBINATION OF ALL MECHANICAL PROPERTIES OF SAE 4335 AT THE 260,000 TO 280,000 PSI STRENGTH LEVEL IS (1) AUSTENITIZE AT 1525 F FOR ONE HR, (2) QUENCH IN AGITATED OIL TO ROOM TEMPERATURE, (3) TEMPER AT 465 F FOR TWO HR, AND (4) AIR COOL TO ROOM TEMPERATURE. THE MECHANICAL PROPERTIES OF SAE 4335 HEAT TREATED TO THE TENSILE STRENGTH LEVEL OF 260 TO 280 KSI BY THIS PROCEDURE INDICATE THAT (1) SAE 4335 HAS SUPERIOR DUCTILITY AND IMPACT PROPERTIES TO SAE 4340, (2) THE BAKING CYCLE OF 3 HR AT 375 F WAS NOT SUFFICIENT TO REMOVE THE EMBRITTLING EFFECT OF CADMIUM PLATING UPON SAE 4335, (3) SHOT PEENING IMPROVED THE SUSTAINED LOAD STRENGTH OF CADMIUM PLATED SPECIMENS, (4) WELDIN EFFICIENCY OF APPROXIMATELY 77% CAN BE ACHIEVED IN ARC WELDED SAE 4335, (5) SAE 4335 IS NOT WELDABLE BY MENASCO'S UNIWELD PROCESS USING TECHNIQUES ESTABLISHED FOR 4340, (6) SAE 4335 HAS SUPERIOR FATIGUE PROPERTIES TO 4340 AT STRESS LEVELS BELOW 140,000 PSI, (7) CHROMIUM AND CADMIM PLATING LOWERED THE FATIGUE STRENGTH OF 4335, AND (8) SHOT PEENING IMPROVED THE FATIGUE STRENGTH OF 4335. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-409 151
WEIBULL (WALODDI) LAUSANNE (SWITZERLAND)

HISTORY OF SERVICE SIMULATED LOAD SPECTRUM FATIGUE TESTING. (U)

DESCRIPTIVE NOTE: FINAL REPT., 15 APR-31 DEC 56,
DEC 56 IV WEIBULL,WALODDI ;
CONTRACT: AF61 514 944

UNCLASSIFIED REPORT
DISTRIBUTION: MICROFICHE ONLY AFTER ORIGINAL COPIES EXHAUSTED.

DESCRIPTORS: (•MATERIALS, FATIGUE), TESTS, STRUCTURAL PROPERTIES, AIRCRAFT, HISTORY, LOADING, STRESSES, SIMULATION. (U)
IDENTIFIERS: LOAD SPECTRUM, 1956. (U)

THE OBJECT OF THIS INVESTIGATION IS TO COMPILE ALL AVAILABLE EUROPEAN AND AMERICAN TEST DATA AND LITERATURE ON EACH KIND OF PROGRAM AND SPECTRUM TESTING, DEFINED ACCORDING TO PROPOSED DEFINITIONS AND NOMENCLATURE. A CLASSIFICATION SYSTEM OF FATIGUE TESTS INCLUDING CONSTANT-STRESS AS WELL AS VARIABLE-STRESS TESTS HAS BEEN SET UP AND APPLIED TO THE TEST DATA GIVEN IN THE REFERENCES. AN ABSTRACT HISTORY OF THE DEVELOPMENT OF THE TESTING TECHNIQUE IN THE FOLLOWING COUNTRIES IS GIVEN: FRANCE, GERMANY, NETHERLANDS, ITALY, SWEDEN, SWITZERLAND, UNITED KINGDOM, U.S.A., AND U.S.S.R. PAST ACCOMPLISHMENTS AND FUTURE POSSIBILITIES WITH PARTICULAR REGARD TO THE AIRCRAFT INDUSTRY HAS BEEN BRIEFLY DISCUSSED. A SURVEY OF VARIOUS THEORIES, HYPOTHESES AND ENGINEERING RULES IS PRESENTED TOGETHER WITH SOME CONCLUDING REMARKS AND EXPLANATIONS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-410 497
IIT RESEARCH INST CHICAGO ILL

LITERATURE ON DESIGN TECHNIQUES AND ANALYTICAL METHODS FOR BRITTLE MATERIALS, (U)

APR 63 258P BARNETT,RALPH L.;
REPT. NO. REPT. NO. 8259
TASK: 2

UNCLASSIFIED REPORT

DESCRIPTORS: (*BRITTLENESS, BIBLIOGRAPHIES), STRESSES, ANALYSIS, DESIGN, CERAMIC MATERIALS, REFRACTORY MATERIALS, GLASS TEXTILES, METALS, ALLOYS, MATERIALS, COMPOSITE MATERIALS, MECHANICAL PROPERTIES, GLASS, TEXTILES, CONCRETE, AIR FRAMES, MECHANICS, STATISTICAL ANALYSIS, STRUCTURES, FRACTURE(MECHANICS), FATIGUE(MECHANICS), THERMAL STRESSES, CREEP, JOINTS, THEORY, TEST METHODS, FAILURE(MECHANICS), LOADING(MECHANICS), DEFORMATION, STATISTICAL MECHANICS (U)
IDENTIFIERS: 1963. (U)

CONTENTS: STATISTICAL STATIC STRENGTH THEORIES FATIGUE FRACTURE THEORY BRITTLE BEHAVIOR THERMAL STRESS NOTCH SENSITIVITY AND STRESS CONCENTRATION CREEP CRACK PROPAGATION MATERIALS ENVIRONMENT JOINTS (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-430 152
GENERAL DYNAMICS/FORT WORTH TEX

MATERIALS - 7075-T6 ALUMINUM ALLOY - CUMULATIVE DAMAGE EFFECTS - INVESTIGATION OF -. (U)

JAN 64 23P
REPT. NO. FTDM2892
CONTRACT: AF33 657 11214

UNCLASSIFIED REPORT

DESCRIPTORS: (*ALUMINUM ALLOYS, FATIGUE (MECHANICS)), (*FATIGUE (MECHANICS), ALUMINUM ALLOYS), MAGNESIUM ALLOYS, ZINC ALLOYS, EXPERIMENTAL DATA, TENSILE PROPERTIES, STRESSES, LOADING (MECHANICS), TEST EQUIPMENT, DAMAGE, JET BOMBERS (U)
IDENTIFIERS: 1964, 7075 ALUMINUM ALLOY, B-58 AIRCRAFT (U)

THE S-NCURVES AND THE RESULTS OF VARIOUS MULTIPLE LOADINGS ON INDIVIDUAL SPECIMENS FROM A SINGLE PLATE OF 7075-T6 ALUMINUM ALLOY ARE PRESENTED AS EMPIRICAL DATA FOR THE EVALUATION OF METHODS OF CUMULATIVE FATIGUE DAMAGE ASSESSMENT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-438 893
OKLAHOMA UNIV RESEARCH INST NORMAN

INVESTIGATION OF EDDY CURRENT TECHNIQUES IN ANALYZING AIRCRAFT STRUCTURES FOR FATIGUE DAMAGE. (U)

DESCRIPTIVE NOTE: REPT. FOR 12 SEP 63-31 MAR 64,
APR 64 54P SIMS,E. M. ;
CONTRACT: AF34 601 17360
PROJ: 1493 1

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRCRAFT, NONDESTRUCTIVE TESTING), (*STRUCTURES, FATIGUE (MECHANICS)), (*ALUMINUM ALLOYS, FATIGUE (MECHANICS)), TEST EQUIPMENT, INSTRUMENTATION, STRESSES, RUPTURE, TENSILE PROPERTIES, FRACTURE MECHANICS, METAL PLATES, SHEETS, ELECTRIC CURRENTS, MAGNETIC FIELDS, LOADING (MECHANICS), VIBRATION, STEEL, DAMAGE, DETECTION, FRACTOGRAPHY, PHOTOMICROGRAPHY, DYES, PENETRATION, TABLES (U)
IDENTIFIERS: EDDY CURRENTS, ALUMINUM ALLOY 2024-T3, ALUMINUM ALLOY 6061-T6, ALUMINUM ALLOY 7075-T6, STEEL 4130 (U)

THE PRIMARY OBJECTIVE OF THE PROGRAM WAS TO DEVELOP NONDESTRUCTIVE METHODS OF EVALUATING AIRCRAFT STRUCTURES OF ALUMINUM ALLOYS FOR FATIGUE DAMAGE. THE APPROACH TO THE PROBLEM WAS PRIMARILY THROUGH THE USE OF EDDY CURRENT INSTRUMENTATION. FLAT PLATE AND SHEET ALUMINUM ALLOYS, OF TYPES 7075-T6, 6061-T6, AND 2024-T3, WERE SUPPLIED BY OCAMA FOR THE TEST PROGRAM. SPECIMENS WERE REVERSE STRESS CYCLED TO VARYING DEGREES OF DAMAGE AND INSPECTED WITH EDDY CURRENT INSTRUMENTATION. THESE WERE THEN PULLED TO RUPTURE TO CORRELATE EDDY CURRENT RESPONSE TO REDUCTION IN STRENGTH AND DUCTILITY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-600 008
MANLABS INC CAMBRIDGE MASS

INVESTIGATION OF FRACTURE TOUGHNESS IN HIGH STRENGTH ALLOYS. (U)

DESCRIPTIVE NOTE: REPT. FOR 15 AUG 62-15 AUG 63
JAN 64 120P LEMENT,B. S. ;KREDER,K. ;
TUSHMAN,H. ;
CONTRACT: AF33 616 8155
PROJ: 7381
TASK: 738103
MONITOR: ASD TDR62-868 P2

UNCLASSIFIED REPORT

DESCRIPTORS: (*STEEL, TOUGHNESS), (*FRACTURE (MECHANICS), STEEL), AIRPLANE PANELS, ALLOYS, TENSILE PROPERTIES, HEAT TREATMENT, STRESSES, METALLOGRAPHY, GRAIN STRUCTURES (METALLURGY), FRACTOGRAPHY (U)

A COMPREHENSIVE INVESTIGATION OF THE FRACTURE TOUGHNESS OF 4335-V STEEL TEMPERED IN THE RANGE OF 400 TO 800 F WAS CARRIED OUT BASED PRIMARILY ON PRECRACKED CHARPY IMPACT AND SLOW BEND TESTS OF REGULAR AND BRITTLE-BOUNDARY SPECIMENS WITH THICKNESSES IN THE RANGE OF ABOUT 0.04 TO 0.40 INCH. THESE TESTS WERE SUPPLEMENTED BY NOTCHED AND UNNOTCHED TENSILE TESTS; AND BY METALLOGRAPHIC AND FRACTOGRAPHIC EXAMINATIONS USING BOTH LIGHT AND ELECTRON MICROSCOPY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-604 125
COLUMBIA UNIV NEW YORK

RANDOM FATIGUE FAILURE OF A MULTIPLE LOAD PATH REDUNDANT STRUCTURE. (U)

DESCRIPTIVE NOTE: REPT. FOR 1 SEP 62-31 JAN 64, 39P HELLER,A. S. ;HELLER,R. A. ; FREUDENTHAL,A. M. ;
CONTRACT: AF33 616 7042
PROJ: AF-7351
TASK: 735106
MONITOR: AFML TDR64 160

UNCLASSIFIED REPORT

DESCRIPTORS: (•ALUMINUM ALLOYS, FAILURE (•MECHANICS)), (•STEEL, FAILURE (•MECHANICS)), (•FAILURE (MECHANICS), AIRFRAMES), LOADING (MECHANICS), MATHEMATICAL ANALYSIS, STRUCTURES, STRESSES, STRUCTURAL PARTS, FATIGUE (MECHANICS), SAFETY, LIFE EXPECTANCY, GUST LOADS, STATISTICAL DISTRIBUTIONS, LOAD DISTRIBUTION, MECHANICAL PROPERTIES, PROBABILITY, FUNCTIONS, DIFFERENTIAL EQUATIONS (U)
IDENTIFIERS: ALUMINUM ALLOY 7075, ALUMINUM ALLOY 2024, STEEL 4340 (U)

THE OBJECT OF THE INVESTIGATION IS THE DETERMINATION OF THE FATIGUE LIFE OF A MULTIPLE LOAD PATH REDUNDANT STRUCTURE CONSISTING OF GEOMETRICALLY SIMILAR MEMBERS HAVING STATISTICALLY DISTRIBUTED INITIAL STRENGTHS AND SUBJECTED TO RANDOMIZED FATIGUE LOADS DERIVED FROM AN EXPONENTIALLY DISTRIBUTED GUST SPECTRUM. A MODIFIED LINEAR DAMAGE RULE AND FAILURE CONDITION BASED ON ULTIMATE CARRYING CAPACITY IS BEING USED. THE METHOD ALLOWS COMPUTATION OF A MEDIAN 'FAIL-SAFE' FATIGUE LIFE OF THE STRUCTURE AS WELL AS THE CONSECUTIVE FAILURE OF INDIVIDUAL MEMBERS. THREE AIRCRAFT STRUCTURAL MATERIALS, 7075-T6 AND 2024-T4 ALUMINUM AS WELL AS SAE 4340 STEEL HAVE BEEN INVESTIGATED. FATIGUE LIVES SHORTER THAN THOSE CALCULATED USING THE LINEAR DAMAGE RULE ARE OBTAINED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-623 128
OKLAHOMA UNIV RESEARCH INST NORMAN

DYNAMIC ELASTIC, DAMPING, AND FATIGUE CHARACTERISTICS OF FIBERGLASS-REINFORCED SANDWICH STRUCTURE. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
OCT 65 94P NORDBY,GENE M. ;CRISMAN,W. C. ;BERT,CHARLES W. ;
CONTRACT: DA44 177AMC164T
TASK: 1P121401A14176
MONITOR: USAAVLABS , TR-65-60

UNCLASSIFIED REPORT

DESCRIPTORS: (*LAMINATED PLASTICS, COMPOSITE MATERIALS), (*COMPOSITE MATERIALS, SANDWICH CONSTRUCTION), (*GLASS TEXTILES, REINFORCING MATERIALS), (*SANDWICH PANELS, HONEYCOMB CORES), AIRPLANE PANELS, EPOXY PLASTICS, ALUMINUM ALLOYS, PHENOLIC PLASTICS, FOILS, ELASTICITY, DAMPING, FATIGUE(MECHANICS), STRUCTURAL PROPERTIES, STRUCTURES, MATHEMATICAL ANALYSIS (U)
IDENTIFIERS: ALUMINUM 5052 (U)

RESEARCH WAS CONDUCTED TO DETERMINE THE BASIC DYNAMIC PROPERTIES OF FIBERGLASS-REINFORCED PLASTIC (FRP) SANDWICH STRUCTURE SUITABLE FOR USE AS A PRIMARY AIRFRAME STRUCTURAL MATERIAL. THE RESEARCH PROGRAM WAS CARRIED OUT IN TWO SEPARATE PARTS: (A) DETERMINING DYNAMIC MODULI AND DAMPING, AND (B) DETERMINING FATIGUE BEHAVIOR. IN EACH PART, TWO TYPES OF HEXAGONALCELL HONEYCOMB CORE MATERIALS WERE INVESTIGATED: 5052 ALUMINUM FOIL AND HRP (HEAT RESISTANT PHENOLIC) FIBERGLASS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-630 926 20/11 11/6 11/9
SIKORSKY AIRCRAFT DIV UNITED AIRCRAFT CORP STRATFORD CONN

FATIGUE CRACK PROPAGATION IN AIRCRAFT MATERIALS. (U)

DESCRIPTIVE NOTE: REPT. FOR 25 FEB 63-31 AUG 65.
MAR 66 74P DEGNAN,WILLIAM G. ;DRIPCHAK, PETER D. ;MATUSOVICH,CHARLES J. ;
REPT. NO. SER-50411.
CONTRACT: DA-44-177-AMC-84(T)
TASK: 1P1259U1A14227.
MONITOR: USAAVLABS , TR-66-9

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRCRAFT, MATERIALS), (*ALLOYS, *FATIGUE(MECHANICS)), ALUMINUM ALLOYS, MAGNESIUM ALLOYS, TITANIUM ALLOYS, STEEL, LAMINATED PLASTICS, FRACTURE(MECHANICS), TENSILE PROPERTIES, TOUGHNESS, COLD WORKING (U)

THE INFLUENCE OF METALLURGICAL, CHEMICAL, AND GEOMETRIC VARIABLES ON FATIGUE CRACK PROPAGATION RATES WAS INVESTIGATED IN ALLOYS OF ALUMINUM, MAGNESIUM, STEEL, AND TITANIUM. SOME LIMITED FATIGUE CRACK PROPAGATION WAS DONE IN LAMINATED PLASTICS. A POSSIBLE CORRELATION BETWEEN FATIGUE CRACK PROPAGATION, FRACTURE TOUGHNESS, AND TENSILE STRENGTH WAS ALSO INVESTIGATED. ALL MATERIALS ARE RANKED ACCORDING TO THEIR RESISTANCE TO FATIGUE CRACK PROPAGATION. THE CRITICAL PLANE STRAIN FRACTURE TOUGHNESS, CRITICAL PLANE STRESS FRACTURE TOUGHNESS (WHERE APPLICABLE), ULTIMATE TENSILE STRENGTH, AND PER CENT ELONGATION ARE ALSO REPORTED FOR ALL MATERIALS. FOR THE MATERIALS TESTED IN THIS PROGRAM, THERE WAS NO APPRECIABLE THICKNESS OR CHEMICAL EFFECT. SHOT-PEENING DID INCREASE RESISTANCE TO FATIGUE CRACK PROPAGATION. IN GENERAL, THERE WAS AN INCREASE IN THE RESISTANCE TO FATIGUE CRACK PROPAGATION IN MATERIALS WITH GREATER DUCTILITY. THE CORRELATION BETWEEN FATIGUE CRACK PROPAGATION AND STATIC FRACTURE TOUGHNESS WAS VERY POOR. THE CRACK PROPAGATION RESULTS OF LAMINATED PLASTICS WAS ALSO CONSIDERED UNSATISFACTORY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-632 123 1/3 20/11 11/6
GENERAL DYNAMICS/CONVAIR SAN DIEGO CALIF

A METHOD FOR ESTIMATING THE FATIGUE LIFE OF 7075-T6 ALUMINUM ALLOY AIRCRAFT STRUCTURES. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
DEC 65 70P SMITH,CLARENCE R. ;
CONTRACT: N156-41307,
PROJ: PA-1-23-60,
MONITOR: NAEC-ASL 1096

UNCLASSIFIED REPORT

DESCRIPTORS: (*ALUMINUM ALLOYS, *FATIGUE(MECHANICS), (*AIRFRAMES, ALUMINUM ALLOYS), (*METALLOGRAPHY, ALUMINUM ALLOYS), STRUCTURES, LIFE EXPECTANCY, TEST METHODS, STRAIN(MECHANICS), LOADING(MECHANICS), STRESSES, FRACTURE(MECHANICS), FAILURE(MECHANICS), MATHEMATICAL PREDICTION, AVIATION SAFETY (U)
IDENTIFIERS: ALUMINUM ALLOY 7075, SMITH'S METHOD (U)

THE PURPOSE OF THIS INVESTIGATION WAS TO ASSESS THE VALIDITY OF THE 'SMITH CUMULATIVE DAMAGE' HYPOTHESIS FOR 7075-T6 ALUMINUM ALLOY SPECIMENS AND STRUCTURES. IT WAS FOUND THAT THE RESULTS OF A SINGLE-AMPLITUDE TEST (AT SHORT LIFE) CAN BE USED TO ESTIMATE THE STRESS AT THE POINT OF FAILURE, INCLUDING RESIDUAL STRESS. THIS PERMITS USING S-N DATA FOR AXIALLY LOADED UNNOTCHED SPECIMENS TO PREDICT SPECTRUM LIFE. EXCELLENT AGREEMENT WAS FOUND BETWEEN CALCULATED AND EXPERIMENTAL LIVES OF FULL-SCALE STRUCTURES; HOWEVER, TEST LIVES OF SMALL SPECIMENS WERE CONSISTANTLY SHORTER THAN PREDICTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-648 687 1/3 11/6 20/11
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

AVIATION TECHNOLOGICAL INSTITUTE, MOSCOW, VOL 51, 1961: COLLECTION OF ARTICLES, (U)

FEB 67 82P BORODIN,N. A. ;GIATSINTOV, E. V. ;STEPNOR,M. N. ;
REPT. NO. FTD-MT-64-91
MONITOR: TT 67-61327

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: ISSLEDOVANIYA USTALOSTI I DLITELNOI STATICHESKOI PROCHNOSTI ALYUMINIEVYKH SPLAVOV, EDITED MACHINE TRANS. OF AVIATSIONNYI TEKHNOLOGICHESKII INSTITUT, MOSCOW. TRUDY (USSR) V51 100P 1961.

DESCRIPTORS: (*AIRCRAFT, *METALLOGRAPHY), (*FATIGUE(MECHANICS), ALUMINUM ALLOYS), RODS, HEAT-RESISTANT MATERIALS, HELICOPTERS, ROTOR BLADES(ROTARY WINGS), ROTATION, STRUCTURAL PROPERTIES, STEEL, CAPTIVE TESTS, METALS, USSR (U)

CONTENTS: MECHANICAL PROPERTIES OF ALUMINUM ALLOYS D16 AND V95 IN CONNECTION WITH THE TECHNOLOGY OF MANUFACTURING SEMI-FINISHED PRODUCTS FROM THEM; FATIGUE PROPERTIES OF ALUMINUM ALLOY USED FOR HELICOPTER BLADES; INFLUENCE OF CONCENTRATION OF STRESSES ON FATIGUE OF ALUMINUM ALLOY V95; EFFECT OF CONCENTRATION OF STRESSES ON STATIC CRACK STRENGTH OF ALUMINUM ALLOY V95; METHOD OF DETERMINING STRESS-RUPTURE STRENGTH OF SLIGHTLY EMBRITTLED MATERIALS; INVESTIGATION OF MECHANICAL PROPERTIES OF ALUMINUM ALLOYS DURING COMPRESSION. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-650 417 20/11 1/3 11/6
BOEING SCIENTIFIC RESEARCH LABS SEATTLE WASH SOLID STATE PHYSICS LAB

FATIGUE CRACK PROPAGATION UNDER PROGRAMMED AND RANDOM LOADS, (U)

JUL 66 85P MCMILLAN,J. COREY ;
PELLOUX,REGIS M. N. ;
REPT. NO. D1-82-0553

UNCLASSIFIED REPORT

DESCRIPTORS: (*CRACK PROPAGATION, *FATIGUE(MECHANICS)), (*AIRFRAMES, FATIGUE(MECHANICS)), (*ALUMINUM ALLOYS, FATIGUE(MECHANICS)), LOADING(MECHANICS), FRACTOGRAPHY, STRESSES, LOAD DISTRIBUTION (U)

THE INFLUENCE OF MAXIMUM STRESS, STRESS RANGE, AND SEQUENCE OF LOAD APPLICATION ON THE RATE AND MECHANISM OF FATIGUE CRACK PROPAGATION IN 2024-T3 ALUMINUM ALLOY WAS STUDIED BY MEANS OF ELECTRON FRACTOGRAPHY. THE MACROSCOPIC GROWTH RATES WERE DETERMINED ON CENTER-NOTCHED CRACK GROWTH PANELS AND THE FRACTURE SURFACES WERE EXAMINED BY ELECTRON FRACTOGRAPHY. AN EMPIRICAL EQUATION RELATING RELATIVE MICROSCOPIC GROWTH RATES AT A GIVEN CRACK LENGTH TO MAXIMUM LOADS AND LOAD AMPLITUDES WAS OBTAINED. IT WAS ALSO FOUND THAT THE ADVANCE OF A FATIGUE CRACK FRONT TAKES PLACE ONLY DURING THE LOADING PART OF A CYCLE AND THAT IN THE PSEUDORANDOM LOAD CASE THE SEQUENCE OF LOAD APPLICATION CAN MARKEDLY INFLUENCE CRACK GROWTH RATE ON ANY ONE CYCLE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-653 282 11/6 1/3
ILLINOIS UNIV URBANA DEPT OF THEORETICAL AND APPLIED MECHANICS

MONOTONIC AND COMPLETELY REVERSED CYCLIC STRESS-STRAIN AND FATIGUE BEHAVIOR OF REPRESENTATIVE AIRCRAFT METALS. (U)

DESCRIPTIVE NOTE: FINAL REPT., 1 FEB 65-1 FEB 66,
JUN 66 38P ENDO,T. ;MORROW,JODEAN ;
CONTRACT: N156-46063
MONITOR: NAEC-ASL 1105

UNCLASSIFIED REPORT

DESCRIPTORS: (*ALUMINUM ALLOYS, MECHANICAL PROPERTIES), (*STEEL, MECHANICAL PROPERTIES), (*TITANIUM ALLOYS, MECHANICAL PROPERTIES), AIRCRAFT, METALS, STRESSES, STRAIN(MECHANICS), FATIGUE(MECHANICS), PLASTICITY, ELASTICITY, TENSILE PROPERTIES (U)
IDENTIFIERS: ALUMINUM ALLOY 7075, ALUMINUM ALLOY 2024, STEEL 4340, TITANIUM ALLOY 8AL 1MO 1V (U)

MONOTONIC AND CYCLIC STRESS-STRAIN AND FATIGUE BEHAVIOR IN THE LIFE RANGE OF APPROXIMATELY 10 TO 100,000 CYCLES ARE EXPERIMENTALLY DETERMINED FOR 2024-T4 AND 7075-T6 ALUMINUM ALLOYS, SAE 4340 STEEL (QUENCHED AND TEMPERED AT 1000F), AND TITANIUM ALLOY 8-1-1. THE PURPOSE OF THE INVESTIGATION IS TO ESTABLISH THE NECESSARY MATERIALS INFORMATION AND BASE LINE FATIGUE DATA FOR CUMULATIVE DAMAGE STUDIES. PLOTS OF THE FATIGUE LIFE AS FUNCTION OF ELASTIC, PLASTIC AND TOTAL STRAIN AT HALF THE FATIGUE LIFE ARE PRESENTED FOR THE FOUR METALS. THE USUAL LOG-LOG LINEAR RELATIONSHIPS BETWEEN FATIGUE LIFE AND THE ELASTIC AND PLASTIC COMPONENTS OF STRAIN DO NOT SATISFACTORILY FIT THE FATIGUE RESULTS, ESPECIALLY FOR THE TWO ALUMINUM ALLOYS. THUS, IT WILL BE NECESSARY TO USE THE ACTUAL FATIGUE PLOTS RATHER THAN SIMPLE POWER FUNCTIONS AS THE BASE LINE FATIGUE DATA FOR CUMULATIVE DAMAGE STUDIES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-659 302 11/6 20/11
ILLINOIS UNIV URBANA DEPT OF THEORETICAL AND APPLIED MECHANICS

CUMULATIVE FATIGUE DAMAGE UNDER CYCLIC STRAIN CONTROL. (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 FEB 66-30 APR 67,
JUN 67 35P TOPPER,T. H. ;SANDOR,B.
I. ;MORROW,JO DEAN ;
CONTRACT: N156-46083
PROJ: P.A. 1-23-3R
MONITOR: NAEC-ASL 1115

UNCLASSIFIED REPORT

DESCRIPTORS: (•METALS, •FATIGUE(MECHANICS)), (•ALUMINUM ALLOYS, MECHANICAL PROPERTIES), (•STEEL, MECHANICAL PROPERTIES), (•TITANIUM ALLOYS, MECHANICAL PROPERTIES), AIRCRAFT, STRESSES, STRAIN(MECHANICS), PLASTICITY, ELASTICITY, TENSILE PROPERTIES (U)

CYCLIC DEFORMATION RESISTANCE AND FATIGUE DAMAGE ACCUMULATION ARE INVESTIGATED USING MULTIPLE LEVEL STRAIN CONTROL. DATA ARE REPORTED FOR 2024-T4 AND 7075-T6 ALUMINUM ALLOYS, AIRCRAFT QUALITY SAE 4340 STEEL, AND TITANIUM 811. EFFECTS OF CYCLIC STRAIN LEVEL, SEQUENCE OF STRAINING, NUMBER OF BLOCKS, AND MEAN STRESS ARE INVESTIGATED. FOR COMBINATIONS OF RELATIVELY LARGE CYCLIC STRAIN RANGES THERE IS NO MEAN STRESS PRESENT AND DAMAGE SUMMATIONS BASED ON COMPLETELY REVERSED STRAIN VS LIFE PLOTS ARE CLOSE TO ONE. TENSILE OR COMPRESSIVE MEAN STRESSES MAY BE INDUCED WHEN THE CYCLIC STRAIN SEQUENCE IS FROM A HIGH TO A LOW LEVEL. DAMAGE SUMMATIONS BASED ON COMPLETELY REVERSED STRAIN VS LIFE DATA ARE REDUCED IF THE MEAN STRESS IS TENSILE AND ARE GENERALLY INCREASED IF THE MEAN STRESS IS COMPRESSIVE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-669 772 20/11 13/13
ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT
PARIS (FRANCE)

RESIDUAL STRENGTH IN THE PRESENCE OF FATIGUE CRACKS. (U)

67 10UP KUHN,PAUL ;
REPT. NO. AGARD ADVISORY-11

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED. PRESENTED AT THE STRUCTURES AND MATERIALS PANEL OF AGARD. SECTIONS 1-4, TURIN (ITALY), 17 APR 67, AND SECTIONS 5-7, OTTAWA (CANADA), 25 SEP 67.

