# HEAVY LIFT HELICOPTERS

## A DDC BIBLIOGRAPHY

DDC-TAS-72-16-I

APRIL 1972







DEFENSE DOCUMENTATION CENTER
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13 ABSTRACT

This bibliography contains unclassified references on Heavy Lift Helicopters with a minimum payload of about 9,000 pounds or a minimum gross weight of 17,000 pounds. These references relate to rotor characteristics, rotor systems, rotor loads, lift propulsion, payloads, heavy lift rotors, configurations, design, and performance capabilities of the heavy lift helicopters.

Computer-generated indexes of Corporate Author-Monitoring Agency, Subject, Personal Author, and Title are included.

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UNCLASSIFIED

Security Classification

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Security Classification

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| | ROLE | WT | ROLE | WT | ROLE | WT |
| *Heavy Lift Helicopters | | | | | | |
| *Helicopters | | | | | | |
| *Bibliographies | | | | | | |
| Heavy Lift Rotors | | | | | | |
| Helicopter Engines | | | | | | |
| Helicopter Rotors | | | | | | |
| Payload | | | | | | |
| Rotor Blades(Rotary Wings) | | | | | | |
| HLH(Heavy Lift Helicopters) | | | | | | |
| Cargo | | | | | | |
| CH-53A Aircraft | | | | | | |
| S-60 Aircraft | | | | | | |
| H-53 Aircraft | | | | | | |
| Weight | | | | | | |
| Air Transportation | | | | | | |

UNCLASSIFIED

Security Classification

AD- 740 900

# HEAVY LIFT HELICOPTERS

## A DDC BIBLIOGRAPHY

October 1962 - January 1971

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APRIL 1972



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CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

# F O R E W O R D

This bibliography contains 34 unclassified references relating to *Heavy Lift Helicopters* with a minimum payload of about 9,000 pounds or a minimum gross weight of 17,000 pounds. These references were selected from entries processed into the Defense Documentation Center Data Bank during the period of January 1953 through December 1971.

**BY ORDER OF THE DIRECTOR, DEFENSE SUPPLY AGENCY**

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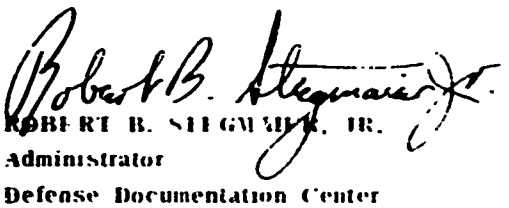

**ROBERT B. STEGMAIER, JR.**
**Administrator**
**Defense Documentation Center**

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| SUBJECT | S-1 |
| TITLE | T-1 |
| PERSONAL AUTHOR | P-1 |

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-286 576
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

PROBLEMS OF THE AERODYNAMICS OF HELICOPTER LIFTING ROTORS (U)

OCT 62 IV
REPT. NO. TT 62 815

UNCLASSIFIED REPORT

DESCRIPTORS: •HELICOPTER ROTORS, AERODYNAMIC CHARACTERISTICS, HOVERING, LANDINGS, LIFT, LOAD DISTRIBUTION, MATHEMATICAL ANALYSIS, TAKE-OFF, THEORY, TRANSLATIONS, VELOCITY, VORTICES (U)
IDENTIFIERS: USSR, HEAVY LIFT HELICOPTERS (U)

RESULTS OF EXPERIMENTAL RESEARCH ON HELICOPTER ROTORS ARE PRESENTED IN THE HOVERING REGIME. OPTIMUM PARAMETERS ARE DISCUSSED FOR HEAVILY LOADED ROTORS. A GENERALIZED VORTICITY THEORY OF THE HELICOPTER LIFTOBORONGIZ, MOSKVA, 141P., 1961) UNCLASSIFIED REPORT DESCRIPTORS: •HELICOPTER ROTORS, LOAD DISTRIBUTION, LIFT, VORTICES, VELOCITY, AERODYNAMICS, TAKE-OFF, LANDING, MATHEMATICAL ANALYSIS, THEORY, USSR, TRANSLATIONS, IDENTIFIERS: HOVERING. RESULTS OF EXPERIMENTAL RESEARCH ON HELICOPTER ROTORS ARE PRESENTED IN THE HOVERING REGIME. OPTIMUM PARAMETERS ARE DISCUSSED FOR HEAVILY LOADED ROTORS. A GENERALIZED VORTICITY THEORY OF THE HELICOPTER LIFTING ROTOR IS SET FORTH; THIS MAKES IT POSSIBLE TO DETERMINE THE INDUCED VELOCITY AT ANY POINT IN SPACE FOR THE BASIC FLIGHT MODE. THE RESULTS OF AERODYNAMIC RESEARCH ON COMPUTATION OF THE FLIGHT CHARACTERISTICS OF THE HELICOPTER ROTOR IN THE VERTICAL-DESCENT MODE ARE SET FORTH. METHODS ARE GIVEN FOR DETERMINING THE CHARACTERISTICS OF THE ROTOR. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-408 650
HUGHES TOOL CO CULVER CITY CALIF

PRELIMINARY DESIGN STUDY HOT CYCLE RESEARCH AIRCRAFT. (U)

DESCRIPTIVE NOTE: SUMMARY REPT.
MAR 63 174P
CONTRACT: DA-44-177-TC-832
PROJ: DA-1-D-121401-D-144
TASK: 1-D-121401-D-14403
MONITOR: TRECOM TR-62-102

UNCLASSIFIED REPORT

DESCRIPTORS: (*HELICOPTERS, DESIGN), (*HELICOPTER ENGINES, GAS TURBINES), JET HELICOPTER ROTORS, AERODYNAMIC CONFIGURATION, WEIGHT, AUTOGYROS, STABILITY, CONTROL, AIRFRAMES, CARGO, PAYLOAD, DUCTS, FEASIBILITY STUDIES. (U)
IDENTIFIERS: T-64 ENGINES, S-60 AIRCRAFT, S-64 AIRCRAFT, J-85 ENGINES, 1963, HEAVY LIFT HELICOPTERS (U)

A PRELIMINARY DESIGN STUDY HAS BEEN COMPLETED OF A TWIN-ENGINE HOT CYCLE RESEARCH HELICOPTER UTILIZING THE EXISTING ROTOR WITH THE FOLLOWING DESIGN OBJECTIVES: (1) 15,300 LB DESIGN GROSS WEIGHT; (2) 25,500 LB ALTERNATE HEAVY-LIFT HOVERING GROSS WEIGHT; (3) 145 KT AT A GROSS WEIGHT OF 15,300 LB, HELICOPTER MODE; AND (4) 197 KNOTS AT A GROSS WEIGHT OF 10,000 LB AUTO GYRO MODE. MAJOR DESIGN AREAS COVERED IN THE STUDY INCLUDE THE ROTOR MODIFICATIONS, AIRFRAME, ENGINE INSTALLATION, ENGINE CONTROLS, FLIGHT CONTROLS, DIVERTER VALVES, BLADE DUCT VALVES, FLIGHT INSTRUMENTATION, ELECTRICAL SYSTEM, HYDRAULIC SYSTEM, AND FUEL SYSTEM. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-822 586
BOEING CO MORTON PA VERTOL DIV

TRANSMISSION STUDY FOR TANDEM-ROTOR SHAFT-DRIVEN HEAVY-LIFT HELICOPTERS. (U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 27 JUN-27 DEC 64,
SEP 65 148P MACK,JOHN ;
REPT. NO. R-379
CONTRACT: DA44 177AMC241T
PROJ: DA-1M121401D144
TASK: 1M121401D14414
MONITOR: USAAVLABS , TR-65-56

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: AVAILABLE COPY WILL NOT PERMIT FULLY LEGIBLE REPRODUCTION. REPRODUCTION WILL BE MADE IF REQUESTED BY USERS OF DDC. COPY IS AVAILABLE FOR PUBLIC SALE.

