VERTICAL TAKE-OFF PLANES

A DDC BIBLIOGRAPHY

DDC-TAS-72-46

JUNE 1972

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Best Available Copy
VERTICAL TAKE-OFF PLANES

References in this bibliography relate to design, configurations, flight testing, flight control systems, model tests, lift fans, shrouded propellers, rotary wings, aerodynamic characteristics, propulsion systems, performance engineering, capabilities and effectiveness of the Vertical Take-Off Planes. Computer generated indexes are included.
**KEY WORDS**

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VERTICAL TAKE-OFF PLANES

A DDC BIBLIOGRAPHY

DDC-TAS-72-46

January 1962 - January 1972

JUNE 1972

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DEFENSE DOCUMENTATION CENTER
DEFENSE SUPPLY AGENCY
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

UNCLASSIFIED
FOREWORD

This bibliography contains 199 unclassified references relating to *Vertical Take-Off Planes*. These references were selected from entries processed into the Defense Documentation Center's data bank during the period of January 1962 through January 1972.

This bibliography is a revision of AD-683 500.

Individual entries are arranged in AD number sequence under the heading AD Bibliographic References. Corporate Author-Monitoring Agency, Subject, Title, and Personal Author Indexes are included.

BY ORDER OF THE DIRECTOR, DEFENSE SUPPLY AGENCY

OFFICIAL

ROBERT B. STEGMAIER, JR.
Administrator
Defense Documentation Center

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RESULTS OF A VTOL PROPELLER-TYPE AIRCRAFT TESTED IN THE SUBSONIC WIND TUNNEL IN A HIGH-SPEED CONFIGURATION, (U)

NOV 13 15P BARNARD, MILLARD J.;
REPT. NO. DTMB-AERO-1062

UNCLASSIFIED REPORT

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, DESIGN), ROTARY BLADES (ROTARY WINGS), WIND TUNNEL MODELS, FEASIBILITY STUDIES, MODEL TESTS, ROTARY WINGS, HOVERING, LIFT, DRAG, PITCH (MOTION), AERODYNAMIC CHARACTERISTICS, PERFORMANCE (ENGINEERING), SUBSONIC CHARACTERISTICS, PROPELLERS (AERIAL)

THE ABILITY OF A PROPELLER TO DEVELOP A FORCE PERPENDICULAR TO THE AXIS OF ROTATION IS THE BASIS FOR A VTOL AIRCRAFT THAT APPEARS TO BE CAPABLE OF HOVERING, AND AT THE SAME TIME TO BE SUPERIOR TO EXISTING TYPES OF VTOL AIRCRAFT IN HIGH-SPEED PERFORMANCE. LOW-SPEED WIND-TUNNEL TEST RESULTS FOR A MODEL INDICATED A LIFT-DRAG RATIO OF 6 WITH PROPELLERS WINDMILLING IN THE HIGH-SPEED CONFIGURATION. FOR EXISTING VTOL AIRCRAFT, THE MAXIMUM LIFT-DRAG ATTAINED IN A HIGH-SPEED CONFIGURATION IS ABOUT 5. (AUTHOR)
THE EFFECT OF GROUND PROXIMITY ON THE PERFORMANCE OF POWERED LIFT VEHICLES WAS INVESTIGATED ON SIMPLE MODELS USING TWO DIFFERENT TESTING METHODS. SINGLE AND DOUBLE-JET MODELS REPRESENTING VERTICAL TAKE-OFF PLANES, GROUND EFFECT, PERFORMANCE, ENGINEERING, JETS, LIFT, PITCH, AERODYNAMIC CHARACTERISTICS, PRESSURE, MOMENTUM, GROUND EFFECT MACHINES, WIND TUNNEL MODELS. RESULTS OBTAINED WITH BOTH METHODS ARE COMPARED.
RESULTS OF WIND TUNNEL TESTS OF A FULL-SCALE, WING-MOUNTED, TIP-TURBINE-DRIVEN LIFT FAN. (U)

SEP 63 379P

THE FULL-SCALE WING-TIP TURBINE-DRIVEN LIFT FAN WAS MODEL TESTED IN THE NASA AMES RESEARCH CENTER 40-FOOT BY 80-FOOT WIND TUNNEL. THIS SERIES OF TESTS HAS PROVIDED THE FIRST LARGE SCALE TEST DATA WITH FANS INSTALLED IN WINGS. DETAILED DISCUSSIONS AND TABULAR DATA ARE PRESENTED ON THE FOLLOWING: WIND TUNNEL MODEL; TEST INSTRUMENTATION; AND TEST PROCEDURES AND RESULTS. ANALYSIS OF RESULTS CONSIDERS THE BASIC AIRCRAFT PERFORMANCE (POWER OFF), FAN AERODYNAMIC PERFORMANCE, FAN THERMODYNAMIC PERFORMANCE, FAN POWERED AIRCRAFT PERFORMANCE, FAN MECHANICAL PERFORMANCE AND HARDWARE INSPECTION. (AUTHOR) (U)
SOME DYNAMIC ASPECTS OF STABILITY IN LOW-SPEED FLYING MACHINES.

NOV 63, 59P, DUKES, THEODOR A., CARBALLAL,

CONTRACT: DA-44-77-TC-835

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, ADAPTIVE CONTROL SYSTEMS), (*FLIGHT CONTROL SYSTEMS, VERTICAL TAKE-OFF PLANES), STABILITY, PITCH (MOTION), FEEDBACK, DAMPING, DIFFERENTIAL EQUATIONS, MATHEMATICAL ANALYSIS, ANALOG COMPUTERS, TIME, PROGRAMMING (COMPUTERS), LINEAR SYSTEMS, SUBSONIC CHARACTERISTICS

IDENTIFIERS: 1963

THIS REPORT IS CONCERNED WITH A LINEAR TIME VARYING APPROXIMATION TO THE DYNAMICS OF LOW-SPEED FLYING MACHINES. SIMPLIFICATIONS AND APPROXIMATIONS ARE APPLIED WIDELY IN ORDER TO EMPHASIZE ESSENTIAL ASPECTS. THE RANGE OF TIME VARIATION IS DESCRIBED IN TERMS OF FROZEN SYSTEM LOCI OF THE ROOTS CORRESPONDING TO THE PREDOMINANT MODE OF A SYSTEM. THE RATE OF THE TIME VARIATION IS DESCRIBED IN TERMS OF THE DEVIATION FROM THE FROZEN SYSTEM APPROXIMATION. AN ANALOG COMPUTER STUDY WAS MADE TO SPECIFY QUANTITATIVELY THOSE RATES OF TIME VARIATION WHICH CANNOT BE CONSIDERED AS SLOW. THE LONGITUDINAL DYNAMICS OF VTOL AIRCRAFT IS STUDIED AS AN EXAMPLE IN RATHER GENERAL TERMS.

APPROXIMATIONS AND THE APPLICATION OF ROOT LOCUS METHODS IN TERMS OF THE MOST SIGNIFICANT STABILITY DERIVATIVES LEAD TO A CONSTRUCTION DESCRIBING THE BEHAVIOR OF THE OSCILLATORY ROOTS DURING TRANSITION. THE RESULTS ARE USED IN A DISCUSSION OF THE FOLLOWING VARIABLE FEEDBACK CONFIGURATIONS: DIRECT FEEDBACK ADJUSTMENTS, ADAPTIVE FEEDBACK, AND PROGRAMMED FEEDBACK ADJUSTMENTS. (AUTHOR)
UNCLASSIFIED

DDU REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0H07

AD-447 839
GENERAL ELECTRIC CO CINCINNATI OHIO

XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT. (U)

DESCRIPTIVE NOTE: QUARTERLY TECHNICAL PROGRESS REPORT NO. 9, 16 NOV 63-16 FEB 64

APR 64 ISP

CONTRACT: DAM4 177TC/16

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

IDENTIFIERS: V-5 AIRCRAFT, LIFT FAN, J-85 ENGINES (U)

DURING THE NINTH QUARTER (NOVEMBER 16, 1963 TO FEBRUARY 15, 1964) PROGRESS UNDER THE PROPULSION SYSTEM PROGRAM INCLUDED: (1) SEVEN TECHNICAL PROGRAM REPORTS COMPLETED AND TRANSMITTED TO TRELUM WITH THE REMAINING DATA NECESSARY FOR LOW SPEED FLIGHT CLEARANCE NEARING COMPLETION; (2) REVISION TO MAINTENANCE MANUAL COMPLETED; (3) PROPULSION SYSTEM SPARE PARTS: QUANTITIES, PRICE CONTROL, AND AUTHORITY FOR USE ESTABLISHED WITH TRELUM; (4) SPARE J-85 ENGINES, J-85 LIFT FAN, J-85 PITCH FAN, PLUS ENGINE AND FAN SPARE COMPONENTS PACKAGED FOR SHIPMENT TO EDWARDS; (5) PROVIDED PROPULSION SYSTEM SUPPORT DURING AIRCRAFT GROUND TESTS; AND (6) PREPARATION FOR FULL SCALE WIND TUNNEL TEST WAS COMPLETED IN TERMS OF DETAIL TEST PLAN, INSTRUMENTATION, TEST FIXTURES, AND DATA REDUCTION PROGRAM. (AUTHOR) (U)
UNCLASSIFIED

EFFECTS OF AIRFRAME GEOMETRY ON DOWNWASH PROBLEMS OF TANDEM DUCTED-PROPELLER VTOL AIRCRAFT.  (U)

DESCRIPTIVE NOTE:  REPT. FOR JUL 61-MAY 63.  JAN 64  112P  PRUYN, RICHARD N.  .6
REPT. NO.  179T80 6
CONTRACT:  NON-61-0920

SUPPLEMENTARY NOTE:

DESCRIPTORS:  • VERTICAL TAKE-OFF PLANES; DUCTED FANS);  (DUCTED FANS, DOWNWASH), MODEL TESTS, GROUND EFFECT, PERFORMANCE (ENGINEERING); AERODYNAMIC CHARACTERISTICS, INTERFERENCE, DUCTS, DEFLECTION, FLUID DYNAMIC PROPERTIES, AERODYNAMIC CONFIGURATIONS, DUCT INLETS (U)
IDENTIFIERS:  TANDEM PROPELLERS (U)

A FULL SCALE HALF-MODEL SIMULATION OF A DUAL TANDEM DUCTED PROPELLER VTOL AIRCRAFT HAS BEEN TESTED AT HEIGHTS OF LESS THAN TWO DUCT DIAMETERS ABOVE SAND AND WATER TERRAIN; DATA ON TERRAIN TRANSPORT, TERRAIN CAUSED AIRCRAFT DAMAGE, FLOW FIELD MEASUREMENTS AND DUCTED PROPELLER PERFORMANCE WERE OBTAINED.  THESE TESTS WERE CONDUCTED AT PROPELLER DISC LOADINGS UP 10 60 POUNDS PER SQUARE FOOT WITH VARIOUS AIRCRAFT CONFIGURATIONS AND DUCTED PROPELLER ORIENTATIONS.  THE DUAL TANDEM CONFIGURATION WAS FOUND TO CAUSE A SIGNIFICANT INCREASE IN DOWNWASH PROBLEMS COMPARED TO ISOLATED PROPELLER CONFIGURATIONS PREVIOUSLY TESTED.  REDUCED PERFORMANCE, SEVERE ENGINE AND PROPELLER DAMAGE AND AN OSCILLATING AERODYNAMIC INTERFERENCE WERE EXPERIENCED.  SEVERAL PROMISING DEVICES TO ALLEVIATE DOWNWASH PROBLEMS WERE EVALUATED.  (AUTHOR)  (U)
UNCLASSIFIED

UNCLASSIFIED REPORT BIBLIOGRAPHY

UNCLASSIFIED

ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

THE STATIC PRESSURE DISTRIBUTION AROUND A CIRCULAR JET EXHAUSTING NORMALLY FROM A PLANE WALL INTO AN AIRSTREAM.

AUG 64 37P BRADBURY, L. J. S.; WOOD, M. N.:

REPT. NO. TN AERU2978

UNCLASSIFIED REPORT

S U P P L E M E N T A R Y NOTE:

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES: LIFT), (JETS, AXIALLY SYMMETRIC FLOW), (PRESSURE, DISTRIBUTION, BOUNDARY LAYER, THICKNESS, REYNOLDS NUMBER, AERODYNAMIC CHARACTERISTICS, WINGS, WIND TUNNEL MODELS, VELOCITY, MEASUREMENT, INTERFERENCE)

MEASUREMENTS HAVE BEEN MADE OF THE STATIC PRESSURE DISTRIBUTION ON THE WALL AROUND A CIRCULAR JET EXHAUSTING NORMALLY FROM ONE WALL OF A WIND TUNNEL INTO THE MAINSTREAM FLOW THROUGH THE TUNNEL. THE MEASUREMENTS SHOW THE WAY IN WHICH THE PRESSURE DISTRIBUTIONS VARY WITH THE RATIO OF JET TO FREE-STREAM VELOCITY AND ALSO SHOW THE REGIONS ON THE WALL WHICH CONTRIBUTE MOST TO THE OVERALL SUCTION FORCE ON THE WALL. THESE OVERALL SUCTION FORCES ARE SHOWN TO BE OF THE RIGHT ORDER OF MAGNITUDE TO ACCOUNT FOR THE LIFT LOSS OBSERVED ON MODELS OF DIRECT JET LIFT VTOL AIRCRAFT. THEORETICAL WORK ON THE PROBLEM IS BRIEFLY DISCUSSED AND IT IS SHOWN THAT A PARTICULARLY SIMPLE MODEL OF THE FLOW WHICH HAS PREVIOUSLY BEEN SUGGESTED ON A NUMBER OF OCCASIONS IS NOT REALLY ADEQUATE. SOME DETAILS OF AN ALTERNATIVE MODEL WHICH IS PROVING MORE SUCCESSFUL ARE GIVEN.

(AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0M07

AD-455 562
AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB OHIO

TEST RESULTS OF RESEARCH FOR RAPID SITE PREPARATION FOR VTOL AIRCRAFT. (U)

DESCRIPTIVE NOTE: REPT. FOR AUG 62-AUG 64
NOV 64 41P VASILOFF, A.
REPT. NO. 10864 104
PROJ: 8174
TASK: 817401

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

IDENTIFIERS: X-14 Aircraft, J-85 Engines (U)

TO OPERATE VTOL AIRCRAFT IN REMOTE FRONT-LINE AREAS, SITES MUST BE PREPARED TO PREVENT FLYING FOREIGN OBJECTS FROM DAMAGING THE AIRCRAFT. RESEARCH WAS CONDUCTED TO DETERMINE WHETHER ANY QUICK-SETTING SOIL HARDENERS COULD WITHSTAND THE BLAST ENVIRONMENT OF THE VTOL AFTERBURNER. SAMPLES OF NUMEROUS MATERIALS WERE TESTED IN A SPECIAL VTOL TEST FACILITY CONSISTING OF A J-85-5 JET ENGINE WITH AFTERBURNER THAT COULD BE ROTATED TO A VERTICAL POSITION TO DUPLICATE GROUND CONDITIONS IMPOSED BY THE VTOL JET BLAST. A FASTCURING, SPRAYABLE, RESIN FORMULATION WAS DEVELOPED AND TESTED, AND FULL-SCALE TESTS WERE MADE WITH AN X-14 VTOL AIRCRAFT. (AUTHOR) (U)
PROPELLUSION SYSTEM DELIVERIES WERE COMPLETED WITH ACCEPTANCE OF THE LAST SPARE LIFT FAN. FAN SPEED VTOL AND CTOL FLIGHT CLEARANCE WAS REQUESTED AND GRANTED FOR A/C NUMBER TWO. LIFT FAN AND J-85 SPARE PARTS WERE SHIPPED TO EDWARDS AIR FORCE BASE. NUMBER ONE A/C COMPLETED MODIFICATION AND GROUND TESTS AT NASA-AMES PRIOR TO FULL SCALE WIND TUNNEL TESTS. ENGINEERING DESIGN AND ANALYSIS WAS COMPLETED FOR THE HIGHER LOADING IN THE EXIT LOUVER ACTUATION SYSTEM. BOTH AIRCRAFT COMPLETED SYSTEMS FUNCTIONAL TESTS AT SAN DIEGO. A/C NUMBER TWO WAS SHIPPED TO EDWARDS AFB TO BEGIN FLIGHT TESTS AND A/C NUMBER ONE WAS SHIPPED TO NASA-AMES FOR WIND TUNNEL TESTING. NOSE WHEEL SHIMMY ENCOUNTERED DURING TAXI TESTS CAUSING AIRCRAFT DAMAGE. NOSE GEAR REDESIGN AND SUCCESSFUL DYNAMIC AND STATIC TESTS WERE COMPLETED. A SYSTEMS FAILURE EVALUATION WAS CONDUCTED ON THE FLIGHT SIMULATOR TO ESTABLISH EMERGENCY PROCEDURES. A/C DAMAGE AS A RESULT OF NOSE GEAR FAILURE WAS CORRECTED. (AUTHOR)
A major milestone was accomplished with achievement of the first flight of the XC-142A. The flight, made on the 2 aircraft, was 38 minutes in length during which time the aircraft handling characteristics were checked at an altitude of 10,000 feet and a speed of approximately 150 knots, with landing gear down throughout the entire flight. Takeoff and landing were made with wing and flaps at 10 degrees throughout the flight, the aircraft demonstrated smooth response and stable aerodynamic characteristics. Several other items of significance were accomplished in the overall test program: high speed taxi tests on the 2 aircraft were achieved; the 50-hour tie-down test on the 1 aircraft was completed, as well as the teardown inspection of transmission and propulsion system components. (Author)
The lateral control investigation was completed with the static load test successfully completed at San Diego, the necessary hardware manufactured and modification to aircraft number 2 completed, with Edwards vertical thrust stand plus flight testing verification of the increased lateral control power. Full scale wind tunnel testing was completed with aircraft number 1, and the aircraft returned to Edwards for preparation for flight test. Lift fan inlet vane failures were experienced during the wind tunnel tests, modifications designed, manufactured, and tested to establish a flight envelope. Potential longitudinal trim problems were seen during the wind tunnel, a horizontal tail slat and instrumentation boom for measuring tail angle of attack were designed and installed on aircraft number 2. The nose wheel shimmy investigation was completed and modifications accomplished to the aircraft which allowed successful conventional flights to commence May 25, 1964. Initial hover flights began on July 16, 1964. A J-85 stall investigation was conducted as a result of several compressor stalls experienced during flight.
AN ANALYSIS OF GROUND EROSION CAUSED BY JET DOWNWASH IMPINGEMENT.

DESCRIPTIVE NOTE: MASTER'S THESIS; 65 101P SHUTER, DAVID V.

UNCLASSIFIED REPORT

DESCRIPTORS: (DOWNWASH, VERTICAL TAKE-OFF PLANES), EROSION, SHORT TAKE-OFF PLANES, LANDING FIELDS, AERODYNAMIC LOADING, AERODYNAMIC CHARACTERISTICS, FLOW FIELDS, JET PLANES, FLUID FLOW, BOUNDARY LAYER, THEORY, EXHAUST NOZZLES, EXPERIMENTAL DATA, MATHEMATICAL MODELS, TERRAIN, LIFT, DRAG, PRESSURE, NOZZLES, HAZARUS, SAFETY

IDENTIFIERS: FORTRAN, THESSES

RECENT INTEREST IN MILITARY VTOL/STOL AIRCRAFT EMPLOYING UNPREPARED LANDING SITES HAS LED TO INTEREST IN THE PROBLEM OF LANDING SURFACE EROSION. SURFACE EROSION IS CAUSED BY THE AERODYNAMIC FORCES ON GROUND PARTICLES EXISTING WITHIN THE FLOW FIELD OF AN IMPINGING JET. THE INVISCID FLOW FIELD IS DISCUSSED AND THE VISCOUS GROUND BOUNDARY LAYER IS ANALYZED UTILIZING BOTH THEORY AND AVAILABLE EXPERIMENTAL DATA. A MATHEMATICAL MODEL OF THE PROCESS OF ENTRAINMENT OF GROUND PARTICLES IS CONSTRUCTED. EROSION RATES IN THE FORM OF EROSION PROFILES ARE PREDICTED FOR SELECTED JET CONFIGURATION AND TYPES OF TERRAIN. A CRITERIUM FOR ENTRAINMENT, DUE TO BOTH LIFT AND DRAG, WAS FOUND AND PRESENTED FOR SELECTED DISTANCES FROM THE JET CENTERLINE.

(AUTHOR)
A COMPARISON OF DUCTED PROPELLER THEORY WITH BELL X-22A EXPERIMENTAL DATA.

DESCRIPTIVE NOTE: FINAL REPORT

DEC 65 1BP HOUGH, GARY K. KASKEL,

ALVIN L.

REPT NO. TAK-TR-6510

CONTRACT: NONR-4357(40)

PROJECT NR-212-103

FOR THE FORWARD FLIGHT REGIME, A LIMITED COMPARISON IS MADE BETWEEN THEORETICAL PREDICTIONS OF DUCT PRESSURE DISTRIBUTIONS AND DATA OBTAINED FROM ONE-THIRD AND FULL SCALE MODEL TESTS OF THE X-22A DUCTED PROPELLER UNIT. THE THEORETICAL CALCULATIONS ARE BASED UPON PREVIOUS STUDIES OF DUCTED PROPELLERS WITH FINITE BLADE NUMBER. IT IS FOUND THAT THE THEORY IS IN REASONABLE AGREEMENT WITH EXPERIMENT AND GENERALLY TENDS TO UNDERESTIMATE THE MEASURED PRESSURES. ALSO, THE CHARACTERISTIC SHAPE OF THE PREDICTED DISTRIBUTION AGREES WELL WITH THE MEASURED DISTRIBUTION.
XC-142A VTOL TRANSPORT PROGRAM.

DESCRIPTIVE NOTE: MONTHLY PROGRESS REPORT NO. 29, MAY 64.

CONTRACT: AF 33(657)-7868

UNCLASSIFIED REPORT

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, *TRANSPORT PLANES), TILT WINGS, PRODUCTION, CALIBRATION, CHECKOUT PROCEDURES, SCHEDULING, FLIGHT CONTROL SYSTEMS, HEAT TRANSFER, GEAR, FLIGHT TESTING, LANDINGS, FUEL SYSTEMS, STATICS, DROP TESTING, PROPELLERS, AERIAL, QUALITY CONTROL, CAPTIVE TESTS

IDENTIFIERS: C-142 AIRCRAFT

XC-142A VTOL TRANSPORT PROGRAM.
DESCRIPTIONS: (*RESEARCH PLANES, VERTICAL TAKE-OFF PLANES), (*VERTICAL TAKE-OFF PLANES, DUCTED FANS), DESIGN, AIRFRAMES, SUBSONIC FLOW, TURBOJET ENGINES, LIFT, THRUST
IDENTIFIERS: J-85 ENGINES, V-5 AIRCRAFT

THIS REPORT TRACES THE DEVELOPMENT OF THE XV-5A RESEARCH AIRCRAFT. THE AIRCRAFT, THOUGH PURELY EXPERIMENTAL, DEMONSTRATES THE PRACTICABILITY OF VTOL LIFT-FAN PROPELLED FLIGHT, COMBINED WITH CONVERSION FROM THE VTOL MODE TO THE CTOL MODE AND FLIGHT IN THE PURELY CONVENTIONAL MODE. THE XV-5A IS AN ALL-METAL, TWIN ENGINE, GAS-PROPELLED, SUBSONIC, TRI-FAN, TRICYCLE LANDING GEAR, VTOL/CTOL AIRCRAFT. IT IS 49.92 FT. LONG. ITS WINGSPAN IS 29.83 FT., AND ITS HEIGHT TO THE TOP OF THE VERTICAL STABILIZER IS 14.75 FT. IT IS POWERED BY TWO J85-5B TURBOJET ENGINES. ITS TWO X363-5 WING FANS (LIFT) ARE 62.5 IN. IN DIAMETER. ITS X373-A NOSE FAN (PITCH CONTROL, AND LIFT) IS 36 IN. IN DIAMETER AND IS LOCATED IN THE NOSE AHEAD OF THE COCKPIT. ALL FANS ARE OPERATED BY DIVERTING ENGINE EXHAUST GASES THROUGH CROSSOVER DUCTS TO THE TIP TURBINES ON THE RIMS OF THE FANS. THRUST LOUVERS BELOW THE FANS CONTROL THE THRUST GENERATED BY THE REVOLVING FANS AND EXHAUST GASES. MODIFICATIONS SUGGESTED AS A RESULT OF TESTS ARE BEING MADE AND POSSIBLE MILITARY APPLICATIONS OF LIFT-FAN PRINCIPLES OF PROPULSION TO HEAVY AIRCRAFT ARE BEING MADE. (AUTHOR)
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL #20407

AD-482 425 1/3
LTV VOUGHT AERONAUTICS DIV-LING-TEMCO-VOUGHT INC DALLAS
TEX

XC-142A VTOL TRANSPORT PROGRAM. (U)

DESCRIPTIVE NOTE: MONTHLY PROGRESS REPT. NO. 25, FOR JAN 64.
JAN 64 32P
CONTRACT: AF 33(657)-7668

UNCLASSIFIED REPORT

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, TRANSPORT PLANES), DESIGN, SCHEDULING, TEST METHODS,
FLIGHT TESTING, AIRPLANE MODELS, TEST EQUIPMENT,
FLIGHT CONTROL SYSTEMS, AIRFRAME, VIBRATION,
EJECTION SEATS, SPARE PARTS, GROUND SUPPORT
EQUIPMENT, AIR FORCE TRAINING, AIR FORCE
PROCUREMENT, ASSEMBLING, AIRCRAFT EQUIPMENT,
GROUND EFFECT (U)
IDENTIFIERS: C-142 AIRCRAFT (U)

XC-142A VTOL TRANSPORT PROGRAM.

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UNCLASSIFIED /20407
AD-486-371 1/3
LTV VOUGHT AERONAUTICS DIV LING-TEMCO-VOUGHT INC DALLAS TEX

XC-142A VTOL TRANSPORT PROGRAM (U)

DESCRIPTIVE NOTE: MONTHLY PROGRESS REPT. NO. 50 FOR FEB 66

FEB 66 16P

CONTRACT: AF 33(657)-7868

UNCLASSIFIED REPORT

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, TRANSPORT PLANES), RESEARCH PROGRAM ADMINISTRATION, SCHEDULING, TRANSMISSIONS, TILT WINGS, FLIGHT TESTING, TIME, TAXIING, TAKE-OFF, HOVERING, WATER, RUNWAYS, RUBBER COATINGS, MEMBRANES, LANDING MATS, ACTUATORS, DE-ICING SYSTEMS, THRUST, PROPELLERS(AERIAL) (U)

IDENTIFIERS: C-142 AIRCRAFT (U)

A TOTAL OF 141 FLIGHTS AND 20.5 FLIGHT HOURS WERE ACHIEVED. THESE FLIGHTS INCLUDED TAXI RUNS AND STOL OPERATIONS WITH WATER ON THE RUNWAY, THE FIRST VERTICALCIRCUIT AT NIGHT, STOL PASSES AND HOVER OVER WATER, OFF-RUNWAY TESTS VERTICAL LANDINGS ON A RUBBERIZED MEMBRANE AND STOL AND HOVER WORK OVER FORWARD AREA LANDING MATS. THE CATEGORY 1 FLIGHT TOTAL REMAINED AT 191 FLIGHTS AND 136 HOURS AND 25 MINUTES OF FLIGHT TIME WHILE THE CATEGORY 2 FLIGHTS NUMBERED 46 FOR 54 HOURS AND 24 MINUTES OF FLIGHT TIME. TOTAL TIME ON THE FOUR AIRCRAFT AMOUNTED TO 237 FLIGHTS FOR 190 HOURS AND 49 MINUTES. (U)
UNCLASSIFIED

MONTHLY PROGRESS REPT. NO. 48 FOR DEC 65

UNCLASSIFIED REPORT

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES, TRANSPORT PLANES), PERFORMANCE (ENGINEERING), FLIGHT TESTING, TURBOPROP ENGINES, ACOUSTIC PROPERTIES, THRUST, STABILITY, STATICS, FLIGHT CONTROL SYSTEMS, AUTOMATIC, SYNCHROS, FLAPS, DUCT INLETS, LEADING EDGE, PROPELLERS (AERIAL), GROUND SUPPORT EQUIPMENT

IDENTIFIERS: C-142 AIRCRAFT

DURING THE MONTH, NO. 1 AIRCRAFT MADE A TOTAL OF 14 FLIGHTS FOR 9 HOURS 33 MINUTES FLIGHT TIME, BRINGING THE TOTAL CUMULATIVE TIME FOR THE AIRCRAFT TO 50 HOURS 16 MINUTES IN 69 FLIGHTS. SIGNIFICANT FLIGHT TEST ACCOMPLISHMENTS DURING THE MONTH INCLUDED ACOUSTICAL MEASUREMENTS, ENGINE JET THRUST DETERMINATION, FLYING QUALITY EVALUATION, OFF-FLAP PROGRAMMING, AND LONGITUDINAL STATIC STABILITY INVESTIGATIONS. AT THE END OF THE REPORTING PERIOD, A TOTAL OF 18 PERSONS HAD FLOWN THE XC-142A AIRCRAFT INCLUDING TWO AIR FORCE GENERAL OFFICERS.
THE OVER-ALL XC-142A PROGRAM WAS ON SCHEDULE. EVALUATION OF THE NEW CONFIGURATION PROPELLERS (2FF) WAS ACCOMPLISHED ON THE NO. 1 AIRCRAFT WITH GOOD RESULTS. IN ADDITION TO PROP STRESS MEASUREMENTS IN THE HOVER AND CONVENTIONAL FLIGHT MODES, THE AIRCRAFT ACCOMPLISHED A NUMBER OF TAXI TESTS OVER SIMULATED BUMPS ON THE RUNWAY. THE REMAINDER OF THE PERIOD WAS DEVOTED TO READYING THE AIRCRAFT FOR DELIVERY. THE NO. 2 AIRCRAFT PROGRESSED SATISFACTORY THROUGH PORTIONS OF REPAIR WORK, LEADING TO DELIVERY. THE NO. 3 AIRCRAFT UNDERWENT CLEAN CONFIGURATION SHAKEDOWN EARLY IN PREPARATION FOR DELIVERY. THE NO. 3 AIRCRAFT REMAINED IN A DORMANT STATUS, PENDING A REPAIR DECISION. THE NO. 4 AIRCRAFT RETURNED TO FLIGHT STATUS. FLIGHTS WERE CONDUCTED PRIMARILY FOR EXTRACTION CHUTE TESTS TO DETERMINE EXTRACTION LOADS AT VARIOUS SPEEDS.
AD-486 999
LTV VOUGHT AERONAUTICS DIVLING-LEMCO-VOUGHT INC DALLAS

XC-142A VTOL TRANSPORT PROGRAM. (U)

DESCRIPTIVE NOTE: MONTHLY PROGRESS REPORT NO. 44 FOR AUG
65, AUG 65 20P HESS, W. J.

CONTRACT: AF 33(657)-766

UNCLASSIFIED REPORT

DESCRIPTORS: (VERTICAL TAKE-OFF PLANE), PERFORMANCE (ENGINEERING), FLIGHT TESTING,
PITCH (MOTION), DESIGN, SPARE PARTS, HANDLING,
CONTROL, MANEUVERABILITY, AIRSPEED, SHORT TAKE-
OFF PLANES, NIGHT FLIGHT, INSTRUMENT LANDINGS,
HOVERING, GROUND SUPPORT EQUIPMENT, AERODYNAMIC
CONTROL SURFACES, WIND TUNNEL MODELS, MODEL TESTS

IDENTIFIERS: C-142 AIRCRAFT

CONTENTS: DEVELOPMENT OF XC-142A AND
FABRICATION OF FIVE PROTOTYPE MODELS;
FABRICATION OF MCKUP; GROUND TEST PROGRAM;
ENGINEERING DATA; DESIGN DATA; FLIGHT
TEST; REPORTS; SPARE PARTS FOR FIVE
PROTOTYPE AIRPLANES; AND DEVELOPMENT AND
FABRICATION OF AGE.
FLIGHTS ON THE NO. 1 AIRCRAFT WERE ACCOMPLISHED TO OBTAIN PROP STRESS DATA AND TO EVALUATE FLYING QUANTITIES WITH THE NEW CONFIGURATION PROPELLERS (2FF). IN ADDITION, THE AIRCRAFT HOVERED OVER, LANDED AND TOOK OFF VERTICALLY FROM A 120 FT DIAMETER HELICOPTER LANDING PAD OF POLYESTER RESIN AND FIBERGLASS. A COMPLETELY SUCCESSFUL AIR DROP PROGRAM WAS CONDUCTED AT UTILIZING THE NO. 4 AIRCRAFT. IN 8 HOURS AND 29 MINUTES OF FLIGHT TIME, THE AIRCRAFT ACCOMPLISHED APPROXIMATELY FORTY DROPS OF VARIOUS KINDS; INCLUDING LOADS RANGING FROM 500 TO 4000 POUNDS, 5 AND 95 PERCENTILE DUMMIES AND 10 PARATROOPERS. METHODS EMPLOYED INCLUDED EXTRACTION, GRAVITY AND "DUMP TRUCK" AT VARIOUS ALTITUDES AND FORWARD SPEEDS FROM ZERO TO 125 KNOTS. THE NO. 5 AIRCRAFT FLEW FROM EAFB TO THE AIRCRAFT CARRIER USS BENNINGTON FOR FLIGHT EVALUATION UNDER VARIOUS CONDITIONS. TWO SERIES OF SUCCESSFUL OPERATIONS WERE CONDUCTED, INCLUDING VERTICAL AND SHORT TAKE-OFFS AND LANDINGS, CONVERSIONS AND RECONVERSIONS AND HOVER WITH WIND OVER THE DECK FROM APPROXIMATELY 12 TO 37 KNOTS.
A supplementary note: Report on study, equations of motion of vertical/short takeoff and landing operational flight/weapon system trainers.

Descriptors: (*helicopters, simulation), (*vertical take-off planes, simulation), aerodynamic characteristics, mathematical models, programming computers, analog computers, digital computers, mathematical analysis

The objective of the report is to present the aerodynamic and dynamic helicopter equations supported by derivations and a comprehensive discussion. The aerodynamic equations are developed through a modified blade element approach although other alternative techniques are considered. The equations are not constrained to a given, or a number of given, flight conditions but are valid for the entire flight regime including hover, transition, autorotation, the effects of varying altitude, ground effects, and blade aeroelasticity in twist. The dynamic derivation develops a set of unabridged and simplified equations of translational and angular rates specifically for a tandem rotor helicopter. The dynamic and aerodynamic effects on the helicopter rotor are combined to produce equations to describe blade acceleration, velocity, and position, while flapping, at chosen points during a rotation. A technique is also presented for greatly simplifying the simulation of a tandem-rotor helicopter which eliminates the necessity of construction detailed, identical mathematical models for the two rotors.
AN INVESTIGATION OF THE OVER WATER ASPECTS OF VTOL AIRPLANES AT HIGH DISC LOADING.