DESCRIPTORS: (*STRUCTURAL PARTS, FATIGUE(MECHANICS)), STRUCTURES, CRACKS, FAILURE(MECHANICS), MATHEMATICAL ANALYSIS, SENSITIVITY, THICKNESS, ALUMINUM ALLOYS, CERAMIC MATERIALS, TITANIUM ALLOYS, COMPOSITE MATERIALS, SHEETS, MODELS(SIMULATIONS), STRESSES, HEAT-RESISTANT METALS + ALLOYS, STEEL, FLEXURAL STRENGTH, AIRFRAMES (U)

THE RESULTS ARE PRESENTED OF AN AGARD PROJECT - 'TO REVIEW THE EXISTING STATE OF KNOWLEDGE WITH RESPECT TO THE RESIDUAL STRENGTH OF MATERIAL SPECIMENS CONTAINING FATIGUE CRACK FAILURE INITIATION OF KNOWN PROPORTIONS; AND TO ASCERTAIN THE PRESENT KNOWLEDGE EXISTING WITH RESPECT TO THE RESIDUAL STRENGTH OF TYPICAL STRUCTURES USING VARIOUS TYPES OF MATERIALS.' THE REPORT CONCENTRATES ON THE CRITICAL ANALYSIS OF METHODS OF CALCULATION USEFUL IN PRACTICE, RATHER THAN THE PRESENTATION OF A COMPREHENSIVE SUMMARY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-673 253 20/11 11/6
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

TOUGH ENEMIES AGAINST THE STRENGTH OF AIRCRAFT. FATIGUE AND CREEP OF METALS. (U)

AUG 67 9P TSO.JEN ;
REPT. NO. FTD-HT-67-289

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF HANG K'UNG CHIH SHIH (CHINESE PEOPLE'S REPUBLIC) V2 N10 P14-15 1965.

DESCRIPTORS: (*METALS, MECHANICAL PROPERTIES), (*AIRFRAMES, FAILURE(MECHANICS)), FATIGUE(MECHANICS), CREEP, METALLOGRAPHY, CRYSTALLOGRAPHY, CHINA (U)
IDENTIFIERS: TRANSLATIONS (U)

THE AUTHOR DISCUSSES METAL FATIGUE AND PLASTIC DEFORMATION AND THE EFFECT THEY HAVE ON AIRCRAFT PARTS. THE CAUSES OF METAL FATIGUE AND PLASTIC DEFORMATION, THE AIRCRAFT PARTS THEY AFFECT, AND PREVENTIVE MEASURES ARE CONSIDERED IN THE ARTICLE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-674 880 11/6 20/11 1/3
COLUMBIA UNIV NEW YORK DEPT OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

INVESTIGATION OF HIGH STRENGTH STEELS UNDER HISTORY PROGRAM FATIGUE, PART I. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
FEB 68 129P BRANGER,J. ;RONAY,M. ;
REPT. NO. TR-56
CONTRACT: NONR-266(91)
PROJ: NR-064-470

UNCLASSIFIED REPORT

DESCRIPTORS: (*STEEL, FATIGUE(MECHANICS)), AIRFRAMES, CHROMIUM ALLOYS, NICKEL ALLOYS, MOLYBDENUM ALLOYS, CARBON ALLOYS, MARTENSITE, MICROSTRUCTURE, CRACKS, NON-DESTRUCTIVE TESTING, MICROSCOPY, JET FIGHTERS (U)
IDENTIFIERS: HIGH STRENGTH STEELS, VENOM (U)

AS THE FIRST HIGH STRENGTH STEEL IN A LONG RANGE RESEARCH PROGRAM ON THE FATIGUE PERFORMANCE OF SUCH STEELS IN AIRCRAFT STRUCTURES A 0.15% C, 1.12% CR, 3.69% NI AND 0.67% MO STEEL OF TEMPERED MASSIVE MARTENSITE STRUCTURE (SIGMA SUB U = 120-125 KP/SQ MM) WAS INVESTIGATED IN A SIX BAR FATIGUE TEST BED UNDER A HISTORY PROGRAM LOADING USING BOTH NOTCHED AND UNNOTCHED FATIGUE SPECIMENS. THE APPLIED FATIGUE PROGRAM SIMULATES THE SERVICE HISTORY OF THE VENOM FIGHTER PLANE UNDER THE OPERATIONAL AND GUST CONDITIONS OF SWITZERLAND. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-676 590 11/6 20/11 1/3
NATIONAL AERONAUTICAL ESTABLISHMENT OTTAWA (ONTARIO)
STRUCTURES AND MATERIALS SECTION

FATIGUE TESTS ON NOTCHED SPECIMENS OF 2024-T351 ALUMINUM ALLOY UNDER A LOW ALTITUDE AIRCRAFT LOAD SPECTRUM. (U)

MAY 68 24P DUNSBY,J. A. ;
MONITOR: NRC,NAE 10329,LR-504

UNCLASSIFIED REPORT

DESCRIPTORS: (*ALUMINUM ALLOYS, FATIGUE(MECHANICS)), (*AIRFRAMES, LOADING(MECHANICS)), LOAD DISTRIBUTION, STRESSES, LIFE EXPECTANCY, LOW ALTITUDE, TENSILE PROPERTIES (U)
IDENTIFIERS: ALUMINUM ALLOY 2024 (U)

EXPERIMENTS ARE DESCRIBED IN WHICH NOTCHED SPECIMENS OF 2024-T351 ALUMINUM ALLOY WERE SUBJECTED TO A FATIGUE LOAD DISTRIBUTION TYPICAL OF THAT ENCOUNTERED BY AN AIRCRAFT OPERATING CONTINUOUSLY AT LOW ALTITUDE. WHILE THE EXPERIMENTS LACK STATISTICAL VALIDITY, THEY SERVE TO DEMONSTRATE THE EFFECTS OF DESIGN STRESS LEVEL ON LIFE AND SUGGEST THAT THE LIVES OF GENERAL-PURPOSE AIRCRAFT CURRENTLY USED IN THESE ROLES MAY BE AS LOW AS 2000 TO 3000 HOURS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-683 947 11/6 20/11
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

METAL FATIGUE IN AN AIRCRAFT STRUCTURE, (U)

NOV 68 87P SHEVELKO,P. S. ;
REPT. NO. FTD-HT-23-491-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF MONO. USTALOST METALLOV V KONSTRUKTSIYAKH SAMOLETOV, MOSCOW, 1967 P1-110.

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PROPERTIES), (*METALS, FATIGUE(MECHANICS)), MAINTENANCE, LIFE EXPECTANCY, FAILURE(MECHANICS), LOADING(MECHANICS), STRESS CORROSION, NON-DESTRUCTIVE TESTING, USSR (U)
IDENTIFIERS: TRANSLATIONS (U)

THIS BOOK, INTENDED FOR PROFESSIONAL READERS, INTRODUCES THE PROBLEM OF METAL FATIGUE IN AIRCRAFT STRUCTURES; DESCRIBES SOME PHYSICAL BASES FOR FATIGUE PROCESSES WHICH TAKE PLACE IN AIRPLANE STRUCTURES; AND MAKES RECOMMENDATIONS HOW TO AVOID FORMATION OF METAL FATIGUE WHILE THE AIRPLANE IS IN SERVICE. MODERN METHODS OF DETECTION OF FATIGUE CRACKS ARE DESCRIBED. RESEARCH MATERIALS, BOTH SOVIET AND FOREIGN, WERE USED IN THIS STUDY. (AUTHOR) (U)

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-687 489 11/6 20/11
ARA INC WEST COVINA CALIF

RESEARCH ON ENERGY ABSORBING STRUCTURES, PART VII. (U)

DESCRIPTIVE NOTE: ANNUAL REPT. 1 FEB 68-1 FEB 69, MAR 69 56P MAZELSKY,BERNARD ;LIN,T. H. ;LIN,SHENG-RONG ;YU,CHI-KUNG ;
REPT. NO. ARA-101
CONTRACT: F44620-68-C-0041
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR 69-0645TR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO PART 6, AD-669 836.

DESCRIPTORS: (*STRUCTURAL PARTS, METAL PLATES), (*METAL PLATES, STRUCTURAL PROPERTIES), ALUMINUM ALLOYS, BERYLLIUM ALLOYS, COPPER ALLOYS, STAINLESS STEEL, LOADING(MECHANICS), HYDROSTATIC TESTS, FATIGUE(MECHANICS), TEST METHODS, MATHEMATICAL ANALYSIS, PRESSURE VESSELS, LANDING GEAR, LIFE EXPECTANCY, TORSION, STRESSES, BODIES OF REVOLUTION, PREDICTIONS, THEORY, PLASTICITY, ELASTICITY (U)
IDENTIFIERS: ALUMINUM ALLOY 2024, STEEL 347, COPPER ALLOY 2BE, BERYLLIUM COPPER, AXIAL LOADING, AXIAL STRESS, AXIAL STRAIN (U)

SPECIMENS OF ALUMINUM ALLOYS, STAINLESS STEEL AND BERYLLIUM COPPER UNDER STATIC COMPRESSIVE STRESSES WERE TESTED IN LOW CYCLE FATIGUE IN TORSION. THE DATA OBTAINED INDICATES THAT COMPRESSIVE STRESS INCREASES THE LOW CYCLE FATIGUE LIFE OF ALL THESE SPECIMENS. THIS EFFECT IS SIMILAR TO THE EFFECT OF HYDROSTATIC PRESSURE WHICH IMPROVES THE FATIGUE BEHAVIOR OF METALS UNDER TORSION AS REPORTED BY PREVIOUS INVESTIGATORS. CYCLIC TORSION TESTS WITH NO AXIAL STRESS WERE ALSO CONDUCTED ON THESE METALS. THE RESULTS OF THESE CYCLIC TORSION TESTS WITHOUT AXIAL STRESS ARE APPROXIMATED BY THE EMPIRICAL LOW CYCLE FATIGUE RELATION PROPOSED BY COFFIN AND MANSON. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-688 233 11/6 20/11 1/3
NEW MEXICO UNIV ALBUQUERQUE BUREAU OF ENGINEERING RESEARCH

A CRITERION FOR DYNAMIC LOW-CYCLE SHEAR FRACTURE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAR 69 10SP JU,FREDERICK D. ;YAO,JAMES T. P. ;LIU,TEH T. ;
REPT. NO. ME-39
CONTRACT: AF-AFOSR-568-67
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR 69-0999TR

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PROPERTIES), (*ALUMINUM ALLOYS, FRACTURE(MECHANICS)), GUST LOADS, AERODYNAMIC LOADING, LIFE EXPECTANCY, DEFORMATION, PLASTICITY, CALIBRATION, STRESSES, STRAIN(MECHANICS), SHEAR STRESSES, FATIGUE(MECHANICS), TENSILE PROPERTIES, MEASUREMENT (U)
IDENTIFIERS: ALUMINUM ALLOY 6061, CYCLIC FATIGUE, COMPUTER ANALYSIS (U)

THE PRESENT INVESTIGATION ESTABLISHES A CUMULATIVE-DAMAGE CRITERION FOR SPECIMENS SUBJECTED TO REVERSED CYCLIC DYNAMIC SHEAR LOADS. SPECIMENS OF 6061-T6 ALUMINUM ALLOY WERE TESTED UNDER REVERSED SHEAR LOADINGS FROM 1 TO 22 APPLICATIONS PRIOR TO FRACTURE. THE AMOUNT OF SHEAR DEFORMATION WAS MEASURED AT THE CENTER PART OF THE CRITICAL SECTION. THE DATA WAS ANALYZED WITH THE AID OF A DIGITAL COMPUTER. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-688 971 11/5 11/2 11/4
BOEING CO PHILADELPHIA PA VERTOL DIV

STATIC AND FATIGUE TEST PROPERTIES FOR WOVEN AND NONWOVEN S-GLASS FIBERS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
APR 69 182P CUTLER,MARTIN B. ;PINCKNEY, ROBERT L. ;
REPT. NO. D8-0926
CONTRACT: DA-44-177-AMC-440(T)
PROJ: DA-1-F-62204-A-170
TASK: 1-F-62204-A-17003
MONITOR: USAAVLABS TR-69-9

UNCLASSIFIED REPORT

DESCRIPTORS: (*GLASS TEXTILES, MECHANICAL PROPERTIES), FATIGUE(MECHANICS), STATICS, DYNAMICS, FLEXURAL STRENGTH, LIFE EXPECTANCY, TENSILE PROPERTIES, COMPRESSIVE PROPERTIES, STRESSES, EPOXY PLASTICS, MANUFACTURING METHODS, LAMINATES, SANDWICH CONSTRUCTION, ADHESIVES, JOINTS, TEMPERATURE, ENVIRONMENTAL TESTS, TORSION, STATISTICAL PROCESSES, DESIGN, HELICOPTER ROTORS, COMPOSITE MATERIALS, WEATHER, HUMIDITY (U)
IDENTIFIERS: *S-GLASS, PREPREG MATERIALS, SCOTCHPLY, AUTOCLAVING, WEATHERING, S-N DIAGRAMS, TORSION TUBES (U)

THE STATIC AND DYNAMIC PROPERTIES OF ALUMINO-SILICATE S-GLASS PREPREG MATERIALS WERE INVESTIGATED. UTILIZING A SERIES OF PROCESS FABRICATION PARAMETERS, SOLID LAMINATES, SANDWICH BEAMS, TUBULAR SPECIMENS WERE FABRICATED BY FLUID PRESSURE (AUTOCLAVE TECHNIQUES. THE ULTIMATE STRENGTHS AND FATIGUE ENDURANCE LIMITS OF THE SPECIMENS WERE DETERMINED OVER AN AMBIENT TEMPERATURE RANGE OF MINUS 65F TO 160F. THE EFFECTS OF ACTUAL WEATHER, ARTIFICIAL WEATHERING AND CONDENSING HUMIDITY ON STRUCTURAL PROPERTIES WERE ALSO DETERMINED. A MEANS OF REDUCING ROOM TEMPERATURE FATIGUE DATA ON A STATISTICAL BASIS WAS DEVELOPED TO ACCOUNT FOR THE PROCESSING AND ENVIRONMENTAL PARAMETERS. DESIGN PROPERTIES FOR THE MATERIALS IN HELICOPTER ROTOR APPLICATIONS ARE PRESENTED IN THE FORM OF S-N CURVES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-689 746 11/6 11/3
AEROSPACE CORP EL SEGUNDO CALIF LAB OPERATIONS

ALLOY COMPATIBILITY WITH SEVERAL CLEANING AGENTS. (U)

DESCRIPTIVE NOTE: REPT. FOR 1 SEP 68-31 JAN 69,
MAY 69 28P DULL,DENNIS L. ;RAYMOND, LOUIS ;USELL,RAYMOND J. ;
REPT. NO. TR-0200(4250-10)-9
CONTRACT: F04701-68-C-0200
MONITOR: SAMSO TR-69-178

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, FINISHES + FINISHING), (*METALS, STRESS CORROSION), CLEANING, STEEL, STAINLESS STEEL, ALUMINUM ALLOYS, TITANIUM ALLOYS, CORROSION, FRACTURE(MECHANICS), CRACK PROPAGATION, HALOGENATED HYDROCARBONS, KETONES (U)
IDENTIFIERS: STAINLESS STEEL 347, STEEL AM 350, TITANIUM ALLOY 6AL 4V, ALUMINUM ALLOY 7075, METHYL ETHYL KETONE, ETHYLENE/TRICHLORO (U)

THIS INVESTIGATION WAS CONDUCTED TO SCREEN THE COMPATIBILITY OF FOUR COMMON AEROSPACE STRUCTURAL MATERIALS WITH THREE COMMON CLEANING AGENT ENVIRONMENTS IN ORDER TO IDENTIFY THE PROBLEM SOURCES AND SUGGEST METHODS TO AVOID THESE PROBLEMS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-690 215 13/13 20/11 1/3
STANFORD UNIV CALIF DEPT OF AERONAUTICS AND ASTRONAUTICS

MAXIMUM LOAD PREDICTION FOR SANDWICH PLATES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
APR 69 52P MAYERS,J. ;CHU,YUAN-SHAN ;
REPT. NO. SUDAAR-366
CONTRACT: DAAJ02-68-C-0035
PROJ: DA-1-F-162204-A-17J
TASK: 1-F-162204-A-17002
MONITOR: USAAVLABS TR-69-3

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PARTS), (*SANDWICH CONSTRUCTION, BUCKLING(MECHANICS)), ALUMINUM ALLOYS, COMPOSITE MATERIALS, SANDWICH PANELS, MATHEMATICAL ANALYSIS, ELASTICITY, STRESSES, STRAIN(MECHANICS), LOADING(MECHANICS), PREDICTIONS, PLASTICITY (U)
IDENTIFIERS: ALUMINUM ALLOY 2024 (U)

AN INVESTIGATION OF THE POSTBUCKLING BEHAVIOR OF SANDWICH PLATES COMPRESSED BEYOND THE GENERAL INSTABILITY LOAD INTO THE PLASTIC RANGE HAS BEEN UNDERTAKEN. THE PURPOSE OF THE PRESENT INVESTIGATION IS TO ASSESS THE EFFECTS OF TRANSVERSE SHEAR DEFORMATIONS ON THE MAXIMUM STRENGTH OF SANDWICH PLATES WHEN THE PRIMARY MODE OF INITIAL BUCKLING IS THAT OF GENERAL INSTABILITY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-692 428 11/6 20/12 1/3
COLUMBIA UNIV NEW YORK DEPT OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

STUDY OF A HETEROGENEOUS 18 NI (300) MARAGING STEEL. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAY 69 77P RONAY,MARIA ;
REPT. NO. TR-64
CONTRACT: NONR-266(91)
PROJ: NR-064-470

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, MARAGING STEELS), (*MARAGING STEELS, FATIGUE(MECHANICS)), NICKEL ALLOYS, MICROSTRUCTURE, COBALT ALLOYS, MOLYBDENUM ALLOYS, MARTENSITE, TRANSFORMATIONS (U)
IDENTIFIERS: STEEL 18NI (U)

THE SWISS FEDERAL AIRCRAFT ESTABLISHMENT AND THE FATIGUE INSTITUTE OF COLUMBIA UNIVERSITY ARE COOPERATING IN A LONG-RANGE RESEARCH PROGRAM ON THE FATIGUE PERFORMANCE OF HIGH STRENGTH STEELS IN AIRCRAFT STRUCTURES. THE ALLOYED STEELS INVOLVED IN THE PROGRAM FALL INTO THREE GROUPS ACCORDING TO CARBON CONTENT, I.E. STEELS WITH MEDIUM (0.3-0.4%), RELATIVE LOW (0.1-0.2%) AND VERY LOW (MAX. 0.03%) CARBON CONTENT, THE LAST GROUP CONSISTING OF MARAGING STEELS. THE GREATEST EXPECTATION AND INTEREST WAS FOCUSED ON THE 18 NI 300 GRADE MARAGING STEEL BECAUSE OF ITS TOUGHNESS AND WELDABILITY COUPLED WITH THE HIGHEST YIELD STRENGTH. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-693 941 11/6 13/8 20/12
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

EFFECT OF PROLONGED HEATING ON THE MECHANICAL PROPERTIES OF SINTERED ALUMINUM POWDER. (U)

MAY 69 14P STEPANOVA,M. G. ;RADETSKAYA, E. M. ;STRUNIN,B. M. ;DROZDOVSKII,B. A. ; GALKIN,A. E. ;
REPT. NO. FTD-HT-23-1344-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF ALUMINIEVYE SPLAVY (USSR) N5 P208-217 1968.

DESCRIPTORS: (*STRUCTURAL PARTS, POWDER METALLURGY), (*POWDER ALLOYS, *ALUMINUM ALLOYS), (*HEAT TREATMENT, EFFECTIVENESS), MECHANICAL PROPERTIES, ALUMINA, PANELS(STRUCTURAL), AIRPLANE PANELS, RODS, ALUMINUM COATINGS, ELONGATION, CREEP, IMPACT TESTS, FRACTURE(MECHANICS), THERMAL EXPANSION, USSR (U)
IDENTIFIERS: *SINTERED ALUMINUM POWDERS, TRANSLATIONS (U)

MECHANICAL PROPERTIES OF SINTERED ALUMINUM POWDER SAP-1 SHEETS PRODUCED BY ROLLED LAMINATION AND OF SAP-1 AND SAP-3 RODS THAT ARE PRESSED ARE STUDIED IN CONNECTION WITH THE EFFECT OF PROLONGED HEATING; HEATING AT 250 DEGREES C FOR 1000 AND 5000 HOURS RESULTS IN NO INFLUENCE ON PROPERTIES IN SHORT-TERM ELONGATION. SENSITIVITY TO CRACKING IN IMPACT BENDING IS SLIGHTLY REDUCED. HEATING OF SAP-1 SHEETS TO A TEMPERATURE ABOVE 450 DEGREES DECREASES ULTIMATE STRENGTH AT 20 DEGREES AND INCREASES RELATIVE ELONGATION. AT 250-500 DEGREES THE STRENGTH CHARACTERISTICS UNDERGO NO CHANGE. PROLONGED HEATING (100-5000 HOURS) AT 250-500 DEGREES C HAS NO EFFECT ON ANY GRADES OF PRESSED SAP SEMIFINISHED PRODUCTS. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-695 795 11/6 20/12
BOEING CO RENTON WASH COMMERCIAL AIRPLANE GROUP

STAINLESS STEELS CAN BE STRONG AND TOUGH. (U)

AUG 69 12P WEBSTER,DONALD ;
REPT. NO. D6-24379
CONTRACT: N00014-66-C-0365, ARPA ORDER-878

UNCLASSIFIED REPORT

DESCRIPTORS: (*STAINLESS STEEL, TOUGHNESS), STRESS CORROSION, CORROSION RESISTANCE, FRACTURE(MECHANICS), CRACK PROPAGATION, HEAT TREATMENT, MECHANICAL WORKING, CHROMIUM ALLOYS, MOLYBDENUM ALLOYS, COBALT ALLOYS, VANADIUM ALLOYS, AIRFRAMES (U)
IDENTIFIERS: HIGH STRENGTH STEELS, STAINLESS STEEL AFC 77 (U)

THE COMPETITIVE POSITION OF HIGH STRENGTH STAINLESS STEELS IN THE AEROSPACE INDUSTRY IS REVIEWED IN LIGHT OF THE SIGNIFICANT IMPROVEMENTS IN MECHANICAL PROPERTIES THAT HAVE BEEN ACHIEVED IN THE PAST YEAR. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-697 956 14/2 11/4 11/9 1/3
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

AEROSPACE-AFML CONFERENCE ON NDT OF PLASTIC/ COMPOSITE STRUCTURES, DAYTON, OHIO, MARCH 18-20, 1969. (U)

DESCRIPTIVE NOTE: TECHNICAL PAPERS
MAR 69 474P
PROJ: AF-7351
TASK: 735109

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PARTS), (*REINFORCED PLASTICS, *NON-DESTRUCTIVE TESTING), (*COMPOSITE MATERIALS, NON-DESTRUCTIVE TESTING), SYMPOSIA, STATE-OF-THE-ART REVIEWS, QUALITY CONTROL, X-RAY PHOTOGRAPHY, ULTRASONIC RADIATION, OPTICAL PROPERTIES, THERMAL PROPERTIES, ELECTRON MICROSCOPY, SCHLIEREN PHOTOGRAPHY, MICROWAVES, DATA PROCESSING SYSTEMS, LAMINATES, HONEYCOMB CORES, SANDWICH CONSTRUCTION, BONDING, DEFECTS(MATERIALS), SYSTEMS ENGINEERING, BLADE AIRFOILS, FUEL NOZZLES (U)
IDENTIFIERS: FIBER COMPOSITES, HOLOGRAPHY, COMPUTER GRAPHICS, EVALUATION, F-111 AIRCRAFT, F-5 AIRCRAFT, T-38 AIRCRAFT (U)

THE DOCUMENT CONTAINS A COLLECTION OF TWENTY PAPERS PRESENTED BY NONDESTRUCTIVE TESTING ENGINEERS AND SCIENTISTS AT THE AEROSPACE-AFML CONFERENCE ON NONDESTRUCTIVE TESTING OF PLASTIC/COMPOSITE STRUCTURES HELD IN MARCH, 1969. TOPICS COVERED INCLUDED A STATE OF THE ART REVIEW, ACOUSTIC OPTICAL IMAGING, X-RAY MAPPING OF FLAWS BY COMPUTER GRAPHICS, ULTRASONICS, MICROWAVE AND THERMAL TECHNIQUES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-701 800 11/6 20/11
DEFENSE DOCUMENTATION CENTER ALEXANDRIA VA

MECHANICAL PROPERTIES OF BERYLLIUM. VOLUME I. (U)

DESCRIPTIVE NOTE: REPORT BIBLIOGRAPHY DEC 60-NOV 68.
FEB 70 119P
REPT. NO. DDC-TAS-70-9-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 2, AD-867 902L.