DESCRIPTORS: (*HELICOPTER ROTORS, TRANSMISSIONS), (*TRANSMISSIONS, HELICOPTERS), SHAFTS, HELICOPTER ENGINES, DRIVES, BEARINGS, TITANIUM, TENSILE PROPERTIES, FATIGUE(MECHANICS), REDUCTION GEARS, CONTROL SYSTEMS (U)

MECHANICAL DRIVE SYSTEMS FOR HEAVY-LIFT TANDEM-ROTOR HELICOPTERS WERE STUDIED. THREE- AND FOUR-ENGINE CONFIGURATIONS WERE ANALYZED. CONFIGURATIONS INCLUDED AFT-MOUNTED AND FORE- AND AFT-MOUNTED ENGINES, SINGLE AND DUAL DRIVE SYSTEMS, AND HIGH-MOUNTED AND LOW-MOUNTED AFT PLANETARIES. WEIGHTS WERE ESTIMATED. PROBLEMS OF GEAR SURFACE DURABILITY, MULTIENGINE CONTROL, AND OVER-RUNNING CLUTCHES WERE DEFINED. THE EFFECTS OF INCREASED GEAR TOOTH BENDING FATIGUE STRENGTH, HIGHER BEARING CAPACITY, SUPERCRITICALSPEED SHAFTING, AND THE USE OF TITANIUM AND IMPROVED FERROUS METALS WERE EVALUATED. IN THE MORE SIGNIFICANT FACTORS, THE SATISFACTORY SOLUTION OF THE HEAVY-LIFT HELICOPTER DRIVE SYSTEM LIES WITHIN THE CURRENT STATE-OF-THE-ART. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-624 145 1/3 21/5
KAMAN AIRCRAFT CORP BLOOMFIELD CONN

A MAIN POWER SYSTEM FOR SHAFT-DRIVEN HEAVY LIFT HELICOPTERS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
OCT 65 119P BOSSLER,ROBERT B. ,JR.;
REPT. NO. KAMAN-R-555
CONTRACT: DA-44-177-AMC-212(T)
PROJ: DA-1M121401D144
TASK: 1M121401D14414
MONITOR: USAAVLABS , TR-65-52

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (•HELICOPTER ENGINES, DESIGN), (•HELICOPTERS, POWER), (•TURBINES, HELICOPTERS), HELICOPTER ROTORS, TRANSMISSIONS, SHAFTS (U)
IDENTIFIERS: TIGR (TURBINE INTEGRATED GEARED ROTOR) (U)

MULTIPLE GAS GENERATORS, INSTALLED IN A CONVENTIONAL HORIZONTAL POSITION, ARE ALL GAS-COUPLED TO THE SAME PERIPHERALLY-DRIVEN REMOTE TURBINE OF THE LIFT AND CRUISE FAN TYPE. THE REMOTE TURBINE IS MOUNTED CO-AXIALLY TO A SPEED-REDUCING GEARBOX WHICH IS ALSO COAXIAL WITH THE ROTOR. THE CONCEPT IS KNOWN AS THE TURBINE INTEGRATED GEARED ROTOR 'TIGR'. THE TIGR ARRANGEMENT ELIMINATES FROM TRANSMISSION DESIGN THE FUNCTIONS OF ENGINE COMBINING, CHANGE OF DIRECTION, PART OF THE REQUIRED SPEED REDUCTION FROM CONVENTIONAL ENGINE SPEED TO ROTOR SPEED, MISALIGNMENT COUPLINGS AND ALL OF THE MULTIPLE INDIVIDUALENGINE OVERRUNNING-CLUTCH PROVISIONS REQUIRED FOR ENGINEOUT OPERATION AND FOR AUTOROTATION. A THREE-PHASE PROGRAM OF DESIGN, ANALYSIS, AND COMPARATIVE EVALUATION OF TIGR, INCLUDING THE EFFECT ON ADJACENT SYSTEMS AND THE RESULTING HEAVY LIFT HELICOPTER (HLH) AIRCRAFT, IS PRESENTED. THE RESULTS SHOW TIGR HAS A 280 PERCENT IMPROVEMENT IN MEAN TIME BETWEEN MISSION-ABORT FAILURE OVER CONVENTIONAL MULTIPLE ENGINE/TRANSMISSION PRACTICE FOR THE ENTIRE HLH POWER TRAIN FROM THE ENGINE INLETS TO THE ROTOR HUB. COST PER HLH FLIGHT HOUR IS REDUCED, AND THE HIGH FUEL EFFICIENCY OF MECHANICALLY-DRIVEN ROTORS IS RETAINED. TIGR IS BELIEVED TO BE EMINENTLY PRACTICAL AND IS READY FOR DYNAMIC TESTING. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-624 716 1/3 21/5
HILLER AIRCRAFT DIV FAIRCHILD HILLER CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME XI. ENGINE DESIGN. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. OCT 65 111P
CONTRACT: DA-44-177-AMC-25(T)
PROJ: DA-1M121401D144
TASK: 1M121401D11412
MONITOR: USAAVLABS , TR-64-68K

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH CONTINENTAL AVIATION AND ENGINEERING CORP., DETROIT, MICH., REPT. NO. CAE-942. SEE ALSO AD-624 814.

DESCRIPTORS: (*HELICOPTER ENGINES, DESIGN), (*TURBOJET ENGINES, DESIGN), (*HELICOPTER ROTORS, DESIGN), ROTOR BLADES(ROTARY WINGS), HOVERING, FUEL PUMPS, JET ENGINE INLETS, LIFT (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT DISCUSSES THE DESIGN OF THE MODEL 357-1 ENGINE FOR ROTOR TIP OPERATIONAL ENVIRONMENT. THE DETAIL DESIGN MEETS REQUIREMENTS OF MIL-E-5007B EXCEPT FOR ITEMS PECULIAR TO ROTOR TIP OPERATION. THESE ITEMS INCLUDE OPERATIONAL ATTITUDES, EFFECT OF CONTINUOUS GYROSCOPIC COUPLES AND HIGH G FIELD ENVIRONMENT. THE REPORT INCLUDES AN ANALYTICAL DESIGN ANALYSIS OF THE STATIC STRUCTURE, ROTATING ELEMENTS, BEARINGS, ACCESSORY DRIVES, LUBRICATION SYSTEM, AND MISCELLANEOUS ENGINE PARTS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-624 762 1/3
HILLER AIRCRAFT DIV FAIRCHILD HILLER CORP PALO ALTO CALIF