DESCRIPTIVE NOTE: FINAL REPT.
DEC 63
REPT. NO. 012 26
CONTRACT: N0-62-0279

SUPPLEMENTARY NOTE:

IDENTIFIERS: X-19 AIRCRAFT, X-100 AIRCRAFT

TESTS, USING SMALL SCALE MODELS OF THE CURTISS-WRIGHT X-100 AND X-19 AIRCRAFT, HAVE BEEN CARRIED OUT TO INVESTIGATE THE DISTURBANCE AND SPRAY CAUSED BY VTOL AIRCRAFT HOVERING ABOVE WATER. FULL SCALE DISC LOADINGS IN THE RANGE 20 TO 70 LB./SQ. FT. WERE REPRESENTED. CORRELATION OF THE MODEL TEST RESULTS WITH FULL SCALE TESTING OF THE X-100 AIRPLANE OVER WATER AT A DISC LOADING OF 23 LB./SQ. FT. AND HEIGHT OF 21 FEET SHOW EXCELLENT AGREEMENT. DOWNWASH EFFECTS ON OBJECTS FLOATING BELOW THE X-19 MODEL WERE ALSO DEMONSTRATED. SPRAY IS SHOWN TO RISE TO CONSIDERABLE HEIGHTS AT THE HIGHER DISC LOADINGS WITH THE MODELS CLOSE TO THE WATER SURFACE, AND FLOATING OBJECTS MAY BE SUBJECTED TO SEVERE BUFFETING UNDER THESE CONDITIONS. (AUTHOR)
APPLICATION OF A MECHANICAL GYROSCOPIC STABILIZER TO VTOL AIRCRAFT.

NOV 63 143P
REPT. NO. 22U490 2
CONTRACT: NOW-62-0819

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*GYRO STABILIZERS, VERTICAL TAKE-OFF PLANES), (*VERTICAL TAKE-OFF PLANES, GYRO STABILIZERS), DESIGN, AERODYNAMIC CHARACTERISTICS, PERFORMANCE (ENGINEERING), RELIABILITY, EQUATIONS, DIFFERENTIAL EQUATIONS, MOTION, DAMPING STABILITY

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZDM07

AO-604 427
MELPAR INC FALLS CHURCH VA

SIMULATION OF HELICOPTER AND V/STOL AIRCRAFT. VOLUME II, V/STOL ANALYSIS REPORT. STUDY, EQUATIONS OF MOTION OF VERTICAL/SHORT TAKE-OFF AND LANDING OPERATIONAL FLIGHT/WEAPON SYSTEM TRAINERS, (U)

SEP 63 119P MCINTYRE, WALTER:

CONTRACT: N61339 1205
MONITOR: NAVTRADEV/CE 1205-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTIONS: (*HELICOPTERS, FLIGHT SIMULATORS), (*VERTICAL TAKE-OFF PLANES, AERODYNAMIC CONFIGURATIONS), TRAINING DEVICES, SIMULATION, SHORT TAKE-OFF PLANES, AERODYNAMIC CHARACTERISTICS, MATHEMATICAL MODELS, TENSOR ANALYSIS, AIRPLANE LANDINGS, SPECIAL PURPOSE COMPUTERS, NAVAL TRAINING (U)

IDENTIFIERS: V/STOL AIRCRAFT, EQUATIONS OF MOTION (U)

THE REPORT PROMOTES AN UNDERSTANDING OF V/STOL ANALYSIS FOR SIMULATION PURPOSES AND DEVELOPS EQUATIONS OF MOTION COMPATIBLE TO EITHER ANALOGUE OR REAL TIME DIGITAL SOLUTION. A GENERAL SET OF EQUATIONS OF MOTION ARE DEVELOPED IN WHICH AXIS SYSTEMS AND AERODYNAMIC COEFFICIENTS ARE MINIMIZED. EQUATIONS OF MOTION ARE THEN DEVELOPED FOR FIVE DIFFERENT V/STOL AIRCRAFT WHEREIN THE NEED FOR ADDITIONAL AXIS SYSTEMS AND AERODYNAMIC COEFFICIENTS FOR A PARTICULAR V/STOL CONFIGURATION IS DEVELOPED. (AUTHOR) (U)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO: /20X0/

AU-607 737
MELPAR INC FALLS CHURCH VA

SIMULATION OF HELICOPTER AND V/STOL AIRCRAFT, VOLUME
III: PART I: COMPUTATIONAL METHODS ANALOG STUDY,
EQUATIONS OF MOTION OF VERTICAL/SHORT TAKE-OFF AND
LANDING OPERATIONAL FLIGHT/WEAPON SYSTEM
TRAINERS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAY 64 23UP CASTLE, R. A.; GRAY, A. L.; I
MCINTYRE, WALTER I
CONTRACT: N61339 1205
MONITOR: NAVTRADEVCEN, 1205 3

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTES:

DESCRIPTORS: (HELIICOPTERS, SIMULATION), (VERTICAL
TAKE-OFF PLANES, SIMULATION), (EQUATIONS, MOTION),
PROGRAMMING (COMPUTER), MATHEMATICAL MODELS, ANALOG
COMPUTERS, TILT WINGS, SHORT TAKE-OFF PLANES, AIRPLANE
LANDINGS, WEAPON SYSTEMS, TRAINING DEVICES, NAVAL
TRAINING, AERODYNAMIC CHARACTERISTICS, FLIGHT
SIMULATORS

THIS REPORT DEMONSTRATES METHODS OF MECHANIZING THE
EQUATIONS OF MOTION OF HELICOPTERS AND V/STOL
AIRCRAFT BY THE USE OF ANALOG COMPUTING EQUIPMENT.
THE EQUATIONS OF MOTION OF THESE AIRCRAFT ARE
PRESENTED IN NAVTRADEVCEN TECHNICAL REPORTS 1205-
1, -2 (AD-601 022, AD-602 427), AND THIS REPORT
ASSUMES A KNOWLEDGE OF SUCH EQUATIONS BY THE READER.
THE REPORT REVIEWS AND DISCUSSES CRITERIA FOR THE
SELECTION OF ANALOG COMPUTER TYPE AS 60 CYCLE AND 400
CYCLE, AND CHOICE OF CARRIER, AS WELL AS SPECIFIC
COMPUTER COMPONENTS. A HELICOPTER AND A TILT WING
V/STOL ARE SELECTED FOR COMPUTER MECHANIZATION AND
THE PRESENTATION OF COMPUTER FLOW DIAGRAMS WHICH MAY
BE TYPICAL COMPUTER DIAGRAMS USED IN THE ANALOG
SIMULATION OF SUCH AIRCRAFT ARE DISCUSSED.
(AUTHOR) (U)

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UNCLASSIFIED /Z0X07
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO: /ZUM07

AD-60/738

MELPAR INC FALLS CHURCH VA

SIMULATION OF HELICOPTER AND V/STOL AIRCRAFT. VOLUME III, PART II. COMPUTATIONAL METHODS DIGITAL STUDY, EQUATIONS OF MOTION OF VERTICAL/SHORT TAKE-OFF AND LANDING OPERATIONAL FLIGHT/WEAPON SYSTEM TRAINERS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT., AUG 64 120P TREGUB, BURTON G. COFFEE, MERLIN P. RUSSELL, C. E.; CONTRACT: N61339 1205; MONITOR: NAVTRADEVCEN, 1205 3

UNCLASSIFIED REPORT


DESCRIPTORS: (*HELICOPTERS, SIMULATION), (*VERTICAL TAKE-OFF PLANES, SIMULATION), (*EQUATIONS, MOTION), PROGRAMMING (COMPUTERS), MATHEMATICAL MODELS, DIGITAL COMPUTERS, TILT WINGS, SHORT TAKE-OFF PLANES, AIRPLANE LANDINGS, WEAPON SYSTEMS, TRAINING DEVICES, NAVAL TRAINING, AERODYNAMIC CHARACTERISTICS, FLIGHT SIMULATORS (U)

THIS REPORT WAS WRITTEN WITH THE PURPOSE OF DEMONSTRATING THE METHODS OF MECHANIZING THE EQUATIONS OF MOTION OF HELICOPTERS AND V/STOL AIRCRAFT BY DIGITAL COMPUTING EQUIPMENT. THE REPORT IS BASED ON THE MECHANIZATION OF THE FINAL EQUATIONS DEVELOPED IN VOLUMES I AND II OF THIS REPORT AND ASSUMES A KNOWLEDGE OF THEM. A GENERAL TREATMENT OF MATHEMATICAL METHODS OF ANALYSIS AND OF DIGITAL COMPUTER TECHNIQUES IS PRESENTED. THE MATHEMATICAL MODELS DEVELOPED IN VOLUMES I AND II FOR HELICOPTERS, BOTH SINGLE AND TANDEM ROTOR, AND FOR V/STOL AIRCRAFT ARE PRESENTED IN A DIGITALLY APPLICABLE FORM. RECOMMENDATIONS ARE GIVEN FOR COMPUTER MEMORY SIZE AND FOR COMPUTER SOPHISTICATION BASED ON THE FINDINGS OF THE STUDY REPORTED. (AUTHOR) (U)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZUM07

AU-608 18b
DYNASCIENTES CORP FORT WASHINGTON PA

DOWNWASH IMPINGEMENT DESIGN CRITERIA FOR VTOL AIRCRAFT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. FOR JUL 63-MAR 64.
AUG 64 137P GEORGE, M. M.; PERLMUTTER, A. A.; BUTLER, L. J.;
REPT. NO. DCM-139
CONTRACT: DA49 177AMC6ST
TASK: ID121401A14129
MONITOR: TRECQ, TR64 48

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, DESIGN),
(*DOWNWASH, VERTICAL TAKE-OFF PLANES), TERRAIN,
PARTICLES, INHIBITION, VISION, FIUTS, DAMAGE, JETS,
PERFORMANCE (ENGINEERING), AVIATION ACCIDENTS,
PROPELLERS (AERIAL), PRESSURE (U)

THE OBJECTIVE OF THE PROGRAM WAS TO UTILIZE
EXISTING DATA FOR THE PREPARATION OF DESIGN CHARTS
FOR VTOL AIRCRAFT TO AID IN THE ESTABLISHMENT OF
AIRCRAFT DESIGNS THAT WILL ALLEVIATE THE ADVERSE
OPERATIONAL CONDITIONS RESULTING FROM DOWNWASH
IMPINGEMENT ON TERRAIN. SPECIFIC AREAS OF
INVESTIGATION INCLUDED PARTICLE ENTRAINMENT AND
INGESTION AND THEIR EFFECT ON PILOT VISION, AIRCRAFT
DAMAGE, PERSONNEL INJURY, AND AIRCRAFT SIGNATURE.
METHOIDS TO QUANTITATELY PREDICT OPERATIONAL
CONDITIONS RESULTING FROM DOWNWASH IMPINGEMENT OF A
VTOL AIRCRAFT ARE PRESENTED. (AUTHOR) (U)
UNCLASSIFIED

THEORETICAL AND EXPERIMENTAL STUDIES OF IMPINGING UNIFORM AND NONUNIFORM JETS, (U)

AUG 64 102P BRADY, W. GORDON; LUDIG; GARY

REPT. NO. CAL-TG-1810-S-1

CONTRACT: DA44-177AMC187

TASK: 101214U1A14129

MONITOR: TRECOM, TR64 42

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: CONTINUATION OF CONTRACT DA44 177TC782. SEE ALSO AD-408 669.

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANE, DOWNWASH), (JETS, FLUID FLOW), IMPPELLERS, DUCTED FANS, BOUNDARY LAYER, VELOCITY, EXHAUST NOZZLES, BOUNDARY LAYER TRANSITIONS, MATHEMATICAL ANALYSIS, EXPERIMENTAL DATA, MATHEMATICAL MODELS, THEORY, VORTICES, ITERATIVE METHODS, AERODYNAMIC CHARACTERISTICS (U)

IDENTIFIERS: IBM 704 (U)

THE RESULTS OF AN EXPERIMENTAL INVESTIGATION OF THE FLOW UNDER A NORMALLY IMPINGING NONUNIFORM JET ARE PRESENTED. THE JET VELOCITY PROFILE WAS DESIGNED TO BE REPRESENTATIVE OF ROTORS AND DUCTED FANS. THE JET WAS TESTED AT DISTANCES FROM THE GROUND OF 4, 2, AND 1/2 NOZZLE DIAMETERS. AN APPROXIMATE ANALYSIS WHICH USES AN EMPIRICAL RELATION FOR RADIAL MASS FLOW NEAR THE GROUND IS USED TO CALCULATE THE PROPERTIES OF THE FLOW ALONG THE GROUND AT RADIi LARGE ENOUGH SO THAT THE PRESSURE GRADIENT IS APPROXIMATELY ZERO. A METHOD OF CALCULATING THE PROPERTIES OF THE FLOW IN AN INVISID, NORMALLY IMPINGING, UNIFORM JET HAS BEEN FORMULATED. THE FORMULATION IS APPLICABLE FOR ALL DISTANCES BETWEEN THE JET NOZZLE AND THE GROUND. SOLUTIONS HAVE BEEN OBTAINED FOR JETS AT NOZZLE-TO-GROUND DISTANCES OF 1/4 AND 1 JET DIAMETERS. THE MATHEMATICAL MODEL USED WAS BASED ON A VORTEX-SHEET REPRESENTATION, AND SOLUTIONS WERE OBTAINED BY MEANS OF AN ITERATIVE TECHNIQUE USING AN IBM 704 DIGITAL COMPUTER. GOOD AGREEMENT WAS OBTAINED WITH EXPERIMENTAL GROUND-PLANE AND JET-CENTERLINE PRESSURE DISTRIBUTIONS, AND WITH NOZZLE-EXIT VELOCITY PROFILES. (U)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO: /ZDM07

AD-614 927
LING-TEMCO-VOUGHT INC DALLAS TEX LTV Vought Aeronautics
DIV

DATA REPORT FOR LTV LOW SPEED WIND TUNNEL TEST NUMBER
172; TEST OF HIGH MASS RATE Vectored Propulsion Flow
Model.

FEB 65 1985 MEHTAUGH, L J JR;
REPT. NO. Z-6310/5R-2172
CONTRACT: 1AJ1 124ARU 0262
PROJ: 2260E
MONITOR: AROJ, 5260J

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DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, WIND TUNNEL
MODELS), (*WIND TUNNEL MODELS, VERTICAL TAKE-OFF
PLANES), WIND TUNNELS, TESTS, DATA, LIFT, ROLL, PITCH
MOTION, DRAG, ANGLE OF ATTACK, AERODYNAMIC
CHARACTERISTICS, AERODYNAMIC CONFIGURATIONS, AERODYNAMIC
LOADING, THRUST VECTOR CONTROL SYSTEMS, PROPULSION, GAS
FLOW (U)

THE WIND TUNNEL DATA RESULTING FROM A LOW SPEED
WIND TUNNEL TEST OF A SEMI-SPAN MODEL OF A CLOSE
SUPPORT, VTOL AIRCRAFT IS PRESENTED. THE MODEL
FEATURED AN INTEGRATED PROPULSION/LIFTING SURFACE
SYSTEM AS WELL AS VERTICAL AND HORIZONTAL TAILS
LOCATED ON AN AFT, WING TIP EXTENSION. THE
PROPULSION SYSTEM EXHAUST FLOW, WHICH IS SIMULATED
WITH COLD AIR, EXHIBITS OVER THE WING TRAILING EDGE
FLAP (FLAP JET) AND OUT OF THE LOWER SURFACE OF
THE WING (WING BOX JET). THE EXHAUST FLOWS CAN
BE INDEPENDENTLY VECTORED THROUGH 90 DEGREES WITH
RESPECT TO THE WING CHORD PLANE. THE TEST DATA ARE
PRESENTED IN THE FORM OF LIFT AND ROLLING MOMENT
COEFFICIENTS AS FUNCTIONS OF ANGLE OF ATTACK, AND
DRAG AND PITCH MOMENT COEFFICIENTS AS FUNCTIONS OF
LIFT COEFFICIENT. THE COEFFICIENT DATA ARE GIVEN
WITH AND WITHOUT THE DIRECT THRUST CONTRIBUTION
INCLUDED. THE STATIC THRUST DATA ARE GIVEN IN THE
FORM OF LIFT, DRAG, PITCHING MOMENT AND ROLLING
MOMENT AS FUNCTIONS OF ANGLE OF ATTACK. NO
ANALYSIS OF THE DATA IS PRESENTED. (AUTHOR) (U)

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UNCLASSIFIED /ZDM07
AN ANALYSIS OF SELECTED PORTIONS OF THE DATA
RESULTING FROM A LOW SPEED WIND TUNNEL TEST OF A
SEMI-SPAN MODEL OF A VTOL AIRCRAFT IS PRESENTED.
THE MODEL FEATURES AN INTEGRATED PROPULSION/LIFTING
SURFACE SYSTEM AS WELL AS A HORIZONTAL TAIL LOCATED
ON AN AFT, WING TIP EXTENSION. THE PROPULSION
SYSTEM FLOW, SIMULATED WITH CHORD LINE, EXHAUSTS OVER
THE WING TRAILING EDGE FLAP (FLAP JET) AND OUT OF
THE LOWER SURFACE OF THE WING (WING BOX JET).
THE EXHAUST FLOWS CAN BE INDEPENDENTLY VECTORED
THROUGH 90 DEGREES. FORCE AND MOMENT DATA ARE
PRESENTED FOR BOTH STATIC AND FORWARD FLIGHT
CONDITIONS. SOME COMPARISON WITH THEORETICAL
PREDICTIONS ARE PRESENTED. PORTIONS OF THE DATA
ARE SHOWN WITH THE DIRECT THRUST COMPONENTS REMOVED.
THE RESULTS OF THIS ANALYSIS SHOW THAT: (1)
THE OUTBOARD LOCATION OF THE HORIZONTAL TAIL
PROVIDES A REDUCTION IN AIRPLANE INDUCED DRAG, (2)
A SIGNIFICANT PORTION OF THE THEORETICAL JET FLAP
EFFECT IS OBTAINED WITH THE WING BOX JET DIRECTED
PARALLEL TO THE WING CHORD PLANE; (3) A REDUCED
JET FLAP EFFECT IS AVAILABLE WITH DEFLECTIONS OF THE
WING BOX JET AWAY FROM THE WING CHORD PLANE,
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0407

AD-616 650
UNITED AIRCRAFT CORP NORWALK CONN NORDEN DIV

UNIVERSAL CONTACT ANALOG DISPLAY (UCAU) RESEARCH, PHASE I: SYSTEMS ANALYSIS,

DESCRIPTIVE NOTE: TECHNICAL PROGRESS REPT., APR 65 112P WILLIAMS, PETER;
REPT. NO. 1161-R-0011
CONTRACT: NONR44990

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTIONS: (*FLIGHT INSTRUMENTS, SPECIFICATIONS),
(*VERTICAL TAKE-OFF PLANES, FLIGHT INSTRUMENTS),
(*TELEVISION DISPLAY SYSTEMS, FLIGHT INSTRUMENTS),
DESIGN, SYSTEMS ENGINEERING, ANALOG SYSTEMS,
SONAR, CARRIER LANDINGS, HOVERING, ROTARY WINGS,

THE RESULTS ARE PRESENTED OF THE SYSTEMS ANALYSIS PHASE OF THE UNIVERSAL CONTACT ANALOG DISPLAY (UCAU) RESEARCH PROGRAM, INITIATED IN JUNE 1964. THE GOAL OF THIS RESEARCH IS THE DEVELOPMENT OF DESIGN SPECIFICATIONS FOR A UNIVERSAL RASTER-SCAN TV FLIGHT INSTRUMENT SUITABLE FOR USE IN FIXED-WING, ROTARY-WING, AND VTOL AIRCRAFT. INFORMATION PARAMETERS WERE IDENTIFIED AND QUANTIFIED BY MEANS OF A SYSTEMATIC ANALYSIS OF AIRCRAFT PERFORMANCE AND FLIGHT INFORMATION REQUIREMENTS. MISSION SEGMENTS, CONSISTING OF COMMON FLIGHT MANEUVERS, WERE DEFINED AS A RESULT OF MISSION ANALYSES. LOOP DIAGRAMS ARE CONFIGURED FOR FIXED- AND ROTARY-WING AIRCRAFT INCORPORATING LINEAR TRANSFER FUNCTIONS. AIRCRAFT RESPONSE CRITERIA ARE DEVELOPED BASED ON A COMBINATION OF MILITARY HANDLING QUALITY SPECIFICATIONS AND PILOT OPINION REPORTS. DISPLAY AUGMENTATION REQUIREMENTS WERE SPECIFIED. TOTAL DISPLAY INFORMATION REQUIREMENTS FOR FLIGHT CONTROL, PROPULSION SYSTEMS, AND SPECIAL MISSION PARAMETERS WERE ESTABLISHED.
A VTOL model incorporating a lifting fan mounted vertically in the fuselage was tested in the M* 1. T. WRIGHT BROTHERS WIND TUNNEL TO EXAMINE THE VARIATIONS OF THE PITCHING MOMENT AND LATERAL FORCES WITH CHANGES IN THE ANGLE OF ATTACK AND FORWARD VELOCITY. THE MODEL WAS TESTED AT ANGLES OF ATTACK BETWEEN -90 DEGREES, BUT THE RESULTS WERE CONSIDERED RELIABLE ONLY UP TO +45 DEGREES DUE TO STALLING OF THE MODEL FAN BLADES. MOMENT WAS FOUND TO BE UNSTABLE BETWEEN THE MEASURED ANGLES OF ATTACK FROM -45 DEGREES TO +10 DEGREES, INCREASING MODERATELY AS ANGLE OF ATTACK INCREASED. AN INCREASE IN THE RATIO OF FORWARD VELOCITY TO FAN EFFLUX VELOCITY ALSO PRODUCED AN INCREASED MOMENT. A THEORY DEVELOPED BY A. R. KRIEBEL BASED UPON A FOURIER ANALYSIS OF THE VORTEX DISTRIBUTION ON A THIN CYLINDRICAL DUCTED FAN WAS EMPLOYED TO PREDICT THE RESULTS OF THE EXPERIMENT. CONSIDERING THE SIMPLIFYING ASSUMPTIONS USED IN THE THEORY, THE CORRELATION WAS FOUND TO BE REASONABLY GOOD EXCEPT AT HIGH RATIOS OF FREE STREAM TO FAN EFFLUX VELOCITY. AT THESE RATIOS, AN UNCOMPENSADED LOW PRESSURE AREA AFT OF THE EXHAUST DUCT RESULTED IN CONSIDERABLY ERRONEOUS PREDICTIONS. THRUST GENERALLY INCREASED WITH ANGLE OF ATTACK AND VARIED WITH THE VELOCITY RATIO, THE VARIATION BEING RELATED TO THE SIGN OF THE ANGLE OF ATTACK. (AUTHOR)
DESCRIBITVE NOTE: DATA RPT.
Jul 65 20UP
DAVIDSON, J. K.
REPT. NO. 2-531U/5R-2217
CONTRACT: DA31 1244ARU 0262
PROJ: ARU 02620E
MONITOR: AROD 5260:5

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AVAILABILITY: MICROFICHE ONLY AFTER ORIGINAL COPIES EXHAUSTED.
SUPPLEMENTARY NOTE: AVAILABLE ONLY FOR REFERENCE USE AT DDC FIELD SERVICES; COPY IS NOT AVAILABLE FOR PUBLIC SALE.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES; MODEL TESTS), (*PROPULSION, VERTICAL TAKE-OFF PLANES), THRUST, LIFT, PITCH (MOTION), WIND TUNNEL MODELS, TAILS (AIRCRAFT), TRAILING CONTROL SURFACES, ROLL, DRAG, ANGLE OF ATTACK, THRUST VECTOR CONTROL SYSTEMS, GRAPHICS


(AUTHOR)
A SUMMARY OF THE DESIGN OF THE XV-9A HOT CYCLE RESEARCH AIRCRAFT IS PRESENTED. A DISCUSSION OF THE CONCEPTS UTILIZED IN DESIGN AND ADDITIONAL INFORMATION RELATING TO CONFIGURATION, WEIGHT AND BALANCE, PERFORMANCE, STABILITY AND CONTROL, DYNAMICS, AND STRUCTURAL CHARACTERISTICS ARE PRESENTED. (AUTHOR)
A qualitative discussion of the stability and control of VTOL aircraft during hover (out of ground effect) and transition.

A survey of the latest available literature was made in order to qualitatively discuss stability and control problems of vertical takeoff and landing (VTOL) aircraft during hover (out of ground effect) and the transition to level flight. Modes of propulsion and methods of performing the transition maneuver are discussed. Comparisons are made of the various methods utilized for providing control forces at zero and very low speeds. The need for quantitative control power requirements and handling qualities criteria is presented. The instability of VTOL aircraft while hovering is discussed, as are the basic reasons for the poor damping characteristics at low speeds. Problems which have been encountered to date with research aircraft and which are peculiar to a given VTOL mode are discussed by mode. The need for automatic stabilization and precision instrumentation requirements are presented. (Author)
A fundamental study is presented of the effects of vehicle size on handling qualities of jet and helicopter-type VTOL aircraft at hover and low speeds, size being defined by the characteristic linear dimension. The effects of size on vehicle handling qualities capability and pilot-vehicle compatibility are developed. Consideration is given to the pilot as an adaptive nonlinear servo. The study indicates: (1) control power/ inertia and damping/inertia tend to decrease with size; (2) except for tail rotor helicopters in yaw, final angular rates are relatively invariant with size; (3) characteristic time to reach final angular rate increases with size; (4) linear accelerations and motions are nearly invariant with size; (5) effects of external disturbances and trim changes with speed on jet VTOL vehicles decrease at least as rapidly as control power/inertial.
EFFECTS OF WEIGHT, INERTIA, AND VELOCITY ON CONTROL POWER REQUIREMENTS FOR VTOL AIRCRAFT.

DESCRIPTIVE NOTE: MASTER'S THESIS, AUG 65 7IP ROMINE, BYRON HARL

SUPPLEMENTARY NOTE:

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES), STABILIZATION SYSTEMS, POWER, STABILITY, CONTROL SYSTEMS, HEIGHT, VELOCITY, ROLL, AILERONS

IDENTIFIERS: VZ-4 AIRCRAFT

THE PILOT-VEHICLE SYSTEMS ANALYSIS IS APPLIED TO THE PROBLEM OF DETERMINING THE EFFECTS OF GROSS WEIGHT, INERTIA, AND VELOCITY ON THE STABILIZATION CONTROL POWER REQUIREMENTS FOR THE SINGLE-LOOP ROLL CONTROL SYSTEM OF A DOAK VZ-4 VTOL AIRCRAFT. THE AIRCRAFT IS SUBJECTED TO RANDOM ROLL INPUTS IN THE FORM OF ATMOSPHERIC DISTURBANCES. ONLY THE CONTROL POWER REQUIRED TO STABILIZE THE AIRCRAFT ROLL ANGLE BY THE PILOT'S USE OF AILERONS ALONE IS CONSIDERED. THE OPEN-LOOP GAIN OF THE SYSTEM IS DETERMINED BY MAXIMIZING THE CLOSED-LOOP DAMPING RATIO. THERE ARE NO SIGNIFICANT DIFFERENCES IN THE STABILIZATION CONTROL POWER REQUIREMENTS AT THE GROSS WEIGHT CONDITIONS ANALYZED. INCREASED MOMENTS OF INERTIA DO NOT DRIVE THE SYSTEM UNSTABLE, BUT THE CONTROL POWER REQUIREMENTS DECREASE BY ABOUT SIXTY PER CENT AS THE MOMENTS OF INERTIA ARE INCREASED FROM 2800 SLUG-SQ FT TO 3300 SLUG-SQ FT. (AUTHOR)
A general theory for performance calculations was formulated based on a continuous vortex representation along the lines of the classical lifting-line model. As opposed to forward flight, the deformation of the wake is appreciable just behind the propeller, and its determination constitutes the heart of the static problem. A computer program has been developed to calculate both the inflow at the propeller and the induced velocity at any field point for an arbitrary description of the trailing vortex sheets. To approximate the force-free condition imposed on the wake, an initial wake hypothesis derived from the theory of the generalized actuator disk was first used. The resulting comparisons with both detailed and gross measurements were unsatisfactory and a refined hypothesis was derived. The refined wake hypothesis provides a more reasonable representation of the "pitch" of the elements of the deflected trailing vortex sheets as well as the envelope of their trajectories. (Author)
A concept was developed for a portable vertical take-off and landing blast diverting platform which would direct the exhaust blast away from the aircraft and into the air to prevent terrain erosion, hot gas reingestion, ground effects, and signature. The platform would be assembled on site from modular sections, each section containing deflector vanes and topped by a load bearing grid. The feasibility of this concept has been demonstrated by scale model testing. The results indicate that such a platform is efficient in conducting engine exhaust blast and accompanying entrained air way from the aircraft. Significant reduction in thrust loss and lower surface temperature on the aircraft model were observed. (Author)
UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

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

COMPONENT TESTING XV-YA HOT CYCLE RESEARCH AIRCRAFT

DESCRIPTIVE NOTE: SUMMARY REP. 29 SEP 62-15 MAR 65,
NOV 65 1995 DEVEAUX, G. D.;
REPORT NO. HTC-AD-64-26 (385-T-16)
CONTRACT: DA-44-177-AMC-877(T)
TASK: IME219401019403
MONITOR: USAAVLABS, TR-65-38

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTES: SEE ALSO AD-621 684.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, ROTOR
BLADES (ROTOR WINGS)), (ROTOR BLADES (ROTOR
WINGS), TESTS), JET HELICOPTER ROTORS,
FATIGUE (MECHANICS), ROTOR BLADES, FREQUENCY,
JOINTS, RESEARCH PLANES

IDENTIFIERS: V-9 AIRCRAFT

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)
UNCLASSIFIED

UDL REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0M07

AD-627 370 1/2
PRINCETON UNIV NJ DEPT OF AEROSPACE AND MECHANICAL SCIENCES

AN ANALYTICAL STUDY OF THE DYNAMICS OF AIRCRAFT IN UNSTEADY FLIGHT,

UCT 65 234P CURTISS, H. C. JR.
REPT. NO. AEROSPACE/MECHANICAL SCI-709
contract: DA-44-177-AMC-8(T)
TASK: 1D12140141203
MONITOR: USAVLABS, TR-65-48

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (AIRCRAFT, AERODYNAMICS), (VERTICAL TAKE-OFF PLANES, AERODYNAMICS), FLIGHT, DIFFERENTIAL EQUATIONS, DYNAMICS, STABILITY

THE DYNAMIC RESPONSE OF CONVENTIONAL AND VTOL AIRCRAFT WITH VARYING FLIGHT VELOCITY IS INVESTIGATED. IT IS ASSUMED THAT THE DYNAMIC MOTIONS OF AIRCRAFT MAY BE DESCRIBED BY LINEAR DIFFERENTIAL EQUATIONS WHOSE COEFFICIENTS (STABILITY DERIVATIVES) ARE FUNCTIONS OF FLIGHT VELOCITY, AND THEREFORE VARY WITH TIME. PRIMARY EMPHASIS IS PLACED ON THE EVALUATION OF THE GENERAL NATURE OF THE VEHICLE RESPONSE AND ITS DEPARTURE FROM FROZEN SYSTEM (CONSTANT COEFFICIENTS) CHARACTERISTICS.

(IU)

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UNCLASSIFIED /Z0M07
DOWNWASH TESTS OF THE DUAL TANDEM DUCTED PROPELLER VTOL RESEARCH AIRCRAFT CONFIGURATIONS TO EVALUATE ENGINE INLETS, PROTECTION DEVICES AND STUDY AERODYNAMIC INTERFERENCE.

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 120407

UNCLASSIFIED

AD-624 669
KELLETT AIRCRAFT CORP WILLOW GROVE PA

SUPPLEMENTARY REPORT

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, DOWNWASH), (*AERODYNAMIC CONFIGURATIONS, RESEARCH PLANES), ENGINE AIR SYSTEMS COMPONENTS, FLIGHT TESTING, DRAG, THRUST, PROPELLER BLADES, SIMULATION, INTERFERENCE, SAFETY DEVICES

A FULL SCALE HALF-MODEL SIMULATION OF A DUAL TANDEM DUCTED PROPELLER VTOL AIRCRAFT WAS TESTED UNDER THE SEVERE ENVIRONMENT CAUSED BY OPERATION SIMULATING VERTICAL FLIGHT IN CLOSE PROXIMITY TO SAND AND CRUSHED STONE COVERED TERRAIN. FOUR ENGINE INLET PROTECTION DEVICES WERE EVALUATED IN THIS SERIES OF TESTS: A WING-LIKE DEFLECTOR DEVICE WAS TESTED IN TWO CONFIGURATIONS OF DIFFERENT CHORD LENGTHS, A FULL INLET SCREEN AND A BLOCKED HALF-SCREEN INLET PROTECTION DEVICE WERE ALSO TESTED. IT WAS FOUND THAT DUE TO ITS LOCATION IN THE UPLIFT REGION, THE FULL SCREEN TENDED TO COLLECT PARTICLES AND THEREBY AGGRAVATED INLET INGESTION. THE BLOCKED HALF-SCREEN AND THE DEFLECTOR DEVICES SIGNIFICANTLY REDUCED INGESTION, BUT WERE NOT SUFFICIENTLY EFFECTIVE TO POSITIVELY PREVENT ENGINE DAMAGE. TESTS OVER CRUSHED STONE CAUSED SIGNIFICANTLY WORSE INLET INGESTION AND AIRFRAME DAMAGE PROBLEMS THAN THOSE EXPERIENCED OVER SAND. (AUTHOR)
A SURVEY OF V/S10 WIND TUNNEL WALL CORRECTIONS AND TEST TECHNIQUES,

DEC 65  87P       OLCOTT, JOHN M.
REPT. NO. 7269
CONTRACT: NONR-1856(14)
PROJ: NR-212-155,

SUPPLEMENTARY NOTE:

A DISCUSSION OF WIND TUNNEL BOUNDARY CORRECTIONS AS THEY APPLY TO VTOL MODEL TESTING IS PRESENTED. CONVENTIONAL WALL CORRECTION THEORY IS INADEQUATE SINCE IT FAILS TO ACCOUNT FOR BOTH THE PRESENCE OF A HIGHLY DEVELOPED WAKE AND THE TOTAL LIFT ACTING ON THE MODEL. CORRECTION THEORIES THAT DO CONSIDER THE LIFT AND WAKE CHARACTERISTICS OF VTOL DESIGNS GIVE SATISFACTORY RESULTS, PROVIDED THERE IS NO WAKE DISTORTION DUE TO THE INTERFERENCE OF TUNNEL WALLS. BOTH THE HEYSON AND KIRKPATRICK VTOL BOUNDARY CORRECTION THEORIES ARE EXAMINED AND THEIR LIMITATIONS DISCUSSED. A COMPARISON OF FREE AIR AND TUNNEL RESULTS FOR A 1/16TH SCALE NORTH AMERICAN AVIATION TILT WING DESIGN AND A FREE AIR STUDY OF AN EARLY HAMILTON STANDARD XC 142 PROPELLER MODEL ARE DISCUSSED. THE PROPELLER DATA AGREED WITH THEORETICALLY PREDICTED VALUES, BUT DISCREPANCIES, PARTICULARLY IN DRAG FORCE, APPEARED WHEN THE AIRSHIP NORTH AMERICAN AVIATION DATA WERE COMPARED WITH SIMILAR TUNNEL RESULTS. THE EXACT CAUSE OF THE DIFFERENCES WAS NOT DETERMINED, BUT THE IMPORTANCE OF THE VTOL MODEL WAKE IS SUBSTANTIATED. MINIMUM TUNNEL SIZES NECESSARY TO AVOID WAKE IMPINGEMENT AND DISTURBANCE ARE PRESENTED.
WIN TUNNEL TESTS WERE CONDUCTED ON A 1/7 SCALE MODEL OF THE OV-1 AIRPLANE TO DETERMINE THE POWER-OFF DRAG, LIFT, AND PITCHING MOMENT COEFFICIENTS OF THE MODEL AND ITS VARIOUS COMPONENTS. SIGNIFICANT DRAG DIFFERENCES WERE MEASURED BETWEEN PRODUCTION CANOPY AND NACELLE CONFIGURATIONS AND STREAMLINED FUSELAGE AND NACELLE CONFIGURATIONS, BUT ARE NOT CONSIDERED APPLICABLE, NO OTHER SIGNIFICANT DRAG DIFFERENCES WERE MEASURED. (AUTHOR)
UNCLASSIFIED

DOG REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0H07

AD-631 414 1/3 21/5
HUGHES TOOL CO CULVER CITY CALIF AIRCRAFT DIV

GROUND AND FLIGHT TESTS; XV-9A HOT CYCLE RESEARCH AIRCRAFT.