DESCRIPTORS: (*BERYLLIUM, MECHANICAL PROPERTIES), (*BIBLIOGRAPHIES, BERYLLIUM), POWDER METALS, DUCTILITY, HARDNESS, DEFORMATION, THERMAL PROPERTIES, FAILURE(MECHANICS), FATIGUE(MECHANICS), AIRPLANES, MATERIAL FORMING, AIRFRAMES, FUEL TANKS, STORAGE TANKS, ROCKET CASES, CRYSTALLOGRAPHY, WELDING, WIRE (U)

THE ANNOTATED BIBLIOGRAPHY COMPRISES CITATIONS OF UNCLASSIFIED REPORTS DEALING WITH THE PROPERTIES AND METALLURGY OF BERYLLIUM AND ITS APPLICATIONS. THE INFORMATION COVERS TESTS FOR SUCH PROPERTIES AS DUCTILITY, HARDNESS, DEFORMATION, HEAT RESISTANCE, FAILURE, AND FATIGUE. APPLICATIONS OF BERYLLIUM IN AIRFRAMES, BRAKES, FUEL TANKS, STORAGE TANKS AND ROCKET CASES ARE ALSO DISCUSSED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-718 432 11/6 11/4 11/3 11/1
13/6 11/5

AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

AIR FORCE MATERIALS SYMPOSIUM '70, TECHNICAL SPECIALIST SESSIONS, HELD IN MIAMI BEACH, FLORIDA ON 18-22 MAY 1970. SUMMARY ABSTRACTS. (U)

MAY 70 101P

UNCLASSIFIED REPORT

DESCRIPTORS: (*MATERIALS, SYMPOSIA), ABSTRACTS, AIRFRAMES, COMPOSITE MATERIALS, THERMAL INSULATION, HEAT-RESISTANT MATERIALS, COATINGS, CORROSION, JOINING, NON-DESTRUCTIVE TESTING, LUBRICANTS, GAS TURBINES, ARMOR, SEALS, TEXTILES, MATERIAL REMOVAL, MATERIAL FORMING (U)

THE DOCUMENT CONTAINS THE 100-WORD ABSTRACTS OF ALL THE PAPERS PRESENTED IN THE TECHNICAL SPECIALIST SESSIONS OF THE AIR FORCE MATERIALS SYMPOSIUM '70 HELD IN MIAMI BEACH, FLORIDA ON 18-22 MAY 1970. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-720 396 11/4 1/3
IIT RESEARCH INST CHICAGO ILL

INVESTIGATION OF THE INFLUENCE OF MATERIAL VARIABLES ON FATIGUE MECHANISMS IN COMPOSITES. (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 MAY-30 NOV 70,
DEC 70 71P RAO,P. N. IHOFER,K. E. ,
JR;
REPT. NO. IITRI-U6056-FR
CONTRACT: N00019-70-C-0378

UNCLASSIFIED REPORT

DESCRIPTORS: (*COMPOSITE MATERIALS, FATIGUE(MECHANICS)), (*AIRFRAMES, COMPOSITE MATERIALS), EPOXY PLASTICS, CARBON FIBERS, GRAPHITE, GLASS TEXTILES, LAMINATES, CRACK PROPAGATION (U)
IDENTIFIERS: *GRAPHITE COMPOSITES (U)

THE INVESTIGATION PURSUED THE FOLLOWING AREAS: (1) DETERMINATION OF THE STATIC AND FATIGUE CHARACTERISTICS OF GRAPHITE/EPOXY COMPOSITE OF CURRENT INTEREST TO THE NASC (MODMOR II (HTS)/ NARMCO 5206 PREPREG). (2) VARIATION OF TEMPERATURE, STRESS MODE AND STRESS RATIO. (3) UTILIZATION OF OPTICAL AND SCANNING ELECTRON MICROSCOPIC TECHNIQUES IN CONJUNCTION WITH SECTIONING OF THE SAMPLES TO DETERMINE THE FEASIBILITY OF FOLLOWING THE PROGRESS OF FATIGUE CRACKING IN THESE GRAPHITE COMPOSITES. (4) VARIATION OF FABRICATION PROCESSING (USE OF GLASS SCRIM CLOTH INTERLAYERS). (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-723 631 20/11 1/3 11/6
AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB OHIO

A GENERAL FATIGUE PREDICTION METHOD BASED ON NEUBER NOTCH STRESSES AND STRAINS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
FEB 71 35P POTTER,JOHN M. ;
REPT. NO. AFFDL-TR-70-161
PROJ: AF-1347
TASK: 134703

UNCLASSIFIED REPORT

DESCRIPTORS: (*NOTCH TOUGHNESS, *ALUMINUM ALLOYS), (*AIRFRAMES, FATIGUE(MECHANICS)), (*FATIGUE(MECHANICS), MATHEMATICAL PREDICTION), STRESSES, STRAIN(MECHANICS), LOADING(MECHANICS), ELASTICITY, PLASTICITY (U)
IDENTIFIERS: ALUMINUM ALLOY 2024, ALUMINUM ALLOY 7075, NEUBER EQUATION (U)

A NEW COMBINATION OF THE NEUBER PARAMETER AND STRESS-STRAIN DATA IS PROPOSED AND INVESTIGATED FOR A COMPLETELY GENERAL GRAPHIC ANALYSIS OF CYCLE-BY-CYCLE NOTCH STRESS LEVEL. THE PROPOSED ANALYSIS IS APPLIED TO TWO COMMON AIRCRAFT STRUCTURAL MATERIALS, 2024-T4 AND 7075-T6. LIFE TO FAILURE PREDICTIONS BASED ON THE GRAPHICALLY DERIVED NOTCH STRESS LEVELS COMPARE VERY FAVORABLY WITH CONSTANT STRESS AMPLITUDE NOTCHED COUPON RESULTS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-725 470 11/6 1/3
NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA AERO MATERIALS DEPT

FATIGUE CRACK GROWTH BEHAVIOR OF FOUR HIGH STRENGTH STEELS IN TWO HUMID ENVIRONMENTS. PART I. (U)

JAN 71 30P NEU,C. E. ;FLETCHER,ARTHUR R. ;

REPT. NO. NADC-MA-7060
PROJ: FS1-541-201

UNCLASSIFIED REPORT

DESCRIPTORS: (*STEEL, *CRACK PROPAGATION), (*NAVAL AIRCRAFT, AIRFRAMES), ENVIRONMENTAL TESTS, HUMIDITY, CRACKS, TENSILE PROPERTIES, FATIGUE(MECHANICS), NOTCH TOUGHNESS, STRUCTURAL PARTS (U)
IDENTIFIERS: STEEL 18NI, STEEL HP 9-4, STEEL D6AC, STEEL 4340, FRACTURE TOUGHNESS (U)

FATIGUE CRACK GROWTH RATES (DA/DN) AS A FUNCTION OF APPLIED STRESS INTENSITY AMPLITUDE (DELTA K) WERE DETERMINED FOR FOUR HIGH STRENGTH STEELS (HP 9-4-.45, 18% NI MARAGE 250, D6AC, AISI 4340) IN AIR AT 10 PERCENT AND AT 80 PERCENT RELATIVE HUMIDITIES (R.H.). ALL FOUR STEELS DEMONSTRATED SENSITIVITY TO HIGH HUMIDITY WITH CRACK GROWTH RATES IN 80 PERCENT R.H. AIR BEING ONE AND ONE-HALF TO TWO TIMES AS HIGH AS IN 10 PERCENT R.H. AIR. OVERALL CRACK GROWTH RATES OF THREE STEELS, HP 9-4-.45, 18% NI MARAGE 250, AND D6AC, WERE SIMILAR, WHILE RATES FOR AISI 4340 WERE UNIFORMLY HIGHER THAN THOSE OF THE OTHER THREE STEELS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-730 348 20/11 14/2
NORTH AMERICAN ROCKWELL CORP LOS ANGELES CALIF LOS ANGELES DIV

THE EARLY DETECTION OF FATIGUE DAMAGE. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. 1 JUL 68-30 JUN 71,
SEP 71 178P MOUER,JOHN F. ;TSANG, SCHILLINGS ;MARTIN,GEORGE ;
REPT. NO. NA-71-590
CONTRACT: F33615-68-C-1706, ARPA ORDER-1244
PROJ: ARPA-8D10
MONITOR: AFML TR-71-185

UNCLASSIFIED REPORT

DESCRIPTORS: (*FATIGUE(MECHANICS), *NON-DESTRUCTIVE TESTING), ALUMINUM ALLOYS, AIRFRAMES, TITANIUM ALLOYS, CRACKS, ULTRASONIC RADIATION, ELECTRON MICROSCOPY, EMISSIVITY, MICROSTRUCTURE (U)
IDENTIFIERS: ALUMINUM ALLOY 1100, ALUMINUM ALLOY 7075, STEEL D6AC, TITANIUM ALLOY 6AL 4V, *EADELECTRON EMISSION (U)

THE REPORT IS THE FINAL TECHNICAL REPORT FOR A PROGRAM DIRECTED AT THE DEVELOPMENT OF NONDESTRUCTIVE TEST (NDT) METHODS FOR THE DETECTION OF EARLY FATIGUE AND FRACTURE DAMAGE IN METALS AND ALLOYS. THE PROGRAM IS BASED ON AN INTERDISCIPLINARY APPROACH DESIGNED TO INTERRELATE THE FACTORS OF EARLY FATIGUE DAMAGE WITH MEASURABLE PHYSICAL PHENOMENA. THE PROGRAM INITIALLY CONCENTRATED ON A COMPREHENSIVE STUDY OF THE EXISTING KNOWLEDGE OF FATIGUE PHENOMA IN METALS, AND THE RESULTS OF THE STUDY ARE DESCRIBED IN TERMS OF FATIGUE AND FATIGUE-ASSOCIATED PHENOMENA, METALLURGICAL STRUCTURE, EFFECT OF INTERRELATING FATIGUE PHENOMENA ON PHYSICAL PROPERTIES, AND THE AVAILABILITY OF APPROPRIATE MEASUREMENT TECHNIQUES AND EQUIPMENT. NEXT, THE PROGRAM DEVELOPED A SERIES OF CONTROLLED FATIGUE EXPERIMENTS TO QUANTITATIVELY MEASURE THE FATIGUE EFFECTS IN SELECTED METAL SPECIMENS. THESE TESTS ALSO INCLUDED A SYSTEMATIC METALLOGRAPHIC EVALUATION TO DETERMINE THE ACTUAL DEPTH AND CHARACTER OF THE SURFACE LAYER AFFECTED BY PROGRESSIVE FATIGUE, PARTICULARLY IN THE EARLY STAGES OF FATIGUE. FINALLY, NDT METHODS WERE EVALUATED IN TERMS OF THEIR POTENTIAL DETECTION AND MEASUREMENT CAPABILITY OF THE OBSERVED FATIGUE-RELATED EFFECTS AND DAMAGE AS DETERMINED BY THE STUDY AND FATIGUE EVALUATION TESTS.(U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-732 291 1/3 20/11
ARNOLD ENGINEERING DEVELOPMENT CENTER ARNOLD AIR FORCE STATION TENN

INVESTIGATION OF THE AEROELASTIC STABILITY OF THIN CYLINDRICAL SHELLS AT SUBSONIC MACH NUMBERS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
NOV 71 31P WHITE,WARREN E. ;
REPT. NO. AEDC-TR-71-173
CONTRACT: F40600-72-C-0003
PROJ: ARO-PB0189
TASK: 01

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH ARO, INC., TULLAHOMA, TENN., REPT. NO. ARO-PWT-TR-71-127.

DESCRIPTORS: (*AIRFRAMES, AEROELASTICITY), (*SUBSONIC CHARACTERISTICS, AIRFRAMES), CYLINDRICAL BODIES, FLUTTER, PRESSURE, BOUNDARY LAYER, STABILITY, BUCKLING(MECHANICS), OGIVES, STRUCTURAL SHELLS (U)
IDENTIFIERS: *CYLINDRICAL SHELLS (U)

BOUNDARY-LAYER AND STATIC-PRESSURE DATA WERE OBTAINED OVER A RIGID PRESSURE SHELL AT MACH NUMBERS FROM 0.6 TO 0.9 AND REYNOLDS NUMBERS PER FOOT FROM 300,000 TO 5,300,000. THESE DATA WERE OBTAINED WITH AND WITHOUT THE ADDITION OF AIR INJECTED INTO THE BOUNDARY LAYER THROUGH A CIRCULAR SLOT UPSTREAM OF THE TEST SHELL. STATIC AEROELASTIC CHARACTERISTICS OF THIN CYLINDRICAL SHELLS WERE OBTAINED AT MACH NUMBER 0.9 WITHOUT THE USE OF BOUNDARY-LAYER CONTROL AND WITHOUT SHELL AXIAL-FORCE LOADING. AN AEROELASTIC BUCKLING FAILURE WAS INDUCED ON ALL THREE SHELLS BY REDUCING THE CAVITY PRESSURE. FLUTTER OF THE SHELL WAS NOT ENCOUNTERED DURING THE TEST. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-732 489 11/4
BOEING CO PHILADELPHIA PA VERTOL DIV

DETERMINATION OF PHYSICAL AND STRUCTURAL PROPERTIES OF MIXED-MODULUS COMPOSITE MATERIALS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JUN 71 75P PINCKNEY,ROBERT L. (FREEMAN, RICHARD B. ;
REPT. NO. D210-10196-1
CONTRACT: DAAJ02-69-C-0059
PROJ: DA-1-F-162204-A-170
TASK: 1-F-162204-A-17003
MONITOR: USAAVLABS TR-71-7

UNCLASSIFIED REPORT

DESCRIPTORS: (*COMPOSITE MATERIALS, PHYSICAL PROPERTIES), (*REINFORCING MATERIALS, MODULUS OF ELASTICITY), LAMINATES, CARBON FIBERS, GLASS TEXTILES, SANDWICH CONSTRUCTION, PIPES, FATIGUE(MECHANICS), CREEP, FAILURE(MECHANICS), ALIGNMENT, HELICOPTER ROTORS, ROTOR BLADES(ROTARY WINGS) (U)
IDENTIFIERS: *FIBER COMPOSITES (U)

THE OBJECTIVE OF THE PROGRAM WAS TO DETERMINE THE PHYSICAL AND STRUCTURAL PROPERTIES OF MIXED-MODULUS COMPOSITE MATERIALS USING COMBINATIONS OF GRAPHITE AND S-GLASS FIBERS UNDER STATIC AND FATIGUE LOADING CONDITIONS. THIS REPORT COVERS THE WORK COMPLETED UNDER PHASE I AND PHASE II OF THE PROGRAM AND SUMMARIZES THE DATA OBTAINED FOR SOLID LAMINATES, TUBULAR SPECIMENS AND SANDWICH BEAMS IN WHICH THE S-GLASS MATERIAL WAS ORIENTED PARALLEL TO THE LONGITUDINAL AXIS OF THE SPECIMENS AND THE GRAPHITE FIBERS WERE ORIENTED AT PLUS OR MINUS 45 DEGREES TO THE SAME AXIS. THE TEST RESULTS ARE TABULATED IN APPROPRIATE ENGINEERING FORMAT. S-N CURVES ARE INCLUDED TO ILLUSTRATE THE FATIGUE PERFORMANCE OF THE MATERIALS. STRESS-STRAIN AND S-N CURVES ARE COMPARED TO APPROPRIATE DATA ON PURE S-GLASS AND PURE GRAPHITE MATERIAL WHERE SUCH DATA CONTRIBUTES TO AN UNDERSTANDING OF THE MIXED MATERIALS PERFORMANCE. THE DATA INDICATES THAT THE MIXED-MODULUS SYSTEM OF S-GLASS AND GRAPHITE IS COMPATIBLE WITH THE STRUCTURAL AND FAILURE MODE REQUIREMENTS OF HELICOPTER ROTOR BLADES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-733 370 1/3 20/4
TEXAS UNIV AUSTIN DEPT OF AEROSPACE ENGINEERING AND ENGINEERING MECHANICS

SUMMARY OF RESEARCH ACCOMPLISHMENTS FOR THE PERIOD 1 DECEMBER 1966 TO 30 NOVEMBER 1970. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JAN 71 30P STEARMAN,RONALD ;
CONTRACT: AF-AFOSR-1234-67
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR TR-71-2895

UNCLASSIFIED REPORT

DESCRIPTORS: (*STRUCTURAL SHELLS, AEROELASTICITY), AERODYNAMIC LOADING, LAMINAR BOUNDARY LAYER, TURBULENCE, FLUTTER, BUCKLING(MECHANICS), AEROSPACE PLANES, AIRFRAMES (U)

A COMBINED THEORETICAL AND EXPERIMENTAL RESEARCH PROGRAM HAS BEEN CARRIED OUT OVER THE PAST FOUR YEARS TO ESTABLISH PRELIMINARY DESIGN CRITERIA FOR ESTIMATING THE AEROELASTIC STABILITY AND FORCED-RESPONSE CHARACTERISTICS OF THIN-WALLED CIRCULAR CYLINDRICAL SHELL STRUCTURES. AS A RESULT OF THIS STUDY, SEVERAL BASIC OBSERVATIONS WERE MADE CONCERNING THE DEGREE OF SOPHISTICATION REQUIRED IN THE AERODYNAMIC AND STRUCTURAL MODELING OF THIS AEROELASTIC PROBLEM. IT WAS FOUND, FOR EXAMPLE, THAT SMALL DETAILS IN THE DESCRIPTION OF THE STRUCTURAL BOUNDARY CONDITIONS CAN STRONGLY INFLUENCE THE AEROELASTIC STABILITY OF THE SHELL. THE MOST SIGNIFICANT STRUCTURAL BOUNDARY CONDITION EFFECT WAS OBSERVED WHEN THE SHELL GEOMETRY AND LOADING CONDITIONS WERE SUCH THAT THE EDGE DISTURBANCES WERE PROPAGATED WELL INTO THE INTERIOR OF THE SHELL. ON THE OTHER HAND, WHEN CONDITIONS WERE SUCH THAT THESE EDGE DISTURBANCES WERE CONFINED TO A SMALL BOUNDARY LAYER REGION NEAR THE ENDS OF THE SHELL NO SIGNIFICANT EDGE EFFECTS WERE NOTICED ON THE OVERALL SHELL AEROELASTIC STABILITY. SMALL INITIAL DEVIATIONS OF THE SHELL'S SURFACE FROM ITS IDEALIZED SHAPE WERE ALSO SHOWN TO DRASTICALLY REDUCE ITS RESISTANCE TO PANEL FLUTTER EVEN THOUGH THE DEVIATIONS WERE ONLY ON THE ORDER OF ONE SHELL THICKNESS. PANEL FLUTTER INSTABILITIES IN THE PRESENCE OF A LAMINAR BOUNDARY LAYER PROFILE WERE ALSO FOUND TO BE MUCH LESS DESTRUCTIVE TO THE SHELL. (U)

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-737 398 1/3 11/6
ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT PARIS (FRANCE)

THE ACCUMULATION OF FATIGUE DAMAGE IN AIRCRAFT MATERIALS AND STRUCTURES. (U)

DESCRIPTIVE NOTE: AGARDOGRAPH REPT., JAN 72 125P SCHIJVE,J. ;
REPT. NO. AGARD-AG-157

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED.

DESCRIPTORS: (*AIRFRAMES, FATIGUE(MECHANICS)), DAMAGE, LOADING(MECHANICS), REVIEWS, FRANCE (U)

THE AVAILABLE LITERATURE IS SURVEYED AND ANALYSED. PHYSICAL ASPECTS OF FATIGUE DAMAGE ACCUMULATION ARE DISCUSSED, INCLUDING INTERACTION AND SEQUENCE EFFECTS. EMPIRICAL TRENDS OBSERVED IN VARIABLE-AMPLITUDE TESTS ARE SUMMARIZED INCLUDING THE EFFECTS OF A HIGH PRELOAD, PERIODICAL HIGH LOADS, GROUND-TO-AIR CYCLES AND THE VARIABLES PERTAINING TO PROGRAM LOADING, RANDOM LOADING AND FLIGHT-SIMULATION LOADING. THIS ALSO INCLUDES RESULTS FROM FULL-SCALE FATIGUE TEST SERIES. VARIOUS THEORIES ON FATIGUE DAMAGE ACCUMULATION ARE RECAPITULATED. THE SIGNIFICANCE OF THESE THEORIES FOR EXPLAINING EMPIRICAL TRENDS AS WELL AS FOR ESTIMATING FATIGUE PROPERTIES AS A DESIGN PROBLEM IS EVALUATED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-737 779 11/6 1/3
BATTELLE COLUMBUS LABS OHIO METALS AND CERAMICS INFORMATION CENTER

CRACK BEHAVIOR IN D6AC STEEL: AN EVALUATION OF FRACTURE MECHANICS DATA FOR THE F-111 AIRCRAFT. (U)

JAN 72 225P FEDDERSEN,C. E. ;MOON,D. P. ;HYLER,W. S. ;
REPT. NO. MCIC-72-04

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: LIBRARY OF CONGRESS CATALOG NO. 71-190408.

DESCRIPTORS: (*STEEL, FRACTURE(MECHANICS)), FATIGUE(MECHANICS), CRACK PROPAGATION, JET FIGHTERS, AIRFRAMES, TABLES, METAL PLATES (U)
IDENTIFIERS: STEEL D6AC, F-111 AIRCRAFT (U)

A MULTILABORATORY EXPERIMENTAL PROGRAM WAS CONDUCTED TO DETERMINE THE FRACTURE TOUGHNESS, FATIGUE-CRACK PROPAGATION, AND SUSTAINED-LOAD CRACK BEHAVIOR OF THE D6AC STEEL PLATE AND FORGING MATERIALS USED IN THE F-111 AIRCRAFT. THE PURPOSE OF THIS EFFORT WAS TO ASSESS CRACK BEHAVIOR IN D6AC STEEL IN ACCORDANCE WITH THE PRINCIPLES OF ELASTIC FRACTURE MECHANICS, SUCH THAT ADEQUARE INFORMATION WOULD BE AVAILABLE TO PREDICT THE STRUCTURAL INSPECTION INTERVALS REQUIRED FOR THE F-111 AIRCRAFT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-736 450 11/6
NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA AERO MATERIALS DEPT

MECHANISM OF FATIGUE ENHANCEMENT IN SELECTED HIGH STRENGTH ALUMINUM ALLOYS. (U)

DESCRIPTIVE NOTE: PROGRESS REPT.,
DEC 71 42P TRABOCCO,RONALD E. ;
REPT. NO. NADC-MA-7171
PROJ: A320-5203/202-A/1R00-70-101

UNCLASSIFIED REPORT

DESCRIPTORS: (*ALUMINUM ALLOYS, FATIGUE(MECHANICS)), MICROSTRUCTURE, FRACTURE(MECHANICS), AIRFRAMES (U)
IDENTIFIERS: ALUMINUM ALLOY 7080, ALUMINUM ALLOY 7050 (U)

THE INITIAL PHASE OF AN INVESTIGATION CONCERNED WITH THE MECHANISM OF FATIGUE ENHANCEMENT IN SELECTED HIGH STRENGTH/WEIGHT ALUMINUM ALLOYS WAS COMPLETED. DATA INDICATES THAT IN BOTH X7080-T7 AND X 7050, ALUMINUM ALLOYS FATIGUE ENHANCEMENT IS RELATED TO UNIQUE MICROSTRUCTURES. IN THE CASE OF THE X7080 AL ALLOY IT IS THE PRESENCE OF ALIGNED LIGHT ETCHING REGIONS AND IN THE X 7050 ALLOY, IT IS THE DIRECTIONAL PROLIFERATION OF PRECIPITATES PREDOMINATELY AT GRAIN BOUNDARIES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-853 407 11/6 13/8 1/3
ALUMINUM CO OF AMERICA NEW KENSINGTON PA ALCOA RESEARCH LABS

INVESTIGATION TO IMPROVE THE STRESS CORROSION RESISTANCE OF ALUMINUM AIRCRAFT ALLOYS THROUGH ALLOY ADDITIONS AND SPECIALIZED HEAT TREATMENT. (U)

DESCRIPTIVE NOTE: FINAL REPT. 15 DEC 67-14 DEC 68, FEB 69 199P STALEY,J. T. ;
CONTRACT: N00019-68-C-0146

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, STRUCTURAL PARTS), (*ALUMINUM ALLOYS, STRESS CORROSION), CRACK PROPAGATION, SOLID SOLUTIONS, SOLUTION HEAT TREATMENT, TENSILE PROPERTIES, FAILURE(MECHANICS), AGING(MATERIALS), ELECTRICAL CONDUCTANCE, STRESSES, HARDNESS, ENVIRONMENTAL TESTS, MICROSTRUCTURE, TABLES (U)
IDENTIFIERS: ALUMINUM ALLOY 7075 (U)

THE OBJECTIVE OF THIS PROGRAM WAS TO DEVELOP A HIGH-STRENGTH ALUMINUM ALLOY RESISTANT TO STRESS-CORROSION CRACKING IN THE SHORT-TRANSVERSE DIRECTION. THE ALLOYS INVESTIGATED INCLUDED A 7075 CONTROL, 7075 TYPE ALLOYS WHICH CONTAINED EITHER 0.38 MN OR 0.18 ZR IN PLACE OF 0.28 CR, SIMILAR ALLOYS WHICH ALSO CONTAINED 0.3% AG, AND CHROMIUM-BEARING ALLOYS WHICH CONTAINED EITHER HIGHER ZINC OR HIGHER COPPER THAN THE MAXIMUM AMOUNTS SPECIFIED FOR 7075. THESE MATERIALS WERE EVALUATED AS TWO-INCH THICK PLATE TO INSURE THAT THE STRUCTURES WOULD BE REPRESENTATIVE OF THICK, HOT-WORKED PRODUCTS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-861 490 11/4 11/9 20/11 1/3
IIT RESEARCH INST CHICAGO ILL

AN INVESTIGATION OF FATIGUE BEHAVIOR OF REINFORCED PLASTICS FOR PRIMARY AIRCRAFT STRUCTURES. (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 FEB 68-1 JUN 69,
JUL 69 241P RAO,P. N. ;HOFER,K. E. ,
JR;
REPT. NO. IITRI-D6002-F
CONTRACT: N00019-68-C-0319
PROJ: IITRI-D6002

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, COMPOSITE MATERIALS), (*REINFORCED PLASTICS, FATIGUE(MECHANICS)), STRUCTURAL PARTS, CANTILEVER BEAMS, LAMINATES, INTERFACES, CRACK PROPAGATION, LOADING(MECHANICS), LIFE EXPECTANCY, FAILURE(MECHANICS), STRESSES, SHEAR STRESSES, GLASS TEXTILES, ULTRASONIC PROPERTIES, VISUAL INSPECTION (U)
IDENTIFIERS: FIBERGLASS REINFORCED PLASTICS (U)

THE FOLLOWING ASPECTS OF FATIGUE BEHAVIOR OF REINFORCED PLASTICS COMPOSITE MATERIALS WERE STUDIED. (1) INVESTIGATION OF DAMAGE PROPAGATION IN CANTILEVER BEAM SPECIMENS OF DIFFERENT COMPOSITE MATERIALS SUBJECTED TO FATIGUE CYCLE OF COMPLEX STRESSES. THE STUDIES INCLUDED RESIDUAL STRENGTH DETERMINATION, ULTRASONIC EXAMINATION AND MICROSCOPIC INSPECTION. (2) INVESTIGATION OF DAMAGE IN DIFFERENT COMPOSITE SPECIMENS UNDER TENSION FATIGUE STRESS CYCLING. THE STUDIES WERE RESIDUAL STRENGTH DETERMINATION, ULTRASONIC INSPECTION AND SCANNING ELECTRON MICROSCOPE EXAMINATION. (3) A STUDY OF CUMMULATIVE TENSION FATIGUE DAMAGE MECHANISMS UNDER PROGRAMMED LOADING AND ANALYSIS FOR GLASS CLOTH COMPOSITES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-867 805 11/9 11/4 1/3
IIT RESEARCH INST CHICAGO ILL

AN INVESTIGATION OF FATIGUE BEHAVIOR OF REINFORCED PLASTICS FOR PRIMARY AIRCRAFT STRUCTURES. (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 JAN-31 DEC 69, FEB 70 151P RAO,P. N. ;HOFER,K. E. ;
REPT. NO. IITRI-D6010-FR
CONTRACT: N00019-69-C-0282
PROJ: IITRI-D6010

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, REINFORCED PLASTICS), (*REINFORCED PLASTICS, FATIGUE(MECHANICS)), GLASS TEXTILES, GRAPHITE, CERAMIC FIBERS, EPOXY PLASTICS, FRACTURE(MECHANICS), CRACK PROPAGATION (U)
IDENTIFIERS: FIBERGLASS REINFORCED PLASTICS, FIBER COMPOSITES (U)

THE FOLLOWING ASPECTS OF FATIGUE BEHAVIOR OF REINFORCED PLASTIC COMPOSITE MATERIALS WERE STUDIED (1) FIBER SURFACE FINISH EFFECTS ON FATIGUE LIFE OF GLASS REINFORCED PLASTICS. (2) LOW CYCLE FATIGUE EFFECTS ON MECHANICAL PROPERTIES OF GRAPHITE REINFORCED PLASTICS (GRP). (3) HOLLOW GLASS PREPREG COMPOSITE PERFORMANCE IN COMPRESSION FATIGUE. (4) GRAPHITE/EPOXY AND GRAPHITE/SCRIM CLOTH/EPOXY COMPOSITE BEHAVIOR IN COMPRESSION FATIGUE. (5) QUASI-ISOTROPIC GRP BEHAVIOR IN TENSION FATIGUE. (6) EFFECT OF HOSTILE HUMIDITY-TEMPERATURE ENVIRONMENT ON GRP. (7) TENSION CRACK TOUGHNESS TESTS AND CRACK PROPAGATION IN GRP. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-875 665 11/6 1/3
NORTH AMERICAN ROCKWELL CORP COLUMBUS OHIO COLUMBUS DIV

SPECTRUM CORROSION FATIGUE TEST OF VARIOUS ALUMINUM ALLOYS. PHASES I AND II. RA-5C EXTENDED SERVICE LIFE PROGRAM. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
AUG 69 140P GRUFF,JAMES J. ;HUTCHESON, JOSEPH S. ;
REPT. NO. NR69H-425
CONTRACT: N00019-68-C-0061