HEAVY-LIFT TURBOJET ROTOR SYSTEM. VOLUME III. DESIGN LAYOUT STUDIES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
OCT 65 113P
REPT. NO. ENGINEERING-64-43
CONTRACT: DA-44-177-AMC-25(T)
PROJ: DA-1M1214O1D144
TASK: 1M121401D11412
MONITOR: USAAVLABS , TR-64-68C

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (•ROTOR BLADES(ROTARY WINGS), DESIGN), (•HELICOPTER ROTORS, DESIGN), TURBOJET ENGINES, HELICOPTER ENGINES, HELICOPTERS, LIFT (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT DESCRIBES THE DESIGN LAYOUT STUDIES PERFORMED DURING THE PRELIMINARY DESIGN OF A TIP TURBOJET ROTOR SYSTEM APPLICABLE TO A HELICOPTER OF 60,000 POUNDS TO 80,000 POUNDS GROSS WEIGHT. THE BASIC ROTOR SYSTEM GEOMETRY FOR WHICH THESE STUDIES WERE PERFORMED WAS ESTABLISHED BY MEANS OF A PARAMETRIC DESIGN STUDY. DESIGN INVESTIGATIONS WERE DIRECTED PRIMARILY TOWARDS THE COMPONENTS ABOVE THE ATTACHMENT OF THE ROTOR SYSTEM TO THE AIRFRAME. THESE INCLUDED ROTOR HUB AND BLADE RETENTION CONFIGURATION, ROTOR BLADE STRUCTURAL ARRANGEMENT, POWER PLANT INSTALLATION, FLIGHT CONTROLS, AND AIRFRAME/ROTOR MOUNTED FUEL, LUBRICATION, ELECTRICAL, ENGINE STARTING, AND POWER MANAGEMENT SYSTEMS. CONSIDERATION WAS ALSO GIVEN TO TAIL ROTOR AND ACCESSORIES DRIVE SYSTEMS. THESE DESIGN STUDIES AND ASSOCIATED STRESS AND WEIGHT ANALYSES HAVE ESTABLISHED THE PRACTICABILITY OF THE DESIGN AND FABRICATION OF THE TIP TURBOJET ROTOR SYSTEM, AS WELL AS PROVIDING VERIFICATION FOR THE SYSTEMS' WEIGHTS ESTABLISHED BY THE PARAMETRIC DESIGN STUDY WEIGHT EQUATIONS. DEVELOPMENT OF A TIP TURBOJET HELICOPTER OF 60,000 POUNDS TO 80,000 POUNDS GROSS WEIGHT HAS BEEN FOUND TO BE WELL WITHIN THE STATE OF THE ART OF ALL TECHNOLOGIES ASSOCIATED WITH THE DESIGN AND FABRICATION OF AN AIRCRAFT OF THIS TYPE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-624 763 1/3
HILLER AIRCRAFT DIV FAIRCHILD HILLER CORP PALO ALTO CALIF

HEAVY-LIFT TURBOJET ROTOR SYSTEM. VOLUME IV. STATIC AND DYNAMIC LOADS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
OCT 65 117P
REPT. NO. ENGINEERING-64-44
CONTRACT: DA-44-177-AMC-25(T)
PROJ: DA-1M121401D144
TASK: 1M121401D14412
MONITOR: USAAVLABS , TR-64-68D

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-624 762.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), LOADING(MECHANICS), STRUCTURAL PARTS, TURBOJET ENGINES, ROTOR BLADES(ROTARY WINGS), HELICOPTERS, LIFT (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT PRESENTS THE STRUCTURAL DESIGN CRITERIA, STATIC DESIGN LOADS, AND DYNAMIC DESIGN LOADS FOR THE MODEL 1108 HELICOPTER. THE VOLUME IS THE BASIS FOR THE STRUCTURAL DESIGN AND ANALYSIS OF THE TIP TURBOJET MAIN ROTOR SYSTEM. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-624 764 1/3
HILLER AIRCRAFT DIV FAIRCHILD HILLER CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME VI. DYNAMIC AND AEROELASTIC STUDIES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
OCT 65 55P
REPT. NO. HILLER-ER-64-46
CONTRACT: DA-44-177-AMC-25(T)
TASK: 1M121401D-14412

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-624 763.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), (*ROTOR BLADES(ROTARY WINGS), AERODYNAMIC CHARACTERISTICS), HELICOPTER ENGINES, TURBOJET ENGINES, LIFT, AEROELASTICITY, FREQUENCY, FLUTTER, SIMULATION, ANALOG COMPUTERS, HELICOPTERS (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE STUDIES PERTAIN TO DYNAMIC AND AEROELASTIC PHENOMENA OF THE ROTOR SYSTEM FOR A HEAVY-LIFT HELICOPTER EMPLOYING TURBOJET ENGINES MOUNTED AT THE TIPS OF THE ROTOR BLADES. A MAJORITY OF THE ROTOR BLADE FREQUENCY AND BLADE FLUTTER BOUNDARY WORK WAS ACCOMPLISHED USING A LUMPED MASS ROTOR BLADE SIMULATION ON A DIRECT ANALOG COMPUTER. THE IMPORTANT RESULTS OF THESE STUDIES AS WELL AS OTHER DYNAMIC INVESTIGATIONS WHICH ARE NECESSARY TO INSURE ADEQUATE HELICOPTER PERFORMANCE ARE INCLUDED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-624 813 1/3
HILLER AIRCRAFT DIV FAIRCHILD HILLER CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME VII. WEIGHT AND BALANCE STUDIES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
OCT 65 30P
REPT. NO.: HILLER-ER-64-47
CONTRACT: DA-44-177-AMC-25(T)
PROJ: DA-1M121401D144
TASK: 1M121401D14412
MONITOR: USAAVLABS . TR-64-68G

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-624 769.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), (*HELICOPTERS, WEIGHT), STATISTICAL ANALYSIS, ROTOR BLADES(ROTARY WINGS), DRAG, LIFT, HELICOPTER ENGINES, TURBOJET ENGINES, CENTER OF GRAVITY (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT DISCUSSES STATISTICAL, ANALYTICAL, AND EMPIRICAL WEIGHT ANALYSIS METHODS USED TO EVALUATE THE EMPTY WEIGHT OF THE HELICOPTER. BLADE LAG CHARACTERISTICS ARE ALSO DISCUSSED, INCLUDING AN ANALYSIS SHOWING BLADE LAG ANGLES WITH ONE AND TWO ENGINES INOPERATIVE. INCLUDED ARE AIRCRAFT BALANCE PREDICTIONS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-624 814 1/3
HILLER AIRCRAFT DIV FAIRCHILD HILLER CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME VIII. WIND-TUNNEL STUDIES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
OCT 65 540P
REPT. NO. ENGINEERING-64-48
CONTRACT: DA-44-177-AMC-25(T)
PROJ: DA-1M121401D144
TASK: 1M121401D14412
MONITOR: USAAVLABS , TR-64-68H