DESCRIPTIVE NOTE: SUMMARY REPT., 1U AUG 64-S FEB 65,
MAR 66 156P PIEPER, C. W., ;
REPT. NO. HTC-AD-66-13,
CONTRACT: DA-45-0177-AMC-877(T)
TASK: IM12401114403,
MONTOR: USAVADS, TH-65-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (GAS TURBINES; THERMODYNAMIC CYCLES);
(VERTICAL TAKE-OFF PLANE; TESTS);
(THERMODYNAMIC CYCLES; HELICOPTER ENGINES);
(HELICOPTER ENGINES; PERFORMANCE [ENGINEERING]);
HELICOPTER ROTORS; FLIGHT TESTING; STRUCTURAL
PROPERTIES; PROPULSION; RESEARCH PLANE;
FEASIBILITY STUDIES; TEST EQUIPMENT;
LOADING [MECHANICS]; COOLING
IDENTIFIERS: V-9 AIRCRAFT

THE PERFORMANCE, STRUCTURAL QUALITIES, AND
FEASIBILITY OF THE HOT CYCLE ROTOR AND PROPULSION
SYSTEM WERE SUCCESSFULLY VERIFIED FOR ALL NORMAL
HELICOPTER FLIGHT MODES. GROUND TESTS CONSISTED OF
PRELIGHT AND TIE-DOWN TESTS, WHICH PROVIDED A
FUNCTIONAL CHECKOUT OF THE AIRCRAFT SYSTEMS AND TEST
INSTRUMENTATION AND A FINAL CHECKOUT OF THE COMPLETED
AIRCRAFT PRIOR TO START OF FLIGHT TESTS. THE 15
HOURS OF FLIGHT TESTING INCLUDED EVALUATION OF
AIRCRAFT AND ROTOR SYSTEM PERFORMANCE, FLIGHT LOADS,
COOLING, AND FLYING QUALITIES IN VARIOUS FLIGHT
MODES. (AUTHOR)
WIN-D-TUNNEL INVESTIGATION OF THE HOVERING, TRANSITION, AND CRUISING PERFORMANCE OF AN ARRESTED ROTOR (TRIDENT) VTOL AIRCRAFT CONCEPT. (U)

DESCRIPTIVE NOTE: FINAL REPT., FEB 66 4JP BRASSEUR, GARY W. MAGUIRE, WILLIAM B. 
REPT. NO. DTMB-2172, DTMB-AERO-1101 
PROJ.: 632-542, UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANE, PERFORMANCE ENGINEERING), HOVERING, ROTARY WINGS, MODEL TESTS, AERODYNAMIC CHARACTERISTICS, WINGS, FLIGHT TESTING (U)

WIN-D-TUNNEL TESTS WERE CONDUCTED TO EVALUATE STATIC STABILITY AND CONTROL CHARACTERISTICS WITH EMPHASIS ON DETERMINING THE MAGNITUDE OF TRANSITION PROBLEMS. EVALUATING THE COMPATIBILITY OF THE COMPETING INTERNAL AND EXTERNAL AERODYNAMIC REQUIREMENTS FOR HIGH STATIC LIFT AND EFFICIENT CRUISING WAS AN ADDITIONAL TEST OBJECTIVE. TEST RESULTS SHOW THAT THE MODEL EXHIBITS A STRONG DIRECTIONAL THRESHOLD THROUGH TRANSITION. THE PATTERN SELECTED FOR ROTOR ARRESTMENT DURING EVALUATION OF THE TRANSITION CHARACTERISTICS WAS NOT ACCEPTABLE ON THE BASIS OF POWER REQUIRED TO SUPPORT VEHICLE WEIGHT OR CONTROL OF TRAJECTORY. THE RESULTS FURTHER INDICATED THAT THE PERFORMANCE POTENTIAL OF THE DUCTED ROTOR -NOZZLE SYSTEM MAY BE LIMITED BECAUSE OF THE STRUCTURAL REQUIREMENTS. MODEL ROTOR DUCT DESIGN, FROM THE STANDPOINT OF INTERNAL AERODYNAMICS, WAS COMPROMISED BY ADDING STRUCTURE TO ACCOMMODATE THE WING BENDING LOADS FOR HIGH-SPEED CRUISING. (AUTHOR) (U)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. /20M07

AD-633 269 1/4 5/8
BELL AEROSYSTEMS CO BUFFALO N Y

APPLICATION OF PILOT-CONTROLLER INTEGRATION
TECHNIQUES TO A REPRESENTATIVE V/STOL AIRCRAFT* (U)

DESCRIPTIVE NOTE: FINAL REPT*,
OCT 65 15&P GAUL JOHN W. ;
REPT* NO. 2226-9U3U01,
CONTRACT: AF 33(615)-1866,
PROJ: AF 8219,
TASK: 821904,
MONITOR: AFFUL, TR-65-200

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES, FLIGHT
CONTROL SYSTEMS), DESIGN, PILOTS, MAN-MACHINE
SYSTEMS, COSTS
IDENTIFIERS: X-22 AIRCRAFT

THE REPORT PRESENTS FINAL RESULTS OF A STUDY OF THE
APPLICATION OF PILOT-CONTROLLER INTEGRATION
(PCI) DESIGN TECHNIQUES TO THE FLIGHT CONTROL
SYSTEM OF A REPRESENTATIVE V/STOL AIRCRAFT.*
UNDER THIS PROGRAM THE VALIDITY OF THE CONCEPT WAS
ESTABLISHED IN THE APPLICATION TO THE X-22A V/
STOL.* IN THIS APPLICATION THE PCI TECHNIQUE
INDICATED THE AREAS OF THE X-22A FLIGHT CONTROL
SYSTEM WHERE MODIFICATIONS WOULD RESULT IN THE
GREATEST IMPROVEMENT TO THE PROBABILITY OF MISSION
ACCOMPLISHMENT. DESIGN MODIFICATIONS WERE MADE AND
AN ITERATION USING THE TECHNIQUE WAS ACCOMPLISHED AND
THE PAYOFF WAS EVALUATED. THE DIGITAL PROGRAM WAS
DEVELOPED AND APPLIED TO THE X-22A HAS GENERAL
APPLICABILITY TO OTHER AIRCRAFT. SEVERAL
IMPROVEMENTS TO THIS PROGRAM AS WELL AS TO THE
DETAILS OF TECHNIQUE APPLICATION ARE SUGGESTED. (AUTHOR)

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UNCLASSIFIED /20M07
UNCLASSIFIED

CDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. Z20407

AD-634 943 1/3 21/5
GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION LAB
DEPT

X353-5B PROPULSION SYSTEM SPECIFICATION. (U)

JAN 62 105P
REPT. NO. SPECIFICATION-112;
CONTRACT: DA-44-177-1C-715;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON VZ-11 LIFT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-
634 944.

DESCRIPTIONS: (1) VERTICAL TAKE-OFF PLANES,
(2) PROPULSION, SPECIFICATIONS, DUCTED FANS,
TURBOJET ENGINES, AIRCRAFT ENGINES, RESEARCH
PLANES, MILITARY REQUIREMENTS (U)
IDENTIFIERS: V-5 AIRCRAFT, X353-5B ENGINE (U)

THIS SPECIFICATION COVERS THE CHARACTERISTICS OF
THE X353-5B CONVERTIBLE V/STOL PROPULSION
SYSTEM INTENDED FOR USE IN A PILOTED FLIGHT RESEARCH
AIRPLANE. THE GENERAL ELECTRIC X353-5b
ENGINE IS A HIGH LIFT-WEIGHT RATIO CONVERTIBLE
ENGINE FOR TURBOJET OPERATION AND AUGMENTED LIFT
OPERATION. THE BASIC X353-5B ENGINE COMPRIS
A TURBOJET ENGINE MODIFIED FOR NON-REHEAT OPERATION,
A TIP-TURBINE LIFT FAN AUGMENTING TURBOJET THRUST FOR
V/STOL LIFT AND PROPELLING THRUSTS, A GAS DIVERTER
VALVE FOR SELECTING ENGINE OPERATING MODE, AND
ASSOCIATED ENGINE CONTROLS AND ACCESSORIES. THE
TWO PART SCROLL ON EACH LIFT FAN PERMITS
INCORPORATION OF THE X353-5B INTO AN AIRPLANE
POWERPLANT CONFIGURATION COMPRISING TWO (2) BASIC
X353-5B CONVERTIBLE ENGINES PNEUMATICALLY COUPLED
SUCH THAT EACH TURBOJET PROVIDES HALF OF THE REQUIRED
DRIVING POWER FOR EACH OF THE LIFT FANS. ROTORS OF
THE TWO LIFT FANS ROTATE IN OPPOSITE DIRECTIONS TO
MINIMIZE GYNOSSCPIC RELATIONS. ALL PERFORMANCE
FIGURES, WEIGHTS, QUANTITIES, ETC., IN THIS
SPECIFICATION ARE GIVEN FOR ONE X353-5B (ONE
TURBOJET ENGINE, ONE FAN, ONE DIVERTER VALVE)
UNLESS SPECIFICALLY STATED OTHERWISE. (U)
UNCLASSIFIED

UICLASSIFIEU

UDL REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /Z0M07

AD-634 944 1/3 21/5
GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION LAB DEPT

X376 PITCH FAN SPECIFICATION.

NUM 62 56P
REPT NO. SPECIFICATION-113,
CONTRACT: DA-44-177-TC-715,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON VZ-11 LIFT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-
634 946.

DESCRIPTORS: (DUCTED FANS, FLIGHT CONTROL SYSTEMS),
(VERTICAL TAKE-OFF PLANES, FLIGHT CONTROL
SYSTEMS), GAS TURBINES, SPECIFICATIONS, TURBOJET
ENGINES, AIRCRAFT ENGINES, RESEARCH PLANES,
PITCH (MOTION)
IDENTIFIERS: V-5 AIRCRAFT, X376 FAN, X353-SB
ENGINES

THIS SPECIFICATION COVERS THE CHARACTERISTICS OF
THE X376 PITCH FAN INTENDED FOR USE IN A
PILOTED FLIGHT RESEARCH AIRPLANE. THE GENERAL
ELECTRIC X376 PITCH FAN IS A HIGH LIFTWEIGHT
RATIO GAS-DRIVEN LIFT FAN FOR SUPPLYING AUGMENTED
CONTROL AND TRIM FORCE IN V/STOL SYSTEMS. THE
X376 PITCH FAN COMPRISSES A SINGLE STAGE, TIP-
TURBINE DRIVEN LIFT FAN SUPPLIED WITH TURBOJET
EXHAUST GAS BLEED THROUGH TWO SEPARATE NOZZLE
SCROLLS. THE DOUBLE SCROLL ARRANGEMENT PROVIDES
SINGLE-ENGINE OPERATING CAPABILITY IN A TWO-ENGINE,
CROSS-DUCTED LIFT PROPULSION SYSTEM.

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UNCLASSIFIED /Z0M07
UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY SEARCH CONTROL NO: /ZOM07

AD-634-415 1/3 21/5
GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION LAB

DEPT

X35J-SB PROPULSION SYSTEM FLIGHTWORTHINESS RATING
TEST. (U)

SUPPLEMENTARY NOTE: REPORT ON VZ-11 LIFT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-
634 944.

DESCRIPTION: (VERTICAL TAKE-OFF PLANES;
PROPOSITION), FLIGHT TESTING, SPECIFICATIONS,
DUCTED FANS, TURBOJET ENGINES, AIRCRAFT ENGINES,
RESEARCH PLANES, TESTS
IDENTIFIERS: V-S AIRCRAFT, X353-SB ENGINES

THIS SPECIFICATION DEFINES THE FLIGHTWORTHINESS
RATING TEST REQUIREMENTS FOR THE X353-SB
CONVERTIBLE, DUCTED LIFT FAN PROPULSION SYSTEM. THE
X35J-SB PROPULSION SYSTEM IS COMPRised OF A
JSB-GE-5 TURBOJET ENGINE, LESS AFTERBURNER, USED
AS A GAS GENERATOR PLUS TWO ADDITIONAL MAJOR
COMPONENTS: A DIVERTER VALVE TO DIRECT THE GAS
FLOW: AND AN X35J-SB LIFT FAN. (U)
GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION LAB DEPT

X376 PITCH FAN FLIGHTWORTHINESS RATING TEST. (U)

DESCRIPTIVE NOTE: REVISED ED.
APR 62 3UP
REPT. NO. SPECIFICATION-115,
CONTRACT: DA-44-177-TC-715,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REVISION OF DOCUMENT SUBMITTED 25 MAR 62. REPORT ON VZ-11 LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634 944/

DESCRIPTIONS: (DUCTED FANS, FLIGHT CONTROL SYSTEMS), (VERTICAL TAKE-OFF PLANES, FLIGHT CONTROL SYSTEMS), FLIGHT TESTING, SPECIFICATIONS, GAS TURBINES, AIRCRAFT ENGINES, RESEARCH PLANES, PITCH (MOTION)

IDENTIFIERS: V-5 AIRCRAFT, X376 FAN

THIS SPECIFICATION DEFINES THE FLIGHTWORTHINESS RATING TEST REQUIREMENTS FOR THE X376, DUCTED, PITCH TRIM CONTROL FAN. THE GENERAL ELECTRIC X376 PITCH FAN IS DESIGNED FOR SUPPLYING AUGMENTED CONTROL AND TRIM FORCE IN V/STOL SYSTEMS. IT IS COMPRISSED OF A SINGLE STAGE, TIP-TURBINE DRIVEN FAN SUPPLIED WITH TURBOJET EXHAUST GAS BLED THROUGH TWO SEPARATED NOZZLE SCROLLS. THE DOUBLE SCROLL ARRANGEMENT PROVIDES SINGLE-ENGINE OPERATING CAPABILITY IN A TWO-ENGINE, CROSS-DUCTED LIFT PROPULSION SYSTEM. (AUTHOR)
DESCRIPTIVE NOTE: REVISED ED.
MAY 62 20P
REPT. NO. SPECIFICATION-116;
CONTRACT: DA-44-177-TC-715;

SUPPLEMENTARY NOTE: REVISION OF DOCUMENT SUBMITTED 15
APR 62. REPORT ON VZ-11 LIFT FAN FLIGHT
RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634, 945.

IDENTIFIERS: V-5 AIRCRAFT, X-353-5B ENGINES

THIS SPECIFICATION DEFINES THE ACCEPTANCE TEST
REQUIREMENTS FOR THE LIFT FAN AND DIVERTER VALUE
COMPONENTS OF THE X353-5B CONVERTIBLE, DUCTED,
LIFT FAN PROPULSION SYSTEM CONFORMING TO
SPECIFICATION NO. 112, (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /20407

AD-634 949 1/3 21/5
GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION LAB
DEPT

X376 PITCH FAN ACCEPTANCE TEST. (U)

DESCRIPTIVE NOTE: REVISED ED.
MAY 62 29P
REPT. NO. SPECIFICATION-117,
CONTRACT: DA-44-177-TC-715,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REVISION OF DOCUMENT SUBMITTED 18
APRIL 1962. REPORT ON VZ-11 LIFT FAN FLIGHT
RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634 949.

DESCRIPTORS: (DUCTED FANS, FLIGHT CONTROL SYSTEMS),
(VEHICAL TAKE-OFF PLANES, FLIGHT CONTROL
SYSTEMS), SPECIFICATIONS, ACCEPTABILITY, TESTS,
TURBOJET ENGINES, AIRCRAFT ENGINES, RESEARCH
PLANES, PITCH(MOTION),
IDENTIFIERS: V-5 AIRCRAFT, X376 FAN (U)

THIS SPECIFICATION DEFINES THE ACCEPTANCE TEST
REQUIREMENTS FOR THE X376, DUCTED, PITCH TRIM
CONTROL FAN CONFORMING TO SPECIFICATION NO. 113. (U)
UNCLASSIFIED

GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

X353-5B PROPULSION SYSTEM FLIGHTWORTHINESS TEST REPORT (PENALTY TESTS). VOLUME I. SUPPLEMENT I. (U)

OCT 63 72P

CONTRACT: DA-44-177-TC-715,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: KEPT ON LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTORS: (OPROPULSION, VERICAL TAKE-OFF PLANES), FLIGHT TESTING, RESEARCH PLANES, TURBOJET ENGINES, CONVERTIBLE PLANES, DUCTED FANS (U)

IDENTIFIERS: V-5 AIRCRAFT, X 353-5B ENGINES (U)

THE REQUIRED 10-HOUR PENALTY TEST TO EVALUATE DESIGN MODIFICATIONS TO THE X353-5B LIFT FAN INLET VANES AND ALUMINUM EXIT LOUVERS WAS COMPLETED IN ACCORDANCE WITH THE SCHEDULE OF TEST RECOMMENDED TO THE ARMY IN THE X353-5B PROPULSION SYSTEM FLIGHTWORTHINESS TEST REPORT. THE TEST WAS COMPLETED ON A SLAVE X353-5B LIFT FAN WHICH WAS ALSO AN ACCEPTANCE TEST VEHICLE. THIS REPORT IS A SUPPLEMENT TO THE X353-5B PROPULSION SYSTEM FLIGHTWORTHINESS TEST REPORT AND DOCUMENTS THE PENALTY TEST AND RESULTS. IT IS SUBMITTED TO THE U. S. ARMY (TRECOM) IN ACCORDANCE WITH SPECIFICATION 114 TO FORM THE BASIS FOR ESTABLISHING A FLIGHTWORTHINESS RATING FOR THE COMPLETE PROPULSION SYSTEM INCLUDING LIFT FAN INLET VANES, ALUMINUM EXIT LOUVERS AND DIVERTER VALVES.

UPON COMPLETION OF THE TEST, THE INSPECTION RESULTS SHOWN ALL LIFT FAN COMPONENTS INCLUDING INLET VANES AND ALUMINUM EXIT LOUVERS TO BE IN SATISFACTORY CONDITION. THE NEW Motor ASSEMBLY TECHNIQUE RECOMMENDED IN THE FWT REPORT AND DESCRIBED IN FRV SPECIFICATION 124 WAS COMPLETELY SUCCESSFUL IN AVOIDING FRETTS. PARTIAL DISASSEMBLY OF THE ROTOR FOLLOWING THE TEST, WITNESSED BY AN ARMY (TRECOM) REPRESENTATIVE, SHOWED ALL OF THE ROTOR HARDWARE TO BE IN EXCELLENT CONDITION. THE XV-5A FLIGHT TYPE DIVERTER VALVE ACTUATION SUCCESSFULLY COMPLETED THE PENALTY TEST PLUS TWO ACCEPTANCE TESTS WITHOUT INCIDENT AND IS IN EXCELLENT CONDITION. (U)
UNCLASSIFIED

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZUM07

AD-634Y51 11/3 1/3
GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION LAB
DEPT

FINISH SPECIFICATION

AUG 62 IJP
REPT. NO. SPECIFICATION-14359-1,
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON VZ-11 LIFT FAN FLIGHT
RESEARCH AIRCRAFT PROGRAM.

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES, AIRCRAFT
FINISHES), SPECIFICATIONS, PROTECTIVE TREATMENTS,
RESEARCH PLANES, FINISHES + FINISHING, COATINGS,
CORROSION INHIBITION, ALUMINUM ALLOYS, MAGNESIUM
ALLOYS, TITANIUM ALLOYS, STEEL, PIPES, ALLOYS,
GLASS TEXTILES

IDENTIFIERS: V-5 AIRCRAFT

THE PURPOSE OF THIS SPECIFICATION IS TO DEFINE THE
FINISHES NECESSARY TO ASSURE ADEQUATE SURFACE
PROTECTION FOR THE MATERIALS USED IN THE ARMY VZ-
11 AIRPLANES (MODEL 143).

UNCLASSIFIED
A program was conducted to determine the feasibility of the augmented jet ejector concept for attaining a VTOL capability for aircraft. During the flight test program, the actual vertical thrust realized was only about 93 percent of that predicted and consequently the aircraft, the XV-4A, had a marginal lift capability. This marginal lift capability severely limited the capability to conduct quantitative data gathering during the flight test program. The report presents the limited quantitative results obtained and a brief summary of the aircraft design, systems, flight test program, VTOL lift improvement program, and small-scale and full-scale wind tunnel programs. The feasibility of the augmented jet ejector concept was demonstrated; however, this concept is not considered to be competitive with other concepts for attaining a VTOL capability. (Author)
UNCLASSIFIED

GROUND VIBRATION TEST RESULTS

APR 66
REPT. NO. 167.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON SV-SA LIFT VAN FLIGHT
RESEARCH AIRCRAFT. SEE ALSO AD-634 949.

DESCRIPTION: (VERTICAL TAKE-OFF PLANES, VIBRATION),
TESTS, RESEARCH PLANES, PERFORMANCE
(ENGINEERING), CAPTIVE TESTS, RESONANCE,
EXPERIMENTAL DATA, MOTION

IDENTIFIERS: V-5 AIRCRAFT

THIS REPORT CONTAINS THE RESULTS OF THE
EXPERIMENTAL INVESTIGATION OF THE STATIC AND DYNAMIC
CHARACTERISTICS OF THE U.S. ARMY XV-SA LIFT
FAN RESEARCH AIRCRAFT AS PERTAINING TO THE
FLUTTER AND VIBRATION EFFORT ON THE XV-SA
AIRCRAFT.
UNCLASSIFIED

AD-635 640 173 2175
GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION LAB DEPT

X-353-5B PROPULSION SYSTEM FLIGHT WORTHINESS TEST REPORT. VOLUME II. (U)

JAN 63 14UP

CONTRACT: DA-44-177-TC-715,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON VZ-11 LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634 950.

DESCRIPTIONS: (*PROPULSION, *VERTICAL TAKE-OFF PLANES), FLIGHT TESTING, RESEARCH PLANES, TURBOJET ENGINES, DUCTED FANS, VALVES, QUALITY CONTROL, DEFECTS (MATERIALS) (U)

IDENTIFIERS: V-5 AIRCRAFT, X353-5B ENGINES (U)

THIS VOLUME OF THE FWT REPORT PRESENTS PHOTOGRAPHS WITH A BRIEF IDENTIFICATION OF HARDWARE CONDITION AND DISCREPANCIES FOUND AFTER COMPLETION OF TESTS DESCRIBED IN SPECIFICATIONS NUMBER 114 AND 115. CERTIFICATES OF INSPECTION ARE INCLUDED. CLEARANCE CHECKS WERE IDENTICAL WITH ORIGINAL ASSEMBLY VALUES. (AUTHOR) (U)
UNCLASSIFIED

DDC REPORT  BIBLIOGRAPHY SEARCH CONTROL NO. /Z0H07

AD-63b-695  1/3
GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION LAB
DEPT

AIRPLANE DETAIL SPECIFICATION. (U)

APR 63 170P
REPT. NO. SPECIFICATION-110A,
CONTRACT: DA-44-177-TC-715,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE; REPT. ON XV-SA LIFT FAN FLIGHT
RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634 943.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES,
SPECIFICATIONS), DESIGN, DUCTED FANS, LIFT,
THRUST ENGINES, RESEARCH PLANES, PROPULSION (U)
IDENTIFIERS: V-5 AIRCRAFT, X353-58 (U)

THIS SPECIFICATION COVERS A MID-WING, LIFT-FAN
POWERED RESEARCH AIRCRAFT. IT SHALL BE PROPELLED
BY TWO G. E. X353-58 PROPULSION SYSTEMS. IT
SHALL BE CAPABLE OF VTOL AND STOL IN THE FAN-
SUPPORTED FLIGHT MODE. THE AIRCRAFT SHALL BE
CAPABLE OF CONVENTIONAL WING-SUPPORTED FLIGHT AT HIGH
SUBSONIC SPEEDS. THE AIRCRAFT SHALL ALSO BE CAPABLE
OF TRANSITION FROM ZERO HORIZONTAL SPEED TO HIGH
HORIZONTAL SPEED AND RETURN THROUGH TRANSITION TO
HOVERING FLIGHT. IT SHALL BE CAPABLE OF
CONVENTIONAL TAKE-OFF AND LANDING. DURING WING-
SUPPORTED FLIGHT, CONVENTIONAL CONTROL SURFACES SHALL
BE UTILIZED. DURING FAN SUPPORTED FLIGHT, CONTROL
SHALL BE ACCOMPLISHED THROUGH MODULATION OF THE
ARFLOW THROUGH THE FANS. (AUTHOR) (U)
DEVELOPMENT OF A METHOD FOR PREDICTING THE PERFORMANCE AND STRESSES OF VTOL-TYPE PROPELLERS. (U)

THE REPORT PRESENTS A THEORETICAL METHOD WHICH ALLOWS THE PREDICTION OF PERFORMANCE AND STRESS CHARACTERISTICS OF A SINGLE VTOL-TYPE OF PROPELLER-WING-NACELLE COMBINATION OPERATING IN VARIOUS FLIGHT CONDITIONS FROM HOVERING THROUGH TRANSITION AND INTO AXIAL FLIGHT. THE METHOD INCLUDES (1) THE EFFECTS OF A DISTORTED WAKE, I. E., THE EFFECTS OF CONTRACTION AND RADIAL AND AXIAL VELOCITY VARIATIONS; (2) THE EFFECTS OF HOVERING CLOSE TO THE GROUND; (3) THE INTERFERENCE EFFECTS FROM A NACELLE AND WING BURIED IN THE PROPELLER SLIPSTREAM. ALSO PRESENTED ARE EXPERIMENTAL THRUST AND TORQUE DATA. HOWEVER, BECAUSE OF THE INSUFFICIENT ACCURACY OF THE EXPERIMENTAL DATA COLLECTED, NO DEFINITE EVALUATION OF THE MODEL IS MADE. (AUTHOR) (U)
UNCLASSIFIED

AD-636 263 1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

WEIGHT ANALYSIS. (U)

NOV 63 19P
REPT. NO. 139;
CONTRACT: DA-49-017-FC-715;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT ON XV-SA LIFT FAN, FLIGHT RESEARCH AIRCRAFT PROGRAM, SEE ALSO AD-635 695.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, WEIGHT), ANALYSIS, RESEARCH PLANES, DESIGN, DUCTED FANS (U)
IDENTIFIERS: V-5 AIRCRAFT (U)

AIRCRAFT WEIGHT INCREASED DURING THE DESIGN AND MANUFACTURING OF THE XV-SA, IN SPITE OF THE CLOSE SURVEILLANCE AND CAREFUL CONSIDERATION OF THE PRINCIPAL PROGRAM OBJECTIVES AND THE BEST WAY TO MEET THE NEEDS OF THE ARMY. THE OVERWEIGHT ESTIMATE OF 335 POUNDS BECOMES SECONDARY WHEN THE ADDITIONAL SYSTEM LIFT (1000 POUNDS) IS CONSIDERED AT REDUCED LOAD FACTOR 3.72 RATHER THAN 4.0; THE ENDURANCE TIMES UNDER VTOL CONDITIONS ARE PREDICTED TO BE IN ACCORDANCE WITH THE SPECIFICATION. (AUTHOR)
The structural analysis of model XV-5A primary flight control systems is presented in this report. The primary flight control systems consist of conventional stick and rudder pedals mechanically connected to rudder, elevator, and to servo actuators, which control the ailerons, wing-fan exit louvers and nose-fan thrust modulator. The structural analysis is primarily intended to provide load information for the major components. The conventional flight control systems were satisfactorily tested in the airplane by applying limit load to the cockpit controls and reacting the load by locking the surfaces. The wing-fan louver and nose-fan modulator actuating mechanisms were satisfactorily proof tested on the simulator. 

(Author)
This report describes the detailed plan for determining the experimental vibration characteristics of the U.S. Army Model XV-SA Lift-Fan Flight Research Airplane.
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM07

AD-630 574 1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

STRUCTURAL ANALYSIS OF WING SECONDARY COMPONENTS. (U)

DEC 63 88P
REPT. NO. 138,
CONTRACT: DA-44-177-TC-71S;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM, SEE ALSO AD-635 69S.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, STRUCTURAL PROPERTIES), (WINGS, VERTICAL TAKE-OFF PLANES), RESEARCH PLANES, STRUCTURAL PARTS, DUCTED FANS, OILEXONS, FLAPS, TRAILING EDGE, DOORS (U)
IDENTIFIERS: V-5 AIRCRAFT

STRUCTURAL ANALYSIS OF THE FLAP, AILERON, WING FAN CLOSURE DOORS, WING TRAILING EDGE, AND WING FITTINGS FOR THE U.S. ARMY XV-SA LIFT FAN RESEARCH AIRCRAFT ARE PRESENTED IN THIS REPORT. FOR EACH COMPONENT, A SUMMARY TYPE ANALYSIS IS PRESENTED PRIMARILY WITH THE INTENT OF GIVING STRUCTURAL CONFIGURATION, FINAL CRITICAL LOADING, AND ASSUMPTIONS MADE. STRUCTURAL PROOF TESTS WERE CONDUCTED SATISFACTORILY ON THE BASIC WING, THE FAN DOORS, FAN FITTINGS, FLAP AND AILERON. (AUTHOR) (U)

66

UNCLASSIFIED /ZOM07
XV-9A HOT CYCLE RESEARCH AIRCRAFT PROGRAM. (U)


UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, ROTARY WINGS), RESEARCH PLANES, PROPULSION, GAS GENERATING SYSTEMS, DESIGN, CAPTIVE TESTS, FLIGHT TESTING

IDENTIFIERS: V-9 AIRCRAFT, HOT CYCLE PROPULSION SYSTEMS, YT-64 GAS GENERATOR

UNCLASSIFIED

UNCLASSIFIED REPORT

BIBLIOGRAPHY SEARCH CONTROL NO. 7/2007

AD-639 299
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND
TECHNOLOGY DEPT

FINAL SYSTEMS ANALYSIS AND FLIGHT SIMULATION REPORT
VOLUME I.

MAR 65 229P
REPT. NO. 157-VOL-1,
CONTRACT: DA-44-177-TC-715,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5 LIFT FAN FLIGHT
RESEARCH AIRCRAFT PROGRAM.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, FLIGHT
SIMULATORS), (RESEARCH PLANES, VERTICAL TAKE-OFF
PLANES), ANALYSIS, TESTS, LIFT

IDENTIFIERS: V-5 AIRCRAFT

A COMPREHENSIVE DOCUMENTATION OF THE FLIGHT
SIMULATOR STUDY IS GIVEN. SIMULATOR INVESTIGATIONS
OF HIGH SPEED CONVENTIONAL FLIGHT ARE DESCRIBED.
THE CONSTRUCTION OF THE XV-5A FLIGHT SIMULATOR
FROM INITIAL DEVELOPMENT OF METHODS FOR INCORPORATION
OF THE AIRCRAFT AERO-PROPULSION CHARACTERISTICS INTO
THE ANALOG COMPUTER TO FINAL CHECKOUT OF THE
COMPLETED HYDRAULIC AND CONTROLS SIMULATOR IS GIVEN.