UNCLASSIFIED REPORT

DESCRIPTORS: (*ALUMINUM ALLOYS, FATIGUE(MECHANICS)), (*AIRPLANE PANELS, FATIGUE(MECHANICS)), CORROSION, WINGS, SUPERSONIC PLANES, ENVIRONMENTAL TESTS, LIFE EXPECTANCY, RECONNAISSANCE PLANES (U)
IDENTIFIERS: ALUMINUM ALLOY 2020, RA-5C AIRCRAFT, A-5 AIRCRAFT, SERVICE LIFE, ALUMINUM ALLOY 2024, ALUMINUM ALLOY 7075 (U)

A PRIMARY PURPOSE OF THIS PROGRAM WAS TO STUDY THE BEHAVIOR OF 2020-T651 ALUMINUM ALLOY PLATE SPECIMENS UNDER ADVERSE ENVIRONMENTAL CONDITIONS TO EVALUATE THE SERVICE LIFE OF RA-5C INNER PANEL WING SKINS. COMPARATIVE EVALUATIONS WERE MADE ALSO ON 7075-T651, 7075-T73, 2024-T851 AND 2024-T351 PLATE MATERIALS. PRE-FRETTED COUNTERSUNK HOLE SPECIMENS WERE TESTED UNDER A MANEUVER SPECTRUM LOADING APPLIED WITH A SEPARATE OR COMBINED 30-DAY 3-1/2% SALT SOLUTION ALTERNATE IMMERSION PRE-EXPOSURE, OR CONCURRENT 3-1/2% SALT SOLUTION OR DISTILLED WATER EXPOSURE WHILE CYCLING. LIMITED TESTS WERE CONDUCTED WITH 'ALODINE' COATING IN THE HOLE, WITH SPECIMENS MADE FROM WINGS OF FIVE YEAR EXPOSURE, AND WITH REWORKING OF CORRODED AND FATIGUE DAMAGED HOLES TO RESTORE FATIGUE LIFE. SIMULATED CORROSIVE ENVIRONMENTS HAD A SIGNIFICANT ADVERSE EFFECT ON MANEUVER SPECTRUM FATIGUE LIFE FOR ALL FIVE ALUMINUM ALLOY PLATE MATERIALS TESTED. IT IS BELIEVED THAT THE RESULTS ARE INDICATIVE OF A REDUCTION IN FATIGUE LIFE THAT CAN OCCUR IN SERVICE OPERATION WHEN FATIGUE-CRITICAL WING SKIN HOLES ARE NOT PROTECTED ADEQUATELY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZCML1

AD-877 677 11/6 1/3 13/8
ALUMINUM CO OF AMERICA NEW KENSINGTON PA PHYSICAL METALLURGY DIV

EXPLORATORY DEVELOPMENT OF HIGH STRENGTH, STRESS-CORROSION RESISTANT ALUMINUM ALLOY FOR USE IN THICK SECTION APPLICATIONS. (U)

DESCRIPTIVE NOTE: ANNUAL SUMMARY TECHNICAL REPT. NO. 1, 1 JUN 69-30 SEP 70,
NOV 70 152P STALEY,JAMES T. ;HUNSICKER, HAROLD Y. ;
CONTRACT: F33615-69-C-1644
PROJ: AF-7351
TASK: 735105
MONITOR: AFML TR-70-256

UNCLASSIFIED REPORT

DESCRIPTORS: (*ALUMINUM ALLOYS, CORROSION RESISTANCE), (*AIRFRAMES, ALUMINUM ALLOYS), TENSILE PROPERTIES, FRACTURE(MECHANICS), CHEMICAL ANALYSIS, ELECTRON MICROSCOPY, QUENCHING(COOLING), AIRPLANE PANELS (U)

AN ALLOY HAS BEEN DEVELOPED WHICH EXHIBITS A GOOD RESISTANCE TO STRESS-CORROSION CRACKING AT 25 KSI OR HIGHER STRESS IN THE SHORT-TRANSVERSE DIRECTION BASED ON 30 DAYS EXPOSURE IN THE 3.5% NACL ALTERNATE IMMERSION TEST. ESTIMATED MINIMUM STRENGTH OF THREE-INCH THICK PLATE EXCEEDS THE GUARANTEED MINIMUM STRENGTH OF THE CLOSEST COMPETING ALUMINUM ALLOY BY 3 KSI AND THE ADVANTAGE INCREASES WITH INCREASING THICKNESS. ECCENTRICITIES IN THE RESULTS OF 84 DAY ALTERNATE IMMERSION TESTS AND LACK OF DATA REGARDING PERFORMANCE OF ALLOYS OF THIS TYPE IN NATURAL ENVIRONMENTS FOR LONGER THAN 10 MONTHS, HOWEVER, INDICATE THAT CAUTION MUST BE USED IN EXTRAPOLATING THE RESULTS OF THE ACCELERATED TESTS TO PREDICT SERVICE PERFORMANCE. (AUTHOR) (U)

V.

AIRPLANE PANELS

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-272 016
MINNESOTA UNIV MINNEAPOLIS

DAMPING AND FATIGUE PROPERTIES OF SANDWICH CONFIGURATIONS IN FLEXURE (U)

NOV 61 60P KEER,LEON;LAZAN,B.J.;

CONTRACT: AF33 616 6828
PROJ: AF-7351
TASK: 73521
MONITOR: ASD TR61 646

UNCLASSIFIED REPORT

DESCRIPTORS: *DAMPING, *DEFLECTION, *SANDWICH PANELS, AIRPLANE PANELS, ALUMINUM, BEAMS (ELECTROMAGNETIC), BEAMS (STRUCTURAL), COMPOSITE MATERIALS, DATA, DESIGN, DYNAMICS, FATIGUE (MECHANICS), GLASS TEXTILES, HONEYCOMB CORES, LAMINATES, MATHEMATICAL ANALYSIS, MECHANICS, PAPER, PLASTICS, SHEETS, STRESSES, SURFACES, TESTS, THEORY, VIBRATION, WOOD (U)

A COMBINED THEORETICAL AND EXPERIMENTAL STUDY WAS UNDERTAKEN TO DEVELOP AN ANALYTICAL APPROACH FOR PREDICTING THE DAMPING OF SANDWICH CONFIGURATIONS IN FLEXURE. THE THEORY DEVELOPED ANALYZES THE VARIOUS CONTRIBUTIONS TO TOTAL DAMPING, CONSIDERING STRESS DISTRIBUTION AND UNIT DAMPING PROPERTIES OF SKIN AND CORE, AND EMPLOYS A SIMPLE SUMMATION PROCESS TO DETERMINE THE DAMPING OF THE COMPOSITE. TO CONFIRM THE THEORY, A SPECIAL TEST SET-UP WAS DEVELOPED IN WHICH SANDWICH CONFIGURATIONS WERE VIBRATED AS FREE-FREE BEAMS UTILIZING ELECTROMAGNETIC EXCITATION. A SERIES OF TESTS WERE PERFORMED ON SEVERAL TYPES OF CONVENTIONAL SANDWICH BEAMS. DAMPING PREDICTED BY THE THEORY WAS IN GOOD AGREEMENT WITH MEASURED EXPERIMENTALLY. FATIGUE TESTS WERE ALSO PERFORMED IN THE SPECIALLY DESIGNED DAMPING MACHINE AND S-N CURVES ARE PRESENTED. METHODS OF FAILURES AND INFLUENCE OF DISCONTINUITIES ARE DISCUSSED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-416 002
AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA INC WASHINGTON D C

PANEL FLUTTER SURVEY AND DESIGN CRITERIA. (U)

AUG 62 49P MIROWITZ,L.I.;ZIMMERMAN, N.H.;SCHWEIKER,J.W.;
REPT. NO. ATC REPT. NO. ARTC32

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRCRAFT PANELS, FLUTTER), VIBRATION, FATIGUE (MECHANICS), SWEPT-BACK WINGS, ASPECT RATIO, MODEL TESTS, WIND TUNNEL MODELS, AERODYNAMIC CHARACTERISTICS, FLIGHT TESTING. (U)
IDENTIFIERS: 1962, F-101 AIRCRAFT, X-15 AIR CRAFT, A-5 AIRCRAFT, F-4 AIRCRAFT. (U)

THE ASSIGNMENTTHERING DATA ON IN-FLIGHT INCIDENCES OF PANEL FLUTTER WAS UNDERTAKEN FOR THE PURPOSE OF IMPROVING THE STATE-OF-THE-ART. THE FOLLOWING REPORT PRESENTS THE RESULTS OF THIS SURVEY INCLUDING THE DATA COMPILATION, REDUCTION, PRESENTATION, TENTATIVE SUGGESTED CRITERIA, PRES ENT STATE-OF-THE-ART EVALUATION AND SUGGESTIONS FOR ADDITIONAL PANEL FLUTTER RESEARCH REQUIRED TO SATISFY CURRENT AND FUTURE INDUSTRY NEEDS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-652 415 11/4 1/3 20/11
IIT RESEARCH INST CHICAGO ILL

AN INVESTIGATION OF THE FATIGUE AND CREEP PROPERTIES OF GLASS REINFORCED PLASTICS FOR PRIMARY AIRCRAFT STRUCTURES. (U)

DESCRIPTIVE NOTE: FINAL REPT., 1 MAY 65-1 DEC 66,
APR 67 257P HOFER,K. E. , JR.;OLSEN,
E. M. ;
REPT. NO. IITRI-M6104
CONTRACT: NOw-65-0425

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRPLANE PANELS, REINFORCED PLASTICS), (*AIRFRAMES, REINFORCED PLASTICS), (*REINFORCED PLASTICS, MECHANICAL PROPERTIES), COMPOSITE MATERIALS, FATIGUE(MECHANICS), CREEP, STRAIN(MECHANICS), AEROELASTICITY, STRESSES, GLASS TEXTILES, EPOXY PLASTICS, COATINGS, MOISTURE, LAMINATED PLASTICS, CARBON FIBERS (U)

FATIGUE OF GLASS REINFORCED EPOXY COMPOSITE MATERIALS IS EXAMINED FROM SEVERAL POINTS OF VIEW. HIGH CYCLE AND LOW CYCLE FATIGUE AND THE EFFECTS OF FREQUENCY, MOISTURE, AND STATE OF STRESS ON THE FATIGUE LIFE ARE INCLUDED. THE EFFECTS OF CREEP AND STRAIN RATE ARE ALSO STUDIED WITH A VIEW TOWARD THEIR EFFECT ON FATIGUE LIFE. CUMULATIVE FATIGUE DAMAGE STUDIES INCLUDE NONDESTRUCTIVE ULTRASONIC TECHNIQUES APPLIED TO DAMAGE LEVELS AND APPLICATION OF PHENOMOLOGICAL THEORY TO THE RESULTS OF TWO STRESS LEVEL TESTING. APPENDICES ACCOMPANYING THE REPORT INCLUDE (1) A SURVEY OF GRP FATIGUE LITERATURE, AND (2) A SURVEY OF EXISTING CUMULATIVE FATIGUE DAMAGE THEORIES WITH POTENTIAL APPLICATION TO GRP. TWO TYPES OF REINFORCEMENT WERE USED, UNIAXIAL ROVING AND GLASS CLOTH. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-692 359 1/3 13/13 20/11
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

OPTIMUM PARAMETERS OF CYLINDRICAL SANDWICH SHELLS WITH CORRUGATED-SHEET CORE STIFFENED BY ELASTIC FRAME. (U)

MAY 69 11P PANASENKO,B. A. I
REPT. NO. FTD-HT-23-1281-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF SAMOLETOSTROENIE I TEKHNIKA VOZDUSHNOGO FLOTA (USSR) N8 P101-105 1966, BY E. HARTER.

DESCRIPTORS: (*STRUCTURAL SHELLS, SANDWICH CONSTRUCTION), (*AIRPLANE PANELS, COMPRESSIVE PROPERTIES), STIFFENED CYLINDERS, BUCKLING(MECHANICS), STRESSES, ELASTICITY, LOADING(MECHANICS), OPTIMIZATION, USSR (U)
IDENTIFIERS: TRANSLATIONS (U)

A METHOD FOR DETERMINING THE OPTIMUM DIMENSIONS OF STRAIGHT, CIRCULAR, CYLINDRICAL, TRANSVERSELY STIFFENED SANDWICH SHELLS HAVING CORES MADE OF A SHELL MATERIAL CORRUGATED IN SAW-TOOTH FORM IS PROPOSED. A SHELL OF A GIVEN OUTER RADIUS, LENGTH, AND ELASTIC CHARACTERISTICS OF THE MATERIAL IS SUBJECTED TO A UNIFORM COMPRESSION LOAD. THE OPTIMUM VALUES OF THE FOLLOWING UNKNOWN PARAMETERS HAVE TO BE DETERMINED. CORE PARAMETERS (SAW-TOOTH HEIGHT, PITCH, AND SHEET THICKNESS); THICKNESS (IDENTICAL) OF THE FACE LAYERS; DISTANCE BETWEEN EQUALLY SPACED IDENTICAL TRANSVERSE FRAMES AND THEIR MOMENT OF INERTIA; AND BUCKLING STRESS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-701 447 1/3 20/11
TECHNION - ISRAEL INST OF TECH HAIFA DEPT OF AERONAUTICAL ENGINEERING

THE BUCKLING OF STIFFENED AND UNSTIFFENED CONICAL AND CYLINDRICAL SHELLS. (U)

DESCRIPTIVE NOTE: FINAL SCIENTIFIC REPT. 1 MAR 66-15 SEP 69,
OCT 69 27P SINGER,JOSEF ;
REPT. NO. TAE-102
CONTRACT: AF 61(052)-905
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR 70-0359TR

UNCLASSIFIED REPORT

DESCRIPTORS: (*STRUCTURAL SHELLS, *BUCKLING(MECHANICS)), (*AIRFRAMES, BUCKLING(MECHANICS)), STIFFENED CYLINDERS, CONICAL BODIES, LOADING(MECHANICS), COMPRESSIVE PROPERTIES, BOUNDARY VALUE PROBLEMS, ELASTICITY, ISRAEL (U)
IDENTIFIERS: *CYLINDRICAL SHELLS, *CONICAL SHELLS (U)

THEORETICAL AND EXPERIMENTAL RESEARCH ON THE BUCKLING OF STIFFENED AND UNSTIFFENED CONICAL AND CYLINDRICAL SHELLS, CARRIED OUT OVER A PERIOD OF 3 YEARS, IS SUMMARIZED. THE TOPICS OF EARLIER WORK ARE OUTLINED AND THE MORE RECENT TOPICS ARE SUMMARIZED. THESE INCLUDE: DISCRETENESS EFFECT IN STRINGER-STIFFENED SHELLS AND THE EFFECT OF ELASTIC RESTRAINT ON PANELS AND SUB-SHELLS; THE INFLUENCE OF INPLANE BOUNDARY CONDITIONS FOR RING-STIFFENED CYLINDRICAL SHELLS; EXTENSIVE TESTS ON STRINGER-STIFFENED CYLINDRICAL SHELLS UNDER AXIAL COMPRESSION AND RING STIFFENED CONICAL SHELLS UNDER TORSION; AND ALSO THERMAL BUCKLING OF CYLINDRICAL SHELLS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-710 352 1/3 13/8
NAVAL RESEARCH LAB WASHINGTON D C

ADHESIVE BOND FAILURES IN AIRCRAFT HONEYCOMB SANDWICH COMPOSITES. (U)

DESCRIPTIVE NOTE: INTERIM REPT.,
JUN 70 29P WALTON,T. R. ;COWLING,J. E. ;
REPT. NO. NRL-7077
PROJ: A32-520/652/70F51-544-201

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRPLANE PANELS, HONEYCOMB CORES), (*BONDING, AIRPLANE PANELS), SANDWICH CONSTRUCTION, FAILURE(MECHANICS), BONDED JOINTS, ADHESIVES, CORROSION INHIBITION, ALUMINUM ALLOYS, EPOXY PLASTICS (U)

A NUMBER OF APPROACHES WERE INITIATED TO IMPROVE BOND STRENGTH AND DURABILITY OF HONEYCOMB CORE-SANDWICH STRUCTURES, SOME OF WHICH ARE DESCRIBED IN THE REPORT. THE OVERALL OBJECTIVE WAS TO DETERMINE WHY AND HOW THESE COMPOSITES FAIL AND THEN DETERMINE WHAT CAN BE DONE TO ELIMINATE OR REDUCE THESE FAILURES. FAILURE, IN PART, APPEARS TO BE CAUSED BY AN UNDERCUTTING TYPE OF CORROSION WHICH DESTROYS THE BOND. THE ADHESIVES THEMSELVES APPEAR ALSO TO BE PARTIALLY TO BLAME. ALTHOUGH THEIR INITIAL STRENGTH IS PROBABLY SUFFICIENT, THEIR DURABILITY TO ENVIRONMENTAL CONDITIONS IS POOR. THE DEFICIENCIES IN THE ADHESIVE ARE INADEQUATE MOISTURE RESISTANCE, HIGH VOID CONTENT, AND BRITTLENESS. TO CORRECT THESE PROBLEMS, CORROSION-INHIBITIVE PRIMERS AND TREATMENTS ARE BEING STUDIED, NEW WATER-RESISTANT RESINS ARE BEING SYNTHESIZED, AND BONDING PROCEDURES ARE BEING STUDIED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-720 844 13/13 11/9 11/4
ARA INC WEST COVINA CALIF

RESEARCH ON ENERGY ABSORBING STRUCTURES.
PART IX. (U)

DESCRIPTIVE NOTE: ANNUAL REPT. 1 FEB 70-1 FEB 71
(FINAL),
FEB 71 62P MAZELSKY,BERNARD ;LIN,T.
H. ;LIN,SHENG-RONG ;HEWITT,ROBERT R. ;
REPT. NO. ARA-129
CONTRACT: F44620-68-C-0041
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR TR-71-0127

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO PART 8, AD-706 417.

DESCRIPTORS: (*PANELS(STRUCTURAL), BENDING),
(*REINFORCED PLASTICS, NON-DESTRUCTIVE TESTING),
(*AIRFRAMES, PANELS(STRUCTURAL)), DEFLECTION,
STRUCTURAL PROPERTIES, ITERATIVE METHODS,
STRESSES, REINFORCING MATERIALS, SPECTROMETERS,
STRAIN(MECHANICS), COMPUTER PROGRAMS (U)

AN ANALYTICAL METHOD FOR PREDICTING THE ELASTO-PLASTIC BENDING OF RECTANGULAR PLATES WITH LARGE DEFLECTION IS STUDIED. THE CONCEPT OF EQUIVALENT BODY FORCE IS APPLIED TO ACCOUNT FOR THE PLASTIC STRAIN GRADIENTS AND THE NON-LINEAR TERMS OF DISPLACEMENT DERIVATIVES. THE CALCULATED DEFLECTION FOR PURELY ELASTIC PLATES COMPARES WELL WITH OTHER EXISTING SOLUTIONS. THE DEFLECTION IS INCREASED SLIGHTLY BY PLASTIC STRAIN; HOWEVER, THE STRESS IS CONSIDERABLY RELIEVED BY PLASTIC YIELDING. NUCLEAR QUADRUPOLE RESONANCE(NQR) ON DILUTE INERT FILLERS IN SEVERAL POLYMERS AND ADHESIVES IS MADE AS A FUNCTION OF COMPRESSION AND TENSION. THE CHANGE IN THE NQR RESPONSE IS FOUND TO BE PROPORTIONAL TO THE STRAIN APPLIED TO THE HOST MATERIAL. NQR MEASUREMENTS ON REINFORCED POLYMERS AND ADHESIVE BONDS ARE REPORTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-721 517 20/11 1/3
NATIONAL AERONAUTICAL ESTABLISHMENT OTTAWA (ONTARIO)

FREE VIBRATIONS AND RANDOM RESPONSE OF AN INTEGRALLY-STIFFENED PANEL. (U)

DESCRIPTIVE NOTE: AERONAUTICAL REPT.,
OCT 70 121P OLSON,MERVYN D. ;LINDBERG, GARRY M. ;
REPT. NO. NAE-LR-544
MONITOR: NRC 11855

UNCLASSIFIED REPORT

DESCRIPTORS: (*METAL PLATES, *VIBRATION), (*AIRPLANE PANELS, VIBRATION), AERODYNAMIC LOADING, ACOUSTICS, SONIC FATIGUE, BOUNDARY LAYER, RESONANT FREQUENCY, ALUMINUM ALLOYS, BENDING, MATRIX ALGEBRA, INTEGRALS, CANADA (U)
IDENTIFIERS: FINITE ELEMENT ANALYSIS, DYNAMIC STRUCTURAL ANALYSIS, DYNAMIC RESPONSE, PLATES(STRUCTURAL MEMBERS) (U)

THE FREE VIBRATIONS AND RANDOM RESPONSE TO JET NOISE OF AN INTEGRALLY-STIFFENED FIVE-BAY PANEL HAVE BEEN STUDIED BOTH THEORETICALLY AND EXPERIMENTALLY. A FINITE ELEMENT APPROACH WAS USED TO REPRESENT THE PANEL FOR BOTH PARTS OF THE STUDY, AND THE PREDICTIONS WERE VERIFIED BY MEASUREMENTS ON A MODEL PANEL INTEGRALLY MACHINED FROM SOLID ALUMINUM STOCK. THE PREDICTED MODES AND FREQUENCIES WERE USED IN A MODAL ANALYSIS OF THE PANEL'S RESPONSE TO JET NOISE WITH A CONSISTENT FINITE ELEMENT METHOD BEING INTRODUCED TO CALCULATE THE REQUIRED CROSS-SPECTRAL MODAL FORCE TERMS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-725 601 1/3 20/11
GEORGIA INST OF TECH ATLANTA SCHOOL OF AEROSPACE ENGINEERING

AN INVESTIGATION OF THE OUT-OF PLANE DEFLECTION BEHAVIOR OF THIN SHEETS WITH CUT-OUTS IN A TENSILE FIELD. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUN 71 199P ZIELSDORFF,GEORGE F. ;
CONTRACT: DAHC04-68-C-0004
MONITOR: AROD T-2:20-E

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRPLANE PANELS, BUCKLING(MECHANICS)), STRESSES, TENSILE PROPERTIES, COMPRESSIVE PROPERTIES, DEFLECTION, METAL PLATES, MATHEMATICAL MODELS, DISTRIBUTION FUNCTIONS (U)
IDENTIFIERS: *WINDOW OPENINGS, FINITE DIFFERENCE ANALYSIS, HOLES(APERTURES) (U)

THE PROBLEM OF A TENSIONED THIN PLATE CONTAINING A CENTRALLY LOCATED HOLE IS CONSIDERED. THE KARMAN PLATE FORMULATION FOR MODERATELY LARGE DEFLECTION IS EXTENDED TO INCLUDE MULTIPLY CONNECTED PLATES BY DERIVING THE SET OF AUXILIARY CONDITIONS WHICH MUST BE SATISFIED BY A SOLUTION ON EACH INTERNAL BOUNDARY. THE COUPLED, NONLINEAR KARMAN EQUATIONS MAY BE LINEARIZED AND UNCOUPLED UNDER SPECIFIED CONDITIONS AND THEN THE EQUATIONS DESCRIBE A PLANE STRESS ELASTICITY PROBLEM AND A BUCKLING PROBLEM WITH A NONUNIFORM PREBUCKLE STRESS STATE. THE STRESS DISTRIBUTION FOR A TENSIONED INFINITE SHEET WITH A SLOT HOLE IS DETERMINED BY A COMPLEX VARIABLE ANALYSIS. RESULTS OF A PHOTOELASTIC STRESS ANALYSIS FOR FINITE WIDTH PLATES ARE ALSO PRESENTED AND COMPARED WITH THE COMPLEX VARIABLE SOLUTION FOR THE SAME HOLE GEOMETRIES. BY AN EXAMINATION OF THE STABILITY PROBLEM, IT IS SHOWN THAT A SOUTHWELL FORM LOAD-DISPLACEMENT RELATION CAN BE DERIVED. THE LIMIT OF APPLICABILITY OF THE SOUTHWELL TECHNIQUE IS FOUND TO DEPEND ON THE EXTENT TO WHICH STIFFENING DUE TO MIDDLE SURFACE STRETCHING INFLUENCES THE LOAD-DEFLECTION RESPONSE. A METHOD OF EXPERIMENTALLY DETECTING THIS EFFECT IS DESCRIBED AND USED AS A BASIS FOR AN EXPERIMENTAL STUDY OF THE LOCAL BUCKLING BEHAVIOR OF TENSIONED SHEETS WITH SLOTS. THE BUCKLING DATA OBTAINED ARE ANALYZED, (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-720 164 1/3 20/11
NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA AERO STRUCTURES DEPT

STRESSES AND STRAINS AROUND OPEN AND FILLED HOLES IN AN ALUMINUM SHEET DURING CYCLIC LOADING. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JAN 71 87P VINING,RALPH E. ;
REPT. NO. NADC-ST-7009
PROJ: NADC-IR-TR-4-01, ZR011-01-01

UNCLASSIFIED REPORT

DESCRIPTORS: (•METAL PLATES, STRUCTURAL PROPERTIES), (•AIRPLANE PANELS, METAL PLATES), ALUMINUM ALLOYS, STRESSES, STRAIN(MECHANICS), FRACTURE(MECHANICS), TENSILE PROPERTIES, TEST EQUIPMENT, TEST METHODS (U)
IDENTIFIERS: ALUMINUM ALLOY 7075, HOLES(OPENINGS) (U)

THE STRESS AND STRAIN HISTORY AT A POINT OF STRESS CONCENTRATION WERE STUDIED IN AN EFFORT TO RESOLVE CONFLICTS REGARDING THE EFFECTS OF SPECTRUM BLOCK SIZE IN FATIGUE TESTING. FATIGUE TESTS WERE PERFORMED USING AS SPECIMENS LARGE SHEETS OF 7075-T6 ALUMINUM ALLOY WITH A CENTRAL HOLE. PLASTIC DEFORMATION WAS INDUCED AT THE EDGE OF THE HOLE, ALTHOUGH THE GROSS AREA STRESS IN THE SHEET REMAINED IN THE ELASTIC RANGE. IT WAS FOUND THAT THE STRAINS AT THE STRESS CONCENTRATOR VARIED DURING SUBSEQUENT CONSTANT-AMPLITUDE FATIGUE CYCLING. RELAXATION OF THE MEAN STRESS AND STRAIN HARDENING WERE QUALITATIVELY DETECTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-728 009 1/3
NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA AERO STRUCTURES DEPT

STRUCTURAL INTEGRITY INVESTIGATION OF REWORKED S-2 CORRUGATED WING SKIN PANELS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
APR 71 38P LYSTAD,HENRY D. ;BERMAN, LOUIS ;
REPT. NO. NADC-ST-7107
PROJ: WR-1-5060

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRPLANE PANELS, FATIGUE(MECHANICS)), (*ANTISUBMARINE AIRCRAFT, AIRPLANE PANELS), WINGS, CORROSION, ANTISUBMARINE AIRCRAFT, MAINTENANCE (U)
IDENTIFIERS: FATIGUE TESTS, S-2 AIRCRAFT (U)

LABORATORY FATIGUE TESTS WERE PERFORMED ON REWORKED S-2 CORRUGATED WING SKIN PANELS TO DETERMINE THE EFFECT ON THE STRUCTURAL INTEGRITY OF SKIN MATERIAL REMOVAL DUE TO CORROSION DAMAGE. REWORKING OF THE S-2 AIRCRAFT CORRUGATED WING SKIN PANELS, AS PERFORMED BY THE NAVAL AIR REWORK FACILITIES, TO REMOVE CORROSION DAMAGED MATERIAL, DOES NOT ADVERSELY AFFECT THE STRUCTURAL INTEGRITY OF THE PANELS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-729 641 11/6 1/3
NAVAL RESEARCH LAB WASHINGTON D C

COMPARISON OF PLANE-STRESS FRACTURE TOUGHNESS FOR THREE ALUMINUM SHEET ALLOYS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
AUG 71 12P FREED,CHARLES N. ;SULLIVAN, ANNA M. ;STOOP,JOSEPH ;
REPT. NO. NRL-7299
PROJ: RR007-01-46-5431, NRL-M01-24

UNCLASSIFIED REPORT

DESCRIPTORS: (*ALUMINUM ALLOYS, FRACTURE(MECHANICS)), (*AIRPLANE PANELS, ALUMINUM ALLOYS), STRESSES, LOADING(MECHANICS), HEAT TREATMENT, CRACKS, CRACK PROPAGATION, ELONGATION, TEST METHODS (U)
IDENTIFIERS: ALUMINUM ALLOY 7178, ALUMINUM ALLOY 7075, ALUMINUM ALLOY 7475, ULTRAHIGH STRENGTH ALLOYS, *FRACTURE TOUGHNESS (U)