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-624 813.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), (*ROTOR BLADES(ROTARY WINGS), MODEL TESTS), (*NACELLES, MODEL TESTS), AERODYNAMIC CONFIGURATIONS, WIND TUNNEL MODELS, LIFT, TURBOJET ENGINES, HELICOPTERS, HYPERSONIC FLOW (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

WIND-TUNNEL TESTS WERE CONDUCTED TO PROVIDE NACELLE DESIGN INFORMATION WHICH WOULD ASSIST IN THE DESIGN OF THE TIP TURBOJET INSTALLATION. THE MODEL WAS CONSTRUCTED TO PROVIDE FOR SINGLE, OVER-UNDER, AND SIDE-BY-SIDE ENGINE ARRANGEMENTS. THE NACELLE LOADS WERE MEASURED WITH A SIX-COMPONENT STRAIN-GAGE BALANCE. TESTS WERE CONDUCTED AT NACELLE REYNOLDS NUMBERS FROM 450,000 TO 1,830,000 WITH MOST OF THE DATA TAKEN AT THE HIGHER VALUE. THE MODEL PITCH ANGLE WAS VARIED FROM -3 DEGREES TO +12 DEGREES AND THE YAW ANGLE WAS VARIED FROM -20 DEGREES TO +20 DEGREES. NACELLE INLET TO FREESTREAM VELOCITY RATIOS WERE VARIED FROM 0 TO .7625, THE MAXIMUM OBTAINABLE WITH FREESTREAM TOTAL PRESSURE SUPPLYING THE ENERGY NECESSARY TO OVERCOME INTERNAL LOSSES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-624 822 1/3 21/5
HILLER AIRCRAFT DIV FAIRCHILD HILLER CORP PALO ALTO CALIF

HEAVY-LIFT TURBOJET ROTOR SYSTEM. VOLUME XII. FUEL PUMP AND CONTROL SYSTEM DESIGN. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
OCT 65 192P
CONTRACT: DA-44-177-AMC-25(T)
PROJ: DA-1M121401D144
TASK: 1M121401D14412
MONITOR: USAAVLABS , TR-64-68L

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH CONTINENTAL AVIATION AND ENGINEERING CORP., DETROIT, MICH., REPT. NO. CAE-943. SEE ALSO AD-624 716.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), (*FUEL PUMPS, DESIGN), (*HELICOPTER ENGINES, FUEL PUMPS), CONTROL SYSTEMS, TURBOJET ENGINES, HOVERING, FEASIBILITY STUDIES, LIFT (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT DISCUSSES THE PROPOSAL OF A COMBINATION HYDROMECHANICAL-ELECTRONIC FUEL CONTROL AND FUEL PUMP FOR CONTROL OF A HELICOPTER ROTOR TIP MOUNTED ENGINE (CAE MODEL 357-1) WHICH DURING NORMAL OPERATION IS SUBJECTED TO 235G OF CENTRIFUGAL FORCE. THE PROPOSED PRELIMINARY DESIGN IS SUBMITTED TO MEET THE SPECIFICATION REQUIREMENT OF THE ENGINE IN THE TIP TURBOJET HOVER MODE OF OPERATION. ANALYTICAL DESIGN STUDIES AND PRELIMINARY TEST RESULTS SHOW FEASIBILITY OF THIS DESIGN FOR OPERATION IN A 235G FIELD. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-625 818 1/3
HILLER AIRCRAFT CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM, VOLUME I. (U)

DESCRIPTIVE NOTE: SUMMARY REPT.
65 113P
REPT. NO. ER-64-41
CONTRACT: DA-44-177-AMC-25(T)
TASK: 1M121401D14412
MONITOR: USAAVLABS , TR-64-68A

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), HELICOPTERS, TURBOJET ENGINES, LIFT, PERFORMANCE(ENGINEERING), WEIGHT, STABILITY (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE STUDY OF A TIP-TURBOJET-POWERED ROTOR SYSTEM FOR A HEAVY-LIFT HELICOPTER, WHICH IS PRESENTED IN THIRTEEN VOLUMES, IS SUMMARIZED. INCLUDED UNDER THIS GENERAL SUBJECT ARE STUDIES ON PARAMETRIC DESIGN, PERFORMANCE, STRUCTURES AND DYNAMICS, WIND TUNNEL, PRELIMINARY DESIGN, WEIGHT AND BALANCE, STABILITY, AND POWER PLANT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-625 819 1/3 21/5
HILLER AIRCRAFT CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME II. PARAMETRIC DESIGN STUDY. (U)

DESCRIPTIVE NOTE: ENGINEERING REPT.
OCT 65 104P
REPT. NO. ER-64-42
CONTRACT: DA-44-177-AMC-25(T)
TASK: 1M121401D14412
MONITOR: USAAVLABS , TR-64-68B

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-625 818.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), HELICOPTERS, LIFT, TURBOJET ENGINES, ROTOR BLADES(ROTARY WINGS), OPTIMIZATION, WEIGHT, AERODYNAMIC CHARACTERISTICS, CONFIGURATION (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE PARAMETRIC ANALYSIS DETERMINES THE OPTIMUM DESIGN PARAMETERS OF A 24,000-LB.-PAYLOAD HELICOPTER POWERED BY TURBOJET ENGINES INSTALLED AT THE ROTOR BLADE TIPS. THE METHOD USED DETERMINED A GROSS WEIGHT WHICH WOULD SATISFY STATISTICAL COMPONENT WEIGHT EQUATIONS AND AERODYNAMIC EQUATIONS SIMULTANEOUSLY. THE OPTIMIZING CRITERION WAS THE MINIMUM GROSS WEIGHT REQUIRED TO PERFORM A SPECIFIC MISSION. THE RESULTS OF THE ANALYSIS INDICATE THAT THE OPTIMUM CONFIGURATION USING THE CONTINENTAL MODEL 357-1 ENGINE IS A HELICOPTER WITH (A) FOUR BLADES, (B) TWO ENGINES PER BLADE, AND (C) A CRANETYPE FUSELAGE. THE OPTIMUM CONFIGURATION WITH A GENERALIZED OR 'RUBBER' ENGINE IS A HELICOPTER WITH (A) THREE BLADES, (B) ONE ENGINE PER BLADE, AND (C) A CRANETYPE FUSELAGE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-625 820 1/3
HILLER AIRCRAFT CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME V. STRUCTURAL ANALYSIS. (U)

DESCRIPTIVE NOTE: ENGINEERING REPT.
OCT 65 127P
REPT. NO. ER-64-45
CONTRACT: DA-44-177-AMC-25(T)
TASK: 1M121401D1 412
MONITOR: USAAVLABS , TR-64-68E

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-624 814.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), (*ROTOR BLADES(ROTARY WINGS), DESIGN), HELICOPTERS, TURBOJET ENGINES, LIFT, STRESSES (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT DISCUSSES STRESS CALCULATIONS FOR MAJOR STRUCTURAL COMPONENTS OF THIS SYSTEM. TIP ENGINE ATTACHMENT HARDWARE IS ALSO ANALYZED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-625 821 1/3 21/5
HILLER AIRCRAFT CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME IX. PERFORMANCE ANALYSIS. (U)