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UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0H07

AD-639 230 1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

FINAL SYSTEMS ANALYSIS AND FLIGHT SIMULATION REPORT, VOLUME II. (U)

MAR 65 121P
REPT. NO. 157-VOL-2,
CONTRACT: DA-44-177-IC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5 LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-639 229.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, SIMULATION), (*RESEARCH PLANES, VERTICAL TAKE-OFF PLANES), FLIGHT SIMULATORS, FLIGHT TESTING, ANALYSIS, STABILITY, HOVERING, LIFT

IDENTIFIERS: V-5 AIRCRAFT

STABILITY AUGMENTATION (SA) SYSTEM GAINS WERE OPTIMIZED BY PILOTED FLIGHT SIMULATOR EVALUATION OF HOVERING UNDER GUSTY WIND CONDITIONS. WHILE OPERATION OF THE SA SYSTEM POSES NO PROBLEMS DURING TRANSITION, STABILITY AUGMENTATION IS UNNECESSARY ABOVE 40 KNOTS IAS. FOR THE 2,500 FT. HOT DAY CONDITIONS SIMULATED, THE RAPIDITY WITH WHICH A CONSTANT ALTITUDE TRANSITION FROM HOVERING COULD BE ACCOMPLISHED WAS LIMITED BY POWER AVAILABLE AND, AT THE MORE AFT Cg LOCATION WHEN USING A NOSE FAN THRUST REVERSAL CAPABILITY OF 30%, BY LONGITUDINAL TRIM CAPABILITY. AN AUTOMATIC HORIZONTAL TRIM FEATURE HAS BEEN SELECTED FOR TRANSITION WHICH PROGRAMS THE TAIL TO THE FULL 20 DEGREE INCIDENCE LIMIT AT ALL LOUVER VECTOR ANGLES OF 40 DEGREES OR LESS. CONVERSION BETWEEN CONVENTIONAL AND FAN FLIGHT MODES IS ACCOMPLISHED BY TIMED SEQUENCING OF THE WING FAN DOOR OPENING AND HORIZONTAL TAIL INCIDENCE CHANGE AS A FUNCTION OF DIVERTER VALVE MOVEMENT. FAILURE STUDIES HAVE SHOWN THAT UNCUMMANDED TAIL MOTION COULD RESULT IN A DANGEROUS FLIGHT CONDITION. (AUTHOR) (U)

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UNCLASSIFIED /Z0H07
THE U.S. ARMY XV-5A SATISFACTORILY COMPLETED AN EXTENSIVE FLIGHT TEST PROGRAM CONSISTING OF INVESTIGATIONS OF THE HOVERING, TRANSITION AND CONVENTIONAL FLIGHT REGIMES. A TOTAL OF 45 FLIGHT HOURS WERE ACCOMPLISHED DURING WHICH 53 VERTICAL TAKE-OFFS, 72 CONVENTIONAL TAKE-OFFS, 17 FAN FLIGHT MODE TAKE-OFFS AT FORWARD SPEED, AND 74 CONVERSIONS BETWEEN FAN AND CONVENTIONAL FLIGHT MODES WERE PERFORMED. ORIGINAL FLIGHT TEST OBJECTIVES WERE SYSTEMATICALLY ACCOMPLISHED IN SUCCESSFULLY DEMONSTRATING THE FEASIBILITY OF THE LIFT FAN CONCEPT OF FLIGHT. (AUTHOR)
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0M07

AD-639 233 1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND
TECHNOLOGY DEPT

PHASE I FLIGHT TEST RESULTS VOLUME III

MAR 66 248P
REPT. NO. 166-VOL-3,
CONTRACT: DA-44-177-TC-715,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5 LIFT FAN FLIGHT
RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-639 232.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, FLIGHT
TESTING), (*RESEARCH PLANES, FLIGHT TESTING),
GRAPHICS, LIFT, DUCTED FANS, STABILITY, FLIGHT
CONTROL SYSTEMS
IDENTIFIERS: V-5 AIRCRAFT

THE VOLUME CONSISTS OF APPENDIX FIGURES
EXCLUSIVELY.
THE REPORT PRESENTS THE DYNAMIC STABILITY CHARACTERISTICS OF THE U.S. ARMY XV-5A LIFT FAN RESEARCH AIRCRAFT BASED ON THEORETICAL AND EMMPIICAL ESTIMATES OF DYNAMIC STABILITY DERIVATIVES AND STATIC AERODYNAMIC CHARACTERISTICS DERIVED FROM SCALE MODEL WIND TUNNEL TESTS. EXCEPT FOR A PRESENTATION OF THE LIFT FAN NATURAL DAMPING CONTRIBUTIONS TO FLIGHT IN THE LIFT FAN MODE, THE REPORT IS RESTRICTED TO ANALYSIS OF CONVENTIONAL FLIGHT CHARACTERISTICS. INVESTIGATION SHOWS THAT THE DYNAMIC STABILITY CHARACTERISTICS OF THE AIRCRAFT ARE SATISFACTORY FOR THE RESEARCH OBJECTIVES WITHIN THE EXAMINED FLIGHT ENVELOPE. (AUTHOR)
THE XV-SA IS A TWO-ENGINE, TWO-PLACE V/STOL RESEARCH AIRCRAFT WITH A DESIGN GROSS WEIGHT OF 9200 POUNDS AND AN ASPECT RATIO 3.42 WING OF 260 SQUARE FEET. IN CONVENTIONAL FLIGHT MODE THE AIRCRAFT HAS A POWER-OFF FLAPS-DOWN STALL SPEED OF 89 KNOTS AND A DESIGN MAXIMUM SPEED OF 450 KNOTS. IN FAN FLIGHT MODE THE AIRCRAFT CAN SUSTAIN FLIGHT AT ANY SPEED FROM HOVERING TO SPEEDS IN EXCESS OF CONVENTIONAL STALL SPEED. THE REPORT REPRESENTS AN ESTIMATE THE XV-SA AERODYNAMIC CHARACTERISTICS, BASED ON THEORETICAL AND EMPIRICAL CONSIDERATIONS, INCLUDING THE RESULTS OF 420 HOURS OF WIND TUNNEL TESTS OF 1/8 AND 1/6 SCALE MODELS. IN THE FAN FLIGHT MODE, THE AIRCRAFT IS ESTIMATED TO BE STATICALLY UNSTABLE IN PITCH WITH THE MOST AFT CG AT LOW SPEEDS BELOW APPROXIMATELY 70 KNOTS BUT WITH AN INCREASING STABILITY WITH SPEED TO THE CONVERSION SPEED WHERE THE STABILITY LEVEL CORRESPONDS TO THAT FOR CONVENTIONAL FLIGHT. THE AIRCRAFT POSSESS POSITIVE LATERAL AND DIRECTIONAL STATIC STABILITY WITH SIDESLIP AT ALL FORWARD SPEEDS IN FAN-POWERED FLIGHT AND THE EFFECTIVENESS OF THE CONVENTIONAL FLIGHT CONTROL SYSTEM IS SHOWN TO BE UNAFFECTED BY FAN OPERATION. THE EXIT LOUVER CONTROL SYSTEM IS CAPABLE OF PROVIDING THE REQUIRED PROPULSIVE FORCE FOR ACCELERATION OF THE AIRPLANE FROM A MINIMUM OF 10 KNOTS REARWARD TO CONVERSION SPEED AND PROVIDES A THRUST ATTENUATION OF UP TO 22% FOR HOVERING LIFT CONTROL. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM07

AD-64U 338 I/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

FUSELAGE STRUCTURAL ANALYSIS. VOLUME IV. ENGINE INLET, THRUST SPOILER, PITCH FAN LOUVERS. (U)

MAR 65 44P
REPT. NO. 144,
CONTRACT: DA-44-177-TC-719,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES; FUSELAGES), (*RESEARCH PLANES; FUSELAGES), (*FUSELAGES, STRUCTURAL PROPERTIES), AIRCRAFT ENGINE DUCTS, SPOILERS, DUCTED FANS, THRUST, PITCH(MOTION), ANALYSIS
IDENTIFIERS: V-5 AIRCRAFT

THE TEST PROGRAM IS DESIGNED TO DEMONSTRATE INTEGRITY OF AIRCRAFT STRUCTURE AND THE INFORMATION PRESENTED WILL BE USED TO ESTABLISH DETAIL TEST PROCEDURES. THE PARTICULAR FLIGHT AND LANDING LOAD CONDITIONS TO BE SIMULATED DURING TEST HAVE BEEN DERIVED FROM STRUCTURAL ANALYSIS USING THE CONDITIONS SPECIFIED IN THE AIRPLANE STRUCTURAL DESIGN CRITERIA AND HAVE BEEN FOUND CRITICAL. A DETAILED LISTING OF ALL TEST DATA REQUIREMENTS IS GIVEN. THE PARTICULAR LOADS AND REACTIONS TO BE APPLIED TO THE AIRFRAME AND THE MAJOR COMPONENTS ARE ALSO GIVEN. ALONG WITH THE STRENGTH TESTS, SOME ADDITIONAL CONTROL SYSTEM TESTS ARE TO BE PERFORMED AND ARE ALSO DESCRIBED. (AUTHOR)
AN ANALYTICAL STUDY OF FACTORS INFLUENCING THE LONGITUDINAL STABILITY OF TILT-WING VTOL AIRCRAFT. (U)

JUL 66 108P BEPPU, G. CURTISS, H. C. JR.

REPT. NO. 756, CONTRACT: DA-44-177-AMC-8(T), PROJ: DA-1P125901A142 TASK: 1P125901A142-33 MONITOR: USAAVLABS TR-66-53

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES, PITCH(MOTION), STABILITY, ANALYSIS, TILT WINGS, HOVERING, TRANSPORT PLANES) IDENTIFIERS: C-142 AIRCRAFT

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20407

AD-641 371 1/1 1/3
AIR FORCE FLIGHT TEST CENTER EDWARDS AFB CALIF

IMPORTANT VSTOL AIRCRAFT STABILITY DERIVATIVES IN
HOVER AND TRANSITION. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
UCT 66 27P RAMPY, J. H. 1
REPT. NO. FTC-TR-66-29

UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES,
STABILITY), (*AERODYNAMIC CHARACTERISTICS,
VERTICAL TAKE-OFF PLANES), HOVERING, FLIGHT,
SIMULATORS, MATHEMATICAL ANALYSIS, MOTION, TEST
FACILITIES

TO DESIGN BETTER GROUND TEST FACILITIES AND TO
SPECIFY HANDLING QUALITIES CRITERIA, THE AERODYNAMIC
PARAMETERS INVOLVED MUST BE IDENTIFIED. THE PURPOSE
OF THE STUDY WAS TO IDENTIFY THESE PARAMETERS FOR THE
CRITICAL FLIGHT REGIME OF HOVER THROUGH TRANSITION.
BOTH ANALOG AND DIGITAL COMPUTERS WERE USED. THE
PURPOSE OF THE ANALOG SIMULATION WAS TO QUALITATIVELY
ANALYZE THE BEHAVIOR OF VSTOL AIRCRAFT TO CONTROL
INPUTS AND IDENTIFY THE MOST IMPORTANT DERIVATIVES.
TWO TYPICAL VSTOL AIRCRAFT WERE INVESTIGATED.
THE METHOD USED TO DETERMINE THE IMPORTANT
DERIVATIVES WAS THAT OF VARYING THE STABILITY
DERIVATIVES ABOUT SOME BASIC VALUE. THE AMOUNT OF
SIMULATOR RESPONSE IDENTIFIED THE MOST IMPORTANT
DERIVATIVES. NEXT, THE DIGITAL COMPUTER WAS USED
TO AFFIX A MAGNITUDE TO THE RELATIVE IMPORTANCE OF
EACH DERIVATIVE. TO ESTABLISH THE RELATIVE
IMPORTANCE, A SENSITIVITY FACTOR WAS DERIVED. THE
INFORMATION NECESSARY TO CALCULATE THIS FACTOR WAS
OBTAINED FROM A MATHEMATICAL ANALYSIS OF THE
EQUATIONS OF MOTION. THE IMPORTANT DERIVATIVES WERE
IDENTIFIED FOR BOTH LONGITUDINAL AND LATERAL-
DIRECTIONAL MOTION. (AUTHOR) (U)
A series of tests were made with a powered model of the XC-142A airplane hovering over ground and over a water filled tank. Six component measurements were made of the forces and moments acting on the model. Measurements were made of the water spray recirculated thru the outboard propeller and pictures were taken of the spray patterns developed. The force data showed a slight reduction in model normal force when hovering over water rather than the ground. There was considerable scatter in the moment data. Measurements of spray being recirculated thru the prop were found to be tolerable even at the most critical conditions. While there was considerable spray generated by the downwash, it was blown away from the model leaving the model relatively clear of spray. (Author)
UNCLASSIFIED

UNCLASSIFIED REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /20H07

AD-644 191 1/4 1/3
ARNOLD ENGINEERING DEVELOPMENT CENTER ARNOLD AIR FORCE STATION TENN

ON THE RELATIVE IMPORTANCE OF THE LOW SPEED CONTROL REQUIREMENT FOR V/STOL AIRCRAFT. (U)

DEC 66 3UP GOLDBERGER, STEPHEN;

REPT. NO. AEDC-TR-66-205
CONTRACT: AF 40(600)-1200
PROJ: ARO-BB3602

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH ARO, INC., TULLAHOMA, TENN.

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, FLIGHT SPEEDS), (*FLIGHT SPEEDS, FLIGHT CONTROL SYSTEMS), SHORT TAKE-OFF PLANES, STABILIZATION SYSTEMS, DESIGN, AERODYNAMIC CHARACTERISTICS, PILOTS

IDENTIFIERS: V-5 AIRCRAFT

THE CLOSED LOOP DYNAMIC RESPONSE OF A V/STOL AIRPLANE, PILOT, AND AUTOSTABILIZATION SYSTEM WAS STUDIED WITH THE PURPOSE OF DEMONSTRATING WHICH AIRPLANE PARAMETERS ARE MOST IMPORTANT IN DETERMINING THE AIRPLANE'S LOW SPEED FLIGHT CHARACTERISTICS. THE INFLUENCE OF THE STABILITY AUGMENTATION SYSTEM WAS FOUND TO BE SO GREAT THAT THE OTHER PARAMETERS ARE SMALL BY COMPARISON. THE MOST IMPORTANT STABILITY AND CONTROL PARAMETER IN LOW SPEED, V/STOL AIRCRAFT FLIGHT, THEREFORE, IS CONTROL POWER. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZUM07

AD-645 997
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEP.

PRELIMINARY SYSTEMS ANALYSIS AND SIMULATION. (U)

SEP 63 225P
REPT. NO. 127
CONTRACT: JA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-645 997.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES; SIMULATION), (RESEARCH PLANES; SIMULATION), ANALYSIS, HOVERING, FLIGHT, STABILIZATION SYSTEMS; TESTS
IDENTIFIERS: V-5 AIRCRAFT

SUPPLEMENTARY NOTE: REPORT ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, TESTS); (*RESEARCH PLANES, TESTS); HOVERING, FLIGHT, LIFT, AIRCRAFT ENGINES, PROPULSION

IDENTIFIERS: V-5 AIRCRAFT

THE THE XV-5A AIRCRAFT S/N 24506 WAS GROUND TESTED IN ALL AREAS PERTAINING TO HOVER, FORWARD FAN SUPPORTED FLIGHT, AND LOW SPEED CONVENTIONAL FLIGHT AND IS ACCEPTABLE TO PROCEED INTO ACTIVE FLIGHT TESTING. (AUTHOR)
THE RESULTS OF THE TESTS DEMONSTRATE SATISFACTORY ENERGY ABSORPTION CHARACTERISTICS OF THE SHOCK ABSORBER. THE FIRST TEST CONDITION RESULTS MEETS THE REQUIREMENTS OF THE DEVIATION ALLOWANCE. THE VERTICAL REACTION EXCEEDS THE ORIGINAL REQUIREMENTS FOR APPROXIMATELY .05 SECONDS AT A STRUT STROKE OF 9.15 INCHES WITH A MAXIMUM OF 6600 POUNDS. THE SECOND CONDITION RESULTS MEETS THE TEST REQUIREMENTS. THE OFFICIAL TEST FOR CONDITION THREE WAS RUN WITH AN ADDITIONAL 200 POUNDS ON THE JIG THAT WAS ANTICIPATED TO CORRECT FOR FRICTION IN THE DROP TOWER. THE RESULTS INDICATE, HOWEVER, EXCESSIVE ENERGY INPUT. A PRIOR RUN IS ALSO INCLUDED WITH THE CORRECT JIG WEIGHT AND WITH INSUFFICIENT ENERGY INPUT TO SHOW THE EFFECT OF THE WEIGHT CHANGE. BOTH RUNS ARE WELL WITHIN THE MAXIMUM ALLOWABLE VERTICAL REACTION.
THE REPORT COVERS THE WIND-TUNNEL TESTING, IN THE FLUTTER REGIME OF A DYNAMICALLY SIMILAR MODEL OF THE XV-SA LIFT-FAN RESEARCH AIRCRAFT. THE TEST WAS RESTRICTED ENTIRELY TO AN INVESTIGATION OF THE WING-FUSELAGE COMBINATION AND AS SUCH NO EMPENNAGE WAS REPRESENTED. TEST OBJECTIVES WERE SLANTED TOWARD VERIFICATION OF PREVIOUS ANALYTICAL INVESTIGATIONS WITH CLOSE ATTENTION PAID TO UNCOVERING ANY TRANSONIC EFFECTS WHICH MIGHT HAVE BEEN CRUDELY REPRESENTED ANALYTICALLY. THE TESTS WERE COMPLETED TO THE POINT OF ACHIEVING A 5 PERCENT MARGIN ON EQUIVALENT SPEED FOR THE HIGHEST AILERON ROTATIONAL FREQUENCY STUDIED, APPROXIMATELY 18.9 CPS. ONE ACTUAL CASE OF FLUTTER OCCURRED, AT M = 0.75 AND AT A DYNAMIC PRESSURE (Q) OF APPROXIMATELY 600 PSF FOR AN AILERON ROTATIONAL FREQUENCY OF 16.1 CPS. A SECOND CASE OF FLUTTER OCCURRED AT M = 0.75 AND A Q GREATER THAN 600 PSF. AN AILERON ROTATIONAL FREQUENCY OF 16.1 CPS! HOWEVER, THIS LATTER CASE OF FLUTTER WAS NOT CONSIDERED VALID DUE TO THE APPARENT FATIGUING OF AN AILERON SPRING BRACKET, RESULTING IN ESSENTIALLY A FREE-FLOATING SURFACE. (AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH-CONTROL NO. /ZOM07

AD-696 280 1/3 14/4
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

PRELIMINARY RELIABILITY REPORT. (U)

AUG 63 72P
REPT. NO. 125
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-646 289.

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES; RESEARCH PLANES, RELIABILITY), (*RESEARCH PLANES, RELIABILITY), PROPULSION; LIFT, FANS, STRESSES, CONTROL (U)
IDENTIFIERS: V-5 AIRCRAFT (U)

CONTENTS: XV-5A RELIABILITY PROGRAM; X353-5B AND X376 PROPULSION; AIRCRAFT SUB-CONTRACTORS RELIABILITY PROGRAM. (U)
SUPPLEMENTARY NOTE: REPORT ON XV-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-646 280.

THE REPORT SHOWS THE METHODS OF ANALYSIS, CALCULATED DESIGN LOADS, MANEUVERING TIME-HISTORIES, AEREAELASTIC CHARACTERISTICS AND A CUMULATION OF OTHER PERTINENT CHARACTERISTIC LOADING DATA. THE ANALYSES EXTENSIVELY UTILIZED XV-SA WIND-TUNNEL MODEL DATA AND MECHANIZED DIGITAL COMPUTER (IBM 704) PROGRAMS. FROM THESE STUDIES, AIRFRAME STRENGTH REQUIREMENTS WERE DEVELOPED, PROGRESSIVE PARAMETRIC EVALUATION OF THE AIRPLANE'S INHERENT CAPABILITIES THEN SERVED TO CORROBORATE THE AIRFRAME STRUCTURAL INTEGRITY OR, AS FOR ONE PARTICULAR MANEUVER, DEFINED SAFE FLIGHT-ENVELOPE OPERATING LIMITS. (AUTHOR)
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

MAIN LANDING GEAR DROP TEST REPORT. (U)

MAR 64 25P
REPT. NO. 147
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-646 281.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES; LANDING GEAR), (*RESEARCH PLANES, LANDING GEAR), (*LANDING GEAR; DROP TESTING), LIFT, FANS, PROPULSION, EXPERIMENTAL DATA, SHOCK ABSORBERS (U)

IDENTIFIERS: V-5 AIRCRAFT (U)

THE SHOCK ABSORBER PORTION OF THE XVMAIN LANDING GEAR, BUT USING A DUMMY CYLINDER, WAS TESTED ON 2 AUGUST 1963, IN ACCORDANCE WITH THE H. W. LOUD TEST PROCEDURE 1510LTP-4, REVISION *A*. THE REPORT PRESENTS THE SUCCESSFUL COMPLETION OF THE ESTABLISHED TEST REQUIREMENTS. (AUTHOR) (U)
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

PREDICTED VIBRATION AND ACOUSTIC ENVIRONMENTAL STUDY.

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

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
IDENTIFIERS: V-5 AIRCRAFT

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 SUBJECT TO SIGNIFICANT OSCILLATORY LOAD SHOULD BE INVESTIGATED FOR FATIGUE ON AN INDIVIDUAL BASIS BY THE DESIGN GROUP INVOLVED. (AUTHOR)
UNCLASSIFIED

UNCLASSIFIED REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /ZDM07

AD-646 28Y  1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND
TECHNOLOGY DEPT

X353-5B AND X376 DESIGN SUMMARY REPORT.  (U)

JUL 65  107P
REPT* NO.  161
CONTRACT:  DA-34-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON XV-5A LIFT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-
646 284.

DESCRIPTORS:  (*VERTICAL TAKE-OFF PLANES, FANS),
(*RESEARCH PLANES, FANS), DESIGN, LIFT,
PROPULSION, COMPATIBILITY, AERODYNAMIC
CHARACTERISTICS

IDENTIFIERS:  V-S AIRCRAFT

INSTALLATION STUDIES FOR COMPATIBILITY OF THE
X353-5B AND X376 PROPULSION SYSTEMS TO THE
XV-5A AIRCRAFT ARE DESCRIBED AS WELL AS THE
AERODYNAMIC MECHANICAL DESIGN ASPECTS OF THE LIFT FAN
SYSTEM. DISCUSSIONS ARE CENTERED AROUND THE
CHANGES TO THE FANS DEVELOPED BEYOND CONTRACT DA
44-177-TC-584.  (AUTHOR)  (U)

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UNCLASSIFIED  /ZDM07
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 140407

AD-647 383

GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEVELOPMENT

LANDING GEAR CRITERIA GROUND LOADS AND REACTIONS. (U)

OCT 63 151P

REPT. NO. 131

CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTIONS: (*) VERTICAL TAKE-OFF PLANES, LANDING GEAR); (*) RESEARCH PLANES, LANDING GEAR); (*) LANDING GEAR, LANDING MECHANICS), LANDING IMPACT, AIRCRAFT LANDINGS, COMPUTER PROGRAMS, FUSELAGES, TAXIING, LIFT, FANS, PROPULSION (U)

IDENTIFIERS: V-5 AIRCRAFT (U)

THE MAIN LANDING GEAR IS PROVIDED WITH A TWO-POSITION FEATURE: THE POSITION FORWARD FOR CONVENTIONAL LANDING, AND THE POSITION AFT FOR VERTICAL LANDING. CRITERIA WAS GENERATED FOR BOTH CONVENTIONAL AND VERTICAL LANDING. CALCULATIONS OF GROUND LOADS WERE BASED ON METHODS IN MIL-A-8862. A COMPUTER PROGRAM WAS DEVELOPED WHICH PROVIDES FUSELAGE REACTIONS AND INTERNAL MEMBER LOADS FOR ALL LANDING AND TAXIING CONDITIONS. (AUTHOR) (U)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 470407

AD-647 386 1/3

GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

WIND TUNNEL TEST REPORT, LIFT FAN POWERED SCALE MODEL. (U)

NOV 63 162P

REPT. NO. 137

CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON VX-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES; MODEL TESTS), (*RESEARCH PLANES; MODEL TESTS); AERODYNAMIC CHARACTERISTICS, GROUND EFFECT, FLIGHT, HOVERING, FANS, LIFT, PROPULSION, WINGS, WIND TUNNELS, STATICS (U)

IDENTIFIERS; V-X AIRCRAFT (U)

DATA WERE OBTAINED TO DEFINE THE STATIC CHARACTERISTICS IN AND OUT OF GROUND EFFECT; AERODYNAMIC CHARACTERISTICS IN FORWARD FLIGHT FOR THE TRANSITION, CONVERSION, AND LOW SPEED CONVENTIONAL FLIGHT MODES; AND FLIGHT CHARACTERISTICS AT LOW TRANSLATIONAL SPEEDS NEAR HOVERING IN VERTICAL, LATERAL, AND REARWARD DIRECTIONS. IN ADDITION, WING SURFACE STATIC PRESSURES AND WING FAN INLET CLOSURE DOOR HINGE MOMENTS WERE MEASURED. THE DATA INDICATE AN ADVERSE GROUND EFFECT ON STATIC LIFT AT HEIGHTS LESS THAN 2 WING FAN DIAMETERS WITH A REDUCTION OF APPROXIMATELY 6% AT 1.0 DIAMETER. A CORRESPONDING REDUCTION IN FAN POWER AT CONSTANT FAN RPM COMPENSATES FOR THE LIFT REDUCTION IF OPERATION AT CONSTANT POWER IS CONSIDERED. THE EFFECTS OF WING FAN AND NOSE FAN OPERATION ARE DESTABILIZING WITH RESPECT TO ANGLE OF ATTACK. NOSE FAN OPERATION IS SLIGHTLY DESTABILIZING IN YAW, BUT THE DATA INDICATE POSITIVE LATERAL-DIRECTIONAL STABILITY FOR THE ENTIRE RANGE OF THRUST COEFFICIENT IN FAN-POWERED FLIGHT. A FAVORABLE GROUND EFFECT ON LIFT IS OBTAINED WITH INCREASING FORWARD SPEED AS WOULD OCCUR DURING SHORT TAKE-OFF OPERATION; WITH AN INCREASE OF APPROXIMATELY 22% ABOVE THE OUT-OF-GROUND EFFECT LIFT AT A THRUST COEFFICIENT OF 0.885. THE DATA OBTAINED IN GROUND EFFECT WERE UNCORRECTED FOR WALL EFFECTS BUT THIS CORRECTION IS BELIEVED TO BE SMALL COMPARED WITH THE LIFT INCREASE SHOWN. (AUTHOR) 95 (U)

UNCLASSIFIED /20407
THE REPORT PRESENTS CALCULATED INSTALLED PERFORMANCE CHARACTERISTICS FOR THE U.S. ARMY XV-5A PROPULSION SYSTEM. THE PROPULSION SYSTEM CONSISTS OF TWO GENERAL ELECTRIC X353-5B POWER-PLANTS, ONE GENERAL ELECTRIC X376 PITCH CONTROL FAN, AND ASSOCIATED DUCTING, CONTROLS AND ACCESSORY EQUIPMENT. INSTALLED PERFORMANCE OF TURBOJET MODE IS PRESENTED FOR ARDC STANDARD DAY AND ANA 421 HOT DAY FOR ONE AND TWO ENGINE OPERATION.

PERFORMANCE DATA INCLUDE GROSS THRUST, PROPULSION SYSTEM DRAG, NET THRUST, FUEL FLOW AND COOLING SYSTEM DRAG. A SEA LEVEL STATIC THRUST OF 4,920 POUNDS IS ESTIMATED FOR AN ARDC STANDARD DAY, FOR ANA 421, HOT DAY CONDITIONS AT 2,500 FEET ALTITUDE, STATIC THRUST IS 4,250 POUNDS. A DETAILED ANALYSIS OF J85 ENGINE OPERATION AT NEAR IDLE CONDITION (47% TO 60% RPM) SHOWED THAT EXHAUST GAS TEMPERATURE INCREASED RAPIDLY WITH INCREASING ENGINE AIR INLET TEMPERATURE AND SHAFT POWER EXTRACTION. THUS, TO PRECLUDE EXCEEDING EXHAUST GAS TEMPERATURE LIMITS, DUE TO REINGESTION OF HOT ENGINE EXHAUST GASES AND/OR VARYING POWER EXTRACTION FOR SYSTEM CHECKOUT, A MINIMUM RPM OF 70% FOR THE J85 ENGINES IS RECOMMENDED FOR XV-5A FAN MODE OPERATION. THE ENGINE AIR INLET SHOWS EXCELLENT PERFORMANCE THROUGHOUT ITS REQUIRED OPERATING ENVELOPE. A MINIMUM TOTAL PRESSURE RECOVERY OF 98.4% IS AVAILABLE FOR STATIC OPERATION.
GENERAL ELECTRIC CO  CINCINNATI  OHIO  ADVANCED ENGINE AND TECHNOLOGY DEPT

ONE-FIFTH SCALE INLET MODEL WIND TUNNEL TEST REPORT, VOLUME I.  (U)

MAR 65  246P  
REPT.  NO.  154-VOL-1  
CONTRACT:  DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:  REPT.  ON XV-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.  SEE ALSO AD-647 395.

DESCRIPTIONS:  (*VERTICAL TAKE-OFF PLANES, MODEL TESTS), (*RESEARCH PLANES, MODEL TESTS), WIND TUNNEL MODELS, AIRPLANE MODELS, INSTRUMENTATION, TABLES, TEST EQUIPMENT, LIFT, FANS, PROPULSION  (U)

IDENTIFIERS:  V-S AIRCRAFT  (U)

SUMMARY TABLES, GRAPHS, MODEL DESCRIPTION, INSTRUMENTATION, CONDITIONS TESTED, VALIDITY OF DATA AND OTHER INFORMATION ARE PRESENTED.  (U)
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

ONE-FIFTH SCALE INLET MODEL WIND TUNNEL TEST REPORT, VOLUME II.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-647 394, AD-649 396.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES; MODEL TESTS), (*RESEARCH PLANES; MODEL TESTS), TABLES, WIND TUNNEL MODELS, AIRPLANE MODELS, LIFT, FANS, PROPULSION, SUBSONIC CHARACTERISTICS

IDENTIFIERS: V-5 AIRCRAFT

TABULATED DATA ARE PRESENTED FOR THE LOW SPEED TESTS (MACH 0 TO 0.2).
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AD-647 396
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND
TECHNOLOGY DEPT

ONE-FIFTH SCALE INLET MODEL WIND TUNNEL TEST REPORT,
VOLUME III.

MAN 65 75UP
REPT. NO. 154-VOL-3
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-
647 395.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, MODEL
TESTS), (*RESEARCH PLANES, MODEL TESTS),
TABLES, WIND TUNNEL MODELS, AIRPLANE MODELS,
LIFT, FANS, PROPULSION, SUBSONIC
CHARACTERISTICS
IDENTIFIERS: V-5 AIRCRAFT

TABULATED DATA ARE PRESENTED FOR THE HIGH SPEED
TESTS (MACH 0.4 TO 0.85).

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The X353-5B propulsion system consists of a J85-GE-5 turbojet engine (less afterburner) used as a gas generator, a diverter valve to direct the gas flow, and an X353-5B lift fan equipped with vectored discharge louvers. The X376 pitch trim control fan derives its power from turbine discharge bleed of J85-GE-5 turbojet engines (less after-burners). The X376 is a partial admission tip turbine-driven fan which is connected to the J85 engines through airframe-provided ducting. The fan employs two separate scroffs containing the turbine inlet nozzles; this feature provides for one-engine-out operation.
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /20407

AD-640 007 1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

STRESS REPORT, NOSE LANDING GEAR ASSEMBLY. (U)

NOV 63 318P
REPT. NO. 133
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES, LANDING GEAR), (RESEARCH PLANES, LANDING GEAR), (LANDING GEAR, STRESSES), NOSE WHEELS, MECHANICAL FASTENERS, FANS, LIFT, PROPULSION (U)

IDENTIFIERS: V-5 AIRCRAFT (U)

THE REPORT CONSISTS OF DATA SUBSTANTIATING THE STRUCTURAL INTEGRITY OF THE NOSE LANDING GEAR ASSEMBLY AND THE TRUNNION PINS REQUIRED FOR ATTACHMENT TO THE AIRPLANE. (U)
UNCLASSIFIED

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /2OM07

AD-653 563 1/3
GENERAL ELECTRIC C9 CINCINNATI OHIO ADVANCED ENGINE AND
TECHNOLOGY DEPT

FUSELAGE STRUCTURAL ANALYSIS, VOLUME 1, SHEAR AND
BENDING. (U)

FEB 64 23'P
REPT. NO. 144-VT-1
CONTRACT: UA-4% 177-1C-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM, SEE ALSO
VOLUME 2, AD-653 564.

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES,
FUSELAGES); (*RESEARCH PLANES, FUSELAGES),
(*FUSELAGES, STRUCTURAL PROPERTIES); SHEAR
STRESSES, BENDING, LIFT, DUCTED FANS, ANALYSIS,
LOADING(MECHANICS), TABLES

IDENTIFIERS: V-5 AIRCRAFT (U)

THE FINAL STRESS ANALYSIS OF THE U. S. ARMY
XV-5A LIFT FAN RESEARCH AIRCRAFT FORWARD AND AFT
FUSELAGE SECTIONS IS PRESENTED. THE FORWARD AND
AFT SECTIONS OF THE FUSELAGE ARE CONVENTIONAL
AIRCRAFT SEMI-MONOCOQUE STRUCTURES, AND THE CENTER
SECTION IS A WELDED TUBULAR SPACE TRUSS. THE
ANALYSIS OF THE LONGITUDINAL BENDING MEMBERS AND
SAILS OR WINGS IS CONTAINED. THE PRIMARY INTENT OF
THE REPORT IS TO PROVIDE A TABULATION OF INTERNAL
SHEAR AND BENDING STRESS DISTRIBUTIONS FOR THE FINAL
CRITICAL LOADING CONDITIONS. CRITICAL MARGINS OF
SAFETY OF PRIMARY COMPONENTS ARE COMPUTED.
STRUCTURAL ADEQUACY WAS ALSO DEMONSTRATED BY PROOF
TESTS SIMULATING THE CRITICAL CONDITIONS. ALL
LOADS SHOWN ARE ULTIMATE VALUES. (AUTHOR) (U)

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UNCLASSIFIED /2OM07
UNCLASSIFIED

UNCLASSIFIED REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /Z0M07

AD-653 564  1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

FUSELAGE STRUCTURAL ANALYSIS VOLUME II CENTER FUSELAGE AND ENGINE MOUNTS.

FEB 64 43dp
REPT. NO. 144-VOL-2
CONTRACT: DA-44-177-IC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM SEE ALSO VOLUME I, AD-653 563.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, FUSELAGES), (*RESEARCH PLANES, FUSELAGES), (*FUSELAGES, STRUCTURAL PROPERTIES), (*ENGINE MOUNTS, STRUCTURAL PROPERTIES), AIRCRAFT ENGINES, ANALYSIS, LIFT, DUCTED FANS, PROPULSION, SUPPORTS, LOADING(MECHANICS), ENGINE STRUCTURES, EXHAUST PIPES, TABLES

IDENTIFIERS: V-5 AIRCRAFT


(AUTHOR)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /20M07

AU-653 p65 1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

STRUCTURAL ANALYSIS WING BASIC COMPONENTS* (U)

OCT 63 39dp
REPT. NO. 130
CONTRACT: UA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, WINGS), (*RESEARCH PLANES, WINGS), (*WINGS, STRUCTURAL PROPERTIES), ANALYSIS, LIFT, DUCTED FANS, STRUCTURAL PARTS, STRESSES, LOADING (MECHANICS), TABLES (U)

IDENTIFIERS: V-5 AIRCRAFT (U)


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UNCLASSIFIED /20M07
UNCLASSIFIED

UNCLASSIFIED REPORT


DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, SUBSONIC CHARACTERISTICS), (RESEARCH PLANES, MODEL TESTS), WIND TUNNEL MODELS, DUCTED FANS, LIFT, FORCE (MECHANICS), MOMENTS, TABLES

IDENTIFIERS: V-5 AIRCRAFT

UNCLASSIFIED

WIND TUNNEL TEST REPORT CONVENTIONAL MODEL. VOLUME II. LOW SPEED PRESSURE AND HINGE MOMENTS. (U)

JAN 64 344P
REPT. NO. 191-VOL-2
CONTRACT: UA-44-177-TC-715

SUPPLEMENTARY NOTE: REPT. ON XV-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO VOLUME 1, AD-653 566 AND VOLUME 3, AD-653 569.

DESCRIP'TORS: (*VERTICAL TAKE-OFF PLANES, MODEL TESTS), (*RESEARCH PLANES, MODEL TESTS), HINGE MOMENTS, PRESSURE, WIND TUNNEL MODELS, LIFT, DUCTED FANS, TABLES, AERODYNAMIC CONTROL SURFACES, AERODYNAMIC CHARACTERISTICS (U)
IDENTIFIERS: V-5 AIRCRAFT (U)

THE REPORT PRESENTS THE RESULTS FROM WIND TUNNEL TESTS OF A ONE-EIGHTH SCALE CONVENTIONAL MODEL OF THE U. S. ARMY XV-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT. VOLUME II PRESENTS HINGE MOMENT COEFFICIENTS AND PRESSURE DATA IN PLOTTED AND TABULAR FORM WITH PERTINENT DETAIL EXPLANATORY INFORMATION. PRESSURE AND HINGE MOMENT DATA WERE NOT RECORDED DURING THE SECOND PHASE OF THE LOW SPEED TESTING. (AUTHOR) (U)
THE VOLUME PRESENTS THE RESULTS OF HIGH SPEED WIND TUNNEL TEST OF A ONE-EIGHTH SCALE MODEL OF THE U.S. ARMY XV-5A LIFT FAN RESEARCH AIRCRAFT. THE TESTS WERE CONDUCTED AT THE DAVID TAYLOR MODEL BASIN 7 X 10 FOOT TRANSONIC WIND TUNNEL FACILITY.