A PROGRAM FOR EVOLVING ANALYTICAL PROCEDURES TO CHARACTERIZE THE FRACTURE RESISTANCE OF HIGH-STRENGTH SHEET METALS HAS BEEN INITIATED. THE FIRST PHASE OF THIS PROGRAM IS CONCERNED WITH THE DEVELOPMENT OF A STANDARD PLANE-STRESS TEST METHOD FOR RELIABLE CHARACTERIZATION OF HIGH-STRENGTH SHEET ALLOYS. THE TEST INCORPORATES FRACTURE MECHANICS PRINCIPLES TO DEFINE THE RELATIONSHIP BETWEEN THE STRESS AND CRITICAL CRACK SIZE AT INSTABILITY IN TERMS OF A SINGLE PARAMETER. A CENTER-CRACKED SHEET PANEL HAS BEEN SELECTED AS THE MOST PROMISING TEST-SPECIMEN CONFIGURATION TO INVESTIGATE THIS RELATIONSHIP. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-729 801 20/11 1/3
ARMY MATERIALS AND MECHANICS RESEARCH CENTER WATERTOWN MASS

ANALYSIS OF CRACKS IN WIDE ORTHOTROPIC PLATE WITH LONGITUDINAL STIFFENERS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
AUG 71 18P LAKSHMIKANTHAM,CHATTA ;
REPT. NO. AMMRC-TR-71-29
PROJ: DA-1-T-062105-A-349

UNCLASSIFIED REPORT

DESCRIPTORS: (*CRACKS, STRESSES), (*AIRPLANE PANELS, MECHANICAL PROPERTIES), COMPOSITE MATERIALS, BOUNDARY VALUE PROBLEMS, BENDING (U)
IDENTIFIERS: STIFFENED PLATES (U)

RECENTLY, THE HOWLAND-ISIDA APPROACH TO CRACKS IN ISOTROPIC STRIPS WAS EXTENDED BY LAKSHMIKANTHAM TO THE CASE OF AN ORTHOTROPIC STRIP WITH EDGE STIFFENERS. THE PRESENT REPORT USES HIS TECHNIQUES IN SOLVING THE PROBLEM OF A TENSIONED WIDE PLATE WITH PARALLEL STRINGERS AND STRESS FREE CRACKS IN ALTERNATE PANELS. THE RESULTS OF THIS PROBLEM TOGETHER WITH THE PREVIOUS STUDY ARE EXPECTED TO COVER MANY CASES OF AIRCRAFT STRUCTURAL IMPORTANCE; ESPECIALLY WHERE FIBER-REINFORCED COMPOSITES ARE USED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDML1

AD-732 353 13/8 1/3
PICATINNY ARSENAL DOVER N J

EVALUATION OF THE ADHESIVE BONDING PROCESSES USED IN HELICOPTER MANUFACTURE. PART I. DURABILITY OF ADHESIVE BONDS OBTAINED AS A RESULT OF PROCESSES USED IN THE UH-1 HELICOPTER. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
SEP 71 11UP EGMAN,RAYMOND F. ;ROSS, MARIE C. ;SLOTA,STANLEY A. ;DUDA,EDWARD S.
;
REPT. NO. PA-TR-4186

UNCLASSIFIED REPORT

DESCRIPTORS: (*BONDING, *SANDWICH PANELS), (*AIRPLANE PANELS, BONDING), (*HELICOPTERS, MANUFACTURING METHODS), BONDED JOINTS, TITANIUM ALLOYS, ALUMINUM ALLOYS, COMPOSITE MATERIALS, ANODIC COATINGS, FAILURE(MECHANICS) (U)
IDENTIFIERS: UH-1 AIRCRAFT, H-1 AIRCRAFT, TITANIUM ALLOY 6AL 4V, ALUMINUM ALLOY 2024 (U)

THE METHODS USED TO PREPARE ADHERENDS FOR COMPONENTS OF UH-1 AIRCRAFT (PRIOR TO BONDING) WERE EVALUATED FOR THEIR EFFECT UPON THE DURABILITY OF THE BONDED JOINT. THE PHOSPHATE-FLUORIDE METHOD FOR TITANIUM PRODUCES A SURFACE WHICH, WHEN BONDED, WAS 7.5 TO 10 TIMES MORE DURABLE THAN JOINTS PREPARED FROM TITANIUM SURFACES THAT WERE ALKALINE CLEANED. UPON AGING, THE SURFACE STRUCTURE OF THE PHOSPHATE-FLUORIDE TREATED SPECIMENS SHOWED SIGNS OF CONVERSION TO THE LESS DURABLE STRUCTURE FOUND ON THE ALKALINE-CLEANED TITANIUM. THE METHOD USED TO ANODIZE ALUMINUM PRODUCED A SURFACE WHICH, WHEN BONDED, EXHIBITED ESSENTIALLY THE SAME DURABILITY AS THE BONDS USING PHOSPHATE-FLUORIDE-ETCHED TITANIUM. BONDS TO GLASS-RESIN-COMPOSITE ADHERENDS ARE AS DURABLE AS THE COMPOSITE ITSELF AND FAILURES WERE FOUND TO BE INTERLAMINAR. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDMLI

AD-734 192 20/11 20/4
TEXAS UNIV AUSTIN DEPT OF AEROSPACE ENGINEERING AND ENGINEERING MECHANICS

INFLUENCE OF A SUPERSONIC FLOWFIELD ON THE ELASTIC STABILITY OF CYLINDRICAL SHELLS. (U)

JUN 70 9P BARR,GERALD W. ;STEARMAN, RONALD O. ;

CONTRACT: AFOSR-1998-71
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR TR-71-3080

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN AIAA JNL., V8 N6 P993-1000 JUN 70.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH SANDIA LABS., ALBUQUERQUE, NEW MEXICO. REPT. NO. SC-R-70-4296.

DESCRIPTORS: (*STRUCTURAL SHELLS, AEROELASTICITY), (*PANELS(STRUCTURAL), FLUTTER), SUPERSONIC FLOW, FLOW FIELDS, CYLINDRICAL BODIES, STABILITY, BUCKLING(MECHANICS), STRESSES, LOADING(MECHANICS), COMPRESSIVE PROPERTIES, MATHEMATICAL MODELS, AIRFRAMES (U)
IDENTIFIERS: *CYLINDRICAL SHELLS (U)

THE RATHER COMPLEX INTERACTION PROBLEM OF SHELL DIVERGENCE AND PANEL FLUTTER THAT MAY BE ENCOUNTERED BY AN AEROSPACE VEHICLE DURING THE BOOST PHASE OF A TRAJECTORY IS TREATED THEORETICALLY AND THE RESULTS THEN COMPARED QUALITATIVELY WITH RECENT EXPERIMENTAL OBSERVATIONS. THE ANALYTICAL MODEL CONSIDERS THE COMBINED INFLUENCE OF INTERNAL PRESSURE AND AXIAL COMPRESSIVE LOADING ON A THIN-WALLED CYLINDRICAL SHELL IN A SUPERSONIC FLOWFIELD. RADIAL EDGE CONSTRAINT AND INITIAL IMPERFECTIONS ALSO ARE CONSIDERED. THE FORMULATION EMPLOYS THE NONLINEAR DONNELL SHELL EQUATIONS AND A LINEAR 'PISTON THEORY' AERODYNAMIC APPROXIMATION AND UTILIZES A KINETIC STABILITY APPROACH. THE AEROELASTIC STABILITY OF THE SHELL IS DETERMINED ABOUT ITS DEFORMED MIDDLE SURFACE USING GALERKIN'S TECHNIQUE IN A MODAL SOLUTION. (AUTHOR) (U)

VI.

WINGS

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-260 079
CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL LABS

A REVIEW OF RECENT RESEARCH AT GALCIT CONCERNING FRACTURE INITIATION (U)

APR 61 1V. WILLIAMS,M.L.;
CONTRACT: AF33 616 5740

UNCLASSIFIED REPORT

DESCRIPTORS: *FATIGUE (MECHANICS), *FRACTURE (MECHANICS), *STRESSES, DEFORMATION, ELASTICITY, MATHEMATICAL ANALYSIS, MECHANICAL PROPERTIES, MECHANICS, SWEPT-BACK WINGS, SWEPT WINGS, TENSILE PROPERTIES (U)

THE MECHANICS OF FRACTURE INITIATION WERE INVESTIGATED WITH PARTICULAR EMPHASIS ON THE EFFECTS OF: COMBINED BENDING AND EXTENSIONAL STRESS ON AN ISOTROPIC OR ORTHOTROPIC CRACKED SPECIMEN; INITIAL SHEET CURVATURE ON THE STRESS FIELD IN THE VICINITY OF A CRACK; AND SIZE AND SHAPE OF THE YIELDED REGION, OR PLASTIC ENCLAVE, NEAR THE POINT OF THE CRACK. IT WAS FOUND THAT ACCORDING TO REISSNER THEORY, THE CIRCUMFERENTIAL DISTRIBUTION OF SURFACE STRESSES AT THE TIP OF A CRACK IN AN ISOTROPIC PLATE SUBJECTED TO BENDING IS IDENTICAL TO THE EXTENSIONAL STRESS DISTRIBUTION. SECOND, THE INITIAL CURVATURE OF A CRACKED PLATE WAS ASSOCIATED ANALYTICALLY AND EXPERIMENTALLY WITH AN ELASTIC FOUNDATION SUPPORTING A FLAT CRACKED PLATE. THIRD, ANALYTICAL SOLUTIONS FOR BOTH INTERNALLY AND EXTERNALLY CRACKED INFINITE ELASTIC ORTHOTROPIC PLATES WERE OBTAINED. FOURTH, AN ANALYSIS OF THE PLASTIC ENCLAVE AT THE CRACK POINT IN AN ISOTROPIC SHEET WAS CONDUCTED FOR AN EXTERNALLY CRACKED SPECIMEN, USING RELAXATION METHODS. THE AREA OF THE ENCLAVE IS PRESENTED AS A FUNCTION OF APPLIED TENSILE STRESS. BASED UPON THE SIZE OF THE ENCLAVE, THE PLASTIC STRAIN ENERGY IS ESTIMATED, AND A DUCTILE FRACTURE CRITERION IS PROPOSED. A THEORY OF FRACTURE INITIATION IS PROPOSED FOR HIGH-STRESS, LOW-CYCLE FATIGUE WHICH, AS A NATURAL RESULT, DISTINGUISHES BETWEEN DIFFERENT ORDERS OF LOAD SPECTRA. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-271 897
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON D C

A NOTE ON HELICOPTER ROTOR-BLADE FATIGUE-CRACK PROPAGATION RATES UNDER EQUIVALENT-LIFETIME FATIGUE LOADINGS (U)

FEB 62 1V WARD,JOHN F.;
REPT. NO. TN D 1018

UNCLASSIFIED REPORT

DESCRIPTORS: *ROTOR BLADES (ROTARY WINGS), FATIGUE (MECHANICS), FRACTURE (MECHANICS), HELICOPTER ROTORS, LIFE EXPECTANCY, LOAD DISTRIBUTION, OSCILLATION, STRESSES, TESTS (U)

RESULTS ARE GIVEN FOR A BRIEF INVESTIGATION OF THE RELATIVE RATES OF FATIGUE-CRACK PROPAGATION OBTAINED IN HELICOPTER-ROTOR-BLADE FATIGUE TESTS IN WHICH SIMPLIFIED, EQUIVALENT-TOTAL-LIFETIME, FATIGUE-TEST LOADINGS AT ZERO MEAN LOAD ARE USED TO SIMULATE A FLIGHT FATIGUE LOADING THAT INCLUDES A MEAN TENSION LOAD. THE CONVENTIONAL EQUIVALENT-LIFETIME LOADINGS DO NOT GIVE EQUIVALENT RATES OF CRACK PROPAGATION. FOR TYPICAL ROTOR-BLADE LOADINGS, WHICH INCLUDED LARGE MEAN TENSION LOAD, THE GENERAL TREND WAS TOWARD GREATLY REDUCED RATES OF FATIGUE-CRACK PROPAGATION UNDER THE EQUIVALENT-LIFETIME LOADINGS PROVIDED A NONCONSERVATIVE BASIS FOR ESTABLISHING ROTOR-BLADE INSPECTION INTERVALS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-272 163
GENERAL DYNAMICS/FORT WORTH TEX

B-58 WING - PYLON BOX FORGING - MECHANICAL PROPERTIES - DETERMINATION OF (U)

JAN 62 IV JONES,R.L.;
REPT. NO. FGT 2742
CONTRACT: AF33 600 41891

UNCLASSIFIED REPORT

DESCRIPTORS: *AIRCRAFT PROTUBERANCES, *FORGING, *WINGS, AIRPLANES, FATIGUE (MECHANICS), MECHANICAL PROPERTIES, MICROSTRUCTURE, MOUNTING BRACKETS, STAINLESS STEEL, STEEL, TENSILE PROPERTIES (U)
IDENTIFIERS: AOI-402 ENGINES (U)

A PROPOSED DESIGN CHANGE FOR THE FABRICATION OF THE INBOARD PYLON ATTACH BRACKET 4W3306-29 AND -30, USED ON B-58 AIRPLANES, INVOLVED FORGING A SINGLE SAE 4335 MOD. STEEL BILLET INTO THE ROUGH SHAPE OF THE WING-PYLON BOX WHICH WOULD THEN BE MACHINED TO THE FINAL CONFIGURATION. IN GENERAL THE MECHANICAL PROPERTIES OF THE SAE 4335 MOD. STEEL FORGING COMPARED FAVORABLY WITH THOSE OBTAINED FROM THE BAR STOCK. THOSE AREAS TESTED IN THE FORGING HAD LOWERED DUCTILITY AND FATIGUE STRENGTH WERE EXPLAINED BY REASON OF PROXIMITY TO THE FORGING PARTING PLANE, TRANSVERSE GRAIN DIRECTION, AND/OR INCLUSIONS. AT THE 190 KSI HEAT TREAT LEVEL, THE STATIC STRENGTH OF THE FORGING WAS NOT NOTCH SENSITIVE TO STRESS CONCENTRATIONS AS HIGH AS K SUB T EQUALS 11. THE MAJORITY OF THE FATIGUE CRACKS IN THE SMOOTH FATIGUE SPECIMENS STARTED AT INCLUSIONS WHICH WERE EXPOSED TO THE SPECIMEN OUTER SURFACE. IN THOSE SPECIMENS WHERE THE INCLUSIONS WERE CONCENTRATED OR UNUSUALLY LARGE, THE FATIGUE STRENGTH OF THE MATERIAL WAS DRASTICALLY REDUCED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-286 841
GENERAL DYNAMICS/FORT WORTH TEX

WING-DYNAMIC ETCHED CORRUGATED SPAR WEBS-FATIGUE TENSILE-TEST OF (U)

JUL 58 IV MAY,J.;
REPT. NO. FTDM 1949
CONTRACT: AF33 657 7248

UNCLASSIFIED REPORT

DESCRIPTORS: *ALUMINUM, *WINGS, ELASTICITY, FATIGUE (MECHANICS), MANUFACTURING METHODS, MECHANICAL PROPERTIES, TENSILE PROPERTIES, TESTS (U)

DETERMINATION OF FATIGUE CHARACTERISTICS OF ETCHED CORRUGATED WEBS COMPARED TO THOSE OF PLAIN CORRUGATED WEBS.

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-290 284
HUGHES TOOL CO CULVER CITY CALIF

HOT CYCLE ROTOR SYSTEM RESULTS OF COMPONENT TEST PROGRAM (U)

MAR 62 1V DEVEAUX,G.D.;
REPT. NO. 285 9 8 62 8
CONTRACT: AF33 600 30271

UNCLASSIFIED REPORT

DESCRIPTORS: *HELICOPTER ROTORS, *JET HELICOPTER ROTORS, BEARINGS, DESIGN, DUCTS, FATIGUE (MECHANICS), FRACTURE (MECHANICS), FREQUENCY, OSCILLATION, RESONANCE, ROTOR BLADES (ROTARY WINGS), SEALS (STOPPERS), TEST EQUIPMENT, TEST METHODS, TITANIUM (U)

COMPONENT TESTS WERE CONDUCTED ON THE HOT CYCLE ROTOR SYSTEM. THE BLADE FATIGUE TEST, AFTER MODIFICATIONS, GAVE A SATISFACTORY SERVICE LIFE. THE ARTICULATE DUCT OUTBOARD SEAL TEST AND THE BLADE FLAPPING-FEATHERING BEARING WEAR TEST INDICATED SATISFACTORY SERVICE LIFE WITH NEGLIGIBLE WEAR AND LEAKAGE. THE TWO SEGMENT DUCT SEALANT TEST DEMONSTRATED THE ABILITY OF THE RTV-601 SILASTIC RUBBER COMPOUND TO WITHSTAND THE PRESSURE AND THERMAL ENVIRONMENTS OF THE HOT CYCLE ROTOR SYSTEM. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-409 081L
SPECIAL AIR WARFARE CENTER EGLIN AFB FLA

T-28 B/D STRUCTURAL INTEGRITY PROGRAM FLIGHT EVALUATION PHASE. (U)

DESCRIPTIVE NOTE: TECHNICAL DOCUMENTARY REPT.,
JUL 63 14P IDDINGS,ARCHIE T. , JR.;
ROWAN,JOHN M. ;
REPT. NO. SAWC-TDR-63-2

UNCLASSIFIED REPORT
DISTRIBUTION: USGO: OTHERS TO TACTICAL AIR COMMAND, ATTN: DORQ. LANGLEY AFB, VA. 23365.

DESCRIPTORS: (*TRAINING PLANES, FLIGHT TEST ING), (*WINGS, DEFORMATION). (U)
IDENTIFIERS: T-28 AIRCRAFT, WRINKLING, MISSION PROFILES, 1963. (U)

ELEVEN MISSIONS WERE FLOWN TO GATHER DATA ON THE PERMANENT WRINKLING OF THE UPPER WING SKIN AND CRACKING OF THE DOUBLER AND SKIN ADJACENT TO THE CAMERA ACCESS DOOR, EXHIBITED BY T-28 AIRCRAFT. DATA WERE NEEDED WHICH WOULD ACCURATELY DEFINE THE LIMIT LOAD FACTOR ENVELOPE IN THE WEIGHT AND STORE CONFIGURATIONS. SYMMETRICAL G BUILDUP WAS ACCOMPLISHED IN 1/2-G INCREMENTS AT 275 KIAS. MINOR UPPER WING SKIN WRINKLING OCCURED AT 5.LG. AFTER PERFORMANCE OF FULL AILERON DEFLEC TION 1.0-G ROLLS AT 250 KIAS THERE WAS EVIDENCE OF THE ONSET OF MINOR UPPER WING SKIN WRINKLING. TWO SMALL UPPER WING SKIN WRINKLES OCCURED DURING AN AEROBATIC TRAINING MISSION PROFILE. MAXIMUM ACCELERATION ON THIS MISSION WAS APPROXIMATELY 4.1G. INCREMENTAL ACCELERATION BUILDUP DURING ROLLING MANEUVERS WAS ACCOMPLISHED UP TO A LEVEL OF 4.0 G. NO WING WRINKLING OCCURED DURING THESE MANEUVERS. NO NEW WRINKLES WERE NOTED SUBSEQUENT TO GUNNERY/BOMBING PROFILES. NORMAL DIVE BOMB RECOVERY (40 DEGREES DIVE ANGLE) WAS FOUND TO REQUIRE APPROXIMATELY 4.0 G. ALL WING WRINKLING WHICH WAS ENCOUNTERED WAS SUPERFICIAL DAMAGE TO THE UPPER WING SKIN. INSPECTION OF THE WING AND ANALYSIS OF FLIGHT TEST DATA INDICATED THAT THIS DEFORMATION HAD NOT AFFECTED THE BASIC STRUCTURAL STRENGTH OF THE WING. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-627 361 1/3
HUGHES TOOL CO CULVER CITY CALIF AIRCRAFT DIV

COMPONENT TESTING XV-9A HOT CYCLE RESEARCH AIRCRAFT. (U)

DESCRIPTIVE NOTE: SUMMARY REPT. 29 SEP 62-15 MAR 65,
NOV 65 199P DEVEAUX,G. D. ;
REPT. NO. HTC-AD-64-26 (385-T-16)
CONTRACT: DA-44-177-AMC-877(T)
TASK: 1M121401D14403
MONITOR: USAAVLABS , TR-65-38

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-621 684.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, ROTOR BLADES(ROTARY WINGS)), (*ROTOR BLADES(ROTARY WINGS), TESTS), JET HELICOPTER ROTORS, FATIGUE(MECHANICS), ROTARY WINGS, FREQUENCY, JOINTS, RESEARCH PLANES (U)
IDENTIFIERS: V-9 AIRCRAFT (U)

THE COMPONENT TESTS INCLUDED FATIGUE TESTS OF THE BLADE ROOT-END AND CONSTANT SECTION AREAS, HUB GIMBAL SYSTEM, SPAR-TO-SEGMENT AND ROOT-FITTING-TO-SPAR ATTACHMENTS, AND MATERIAL EVALUATION TESTS OF THE BLADE SPARS. SEALING TESTS WERE CONDUCTED ON THE JOINT BETWEEN THE Y-DUCT AND TRIDUCT IN THE HUB AREA, THE JOINT AREA BETWEEN THE GAS GENERATOR AND DIVERTER VALVE, AND THE FIXED-DUCT JOINT ON THE ROTOR BLADE. BLADE NATURAL FREQUENCY TESTS WERE CONDUCTED TO ENSURE THAT THE NATURAL FREQUENCIES OF THE ROTOR BLADE WOULD NOT BE IN A CRITICAL FREQUENCY RANGE. THE INSTRUMENTED FLIGHT BLADE WAS CALIBRATED IN A TEST FIXTURE BEFORE THE FLIGHT TEST PROGRAM. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-631 349 1/3 20/11
NATIONAL AERO- AND ASTRONAUTICAL RESEARCH INST AMSTERDAM (NETHERLANDS)

STRAIN MEASUREMENTS ON EIGHT FULL-SCALE WING CENTER SECTIONS. (U)

DESCRIPTIVE NOTE: SCIENTIFIC REPT.,
DEC 63 47P SEVENHUYSEN,P. J. ;NEDERVEEN, A. ;SCHIJVE,J. ;
REPT. NO. SCIENTIFIC-3,NLR-S.610
CONTRACT: AF 61(052)-439,

UNCLASSIFIED REPORT

DESCRIPTORS: (*WINGS, FATIGUE(MECHANICS)), (*STRAIN(MECHANICS), WINGS), LOADING(MECHANICS), TESTS, CAPTIVE TESTS, STRESSES, NETHERLANDS (U)

FOR AN INVESTIGATION ON THE EQUIVALENCE OF RANDOM AND PROGRAMMED FATIGUE LOADS EIGHT FULL-SCALE WING CENTER SECTIONS WERE TESTED. EACH FATIGUE TEST WAS PRECEDED BY A STATIC TEST TO CHECK THE SIMILARITY OF THE STRESS DISTRIBUTION IN ALL TENSION SKINS. IN THE REPORT THE RESULTS OF THESE STATIC TESTS ARE PRESENTED AND AN ANALYSIS OF THE TRENDS OBSERVED IS GIVEN. THE MAXIMUM LOAD IN THE STATIC TEST WAS ONLY SLIGHTLY BEYOND THE MEAN LOAD OF THE FATIGUE TESTS. THE FOLLOWING OBSERVATIONS WERE MADE: (A) THE STRAIN MEASUREMENTS MADE ON PORT AND STARBOARD OF THE TENSION SKIN ARE IN GOOD AGREEMENT (B) THE SAME APPLIES TO THE STRAIN MEASUREMENTS MADE ON ALL EIGHT TENSION SKINS AT THE SAME LOCATION. (C) AT THE SAME LOCATION ON DIFFERENT TENSION SKINS THE AVERAGE VALUE OF THE STANDARD DEVIATION WAS 2%. THE SCATTER IS MAINLY DUE TO THE MEASUREMENT TECHNIQUES AND NOT TO DIFFERENCES BETWEEN THE TENSION SKINS. (D) SECONDARY BENDING, ALTHOUGH SMALL, INCREASED SOMEWHAT THE SCATTER OF THE RESULTS. (E) THE EFFECT OF FATIGUE LOADING ON THE OUTPUT OF THE STRAIN GAGES WAS VERY SMALL, DESPITE THE HIGH FATIGUE LOADING WHICH INDUCED FAILURE OF MANY GAGES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-631 572 1/3 20/11
NATIONAL AERO- AND ASTRONAUTICAL RESEARCH INST AMSTERDAM (NETHERLANDS)

EXPERIMENTAL DETAILS OF TESTING A FULL-SCALE STRUCTURE WITH RANDOM AND PROGRAMMED FATIGUE LOAD SEQUENCES. (U)

DESCRIPTIVE NOTE: SCIENTIFIC REPT.,
JAN 64 30P NEDERVEEN,A. ;DE RIJK,P. ;
BROEK,D. ;SCHIJVE,J. ;
REPT. NO. SCIENTIFIC-1,NLR-S.608
CONTRACT: AF 61(052)-439,

UNCLASSIFIED REPORT

DESCRIPTORS: (*WINGS, LOADING(MECHANICS)), (*FATIGUE(MECHANICS), WINGS), TESTS, TEST EQUIPMENT, VISUAL INSPECTION, FRACTURE(MECHANICS), X RAYS, NETHERLANDS, TRANSPORT PLANES (U)
IDENTIFIERS: F-27 AIRCRAFT (U)

FOR AN INVESTIGATION ON THE EQUIVALENCE OF RANDOM AND PROGRAMMED FATIGUE LOADS, EIGHT FULL-SCALE WING CENTER SECTIONS WERE TESTED. THE REPORT DESCRIBES THE FATIGUE MACHINE DEVELOPED FOR THIS PURPOSE AND SOME TESTING EXPERIENCE. LOAD MONITORING OF THE HYDRAULIC MACHINE OCCURS BY COMPARING A FEED-BACK SIGNAL FROM A LOAD CELL WITH THE OUTPUT OF A SELECTED WHEATSTONE CIRCUIT WITH AN ADJUSTABLE POTENTIOMETER. THERE ARE 32 CIRCUITS WHICH CAN BE SELECTED BY A DIGITAL TAPE READER IN ANY ARBITRARY SEQUENCE. IN THIS WAY A RANDOM SEQUENCE OF 32 LOAD LEVELS CAN BE APPLIED. THE HYDRAULIC AND THE ELECTRONIC PARTS ARE DESCRIBED IN SOME DETAIL. IN EIGHT FATIGUE TESTS A GOOD RELIABILITY AND ACCURACY WERE OBTAINED. DURING THE FATIGUE TESTS THE INSPECTIONS FOR CRACKS WERE MADE VISUALLY AND WITH X-RAY EQUIPMENT. VISUAL INSPECTIONS WERE MADE WHEN THE TEST WAS RUNNING, IN VIEW OF THE INCREASED SENSITIVITY. THE RESULTS OF THE X-RAY METHOD FOR SMALL CRACKS WERE VERY SENSITIVE FOR THE MEAN LOAD IN THE STRUCTURE. USEFUL RESULTS WERE OBTAINED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-631 573 1/3 20/11
NATIONAL AERO- AND ASTRONAUTICAL RESEARCH INST AMSTERDAM (NETHERLANDS)

FATIGUE LOADS APPLIED ON A FULL-SCALE STRUCTURE IN RANDOM AND PROGRAMMED SEQUENCES. (U)

DESCRIPTIVE NOTE: SCIENTIFIC REPT.,
APR 64 31P SCHIJVE,J. ;
REPT. NO. SCIENTIFIC-2,NLR-S.609
CONTRACT: AF 61(052)-439,

CLASSIFICATION

DESCRIPTORS: (*WINGS, LOADING(MECHANICS)), (*FATIGUE(MECHANICS), WINGS), STRUCTURES, SEQUENCES, TESTS, NETHERLANDS, TRANSPORT PLANES
IDENTIFIERS: F-27 AIRCRAFT (U)
(U)

FOR AN INVESTIGATION ON THE EQUIVALENCE OF RANDOM AND PROGRAMMED FATIGUE LOADS EIGHT FULL-SCALE WING CENTER SECTIONS WERE TESTED. THE REPORT DESCRIBES THE LOAD SEQUENCES APPLIED IN THE TESTS. THE RANDOM SEQUENCE WAS DERIVED FROM A STRAIN-GAGE RECORD OBTAINED WITH AN AIRCRAFT FLYING IN TURBULENT AIR. THIS RECORD WAS AMPLIFIED AND ADAPTED TO THE FATIGUE MACHINE. THE STATISTICAL PROPERTIES AS OBTAINED BY SEVERAL METHODS, COUNTING PEAK LOADS OR LOAD RANGES, ARE PRESENTED. THE LOAD SEQUENCE FOR THE PROGRAM TESTS AND THE ASSESSMENT OF THE GROUND-TO-AIR CYCLES ARE DESCRIBED. THE LOADS APPLIED IN EACH OF THE EIGHT TESTS ARE SUMMARIZED. BRIEF COMMENTS ON THE RESULTS ARE GIVEN. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-631 574 1/3 20/11
NATIONAL AERO- AND ASTRONAUTICAL RESEARCH INST AMSTERDAM (NETHERLANDS)

FATIGUE LIVES OBTAINED IN RANDOM AND PROGRAM TESTS ON FULL-SCALE WING CENTER SECTIONS. (U)

DESCRIPTIVE NOTE: SCIENTIFIC REPT.,
DEC 63 48P SCHIJVE,J. ;DE RIJK,P. ;
REPT. NO. SCIENTIFIC-4,NLR-S.611
CONTRACT: AF 61(052)-439.