DESCRIPTIVE NOTE: ENGINEERING REPT.
OCT 65 73P
REPT. NO. ER-64-49
CONTRACT: DA-44-177-AMC-25(T)
PROJ: DA-1M121401D144
TASK: 1M121401D14412
MONITOR: USAAVLABS , TR-64-681

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-624 813.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), (*HELICOPTERS, PERFORMANCE(ENGINEERING)), ANALYSIS, LIFT, TURBOJET ENGINES, CONFIGURATION, ROTOR BLADES(ROTARY WINGS) (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT PRESENTS A PERFORMANCE AND CHARACTERISTICS SUMMARY OF THE MODEL 1108 TIP TURBOJET-POWERED HEAVYLIFT HELICOPTER. THE CONFIGURATION WAS SELECTED FROM A PARAMETRIC ANALYSIS (USAAVLABS TECHNICAL REPORT 64-68B). STANDARD PERFORMANCE METHODS ARE USED, MODIFIED WHERE NECESSARY BY FACTORS PECULIAR TO TIP TURBOJET PROPULSION. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOMO9

AD-625 822 1/3
HILLER AIRCRAFT CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME X. STABILITY AND CONTROL. (U)

DESCRIPTIVE NOTE: ENGINEERING REPT.
OCT 65 89P
REPT. NO. ER-64-50
CONTRACT: DA-44-177-AMC-25(T)
PROJ: DA-1M121401D144
TASK: 1M121401D14412
MONITOR: USAAVLABS , TR-64-68J

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-625 821.

DESCRIPTORS: (•HELICOPTER ROTORS, DESIGN), (•HELICOPTERS, PERFORMANCE(ENGINEERING)), STABILITY, CONTROL, TURBOJET ENGINES, LIFT, SPECIFICATIONS, HANDLING (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT DISCUSSES THE RESULTS OF A STABILITY AND CONTROL ANALYSIS OF A LARGE CRANE-TYPE HELICOPTER POWERED BY A TIP-MOUNTED TURBOJET SYSTEM. SPECIFICATION MIL-H-8501A WAS USED AS A GUIDE FOR CRITERIA. SPECIFICATION CRITERIA WERE MET; HOWEVER, FOR IMPROVEMENTS IN HANDLING QUALITIES, A STABILITY AUGMENTATION SYSTEM IS RECOMMENDED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-625 823 1/3 21/5
HILLER AIRCRAFT CORP PALO ALTO CALIF

HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME XIII. PRELIMINARY MODEL SPECIFICATION FOR CONTINENTAL MODEL 357-1 ENGINE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
OCT 65 53P
CONTRACT: DA-44-177-AMC-25(T)
TASK: 1M121401D14412
MONITOR: USAAVLABS , TR-64-68M

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH CONTINENTAL AVIATION AND ENGINEERING CORP., DETROIT, MICH. SEE ALSO AD-624 822.

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), (*TURBOJET ENGINES, SPECIFICATIONS), ROTOR BLADES(ROTARY WINGS), HELICOPTERS, LIFT, MODELS(SIMULATIONS), PERFORMANCE(ENGINEERING) (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE REPORT CONTAINS CONTINENTAL PRELIMINARY MODEL SPECIFICATION NO. 2253-A, WHICH CONTAINS REQUIREMENT, CAPABILITY, AND ENGINE PERFORMANCE DATA ON THE CONTINENTAL MODEL 357-1 (1700-POUND THRUST) TURBOJET ENGINE FOR HELICOPTER ROTOR-TIP MOUNTING. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-634 503 1/3 21/5
ARMY AVIATION MATERIEL LABS FORT EUSTIS VA

CH-54A SKYCRANE ENGINE LOAD SHARING. (U)

DESCRIPTIVE NOTE: ENGINEERING LAB. REPT.,
MAY 66 54P CHESTNUTT, DAVID ;BARTEK,L. R.
;
REPT. NO. USAAVLABS-TR-66-47,
PROJ: DA-1M121401D144
TASK: 1M121401D14415

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (•HELICOPTERS, PERFORMANCE(ENGINEERING)), (•HELICOPTER ENGINES, LOADING(MECHANICS)), FLIGHT, OPERATION, DATA, ANALYSIS, TORQUE, TABLES, GRAPHICS (U)
IDENTIFIERS: CH-54A AIRCRAFT (U)

THE ENGINE LOAD-SHARING CHARACTERISTICS OF THE CH-54A SKYCRANE HELICOPTER WERE INVESTIGATED TO DETERMINE IF UNEQUAL LOAD SHARING WOULD BE A SIGNIFICANT PROBLEM. TORQUE-SPLIT SAMPLES WERE SELECTED FROM 67 HOURS OF FLIGHT-LOAD DATA. THE PARAMETERS MEASURED AND RECORDED ON OSCILLOGRAPH RECORDS WERE AIRSPEED, ALTITUDE, ENGINE GAS PRODUCER RPM, ENGINE TORQUE, MAIN ROTOR RPM, VERTICAL ACCELERATION AT AIRCRAFT CENTER OF GRAVITY, AND OUTSIDE AIR TEMPERATURE. THE GROSS WEIGHT AT TAKEOFF AND LANDING AND THE BAROMETRIC PRESSURE WERE MEASURED AND RECORDED AS SUPPLEMENTAL DATA. THE DATA WERE PRESENTED IN A SERIES OF FREQUENCY-OF-OCCURRENCE GRAPHS; VARIATION IN TORQUE SPLITS WAS INDICATED WITH THE OTHER MEASURED PARAMETERS. THE ANALYSIS OF THE DATA INDICATES THAT THE ENGINE LOAD SPLITTING IS SIGNIFICANT AT TAKEOFF AND LANDING AND SHOULD BE INVESTIGATED FURTHER. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /70M09

AD-638 364 1/1
ARMY AVIATION MATERIEL LABS FORT EUSTIS VA

CH-54A SKYCRANE HELICOPTER FLIGHT LOADS INVESTIGATION PROGRAM. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.
JUN 66 183P BRAUN,JOSEPH F. ;GIESSLER,F. JOSEPH ;
REPT. NO. USAAVLABS-TR-66-58,
TASK: 1P125901A14607,

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH TECHNOLOGY, INC., DAYTON, OHIO.