CONVENTIONAL MODEL FORCE, PRESSURE, AND HINGE MOMENT DATA WERE OBTAINED OVER A MACH NUMBER RANGE OF 0.4 TO 0.9 AND PITCH AND SIDESLIP RANGES OF -4 TO 15 DEGREES AND -5 TO +5 DEGREES RESPECTIVELY. THE COMPLETE AIRCRAFT WAS THE PRIMARY CONFIGURATION TESTED, WITH THE MAJORITY OF THE VARIATIONS BEING IN CONTROL SURFACE AND STABILIZER SETTINGS. TESTS WERE ALSO CONDUCTED WITH THE VERTICAL AND HORIZONTAL TAIL SURFACES REMOVED, WITH WING FAN UPPER AND LOWER SURFACE STRUT FAIRINGS REMOVED, AND WITH ENGINE DUCT PRESSURE SURVEY RAKE INSTALLED.
UNCLASSIFIED

CUC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 74808/1

AU-65W 941
UNCLASSIFIED REPORT 61111WAPHY SEARCH CONTROL NO.

GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND
TECHNOLOGY DEPT

CALCULATED WEIGHT, BALANCE AND MOMENTS OF
INERTIA.

JAN 64 139P
REPT. NO. 139
CONTRACl: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: KEPT. ON XV-5A LIGHT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, DESIGN);
(± RESEARCH PLANES, DESIGN), WEIGHT, STABILITY,
MOMENT OF INERTIA, LIFT, PROPULSION, FANS,
TABLES
IDENTIFIERS: V=5 AIRCRAFT

THE REPORT CONTAINS WEIGHT AND BALANCE AND AIRCRAFT
MOMENT OF INERTIA DATA IN SUMMARY AND IN DETAIL.
THE SUMMARY DATA IS GIVEN FOR SEVERAL FUEL, FLIGHT
TEST INSTRUMENTATION COMBINATIONS CONSIDERED
COMPATIBLE WITH THE FLIGHT TEST PROGRAM.
PERFORMANCE REQUIREMENTS WERE WRITTEN FOR ENDURANCE
MISSIONS OF 20 AND 45 MINUTES AND THEREFORE WEIGHTS
DATA ARE GIVEN FOR THE AIRCRAFT WITH FUEL TO PERFORM
THESE MISSIONS WITH FLIGHT TEST INSTRUMENTATION
INCLUDED. THE DESIGN GROSS WEIGHT OF THE AIRCRAFT
IS 9200 LBS., AND THEREFORE DATA IS GIVEN FOR THIS
WEIGHT APPROXIMATELY 85 PERCENT OF THE AIRCRAFT
WEIGHT WAS OBTAINED FROM MEASUREMENT OF COMPONENT AND
SUB-ASSEMBLY WEIGHTS. IN ADDITION, THE AIRCRAFT
ITSELF WAS WEIGHED AND THIS ACTUAL WEIGHT HAS BEEN
USED TO DERIVE VARIOUS GROSS WEIGHT LOADING
CONDITIONS. THE WEIGHT EMPTY GIVEN INCLUDES
ONLY THOSE ITEMS REQUIRED BY THE AIRCRAFT
SPECIFICATION. IT DOES NOT, FOR INSTANCE,
INCLUDE THE AUXILIARY FUEL TANK OR INSTRUMENTATION
OR OTHER TEMPORARY ITEMS INSTALLED FOR INITIAL FLIGHT
TEST PURPOSES. HORIZONTAL DISTANCES USED WERE
MEASURED FROM FUSELAGE STATION ZERO. VERTICAL
DISTANCES ARE MEASURED FROM A THEORETICAL PLANE 100
INCHES BELOW THE FUSELAGE HORIZONTAL REFERENCE PLANE.

(AUTHOR)
UNCLASSIFIED

U S L REPO T BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM07

AD-654 042 1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND
TECHNOLOGY DEPT

STRESS ANALYSIS MAIN LANDING GEAR. (U)

JAN 64 23IP
REPT. NO. 142
CONTRACT: DA-41-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REP'T ON XV-5A LIGHT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, LANDING
GEAR), (RESEARCH PLANES, LANDING GEAR),
(LANDING GEAR, STRESSES), STRUCTURAL
PROPERTIES, MATHEMATICAL ANALYSIS,
LOADING (MECHANICS), LIFT, FANS, PROPULSION (U)
IDENTIFIERS: V-5 AIRCRAFT (U)

THE REPORT CONSISTS OF DATA SUBSTANTIATING THE
STRUCTURAL INTEGRITY OF THE MAIN LANDING GEAR SHOCK
STRUT. (U)
UNCLASSIFIED

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, FLIGHT TESTING), (*RESEARCH PLANES, FLIGHT TESTING), WIND TUNNELS, HOVERING, AERODYNAMIC CHARACTERISTICS, THERMODYNAMICS, PERFORMANCE (ENGINEERING), LIFT, PROPULSION, FANS

IDENTIFIERS: (U) V-5 AIRCRAFT

THE TEST PROGRAM INCLUDED AERODYNAMIC, THERMODYNAMIC AND MECHANICAL EVALUATION OF THE COMPLETE FLIGHT TYPE AIRCRAFT SYSTEM AT FLIGHT SPEEDS EQUIVALENT TO HOVER UP THROUGH 100 KNOTS IN BOTH THE CONVENTIONAL AND FAN POWER MODES OF FLIGHT. THE REPORT SUMMARIZES THE MORE IMPORTANT AERODYNAMIC PERFORMANCE OBTAINED DURING THE TEST PROGRAM. THE DATA ARE PRESENTED GRAPHICALLY IN COEFFICIENT FORM TO PROVIDE A CONSISTENT BASIS OF COMPARISON. THE AERODYNAMIC RESULTS OBTAINED DURING THESE TESTS MAY BE SUMMARIZED BY SAYING THAT THE AIRCRAFT, AS DESIGNED AND TESTED, HAS ADEQUATE CONTROL POWER, LIFT, HORIZONTAL THRUST AND STATIC STABILITY TO PERMIT SAFE TRANSITIONAL FLIGHT BETWEEN A HOVER LIFT-OFF AND CONVERSION TO THE JET MODE OF FLIGHT. THE RESULTS OF THIS WIND TUNNEL TEST PROGRAM HAVE PROVEN TO BE A VALUABLE ASSET DURING CONDUCT OF THE FLIGHT TEST PROGRAM. USING THESE DATA, PREDICTIONS OF AIRCRAFT PERFORMANCE HAVE BEEN VERIFIED BY ACTUAL MEASURED FLIGHT DATA. (AUTHOR)
UNCLASSIFIED

UNCLASSIFIED REPORT

THE TESTS CONSISTED OF 41 RUNS AND A TOTAL OF 944 TEST POINTS. TESTS WERE CONDUCTED OVER A RANGE OF SPEEDS IN ALL PHASES OF FLIGHT FROM HOVER THROUGH TRANSITION TO CONVENTIONAL FLIGHT. PITCH AND YAW RUNS, AS WELL AS CONTROL EFFECTIVENESS RUNS IN ALL THREE MODES WERE MADE. MANY OF THE PITCH RUNS WERE MADE WELL INTO THE SO-CALLED DEEP STALL ANGLE OF ATTACK RANGE. (AUTHOR)
EXTERNAL VISIBILITY CRITERIA FOR VTOL AIRCRAFT.  (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. 1 JUL 65-1 JUL 66.
MAR 67 65P ROBERTS, EDWARD O. I
REPT. NO. AFFDL-TR-67-27
PRJ.: AF-1425
TASK: 1425U1

UNCLASSIFIED REPORT
DISTRIBUTION: NO FOREIGN WITHOUT APPROVAL OF AIR FORCE FLIGHT DYNAMICS LABORATORY, ATTN: FDFFR, W-P AFB, OHIO.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, HUMAN ENGINEERING), (*VISIBILITY, VERTICAL TAKE-OFF PLANES), PILOTS, SPECIFICATIONS, COCKPITS, LANDINGS, DESIGN
IDENTIFIERS: V-4 AIRCRAFT, V-5 AIRCRAFT, X-22 AIRCRAFT, C-142 AIRCRAFT

The effects of spanwise distribution of longitudinal and vertical components of gust velocity and longitudinal distribution of the lateral component on the lateral-directional response of a hovering VTOL aircraft are analyzed. Results show that spanwise effects of the longitudinal and vertical components are negligible, and the longitudinal distribution of the lateral component is significant in computing the power spectral densities of gust-induced side force, yawing moment, rolling moment, and the aircraft sideslip, yaw, and roll root-mean-square response angles. If the gust-induced angles of attack and sideslip angles are in the nonlinear range of lift curve slope, the above conclusions, which are based on linear aerodynamic theory, may not hold and an analysis based on momentum transfer of gust energy to the aircraft is recommended. Flow field interaction effects due to engine intake and exhaust also were not considered. (Author)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /40M07 /

AU-657 989 1/3

GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

STRUCTURAL TEST RESULTS. (U)

MAH 64 365P

REPT. NO. 145

CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPT. ON XV-SA LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, AIRFRAMES), (*RESEARCH PLANES, AIRFRAMES), (*AIRFRAMES, TESTS), FUSELAGES, SUPPORTS, LOADING(MECHANICS), LIFT, FANS, STRUCTURAL PROPERTIES (U)

IDENTIFIERS: V-5 AIRCRAFT (U)

THE DETAILED STATIC TEST PROCEDURES DESCRIBED COVER THE 23 PROOF TESTS AND THE ONE ULTIMATE TEST TO BE ACCOMPLISHED ON THE XV-SA AIRCRAFT. THE PROCEDURES INCLUDE AIRPLANE SUPPORT SYSTEMS, LOADING ARRANGEMENTS AND METHODS OF LOAD APPLICATION, ALONG WITH DETAILED LOAD REACTING STRUCTURES AND LOAD CYLINDER ARRANGEMENTS. TABLES ARE PRESENTED BY WHICH LOAD CYLINDERS MAY BE CALIBRATED PRIOR TO EACH TEST. INSTRUMENTATION DETAILS ARE PROVIDED SHOWING LOCATION OF BOTH STRAIN AND DEFLECTION MEASURING EQUIPMENT AND TIMES DURING WHICH SPECIFIC MEASUREMENTS ARE TO BE MADE. DATA RECORDING DEVICES ARE ALSO INDICATED. (AUTHOR) (U)
UNCLASSIFIED

ODO REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /ZOM07

AD-657 990  1/3
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND
TECHNOLOGY DEPT

FINAL DESIGN WEIGHT REPORT.  (U)

JUN 65  139P
REPT. NO. 159
CONTRACT:  DA-44-177-TC-715

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON XV-S A LIFT FAN
FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTORS:  (*VERTICAL TAKE-OFF PLANES, DESIGN),
(*RESEARCH PLANES, DESIGN), WEIGHT, MOMENT OF
INERTIA, FUSELAGES, PROPULSION, LIFT, FANS (U)
IDENTIFIERS:  V-S AIRCRAFT (U)

THE REPORT CONTAINS WEIGHT AND BALANCE DATA IN
SUMMARY AND IN DETAIL. THE SUMMARY DATA ARE GIVEN
FOR SEVERAL FUEL AND FLIGHT TEST INSTRUMENTATION
COMBINATIONS CONSIDERED COMPATIBLE WITH THE FLIGHT
TEST PROGRAM. PERFORMANCE REQUIREMENTS WERE
WRITTEN FOR ENDURANCE MISSIONS OF 20 TO 45 MINUTES
AND THEREFORE WEIGHTS DATA ARE GIVEN FOR THE AIRCRAFT
WITH FUEL TO PERFORM THESE MISSIONS WITH FLIGHT TEST
INSTRUMENTATION INCLUDED. THE DESIGN GROSS WEIGHT
OF THE AIRCRAFT IS 9200 LBS., AND THEREFORE DATA ARE
GIVEN FOR THIS WEIGHT.  (U)

116

UNCLASSIFIED  /ZOM07
THE PURPOSE OF THESE TESTS IS TO DEMONSTRATE THAT THE XV-5A AIRCRAFT SYSTEMS FUNCTION IN ACCORDANCE WITH THE DESIGN REQUIREMENTS. THE TESTING PROCEDURE IS DIVIDED INTO 12 MAJOR TESTS. THE ORDER OF APPEARANCE IS THE DESIRED CHRONOLOGICAL ORDER. WHEN THE AIRCRAFT IS RECEIVED FOR FUNCTIONAL TESTS, THE HYDRAULIC AND PNEUMATIC SYSTEMS WILL HAVE BEEN FLUSHED, FILLED AND BLED IN ACCORDANCE WITH RYAN REPORT 14399-6. THE CONTROLS WILL HAVE BEEN RIGGED IN ACCORDANCE WITH RYAN REPORT 14395-5. (AUTHOR)
DEPARTMENT OF THE NAVY
NAVY AERONAUTICAL RESEARCH LABORATORY

A VERTICAL TAKE-OFF PLANE, VZ-11 LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634 950.

A VERTICAL TAKE-OFF PLANE, VZ-11 LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634 950.

DEPARTMENT OF THE NAVY
NAVY AERONAUTICAL RESEARCH LABORATORY

A VERTICAL TAKE-OFF PLANE, VZ-11 LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634 950.

DEPARTMENT OF THE NAVY
NAVY AERONAUTICAL RESEARCH LABORATORY

A VERTICAL TAKE-OFF PLANE, VZ-11 LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO AD-634 950.

The data indicate that the XV-5A aircraft is safe and airworthy. This conclusion was substantiated by analysis, ground test and flight test. The XV-5A is shown to be structurally sound and suitable for use in a flight test program of at least 250 hours. The airplane was manufactured to exacting aircraft standards in choice and use of materials, components and sub-systems, and was manufactured and tested with strict quality control standards maintained. Safety and airworthiness of the XV-5A VTOL aircraft, using the lift fan concept, was demonstrated. Flight tests indicate that controllability is adequate and in agreement with acceptable standards. Control is satisfactory in VTOL and CTOL throughout the flight envelope, and during ground roll and taxi. Flutter analysis, and experimental ground, wind tunnel and flight tests indicate that the aircraft is free of flutter within the prescribed flight envelope. (Author)
CALCULATED HEAT TRANSFER AND COOLING SYSTEM PERFORMANCE, VOLUME II*
GENERAL ELECTRIC CO, CINCINNATI, OHIO, ADVANCED ENGINE AND TECHNOLOGY DEPT.

CALCULATED HEAT TRANSFER AND COOLING SYSTEM PERFORMANCE, VOLUME 1. (U)

JUN 65 303P
REPT. NO. 16U-VOL-1
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT
AVAILABILITY: AVAILABLE IN MICROFICHE ONLY.
SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM. SEE ALSO VOLUME 2, AD-667 994.

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, COOLING + VENTILATING EQUIPMENT), (*RESEARCH PLANES, COOLING + VENTILATING EQUIPMENT), (*COOLING + VENTILATING EQUIPMENT, PERFORMANCE ENGINEERING), COOLING, HEAT TRANSFER, TURBOJET ENGINES, DOWNWASH, THERMAL INSULATION, FUSELAGES (U)

IDENTIFIERS: V-5 AIRCRAFT (U)

BASED ON ANALYSIS AND LIMITED TEST DATA, THE AIRCRAFT COOLING AND STRUCTURAL PROTECTION SYSTEMS ARE BELIEVED TO HAVE SUFFICIENT PERFORMANCE CAPABILITY TO PERMIT ORDERLY CONDUCT OF INSTALLED SYSTEM FUNCTIONAL, NASA-AMES 40' X 40' WIND TUNNEL, AND EDWARDS AIR FORCE BASE FLIGHT TEST PROGRAMS EVEN THOUGH EXTERNALLY INDUCED ENVIRONMENTAL TEMPERATURES TO IHD OF DEVELOP DURING FAN MODE OPERATION, OCCASIONAL LOCAL AND MINOR OVERHEATING PROBLEMS ARE EXPECTED WITHIN THE BROAD RANGE OF POSSIBLE OPERATING CONDITIONS. HOWEVER, IT IS EXPECTED THEY CAN BE OVERRIDEN WITH MINOR STRUCTURAL MODIFICATIONS, INSTALLATION OF ADDITIONAL INSULATION, AND/OR MINOR MODIFICATION OF OPERATIONAL PROCEDURES. LACK OF DETAILED KNOWLEDGE OF THE EXTERNALLY INDUCED ENVIRONMENT MADE COOLING AND STRUCTURAL SYSTEMS DESIGNS AND ANALYSIS DIFFICULT. IN AN ATTEMPT TO OBTAIN FURTHER INSIGHT TO THIS COMPLEX PROBLEM, A PROCEDURE WAS DEVELOPED WHEREBY EXISTING LITERATURE DATA ON DOWNWASH PHENOMENA COULD BE APPLIED QUANTITATIVELY TO THE XV-5A INDUCED ENVIRONMENT. RESULTS SHOW DIRECTIONAL EFFECTS OF AIRCRAFT CONTROL SETTINGS, AND INDICATE THE STRONG POSSIBILITIES OF HOT GAS INGESTION BY THE ENGINE AND COOLING SYSTEM AIR INLET. THESE RESULTS ALSO INDICATE MEANS WHEREBY ADVERSE EFFECTS MAY BE MINIMIZED OR ELIMINATED. (AUTHOR) (U)
UNCLASSIFIED

GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

INSTALLED SYSTEMS FUNCTIONAL TESTS REPORT. (U)

SEP 64 312P
REPT. NO. 149
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT

AVAILABILITY: AVAILABLE IN MICROFICHE ONLY.

SUPPLEMENTARY NOTE: REPT. ON XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM.

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, TESTS); (*RESEARCH PLANES, TESTS); AIRCRAFT EQUIPMENT; FLIGHT CONTROL SYSTEMS; COCKPITS; TURBOJET ENGINES; FANS; LIFT, LANDING GEAR; FIRE EXTINGUISHERS; PERFORMANCE(ENGINEERING) (U)

IDENTIFIERS: V-5 AIRCRAFT (U)

THE INSTALLED SYSTEMS TESTS DEMONSTRATE THAT THE AIRCRAFT SYSTEMS FUNCTION IN ACCORDANCE WITH DESIGN REQUIREMENTS. TESTS WERE DIVIDED INTO THIRTEEN MAJOR FUNCTIONAL AREAS AS FOLLOWS: ELECTRICAL SYSTEM CHECKOUT; SURFACE GAINS AND HYSTERESIS; FLIGHT CONTROLS STABILITY; FLIGHT MODE CONVERSION SEQUENCE; COCKPIT CHECKOUT; ENGINE RUN TEMPERATURE SURVEY; ENGINE RUN ELECTRICAL SYSTEM CHECKOUT; AUTO-STABILITY TESTS; FAN FLIGHT THIN RATES; LANDING GEAR TESTS; CONTROLS PROOF LOADING; WEIGHT-BALANCE AND FUEL TESTS; FIRE EXTINGUISHER SYSTEM TESTS. (U)
GENERAL ELECTRIC CO CINCINNATI OHIO ADVANCED ENGINE AND TECHNOLOGY DEPT

FUSELAGE STRUCTURAL ANALYSIS: VOLUME III, FRAMES, BULKHEADS AND FITTINGS.

FEB 64 98P
REPT. NO: 144-VOL-3
CONTRACT: DA-44-177-TC-715

UNCLASSIFIED REPORT


DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, FUSELAGES), (*RESEARCH PLANES, FUSELAGES), (*FUSELAGES, STRUCTURAL PROPERTIES), LOADING(MECHANICS), AIRFRAMES, FITTINGS, MATHEMATICAL ANALYSIS, SUPPORTS (U)
IDENTIFIERS: V-5 AIRCRAFT (U)

A SUMMARY TYPE LOAD ANALYSIS IS PRESENTED FOR EACH COMPONENT, WITH THE PRIMARY INTENT OF SHOWING THE STRUCTURAL CONFIGURATION, FINAL CRITICAL LOADING AND UNUSUAL ASSUMPTIONS MADE. STRUCTURAL ADEQUACY OF MANY OF THE PRIMARY COMPONENTS WAS DEMONSTRATED BY PROOF TESTS. (U)
PERFORMANCE AND STRESSES OBTAINED ON AN ISOLATED VTOL-TYPE PROPELLER OPERATING IN HOVERING, TRANSITIONAL, AND AXIAL FLIGHT* (U)

DESCRIPTIVE NOTE: TECHNICAL KEPT. JUN 65-JAN 67, AUG 67 97P TRENKA, ANDREW R.:
REPT. NO. CAL-88-1840-5-2
CONTRACT: UA-44-177-AMC-75(T)
TASK: IF125901A142
MONITOR: USAAVLabs TR-67-37

UNCLASSIFIED REPORT

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES, PROPELLERS(AERIAL)), (PROPELLERS(AERIAL)), PERFORMANCE(ENGINEERING)), STRESSES, FLIGHT, HOVERING, TEST EQUIPMENT, CALIBRATION, AERODYNAMIC LOADING (U)

EXPERIMENTAL PERFORMANCE AND BLADE STRESSES MEASURED ON A THREE-BLADED VTOL-TYPE PROPELLER TESTED IN FREE AIR ARE PRESENTED. THE ISOLATED PROPELLER WAS TESTED OVER RANGES OF PROP SPEED, FORWARD VELOCITY, BLADE ANGLE SETTING, AND THRUST AXIS TO FREE-STREAM ANGLE. CORRELATION WITH A THEORETICAL METHOD OF PREDICTING PROPELLER PERFORMANCE AND BLADE STRESSES WAS MADE. IT WAS FOUND THAT WHEN THE PROPELLER WAS OPERATING IN A FLIGHT CONDITION FOR WHICH THE THEORY WAS DEVELOPED, CORRELATION BETWEEN THEORY AND EXPERIMENT WAS GOOD. WHEN THE PROPELLER WAS OPERATING IN A FLIGHT CONDITION WHERE VERY SMALL POSITIVE OR NEGATIVE EFFECTIVE ANGLES OF ATTACK WERE ENCOUNTERED, CORRELATION BETWEEN THEORY AND EXPERIMENT WAS POOR. (AUTHOR) (U)
UNCLASSIFIED

UNCLASSIFIED

THERM ADVANCED RESEARCH INC ITHACA N Y

EXPERIMENTAL STUDY OF PILOT VISIBILITY FROM A VTOL AIR/SEA CRAFT NEAR THE OCEAN SURFACE


SECRETARY: E; T

REPT' NO: TAR-TR-6704

A MAJOR PROBLEM ASSOCIATED WITH THE OPERATION OF A VTOL AIR/SEA CRAFT NEAR THE OCEAN SURFACE IS THE IMPAIRMENT OF PILOT VISIBILITY. CLOUDS OF SPRAY, GENERATED BY DOWNWASH IMPINGEMENT ON THE WATER SURFACE, SURROUND THE AIRCRAFT AND BLOCK THE PILOT'S VIEWS. THE OBJECTIVE OF THE STUDY WAS TO DETERMINE PROMISING METHODS FOR ALLEVIATING THE PROBLEM. A MODEL-SCALE EXPERIMENTAL FACILITY WAS CONSTRUCTED TO STUDY THE DETAILS OF SPRAY GENERATION AND THE CHARACTERISTICS OF THE RESULTING SPRAY PATTERN. SEVERAL SPRAY ALLEVIATION DEVICES WERE THEN DESIGNED AND TESTED. TO EVALUATE THEIR EFFECTIVENESS, A TECHNIQUE FOR QUANTITATIVE MEASUREMENT OF VISIBILITY WAS DEVELOPED. COMPARATIVE TESTS WERE CONDUCTED WITH AND WITHOUT THE SPRAY ALLEVIATION DEVICES. (AUTHOR)
A VTOL site is assumed to require a ground slope of 10% or less and be clear of trees. Also, there can be no boulders over 2 feet high or gullies deeper than 2 feet. Single sites, if square, should be 200 feet on a side and if circular, 250 feet in diameter. Assault sites, if square, should be 1500 feet on a side and 2000 feet in diameter. If circular, probability distributions of distances to single and assault sites, based on a study of environmental literature, topographic maps, and aerial photographs are presented for Thailand, India, Nevada, Italy, East Germany, West Germany, trafficability, penetrability, and site selection.
UNCLASSIFIED

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZM07

AU-662 715 1/3 14/4

ARMY AVIATION MATERIEL LABS FORT EUSTIS VA

XV-5A MAINTENANCE AND SYSTEMS EVALUATION

DESCRIPTIVE NOTE: KEPT FOR 27 JAN-15 NOV 65,
JUL 67 216P

RLPT. NO. USAAVLABS-TR-67-53
TASK: AA-65-21

UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, DESIGN),
(*RESEARCH PLANES, MAINTAINABILITY),
RELIABILITY, PERFORMANCE (ENGINEERING),
PROPULSION, FANS, EFFECTIVENESS, HEATING,
AIRCRAFT EQUIPMENT
IDENTIFIERS: V-5 AIRCRAFT, EVALUATION

THE DATA COMPILLED DURING THIS EVALUATION WERE USED TO DETERMINE THE EFFECTIVENESS OF DESIGN AS IT APPLIES TO MAINTAINABILITY OF THE OVERALL AIRCRAFT, ITS SYSTEMS, AND ITS SUBSYSTEMS AND, IN CASES OF DEFICIENCIES, TO RECOMMEND IMPROVEMENTS AND TO SPECIFY AREAS THAT REQUIRE FURTHER RESEARCH BEFORE DERIVATIVE XV-5A-TYPE AIRCRAFT ARE CONSTRUCTED.

AN EXPERIMENTAL INVESTIGATION OF THE LONGITUDINAL DYNAMIC STABILITY CHARACTERISTICS OF A FOUR-PROPELLER TILT-WING VTOL MODEL.

DESCRIPTIVE NOTE: TECHNICAL REPT.
SEP 67 124P CURTISS,H. C., JR.
PUTMAN,E. F.; LEBACZ, J. V.
REPT. NO. 774
CONTRACT: DA-49-177-AMC-f(T)
PROJ: DA-1P125901A142
TASK: 1P125901A14233
MONITOR: USAAVLABS TR-36-80

UNCLASSIFIED REPORT

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, PITCH(MOTION)), AIRPLANE MODELS; SCALE; FLIGHT, TILT WINGS; AERODYNAMIC CHARACTERISTICS, PROPELLERS(AERIAL), TRANSPORT PLANES; ANGLE OF ATTACK, OSCILLATION, DAMPING

THE RESULTS OF EXPERIMENTS CONDUCTED TO EVALUATE THE LONGITUDINAL STABILITY CHARACTERISTICS OF A 1/10 SCALE DYNAMIC MODEL OF A FOUR-PROPELLER TILT-WING VTOL TRANSPORT ARE PRESENTED AND DISCUSSED. THE PRINCETON DYNAMIC MODEL TRACK WAS USED TO MEASURE THE STATIC STABILITY AND THE TRANSIENT RESPONSE OF THE MODEL AT WING INCIDENCES FROM 90 DEGREES TO 40 DEGREES. THE RESULTS ARE INTERPRETED IN TERMS OF FULL-SCALE AIRCRAFT CHARACTERISTICS. ALL DATA ARE PRESENTED FOR A C.G. POSITION OF 90% MAC (THE MOST FORWARD C.G. POSITION OF THE AIRCRAFT IS 15% MAC) AND THE HORIZONTAL TAIL AND FLAP PROGRAM DIFFER FROM THOSE PRESENTLY USED ON THE AIRCRAFT. THE TRANSIENT MOTIONS AT WING INCIDENCES ABOVE 70 DEGREES WERE SIMILAR AND DOMINATED BY HIGH SPEED STABILITY AND LOW ANGULAR DAMPING RESULTING IN AN UNSTABLE OSCILLATION OF APPROXIMATELY A 9-SECOND PERIOD FOR THE FULL-SCALE AIRCRAFT. THE RESPONSES AT WING INCIDENCES BELOW 70 DEGREES WERE MORE COMPLEX DUE TO A RAPID DECREASE IN THE SPEED STABILITY FROM A LARGE POSITIVE VALUE ABOVE 70 DEGREES TO A NEGATIVE VALUE AT 60 DEGREES.
A theoretical and experimental study was conducted to determine the effects of propeller slipstream on wing performance. Previously developed theoretical analyses were expanded and modified to account for radial variation of the propeller slipstream velocity. The experimental program consisted of wind tunnel tests conducted with a motor-propeller system mounted on a semispan wing model. The wing model utilized had a chord to propeller diameter of 0.46, an aspect ratio of 6.37 (3.18 for semispan), a taper ratio of 1.0, and a NACA 0015 airfoil section. The wing model has eight floating wing segments with and without a 45-degree simulated split flap, located within each floating wing segment is a three-component strain gage balance to provide measurements of lift, drag, and pitching moment. The measurements of total wing lift, drag, and pitching moment were obtained with the six-component main wind tunnel balance. The test data obtained included the effects of the variation of propeller slipstream velocity by utilizing two propellers of different geometries. Propeller rotation for all tests was down at the wing tip. The experimental and theoretical results are compared. In general, good correlation is observed.
UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /Z0M07

AD-667 140      1/3     14/4
FEDERAL AVIATION AGENCY WASHINGTON D.C FLIGHT STANDARDS
SERVICE

FAA DEVELOPMENTS RELATIVE TO DESIGN OF NEW AIRCRAFT
STRUCTURES;

66 11P DOUGHERTY, 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 66.

DESCRIPTORS: (*TRANSPORT PLANES, *SUPERSONIC
PLANES), (*VERTICAL TAKE-OFF PLANES, DESIGN),
COMMERCIAL PLANES, AIRFRAMES, AVIATION SAFETY,
SHORT TAKE-OFF PLANES, RELIABILITY, MAINTENANCE,
ROTARY WINGS, HELICOPTERS
IDENTIFIERS: SUPERSONIC TRANSPORT PLANES, FEDERAL
AVIATION REGULATIONS, CRASHWORTHINESS

THE FOLLOWING BROAD AREAS ARE COVERED: (1)
SUPERSONIC TRANSPORTS; (2) TRANSPORT
DESIGNS UNDER FEDERAL AVIATION REGULATION 25;
(3) GENERAL AVIATION DESIGNS UNDER FEDERAL
AVIATION REGULATION 23; (4) ROTORCRAFT
DESIGNS UNDER FEDERAL AVIATION REGULATIONS 27
AND 29; (5) V/STOL AIRCRAFT; (6)
CRASHWORTHINESS AND PASSENGER EVACUATION.
UNCLASSIFIED

DUC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM07

AD-667 264 1/3 9/2
MELPAR INC FALLS CHURCH VA

SIMULATION OF HELICOPTER AND V/STOL AIRCRAFT, VOLUME VI: XC-142 ANALOG COMPUTER PROGRAM STUDY: XC-142A
SIMULATION EQUATION MECHANIZATION.

DESCRIPTIVE NOTE: FINAL REPT.
JAN 65 213P MAKARCZYK, J. A.; FAITH, R.

CONTRACT: N61339-1205
MONITOR: NAVTRADEVCEN 1205-6

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 5, AD-615 452.

DESCRIPTORS: (TRANSPORT PLANES, MATHEMATICAL MODELS), (VERTICAL TAKE-OFF PLANES, MATHEMATICAL MODELS), TILT WINGS, ANALOG COMPUTERS, SIMULATION, HELICOPTERS, SHORT TAKE-OFF PLANES, COMPUTER PROGRAMS, FLOW CHARTING, AIRFOILS, AERO DYNAMIC CHARACTERISTICS, RESEARCH PLANES

IDENTIFIERS: COMPUTER SIMULATION, C-142 AIRCRAFT, XC-142A AIRCRAFT

THE REPORT PRESENTS THE ANALYSIS AND SIMPLIFICATION PROCEDURES THAT ARE REQUIRED TO DEFINE AND PROGRAM THE MATHEMATICAL MODEL FOR THE XC-142A AIRCRAFT IN A FORM WHICH IS SUITABLE FOR MECHANIZATION AND SOLUTION ON A GENERAL PURPOSE ANALOG COMPUTER. THIS PROGRAM WILL ENABLE THE NAVAL TRAINING DEVICE CENTER TO PERFORM DYNAMIC SIMULATION STUDIES FOR A V/STOL TILT-WING AIRCRAFT.

THE FLUID STALL SENSOR IS A REMOTE INDICATING SYSTEM FOR DETECTING STALL ON AIRCRAFT WINGS. WHEN THE FLOW IS ATTACHED TO THE WING, IT CAUSES ASPIRATION FROM A PROBE JUST ABOVE THE WING SURFACE. SEPARATED FLOW, ASSOCIATED WITH STALL, DECREASES THE ASPIRATION. THE CHANGE IN ASPIRATION IS AMPLIFIED BY A HIGH IMPEDEANCE FLUID AMPLIFIER WHICH DRIVES AN INDICATOR. THE POSITION OF INDICATORS FROM SEVERAL PROBES ACROSS THE WING GIVES AN INDICATION OF THE AMOUNT OF LIFT REMAINING.

(AUTHOR)
A general method is presented for the determination of aerodynamic characteristics of fan-in-wing configurations by means of incompressible potential-flow theory. The method is applicable to wings, flapped or unflapped, and to a wide variety of other potential-flow boundary-value problems, arbitrary wing and inlet geometry, fan inflow distribution, thrust vectoring, angle of attack, yaw, flight, flaps, computer programs.


Contract: DA-44-0177-AMC-323(T)

Task: 1F125901A14234

Monitor: USAAVLABS TR-67-61A-VOL-1

Unclassified report

Supplementary note: See also Volume 2, AD-667 981.

Descriptors: (vertical take-off planes, aerodynamic characteristics, ducted fans, wing inlets, incompressible flow, lift, short take-off planes, aerodynamic configurations, potential theory, incompressible flow, boundary layer, jet mixing flow, axially symmetric flow, flow fields, boundary value problems, thrust vector control systems, angle of attack, yaw, flight, flaps, computer programs)

Identifiers: Fan-in-wing configurations, lift fans, streamlines

A general method is presented for the determination of aerodynamic characteristics of fan-in-wing configurations by means of incompressible potential-flow theory. The method is applicable to wings, flapped or unflapped, and to a wide variety of other potential-flow boundary-value problems, arbitrary wing and inlet geometry, fan inflow distribution, thrust vectoring, angle of attack, yaw, and flight speeds from hover through transition can be treated. The theoretical model is completely three-dimensional, with no linearization of boundary conditions. The calculated results include pressure distributions, lift, induced drag and side force, pitching moment, rolling moment and yawing moment. The numerical potential-flow solution is obtained with source and vortex distributions on the boundary surfaces. The representation is composed of small, constant-strength source sheet panels distributed over the exterior wing surfaces, internal vortex filaments which emanate from the wing trailing edge to provide circulation.
UNCLASSIFIED

GENERAL METHOD FOR DETERMINING THE AERODYNAMIC CHARACTERISTICS OF FAN-IN-WING CONFIGURATIONS.