UNCLASSIFIED REPORT

DESCRIPTORS: (*WINGS, LOADING(MECHANICS)), (*FATIGUE(MECHANICS), WINGS), AERODYNAMIC LOADING, TESTS, SEQUENCES, SIMULATION, LIFE EXPECTANCY, STATISTICAL ANALYSIS, NETHERLANDS, TRANSPORT PLANES (U)
IDENTIFIERS: F-27 AIRCRAFT (U)

FATIGUE TESTS WERE CONDUCTED ON EIGHT FULL-SCALE WING CENTER SECTIONS OF THE F-27 FRIENDSHIP AIRCRAFT. THE SPECIMEN CONSISTED OF THE TENSION SKIN, INCLUDING ALL STIFFENING ELEMENTS. THE REMAINDER OF THE WING WAS REPLACED BY A DUMMY STRUCTURE. TWO TESTS WERE CARRIED OUT FOR EACH OF THE FOLLOWING LOAD SEQUENCES: (1) RANDOM LOAD (2) PROGRAMMED LOAD (3) RANDOM LOAD WITH GROUND-TO -AIR CYCLES (4) PROGRAMMED LOAD INCLUDING GROUND-TO-AIR CYCLES. THE RANDOM LOADING WAS BASED ON A SIMULATION OF STRAIN GAGE RECORDS OBTAINED BY FLYING IN TURBULENT AIR. THE PRIMARY AIM OF THE INVESTIGATION WAS TO STUDY THE EQUIVALENCE OF RANDOM AND PROGRAMMED LOADINGS. A COMPARISON OF THE FATIGUE LIVES AND THE CRITICAL COMPONENTS INDICATED THE FOLLOWING TRENDS: (A) CRACKS WERE FOUND IN THE SAME COMPONENTS FOR ALL TESTS. (B) THE FATIGUE LIFE UNDER THE PROGRAMMED LOAD WAS SLIGHTLY LONGER THAN IN THE RANDOM LOAD TESTS, BOTH FOR TESTS WITHOUT AND WITH GROUND-TO-AIR CYCLES. (C) THE ADDITION OF GROUND-TO-AIR CYCLES REDUCED THE FATIGUE LIFE TO 50% OR EVEN LESS. FOR ONE FATIGUE-SENSITIVE ELEMENT SUFFICIENT DATA WERE AVAILABLE FOR A STATISTICAL EVALUATION; THIS INDICATED THAT THE SCATTER WITHIN ONE STRUCTURE MAY BE SMALLER THAN THE VARIABILITY BETWEEN A NUMBER OF IDENTICAL STRUCTURES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-631 575 1/3 20/ 1
NATIONAL AERO- AND ASTRONAUTICAL RESEARCH INST AMSTERDAM (NETHERLANDS)

CRACK PROPAGATION AND RESIDUAL STRENGTH OF FULL SCALE WING CENTER SECTIONS. (U)

DESCRIPTIVE NOTE: SCIENTIFIC REPT.,
64 62P BROEK,D.
REPT. NO. SCIENTIFIC-5,NLR-S.612
CONTRACT: AF 61(052)-439,

UNCLASSIFIED REPORT

DESCRIPTORS: (*WINGS, LOADING(MECHANICS)), (*FATIGUE(MECHANICS), WINGS), (*FAILURE(MECHANICS), WINGS), TENSILE PROPERTIES, PROPAGATION, TESTS, SIMULATION, NETHERLANDS, TRANSPORT PLANES (U)
IDENTIFIERS: F-27 AIRCRAFT (U)

FATIGUE TESTS WERE CONDUCTED ON EIGHT FULL-SCALE WING CENTER SECTIONS OF THE FOKKER F.27 AIRCRAFT. THE SPECIMEN CONSISTED OF THE TENSION SKIN, INCLUDING ALL STIFFENING ELEMENTS. THE REMAINDER OF THE WING WAS REPLACED BY A DUMMY STRUCTURE. TWO TESTS WERE CARRIED OUT FOR EACH OF THE FOLLOWING LOAD SEQUENCIES: (1) RANDOM LOAD, (2) PROGRAMMED LOAD, (3) RANDOM LOAD WITH GROUND-TO-AIR CYCLES, (4) PROGRAMMED LOAD INCLUDING GROUND-TO-AIR CYCLES. THE RANDOM LOADING WAS BASED ON A SIMULATION OF STRAIN GAGE RECORDS OBTAINED BY FLYING IN TURBULENT AIR: THE PRIMARY AIM OF THE INVESTIGATION WAS TO STUDY THE EQUIVALENCE OF RANDOM AND PROGRAMMED LOADINGS. A COMPARISON OF THE CRACK PROPAGATION DATA INDICATED THE FOLLOWING TRENDS: (A) CRACK PROPAGATION WAS SLIGHTLY HIGHER UNDER A RANDOMLY VARYING LOAD THAN UNDER A PROGRAMMED LOAD SEQUENCE, (B) ADDITION OF THE GROUND-TO-AIR CYCLES INCREASED CRACK PROPAGATION RATES BY AN AMOUNT OF ABOUT 50%. AS FOR THE RESIDUAL STATIC STRENGTH OF THE STRUCTURE IN THE PRESENCE OF CRACKS THE FOLLOWING REMARKS CAN BE MADE: (A) IF CRACKS ARE SHORT THE STRUCTURE BEHAVES LIKE AN UNSTIFFENED PANEL, (B) FOR LONG CRACKS THE STRINGERS BECOME EFFECTIVE IN RAISING THE RESIDUAL STRENGTH. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-631 662 1/3
NATIONAL AERO- AND ASTRONAUTICAL RESEARCH INST AMSTERDAM (NETHERLANDS)

RESEARCH ON STRUCTURAL FATIGUE TESTING. (U)

DESCRIPTIVE NOTE: ANNUAL SUMMARY REPT., NO. 1, 15 SEP 60-14 SEP 61,
OCT 61 9P SCHIJVE,J. ;
REPT. NO. MS-61-53,
CONTRACT: AF 61(052)-439,

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRPLANE PANELS, STRUCTURAL PROPERTIES), (*WINGS, STRESSES), TEST EQUIPMENT, FATIGUE(MECHANICS), LOADING(MECHANICS), NETHERLANDS (U)
IDENTIFIERS: F-27 AIRCRAFT (U)

THE REPORT DEALS WITH A RESEARCH PROGRAM FOR RANDOM-LOAD AND PROGRAM FATIGUE TESTS. THE SCOPE OF THE INVESTIGATION IS TO ASCERTAIN THE VALIDITY OF A LOAD SPECTRUM SIMPLIFICATION PROCEDURE WHEN APPLIED TO A STRUCTURE REPRESENTATIVE OF A MODERN AIRCRAFT DESIGN. FOR THIS PURPOSE A NUMBER OF F-27 WING CENTER-SECTION TENSION SKINS WILL BE SUBJECTED TO RANDOM-LOAD AND TO PROGRAM FATIGUE TESTS. THE FIRST PHASE OF THE PROGRAM CONSISTS OF THE DESIGN AND MANUFACTURE OF A TEST RIG FOR MOUNTING THE TENSION SKINS AND OF A HYDRAULIC LOADING SYSTEM WITH SERVO-APPARATUS TO APPLY THE DESIRED RANDOM AND PROGRAMMED LOAD SEQUENCES. THE FIRST PHASE ALSO INCLUDES STATIC TESTING OF THE SPECIMEN IN ORDER TO CHECK THE STRESS DISTRIBUTION IN THE TENSION SKIN. THE REPORT GIVES A BRIEF DESCRIPTION OF THE TEST SET-UP, THE LOADING SYSTEM, AND THE SERVO-APPARATUS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-641 030 1/3
HUGHES TOOL CO CULVER CITY CALIF AIRCRAFT DIV

INVESTIGATION OF GENERALIZED METHODS FOR USE OF EXCITATION PANELS TO PRODUCE HELICOPTER ROTOR BLADE FLIGHT FATIGUE LOADS DURING WHIRL TEST. (U)

DESCRIPTIVE NOTE: FINAL REPT., 14 JAN 65-14 APR 66,
AUG 66 50P EAKIN,J. D. ;AMER,K. B. ;
REPT. NO. HTC-AD-66-7,
CONTRACT: N156-46217,
PROJ: PA-1-23-4R,
MONITOR: NAEC-ASL 1100

UNCLASSIFIED REPORT

DESCRIPTORS: (*ROTOR BLADES(ROTARY WINGS), FATIGUE(MECHANICS)), FLIGHT TESTING, LOADING(MECHANICS), HELICOPTER ROTORS, PANELS(STRUCTURAL), DAMAGE (U)

TO SUPPLEMENT PREVIOUS DATA OBTAINED WITH THREE BLADES, ROTORS WITH TWO AND FOUR BLADES WERE WHIRL TESTED USING THE EXCITATION PANEL TECHNIQUE. ROTOR BLADES WERE TESTED HAVING TWO DIFFERENT CHORD WIDTHS. A SURVEY WAS MADE OF THE TRANSIENT PRESSURES PRODUCED ON THE EXCITATION PANELS BY THE ROTOR BLADES. THE RESONANT FREQUENCY OF THE THIRD BENDING MODE OF THE ROTOR BLADE WAS SHIFTED FROM BELOW THE NORMAL OPERATING RANGE TO THE MAXIMUM CONTINUOUS POWER-ON RPM BY ADDING EXTERNAL WEIGHTS TO THE BLADE LEADING EDGE. THE USE OF A COUNTERWEIGHT TO REPLACE A FATIGUE-DAMAGED ROTOR BLADE DURING WHIRL TESTING WAS STUDIED AND REJECTED AS BEING OVERLY COMPLICATED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-669 414 1/3 20/11
BRITISH AIRCRAFT CORP LTD LONDON (ENGLAND)

FATIGUE TEST RESULTS AND ANALYSIS OF 11 PISTON PROVOST WINGS TO DETERMINE THE EFFECT OF ORDER OF PROGRAMMED LOAD. (U)

JAN 68 16P PARISH,H. E. ;
MONITOR; MIN-TECH S/T-MEMO-5/67

UNCLASSIFIED REPORT

DESCRIPTORS: (*WINGS, FATIGUE(MECHANICS)), LIFE EXPECTANCY, STRESSES, LOADING(MECHANICS), TESTS, FAILURE(MECHANICS), GREAT BRITAIN (U)
IDENTIFIERS: PISTON PROVOST WINGS (U)

FATIGUE RESULTS OF 11 WINGS PROGRAMME-LOADED IN ASCENDING ORDER WERE COMPARED WITH 41 WINGS TESTED IN DESCENDING ORDER. RESULTS INDICATE A SUBSTANTIAL REDUCTION IN THE LOG MEAN LIFE WHEN TESTING IN ASCENDING ORDER BUT NEGLIGIBLE DIFFERENCE IN VARIANCE. COMPARISON OF THESE RESULTS WITH RESULTS FROM TWO OTHER STUDIES INDICATES THAT THE MAGNITUDE OF PEAK STRESS AND SHAPE OF THE SPECTRUM APPLIED, VERY MUCH INFLUENCES WHETHER DESCENDING OR ASCENDING ORDER OF LOAD GIVES THE LONGER ENDURANCE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-669 415 1/3 20/11
BRITISH AIRCRAFT CORP LTD LONDON (ENGLAND)

FATIGUE TEST RESULTS AND ANALYSIS OF FOUR PISTON PROVOST WINGS TESTED IN AN ASCENDING-DESCENDING ORDER OF LOADING. (U)

MAR 68 12P PARISH,H. E. ;
MONITOR: MA S/T-MEMO-1/68

UNCLASSIFIED REPORT

DESCRIPTORS: (•WINGS, FATIGUE(MECHANICS)), LOADING(MECHANICS), LIFE EXPECTANCY, TESTS, CORRELATION TECHNIQUES, FAILURE(MECHANICS), GREAT BRITAIN (U)
IDENTIFIERS: PISTON PROVOST WINGS (U)

RESULTS OF FATIGUE TESTS ON FOUR WINGS PROGRAMME LOADED IN LO-HI-LO ORDER ARE COMPARED WITH SIMILAR TESTS PERFORMED IN HI-LO AND LO-HI ORDERS REPORTED PREVIOUSLY. THE RESULTS LIE ALMOST MID-WAY BETWEEN THE RESULTS FOR HI-LO AND LO-HI TESTS. NO SIGNIFICANT DIFFERENCE IS SHOWN IN EITHER THE VARIANCE OR MEAN VALUE SINCE THE RESULTS LIE WITHIN THE SCATTER OF THE PREVIOUS TESTS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-684 396 1/3
BELL HELICOPTER CO FORT WORTH TEX

WIND TUNNEL INVESTIGATION OF SEMIRIGID FULL-SCALE ROTORS OPERATING AT HIGH ADVANCE RATIOS. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT.,
JAN 69 100P CHARLES,BRUCE D. ;TANNER,
WATSON H. ;
REPT. NO. 576-099-010
CONTRACT: DAAJ02-67-C-0061
PROJ: DA-1-F-162204-A-139
TASK: 1-F-162204-A-13903
MONITOR: USAAVLABS TR-69-2

UNCLASSIFIED REPORT

DESCRIPTORS: (*HELICOPTER ROTORS, PERFORMANCE(ENGINEERING)), ANGLE OF ATTACK, THICKNESS, SUBSONIC CHARACTERISTICS, PITCH(MOTION), STABILIZATION, NON-DESTRUCTIVE TESTING (U)
IDENTIFIERS: UH-1B AIRCRAFT, H-1 AIRCRAFT, ADVANCE RATIO (U)

A UH-1B 44-FOOT-DIAMETER ROTOR HAVING REDUCED-THICKNESS TIPS WAS EVALUATED IN A RANGE OF MACH NUMBERS UP TO 0.94 AND ADVANCE RATIOS OF UP TO 0.52. ADDITIONALLY, UH-1D ROTOR BLADES REDUCED IN DIAMETER TO 34 FEET WERE TESTED AT ADVANCE RATIOS OF UP TO 1.1. CALCULATED PERFORMANCE IS COMPARED WITH THE EXPERIMENTAL RESULTS OBTAINED TO ESTABLISH THE VALIDITY OF THE THEORETICAL TECHNIQUE AT HIGH ADVANCE RATIOS. IN GENERAL, IT WAS FOUND THAT QUASI-STATIC, TWO-DIMENSIONAL TECHNIQUES WERE ADEQUATE UP TO AN ADVANCE RATIO OF ABOUT 0.5. ABOVE THIS ADVANCE RATIO, THEORETICAL TECHNIQUES BREAK DOWN, ESPECIALLY WITH RESPECT TO CALCULATING ROTOR PROPULSIVE FORCE OR DRAG. THEORY-EXPERIMENT COMPARISON WITH THE 44-FOOT-DIAMETER ROTOR, OPERATED AT HIGH MACH NUMBERS, SHOWED THAT MACH NUMBER EFFECTS ARE PREDICTABLE TO AN ADVANCE RATIO OF AT LEAST 0.45. THE 34-FOOT-DIAMETER ROTOR BECAME INCREASINGLY SENSITIVE TO CONTROL INPUT WITH ADVANCE RATIO. AT AN ADVANCE RATIO OF 1.1, THIS ROTOR SYSTEM DISPLAYED A LONG TRANSIENT RESPONSE TO A CONTROL INPUT BEFORE OBTAINING ITS STEADY-STATE ORIENTATION, AND AT THE LARGEST VALUES OF COLLECTIVE PITCH, THE FLAPPING WOULD NOT COMPLETELY STABILIZE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-686 484 1/3 1/1
NATIONAL AERONAUTICAL ESTABLISHMENT OTTAWA (ONTARIO)

ANALYSIS OF FLIGHT LOADS DURING LOW-ALTITUDE PIPELINE PATROL OPERATIONS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
DEC 68 30P SEWELL,R. T. ;
REPT. NO. NAE-LR-516
MONITOR: NRC 10659

UNCLASSIFIED REPORT

DESCRIPTORS: (*PATROL PLANES, *AERODYNAMIC LOADING), LOW ALTITUDE, ACCELERATION, PIPES, FATIGUE(MECHANICS), COMMERCIAL PLANES, LIFE EXPECTANCY, FLIGHT TESTING, STRESSES, ANALYSIS, FREQUENCY, CANADA (U)
IDENTIFIERS: PIPELINES, AZTEC C AIRCRAFT (U)

THE REPORT PRESENTS AN ANALYSIS OF 1135 HOURS DATA FROM COUNTING ACCELEROMETERS INSTALLED IN THREE PIPER AZTEC AIRCRAFT EMPLOYED ON PIPELINE PATROL OPERATIONS IN CANADA. FLIGHT TESTS WERE ALSO MADE TO DETERMINE THE MAGNITUDE OF THE STRESSES IN THE WING MAIN SPAR OVER A RANGE OF NORMAL ACCELERATIONS. THE FREQUENCY DISTRIBUTION OF NORMAL ACCELERATIONS IS THE MOST SEVERE OBTAINED TO DATE FROM CIVIL OPERATIONS IN CANADA, LEADING TO A VERY GREAT REDUCTION IN ESTIMATED FATIGUE LIFE AS COMPARED WITH WHAT MAY BE TERMED THE 'NORMAL OPERATING CASE' FOR THIS CLASS OF AIRCRAFT. FORTUNATELY, THE MAXIMUM STRESS PER 'G' MEASURED IN THE WING SPAR STRUCTURE OF THE AZTEC IS SUFFICIENTLY LOW THAT NO IMMEDIATE FATIGUE PROBLEMS ARE FORESEEN. HOWEVER, IT MUST BE EMPHASISED THAT THE DEGREE OF CONFIDENCE IN THIS STATEMENT IS CONDITIONAL UPON THE TOTAL NUMBER OF HOURS ACCUMULATED BY ANY ONE AIRCRAFT ON PIPELINE PATROL OPERATIONS, AND IT IS RECOMMENDED THAT INTENSIVE CRACK-DETECTION PROCEDURES SHOULD BE INSTITUTED AS SOON AS THE TOTAL HOURS ACCUMULATED BY ANY ONE AIRCRAFT REACH 6000. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-725 595 1/3 14/2 14/1
BOEING CO PHILADELPHIA PA VERTOL DIV

HELICOPTER DEVELOPMENT RELIABILITY TEST REQUIREMENTS. VOLUME I. STUDY RESULTS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
APR 71 315P RUMMEL,KIRK G. ;
REPT. NO. D210-10207-1
CONTRACT: DAAJ02-70-C-0039
PROJ: DA-1-F-162203-A-143
TASK: 1-F-162203-A-14301
MONITOR: USAAMRDL TR-71-18A

UNCLASSIFIED REPORT

DESCRIPTORS: (*TEST METHODS, COST EFFECTIVENESS), (*HELICOPTERS, MAINTENANCE), (*ARMY EQUIPMENT, MANAGEMENT PLANNING), TEST EQUIPMENT, FAILURE(MECHANICS), ROTOR BLADES(ROTARY WINGS), TAIL HELICOPTER ROTORS, TRANSMISSIONS, GEARS, RELIABILITY, SCHEDULING, COSTS (U)

THE REPORT COVERS A STUDY TO IDENTIFY OPTIMUM RELIABILITY PROBLEM IDENTIFICATION AND DEMONSTRATION TEST CONCEPTS FOR HELICOPTER DYNAMIC COMPONENTS, IN ORDER TO FACILITATE FORMULATION OF COST-EFFECTIVE RELIABILITY TEST PROGRAMS FOR FUTURE HELICOPTERS. DETAILED FAILURE MODE TEST TECHNIQUE PROBLEM IDENTIFICATION CAPABILITY AND COST DATA ARE PRESENTED FROM CH-47 HELICOPTER DEVELOPMENT EXPERIENCE TO AID IN CALCULATING SPECIFIC TEST COSTS FOR FUTURE DEVELOPMENT PROGRAMS. SAMPLE TEST PLANS ARE PRESENTED FOR TWO HELICOPTERS REPRESENTING SIZE EXTREMES. A PLAN IS OUTLINED FOR REVISING SELECTED EXISTING DESIGN AND TEST MILITARY SPECIFICATIONS ANDSUPPLEMENTING THEM WITH ADDITIONAL HANDBOOKS AND SPECIFICATIONS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-732 489 11/4
BOEING CO PHILADELPHIA PA VERTOL DIV

DETERMINATION OF PHYSICAL AND STRUCTURAL PROPERTIES OF MIXED-MODULUS COMPOSITE MATERIALS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JUN 71 75P PINCKNEY,ROBERT L. ;FREEMAN, RICHARD B. ;
REPT. NO. D210-10196-1
CONTRACT: DAAJ02-69-C-0059
PROJ: DA-1-F-162204-A-170
TASK: 1-F-162204-A-17003
MONITOR: USAAVLABS TR-71-7

UNCLASSIFIED REPORT

DESCRIPTORS: (*COMPOSITE MATERIALS, PHYSICAL PROPERTIES), (*REINFORCING MATERIALS, MODULUS OF ELASTICITY), LAMINATES, CARBON FIBERS, GLASS TEXTILES, SANDWICH CONSTRUCTION, PIPES, FATIGUE(MECHANICS), CREEP, FAILURE(MECHANICS), ALIGNMENT, HELICOPTER ROTORS, ROTOR BLADES(ROTARY WINGS) (U)
IDENTIFIERS: *FIBER COMPOSITES (U)

THE OBJECTIVE OF THE PROGRAM WAS TO DETERMINE THE PHYSICAL AND STRUCTURAL PROPERTIES OF MIXED-MODULUS COMPOSITE MATERIALS USING COMBINATIONS OF GRAPHITE AND S-GLASS FIBERS UNDER STATIC AND FATIGUE LOADING CONDITIONS. THIS REPORT COVERS THE WORK COMPLETED UNDER PHASE I AND PHASE II OF THE PROGRAM AND SUMMARIZES THE DATA OBTAINED FOR SOLID LAMINATES, TUBULAR SPECIMENS AND SANDWICH BEAMS IN WHICH THE S-GLASS MATERIAL WAS ORIENTED PARALLEL TO THE LONGITUDINAL AXIS OF THE SPECIMENS AND THE GRAPHITE FIBERS WERE ORIENTED AT PLUS OR MINUS 45 DEGREES TO THE SAME AXIS. THE TEST RESULTS ARE TABULATED IN APPROPRIATE ENGINEERING FORMAT. S-N CURVES ARE INCLUDED TO ILLUSTRATE THE FATIGUE PERFORMANCE OF THE MATERIALS. STRESS-STRAIN AND S-N CURVES ARE COMPARED TO APPROPRIATE DATA ON PURE S-GLASS AND PURE GRAPHITE MATERIAL WHERE SUCH DATA CONTRIBUTES TO AN UNDERSTANDING OF THE MIXED MATERIALS PERFORMANCE. THE DATA INDICATES THAT THE MIXED-MODULUS SYSTEM OF S-GLASS AND GRAPHITE IS COMPATIBLE WITH THE STRUCTURAL AND FAILURE MODE REQUIREMENTS OF HELICOPTER ROTOR BLADES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /EML11

AD-734 393 1/3 11/6
NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA

EFFECTS OF SPECTRUM BLOCK SIZE AND STRESS LEVEL ON FATIGUE CHARACTERISTICS OF ALUMINUM ALLOY BOX BEAMS UNDER RANDOM-SEQUENCE UNIDIRECTIONAL LOADING. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
DEC 71 50P BREYAN,WILLIAM ;ROESER,ERWIN P. ;
REPT. NO. NADC-ST-7013
PROJ: F30.422.204

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, FATIGUE(MECHANICS)), (*BEAMS(STRUCTURAL), *ALUMINUM ALLOYS), STRESSES, LOADING(MECHANICS), LIFE EXPECTANCY (U)
IDENTIFIERS: ALUMINUM ALLOY 7075, BOX BEAMS (U)

THE RESULTS OF RANDOM-SEQUENCE FATIGUE TESTS OF 7075-T6 ALUMINUM-ALLOY BOX BEAMS IN UNIDIRECTIONAL BENDING ARE PRESENTED. THE RELATIVE DAMAGING EFFECT OF FOUR AIRPLANE FLIGHT-MANEUVER-LOADS SPECTRA WAS DETERMINED, AND THE EFFECTS ON LIFE FOR VARIATION IN SPECTRUM BLOCK SIZE AND STRESS LEVEL WERE ESTABLISHED. THE EFFECTS OF LOAD SEQUENCE ON LIFE WERE DETERMINED THROUGH COMPARISON AND ANALYSIS OF THESE DATA WITH THAT FOR FIXED-SEQUENCE LOADING OF A PREVIOUS INVESTIGATION. (AUTHOR) (U)

VII.