DESCRIPTORS: (•HELICOPTERS, FLIGHT TESTING), DATA, TABLES, GRAPHICS, PERFORMANCE(ENGINEERING) (U)
IDENTIFIERS: CH-54A AIRCRAFT (U)

THE REPORT DEALS WITH THE ANALYSIS OF THE 110.4 HOURS OF CH-54A SKYCRANE DATA. CENTURY 409B OSCILLOGRAPH RECORDERS WERE USED TO COLLECT THE PARAMETERS MEASURED, INCLUDING AIRSPEED, ALTITUDE, VERTICAL ACCELERATION AT CENTER OF GRAVITY, MAIN ROTOR RPM, LONGITUDINAL CYCLIC STICK POSITION, COLLECTIVE STICK POSITION, OUTSIDE AIR TEMPERATURE, TORQUE ON EACH ENGINE, AND GAS PRODUCER RPM ON EACH ENGINE. BAROMETRIC PRESSURE AND TAKEOFF-AND-LANDING GROSS WEIGHT ESTIMATES WERE ALSO RECORDED AS SUPPLEMENTAL INFORMATION. THE FLIGHT DATA WERE DIVIDED INTO FOUR CATEGORIES BY MISSION: ASCENT, MANEUVER, DESCENT, AND STEADY STATE. THE AIRCRAFT WERE PERFORMING THEIR NORMAL MISSION FUNCTIONS DURING THE PERIOD IN WHICH THE DATA WERE COLLECTED. TIME HISTORY TABLES, HISTOGRAMS, PEAK COUNTS, AND EXCEEDANCE CURVES WERE GENERATED FROM THE DATA. AS A RESULT OF THIS STUDY, DESIGNERS NOW HAVE A LIMITED SAMPLE OF CONDITIONS EXPERIENCED BY FOUR CH-54A AIRCRAFT IN THE FIELD. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-640 946 1/3
LOCKHEED-CALIFORNIA CO BURBANK

PARAMETRIC ANALYSIS AND PRELIMINARY DESIGN OF A SHAFT-DRIVEN ROTOR SYSTEM FOR A HEAVY-LIFT HELICOPTER. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
AUG 66 328P BILEZIKJIAN,VAHE ;BRYE,JAMES M. ;CHILDERS,HARRY M. ;CONWAY,WILLIAM J. ; GOLDSTEIN,HARRY D. ;
REPT. NO. LR-19143,
CONTRACT: DA-44-177-AMC-276(T),
PROJ: DA-1F131001D157,
MONITOR: USAAVLABS TR-66-48

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), LIFT, DRIVE SHAFTS, LOADING(MECHANICS), TRANSPORT PLANES, WEIGHT, AEROELASTICITY, ANALYSIS, STABILITY, CONFIGURATION (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

A PARAMETRIC ANALYSIS AND A PRELIMINARY DESIGN STUDY WERE CONDUCTED TO DETERMINE THE OPTIMUM CHARACTERISTICS OF A SHAFT-DRIVEN ROTOR WHICH WOULD RESULT IN THE LIGHTEST GROSS WEIGHT HELICOPTER CAPABLE OF LIFTING MILITARY LOADS IN THE 12- TO 20-TON RANGE. THE STUDY CONSIDERED SINGLE- AND TANDEM-ROTOR HELICOPTERS WITH INTERNAL CARGO AND CARGO POD. TYPES OF ROTORS ANALYZED WERE ARTICULATED, TEETERED, RIGID, AND MATCHED-STIFFNESS. EXISTING TURBINE ENGINES OR GROWTH VERSIONS THEREOF WERE CONSIDERED. COMPONENT WEIGHT EQUATIONS WERE DEVELOPED AND A COMPUTER PROGRAM WAS UTILIZED TO DETERMINE THE ROTOR CHARACTERISTICS FOR EACH HELICOPTER CONFIGURATION. FOR A GIVEN SET OF ROTOR PARAMETERS, THE PROGRAM COMPUTED THE POWER PLANT RATING, FUEL REQUIRED, AND THE EMPTY WEIGHT CORRESPONDING TO THE HELICOPTER WHICH WOULD SATISFY THE MOST CRITICAL MISSION REQUIREMENTS WITH THE MINIMUM GROSS WEIGHT. THE PERFORMANCE OF THE RESULTING CONFIGURATION WAS DETERMINED. DESIGN STUDIES OF THE ROTOR SYSTEM, ROTOR CONTROLS, ROTOR/PROPULSION ARRANGEMENT, AND THE GENERAL ARRANGEMENT WERE MADE. ROTOR LOADS WERE DEVELOPED AND A STRUCTURAL DESIGN ANALYSIS OF THE ROTOR SYSTEM, INCLUDING FATIGUE AND WEIGHT ANALYSES, WAS PREPARED. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-647 365 1/3
BOEING CO MORTON PA VERTOL DIV

STUDY OF THE HEAVY-LIFT HELICOPTER ROTOR CONFIGURATION, (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
NOV 66 396P WAX, CHARLES M. ;TOCCI, ROCCO C. ;
REPT. NO. R-445
CONTRACT: DA-44-177-AMC-206(T)
PROJ: DA-1P125901A142
TASK: 1P125901A14203
MONITOR: USAAVLABS TR-66-61

UNCLASSIFIED REPORT

DESCRIPTORS: (*TRANSPORT PLANES, HELICOPTERS), (*HELICOPTER ROTORS, CONFIGURATION), LIFT, DESIGN, OPTIMIZATION, DRIVE SHAFTS, MATHEMATICAL ANALYSIS, STALLING, FLUTTER, AERODYNAMIC CHARACTERISTICS, FORCE(MECHANICS), FUSELAGES (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

A TWO-PART PARAMETRIC ANALYSIS AND DESIGN STUDY WAS CONDUCTED TO DEFINE THE OPTIMUM SHAFT-DRIVEN ROTOR SYSTEM FOR THE HEAVY-LIFT HELICOPTER. A PARAMETRIC ANALYSIS WAS MADE FOR THE TANDEM-LIFT ROTOR SYSTEM AND THE SINGLE-LIFT/ANTITORQUE ROTOR SYSTEM; MATHEMATICAL MODELS WERE PROGRAMMED FOR DERIVATION BY LARGE DIGITAL COMPUTERS. THE PRELIMINARY DESIGN STUDY USED THE ROTOR GEOMETRY DETERMINED BY THE ROTOR SYSTEM PARAMETRIC ANALYSIS. ATTENTION WAS GIVEN PRIMARILY TO THE ARTICULATED ROTOR. STUDY OF THE HINGELESS SEMIRIGID ROTOR WAS LIMITED TO AN EXPLORATORY PARAMETRIC ANALYSIS WHICH, HOWEVER, COVERS THE AREAS OF RISK, THE WEIGHT INCREMENT, AND THE AREAS WORTHY OF FURTHER STUDY. THE PRELIMINARY DESIGN STUDY SPECIFICALLY COVERS STALL FLUTTER, FLAP-LAG INSTABILITY, ROTOR HUB SHAKING FORCES, AND FUSELAGE RESPONSE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-649 534 21/5 1/3
AVCO LYCOMING DIV STRATFORD CONN

POWER PLANT STUDY FOR SHAFT-DRIVEN HEAVY-LIFT ROTARY-WING AIRCRAFT. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JAN 67 192P MOELLMANN,H. ;O'CONNOR,W.
;
REPT. NO. 1882.1
CONTRACT: DA-44-177-AMC-242(T)
TASK: 1M121401D14415
MONITOR: USAAVLABS TR-66-42

UNCLASSIFIED REPORT

DESCRIPTORS: (•GAS TURBINES, •HELICOPTERS), PROPULSION, ROTARY WINGS, LIFT, DESIGN, WEIGHT, PERFORMANCE(ENGINEERING) (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