VOLUME II: COMPUTER PROGRAM DESCRIPTION.

DESCRIPTIVE NOTE: FINAL REPT.,
DEC 67, 335P
RICHARD F. SUNDSTRUM, KNUST AE;
CONTRACT: DA-44-177-AMC-323(1)

PROJ: DA-IF125901A142
TASK: IF125901A14234
MONITOR: USAAVLABS TR-67-618-VOL-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME I, AD-667 980.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, AERODYNAMIC CHARACTERISTICS), (*DUCTED FANS, COMPUTER PROGRAMS), WING INLETS, INCOMPRESSIBLE FLOW, LIFT, SHORT TAKE-OFF PLANES, AERODYNAMIC CONFIGURATIONS, POTENTIAL THEORY, THREE-DIMENSIONAL FLOW, BOUNDARY LAYER, JET MIXING FLOW, AXIALLY SYMMETRIC FLOW, FLOW FIELDS, BOUNDARY VALUE PROBLEMS, THRUST VECTOR CONTROL SYSTEMS, ANGLE OF ATTACK, YAN FLIGHT, FLAPS, DIGITAL COMPUTERS

IDENTIFIERS: FAN-IN-WING CONFIGURATIONS, LIFT FANS, CDC-6000 PROGRAMS, FORTRAN, ASCENT PROGRAMMING LANGUAGE

COMPARISON OF LONGITUDINAL STABILITY CHARACTERISTICS OF THREE TILT-WING VTOL AIRCRAFT DESIGNS

JAN 66 104P CURNUTT,R* A: J CURTISS,H*
C., JR.

REPT. NO. 749
CONTRACT: DA-44-177-AMC-8(T)
PROJ: DA-1P125901A142
TASK: 1P125901A14233
MURITOR: USAviolads TR-66-64

UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, PITCH(MOTION)), (*TRANSPORT PLANES, PITCH(MOTION)), RESEARCH PLANES, CONVERTIBLE PLANES, TILT WINGS, STABILITY, DESIGN, RESPONSE, MODEL TESTS, SCALE, WIND TUNNEL MODELS, AIRPLANE MODELS, ANALOG COMPUTERS, AERODYNAMIC CHARACTERISTICS, CORRELATION TECHNIQUES (U)

IDENTIFIERS: C-142 AIRCRAFT, XC-142A AIRCRAFT, VZ-2 AIRCRAFT, TRIM(AIRCRAFT), ANGLE OF INCIDENCE (U)


CONSIDERATION IS GIVEN TO THE IMPORTANCE OF VARIOUS DERIVATIVES IN DETERMINING THE RESPONSE CHARACTERISTICS. A LARGE NUMBER OF ANALOG COMPUTER TRACES ARE INCLUDED. (U)

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UNCLASSIFIED
UNCLASSIFIED

GENERAL ELECTRIC CO CINCINNATI OHIO FLIGHT PROPULSION DIV

INVESTIGATIONS OF A VARIABLE AREA SCROLL FOR POWER TRANSFER IN TIP TURBINE LIFT FAN SYSTEMS. (U)

DESCRIPTION NOTE: FINAL REPT. JUN 66-DEC 66; NOV 67-623P SMITH, EUGENE G.;

CONTRACT: DA-44-177-AMC-22U(T)

PROJECT: UA-1F12I010161

MONITOR: USAAVLABS TN-67-26

UNCLASSIFIED REPORT

DESCRIPTIONS: (*VERTICAL TAKE-OFF PLANES, *GAS TURBINES), (*VARIABLE AREA NOZZLES, *STABILIZATION SYSTEMS), PERFORMANCE (ENGINEERING), AXIAL-FLOW TURBINES, GAS GENERATING SYSTEMS, FLIGHT CONTROL SYSTEMS, ANALOG COMPUTERS, SIMULATION, ROLL, MATERIALS, DESIGN: TURBINE WHEELS, GAS TURBINE ROTORS, STRESSES, ANALOG SYSTEMS, AERODYNAMIC CHARACTERISTICS (U)


DEMONSTRATION TESTS AND ANALOG SIMULATIONS WERE PERFORMED FOR THE VARIABLE AREA SCROLL POWER TRANSFER APPLICABLE FOR THRUST CONTROL OF TIP TURBINE DRIVEN LIFT FANS. THE TIP TURBINE DRIVEN LIFT FAN USED THE LIGHTWEIGHT LF2 ROTOR CONTROL RESPONSE RATES OF 0.01 SECOND FOR ROLL CONTROL AND 0.10 SECOND FOR HEIGHT CONTROL WERE DEMONSTRATED. THE JAZZER, AN ANTICIPATORY DEVICE, IMPROVED THE RESPONSE TO ABOUT ONE-HALF THE ORIGINAL LEVEL. AERODYNAMIC PERFORMANCE OF THE SYSTEM MET OR EXCEEDED OBJECTIVE LEVELS. (AUTHOR) (U)
UNCLASSIFIED

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM07

AU-66B 006 1/3 14/2 5/9
BELL AEROSYSTEMS CO BUFFALO N Y

STUDY, SURVEY OF HELICOPTER AND V/STOL AIRCRAFT SIMULATOR TRAINER DYNAMIC RESPONSE. VOLUME II,
DYNAMIC RESPONSE CRITERIA FOR V/STOL AIRCRAFT FLIGHT TRAINERS.

DESCRIPTIVE NOTE: FINAL REPT.,
MAY 67 187P STREIFF, M. G. I
CONTRACT: N61339-1/5J
PROJ: 7681-1
MONITOR: NAVTRADEVCSN 1753-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME I, AU-668 005.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, FLIGHT SIMULATORS), (FLIGHT SIMULATORS, STANDARDS),
SHORT TAKE-OFF PLANES, HELICOPTERS,
PERFORMANCE (ENGINEERING), AERODYNAMIC CHARACTERISTICS, TRAINING DEVICES, DESIGN,
HANDLING, EQUATIONS OF MOTION, PILOTS, RESPONSE,
COMPUTER PROGRAMS, FLIGHT CONTROL SYSTEMS,
SIMULATION

THE RESULTS OF A STUDY TO DETERMINE THE DYNAMIC RESPONSE CRITERIA FOR V/STOL AIRCRAFT SIMULATOR TRAINERS ARE PRESENTED. THE FUNDAMENTALS OF V/STOL DYNAMICS, CONTROL, AND SIMULATION WITHIN THE VARIOUS V/STOL FLIGHT REGIMES ARE DESCRIBED. DIFFICULTIES LIKELY TO BE ENCOUNTERED IN DEVELOPING AN ADEQUATE V/STOL AIRCRAFT SIMULATION ARE ALSO PRESENTED. METHODS AND PROCEDURES FOR DETERMINING THE ACCURACY TO WHICH SPECIFIC DYNAMIC RESPONSE PARAMETERS MUST BE SIMULATED ARE PRESENTED, AND BASED UPON THESE, SIMULATION TOLERANCES ARE DEVELOPED FOR EACH SIGNIFICANT HANDLING QUALITIES PARAMETER IN EACH FLIGHT REGIME. THE DYNAMIC ATTRIBUTES OF THE PILOT-AIRCRAFT COMBINATION WITH REGARD TO EACH SPECIFIC PARAMETER ARE DISCUSSED. A DETAILED DESCRIPTION OF VARIOUS V/STOL AIRCRAFT EQUATIONS OF MOTION, TRANSFER FUNCTIONS, AND MODES OF MOTION IS INCLUDED AND THE PRACTICAL LIMITATIONS OF VARIOUS METHODS AND PROCEDURES FOR PROGRAMMING THE EQUATIONS OF MOTION FOR PILOTED FLIGHT SIMULATION PURPOSES ARE DISCUSSED. (AUTHOR)

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UNCLASSIFIED /ZOM07
UNCLASSIFIED

LTV AEROSPACE CORP DALLAS TEX LTV VolGHT AERONAUTICS DIV

RESEARCH ON VTOL WATER HOVER EFFECTS, INCLUDING THE EFFECTS OF WIND AND WAVES. (U)

DESCRIPTIVE NOTE: FINAL RPET., APR 68 241P MARSH KEITH R. 1
REPT. NO. 2-5540U/BR-6140
CONTRACT: NOOU1-67-C-0488
PROJ: NR-212-167

UNCLASSIFIED REPORT

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, HOVERING), (WATER, DOWNMASH), TACTICAL AIR SUPPORT, TILT MIGHTS, OCEANS, WATER WAVES, WIND, MODELS (SIMULATIONS), ALL-WEATHER AVIATION, ANTISUBMARINE WARFARE, SEA RESCUES, SURFACE PROPERTIES, TEST FACILITIES, TEST EQUIPMENT, DATA PROCESSING SYSTEMS, STABILITY, DIGITAL SYSTEMS, PHOTOGRAPHIC EQUIPMENT, TEST METHODS, MODEL TESTS (U)

UNCLASSIFIED

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT
PARIS (FRANCE)

FLUID DYNAMICS OF ROTOR AND FAN SUPPORTED AIRCRAFT AT
SUBSONIC SPECTS

DESCRIPTIVE NOTE: CONFERENCE PROCEEDINGS
SEP 67 597P
REPT. NO. AGARD-CP-24

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: NATO FURNISHED, PRESENTED AT A
SPECIALISTS' MEETING OF THE FLUID DYNAMICS PANEL
OF AGARD, GOETTINGEN (GERMANY) 11-13 SEP 67.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES,
SYMPOSIAS), HELICOPTERS, HELICOPTER ROTORS,
ROTARY WINGS, AERODYNAMIC CHARACTERISTICS, WIND
TUNNEL MODELS, MODEL TESTS, FANS, AEROELASTICITY,
JETS, LIFT, DEFLECTION, PROPELLERS (AERIAL),
AIRPLANE NOISE, VORTICES, SHORT TAKE-OFF PLANES
IDENTIFIERS: STOWED ROTOR AIRCRAFT, CROSS FLOW,
LIFT FANS, TRANSITION FLIGHT

THE COLLECTION OF PAPERS EMPHASIZES THE FOLLOWING
AREAS: ROTORS AND FANS IN HOVER AND TRANSITION,
INTERFERENCE WITH THE AIRFRAME AND THE GROUND, GROUND
EFFECTS ON ROTORS AND FANS, NOISE PROBLEMS AND
TESTING TECHNIQUES. THE TOPICS ARE BASED ON LOW-
DISCLOSING DEVICES. (AUTHOR)
THE POTENTIAL ABILITY OF V/STOL AIRCRAFT TO PERFORM ARMY DROP MISSIONS AT VARIOUS ALTITUDES WHILE FLYING AT SPEEDS FROM HOVER TO CONVENTIONAL FLIGHT COULD PROVIDE A BASIS FOR PRECISION IN-FLIGHT DELIVERY AND COULD OVERCOME MAJOR OPERATIONAL RESTRICTIONS ASSOCIATED WITH MANY OF THE CONVENTIONAL AIR-DROP TECHNIQUES. THE STUDY WAS PARTIALLY BASED ON ACTUAL AIR-DROP DEMONSTRATIONS. SINGLE CARGO LOADS OF UP TO 3,000 POUNDS WERE GRAVITY DROPPED IN HOVER AND AT 30 KNOTS, AND LOADS OF UP TO 4,000 POUNDS WERE EXTRACTED BY PARACHUTE AT 127 KNOTS.

USING THESE FLIGHT DATA TO SET UP A REALISTIC SIMULATION, A MATHEMATICAL MODEL OF THE XC-142A AIRPLANE AND A HUMAN PILOT WERE USED TO EXAMINE THE AIRCRAFT'S RESPONSE WITH CARGO WEIGHTS UP TO THE AIRPLANE'S MAXIMUM PAYLOAD OF 8,000 POUNDS IN THE LOW-SPEED PORTION OF TRANSITION AND 12,000 POUNDS AT A 127-KNOT FLIGHT CONDITION. THE STUDY SHOWS THAT THE MAXIMUM PAYLOAD COULD BE SUCCESSFULLY DROPPED WITH PROPER PILOT TECHNIQUE. MEANS OF EXTENDING THE AIRPLANE'S AIR-DROP CAPABILITY THROUGH THE USE OF SPECIAL EXTRACTION FORCES AND PARAMETERS APPLICABLE TO THE AIR-DROP SYSTEM WERE STUDIED.
A Feasibility Study of Advanced V/STOL Propeller

A feasibility study of advanced V/STOL propeller systems for the 1970-1975 time period was conducted. The primary objective of the study was to investigate the application of new materials and new design concepts to define the maximum reductions in specific weight of the complete propeller system (including reduction gearbox) attainable in this time period. Preliminary designs of future propeller systems presented in the report are over 50 percent lighter than comparable present-day V/STOL systems. Three integral gearbox propeller systems, with and without cyclic pitch and with and without a cross-shaft drive pad, were defined in this report using the advanced technology indicated as feasible by the study. Each major component of the IGB propeller system was optimized and then merged into complete system designs. A summary weight tabulation is presented showing the relative contributions of each major component of the propeller system to the total indicated weight reductions. A significant portion of the weight reductions is shown to be achievable by 1970, since the technology required is presently under development or is a natural extension of existing technology. Other significant weight reductions, such as those resulting from the use of boron blade spars and titanium gearing, are at an early phase of their technology development.
AN EXPERIMENTAL STUDY WAS MADE TO INVESTIGATE SOME MEANS TO ALLEVIATE FLOW BREAKDOWN BY USING A NUMBER OF DIFFERENT STRAKE OR FENCE CONFIGURATIONS. A TOTAL OF 23 DIFFERENT CONFIGURATIONS WERE STUDIED IN THE 4 X 6 FT. INSERT WITH A 2 FT. DIAMETER HIGU ROTOR AT ABOUT 7 PSF DISK LOADING. NONE OF THE STRAKE CONFIGURATIONS STUDIED IN THE EXPERIMENT COMPLETELY ELIMINATE THE EFFECT OF FLOW BREAKDOWN. A FURTHER EXPERIMENTAL INVESTIGATION IS DESIRABLE BECAUSE OF THE INCREASING INTEREST IN TESTING V/STOL VEHICLES IN THE TRANSITION SPEED RANGE.

(AUTHOR)
AN OPTIMAL CONTROL METHOD FOR PREDICTING CONTROL CHARACTERISTICS AND DISPLAY REQUIREMENTS OF MANNED-VEHICLE SYSTEMS.

DESCRIPTION NOTE: FINAL REPT. JUL 66-31 AUG 67; JUN 66-173P; ELKIND, JEROME I.; FALB, PETER L.; KLEINMAN, DAVID; LEVISON, WILLIAM H.

REPT. NO. BBN-1569
CONTRACT: AF 33(615)-5160
PHOJ: AF-8219
TASK: 821910
MONITOR: AFFDL TR-67-167

AN ANALYTIC PROCEDURE FOR DETERMINING INFORMATION DISPLAY REQUIREMENTS AND HUMAN CONTROL AND INSTRUMENT MONITORING CHARACTERISTICS FOR COMPLEX MULTIVARIABLE VEHICULAR CONTROL SYSTEMS IS DEVELOPED. THE METHOD IS BASED UPON THE ASSUMPTION THAT THE HUMAN CONTROLLER WILL ACT IN A NEAR OPTIMAL MANNER. OPTIMAL CONTROL THEORY AND ITS ASSOCIATED STATE-SPACE REPRESENTATION IS USED AS THE BASIS FOR THE ANALYTIC PROCEDURE. A MODEL FOR THE HUMAN CONTROLLER IS DEVELOPED IN WHICH THE CONTROLLER'S INHERENT LIMITATIONS ARE APPROXIMATED BY A TIME DELAY. THE MODEL INCLUDES A PREDICTOR FOR COMPENSATING FOR THIS TIME DELAY, A CONTROLLER FOR PRODUCING THE CONTROL INPUTS TO THE VEHICLE AND A COST FUNCTIONAL THAT IS TO BE MINIMIZED. THE CONTROLLER IS ASSUMED TO BE OPTIMAL. SEVERAL SUBOPTIMAL PREDICTORS ARE INVESTIGATED. ONLY QUADRATIC COST FUNCTIONALS ARE CONSIDERED. THE ANALYTIC PROCEDURE ASSUMES THAT THE HUMAN OPERATOR'S CONTROL CHARACTERISTICS CAN BE REPRESENTED BY A SET OF GAINS OPERATING ON THE DELAYED STATE VARIABLES OF THE SYSTEM.
UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /2OM07

AD-703 682 1/3 1/2
FOREIGN TECHNOLOGY DIV RIGHT-PATTERSON AFB OHIO

VERTICAL TAKEOFF AND LANDING (U)

FEB 70 12UP PAVLKOV, V. F. ;
REPT. NO. FTD-MT-24-379-69
PROJ. FTD-7230278

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTL: EDITED MACHINE TRANSLATION OF MONO.
VERTIKALNYI VZLET I POSADKA, MOSCOW, 1968 P1-112, BY
ROBERT ALLEN POTTS.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, PERFORMANCE [ENGINEERING]), TAKE-OFF, AIRCRAFT LAN DINGS, HELICOPTERS, AIRCRAFT ENGINES, FLIGHT CONTROL SYSTEMS, STABILIZATION, AVIATION SAFETY, JETS, FLIGHT, USSR (U)
IDENTIFIERS: ROTARY WING AIRCRAFT;
TRANSLATIONS (U)

CONTENTS:
CERTAIN CHARACTERISTICS OF FLIGHTS IN NATURE; HELICOPTERS AND ROTARY WING AIRCRAFT;
VTOL AIRCRAFT; VTOL AIRCRAFT POWER PLANTS;
STABILIZATION AND CONTROL OF VTOL; TRANSITION CONDITIONS OF FLIGHT OF VTOL AIRCRAFT; FLIGHT SAFETY OF VTOL AIRCRAFT; EFFECT OF A GAS JET ON THE TAKEOFF-LANDING SITE; ANOMALIES OF FLIGHT CHARACTERISTICS OF VTOL. (U)
A procedure is developed for using human response theory and the analytic methods of optimal control theory to analyze a complex manual control task. The central element in the procedures is a model of the human operator that is based on the assumption that well-trained operators perform optimally subject to certain inherent limitations. Recent results in human response theory provide the representation of the human's limitations. Optimal control theory is then used to predict closed-loop human and system performance. The manual control of the longitudinal position of a hovering VTOL vehicle is analyzed using the developed techniques.
A STABILITY AND CONTROL PREDICTION METHOD FOR HELICOPTERS AND STOPPABLE ROTOR AIRCRAFT. VOLUME III: PROGRAMMER'S MANUAL. (U)


UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 2, AD-706 918, AND VOLUME 4, AD-706 919.

DESCRIPTIONS: (HELICOPTERS, STABILITY), (VERTICAL TAKE-OFF PLANES, STABILITY), INSTRUCTION MANUALS, SUBROUTINES, ROTOR BLADES (ROTOR WINGS), HELICOPTER ROTORS, PROGRAMMING (COMPUTERS), CONTROL, DIGITAL COMPUTERS

IDENTIFIERS: *STOPPABLE ROTOR AIRCRAFT (U)

THE REPORT DESCRIBES A MATHEMATICAL MODEL OF ROTORCRAFT THAT MAY BE USED TO DETERMINE CHARACTERISTICS OF PERFORMANCE, STABILITY, RESPONSE, AND ROTOR BLADE LOADS. THE COMPLEXITY OF THE EQUATIONS USED REQUIRES THE USE OF A DIGITAL COMPUTER FOR EFFICIENT SOLUTION. THIS VOLUME CONTAINS AIDS FOR THE COMPUTER PROGRAMMER. THE PROGRAMMING AIDS ARE DIVIDED INTO TWO GROUPS; BACKGROUND MATERIAL FOR THE PROGRAMMER JUST STARTING TO WORK ON THIS COMPUTER PROGRAM AND THE DETAILED EXPLANATION OF THE COMPUTER GENERATED DOCUMENTATION WHICH IS NECESSARY FOR ANY PROGRAMMER TO WORK EFFECTIVELY ON THIS PROGRAM. (AUTHOR) (U)
A STABILITY AND CONTROL PREDICTION METHOD FOR HELICOPTERS AND STOPPABLE ROTOR AIRCRAFT, VOLUME II: USER'S MANUAL. (U)

DESCRIPTIVE NOTE: FINAL REPT. DEC 68-FEB 70, FEB 70 164P BIRD, BILLY J.; IMCLARTY, TYCE T. (U)

CONTRACT: F33615-69-C-1121
PHO: AF-8219
TASK: 821907
MONITOR: AFFDL TR-69-123-VOL-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 3, AU-70b 374.

DESCRIPTIONS: (*HELICOPTERS, STABILITY), (*VERTICAL TAKE-OFF PLANES, STABILITY), ROTOR BLADES (ROTARY KINGS), RESPONSE, LOADING (MECHANICS), PERFORMANCE (ENGINEERING), PROGRAMMING (COMPUTERS), EQUATIONS OF MOTION, HELICOPTER ROTORS, MATHEMATICAL PREDICTION, CONTROL

IDENTIFIERS: *STOPPABLE ROTOR AIRCRAFT

THE VOLUME PRESENTS ALL DOCUMENTATION AVAILABLE TO AID THE USER OF THE COMPUTER PROGRAM DEVELOPED IN THIS WORK. THE INPUT FORMAT SECTION PROVIDES AN EXPLANATION OF HOW TO USE THE COMPUTER PROGRAM. MANY OF THE INPUTS ARE DEFINED BY EQUATIONS SHOWING HOW THEY FUNCTION IN THE PROGRAM. THIS MAKES THE USE OF THE INPUTS AS CLEAR AS POSSIBLE. FOUR TYPICAL SETS OF INPUT DATA ARE INCLUDED AS WORKING EXAMPLES. THE OUTPUT GUIDE GIVES A THOROUGH DISCUSSION OF ALL OF THE FORMS OF COMPUTER OUTPUT OBTAINED BY THE USER. (AUTHOR)
A FLIGHT INVESTIGATION OF LATERAL-DIRECTIONAL HANDLING QUALITIES FOR V/STOL AIRCRAFT IN LOW SPEED MANEUVERING FLIGHT.

DESCRIPTIVE NOTE: FINAL REPT. AUG 68-AUG 69, MAR 70 189P
DOETSCH, K-H., JR., GOULD, D. W., McGUIRE, D. M., I
CONTRACT: AF 33(615)-3736
PROJ: AF-690DC
TASK: 69BDCOU
MONITOR: AFFUL

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH NATIONAL AERONAUTICAL ESTABLISHMENT, OTTAWA (ONTARIO), NAELTR-FRI-12.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, HANDLING), ROLL, MANEUVERABILITY, FLIGHT SIMULATORS, FLIGHT TESTING, FLIGHT SPEEDS, APPROACH

PROPELLER STATIC PERFORMANCE TESTS FOR V/STOL AIRCRAFT. PART II: TEST DATA (APPENDIX III). (U)

DESCRIPTIVE NOTE: REPT. FOR JUL 65-NOV 67, JAN 70-3653 P. CHOPIN, MATTHEW H.; (U)

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO PART I, AD-708 501.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES; PROPELLERS (AERIAL)); (TRANSPORT PLANES, PROPELLERS (AERIAL)); PERFORMANCE (ENGINEERING), EXPERIMENTAL DATA, STATIC, PROPELLER BLADES; DESIGN (U)
IDENTIFIERS: XC-142A AIRCRAFT, C-142 AIRCRAFT (U)

THE REPORT PRESENTS THE REDUCED DATA OBTAINED DURING AN EXTENSIVE SERIES OF PROPELLER STATIC PERFORMANCE TESTS WHICH WERE RUN BECAUSE OF A STATIC PERFORMANCE THRUST DEFICIENCY ENCOUNTERED DURING FLIGHT TESTS OF THE XC-142A V/STOL CARGO AIRCRAFT. THIRTEEN DIFFERENT PROPELLERS WERE USED; 26 DIFFERENT CONFIGURATIONS WERE OBTAINED BY CHANGING PARAMETERS OF SOME OF THE 13 BLADES. THE REDUCED DATA FOR THE 26 VERSIONS OF PROPELLERS TESTED ARE PRESENTED. PARAMETERS STUDIED DURING THE TESTS INCLUDED BLADE CUFF (ON OR OFF), TIP SHAPE, THUST, ACTIVITY FACTOR, CAMBER, AND AIRFOIL SECTION. DATA ON SEVERAL OTHER STATIC THRUST PROPELLERS TESTED ON RIGS 105, 1 AND 4, WHICH WERE NOT A PART OF THIS TEST SERIES, ARE ALSO PRESENTED FOR ADDITIONAL INFORMATION. THE INFORMATION OBTAINED FROM THE TESTS, IN EFFECT, REPRESENTS A STATE-OF-THE-ART STUDY FOR IMPROVING PROPELLER STATIC PERFORMANCE FOR V/STOL AIRCRAFT APPLICATIONS. THE INFORMATION OBTAINED DURING THESE TESTS CAN BE USED TO MORE ACCURATELY PREDICT STATIC THRUST FOR FUTURE PROPELLER DRIVEN V/STOL AIRCRAFT. (AUTHOR) (U)
UNCLASSIFIED

AN INVESTIGATION OF GROUND EFFECT ON VERTICAL TAKEOFF AIRCRAFT. (U)

DESCRIPTIVE NOTE: MASTER'S THESIS, JUN 76 THOMPSON CHARLES DOUGLAS

UNCLASSIFIED REPORT

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, GROUND EFFECT, PRESSURE, FUSELAGE, VELOCITY, NOZZLE GAS FLOW, JETS, THESIS) (U)

THE THEORETICAL SOLUTION FOR THE FLOW BENEATH V/STOL AIRCRAFT WAS EXTENDED TO INCLUDE TILTED JET CONFIGURATIONS. A LABORATORY MODEL WAS CONSTRUCTED TO TEST THE EFFECT OF VARIATION OF THE PARAMETERS GOVERNING THE FLOW. FREE STREAMLINE PLOTS, PRESSURE COEFFICIENTS ON THE GROUND AND FUSELAGE AND VELOCITY PROFILES IN THE NOZZLES WERE DETERMINED FROM HOT-WIRE ANEMOMETER TRAVERSES AND MICROMANOMETER READINGS. EXPERIMENTAL DATA COMPARED FAVORABLY WITH THE THEORETICAL DETERMINATIONS. (AUTHOR) (U)
UNCLASSIFIED

UDL REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 720217

AD-704-411 21/6
INTER-CONTROLS INC. WASHINGTON D.C.

ENGINE CONTROL SYSTEMS STUDY AS APPLIED TO INTER-
ENGINE THRUST CONTROL.

JAN 70 246P CARRAS, ANDREW N.; HUGHETT, PAUL W.
CONTRACT: N00019-66-C-0117

UNCLASSIFIED REPORT

DESCRIPTIONS: (*TURBOFAN ENGINES; CONTROL SYSTEMS),
(*VERTICAL TAKE-OFF PLANES; TURBOFAN ENGINES),
(*GAS TURBINES, MATHEMATICAL MODELS), DUCTED
FANS, TURBINE PARTS, LOGIC CIRCUITS, FUELS,
LIQUID LEVEL CONTROL, FAILURE (MECHANICS),
SIMULATION, COMPUTER PROGRAMS
IDENTIFIERS: WTF-6U ENGINES, COMPUTERIZED
SIMULATION, COMPUTER ANALYSIS, ENGINE CONTROL
SYSTEMS

VTOL TYPE AIRCRAFT INCORPORATING TURBO-FAN ENGINES
AS LIFTING MEANS DO NOT SENSIBLY LEND THEMSELVES TO
THE CROSS-COUPLING PROVISIONS INHERENTLY AVAILABLE
WITH THE SHAFTING OF PROPELLER TYPE ENGINES. AN
ENGINE FAILURE IN THE FAN ENGINE CASE IS THEREFORE A
CONSIDERABLY MORE PECULIAR MATTER FOR WHICH
PROVISION FOR THRUST COMPENSATION MORE RESPONSIVE
THAN A PILOT WOULD APPEAR TO BE REQUIRED. THE STUDY
UTILIZES A VERY COMPREHENSIVE HYBRID SIMULATION OF
THE WTF-6U ENGINE WHEREIN ALL ENGINE COMPONENTS ARE
SIMULATED ON A PERFORMANCE MAP BASIS THEREBY
INCLUDING ALL NON-LINEARITIES AS WELL AS PERMITTING
THE AVAILABILITY OF ANY AND ALL ENGINE PARAMETERS FOR
USE AS CONTROLLED VARIABLES OPERATING IN CONJUNCTION
WITH THE MANIPULATED VARIABLE, FUEL FLOW. FURTHER,
REALISTIC ACCELERATION CONTROL IN THE COURSE OF LARGE
UPSETS IS ACCOMPLISHED THEREBY PERMITTING A CONTROL
SYSTEM ANALYSIS WHICH IS COMPLETELY APPLICABLE TO THE
DETAIL DESIGN OF THE CONTROL SYSTEM AND THE SELECTION
OF COMPONENTS. (AUTHOR)

152
THE PRIMARY OBJECTIVE OF THE PROGRAM WAS TO INVESTIGATE AIRCRAFT DISPLAY REQUIREMENTS FOR STEEP-ANGLE APPROACHES AND LANDINGS WITH 1975-1980 ERA TACTICAL ROTARY-WING AND V/STOL AIRCRAFT. THE STUDY WAS CONDUCTED WITH VARIABLE VELOCITY SIMULATIONS OF BELL UH-1 AND RYAN XV-5 AIRCRAFT. ALTERNATIVE DISPLAY FORMATS WERE DEVELOPED AND EMPIRICALLY EVALUATED BY MEANS OF REAL-TIME MAN-IN-THE-LOOP SIMULATION TECHNIQUES. IN ADDITION, APPROACH ANGLE AND PROFILE CHARACTERISTICS WERE SYSTEMATICALLY VARIED TO ASCERTAIN THEIR EFFECTS ON TASK PERFORMANCE, INTERPRETED WITHIN THE CONSTRAINTS IMPOSED UPON AND BY THE SIMULATIONS. RESULTS OF THE STUDY INDICATED THAT MANUALLY CONTROLLED IFR STEEP-ANGLE APPROACHES AND LANDINGS ARE POSSIBLE WITH ALL DISPLAY FORMATS EVALUATED. GENERALLY, HORIZONTAL SITUATION DISPLAY FORMATS WERE FOUND TO YIELD MORE ACCURATE AND PRECISE PILOTING PERFORMANCE WITH BOTH VEHICLES. EFFECTS OF APPROACH PROFILE VARIATIONS WERE MINOR, WHILE EFFECTS OF APPROACH ANGLE DID VARY AS A FUNCTION OF THE VEHICLE FLOW AND THE AXIS OF ERROR OR PERFORMANCE MEASUREMENT.
A STUDY OF THE CORRELATION OF PILOT MODEL PARAMETERS AND CLOSED-LOOP PERFORMANCE WITH PILOT OPINION OF VTOL HOVER DYNAMICS WAS CONDUCTED. THE ENCOURAGING RESULTS SUGGESTED A PILOT-VEHICLE ANALYSIS METHOD OF PREDICTING PILOT MODEL PARAMETERS, CLOSED-LOOP PILOT-VEHICLE PERFORMANCE WITH GUST INPUTS, AND PILOT OPINION RATINGS FOR A WIDE RANGE OF VEHICLE DYNAMICS. THIS APPROACH WAS, IN TURN, USED TO PREDICT RATINGS FOR COMPARISON WITH FIXED BASE MOVING BASE, AND FLIGHT TEST RESULTS FOR VFR CONDITIONS. AGAIN THE RESULTS WERE PROMISING, AND A NEW METHOD OF SPECIFYING HOVER DYNAMICS FOLLOWED NATURALLY. THE NEW PILOT-VEHICLE ANALYSIS CONCEPT, CALLED THE MINIMUM PILOT RATING METHOD, IS DISCUSSED IN TERMS OF APPLICATIONS TO OTHER TASKS, FLYING QUALITIES SPECIFICATION, AND CONTROL SYSTEM DESIGN. (AUTHOR)
INVESTIGATION OF THE RECIRCULATION REGION OF A FLOW FIELD CAUSED BY A JET IN GROUND EFFECT WITH CROSSFLOW.  

DESCRIPTIVE NOTE: FINAL REPT. 19 MAR-30 APR 70, SEP 70 3UP BINITON, T. # 1 JRI  
REPT. NO. AEUC-TH-70-192  
CONTRACT: F40660-71-C-0002  
PHIJ: AF-8219, ARO-PDD084  

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH ARO, INC., TULLAHOMA, TENN. REPT. NO. ARO-PWT-TR-70-2U2.  

A WIND TUNNEL INVESTIGATION WAS CONDUCTED IN THE LOW SPEED WIND TUNNEL (V/STOL) TO DETERMINE THE VELOCITIES IN THE RECIRCULATION REGION OF THE FLOW FIELD PRODUCED BY THE INTERACTION OF A JET IMPINGING ON A GROUND PLANE WITH CROSSFLOW. AXIAL AND VERTI CAL VELOCITY COMPONENT MEASUREMENTS WERE OBTAINED WITH A FORWARD-SCATTERING LASER DUNPLER VELOCIMETER. TEST RESULTS PROVIDE TWO-COMPONENT VELOCITY FIELDS AND INDICATE THAT THE JET-TU-FREE-STREAM VELOCITY RATIO IS MUCH MORE IMPORTANT IN DETERMINING THE FLOW FIELD THAN THE MAGNITUDE OF THE INDIVIDUAL VELOCITIES. (AUTHOR)
UNCLASSIFIED

EVALUATION OF GEARED FLAP CONTROL SYSTEM FOR TILT WING V/STOL AIRCRAFT, (U)

AUG 70 108P CHURCHILL G. B.

UNCLASSIFIED REPORT

IDENTIFIERS: GEARED FLAP CONTROL SYSTEMS, TRANSITION FLIGHT, EVALUATION (U)

THE GEARED FLAP CONTROL SYSTEM PROVIDES A MEANS FOR CONTROLLING A TILT WING V/STOL AIRCRAFT IN HOVER AND TRANSITION FLIGHT WITHOUT THE USE OF AUXILIARY SYSTEMS SUCH AS CYCLIC PROPELLER PITCH OR TAIL JETS/ROTORS. THE SYSTEM IS BASED ON USING THE FLAP AS AN AERODYNAMIC SERVO TO POSITION THE WING RELATIVE TO THE FUSELAGE. ALTHOUGH THE SYSTEM IS MECHANICALLY SIMPLE, THE CONTROL CHARACTERISTICS ARE DIFFICULT TO VISUALIZE BECAUSE OF THE COUPLED BODY DYNAMICS INVOLVED. THEREFORE, A COMPREHENSIVE ANTHETICAL AND MODEL TESTING PROGRAM WAS PERFORMED TO EVALUATE THE SYSTEM. (AUTHOR)
UNCLASSIFIED

UNCLASSIFIED REPORT

MASS FLOW, VELOCITY AND IN-FLIGHT THRUST MEASUREMENTS BY ION DEFLECTION: (U)

VAUSE, C. RANDE, RUDLAND, R.