FUSELAGES

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-264 390
NAVAL AIR ENGINEERING CENTER PHILADELPHIA PA AERONAUTICAL STRUCTURES LAB

VARIABLE AMPLITUDE FATIGUE CHARACTERISTICS OF A SLAB HORIZONTAL TAIL FOR A TYPICAL FIGHTER AIRPLANE (U)

SEP 61 IV SWARTZ,RONALD P.;ROSENFELD,MAURICE S.;
REPT. NO. 1023 P2

UNCLASSIFIED REPORT

DESCRIPTORS: *JET FIGHTERS, *JET PLANES, *STABILIZERS (HORIZONTAL TAIL SURFACE), COUNTERMEASURES, FAILURE (MECHANICS), FATIGUE (MECHANICS), LIFE EXPECTANCY, LOAD DISTRIBUTION, MATHEMATICAL ANALYSIS, STRESSES, STRUCTURES, TEST EQUIPMENT, TEST METHODS, TESTS, THEO(U)
IDENTIFIERS: F-3 AIRCRAFT (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-286 520
AIR PROVING GROUND CENTER EGLIN AFB FLA

STRUCTURAL COMPATIBILITY TEST OF M61 GUN/LINKLESS FEED SUBSYSTEM AND F-105D AIRCRAFT, (U)

OCT 62 25P PANZARELLA,PHILIP P. ;
REPT. NO. APGC-TDR-62-57
PROJ: 3064216

UNCLASSIFIED REPORT

DESCRIPTORS: (*JET FIGHTERS, AIRCRAFT GUNS), (*AIRCRAFT GUNS, AIRPLANE NOSES), COMPATIBILITY, STRUCTURAL PROPERTIES, FEED MECHANISMS, FRACTURE(MECHANICS), STRESSES, SHOCK RESISTANCE, AUTOMATIC WEAPONS, VIBRATION, SHOCK(MECHANICS), COMBUSTION PRODUCTS, GUN BARRELS, MAINTAINABILITY (U)
IDENTIFIERS: F-105 AIRCRAFT, M-61 GUNS(20-MM) (U)

THE M61 GUN/LINKLESS FEED SUBSYSTEM WAS DESIGNED TO PROVIDE THE F-105D WITH A COMPACT, SELF-CONTAINED, HIGH RATE FIRING CAPABILITY. THE PRIMARY OBJECT OF THIS TEST WAS TO DETERMINE THE EFFECTS OF THIS SUBSYSTEM ON THE STRUCTURAL INTEGRITY OF THE AIRCRAFT NOSE STRUCTURE. AS A RESULT, IT WAS CONCLUDED THAT THE SUBSYSTEM IMPOSES NO SERIOUS STRUCTURAL LIMITATIONS ON THE F-105D; HOWEVER, BECAUSE OF THE EFFECTS OF GUN GAS, THE FIRING ENVELOPE OF THE AIRCRAFT IS LIMITED. MODIFICATIONS TO THE BASIC M61 GUN/LINKLESS FEED SUBSYSTEM (OILER, UNDERCUT BARRELS, MODIFIED BLAST TUBE, AND INTERRUPTER RELAY) WERETESTED AND FOUND TO BE SATISFACTORY. THERE IS A PROBLEM IN MAINTAINING THE M61 GUN/LINKLESS FEED SUBSYSTEM SINCE 134-MAN-HR ARE REQUIRED TO REPAIR THE SUBSYSTEM AFTER A STOPPAGE OCCURS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-430 323
GENERAL DYNAMICS/FORT WORTH TEX

FUSELAGE - B-58 WINDSHIELD POLYMER B AS EXTENDED EDGE MATERIAL - EVALUATION OF -, (U)

JAN 64 11P HOFFMANN,H. C. ;
REPT. NO. FTDM2861
CONTRACT: AF33 657 11214

UNCLASSIFIED REPORT

DESCRIPTORS: (*JET BOMBERS, WINDSHIELDS), (*WINDSHIELDS, DEGRADATION), (*MANUFACTURING METHODS, AIRCRAFT EQUIPMENT), ENVIRONMENTAL TESTS, HUMIDITY, ACIDS, SULFUR COMPOUNDS, OXIDES, LAMINATED GLASS, FRACTURE (MECHANICS), WEAR RESISTANCE, BONDING, SILICONE PLASTICS, AGING (MATERIALS), SEALING COMPOUNDS (U)
IDENTIFIERS: 1964, SULFUR DIOXIDE, B-58 AIRCRAFT, POLYMER B (U)

TESTS WEREINITIATED AS A RESULT OF PRELIMINARY WORK ON SIMULATED B-58 WINDSHIELDS WHICH HAD SHOWN (1) THAT POLYMER B RETARDED THE DEGRADA TION OF SILICON TYPE K INTERLAYER WHEN EXPOSED TO MOISTURE - SO2 - SUNLIGHT; AND (2) THAT AN EXTENDED POSTCURE AT ELEVATED TEMPERATURE ALSO SLOWED DEGRADATION OF THE INTERLAYER. RESULTS OF THE POLYMER B WINDSHIELDS SHOWED THAT ATTEMPTS TO MAKE A SATISFACTORY WINDSHIELD BY THIS METHOD WERE GENERALLY UNSUCCESSFUL. LIBBEYOWENS-FORD DID PERIPHERY DISCLOSED THAT THE POLYMER B HAD NOT CURED PROPERLY. UPON EXPOSURE OF THE WINDSHIELD FOR 35.5 HOURS TO MOISTURESO2 - SUNLIGHT IN A SOLARIUM, CRACKS APPEARED IN THE TYPE K INTERLAYER NEAR THE EDGES OF THE PANEL. AN ATTEMPT WAS MADE TO DETERMINE BURST PRESSURE OF THE WINDSHIELD AT 260F. HOWEVER, THE GLASS SEPARATED ALMOST INTACT FROM THE EDGE ATTACHMENT AT A PRESSURE OF ONE TO TWO PSIG. NO FURTHER TESTING WAS CONDUCTED ON THIS OR THE OTHER POLYMER B WINDSHIELD. (AUTHOR) (U)

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-615 464
BELL HELICOPTER CO FORT WORTH TEX

EFFECT OF EROSION RESISTANT BOOTS ON UH-1B/D TAIL ROTOR BLADES. (U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 18 DEC 64-12 FEB 65.

MAY 65 43P BURPO,FRANK B. ;DARLINGTON, ERNEST C. ;

REPT. NO. 299-099-276
CONTRACT: DA44 177AMC252T
TASK: 1P121401A14176
MONITOR: TRECOM , TR-65-22

UNCLASSIFIED REPORT

DESCRIPTORS: (*TAIL HELICOPTER ROTORS, PROTECTIVE COVERINGS), (*LOADING (MECHANICS), TAIL HELICOPTER ROTORS), (*PROTECTIVE COVERINGS, EROSION), ISOCYANATE PLASTICS, FATIGUE (MECHANICS), OPERATION, STABILITY, FLIGHT TESTING (U)
IDENTIFIERS: UH-1 AIRCRAFT (U)

THE REPORT PRESENTS THE RESULTS OF A FLIGHT TEST PROGRAM CONDUCTED TO EVALUATE EROSION BOOTS INSTALLED ON THE OUTBOARD 18 INCHES OF THE UH-1 HELICOPTER TAIL ROTOR BLADES. THE REPORT IS NOT CONCERNED WITH THE EROSION RESISTANT QUALITIES OF THE BOOT, BUT WITH THE EFFECT OF THE BOOT INSTALLATION ON THE BALANCE, OPERATION, AND FATIGUE LIFE OF THE UH-1B/D TAIL ROTOR DYNAMIC COMPONENTS. LOADS AS MEASURED DURING FLIGHT TESTS OF THE TAIL ROTOR WITH THE BOOTS INSTALLED ARE COMPARED TO LOADS MEASURED USING A STANDARD TAIL ROTOR. IN BOTH THE BALANCED AND UNBALANCED CONDITIONS NO DETRIMENTAL EFFECTS WERE ENCOUNTERED. THE OSCILLATORY LOADS RECORDED IN EITHER CONDITION WOULD NOT CAUSE FATIGUE DAMAGE AND NO PROBLEMS IN OPERATION WERE OBTAINED WITH THE BOOTS INSTALLED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-666 448 1/3
SOUTHAMPTON UNIV (ENGLAND) INST OF SOUND AND VIBRATION RESEARCH

FINITE ELEMENT VIBRATION ANALYSIS OF CRACKED PLATES IN TENSION. (U)

DESCRIPTIVE NOTE: SUMMARY REPT. 1 JAN 65-31 MAR 67,
JAN 68 165P PETYT,MAURICE ;
REPT. NO. ISVR-27
CONTRACT: AF 61(052)-862
PROJ: AF-7351
TASK: 735106
MONITOR: AFML TR-67-396

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRPLANE PANELS, VIBRATION), CRACKS, FATIGUE(MECHANICS), BUCKLING(MECHANICS), PANELS(STRUCTURAL), DEFLECTION, STRUCTURAL SHELLS, STRESSES, STRUCTURAL PROPERTIES (U)
IDENTIFIERS: FINITE ELEMENT ANALYSIS, *CRACKED PLATES (U)

A FINITE ELEMENT METHOD OF ANALYSIS IS DEVELOPED TO DETERMINE THE VIBRATION CHARACTERISTICS OF AN AIRCRAFT FUSELAGE PANEL, CONTAINING A FATIGUE CRACK. EXPERIMENTAL OBSERVATIONS SHOW THAT AS THE LENGTH OF THE CRACK INCREASES, THE FREQUENCY OF VIBRATION REACHES A MINIMUM WHEN THE FREE EDGE OF THE CRACK BUCKLES. THE VARIATION IN THIS PHENOMENA WITH INCREASING PLATE WIDTH IS STUDIED BOTH EXPERIMENTALLY AND THEORETICALLY. THE ANALYSIS IS DEVELOPED IN A SYSTEMATIC MANNER, AND CALCULATIONS ARE PERFORMED, AT EACH STAGE, ON PROBLEMS WITH KNOWN SOLUTIONS, IN ORDER TO DETERMINE THE ACCURACY OF THE METHOD. THE PROBLEMS CONSIDERED INCLUDE THE VIBRATIONS OF FLAT PLATES OF VARYING PLATFORM, THE VIBRATIONS OF A CYLINDRICAL SHELL, THE BUCKLING OF A RECTANGULAR PLATE, AND THE VIBRATIONS OF A RECTANGULAR PLATE IN COMPRESSION. THE METHOD IS FINALLY APPLIED TO THE PROBLEM OF A CRACKED PLATE IN TENSION AND THE RESULTS COMPARED WITH EXPERIMENTAL MEASUREMENTS. THE POST BUCKLING BEHAVIOUR IS CALCULATED USING A STEP-BY-STEP ANALYSIS TO PERMIT LINEARISATION OF THE GOVERNING EQUATIONS. BY CONSIDERING THE CALCULATED STRESS DISTRIBUTIONS, THE VARIATION IN BUCKLING STRESS WITH CRACK LENGTH AND PLATE WIDTH IS EXPLAINED.
(AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-669 112 11/9
NAVAL RESEARCH LAB WASHINGTON D C

TOUGHNESS IN PLASTICS BASED ON FRACTURE SURFACE APPEARANCE. (U)

DESCRIPTIVE NOTE: MEMORANDUM REPT.,
MAR 68 14P SMITH,HERSCHEL L. ;KIES, JOSEPH A. ;CLARK,AUSTIN B. J. ;
REPT. NO. NRL-MR-1863

UNCLASSIFIED REPORT

DESCRIPTORS: (*PLASTICS, TOUGHNESS), FRACTURE(MECHANICS), SURFACE PROPERTIES, CRACK PROPAGATION, AIRCRAFT CANOPIES, STRESSES, ACRYLIC RESINS, FLEXURAL STRENGTH, TRANSPARENT PANELS, MATERIALS, PLASTICITY (U)

RELATIONSHIPS BETWEEN FRACTURE TOUGHNESS AND FRACTURE SURFACE APPEARANCE IN PLASTIC MATERIALS WERE STUDIED AND REPORTED ON A NUMBER OF YEARS AGO. THE REPORT RECALLS SUCH STUDIES IN THE LIGHT OF RENEWED INTEREST IN STRETCHED TRANSPARENT PLASTICS AND SHOWS THE RELATIONSHIP WHICH EXISTS BETWEEN FRACTURE TOUGHNESS AND FRACTURE APPEARANCE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-702 126 20/11
TECHNION - ISRAEL INST OF TECH HAIFA DEPT OF AERONAUTICAL ENGINEERING

EXPERIMENTAL STUDY OF THE THERMAL BUCKLING OF CYLINDRICAL SHELLS. (U)

SEP 69 56P BARUCH,MENAHEM ;FRUM,JOSEPH ;

REPT. NO. SCIENTIFIC-9, TAE-92
CONTRACT: AF 61(052)-905
PROJ: AF-9782
TASK: 978201
MONITOR: AFOSR 70-1000TR

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, AERODYNAMIC HEATING), (*CYLINDRICAL BODIES, *THERMAL STRESSES), BUCKLING(MECHANICS), FUSELAGES, ISRAEL (U)

AIR-AND SPACECRAFT FUSELAGE NORMALLY CONSIST OF CYLINDRICAL AND CONICAL THIN-WALLED SHELLS. HIGH-SPEED FLIGHT CAUSES HEATING (EITHER THROUGH AN EXTERNAL AERODYNAMIC EFFECT, OR FROM AN INTERNAL ENERGY SOURCE SUCH AS THE ROCKET ENGINE), WHICH IS MOSTLY NON-UNIFORM AND MAY INDUCE BUCKLING. EARLIER WORKS ON THIS SUBJECT HAVE SHOWN THAT THE MOST CRITICAL CASE IS THAT OF CIRCUMFERENTIAL VARIATION OF THE TEMPERATURE. THE REPORT DESCRIBES A DEVICE PERMITTING STUDY OF BUCKLING DUE TO COMBINED THERMAL AND MECHANICAL LOAD. A TEST SERIES AND ITS RESULTS ARE PRESENTED. THE TESTS WERE CARRIED OUT ON FIXED-ENDED CYLINDRICAL SHELLS, LINEARLY HEATED ALONG THE UPPER GENERATOR. THE CONCEPT OF THERMAL BUCKLING IS DISCUSSED IN THE LIGHT OF TEST RESULTS. THE PRESENT TESTS ARE COMPARED WITH THOSE OF EARLIER STUDIES AND THEIR CONCLUSION THAT THE RATIO BETWEEN THE NOMINAL THERMAL STRESS TO THE CLASSICAL LINEAR THEORETICAL ONE IS HIGHER THAN THE RATIO BETWEEN THE EXPERIMENTAL STRESS TO THE CLASSICAL ONE IN UNIFORM AXIAL COMPRESSION IS RECONFIRMED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-715 438 1/3 20/4
CORNELL AERONAUTICAL LAB INC BUFFALO N Y

THE FEASIBILITY AND USE OF ANTI-TORQUE SURFACES IMMERSED IN HELICOPTER ROTOR DOWNWASH. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. JAN 68-DEC 69, FEB 70 59P TUNG,CHEE ;ERICKSON,JOHN C. , JR.;DOUWALDT,FRANK A. ;
REPT. NO. CAL-BB-2584-S-2
CONTRACT: N00014-68-C-0241
PROJ: NR-212-182

UNCLASSIFIED REPORT

DESCRIPTORS: (*AERODYNAMIC CONTROL SURFACES, TORQUE), (*TAIL HELICOPTER ROTORS, DOWNWASH), FEASIBILITY STUDIES, PRESSURE, FAILURE(MECHANICS), JET FLAPS, DESIGN (U)
IDENTIFIERS: *ANTITORQUE AERODYNAMIC SURFACES (U)

AN ANALYTICAL INVESTIGATION WAS MADE OF THE EFFECTIVENESS OF ANTI-TORQUE AERODYNAMIC SURFACES IMMERSED IN HELICOPTER ROTOR DOWNWASH. IT IS SHOWN THAT ADDITIONAL VERTICAL TAIL SURFACE HAVING AREAS EQUAL TO ABOUT TWO PERCENT OF THE MAIN ROTOR DISK AREA COULD PROVIDE TORQUE TRIM FOR SPEEDS ABOVE ABOUT 75 FT/SEC FOR REPRESENTATIVE CURRENT VEHICLES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZFML1

AD-738 900 1/3 11/4 13/8
DOUGLAS AIRCRAFT CO LONG BEACH CALIF

DEVELOPMENT OF A GRAPHITE HORIZONTAL STABILIZER. (U)

DESCRIPTIVE NOTE: SEMI-ANNUAL INTERIM TECHNICAL REPT. NO. 4, 1 MAY-31 OCT 71,
FEB 72 221P LEHMAN,GEORGE M. ;
REPT. NO. MDC-J5317
CONTRACT: N00156-70-C-1321

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO REPORT DATED JUL 71, AD-729 050.

DESCRIPTORS: (*STABILIZERS(HORIZONTAL TAIL SURFACE), *LAMINATED PLASTICS), (*ATTACK BOMBERS, STABILIZERS(HORIZONTAL TAIL SURFACE)), COMPOSITE MATERIALS, EPOXY PLASTICS, CARBON FIBERS, AIRPLANE PANELS, SANDWICH CONSTRUCTION, HONEYCOMB CORES, MANUFACTURING METHODS, DESIGN, STRUCTURAL PROPERTIES, STRESSES, NON-DESTRUCTIVE TESTING, ATTACK BOMBERS (U)
IDENTIFIERS: A-4 AIRCRAFT, *GRAPHITE REINFORCED COMPOSITES, *EPOXY MATRIX COMPOSITES (U)

THE STRUCTURAL WEIGHTS, STRESS-ANALYSIS RESULTS, AND MANUFACTURING METHODS ARE SUMMARIZED FOR AN A4 AIRCRAFT HORIZONTAL STABILIZER UTILIZING NARMCO 5206 GRAPHITE-EPOXY LAMINATES IN THE PRIMARY STRUCTURE. THE ACTUAL WEIGHT OF THE FIRST UNIT PRODUCED WAS 178 POUNDS, A WEIGHT REDUCTION OF 30% IN COMPARISON TO THE EQUIVALENT METAL STRUCTURE. THE FINISHED STRUCTURE WEIGHT WAS COMPRISED OF APPROXIMATELY 62 PERCENT GRAPHITE-EPOXY, 11 PERCENT FIBERGLASS-EPOXY, 10, 8, AND 5 PERCENT, RESPECTIVELY OF ALUMINUM, STEEL, AND TITANIUM ALLOYS (INCLUDING ATTACHMENTS), AND 4 PERCENT ADHESIVE AND EPOXY FILLETS. RESULTS OF A DISCRETE ELEMENT STRESS-ANALYSIS ARE PRESENTED FOR THE THREE CRITICAL LOAD CONDITIONS ON THE STABILIZER. (AUTHOR) (U)

VIII.

LANDING GEAR

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-407 438
CHANCE VOUGHT CORP DALLAS TEX

A METHOD FOR ESTABLISHING LANDING DESIGN CRITERIA FOR CARRIER-BASED AIRPLANES. (U)

DESCRIPTIVE NOTE: FINAL REPT., PHASE 2,
APR 63 45P HOY,W.W.;
REPT. NO. 2 53400 3R460

UNCLASSIFIED REPORT

DESCRIPTORS: (*LANDING GEAR, LOADING (MECHANICS)), (*CARRIER LANDINGS, LANDING IMPACT), (*NAVAL AIRCRAFT, LANDING GEAR), DESIGN, MATHEMATICAL ANALYSIS, FATIGUE (MECHANICS), MATHEMATICAL MODELS, DIGITAL COMPUTERS, MONTE CARLO METHOD, ANALYSIS, EQUATIONS. (U)
IDENTIFIERS: 1963. (U)

A METHOD FOR ESTABLISHING LANDING LOADS DESIGN CRITERIA FOR CARRIER-BASED AIRPLANES IS PRESENTED IN THIS PHASE II REPORT. THE AIRPLANE'S LANDING ENVIRONMENT WAS MATHEMATICALLY DEFINED IN PHASE I, AND PROVIDES THE INITIAL CONDITIONS NECESSARY FOR THE EVALUATION OF LANDING LOADS. LADS CRITERIA INCLUDE METHODS FOR DETERMINING DESIGN LOADS, FATIGUE SPECTRA, AND STRENGTH ENVELOPES WHICH ARE COMPATIBLE WITH THE ENVIRONMENTAL CONDITIONS AT AIRPLANE TOUCHDOWN. THE VARIOUS METHODS ARE COMPARED RELATIVE TO THE TIME REQUIRED TO PERFORM THE LOAD ANALYSES, COMPUTER TIME REQUIRED, AND THE SIGNIFICANCE OF THE RESULTS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-601 446
GENERAL DYNAMICS/FORT WORTH TEX

AN EVALUATION OF HIGH STRENGTH STEEL FORGINGS. (U)

DESCRIPTIVE NOTE: REPT. FOR JAN 62-JAN 63,
MAY 64 155P JONES,R. L. ;NORDQUIST,F. C.
;
REPT. NO. FZM4 1479
CONTRACT: AF33 600 41891
MONITOR: RTD TDR63 4050

UNCLASSIFIED REPORT

DESCRIPTORS: (*STEEL, MECHANICAL PROPERTIES), (*FORGING, STEEL), (*LANDING GEAR, MATERIALS), TENSILE PROPERTIES, FATIGUE (MECHANICS), STRESSES, CORROSION, TOUGHNESS, HEAT TREATMENT, NICKEL ALLOYS, COBALT ALLOYS, MOLYBDENUM ALLOYS, MARAGING STEEL (U)
IDENTIFIERS: STEEL 9NI 4CO, STEEL COMO 18NI, STEEL 4340, STEEL H-11 (U)

THIS REPORT PRESENTS THE RESULTS OF AN INVESTIGATION OF THE MECHANICAL PROPERTIES OF HIGH STRENGTH STEEL AIRCRAFT FORGINGS. REPUBLIC STEEL CORPORATION'S 9NI-4CO AND 18 NICOMO(300) WERE EXAMINED IN DETAIL FOR SMOOTH AND NOTCHED TENSILE AND FATIGUE STRENGTH, STRESS CORROSION RESISTANCE AND FRACTURE TOUGHNESS PROPERTIES. TO A LESSER EXTENT FORGED SAE 4340 AND H-11 STEELS WERE EVALUATED FOR COMPARISON. THE FORGINGS EVALUATED WERE TWO CONFIGURATIONS, A 235-LB. M.L.G. SHOCK STRUT CYLINDER AND A 275-LB. M.L.G. AXLE BEAM FORGING. THE EFFECTS OF GRAIN FLOW, FORGING TEMPERATURE, AND HEAT TREATMENT WERE EXAMINED. VARIATIONS FROM HEAT TO HEAT AND FORGING LOT TO FORGING LOT WERE ANALYZED. IN GENERAL, THE 18 NICOMO(300) STEEL WAS CAPABLE OF ATTAINING THE HIGHEST TENSILE STRENGTH, PARTICULARLY YIELD STRENGTH. HOWEVER, THIS HIGHER STRENGTH DID NOT MANIFEST ITSELF UNDER FATIGUE LOADING CONDITIONS. AS A RESULT, THE 9NI-4CO STEEL HAD HIGHER NOTCHED AND SMOOTH AXIAL FATIGUE STRENGTH. FROM A STRESS CORROSION STANDPOINT THE 9NI-4CO STEEL WAS SUPERIOR TO 18 NICOMO WHERE NO STRESS RAISER WAS PRESENT. THE REVERSE WAS TRUE FOR THE PARTIAL CRACKED TEST SPECIMENS. IN BOTH CASES 4340 HAD EXTREMELY LOW STRESS CORROSION STRENGTH. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-601 725
NAVAL RESEARCH LAB WASHINGTON D C

FRACTURE ANALYSIS OF A C-141 LANDING GEAR CYLINDER. (U)

DESCRIPTIVE NOTE: MEMO. REPT.
APR 64 24P BEACHEM,C. D. ;
REPT. NO. NRL-MR-1524

UNCLASSIFIED REPORT

DESCRIPTORS: (*HYDRAULIC CYLINDERS, FRACTURE (MECHANICS)), (*LANDING GEAR, HYDRAULIC CYLINDERS), TRANSPORT PLANES, STEEL, SURFACE PROPERTIES, STRESSES, FATIGUE (MECHANICS), HYDROGEN EMBRITTLEMENT, GRAIN STRUCTURE (METALLURGY) (U)
IDENTIFIERS: C-141 AIRCRAFT, STEEL 4340 (U)

A FRACTURE ANALYSIS WAS CONDUCTED ON THE FRACTURE SURFACE PORTION OF A BROKEN OUTER CYLINDER OF A NOSE LANDING GEAR THAT WAS MANUFACTURED FOR USE IN THE C-141 BUT BROKEN IN THE LABORATORY. THE NOSE-GEAR OUTER CYLINDER FRACTURED DUE TO (1) THE PRESENCE OF A SMALL SURFACE CRACK AND SEVERAL SMALL SUBMERGED CRACKS, ALL OF WHICH WERE INTERGRANULAR, AND (2) THE HIGH STRESSES IMPOSED DURING THE TEST. THE PRESENCE OF THESE CRACKS PROBABLY CONSIDERABLY REDUCED THE NUMBER OF CYCLES TO FAILURE IN THIS SPECIMEN. THE CRACKS WERE QUITE POSSIBLY, BUT NOT DEFINITELY, DUE TO THE PRESENCE OF HYDROGEN AND RESIDUAL STRESSES DURING PLATING OR DURING THE TEST. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-609 907
NAVAL AIR ENGINEERING CENTER PHILADELPHIA PA AERONAUTICAL STRUCTURES LAB

DETERMINATION OF FATIGUE CHARACTERISTICS OF A TYPICAL NOSE LANDING GEAR. (U)

DEC 64 35P ROSENFELD,M. S. ;ZOUDLIK,R. J. ;
REPT. NO. NAEC-ASL-1079

UNCLASSIFIED REPORT

DESCRIPTORS: (*LANDING GEAR, FATIGUE (MECHANICS)), TEST METHODS, LOADING (MECHANICS), LIFE EXPECTANCY, STRESSES, MATHEMATICAL ANALYSIS, TESTS, STRUCTURES (U)

TWENTY IDENTICAL, UNUSED NOSE LANDING GEARS WERE TESTED TO DETERMINE THE STRUCTURAL FATIGUE CHARACTERISTICS OF THESE STRUCTURES. TWELVE SPECIMENS WERE TESTED UNDER CONSTANT-AMPLITUDE LOADING AND EIGHT UNDER SPECTRUM LOADING. THE CONSTANT-AMPLITUDE TESTS WERE CYCLED BETWEEN A LOWER LOAD LEVEL OF ZERO AND VARIOUS UPPER LOAD LEVELS INCLUDING A MAXIMUM VALUE OF 140 PERCENT LIMIT LOAD. THE SPECTRUM TESTS WERE PERFORMED FOR THREE DIFFERENT SPECTRA. FOR EACH SPECTRUM THE LOAD WAS CYCLED FROM A LOWER LOAD LEVEL OF ZERO TO THE VARIOUS UPPER LOAD LEVELS ASSOCIATED WITH EACH SPECTRUM. PRELIMINARY RESULTS FROM THIS AND OTHER INVESTIGATIONS INDICATE THAT USE OF THE MINER-PALMGREN HYPOTHESIS RESULTS IN CONSERVATIVE ESTIMATES OF LIFE COMPARED TO ACTUAL VALUES OBTAINED FROM SPECTRUM TESTS AT R>0 AND RESULTS IN UNCONSERVATIVE ESTIMATES WHEN COMPARED TO ACTUAL VALUES OBTAINED FROM SPECTRUM TESTS AT R<0. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-661 424 11/6 19/6 1/3 16/4
BATTELLE MEMORIAL INST COLUMBUS OHIO DEFENSE METALS INFORMATION CENTER

FRACTURE TOUGHNESS OF HIGH-STRENGTH STEELS FOR MILITARY APPLICATIONS, (U)

AUG 66 2UP CAMPBELL,J. E. ;
REPT. NO. DMIC-MEMO-239
CONTRACT: F33615-66-C-1325

UNCLASSIFIED REPORT

DESCRIPTORS: (*STEEL, TOUGHNESS), SPECIFICATIONS, MILITARY REQUIREMENTS, FRACTURE(MECHANICS), GUN BARRELS, LANDING GEAR, ROCKET CASES, PRESSURE VESSELS, ARMOR PLATE, AIRFRAMES (U)
IDENTIFIERS: HIGH STRENGTH STEELS (U)

THE MEMORANDUM DISCUSSES THE CURRENT SITUATION ON THE INCLUSION OF FRACTURE-TOUGHNESS TESTING REQUIREMENTS IN SPECIFICATIONS FOR HIGH-STRENGTH STEELS USED FOR MILITARY APPLICATIONS. THE MEMORANDUM WAS PREPARED AT THE REQUEST OF THE TECHNICAL COOPERATION PROGRAM (TTCP), AND CONTAINS INFORMATION FROM CANADIAN AND BRITISH MEMBERS OF THAT PROGRAM, AS WELL AS U. S. INFORMATION. MILITARY APPLICATIONS DISCUSSED INCLUDE MISSILE MOTOR CASES, AIRCRAFT LANDING GEAR, GUN TUBES, ARMOR PLATE, AND HYDROFOILS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-715 751 1/3
NATIONAL AERONAUTICAL ESTABLISHMENT OTTAWA (ONTARIO)

A FRACTOGRAPHIC STUDY OF THE FATIGUE FAILURE OF AIRCRAFT WHEELS. (U)

DESCRIPTIVE NOTE: AERONAUTICAL REPT.,
NOV 70 31P WIEBE,W. ;
REPT. NO. NAE-LR-541
MONITOR: NRC 11674

UNCLASSIFIED REPORT

DESCRIPTORS: (*LANDING GEAR, FAILURE(MECHANICS)), FATIGUE(MECHANICS), FRACTOGRAPHY, LOADING(MECHANICS), CRACK PROPAGATION, CANADA (U)