STUDIES WERE CONDUCTED ON VARIOUS MULTIENGINE GAS TURBINE PROPULSION SYSTEMS FOR A SHAFT-DRIVEN, HEAVY-LIFT HELICOPTER. THE HELICOPTER WAS BASED ON A DESIGN GROSS WEIGHT OF 75,000 TO 85,000 POUNDS, HAVING A 40,000-POUND PAYLOAD. GROWTH VERSIONS OF EXISTING GAS TURBINE ENGINES WERE APPLIED TO THE STUDY. THE FOLLOWING TYPES OF ENGINE SYSTEMS WERE INVESTIGATED: FREE-POWER TURBINE, MECHANICAL COUPLING, REGENERATIVE, FRONT DRIVE, FIXED-POWER TURBINE, GAS COUPLING, NONREGENERATIVE, AND REAR DRIVE. THE ENGINE PACKAGING ARRANGEMENTS WERE VERTICAL AND HORIZONTAL INSTALLATIONS IN SINGLE-, TANDEM-, AND QUAD-ROTOR HELICOPTERS. THE PRIME STUDY CRITERIA WERE WEIGHT SAVINGS (FUEL PLUS INSTALLED ENGINE) AND HELICOPTER PERFORMANCE. ADDITIONAL SUBJECTS OF STUDY WERE: POWER AUGMENTATION BY WATER-METHANOL INJECTION OR INCREASED TURBINE-INLET TEMPERATURE; ELECTRICAL, HYDRAULIC, AND PNEUMATIC STARTING SYSTEMS; AND CONTROL PROBLEMS CONCERNING LOAD SHARING, ENGINE-OUT OPERATION, AND STABILITY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-651 217 1/3
HUGHES TOOL CO CULVER CITY CALIF AIRCRAFT DIV

PRELIMINARY DESIGN OF A ROTOR SYSTEM FOR A HOT CYCLE HEAVY-LIFT HELICOPTER. (U)

DESCRIPTIVE NOTE: FINAL REPT., 17 MAR 65-31 AUG 66, MAR 67 389P SIMPSON,JOHN R. ;
REPT. NO. HTC-AD-66-17
CONTRACT: DA-44-177-AMC-225(T)
TASK: 1F131001D15701
MONITOR: USAAVLABS TR-67-1

UNCLASSIFIED REPORT

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), LIFT, HELICOPTERS, ROTOR BLADES(ROTARY WINGS), STABILITY, CONFIGURATION, STRUCTURAL PARTS, PERFORMANCE(ENGINEERING) (U)
IDENTIFIERS: HOT CYCLE PROPULSION SYSTEMS, HEAVY LIFT HELICOPTERS (U)

IN A PRELIMINARY DESIGN STUDY OF A ROTOR SYSTEM FOR A HOT CYCLE HEAVY-LIFT HELICOPTER, THE FOLLOWING ITEMS WERE ACCOMPLISHED. (1) AN ANALYTICAL PROCEDURE WAS DEVELOPED THAT PERMITTED CALCULATION OF FULLY COUPLED BLADE RESPONSE AND DYNAMIC STABILITY CHARACTERISTICS; (2) PARAMETRIC AND CONFIGURATION STUDIES INVOLVING BASIC CHARACTERISTICS OF THE ROTOR SYSTEM WERE CONDUCTED; (3) DESIGN LAYOUTS, STRUCTURAL DESIGN STUDIES, AND DETAILED WEIGHT ANALYSES WERE MADE (DESIGN AND ANALYSIS WERE LIMITED TO THE INTEGRATED LIFT-PROPULSION SYSTEM WITH EMPHASIS ON THE ROTOR SYSTEM); (4) PRELIMINARY DESIGN WAS COMPLETED, AND PERFORMANCE OF THE OPTIMUM ROTOR FOR THE HEAVY-LIFT MISSION REQUIREMENTS WAS DETERMINED; (5) A FULLY COUPLED BLADE LOADS ANALYSIS OF THE OPTIMUM ROTOR WAS MADE; AND (6) A FULL-SCALE MOCKUP OF THE ROTOR HUB AREA WAS CONSTRUCTED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-651 416 1/3
UNITED AIRCRAFT CORP STRATFORD CONN SIKORSKY AIRCRAFT DIV

PARAMETRIC ANALYSIS AND PRELIMINARY DESIGN OF A SHAFT-DRIVEN ROTOR SYSTEM FOR A HEAVY LIFT HELICOPTER. (U)

DESCRIPTIVE NOTE: FINAL REPT., 15 OCT 65-15 OCT 66, FEB 67 638P DUTTON,WALTER J. ;
REPT. NO. 50444
CONTRACT: DA-44-177-AMC-275(T)
TASK: 1D131001D157
MONITOR: USAAVLABS TR-66-56

UNCLASSIFIED REPORT

DESCRIPTORS: (*HELICOPTER ROTORS, DESIGN), DRIVE SHAFTS, LIFT, HELICOPTERS, PAYLOAD, CONFIGURATION, STABILITY, MATHEMATICAL ANALYSIS (U)
IDENTIFIERS: HEAVY LIFT HELICOPTERS (U)

THE PRIMARY OBJECTIVE OF THE PROGRAM WAS TO SELECT AND DESIGN A SHAFT-DRIVEN LIFTING ROTOR SYSTEM FOR A HEAVY LIFT HELICOPTER. THE SELECTION INCLUDED A COMPLETE PARAMETRIC ANALYSIS OF THE AIRCRAFT, BASED ON THREE DEFINED MISSIONS: LIFTING A 20-TON PAYLOAD 20 NAUTICAL MILES, LIFTING A 12-TON PAYLOAD 100 NAUTICAL MILES, AND FERRYING. SEVERAL AIRCRAFT CONFIGURATIONS WERE STUDIED, AND A SINGLE ROTOR CRANE ARRANGEMENT WAS SELECTED. INCLUDED IN THE STUDY WERE SELECTION OF ENGINES AND PARAMETRIC SIZING OF ALL MAJOR AIRCRAFT COMPONENT SYSTEMS. THE AIRCRAFT DEFINED HAS A TAKEOFF GROSS WEIGHT FOR THE 20-TON MISSION OF APPROXIMATELY 79,000 POUNDS, AND USES A SINGLE LIFTING ROTOR 91.6 FEET IN DIAMETER. FERRY RANGE EXCEEDS 2400 NAUTICAL MILES. WHILE DIFFERING IN DETAIL FROM ANY EXISTING HARDWARE, THE ROTOR SYSTEM DESIGN FOLLOWS DIRECTLY FROM PRESENT PRACTICE. ANALYSES OF AIRCRAFT STABILITY AND CONTROL CHARACTERISTICS AND ROTOR SYSTEM STABILITY FOR THE SELECTED CONFIGURATION WERE PERFORMED, AND THE METHODS AND RESULTS REPORTED. FOR ALL OF THE PROPERTIES STUDIED, BOTH THE AIRCRAFT AND THE ROTOR SYSTEM WERE SHOWN TO MEET OR EXCEED THE REQUIREMENTS OF APPLICABLE SPECIFICATIONS AND/OR ACCEPTED PRACTICE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZOM09