UNCLASSIFIED REPORT

DESCRIPTORS: (AIRSPEED INDICATORS, VERTICAL TAKE-OFF PLANES), VELOCITY, THRUST, MEASUREMENTS (U)

IDENTIFIERS: VAMS (VECTOR AIRSPEED MEASURING SYSTEMS), VECTOR AIRSPEED MEASURING SYSTEMS (U)

AN INVESTIGATION WAS MADE OF THE USE OF GASEOUS (ION) DISCHARGE SENSORS TO ACHIEVE ADEQUATE MEASUREMENT OF AIRCRAFT VELOCITY AND INSTALLED THRUST. (AUTHOR) (U)
AN INVESTIGATION OF THE TRAILING VORTEX SYSTEM GENERATED BY A JET-FLAPPED WING OPERATING AT HIGH WING LIFT COEFFICIENTS.

DESCRIPTION NOTE: FINAL REPORT

JUN 70 40P MCCORMICK, BARNES W. I

CONTRACT: F33615-69-C-1165

PROJECT: AF-1366

TASK: 136617

MUNI: AFFUL TK-70-90

DEVELOPMENT OF THE REDUCED SCALE WIF-48 LIFT FAN ENGINE WAS CONTINUED UNDER THIS PROGRAM. THE OBJECTIVE OF THE PROGRAM WAS IMPROVEMENT OF THE PRESSURE RATIO, EFFICIENCY AND DIFFUSION OF THE COMPRESSOR ROTORS. THIS PROGRAM INVESTIGATED THE EFFECTS OF DEBLUNTING AND SHEEP OF THE ROTOR TRAILING EDGE AND MODIFICATION OF THE PASSAGE AREA SCHEDULE AND WALL CONTOURS. THE MODIFICATIONS INVESTIGATED IN THIS PROGRAM DID NOT PRODUCE INCREASED ROTOR PRESSURE RATIO OR EFFICIENCY. AN INCREASE OF 11% IN ROTOR STATIC PRESSURE, ACCOMPANIED BY A 20% REDUCTION IN DIFFUSER LOSSES, WAS ACCOMPLISHED. THIS IMPROVEMENT PRODUCED A 5 POINT INCREASE IN STAGE EFFICIENCY OF THE COMPRESSOR. (AUTHOR)
A noise survey conducted on a deflected-jet VTOL aircraft is described. The test aircraft was mounted on a vertical thrust stand with the nozzles oriented in the hover-stop position while engine runs were made at different power settings. Forty-one (41) microphones were located in the field on the port side of the aircraft and six (6) microphones were located at positions near the aircraft skin. The height of the field microphones was varied (5 ft, 10 ft, and 15 ft). One-third octave band spectra obtained from all microphones and for all engine power settings were flat and did not exhibit the 'haystack' shape which is characteristic of a free jet. Typical one-third octave band sound pressure level spectra and contours of overall sound pressure level are presented. Estimates of jet total acoustic power are developed from the measurements and related to engine operating parameters. Expressions are derived to predict the one-third octave band spectra at positions in the field and on the vehicle from similarly configured aircraft for various engine operating conditions.
A theoretical investigation of a circular lifting jet in a cross-flowing mainstream.

Descriptive Note: Final Rept. Jul 69-Dec 70, Jan 71

Hackett, James E.; Miller, Ronald R.

Contract: F33615-69-C-1753

Project: AF-61698T

Monitor: AFFUL TR-70-170

Unclassified Report


Identifiers: Cross Flow

Finite-element potential-flow-modeling theoretical techniques are described which predict, from first principles, both the rolled-up geometry and the path of a round lifting jet convergent into a cross-flowing mainstream, as on VTOL or direct lift-assisted STOL aircraft. Starting with a straight-cylinder geometry, point vortex elements are perturbed using a predictor-corrector stepping method to give a first estimate of the bent-back shape, using assumed circulation values. A collocation scheme is next used to revise the circulation values, and after three or four iterations, a final exit-plane pressure distribution may be calculated. The fan-induced total pressure rise is simulated by injecting vortex rings at a chosen position in the duct which feeds the jet. Since the scope of the method is entirely non-viscous, separations toward the rear of real jets and the associated pressure changes are not simulated and base-pressure type of pressures cannot be expected. Nevertheless, for forward speed ratios of 0.1, 0.2, 0.3, and 0.4, the low-pressure contours at each side of the jet did show an increasing rearward shift just as is found experimentally, somewhat surprisingly, the simulated plumes were more stable at higher velocity ratios, at lower forward speeds, there was a tendency to flap, rather like a hose end when freed. It is anticipated that, if viscous effects were simulated, these motions might damp out.
A MIND TUNNEL INVESTIGATION OF JETS EXHAUSTING INTO A CROSSFLOW. VOLUME I. TEST DESCRIPTION AND DATA ANALYSIS. (U)

DESCRIPTIONS: (JET MIXING FLOW, INTERFERENCE), (EXHAUST GASES, JET MIXING FLOW), (VERTICAL TAKE-OFF PLANES, NOZZLE GAS FLOW), (FLAT PLATE MODELS, HIND TUNNEL MODELS, FLOW FIELDS, CURVE FITTING, PRESSURE, DATA PROCESSING SYSTEMS, TEST METHODS, FLOW VISUALIZATION, INTERACTIONS, SIDESLIP IDENTIFIERS: TOTAL PRESSURE RAKES, CROSS FLOW, GRAPHS (CHARTS), STATISTICAL PRESSURE DISTRIBUTIONS, CIRCULAR PLATES (U)

A LOW-SPEED MIND TUNNEL TEST OF A FOUR-FOOT DIAMETER CIRCULAR PLATE MODEL WITH UP TO THREE EXHAUSTING JETS WAS CONDUCTED TO DETERMINE SURFACE STATIC PRESSURE DISTRIBUTIONS, JET PATHS, AND JET DECAY CHARACTERISTICS IN THE PRESENCE OF A CROSSFLOW. DATA WERE OBTAINED FOR THE ONE-JET CONFIGURATION WITH THE JET EXITING AT A NUMBER OF ANGLES TO THE PLATE AND AT VARIOUS VELOCITY RATIOS AND SIDESLIP ANGLES. TWO-JET ARRANGEMENTS WERE TESTED WITH THE JETS EXITING NORMAL TO THE PLATE FOR THREE DIFFERENT SPACINGS BETWEEN THE TWO JETS AND AT A NUMBER OF VELOCITY RATIOS AND SIDESLIP ANGLES. THREE-JET CONFIGURATION DATA WERE OBTAINED WITH THE JETS EXITING NORMAL TO THE PLATE FOR A NUMBER OF VELOCITY RATIOS AND SIDESLIP ANGLES. AS A RESULT OF THIS INVESTIGATION, SEVERAL CONCLUSIONS ARE DEDUCED PERTAINING TO THE INTERACTION OF MULTIPLE JETS EXHAUSTING INTO A CROSSFLOW. THE TEST MODEL, INSTRUMENTATION, TEST PROCEDURE, AND REDUCTION AND ACCURACY OF THE TEST DATA ARE DISCUSSED IN THIS VOLUME. A SUMMARY AND DISCUSSION OF THE TEST RESULTS ARE ALSO PRESENTED. (AUTHOR) (U)
A WIND TUNNEL INVESTIGATION OF JETS EXHAUSTING INTO A CROSSFLOW, VOLUME IV.
ADDITIONAL DATA FOR THE THREE-JET CONFIGURATION.

DESCRIPTIVE NOTE: TECHNICAL REPORT.

Peter T. Ziegler, Henry I.

CONTRACT: F33615-69-C-16U2
PROJECT: AF-6986T
TASK: 698ST01
MONITOR: AFFUL TR-70-154-VOL-4

A LOW SPEED WIND TUNNEL TEST OF A FOUR-FOOT DIAMETER CIRCULAR PLATE MODEL WITH UP TO THREE EXHAUSTING JETS WAS CONDUCTED TO DETERMINE SURFACE STATIC PRESSURE DISTRIBUTIONS, JET PATHS, AND JET DECAY CHARACTERISTICS IN THE PRESENCE OF A CROSSFLOW. THREE-JET CONFIGURATION DATA WERE OBTAINED WITH THE JETS EXITING NORMAL TO THE PLATE FOR A NUMBER OF VELOCITY RATIOS AND SIDESLIP ANGLES. AS A RESULT OF THIS INVESTIGATION, SEVERAL CONCLUSIONS ARE DEDUCED PERTAINING TO THE INTERACTION OF MULTIPLE JETS EXHAUSTING INTO A CROSSFLOW. (AUTHOR)
A WIND TUNNEL INVESTIGATION OF JETS EXHAUSTING INTO A CROSSFLOW. VOLUME II.
ADDITIONAL DATA FOR THE ONE-JET CONFIGURATION.

DESCRIPTIVE NOTE: TECHNICAL REPORT.

DEL 70 500P FRICKELLYNN H. WOOLER, PETER T. ZIEGLER, HENRY I.
CONTRACT: F33615-69-C-16UZ
PROJ: AF-69BBT
TASK: 69B701
MONITOR: AFDEL TR-70-154-VOL-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 1; AD-718 122 AND VOLUME 3, AD-720 233.

DESCRIPTORS: (JET MIXING FLOW, INTERFERENCE),
(VERTICAL TAKE-OFF PLANES, NOZZLE GAS FLOW),
DATA, FLAT PLATE MODELS, WIND TUNNEL MODELS,
FLOW FIELDS, PRESSURE, SIDESLIP, VELOCITY
IDENTIFIERS: JET DECAY, STATIC PRESSURE
DISTRIBUTION, VELOCITY RATIOS, ONE JET
CONFIGURATIONS, GRAPHS (CHARTS), CROSS
FLOW


(AUTHOR)
A low speed wind tunnel test of a four-foot diameter circular plate model with up to three exhausting jets was conducted to determine surface static pressure distributions, jet paths, and jet decay characteristics in the presence of a crossflow. Two-jet arrangements were tested with the jets exiting normal to the plate for three different spacings between the two jets and at a number of velocity ratios and sideslip angles. Three-jet configuration data were obtained with the jets exiting normal to the plate for a number of velocity ratios and sideslip angles. As a result of this investigation, several conclusions are deduced pertaining to the interaction of multiple jets exhausting into a crossflow. The report is the third of four volumes. The test model, instrumentation, test procedure, and reduction and accuracy of the test data were discussed in Volume I. The present volume contains additional data pertaining to the two-jet configurations.
CIVIL AERONAUTICS BOARD PLANNING STUDY:
STOL-VTOL AIR TRANSPORTATION SYSTEMS

MAR 7U 37P HINTZE, CARL, JR.

THE STUDY WAS PREPARED TO PROVIDE INFORMATION TO
THE CIVIL AERONAUTICS BOARD MEMBERS AND STAFF
ON THE CURRENT STATUS OF STUL AND VTOL AIRCRAFT,
TERMINALS, AND ALLIED FACILITIES. THE STUDY IS A
CONSOLIDATION OF AVAILABLE INFORMATION ARRANGED TO
INDICATE THE CONSENSUS OF OPINION OF THE VARIOUS
AUTHORITIES IN THE FIELD. THE MAJOR DESIGN CONCEPTS
OF STOL AND VTOL AIRCRAFT AND SUPPORT SYSTEMS ARE
DESCRIBED IN RELATIVELY NON-TECHNICAL TERMS.
INCLUDED IS A BRIEF DESCRIPTION OF THE CHANGING
SOCIO-ECONOMIC ASPECTS OF THE MAJOR METROPOLITAN
AREAS OF THE NATION AND THEIR ANTICIPATED EFFECTS ON
URBAN TRANSPORTATION REQUIREMENTS. THE STUDY
SUMMARIZES THE PROBABLE COURSE OF EVENTS IN THE
EVOLUTION OF STUL AND VTOL AIR TRANSPORTATION
SYSTEMS, AND FUTURE PROJECTIONS. (AUTHOR)

166
A mathematical model for predicting the pilot rating of the flying qualities of a VTOL aircraft in the precision hover mode is described. The model includes the following elements: the longitudinal equations of motion for the VTOL aircraft in hover; a stochastic gust model which describes disturbances to the aircraft; a fixed form pilot model which has four free parameters; and a cost functional which is made up of measures of aircraft performance and pilot workload. The four free pilot parameters of the pilot model are selected to minimize the cost functional. These parameters are adjusted to ensure a 20% stability margin in pilot gains and then used to compute a 'paper pilot' rating of the flying qualities of the VTOL aircraft in the precision hover mode. The mathematical equations and digital computer program used to exercise the model are described. The 'paper pilot' rating was computed for 79 aircraft configuration/gust intensity combinations. The aircraft configurations considered include cases with control lag, stability augmentation system lag, and limited pitch rate authority in the stability augmentation system. The 'paper pilot' ratings are compared to actual pilot ratings obtained in fixed base simulation. The difference between the actual pilot ratings and the 'paper pilot' rating has a mean of 14 and a standard deviation of 6, out of a 10-point rating scale.
UNCLASSIFIED

DOC REPORT BIBLIGRAPHY  SEARCH CONTROL NO. /20M07

AD-721 241 1/3 1/1
DEUTSCHE FORSCHUNGSG- UND VERSUCHSANSTALT FUR LUFT- UND
RAUMFAHRT E V BRUNSWICK (WEST GERMANY)

UNTERSUCHUNGEN ÜBER DEN EINFLUSS EINES
GENEIGTEN TRIEBWERKSTRAHLS AUF DIE
AERODYNAMISCHEN EIGENSCHAFTEN EINES LEITWERKS
(INVESTIGATIONS OF THE INFLUENCE OF AN INCLINE
PROPSLIVE JET ON THE AERODYNAMIC PROPERTIES
OF THE TAIL ASSEMBLY), (U)

APR 70 18P SEIDEL, MANFRED:
REPT. NO. UFVLR-SONDERDRUCK-104

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN ZEITSCHRIFT FUR
FLUGWISSENSCHAFTEN, VI9 N 1 P13-29 1971. NO COPIES
FURNISHED BY DDC OR NTIS.
SUPPLEMENTARY NOTE: TEXT IN GERMAN.

DESCRIPTORS: (STABILIZERS(HORIZONTAL TAIL
SURFACE), AERODYNAMIC CHARACTERISTICS), LIFT,
JETS, PITCH(MOTION), VERTICAL TAKE-OFF PLANES,
MODEL TESTS, WEST GERMANY (U)

IN A BASIC EXPERIMENTAL STUDY THE CHANGE IN LIFT OF
AN 'ISOLATED' TAILPLANE INDUCED BY A COLD CIRCULAR
JET IS DETERMINED. WITH REGARD TO THE LONGITUDINAL
STABILITY OF A VTOL AIRCRAFT IN THE TRANSITION
SPEED RANGE, A DOMINANT PARAMETER IS THE ANGLE OF THE
JET NOZZLE RELATIVE TO THE MAINSTREAM DIRECTION.
AS FURTHER PARAMETERS THE JET-SPEED TO MAINSTREAM-
SPEED RATIO, THE DIAMETER OF THE NOZZLE AND ITS
POSITION RELATIVE TO THE TAILPLANE, THE INCIDENCE,
THE CHORD AND THE THICKNESS OF THE TAILPLANE ARE
INVESTIGATED. SYSTEMATIC FORCE AND PRESSURE
MEASUREMENTS WERE CARRIED OUT ON SEVERAL TAILPLANE
MODELS (NACA 0010 SECTION AND FLAT PLATE WITH A
ROUNDED NOSE) OF RECTANGULAR PLAFORMS AND WITH
SIDEPLATES. THE RESULTS PROVIDE A SURVEY ON THE
MAGNITUDE OF JET-INDUCED TAILPLANE CONTRIBUTIONS TO
CHANGES IN STABILITY AND MAY ALLOW TO ESTIMATE
ROUTHLY ENGINE-EFFLUX EFFECTS IN AN EARLY DESIGN
STAGE OF AN AIRCRAFT. SOME FLUID-MECHANICAL
ASPECTS OF THE SPREADING AND INTERFERENCE OF INCLINED
JETS ARE DISCUSSED. THE TESTING INSTALLATION AND
PERFORMANCE ARE BRIEFLY DESCRIBED. (AUTHOR) (U)

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UNCLASSIFIED /20M07
UNCLASSIFIED

AERODYNAMIC STABILITY AND CONTROL/WIND TUNNEL DATA CORRELATION.

(UNCLASSIFIED)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. 15 OCT 66-31 AUG 70;
MAY 71 219P CASTELE\,G. R. ;
REPT. NO. NA-70-327-4
CONTRACT: AF 33(615)-5323
PROJ: AF-698BT
MUNITUR: AFFOL TR-71-3

UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES,
STABILITY), (*FLIGHT CONTROL SYSTEMS, VERTICAL
TAKE-OFF PLANES), WIND TUNNEL MODELS, HOVERING,
POWER, INTERFERENCE, AERODYNAMIC CHARACTERISTICS,
EXPERIMENTAL DATA

IDENTIFIERS: V-4 AIRCRAFT, XV-4B AIRCRAFT, XV-
5A AIRCRAFT, V-5 AIRCRAFT, V-6 AIRCRAFT,
KESTREL AIRCRAFT

THE GENERAL OBJECTIVE WAS TO COLLECT AND ANALYZE
AERODYNAMIC STABILITY AND CONTROL DATA FOR THE XV-
4B, XV-5A, AND P-1127 VTOL CONFIGURATIONS;
CORRELATION AND ANALYSIS OF EXISTING MODEL DATA
WERE MADE TO INVESTIGATE HOVER AND TRANSITION
CHARACTERISTICS. PARTICULAR EMPHASIS WAS PLACED ON
THE AERODYNAMIC POWER EFFECTS, SOMETIMES REFERRED TO
AS INTERFERENCE EFFECTS. OTHER AREAS OF
INVESTIGATION WERE SOMETIMES REFERRED TO AS
INTERFERENCE EFFECTS. OTHER AREAS OF INVESTIGATION
WERE NONDIMENSIONAL COEFFICIENTS USED TO PRESENT
VTOL DATA AND WIND TUNNEL TEST TECHNIQUES. WIND
TUNNEL TESTS WERE CONDUCTED USING AN INLET ONLY MODEL
AND A JET ONLY MODEL TO INVESTIGATE SPECIAL TEST AND
ANALYSIS PROBLEMS FOR THESE COMPONENTS. THE
AGREEMENT BETWEEN DIFFERENT SETS OF XV-4B MODEL
DATA WAS, IN GENERAL, FOUND TO BE POOR. HOWEVER,
THE NONDIMENSIONAL COEFFICIENTS USED BY LOCKHEED TO
REDUCE TO XV-4B MODEL DATA APPEAR TO BE VALID
PARAMETERS FOR THIS CATEGORY OF VTOL AIRPLANE.
THE JET ENTRAINMENT FLOW WAS SHOWN BY EXPERIMENT TO
BE THE PRIMARY CAUSE OF THE XV-4B POWER EFFECTS,
AND THE XV-4B JET PATH AS EXPERIMENTALLY AND
THEORETICALLY DETERMINED. (AUTHOR)

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UNCLASSIFIED
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

PRINCIPLES OF DESIGN OF VERTICAL TAKEOFF AND
LANDING AIRCRAFT.

FEB 71 KUROCHKIN, F. P.;
REPT NO. FTD-HT-24-255-70
PROJ: AF-5362
TASK: VIA-T65-09-04

THE BOOK IS DEDICATED TO THE DRAFT DESIGNING OF A
COMPARATIVELY NEW TYPE OF AIRCRAFT POSSESSING THE
TAKEOFF AND LANDING PROPERTIES OF HELICOPTERS AND
OTHER FLIGHT CHARACTERISTICS, PECULIAR TO AIRCRAFT.
THE CHARACTERISTICS OF THEIR AERODYNAMIC
CONFIGURATIONS BASIC PARAMETERS, GRAVIMETRIC
CHARACTERISTICS, AND DESIGNS WITH VARIOUS POWER PLANT
COMPOSITIONS ARE EXAMINED. TURBOPROP (TP) AND
 TURBOJET ENGINES (TJ) (ORDINARY AND SPECIAL)
WERE USED IN THE COMPOSITION OF THE LATTER BOTH AS
SUSTAINER AND HOISTING, AND AS COMPOSITE ENGINES
ACCOMPLISHING IN ONE UNIT THE ROLE OF THE FIRST AND
THE SECOND. METHODS ARE GIVEN FOR CALCULATING THE
SPECIFIC VERTICAL TAKEOFF AND LANDING AIRCRAFT
(VTOL) PROCESSES OF FLIGHT, FOR EXAMPLE THE
TRANSFER FROM VERTICAL FLIGHT TO HORIZONTAL FLIGHT
AND CONVERSELY. (AUTHOR)
OPTIMAL AND SUBOPTIMAL CONTROL SYNTHESIS FOR
MINIMUM TIME VTOL TRANSITION.

JUN 70 16P NARDIZZI; LOUIS R. TARNG

CONTRACT: F44620-68-C-0023, NSF-GK-5608
PROJECT: AF-9559
MONITOR: AFOSR TM-71-2211

UNCLASSIFIED REPORT
AVAILABILITY: PUB IN IEEE TRANSACTIONS ON
AEROSPACE AND ELECTRONIC SYSTEMS VAES-7 N3 P506-520
MAY 71.

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH LTV
AEROSPACE CORP., DALLAS, TEX.

DESCRIPTORS: (ADAPTIVE CONTROL SYSTEMS,
MATHEMATICAL MODELS), (VERTICAL TAKE-OFF PLANES,
ADAPTIVE CONTROL SYSTEMS), PARTIAL DIFFERENTIAL
EQUATIONS, INTEGRALS, MATRIX ALGEBRA, FLIGHT
CONTROL SYSTEMS, NUMERICAL ANALYSIS, FEEDBACK,
OPTIMIZATION
IDENTIFIERS: CONTROL THEORY, AUTOMATIC CONTROL,
FEEDBACK CONTROL

OPTIMAL OPEN-LOOP AND SUBOPTIMAL CLOSED-LOOP
CONTROLS FOR VTOL AIRCRAFT IN A MINIMUM, CLIMB-TO-
CRUISE TIME TRANSITION ARE PRESENTED IN THIS PAPER.
THE OPTIMAL OPEN-LOOP CONTROLS ARE SYNTHESIZED BY A
PROPOSED GRADIENT TECHNIQUE WHICH PROVIDES FOR THE
SELECTION OF DESIRED CHANGES IN PHYSICALLY MEANINGFUL
PARAMETERS DURING EACH ITERATION STEP. THE
SUBOPTIMAL CLOSED-LOOP CONTROLS OVER THE MINIMUM
TIME-TO-CLimb INTERVAL, PIECEWISE-CONSTANT
FEEDBACK GAINS AND SWITCHING TIMES ARE SYNTHESIZED
FOR MULTIDIMENSIONAL CONTROL VECTORS WHICH ARE LINEAR
COMBINATIONS OF OBSERVABLE STATES. SEVERAL
COMPUTATIONAL RESULTS ARE PRESENTED FOR OPTIMAL AND
SUBOPTIMAL MINIMUM TIME CONTROLS WITH CONSTRAINED AND
UNCONSTRAINED TERMINAL FLIGHT-PATH ANGLES.

(AUTHOR)
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 720707

AD-728 546 1/3 20/4
AEROSPACE RESEARCH LABS WRIGHT-PATTERSON AFB OHIO

LOW AREA RATIO THRUST AUGMENTING EJECTORS,

71 11P FANCHER RICHARD B.

REPT. NO. ARL-71-0113
PROJ: AF-7116
TASK: 711600

UNCLASSIFIED REPORT

AVAILABILITY: PAPER COPY AVAILABLE FROM AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, 1290 AVE. OF THE AMERICAS, NEW YORK, N. Y. 10019
$2.00/M$1.00. NO COPIES FURNISHED BY DDC OR NTIS.

SUPPLEMENTARY NOTE: PUBLISHED IN AIAA FLUID AND PLASMA DYNAMICS CONFERENCE (4TH) HELD AT PALO ALTO, CALIF. 21-23 JUN 71, AS PAPER 71-576.

DESCRIPTORS: (*SUBSONIC NOZZLES, *THRUST AUGMENTATION, (*VERTICAL TAKE-OFF PLANES, LIFT), SHORT TAKE-OFF PLANES, SECONDARY FLOW, VELOCITY, STATISTICAL DISTRIBUTIONS, MATHEMATICAL MODELS, NOZZLES)

IDENTIFIERS: (THRUST AUGMENTING EJECTORS, ENTRAINMENT, VELOCITY PROFILES)

THE THRUST AUGMENTATION, LIFT AUGMENTATION AND NOISE REDUCTION CHARACTERISTICS OF COMPACT EJECTORS MAKE THEM POTENTIALLY ATTRACTIVE FOR PROPULSION LIFT SYSTEMS, ALTHOUGH IN THE PAST POOR THRUST AUGMENTATION RESULTS HAVE NEGATED THE OTHER BENEFITS. A SYNTHESIS OF AN EJECTOR'S INTERNAL FLOW PHENOMENA DEVELOPED IN THIS PAPER INDICATES THAT IMPROVED MIXING AND DIFFUSION CAN SIGNIFICANTLY INCREASE THRUST AUGMENTATION. A COMPANION EJECTOR EXPERIMENT DESIGNED FOR RAPID MIXING CONFIRMS THE MODEL'S AUGMENTATION PREDICTIONS AND SHOWS REASONABLE AGREEMENT WITH OTHER FLOW CHARACTERISTICS.

(AUTHOR)

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A SLANTED ROUND JET AT LOW FORWARD SPEED; (U)

A NEW THEORY WHICH MAY BE USED FOR ESTIMATES OF THE VARIATION OF THE LIFT OF A SLANTED ROUND JET WITH FORWARD SPEED IS EVALUATED. (U)
DEVELOPMENT OF ADVANCED TECHNIQUES FOR THE
IDENTIFICATION OF V/STOL AIRCRAFT STABILITY
AND CONTROL PARAMETERS

DESCRIPTIVE NOTE: FINAL REPT., MAY 69-DEC 70,
AUG 71, 359P CHEN, ROBERT T. NO: 1
EULRICH, BERNARD J.; LEBACQZ, J. VICTOR 1
REPT. NO. CAL-BM-282U-F-1
CONTRACT: NOOO19-69-C-0534

UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, AERODYNAMIC
CHARACTERISTICS), (*SHORT TAKE-OFF PLANES,
MATHEMATICAL MODELS), FLIGHT CONTROL SYSTEMS,
equations of motion, flight paths, stability,
moving, algorithms (U)
IDENTIFIERS: *TRANSITION FLIGHT, KALMAN FILTERS,
X-22 AIRCRAFT (U)

CONTEMPORARY ANALYSES OF TRANSITION FLIGHT OF V/
STOL AIRCRAFT ARE BASED ON AERODYNAMIC DATA
MEASURED IN A WIND TUNNEL OR ON ANALYTICAL PREDICTION
USING METHODS DEVELOPED FOR CONVENTIONAL AIRCRAFT.
THE VALIDITY AND ACCURACY OF THESE TECHNIQUES FOR
V/STOL AIRCRAFT HAS NOT YET BEEN ESTABLISHED, AND
IT IS ESSENTIAL THAT THEY BE CORRELATED WITH FLIGHT
TEST DATA THROUGH PARAMETER IDENTIFICATION. IN
SPITE OF THE COMPLICATED NATURE OF V/STOL
DYNAMICS IN TRANSITION, SOME METHOD OF IDENTIFYING
这些特征是必需的。这份报告
表明这些技术的开发
、和控制参数的
开发。 (作者)
VORTEX SHEDDING FROM A TURBULENT JET IN A CROSS-WIND,

FEB 71 15P

MCMAHON, M.; HESTER, D.

CONTRACT: DAHC04-68-C-0004

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN JNL. OF FLUID MECHANICS, V48 PT1 P73-80 1971

SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 20 AUG 70.

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, *JET MIXING FLOW), WAKE, TURBULENCE, BLUNT BODIES, NOZZLE GAS FLOW, FLAT PLATE MODELS, MODEL TESTS (U)

IDENTIFIERS: *VORTEX SHEDDING, EXHAUST PLUMES,
*CROSS WIND PROPERTIES, STROUHAL NUMBER (U)

MEASUREMENTS IN THE WAKE BEHIND TURBULENT JETS EXHAUSTING FROM A SOLID SURFACE INTO A CROSS-WIND INDICATE THAT VORTEX SHEDDING OCCURS AS IN THE CASE OF FLOW PAST SOLID BLUFF BODIES. THE STROUHAL NUMBERS FOR FLOW PAST A CIRCULAR AND A BLUNT JET ARE IN QUALITATIVE AGREEMENT WITH THOSE FOR CORRESPONDING SOLID BODIES, PROVIDED THAT THE WIDTH OF THE SPREADING JET SOME DISTANCE FROM THE SURFACE IS USED RATHER THAN THE JET EXIT PLANE DIMENSION. (U)
Flow field measurements of a jet in crossflow with a laser velocimeter. (U)

Descriptive Note: Final Rept., Nov 71 31P 79111.3, JRI.

Rept. No.: AEDC-TR-71-192
Contract: F41660-72-C-0003
Proj.: AF-8219; ARO-PWTR-71-192
Task: 621907

Unclassified Report

Supplementary Note: Prepared in cooperation with ARO, Inc., Tullahoma, Tenn., Rept. No. ARO-PWTR-71-159.


Identifiers: Cross Flow, Laser Velocimeters (U)

Tests were conducted in a low speed wind tunnel (VSTOL) to measure the velocity field of a jet issuing from a flat plate with crossflow. Velocity components were measured with a dual-scatter laser velocimeter at effective velocity ratios of 0.125 and 0.250. The data yielded velocity vectors along lines normal to the jet centerline in three planes parallel to the plane of symmetry. Indications of the flow field turbulence were also measured. (Author)

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UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 120307

AD-733 987 1/3 6/7
NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA AERO MECHANICS
DEPT

AN EVALUATION OF SEARCH AND RESCUE MISSION
CHARACTERISTICS. (U)

DESCRIPTIVE NOTE: FINAL REPORT.
NOV 71 63P BRENNAH THOMAS J.
REPT. NO. NAOC-AM-7136
PROJ: A330-3300/202-C/2465466000

UNCLASSIFIED REPORT

DESCRIPTORS: (HESU CES, VERTICAL TAKE-OFF PLANES),
(VERTICAL TAKE-OFF PLANES, DESIGN), AIRFRAMES,
AIRCRAFT ENGINES, PROPULSION, MISSION PROFILES,
HOVERING
IDENTIFIERS: SAR(SEARCH AND RESCUE), SEARCH
AND RESCUE

THE REPORT PROVIDES AN OVERVIEW OF THE GENERAL
REQUIREMENTS FOR AN AIRBORNE RESCUE SYSTEM TO FULFILL
A MILITARY SAR (SEARCH AND RESCUE) MISSION.
PROJECTED MISSION AND AIRFRAME/PROPULSION SYSTEM
REQUIREMENTS ARE PRESENTED TO PROVIDE A BASELINE FOR
INITIAL DEVELOPMENT ANALYSES. A STANDARD
METHODOLOGY FOR THE CONDUCT OF DETAILED PERFORMANCE
EVALUATION AND OVERALL MISSION ANALYSES ARE PROPOSED
TO DEFINE CRITICAL AREAS IN SAR AIRCRAFT DESIGNS.
AN AIRCRAFT/PROPULSION SYSTEM IS DESIGNED TO
ILLUSTRATE THE APPLICATIONS. (AUTHOR)

(U)

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UNCLASSIFIED /20307
UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /ZON07

AD-734 068 1/3
BOEING CO PHILADELPHIA PA VERTOL DIV

CYCLIC PITCH CONTROL ON A V/STOL TILT WING AIRCRAFT. (U)

DESCRIPTIVE NOTE: FINAL REPT. MAR 70-MAY 71, UCT 71 114P KOL
REPT. NO. D210-10353-1
CONTRACT: F33615-70-C-1000
PROJ: AF-69887
MONITOR: AFFUL TR-71-91

UNCLASSIFIED REPORT

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES, FLIGHT CONTROL SYSTEMS), (FLIGHT CONTROL SYSTEMS, PITCH(MOTION)), TILT WINGS, PROPELLERS(AERIAL), PROPELLER BLADES, AERODYNAMIC CONTROL SURFACES, WIND TUNNEL MODELS, HARMONIC ANALYSIS, HOVERING, STABILITY, TRANSFORM PLANES

IDENTIFIERS: CYCLIC PITCH CONTROL, TRANSITION FLIGHT

THE REPORT PRESENTS THE KEY RESULTS OF A MODEL WING TUNNEL TEST PROGRAM THAT WAS DIRECTED TOWARDS INVESTIGATING THE USE OF CYCLIC PITCH PROPELLERS AS THE LOW SPEED LATERAL CONTROL SYSTEM OF A FOUR PROPELLER V/STOL TILT WING TRANSPORT-TYPE AIRCRAFT. THE ALMOST LINEAR PITCH CONTROL EFFECTIVENESS OF THIS SYSTEM THROUGH TRANSITIONAL FLIGHT AND IN-GROUND EFFECT ALONG WITH THE CORRELATION WITH THEORY IS DISCUSSED, AND THE MODERATE POWER INCREASE ASSOCIATED WITH ITS USE IS SHOWN. (AUTHOR)

179
The primary objective of the study was to investigate, by means of real-time man-in-the-loop simulation techniques, piloting performance as influenced by wind, system data-rate, and contingency-event variables during IFR steep approaches with vertical-lift aircraft. By also simultaneously evaluating effects of display-format, approach-angle and measurement-noise variables to the extent possible within the scope of each study task, an increased degree of generality of study results was obtained. A variable-velocity simulation of the Bell UH-1 Helicopter served as the test vehicle in all study tasks. (Author)
UNCLASSIFIED

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 14007

AD-735 920
1/3
NATIONAL AERONAUTICAL ESTABLISHMENT OTTAWA (ONTARIO)

A FLIGHT INVESTIGATION OF LATERAL-
DIRECTIONAL HANDLING QUALITIES FOR V/STOL
AIRCRAFT IN LOW SPEED MANEUVRING FLIGHT,
(U)

OCT 71 151P

WOETSCH, K-H., JR.; GOULD,
D. G.; MCGROR; D. M. 