A SURVEY OF AIRCRAFT WHEEL FAILURES, AND A REVIEW OF THE PARAMETERS INVOLVED IN THE QUALIFICATION TESTS FOR AIRCRAFT WHEELS, INDICATED A NEED FOR ACCURATE INFORMATION CONCERNING WHEEL SERVICE LOADING CONDITIONS IN ORDER TO FORMULATE REALISTIC WHEEL FATIGUE TEST SPECTRA. THE FRACTOGRAPHIC EXAMINATION OF THREE TYPES OF WHEELS FROM MODERN AIRCRAFT HAS EMPHASIZED THE SIGNIFICANCE OF CORROSION IN THE NUCLEATION OF FATIGUE CRACKS, AND HAS INDICATED THAT LANDING IMPACT LOADS AND BRAKE APPLICATIONS AT HIGH SPEEDS MAY CONTRIBUTE TO THE GROWTH OF THE CRACKS. SEVERAL TYPES OF MACROSCOPIC GROWTH 'BANDS' OR 'LINES' THAT ARE FREQUENTLY OBSERVED ON THE FATIGUE FRACTURE SURFACES OF LABORATORY SPECIMENS AND OF COMPONENTS THAT HAVE FAILED IN SERVICE, HAVE BEEN CITED AND DESCRIBED. THOSE LINES OBSERVED ON THE FRACTURE SURFACES OF THE FAILED WHEELS WERE CORRELATED WITH CRACK GROWTH DURING AIRCRAFT LANDING CYCLES. THE DERIVATION OF FATIGUE CRACK GROWTH RATE INFORMATION FROM THESE LINES HAS FACILITATED THE REVISION OF WHEEL INSPECTION SCHEDULES WITH THE PURPOSE OF PREVENTING THE CATASTROPHIC FAILURE OF AIRCRAFT WHEELS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-730 141 1/3
AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OHIO SCHOOL OF ENGINEERING

A STUDY OF THE PRACTICALITY OF ACTIVE VIBRATION ISOLATION APPLIED TO AIRCRAFT DURING THE TAXI CONDITION. (U)

DESCRIPTIVE NOTE: MASTER'S THESIS,
JUN 71 166P CORSETTI,CHARLES DOMINIC ;
REPT. NO. GGC/EE/71-6

UNCLASSIFIED REPORT

DESCRIPTORS: (*LANDING GEAR, VIBRATION ISOLATORS), (*HYDRAULIC ACTUATORS, VIBRATION ISOLATORS), (*FATIGUE(MECHANICS), *TAXIING), WINGS, VIBRATION, DAMAGE, FEASIBILITY STUDIES, MATHEMATICAL MODELS, FEEDBACK, COSTS, THESES (U)
IDENTIFIERS: AUTOMATIC CONTROL (U)

THE FEASIBILITY OF USING AN ACTIVE CONTROL IN THE LANDING GEAR SYSTEM OF AN AIRCRAFT TO REDUCE WING FATIGUE DAMAGE RESULTING FROM GROUND INDUCED VIBRATIONS DURING TAXIING IS CONSIDERED. THE CHARACTERISTICS OF THREE VEHICLE MODELS ARE DISCUSSED: A SINGLE LANDING GEAR SYSTEM, A TRICYCLE LANDING GEAR SYSTEM AND A SYSTEM OF FIVE LANDING GEARS. MATHEMATICAL EXPRESSIONS FOR THE RUNWAY INPUTS TO EACH VEHICLE MODEL ARE OBTAINED IN THE FORM OF RANDOM INPUTS REPRESENTED BY GAUSS-MARKOV PROCESSES. THE MODEL FOR A LINEAR HYDRAULIC ACTUATOR WHICH IS USED AS THE ACTIVE CONTROL ELEMENT IN THE LANDING GEAR SYSTEM IS PRESENTED. THE RESULTS INDICATE THAT THE COMBINED OPTIMAL ACTIVE CONTROL AND LANDING GEAR SYSTEM CAN PROVIDE A SUBSTANTIAL IMPROVEMENT IN REDUCING WING FATIGUE OVER THAT OF THE LANDING GEAR SYSTEM ALONE. ALSO, THE CONTROL PARAMETERS THAT ARE NECESSARY AND DESIRABLE IN THE OPTIMAL SYSTEM, TOGETHER WITH THE PHYSICAL DEMANDS PLACED ON THE ACTUATOR, ARE DETERMINED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-863 247 13/8 1/3
WYMAN-GORDON CO WORCESTER MASS

ESTABLISH MANUFACTURING METHODS FOR CLOSED DIE ALUMINUM FORGINGS WITH IMPROVED STRESS CORROSION RESISTANCE. (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 OCT 66-1 SEP 69,
SEP 69 258P MORRIS,CHARLES A.; CERRONE, ANTHONY G.;
CONTRACT: F33615-67-C-1040
PROJ: AF-9-126
MONITOR: AFML TR-69-264

UNCLASSIFIED REPORT

DESCRIPTORS: (*FORGING, *ALUMINUM ALLOYS), (*LANDING GEAR, FORGING), CORROSION RESISTANCE, STRESS CORROSION, DIES, CRACKS, MAGNESIUM ALLOYS, ZINC ALLOYS, FRACTURE(MECHANICS) (U)
IDENTIFIERS: *CLOSED DIE FORGING, ALUMINUM ALLOY 7079 (U)

TO EVALUATE SCC SUSCEPTIBILITY AS IT RELATES TO FORGING PROCESSING, A 7079 ALUMINUM ALLOY LANDING GEAR OUTER CYLINDER WAS PRODUCED USING FIVE DIFFERENT FORGING TECHNIQUES. THREE OF THESE TECHNIQUES FORMED THE PART WITH A SOLID BARREL USING DIFFERING PRELIMINARY OPEN DIE WORKING. THE OTHER TWO TECHNIQUES INVOLVED FORWARD AND BACKWARD EXTRUSION. STANDARD UNIAXIAL-TENSILE TESTING REVEALED NO SIGNIFICANT DIFFERENCE BETWEEN THE VARIOUS FORGING TECHNIQUES. HOWEVER, ALTERNATE IMMERSION STRESS CORROSION TESTING IN 3 1/2% NACL INDICATED DIFFERENCES IN STRESS CORROSION CRACKING SUSCEPTIBILITY. THE TWO EXTRUDED FORGINGS (FORWARD AND BACK) WERE SIGNIFICANTLY MORE RESISTANT TO SCC. THE FORWARD EXTRUDED PARTS WERE SOMEWHAT MORE RESISTANT TO SCC THAN THE BACK EXTRUDED PARTS, BUT WERE ALSO SUBSTANTIALLY MORE EXPENSIVE TO PRODUCE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZGML11

AD-684 790 20/11 13/13 1/3 15/5
UNIVERSAL TECHNOLOGY CORP DAYTON OHIO

INVESTIGATION AND ANALYSIS DEVELOPMENT OF EARLY LIFE AIRCRAFT STRUCTURAL FAILURES. (U)

DESCRIPTIVE NOTE: FINAL REPT. 15 APR 68-15 OCT 70, MAR 71 269P GRAN,ROBERT J. ;ORAZIO, FRED D. , JR.;PARIS,PAUL C. ;IRWIN,GEORGE R. ;HERTZBERG,RICHARD I
REPT. NO. UTC-TR-5316
CONTRACT: F33615-68-C-1503
PROJ: AF-1467
TASK: 146704
MONITOR: AFFDL TR-70-149

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH DEL RESEARCH CORP., BETHLEHEM, PA.

DESCRIPTORS: (*STRUCTURAL PROPERTIES, PREDICTIONS), (*STRUCTURAL PARTS, FAILURE(MECHANICS)), (*AIRFRAMES, LIFE EXPECTANCY), LANDING GEAR, CLASSIFICATION, DATA PROCESSING SYSTEMS, FRACTURE(MECHANICS), NON-DESTRUCTIVE TESTING, CRACKS (U)
IDENTIFIERS: *FAILURE ANALYSIS, *FRACTURE MECHANICS (U)

AN INVESTIGATION AND ANALYSIS OF AIRCRAFT STRUCTURAL FAILURES WAS CONDUCTED TO ASSESS THE CONDITION SURROUNDING EARLY LIFE FAILURES AND INITIATE IMPROVED METHODS FOR THE STRUCTURAL ANALYSIS OF SUCH FAILURE PROBLEMS. THE PRIMARY OBJECTIVE WAS TO IDENTIFY CRITICAL STRUCTURAL COMPONENT AREAS AND DEFINE AN ANALYSIS APPROACH WHICH WOULD CONSIDER THE USEFUL LIFE OF A FLAWED OR DAMAGED STRUCTURE. INITIAL PROGRAM EFFORTS INVOLVED THE SURVEY OF GOVERNMENT AND INDUSTRY ORGANIZATIONS CONCERNED WITH ENGINEERING AND MAINTENANCE OF PRESENT OPERATIONAL AIRCRAFT. FAILURE DATA WAS GATHERED ON AIRFRAME STRUCTURES, LANDING GEAR COMPONENTS AND HIGHLY STRESSED AIRCRAFT SUB-COMPONENTS WHICH EXPERIENCED OPERATIONAL FAILURES. THE DATA GATHERED WAS TABULATED UNDER VARIOUS CATEGORIES RELATED TO COMPONENT DESCRIPTION, FAILURE CIRCUMSTANCES, STRESS HISTORY AND ENVIRONMENTAL INFLUENCES IN AN ATTEMPT TO IDENTIFY SIGNIFICANT OR CONTRIBUTING VARIABLES. RESULTS OF THESE FAILURE CORRELATIONS ARE PRESENTED IN TABULAR FORM. (U)

IX.

MECHANICAL FASTENERS

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZHML1

AD-275 378
NATIONAL BUREAU OF STANDARDS WASHINGTON D C

SOME PROBLEMS OF FATIGUE OF BOLTS AND BOLTED JOINTS IN AIRCRAFT APPLICATIONS (U)

JAN 62 1V MORDFIN,LEONARD1

REPT. NO. TN136
MONITOR: NAVWEPS 343 62 1

UNCLASSIFIED REPORT

DESCRIPTORS: *BOLTED JOINTS, *BOLTS, AIRCRAFT, ALLOYS, DESIGN, FATIGUE (MECHANICS), JOINTS, LOCKING FASTENER DEVICES, METAL COATINGS, METAL JOINTS, METAL SEALS, SCREW THREADS, TEMPERATURE (U)

RECOMMENDATIONS ARE GIVEN FOR THE EVALUATION AND SPECIFICATION OF AIRCRAFT BOLTS FOR FATIGUE SITUATIONS.

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZHML1

AD-607 625
GENERAL DYNAMICS/CONVAIR SAN DIEGO CALIF

FATIGUE RESISTANT STRUCTURES, (U)

MAR 59 62P SMITH,C. R. ;
REPT. NO. ZR-658-030

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*STRUCTURES, FATIGUE (MECHANICS)), (*FATIGUE (MECHANICS), STRUCTURES), (*METAL JOINTS, FATIGUE (MECHANICS)), RIVETS, RIVETED JOINTS, AIRFRAMES, STRESSES, LIFE EXPECTANCY, STRAIN (MECHANICS), DEFORMATION, LOADING (MECHANICS), MODEL TESTS, ALUMINUM ALLOYS, STEEL, STAINLESS STEEL, TITANIUM ALLOYS, REINFORCING MATERIALS (U)

THE WORK FOR THE FISCAL YEAR OF 1958 ON BASIC FATIGUE RESEARCH HAS BEEN DIRECTED TOWARDS OBTAINING METHODS FOR DESIGNING FATIGUE RESISTANT STRUCTURES. TWO SUCH METHODS HAVE BEEN OBTAINED: (1) THE USE OF RIVETS DRIVEN THROUGH THE EDGE OF SPLICE DOUBLERS, AND (2) THE USE OF THIN AUXILIARY DOUBLERS TO PERMIT USING EXTRA RIVETS AWAY FROM THE HIGH STRESS AREA IN THE MAIN SPLICE DOUBLER. TEST DATA SHOW THAT A SUBSTANTIALLY LIGHTER STRUCTURE COULD BE HAD FOR THE SAME FATIGUE LIFE BY USING EITHER OF THE TWO METHODS, OR A LIFETIME OF UP TO TWENTY TIMES THAT OF AN EQUIVALENT WEIGHT STRUCTURE OF CONVENTIONAL DESIGN. THIN DOUBLERS ARE BEING USED IN THE MODELS 880 AND 600. EDGE DRIVEN RIVETS HAVE BEEN APPROVED FOR OPERATORS OF COMMERCIAL AIRLINES IN REPAIRS OR AS FATIGUE INHIBITORS OF AIRPLANES NOW IN SERVICE. CONVAIR HAS A PATENT PENDING ON EDGE DRIVEN RIVETS. MISCELLANEOUS DATA ARE ALSO PRESENTED ON FATIGUE BEHAVIOR AND ON PHOTOELASTIC ANALYSIS OF STRESS DISTRIBUTION IN SIMULATED AND BUILT UP STRUCTURES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZHML1

AD-640 436 11/3 13/8 1/3
NAVAL AIR ENGINEERING CENTER PHILADELPHIA PA AERONAUTICAL MATERIALS LAB

THE CORROSION PROTECTION AFFORDED BY VARIOUS COATING SYSTEMS IN AIRCRAFT FASTENER AREAS, (U)

MAY 66 27P OHR,JACK ;
REPT. NO. NAEC-AML-2454,
TASK: RRMA-03-003/200-1/R007-03-01,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*COATINGS, CORROSION INHIBITION), (*MECHANICAL FASTENERS, CORROSION INHIBITION), (*CORROSION INHIBITION, NAVAL AIRCRAFT), PERFORMANCE(ENGINEERING), PLASTIC PAINTS, EPOXY PLASTICS, ACRYLIC RESINS, TESTS, ISOCYANATE PLASTICS, FATIGUE(MECHANICS), FRACTURE(MECHANICS) (U)

A STRESS-CYCLING TEST (AT - 103 F AND ROOM TEMPERATURE) DESIGNED TO SIMULATE THE SPECTRUM OF STRESSES WHICH COULD OCCUR DURING 500 AIRCRAFT FLYING HOURS (ROUGHLY 1 PAR INTERVAL), INDICATES THAT CURRENT SPECIFICATION AND EAPERIMENTAL AIRCRAFT COATINGS CANNOT MEET THESE CONDITIONS WITHOUT CRACKING AROUND FASTENER HEADS. THE COATINGS USED WERE THE MIL-C-22750 EPOXY, THE MIL-L-81352(WEP) ALL-ACRYLIC, AND TWO POLYURETHANES. THE IMPLICATION OF THIS TEST IS THAT, AT THE PRESENT STATE OF THE COATINGS ART, PAINT FILMS OF THE NON-RUBBERY TYPE CANNOT BE EXPECTED TO PROVIDE ADEQUATE CORROSION PROTECTION BY THEMSELVES IN THE FASTENER AREA- A PERSISTENT TROUBLE AREA ON NAVAL AIRCRAFT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZHML1

AD-651 189 13/5 11/6 13/8
NAVAL AIR ENGINEERING CENTER PHILADELPHIA PA AERONAUTICAL MATERIALS LAB

CORROSION RESISTANCE AND DURABILITY OF FASTENERS IN AIRCRAFT STRUCTURES. (U)

DESCRIPTIVE NOTE: PROGRESS REPT., JUL 65-FEB 67,
JAN 67 44P VIGLIONE,JOSEPH ;SHAFFER, IRVING S. ;
REPT. NO. NAEC-AML-2529

UNCLASSIFIED REPORT

DESCRIPTORS: (•MECHANICAL FASTENERS, CORROSION RESISTANCE), AIRFRAMES, CORROSION, FATIGUE(MECHANICS), SCREWS, ALUMINUM ALLOYS, CORROSION INHIBITION, METAL JOINTS, STEEL, SEALING COMPOUNDS, SALT SPRAY TESTS, PERFORMANCE(ENGINEERING) (U)
IDENTIFIERS: ALUMINUM ALLOY 7075 (U)

A CORROSION AND FATIGUE EVALUATION WAS MADE TO DETERMINE WHETHER THE ROUNDING OF COUNTERSUNK HOLES AND/OR FASTENER HEADS WOULD IMPROVE THE CORROSION BEHAVIOR AT THE FASTENER LOCATIONS OR AFFECT THE FATIGUE STRENGTH OF 7075-T6 ALUMINUM ALLOY JOINTS ASSEMBLED WITH CADMIUM PLATED STEEL COUNTERSUNK HEAD SCREWS. TEST ASSEMBLIES WERE PREPARED WITH AND WITHOUT CORROSION BARRIER MATERIALS, INCLUDING A MIL-S-8802 POLYSULFIDE SEALANT, IN THE FINISHING SYSTEM. ROUNDED CONFIGURATIONS DID NOT SIGNIFICANTLY IMPROVE CORROSION BEHAVIOR BUT DID IMPROVE THE FATIGUE STRENGTH OF THE SPECIMENS. THE GREATEST IMPROVEMENT IN FATIGUE PROPERTIES OCCURRED WITH A COMBINATION OF ROUNDED FASTENER HEADS AND ROUNDED COUNTERSUNK HOLES. OF THE VARIOUS CORROSION BARRIER MATERIALS TESTED, ONLY THE POLYSULFIDE SEALANT AFFORDED GOOD CORROSION PROTECTION WHEN USED WITH A PAINT SYSTEM OVERCOAT. HOWEVER, THE USE OF THE SEALANT MORE THAN NEGATED THE BENEFICIAL EFFECT OF THE ROUNDED CONFIGURATIONS ON FATIGUE STRENGTH. THE USE OF THE SEALANT LOWERED THE FATIGUE STRENGTH OF THE CONTROL SPECIMENS WITH STANDARD FASTENER HEADS AND STANDARD COUNTERSUNK HOLES BY APPROXIMATELY 68. THIS LOSS IS COUNTERBALANCED BY THE IMPROVEMENT IN CORROSION BEHAVIOR AFFORDED BY THE SEALANT TO FASTENER AREAS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /4HML1

AD-675 722 13/5 20/11 1/3
GENERAL DYNAMICS/CONVAIR SAN DIEGO CALIF

TAPERED BOLTS. THEIR INFLUENCE ON FATIGUE OF AIRPLANE STRUCTURES. (U)

MAY 60 39P SMITH,C. R. ;
REPT. NO. GDC-ZR-659-053

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, *BOLTS), (*BOLTED JOINTS, FATIGUE(MECHANICS)), BUSHINGS, THEORY, ALUMINUM ALLOYS, MECHANICAL FASTENERS, STRESSES (U)

THIS REPORT IS A CONTINUATION OF THE WORK PRESENTED IN REF. 1 ON FATIGUE RESISTANT STRUCTURES. AN ATTEMPT WILL BE MADE TO MAKE USE OF THE LINEAR STRAIN THEORY IN COMBINATION WITH EXPERIMENTAL EFFECTIVE SPRING CONSTANTS FOR PREDICTING EFFECTS OF PRESSED FIT BUSHINGS ON LUGS AND INTERFERENCE FITS ON BOLTED JOINTS. FATIGUE DATA ARE PRESENTED SHOWING THE EFFECTS OF INTERFERENCE FIT BOLTS OR BUSHINGS ON THE FATIGUE LIFE OF STRUCTURES. (AUTHOR) (U)

CORPORATE AUTHOR - MONITORING AGENCY

*ADVISORY GROUP FOR AERONAUTICAL RESEARCH AND DEVELOPMENT PARIS (FRANCE)

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AGARD-150
THE PROBLEM OF STRUCTURAL SAFETY WITH PARTICULAR REFERENCE TO SAFETY REQUIREMENTS.
AD-661 969

*ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT PARIS (FRANCE)

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CONTROL OF FLEXIBLE AIRCRAFT DYNAMIC RESPONSE.
AD-656 524

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AGARD ADVISORY-8
THE INFLUENCE OF FRETTING ON FATIGUE.
AD-663 783

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AGARD ADVISORY-11
RESIDUAL STRENGTH IN THE PRESENCE OF FATIGUE CRACKS.
AD-669 772

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AGARD-AG-157
THE ACCUMULATION OF FATIGUE DAMAGE IN AIRCRAFT MATERIALS AND STRUCTURES.
AD-737 398

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AGARD-AR-28-70
FATIGUE LOAD MONITORING OF MILITARY AIRCRAFT.
AD-711 259

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AGARD-R-589-71
OPTIMALITY CRITERIA IN STRUCTURAL DESIGN.
AD-736 316

*AERONAUTICAL RESEARCH INST OF SWEDEN STOCKHOLM

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DEVELOPMENT OF STATISTICAL METHODS FOR DESIGNING AIRCRAFT WITH RESPECT TO FATIGUE.
AD-631 350

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FFA-120
STUDY OF INSPECTION INTERVALS FOR FAIL-SAFE STRUCTURES.
AD-723 111

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HU-961
ANALYSIS OF THE PROBABILITY OF COLLAPSE OF A FAILSAFE AIRCRAFT STRUCTURE CONSISTING OF PARALLEL ELEMENTS.
(RTD-TDR-63-4210)
AD-431 826

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TN-1
INSPECTION PERIODS DETERMINED FROM DATA OF CRACK DEVELOPMENT AND STRENGTH REDUCTION OF AN AIRCRAFT STRUCTURE USING STATISTICAL METHODS FOR DESIGNING AIRCRAFT WITH RESPECT TO FATIGUE.
AD-631 351

*AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO

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ASD-TDR62 26
ESTABLISHMENT OF THE APPROACH TO, AND DEVELOPMENT OF, INTERIM DESIGN CRITERIA FOR SONIC FATIGUE
AD-284 597

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ASD-TDR62 165
STUDY OF A RESPONSE LOAD RECORDER. VOLUME II.
AD-403 507

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ASD-TDR62 165 VI
STUDY OF A SONIC LOAD RECORDER
AD-295 464

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ASD-TDR62 501
RESEARCH ON TECHNIQUES OF ESTABLISHING RANDOM TYPE FATIGUE CURVES FOR BROAD BAND SONIC LOADING
AD-290 799

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ASD-TDR62 681
FURTHER ANAYLSIS OF THE RANDOM VIBRATIONS OF THE CARAVELLE TEST SECTION
AD-284 886

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ASD-TDR62 801
INVESTIGATION OF A METHOD FOR THE PREDICTION OF VIBRATORY RESPONSE AND STRESS IN TYPICAL FLIGHT VEHICLE STRUCTURE.
AD-416 784

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ASD-TDR62-868 P2
INVESTIGATION OF FRACTURE TOUGHNESS IN HIGH STRENGTH ALLOYS.
AD-600 008

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ASD-TDR63 207
ASPECTS OF RELIABILITY UNDER CONDITIONS OF ELEVATED TEMPERATURE CREEP AND FATIGUE.
AD-403 500

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ASD-TDR63-704
COMPARISON OF APPROACHES FOR SONIC FATIGUE PREVENTION.
AD-435 020

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ASD-TDR63 420
STRUCTURAL DESIGN FOR ACOUSTIC FATIGUE.
AD-425 405

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ASD-TR60 220
A STUDY OF THE CHARACTERISTICS OF MODERN ENGINE NOISE AND THE RESPONSE CHARACTERISTICS OF STRUCTURES
AD-272 210

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ASD-TR60 486
THE EFFECT OF CADMIUM PLATING ON AIRCRAFT STEELS UNDER STRESS CONCENTRATION AT ELEVATED TEMPERATURES
AD-271 528

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ASD-TR61 262
SONIC FATIGUE RESISTANCE OF STRUCTURAL DESIGNS
AD-269 187

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ASD-TR61 435
INVESTIGATION OF THE REPRESENTATION OF AIRCRAFT SERVICE LOADINGS IN FATIGUE TESTS
AD-276 123

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ASD-TR61 547
STUDY IN THE USE OF STRUCTURAL MODELS FOR SONIC FATIGUE
AD-277 186

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ASD-TR61 646
DAMPING AND FATIGUE PROPERTIES OF SANDWICH CONFIGURATIONS IN FLEXURE
AD-272 016

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ASD-TR-66-57
AIR FORCE AIRCRAFT STRUCTURAL INTEGRITY PROGRAM; AIRPLANE REQUIREMENTS.
AD-707 884

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TDR62 26
ESTABLISHMENT OF THE APPROACH TO, AND DEVELOPMENT OF, INTERIM DESIGN CRITERIA FOR SONIC FATIGUE (ASD-TDR62 26)
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TR61 547
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AD-277 186

•AERONAUTICAL SYSTEMS DIV WRIGHT-PATTERSON AFB OHIO FLIGHT CONTROL LAB

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MANEUVER LOAD DATA FROM C-130 AIRCRAFT
AD-255 752

•AEROSPACE CORP EL SEGUNDO CALIF LAB OPERATIONS

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TR-0200(4250-10)-4
ALLOY COMPATIBILITY WITH SEVERAL CLEANING AGENTS.
(SAMSO-TR-69-178)
AD-689 746

•AEROSPACE INDUSTRIES ASSOCIATION OF

AMERICA INC WASHINGTON D C

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ATC REPT. NO. ANTC32
PANEL FLUTTER SURVEY AND DESIGN CRITERIA.
AD-416 002

•AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB OHIO

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AFFDL-TR64 160
EMPIRICAL CORRELATION OF EXCITATION ENVIRONMENT AND STRUCTURAL PARAMETERS WITH FLIGHT VEHICLE VIBRATION RESPONSE.
AD-610 484

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AFFDL-TR-66-20
THEORETICAL AND EXPERIMENTAL MODEL INVESTIGATIONS OF SEMI-ANECHOIC AND SEMI-REVERBERANT ENVIRONMENTS AND THEIR APPLICATION TO THE RTD SONIC FATIGUE FACILITY.
AD-635 806

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AFFDL-TR-66-112
AERODYNAMIC NOISE SIMULATION IN SONIC FATIGUE FACILITY.
AD-646 022

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AFFDL-TR-69-25
SCRATCH STRAIN GAGE EVALUATION.
AD-692 480

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AFFDL-TR-69-54
THE PREDICTION OF INTERNAL VIBRATION LEVELS OF FLIGHT VEHICLE EQUIPMENTS USING STATISTICAL ENERGY METHODS.
AD-865 731

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AFFDL-TR-70-107
CRACKS, A FORTRAN IV DIGITAL COMPUTER PROGRAM FOR CRACK PROPAGATION ANALYSIS.
AD-717 150

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AFFDL-TR-70-130-VOL-1
A NOITER-TYPE METHOD FOR FINITE ELEMENT ANALYSIS OF NONLINEAR STRUCTURAL BEHAVIOR. VOLUME I. THE MODIFIED STRUCTURE METHOD.
AD-717 740

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AFFDL-TR-70-130-VOL-2
A KOITER-TYPE METHOD FOR FINITE ELEMENT ANALYSIS OF NONLINEAR STRUCTURAL BEHAVIOR. VOLUME II. USER'S MANUAL FOR PROGRAM BEHAVE.
AD-717 181

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AFFDL-TR-70-144
PROCEEDINGS OF THE AIR FORCE CONFERENCE ON FATIGUE AND FRACTURE OF AIRCRAFT STRUCTURES AND MATERIALS, HELD AT MIAMI BEACH, FLA., 15-18 DECEMBER 1969.
AD-719 756

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AFFDL-TR-70-149
INVESTIGATION AND ANALYSIS DEVELOPMENT OF EARLY LIFE AIRCRAFT STRUCTURAL FAILURES.
AD-884 790

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AFFDL-TR-70-161
A GENERAL FATIGUE PREDICTION METHOD BASED ON NEUBER NOTCH STRESSES AND STRAINS.
AD-723 631

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AFFDL-TR-71-89
FRACTURE CONTROL PROCEDURES FOR AIRCRAFT STRUCTURAL INTEGRITY.
AD-731 565

•AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OHIO SCHOOL OF ENGINEERING

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GGC/EE/71-6
A STUDY OF THE PRACTICALITY OF ACTIVE VIBRATION ISOLATION APPLIED TO AIRCRAFT DURING THE TAXI CONDITION.
AD-730 141

•AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

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STRUCTURES, DAYTON, OHIO, MARCH 18-20, 1969.
AD-697 956

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AD-718 432

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AFML-TDR64 160
RANDOM FATIGUE FAILURE OF A MULTIPLE LOAD PATH REDUNDANT STRUCTURE.
AD-604 125

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AFML-TR-64-401
THE STRUCTURAL RELIABILITY OF AIRFRAMES.
AD-615 654

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AFML-TR-67-199
STRESSES IN SKIN PANELS SUBJECTED TO RANDOM ACOUSTIC LOADING.
AD-656 846

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AFML-TR-69-264
ESTABLISH MANUFACTURING METHODS FOR CLOSED DIE ALUMINUM FORGINGS WITH IMPROVED STRESS CORROSION RESISTANCE.
AD-863 247

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AFML-TR-70-202-PT-1
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