AD-667 924 1/3 1/2 17/2
BUNKER-RAMO CORP CANOGA PARK CALIF

ARMY AIRCRAFT VOICE-WARNING SYSTEM STUDY. (U)

DESCRIPTIVE NOTE: FINAL REPT. 10 AUG 67-10 JAN 68,
FEB 68 230P BROWN,JAMES E. ;BERTONE,
CARMINE M. ;OBERMAYER,RICHARD W. ;
REPT. NO. G0131-8U1
CONTRACT: DAAD05-68-C-0025
MONITOR: HEL TM-6-68

UNCLASSIFIED REPORT

DESCRIPTORS: (•HELICOPTERS, EARLY WARNING SYSTEMS), (•SHORT TAKE-OFF PLANES, EARLY WARNING SYSTEMS), (•EARLY WARNING SYSTEMS, •VOICE COMMUNICATION SYSTEMS), ARMY AIRCRAFT, OBSERVATION PLANES, PILOTS, MALFUNCTIONS, COCKPITS, AVIATION ACCIDENTS, HUMAN ENGINEERING, STATISTICAL ANALYSIS, DISPLAY SYSTEMS, AUDITORY SIGNALS, INSTRUMENT PANELS, MISSION PROFILES, JOB ANALYSIS, QUESTIONNAIRES (U)
IDENTIFIERS: •VOICE-WARNING SYSTEMS, UH-1B AIRCRAFT, UH-1D AIRCRAFT, AH-1G AIRCRAFT, H-47 AIRCRAFT, CH-47 AIRCRAFT, H-54 AIRCRAFT, CH-54 AIRCRAFT, V-1 AIRCRAFT, OV-1 AIRCRAFT, H-1 AIRCRAFT (U)

THE REPORT DESCRIBES AN ANALYTICAL STUDY THAT WAS INTENDED TO SERVE AS A BASIS FOR THE APPLICATION OF VOICE-WARNING SYSTEMS (VWS) FOR THE UH-1B AND UH-1D (HUEY), AH-1G (COBRA), CH-47 (CHINOOK), CH-54 (SKYCRANE), AND OV-1 (MOHAWK). THE FOLLOWING PROBLEMS OF INSTALLING A VWS IN THESE ARMY AIRCRAFT WERE STUDIED: (1) THE IDENTIFICATION AND SELECTION OF MESSAGES FOR MAXIMUM EFFECTIVENESS; (2) THE DETERMINATION OF PRIORITY SEQUENCES; AND (3) THE INTEGRATION OF THE VWS INTO EXISTING COCKPITS. THE STUDY INVOLVED THE COLLECTION OF BASIC DATA AND THE CONDUCT AND VALIDATION OF MISSION ANALYSES, OPERATIONAL SEQUENCE DIAGRAMS, TASK ANALYSES, AIRCRAFT CONFIGURATION ANALYSES, PILOT OPINION SURVEYS, AND ARMY AIRCRAFT ACCIDENT ANALYSES. IN THE REPORT, PRIORITY SEQUENCES ARE DERIVED FOR ALL MAJOR EMERGENCIES FOR THE SIX VEHICLES; FURTHER ANALYTICAL EFFORT IS DESCRIBED WHICH REDUCED THE LIST TO 20 MESSAGES FOR INCLUSION IN THE VWS. FOR EACH AIRCRAFT, 2 LISTS OF 20 MESSAGES ARE PROPOSED; ONE LIST ASSUMES ADDITIONAL SENSORS. (U)

SYSTEM. VOLUME VIII. WIND-TUNNEL STUDIES.
(USAAVLABS-TR-64-68H)
AD-624 814

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HILLER-ER-64-46
HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME VI. DYNAMIC AND AEROELASTIC STUDIES.
AD-624 764

* * *

HILLER-ER-64-47
HEAVY-LIFT TIP TURBOJET ROTOR SYSTEM. VOLUME VII. WEIGHT AND BALANCE STUDIES.
(USAAVLABS-TR-64-66G)
AD-624 813

*HUGHES TOOL CO CULVER CITY CALIF

* * *

PRELIMINARY DESIGN STUDY HOT CYCLE RESEARCH AIRCRAFT.
(TRECOM-TR-62-102)
AD-408 650

*HUGHES TOOL CO CULVER CITY CALIF
AIRCRAFT DIV

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HTC-AD-66-17
PRELIMINARY DESIGN OF A ROTOR SYSTEM FOR A HOT CYCLE HEAVY-LIFT HELICOPTER.
(USAAVLABS-TR-67-1)
AD-651 217

*HUMAN ENGINEERING LABS ABERDEEN PROVING GROUND MD

* * *

HEL-TM-6-68
ARMY AIRCRAFT VOICE-WARNING SYSTEM STUDY.
AD-667 924

*KAMAN AIRCRAFT BLOOMFIELD CONN

* * *

R-739
EVALUATION OF HELICOPTER FLIGHT SPECTRUM DATA.
(USAAVLABS-TR-66-68)
AD-680 280

*KAMAN AIRCRAFT CORP BLOOMFIELD CONN

* * *

KAMAN-R-555
A MAIN POWER SYSTEM FOR SHAFT-DRIVEN HEAVY LIFT HELICOPTERS.
(USAAVLABS-TR-65-52)
AD-624 145

*LOCKHEED-CALIFORNIA CO BURBANK

* * *

LR-19143
PARAMETRIC ANALYSIS AND PRELIMINARY DESIGN OF A SHAFT-DRIVEN ROTOR SYSTEM FOR A HEAVY-LIFT HELICOPTER.
(USAAVLABS-TR-66-48)
AD-640 946

*NAVAL AEROSPACE MEDICAL INST PENSACOLA FLA

* * *

SAMPLE HELICOPTER FLIGHT MOTION DATA FOR VESTIBULAR REFERENCE.
AD-701 696

*TECHNOLOGY INC DAYTON OHIO

* * *

FLIGHT LOADS INVESTIGATION OF CH-54A HELICOPTERS OPERATING IN SOUTHEAST ASIA.
(USAAVLABS-TR-70-73)
AD-881 238

*UNITED AIRCRAFT CORP STRATFORD CONN
SIKORSKY AIRCRAFT DIV

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13. ABSTRACT

This bibliography contains unclassified references on Heavy Lift Helicopters with a minimum payload of about 9,000 pounds or a minimum gross weight of 17,000 pounds. These references relate to rotor characteristics, rotor systems, rotor loads, lift propulsion, payloads, heavy lift rotors, configurations, design, and performance capabilities of the heavy lift helicopters.

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| Helicopter Engines | | | | | | |
| Helicopter Rotors | | | | | | |
| Payload | | | | | | |
| Rotor Blades(Rotary Wings) | | | | | | |
| HLH(Heavy Lift Helicopters) | | | | | | |
| Cargo | | | | | | |
| CH-53A Aircraft | | | | | | |
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| H-53 Aircraft | | | | | | |
| Weight | | | | | | |
| Air Transportation | | | | | | |