REPORT NO. NAE-LR-549

MONITOR: NRC 12285

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH CORNELL
AERONAUTICAL LABS, INC., BUFFALO, N. Y.
SUPERSEDES AD-707 631.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES,
HANDLING), ROLL, MANEUVERABILITY, FLIGHT
SIMULATORS, FLIGHT TESTING, FLIGHT SPEEDS,
APPROACH

(U)

AN INVESTIGATION TO DETERMINE THE RANGES OF VARIOUS
LATERAL-DIRECTIONAL CHARACTERISTICS REQUIRED TO
PROVIDE ADEQUATE FLYING QUALITIES FOR TURNING
MANEUVERS AT LOW SPEED HAS BEEN UNDERTAKEN USING AN
AIRBORNE V/STOL AIRCRAFT SIMULATOR. FIVE
PARAMETERS WERE VARIED IN A SYSTEMATIC MANNER: THE
DAMPING RATIO, THE FREQUENCY AND THE RATIO OF THE
ROLL-ANGLE TO THE SIDESLIP-ANGLE IN THE DUTCH ROLL
MODE; TOGETHER WITH THE DAMPING RATIO AND FREQUENCY
OF THE NUMERATOR QUADRATIC OF THE ROLL-ANGLE TO
AILERON-CONTROL-INPUT TRANSFER FUNCTION. THE PILOTS
PERFORMED A LOW SPEED, VISUAL MANEUVRING TASK AND
DOCUMENTED THEIR ASSESSMENT OF THE CHARACTERISTICS
THROUGH EXTENSIVE COMMENTS AND A NUMERICAL RATING.
(AUTHOR)

(U)

182

UNCLASSIFIED
UNCLASSIFIED

DESCRIPTIVE NOTE: FINAL REPT. JAN-JUL 71;
OCT 71 209P TOMASSONI, JOHN E.; TAYLOR, ROBERT B.; DELAMARR, LEON N.; ISCHAGRIN, EDWARD B.;
REPT. NO. D213-1UQUD-6
CONTRACT: F33615-69-C-1577
MONITOR: AFFUL TR-71-26-VOL-6

THE REPORT PRESENTS THE RESULTS OF A WIND TUNNEL TEST ON A POWERED DYNAMIC MODEL OF THE BOEING M-160 TILT ROTOR AIRCRAFT WITH 50' FOOT DIAMETER ROTORS. THE MODEL WAS TESTED IN THE BOEING V/STOL 20 X 20 FOOT WIND TUNNEL DURING JANUARY-FEBRUARY 1971 AND WAS SUPPORTED TO SIMULATE FREE FLIGHT CONDITIONS WITH MOUNT FREQUENCIES MUCH LOWER THAN THE DYNAMIC AIRCRAFT FREQUENCIES. BLADE LOADS, WING LOADS, FLYING QUALITIES AND SKITTISHNESS IN GROUND EFFECT DATA WERE OBTAINED. (AUTHOR)
THE OBJECTIVE WAS TO ESTABLISH DISPLAY INFORMATION AND SUBSYSTEM REQUIREMENTS FOR MANUALLY CONTROLLED STEEP-ANGLE APPROACH AND LANDING UNDER IFR FLIGHT CONDITIONS WITH VERTICAL-LIFT AIRCRAFT. INVESTIGATION WERE CONDUCTED AS A SERIES OF ITERATIVE ANALYSES AND THE REAL-TIME MAN-IN-THE-LOOP SIMULATIONS TO EVALUATE SELECTED DISPLAY FORMATS, THEMSELVES, AS WELL AS THE EFFECTS WHICH RELEVANT SYSTEM AND ENVIRONMENTAL VARIABLES HAVE UPON PILOTING TASK PERFORMANCE. ALTERNATIVE DISPLAY FORMATS WERE INITIALLY TESTED UNDER IDEALIZED FLIGHT CONDITIONS. THE TESTING OF SELECTED FORMATS WAS THEN CONTINUED IN A SERIES OF SIMULATION STUDIES IN WHICH SYSTEM AND ENVIRONMENTAL CHARACTERISTICS WERE SYSTEMATICALLY INTRODUCED TO DETERMINE THEIR INDIVIDUAL AND INTERACTIVE EFFECTS UPON PILOTING PERFORMANCE. (AUTHOR)
PROGRAMMED PILOTAGE AS A MEANS OF IMPROVING ROTORCRAFT PERFORMANCE IN LEVEL FLIGHT. (U)

DESCRIPTIVE NOTE: MASTER'S THESIS, SEP 71 WILDMAN, ROBERT ALAN

UNCLASSIFIED REPORT

DESCRIPTORS: *VERTICAL TAKE-OFF PLANES, *FLIGHT CONTROL SYSTEMS, FLIGHT SPEEDS, OPTIMIZATION, FOLDING HELICOPTER RUTORS, HELICOPTERS, TILT WINGS, HOVERING, AIRSPEED IDENTIFIERS: TRANSITIONAL FLIGHT, DESIGN CRITERIA, *PROGRAMMED PILOTAGE

AIRFRAME DRAG REDUCTION AND ENGINE DUCT DESIGN, WHILE NECESSARY TO THE IMPROVEMENT OF PERFORMANCE, CANNOT ALONE OFFSET THE AERODYNAMIC LIMITATIONS INHERENT IN ROTARY WING FLIGHT. THE LATTER, WHICH HAVE BECOME PREDOMINANT WITH THE ADVENT OF HIGH OUTPUT TURBOSHAFT ENGINES MUST THEN BE OVERCOME BY OTHER MEANS DISCUSSSED IN THIS PAPER. PROGRAMMED PILOTAGE TECHNIQUES WHICH UTILIZE REAL-TIME FLIGHT DATA TO VARY AERODYNAMIC PARAMETERS ARE INVESTIGATED AND INCORPORATED IN THE PRELIMINARY DESIGN OF A HIGH-SPEED ROTORCRAFT. THE ROTOR SPEED AND THE CONTRIBUTION OF LIFT FROM A FIXED WING ARE THUS OPTIMIZED THROUGHOUT THE FLIGHT ENVELOPE, THEREBY GREATLY ENHANCING LEVEL FLIGHT SPEED CHARACTERISTICS. (AUTHOR)
WIND TUNNEL TEST OF THE AERODYNAMICS AND DYNAMICS OF ROTOR SPINUP, STOPPING AND FOLDING ON A SEMISPAN FOLDING TILT-ROTOR MODEL: VOLUME VII. (U)


UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON DESIGN STUDIES AND MODEL TESTS OF THE STOWED TILT ROTOR CONCEPT. SEE ALSO VOLUME 6, AU-735 633.

DESRIPTORS: (*ROTARY WINGS, MODEL TESTS), (*VERTICAL TAKE-OFF PLANES, MODEL TESTS), WIND TUNNEL MODELS, SCALE, STRUCTURAL PROPERTIES, AERODYNAMIC CHARACTERISTICS, LOADING (MECHANICS) (U)

IDENTIFIERS: *TILT ROTOR AIRCRAFT (U)

WIND TUNNEL TEST DATA OBTAINED WITH A 1/9-SCALE SEMISPAN, UNPOWERED, DYNAMICALLY-SCALED MODEL 213 STOWED/TILT ROTOR ARE REPORTED. THE OBJECTIVES OF THE TESTS WERE TO OBTAIN AERODYNAMIC, STRUCTURAL, AND DYNAMICS DATA DURING THE SPINUP, FEATHER AND BLADE FOLD CYCLES OF THIS VEHICLE. (AUTHOR) (U)
UNCLASSIFIED

UC-402 730
LING-TEMCO-VOUGHT INC DALLAS TEXAS LTV VOUGHT AERONAUTICS
DIV

XC-142A VTOL TRANSPORT PROGRAM

DESCRIPTIVE NOTE: MONTHLY PROGRESS REPORT NO. 54 FOR JUN 66

JUN 66 19P

CONTRACT: AF 33(657)-7868

UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, *TRANSPORT
PLANES), SCHEDULING, RESEARCH PROGRAM
ADMINISTRATION, MAINTENANCE, ACCEPTABILITY,
PERFORMANCE (ENGINEERING), DESIGN, GROUND SUPPORT
EQUIPMENT, SPARE PARTS, TRAINING DEVICES, FLIGHT
TESTING

IDENTIFIERS: C-142 AIRCRAFT

CONTENTS:
DEVELOPMENT OF XC-142A AND
FABRICATION OF FIVE PROTOTYPE AIRPLANES;
FABRICATION OF MOCKUP; GROUND TESTS;
ENGINEERING DATA; DESIGN DATA; FLIGHT
TEST REPORTS; SPARE PARTS FOR FIVE
PROTOTYPE AIRPLANES; DEVELOPMENT AND
FABRICATION OF AGE; SPARE PARTS FOR AGE;
TRAINING AND TRAINING EQUIPMENT; AND
CONTRACTOR SUPPORT OF FLIGHT TEST PROGRAM.
UNCLASSIFIED

THE PRINCETON PENNSYLVANIA ARMY AVIONICS RESEARCH PROGRAM.

PROJECT:

CONTRACT:

UNCLASSIFIED REPORT

DESCRIPTIONS: (*HELCIPTERS, *FORMATION FLIGHT),
(*VERTICAL TAKE-OFF PLANES, *AERODYNAMICS),
(*INSTRUMENT LANDINGS, HELICOPTERS),
(*AERONAUTICS, VERTICAL TAKE-OFF PLANES),
CONTROL, THEORY, DYNAMICS, DECELERATION, TAKE-OFF, EQUATIONS OF MOTION, VISIBILITY, FLIGHT PATHS

IDENTIFIERS: *AVIONICS

THE EFFECT OF HELICOPTER DYNAMICS AND CONTROL CHARACTERISTICS ON FORMATION FLIGHT IS A THEORETICAL STUDY OF THE TRAJECTORY LAWS WHICH ARE USED TO DEFINE A FOLLOWER'S NOMINAL POINT AND THE CONTROL LAWS WHICH DETERMINE THE FOLLOWER'S REQUIRED ACTION. EFFECT OF MANEUVERS IS INCLUDED IN THIS EFFORT TO PROVIDE FUNDAMENTAL INFORMATION ON WHICH TO BASE THE DEVELOPMENT OF IFG FORMATION FLIGHT EQUIPMENT FOR THE ARMY. LANDING CONTROL THEORY FOR DECELERATING VTOL AIRCRAFT IS AN ATTEMPT TO OBTAIN OPTIMAL TRAJECTORIES FOR DECELERATING LANDINGS AND ACCELERATING TAKE-OFF MANEUVERS. THE EFFECT OF ACCELERATION, AERODYNAMIC CONSTRAINTS, AND TERMINAL CONSTRAINTS ARE INCLUDED IN THE PROBLEM FORMULATION. SIMPLIFIED EQUATIONS OF MOTION ARE DEVELOPED AND POSSIBLE SCHEMES FOR THEIR SOLUTION ARE INVESTIGATED IN THIS STUDY. TOWARD PROVIDING INFORMATION ON WHICH DEVELOPMENT OF GUIDANCE EQUIPMENT CAN BE BASED, A SYSTEM STUDY OF LOW VISIBILITY APPROACH AND LANDING IS AN EFFORT TO COMBINE THE CONTROL CHARACTERISTICS OF HELICOPTERS WITH THE PERFORMANCE CHARACTERISTICS OF THE PILOT TO DETERMINE GUIDANCE PARAMETERS NEEDED FOR LOW VISIBILITY APPROACHES.
A SEMI-EMPIRICAL APPROACH IS USED TO PREDICT PERFORMANCE LOSSES AND PITCHING MOMENTS CAUSED BY INTERFERENCE EFFECTS ON DIFFERENT AIRCRAFT PLANFORMS IN HOVER AND TRANSITION, DIFFERENT AIRCRAFT PLANFORMS, AND VARIATION OF THE JET EXHAUST COMBINATIONS MAKE THE PROBLEM OF PREDICTING INTERFERENCE EFFECTS DIFFICULT. THE INDUCED FLOW THAT CAUSES THE PERFORMANCE LOSSES IN HOVER IS SUPERIMPOSED ON THE FREE STREAM FLOW TO DETERMINE THE INTERFERENCE EFFECTS ON PERFORMANCE AND PITCH DURING TRANSITION. AN EMPIRICAL FACTOR IS USED TO CORRECT FOR THE COMPRESSIBILITY AND TEMPERATURE EFFECTS OF THE JET EXHAUST ON THE INDUCED FLOW. RESULTS ARE COMPUTED ON THE IBM 7094 COMPUTER.
THE APPROXIMATE LON'IITUINAL STABILITY DERIVATIVES OF A VECTORED THRUST VTOL. (U)

DESCRIPTIVE NOTE: MASTER'S THESIS
MAR 68 153P MINTERS CHARLES P.
REPT. NO. VAN/AD/68-11

UNCLASSIFIED REPORT

DESCRIPTIONS: (VERTICAL TAKE-OFF PLANES, AERODYNAMIC CHARACTERISTICS), (JET FIGHTERS, STABILITY), SUPERSONIC PLANES, PITCH (MOTION), THRUST, PERFORMANCE (ENGINEERING), LIFT, ACCELERATION, HOVERING, EQUATIONS OF MOTION, DRAG, COMPUTER PROGRAMS, NONLINEAR SYSTEMS, DOWNWASH, THRUST, WEIGHT, ANGLE OF ATTACK, THESES, MATHEMATICAL ANALYSIS (U)

IDENTIFIERS: P-1127 AIRPLANE, TRANSITION FLIGHT, PRESSURE GRADIENTS, COMPUTER ANALYSIS (U)

THE OBJECTIVE OF THIS STUDY WAS TO INVESTIGATE THE STABILITY DERIVATIVES AND THE STABILITY OF THE VECTORED THRUST P-1127 AIRPLANE. EXPRESSIONS WERE DERIVED FOR THE DERIVATIVES. THE PERFORMANCE, DERIVATIVES AND STABILITY WERE FOUND FOR BOTH AN ACCELERATING AND NONACCELERATING TRANSITION FROM HOVER TO CONVENTIONAL FLIGHT. THE RESULTS OF THE ACCELERATING TRANSITION WERE COMPARED TO VALUES AVAILABLE FROM HANKER SIDDELEY. BOTH TRANSITIONS WERE UNSTABLE FOR MANY AIRSPEEDS BUT THE TIMES TO DOUBLE AMPLITUDE WERE SUCH THAT A PILOT COULD CONTROL THE AIRPLANE. (AUTHOR) (U)
ANALYSIS OF VTOL HANDLING QUALITIES REQUIREMENTS, PART II: LATERAL-DIRECTIONAL HOVER AND TRANSITION. (U)

SUPPLEMENTARY NOTE: SEE ALSO PART I, AD-445 165.

ANALYSES OF AVAILABLE HANDLING QUALITIES DATA WERE PERFORMED TO DETERMINE LATERAL/DIRECTIONAL DYNAMIC REQUIREMENTS FOR VTOL AIRCRAFT IN HOVER AND LOW SPEED FLIGHT. THE BASIS FOR THIS TREATMENT IS AN EXAMINATION OF THE PILOT/VEHICLE AS A CLOSED-LOOP SERVO SYSTEM. THE QUASI-LINEAR PILOT DESCRIBING FUNCTION IS APPLIED. THE RESULTS OF THE STUDIES SUGGEST THAT THE PRIMARY FACTORS IDENTIFYING SATISFACTORY AND UNACCEPTABLE HOVER MODE DYNAMIC FEATURES ARE RELATED TO THE CLOSED-LOOP DEFICIENCIES. DETAILED CONSIDERATION IS MADE OF THE CONTROL TASK AND PILOTING FUNCTIONS IN TRANSITION FLIGHT. THE RESULTS OF THIS GENERIC APPRAISAL ARE EVOKED TO CONFIRM AND JUSTIFY PRELIMINARY LATERAL/DIRECTIONAL REQUIREMENT FOR CONTROL IN TRANSITION. (AUTHOR) (U)
UNCLASSIFIED

UNCLASSIFIED

UNCLASSIFIED REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0M07

AD-871 154 1/3 19/2
NORTHROP CORP. HAHNTHURNE, CALIF. AIRCRAFT DIV

A STUDY OF V/STOL GROUND-BASED SIMULATION TECHNIQUES

DESCRIPTIVE NOTE: FINAL REPORT, 1 FEB 68-1 JAN 70,
APR 70 43P SIMULOR JOHN B.;
REPT. NO. NON-69-158
CONTRACT: UAAJU2-66-C-GU819
PROJ: VA-1-F-1624-4-A-142
TASK: 1-F-16244-4-A-14233
MONITOR: USAAVLAAS TR-10-16

UNCLASSIFIED REPORT

DESCRIPTIONS: VERTICAL TAKE-OFF PLANES, FLIGHT SIMULATORS, HELICOPTERS, FLIGHT SIMULATORS, SIMULATION, MOTION PERCEPTION (PSYCHOLOGY), VISUAL DISPLAY SYSTEMS, PILOTS, SHORT TAKE-OFF PLANES

THE PURPOSE OF THE STUDY IS TO DEFINE THE SIMULATION CHARACTERISTICS REQUIRED TO ENSURE THE SIMULATOR AS A RELIABLE AND VALID TOOL IN THE DEVELOPMENT OF V/STOL AIRCRAFT AND HELICOPTERS. A FLIGHT SIMULATOR EMPLOYING THE POINT LIGHT SOURCE PRINCIPLE TO GENERATE A VISUAL DISPLAY WAS USED IN THESE STUDIES. PREVIOUS STUDIES OF A JET-LIFT V/STOL AIRCRAFT IN THIS SIMULATOR UNCOVERED A PILOT-VEHICLE PERFORMAACE DEFICIENCY DURING LATERAL MANEUVERS, RESULTING IN A NAUSEA REACTION WHICH LIMITED PILOT PARTICIPATION. IN THE PRESENT INVESTIGATION, HUMAN MOTION PERCEPTION WAS STUDIED, AND SOLUTIONS TO THIS PILOT-VEHICLE PERFORMANCE DEFICIENCY WERE EVOLVED BY THE USE OF A MOVING BASE. THE RESULTS DEMONSTRATED THAT EFFECTIVE SIMULATION IS POSSIBLE WHEN CERTAIN CONSTRAINTS ARE OBSERVED. THE BEST CONSTRAINTS OF THE DRIVE MECHANISM WERE DETERMINED EXPERIMENTALLY AND WERE COMPARED WITH THOSE IMPLIED FROM PHYSIOLOGICAL CONCEPTS OF HUMAN MOTION PERCEPTION. A SIMULATION VALIDATION RATIONALE WAS ALSO DEVELOPED TO ASSIST THE PILOT IN HIS EVALUATIONS. AN EXAMPLE OF THIS IS DESCRIBED TOGETHER WITH A DISCUSSION OF SOME LIMITATIONS.

(AUTHOR)
UNCLASSIFIED

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /20M07

AD-671 424 1/3
PRINCETON UNIV N J DEPT OF AEROSPACE AND MECHANICAL SCIENCES

FEEDBACK CONTROL OF VTOL AIRCRAFT.

DESCRIPTIVE NOTE: FINAL REPORT,
APR 70 69P DUKES THEODOR A.

CONTRACT: UA-44-177-AMC-47(T)
PNOU: UA-1-F-162204-A-142
TASK: 1-F-162204-A-14233
MUNITON: USAVLABS TR-69-96

UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES, FLIGHT CONTROL SYSTEMS), (*FLIGHT CONTROL SYSTEMS, FEEDBACK), TRANSPORT PLANES, TILT WINGS, AERODYNAMIC CHARACTERISTICS, STABILITY, AIRPLANE MODELS, SCALE

IDENTIFIERS: XC-142A AIRCRAFT, C-142 AIRCRAFT, *TRANSITION FLIGHT, *FEEDBACK CONTROL

AN APPROXIMATE ANALYSIS AND DISCUSSION IS GIVEN OF THE BEHAVIOR OF POLES AND ZEROS CHARACTERIZING THE LONGITUDINAL DYNAMICS OF VTOL AIRCRAFT IN TRANSITION. IN FEEDBACK DESIGN, IT IS A DESIRABLE GOAL TO CREATE A DOMINANT ATTITUDE RESPONSE MODE WHICH IS SEPARATED IN FREQUENCY AND VARIES LITTLE THROUGHOUT THE TRANSITION. THE INVESTIGATION DEMONSTRATED THAT THIS GOAL CAN BE ACHIEVED AT FIXED OPERATING POINT IN TRANSITION WITHOUT ACCURATE PRIOR KNOWLEDGE ABOUT THE BEHAVIOR OF THE STABILITY AND CONTROL DERIVATIVES DURING TRANSITION. IN THE LONGITUDINAL DEGREES OF FREEDOM, PITCH ATTITUDE AND PITCH RATE FEEDBACK WERE USED IN THE LATERAL-DIRECTIONAL DEGREES OF FREEDOM, THE SAME GOAL WAS ACHIEVED BY USING YAW RATE, ROLL ANGLE, AND ROLL RATE FEEDBACK. THE GAINS WERE DETERMINED BY AN APPROXIMATE PROCEDURE. LONGITUDINAL AND LATERAL-DIRECTIONAL EXPERIMENTS WERE PERFORMED WITH A 0.1 SCALE MODEL OF THE XC-142A TILT-WING VTOL AIRCRAFT. PULSE RESPONSES OF THE FREE-FLYING MODEL ARE PRESENTED. (AUTHOR)
THE PURPOSE OF THE DOCUMENT IS TO SUGGEST GUIDELINES TO BE USED IN DEVELOPING SOFTWARE INTERFACE COMPUTATIONS SO AS TO EFFECTIVELY INTEGRATE THE PILOT AND MATHEMATICAL VEHICULAR REPRESENTATION TO THE NORTHROP ROTATIONAL SIMULATOR. A DESCRIPTION OF ALL KEY ELEMENTS AND THEIR PERFORMANCE AND OPERATING CHARACTERISTICS IS INCLUDED. PAST USES AND PROJECTED FUTURE USES ARE ALSO GIVEN. SOME VALIDATION METHODS ARE DESCRIBED WITH SUGGESTIONS FOR THEIR USE. SUGGESTED INTERFACE MECHANIZATIONS ARE GIVEN WHICH PROVIDE EFFECTIVE VISUAL AND MOTION STIMULI COMPATIBLE WITH SENSORY CHARACTERISTICS. A RATIONALE FOR THE USE OF MOTION IS INCLUDED. A METHOD IS OUTLINED WHICH ASSISTS THE USER IN ASSESSING THE PROBABILITY OF SUCCESS IN ANY DESIRED SIMULATION AND PREPARATION OF AN EFFECTIVE EXPERIMENTAL DESIGN. (AUTHOR)
DESCRIPTIONS: (ANEMOMETERS, PERFORMANCE ENGINEERING), (VERTICAL TAKE-OFF PLANES, DOWNWASH, WIND, DRAG SPHERES, MEASUREMENT, HELICOPTERS, HOVERING)

TESTS WERE CONDUCTED ON A SIMPLE, LOW-COST DRAG SPHERE ANEMOMETER TO DETERMINE ITS SUITABILITY FOR MEASURING WIND VELOCITIES IN THE VICINITY OF VTOL AIRCRAFT AND HELICOPTERS. A DRAG SPHERE ANEMOMETER IS A DEVICE FOR DETERMINING WIND VELOCITY BY MEASURING THE DRAG FORCE ACTING ON A SPHERICAL BODY OF KNOWN DRAG COEFFICIENT. THE DRAG SPHERE ANEMOMETER, AS TESTED, WAS FOUND TO BE CAPABLE OF MEASURING WIND VELOCITIES AND DIRECTION IN ONE PLANE OVER A SPEED RANGE OF 10 TO 110 MPH. INSTRUMENTATION ACCURACY WAS FOUND TO BE PLUS OR MINUS 2.5 MPH IN THE SPEED RANGE OF 10 TO 50 MPH AND PLUS OR MINUS 7 MPH IN THE SPEED RANGE OF 50 TO 110 MPH. DIRECTIONAL ACCURACY WAS FOUND TO BE APPROXIMATELY PLUS OR MINUS 3 DEG. AT LOW WIND SPEEDS, PLUS OR MINUS 10 DEG. FOR SPEEDS FROM 30 TO 60 MPH, AND PLUS OR MINUS 5 DEG. ABOVE 60 MPH. ON THE BASIS OF THE RELATIVELY UNSOPHISTICATED TESTS PERFORMED, THE DRAG SPHERE ANEMOMETER IS CONSIDERED TO BE SUITABLE FOR MEASUREMENT OF DOWNWASH VELOCITIES IN CLOSE PROXIMITY TO HOVERING VTOL AIRCRAFT. IF REQUIRED, THE UPPER END OF THE USABLE SPEED RANGE COULD BE EXTENDED THROUGH ADDITIONAL WIND-TUNNEL CALIBRATION.

UNCLASSIFIED

195
FLUIDIC VORTEX ANGULAR RATE SENSOR
CONCEPT INVESTIGATION FOR HELICOPTERS AND V/STOL AIRCRAFT.

DESCRIPTION NOTE: FINAL REPORT
APR 76

CONTRACT: DA-1-1-F-162203-A-141
TASK: 1-F-162203-A-14186
MUNITOR: USAVLABS

UNCLASSIFIED REPORT

DESCRIPTORS: (*FLOWMETERS; *FLUIDICS),
(*STABILIZATION SYSTEMS; *HELICOPTERS),
(*VERTICAL TAKE-OFF PLANES; STABILIZATION SYSTEMS; VORTEX; FLOW VISUALIZATION,
GYROSCOPES; PRESSURE, FEASIBILITY STUDIES,
SENSORS)
IDENTIFIERS: VAJARS(VORTEX AXIS JET ANGULAR RATE SENSORS); *VORTEX AXIS JET ANGULAR RATE SENSORS

AN EXPERIMENTAL INVESTIGATION WAS UNDERTAKEN TO
ESTABLISH THE FEASIBILITY OF SENSOR CONCEPTS FOR
APPLICATION IN HELICOPTER AND V/STOL AIRCRAFT
STABILITY AUGMENTATION SYSTEMS. THEORIES OF
VARIOUS POSSIBLE RATE SENSING DEVICES BASED ON RAPID
VORTEX FLOWS ARE PRESENTED, WITH EXPERIMENTAL
DEMONSTRATION OF THE PRINCIPLE OF ONE IN WHICH THE
SMALL FLOW AXIS LAGS BEHIND THE CHAMBER AXIS WHEN THE
CHAMBER IS ROTATED ABOUT A LINE PERPENDICULAR TO ITS
AXIS. TWO MODIFICATIONS YIELDED SENSITIVITIES LESS
THAN ULTIMATELY DESIRED; BY FACTORS ON THE ORDER
OF 2000 AND 200. OBSERVATIONS ON THE FLOW PATTERN IN
JETS EMERGING FROM A PAIR OF CONCENTRIC VORTEX
CHAMBERS SHOWED THAT THE CONCEPT OF THE VORTEX AXIS
JET ANGULAR RATE SENSOR (VAJARS) DISCUSSED
THEORETICALLY IN A PREVIOUS FEASIBILITY STUDY WOULD
HAVE TO OVERCOME PROBLEMS CREATED BY TURBULENCE AND
FLOw REVERSAL ALONG THE AXIS. AN ATTEMPT WAS MADE
TO DEMONSTRATE A DEVICE OF HIGH THEORETICAL
SENSITIVITY, IN WHICH A CYLINDRICAL CORE SUPPORTED ON
AN AXIS PERPENDICULAR TO THE CORE AXIS IS SUBJECTED
TO A TORQUE DUE TO THE PRESSURE GRADIENT GENERATED IN
AN ANNULAR PASSAGE BY CORIOLIS FORCES.
THEORETICAL DISCUSSIONS ARE ALSO GIVEN OF A
GYROSCOPE IN WHICH THE FLUID STREAM IS THE ROTOR. (U)

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UNCLASSIFIED
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UNCLASSIFIED

DOE REPORT BIBLIOGRAPHY  SEARCH CONTROL NO. /20M07

AD-875 238  1/3
GENERAL DYNAMICS/CONVAIR SAN DIEGO CALIF

EFFECTS OF HIGH-LIFT DEVICES ON V/STOL
AIRCRAFT PERFORMANCE, VOLUME II,
BIBLIOGRAPHY.

DESCRIPTIVE NOTE: FINAL REPT.,
JULY 1970, 220p

HIBERT, JOSEPH, JR.

CONTRACT: DAAJO2-69-C-0079
PROJECT: DA-1-F-162204-7-142
TASK: 1-F-162204-A-14231
MONITOR: USAAVLABS TR-70-338

UNCLASSIFIED REPORT

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, LIFT),
SHORT TAKE-OFF PLANES, TILT WINGS, FLAPS,
BOUNDARY LAYER CONTROL, DOWNFLOW, GROUND EFFECT,
MANEUVERABILITY, BIBLIOGRAPHIES,
PERFORMANCE (ENGINEERING)

ALL TYPES OF HIGH-LIFT DEVICES ARE COVERED, BOTH
EXPERIMENTAL AND THEORETICAL TOPICS ARE REVIEWED, AND
THE SELECTED REPORTS ARE LISTED BY A SUBJECT AND AN
AUTHOR INDEX. (AUTHOR)
UNCLASSIFIED

UNCLASSIFIED

WDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z0H07

AU-878 075 1/3
GENERAL DYNAMICS/CONVAIR SAN DIEGO CALIF

EFFECTS OF HIGH-LIFT DEVICES ON V/STOL
AIRCRAFT PERFORMANCE. VOLUME I

DESCRIPTIVE NOTE: FINAL REP'T. 1 JUN 69-31 MAY 70; OCT 70 185P
CARROLL, J.; LAUDEMAN, E.; WHITNEY, C.

CONTRACT: DAAJ02-69-C-0079
PROJECT: F-162204-A-142
TASK: F-162204-A-14231
MONITOR: USAVALABS TK-70-33A

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 2; AD-875 23B.

DESCRIPTORS: (VERTICAL TAKE-OFF PLANES, LIFT),
SHORT TAKE-OFF PLANES, TWO-DIMENSIONAL FLOW,
FLAP, AIRFOILS, PROPELLERS (AERIAL),
LOADING (MECHANICS), DOWNASH, TILT WINGS,
PERFORMANCE (ENGINEERING)

THE PURPOSE OF THE STUDY WAS TO DEVELOP A UNIFIED
ANALYTICAL PROCEDURE TO EVALUATE THE EFFECTS OF
PASSIVE HIGH-LIFT DEVICES ON DEFLECTED-SLIPSTREAM OR
TILT-WING V/STOL CONFIGURATIONS. METHODS WERE
DEVELOPED TO PREDICT THE TWO-DIMENSIONAL FLAPPED
AIRFOIL CHARACTERISTICS TO BE USED IN A SPAN LOAD
PROGRAM. THE SPAN LOAD RESULTS ARE USED IN
PROCEDURES FOR ESTIMATING THE COEFFICIENTS OF LIFT, 
LATERAL FORCE, AND MOMENT FOR A WING PARTIALLY
IMMERSED IN A PROPELLER SLIPSTREAM. THESE
CHARACTERISTICS CAN THEN BE USED IN A PERFORMANCE
PROGRAM DEVELOPED TO CALCULATE THE TAKEOFF, LANDING,
AND TRANSITION MANEUVERS. IN ADDITION TO THESE
TASKS, INVESTIGATIONS WERE MADE INTO DOWNASH
CHARACTERISTICS, WIND TUNNEL WALL CORRECTIONS, AND
CORRELATIONS OF FLIGHT TEST DATA WITH THEORY. AN
ANALYSIS OF THE EFFECTS OF HIGH-LIFT DEVICES ON THE
PERFORMANCE OF A TILT-WING V/STOL CONFIGURATION
IS INCLUDED IN THE APPENDIX. (AUTHOR)

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BACKGROUND INFORMATION AND USER GUIDE FOR
MIL-F-83300-MILITARY SPECIFICATION —
FLYING QUALITIES OF PILOTED V/STOL
AIRCRAFT. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
MAR /1 469P CHALK, CHARLES R.; KEY, DAVID L.; KROLL, JOHN, JR.; ASSERMAN, RICHARD;
RAUFURD, ROBERT C. ;
CONTRACT: AF 33(615)-3736, F33615-70-C-1322
PROJ: AF-698DC
MONITOR: AFFDL TR-70-88

UNCLASSIFIED REPORT

DESCRIPTORS: (*VERTICAL TAKE-OFF PLANES,
PERFORMANCE(ENGINEERING)), (*SHORT TAKE-OFF
PLANES, SPECIFICATIONS), MILITARY REQUIREMENTS,
STATE-OF-THE-ART REVIEWS, FLIGHT TESTING, HOVERING (U)

THE SPECIFICATION WAS COMPILED AFTER AN EXTENSIVE
LITERATURE REVIEW AND MANY MEETINGS AND DISCUSSIONS
WITH PERSONNEL FROM ESSENTIALLY ALL CONCERNED
CIVILIAN AND GOVERNMENTAL ORGANIZATIONS. THE REPORT
ATTEMPTS TO EXPLAIN THE CONCEPT AND PHILOSOPHY
UNDERLYING THE V/STOL SPECIFICATION AND TO
PRESENT SOME OF THE DATA AND ARGUMENTS UPON WHICH THE
REQUIREMENTS WERE BASED. THE DOCUMENT SHOULD ALSO
SERVE AS A SUMMARY OF THE STATE OF THE V/STOL
FLYING QUALITIES ART AS DETERMINED FROM FLIGHT TEST,
sIMULATION, ANALYSIS, AND THEORY. (AUTHOR) (U)

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CORPORATE AUTHOR - MONITORING AGENCY

*ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT - PARIS (FRANCE)
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  FLUID DYNAMICS OF ROTOR AND FAN SUPPORTED AIRCRAFT AT SUBSONIC SPEEDS.
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  AD-661 592

*AEROSPACE RESEARCH LABS WRIGHT
  "PATTERSON AFB OHIO
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*AIR FORCE AERO PROPULSION LAB WRIGHT
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*AIR FORCE FLIGHT DYNAMICS LAB WRIGHT
  "PATTERSON AFB OHIO
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  AFFDL-TH-70-1-F; A
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  * * *
  AFFDL-TH-65-200
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*AIR FORCE OFFICE OF SCIENTIFIC RESEARCH ARLINGTON VA
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* CIVIL AERONAUTICS BOARD WASHINGTON D.C.

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* CORNELL AERONAUTICAL LAB INC BUFFALO, N Y FLIGHT RESEARCH DEPT

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AD-707 631

* BACKGROUND INFORMATION AND USER GUIDE FOR MIL-F-83361-MILITARY SPECIFICATION FOR FLYING QUALITIES OF PILOTED V/STOL AIRCRAFT
(AFFUL-TN-70-86)
AD-884 439

* CORNELL AERONAUTICAL LAB INC BUFFALO, N Y

CAL-BU-1816-S-1
DEVELOPMENT OF A METHOD FOR PREDICTING THE PERFORMANCE AND STRESSES OF VTOL-PROPULSED V/STOL AIRCRAFT WITH DIFFERENT PROPULSION SYSTEMS
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CAL-BU-1814-S-2
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* CENTRE NATIONAL D'ETUDES ET DE RECHERCHES AERONAUTIQUES BRUSSELS (BELGIUM)

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DTMB-2181
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DTMB-AERO-1103
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DTMB-AERO-1106
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DFVL-R-SONDERDRUCK-107
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*DNA SCIENCES CORP. FORT WASHINGTON PA

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*FEDERAL AVIATION AGENCY WASHINGTON D.C. FLIGHT STANDARDS SERVICE

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*FOREIGN TECHNOLOGY DIV. RIGHT PATTERSON AFB- OHIO

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FTD-MC-29-379-69
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*FRANKLIN INST. RESEARCH LABS PHILADELPHIA PA

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*GENERAL ELECTRIC CO. CINCINNATI OHIO

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*HUGHES TOOL CO CULVER CITY, CALIF
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*JOINT ARMY NAVY AIRCRAFT
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