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**NASA CONTRACTOR REPORT 166470**

**(NASA-CR-166470-Vol-2) HELICOPTER  
TECHNOLOGY BENEFITS AND NEEDS. VOLUME 2:  
APPENDICES (Systems Control, Inc., West)  
53 p HC A04/MF A01**

**N83-23241**

**CSSL 05A**

**Unclas  
G3/85 09706**

Helicopter Technology Benefits and Needs

Volume II. Appendices

John Zuk  
Richard J. Adams



**CONTRACT NAS2-10411  
July 1980**

**NASA**

NASA CONTRACTOR REPORT 166470

Helicopter Technology Benefits and Needs

Volume II. Appendices

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under Contract NAS2-10411



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## PREFACE

THE CONTENTS OF THIS DOCUMENT REPRESENT THE CONSENSUS OF PARTICIPANTS IN THE PUBLIC SERVICE HELICOPTER USERS' WORKSHOP HELD AT NASA AMES RESEARCH CENTER, JULY 14 - 16, 1980.

VOLUME I PROVIDES A SUMMARY OF THE WORKSHOP.

VOLUME II PROVIDES THE APPENDICES.

FOR FURTHER INFORMATION ABOUT THE WORKSHOP OR PUBLICATIONS, CONTACT DR. JOHN ZUK, CHIEF, AERONAUTICAL SYSTEMS BRANCH, NASA AMES RESEARCH CENTER, MAIL STOP 237-11, MOFFETT FIELD, CA 94035.

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APPENDIX A

WORKSHOP AGENDA

APPENDIX A

AGENDA

PUBLIC SERVICE HELICOPTER USERS' WORKSHOP

MONDAY, JULY 14, 1980

<u>TIME</u>	<u>ACTIVITY</u>	<u>RESPONSIBLE PERSONNEL</u>
9:00 - 9:05	Welcome to NASA Ames Research Center	Mr. Syvertson-Ames Center Director
9:05 - 9:15	HAA "Key Note" Remarks	Glen Gilbert
9:15 - 9:20	ALEA Introduction	Lt. Bob Morrison
9:20 - 9:25	SCI (Vt.) Program Overview Workshop Objectives & Mechanics	Don Richardson
9:25 - 9:35	NASA Rotorcraft Technology Overview	Jay Christensen
9:35 - 9:50	Aeroacoustics and Rotor Systems	Jim Biggers
9:50 - 10:00	Structures	Bill Wehrend
10:00 - 10:15	COFFEE BREAK	
10:15 - 10:30	Flight Dynamics	Bruce Tinling
10:30 - 10:45	Propulsion	John Zuk
10:45 - 11:00	Human Factors	Ed Huff
11:00 - 11:15	Simulation	Tony Cook
11:15 - 11:30	Navigation and Guidance	John Bull
11:30 - 11:45	Research Vehicles/Advanced Configurations	Bill Snyder
11:45 - 12:05	XV-15	Dan Dugan
12:05 - 1:15	LUNCH	
1:15 - 1:30	Ames Multi-Media Presentation	
1:30 - 2:30	U.S. Coast Guard SRR Helicopter Program	CMDR Dave Young
2:15 - 3:15	Introductory Convening of the Working Groups	
	I. Law Enforcement	Lt. Bob Morrison
	II. Emergency Medical Service (EMS)	Earl Cronin
	III. Search and Rescue (SAR)	Capt Terry Jagerson
	IV. Environmental Control	Don Rominger
3:15 - 4:45	NASA Tour (By Working Groups)	
	1. Anechoic Chamber	I. Dan Dugan
	2. 40 X 80 Wind Tunnel	II. Bill Wehrend
	3. Hangar - Research A/C	III. John Zuk
	4. Simulation	IV. Bill Snyder

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TUESDAY, JULY 15, 1980

<u>TIME</u>	<u>ACTIVITY</u>	<u>RESPONSIBLE PERSONNEL</u>
8:00 - 8:30	ALEA Overview of Law Enforcement Roles for Rotorcraft	Lt. Bob Morrison
8:30 - 9:00	Manufacturer's Perspective on Public Service Helicopters (AHS Spokesman)	Tom Stuelpnagel
9:00 - 9:15	COFFEE BREAK	
9:15 - 12:00	WORKING SESSIONS	
12:00 - 1:00	LUNCH	
1:00 - 2:00	EMS Users' Presentations	Capt. G. Moore (Maryland St. Police) Capt R. Williams (U.S. Coast Guard) Capt. R. D. Taylor (CHP)
2:00 - 2:30	Washington Hospital Center Presentation	Dr. H. Champion
2:30 - 2:45	Fire Fighting Presentation	Don Rominger (Cal Dept of Forestry)
2:45 - 3:00	Film "All for One"	Major Les Spencer, USAF
3:00 - 3:15	COFFEE BREAK	
3:15 - 5:00	WORKING SESSIONS	

7:00 - 9:00	Dinner Guest Speaker: Sergei Sikorsky "Humanitarian Contributions of Helicopters"
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WEDNESDAY, JULY 16, 1980

<u>TIME</u>	<u>ACTIVITY</u>	<u>RESPONSIBLE PERSONNEL</u>
8:00 - 10:30	Presentations	
	N.Y. Environmental Control District	Jay Fuller
	Columbia Helicopter Activity (Related to Mt. St. Helens Volcano)	Dwight Reber
	Office of Aircraft Services	Don Griffis
	U.S. Park Service	Earl Cronin
10:30 - 10:45	COFFEE BREAK	
10:45 - 12:00	WORKING SESSIONS	
12:00 - 1:30	LUNCHEON	
	Guest Speakers:	
	Joseph Stein - Consultant/Free Lance Writer	
	Dwight Reber - Columbia Helicopters "Helicopter Activities Associated With Mt. St. Helens' Volcano"	
1:30 - 2:30	WORKING SESSIONS - Final Review of Recommendations	
2:30 - 4:45	PLENARY SESSION - Working Group Chairman Reports on Workshop Resolves and Recommendations	
	Public Service Study Contract Summary	Richard Adams
	I. SAR	Capt. Jagerson
	II. EMS	Butch Cronin
	III. Law Enforcement	Lt. Morrison
	IV. Environmental Control	Don Rominger

APPENDIX B

WORKING GROUP RESULTS SUMMARY

SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE TECHNOLOGY AREA: VEHICLE DESIGN

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
MINIMUM TRANSIT TIME	300 KT MAX SPEED	RESCUE	PRELIMINARY DESIGN AND WIND TUNNEL TEST (NASA)
HIGH ALTITUDE OPERATIONAL/SAFETY CAPABILITY	HOVER OUT OF GROUND EFFECT @ 20000 FT.	HIGH ALTITUDE RESCUE	PRELIMINARY ANALYSIS & SIMULATION
HIGH ALTITUDE OPERATIONAL/SAFETY CAPABILITY	TWIN ENGINE	HIGH ALTITUDE RESCUE	PRELIMINARY ANALYSIS & SIMULATION
OPERATIONAL RADIUS (300 NM)	FUEL CONSUMPTION/CAPACITY FOR 3 HRS PLUS RESERVE (1 HR HIGH CRUISE OUT +1 HR LOITER, +1 HR HIGH CRUISE BACK)	SEARCH/RESCUE	PRELIMINARY DESIGN + OPERATIONAL TEST OF PROTOTYPE (NASA OR USER)
MINIMUM ROTOR DIA.	MAX 20' DIA. GOAL	RESCUE	WIND TUNNEL TEST + FLIGHT TEST (NASA)
MINIMUM FUSELAGE LENGTH	NO TAIL ROTOR	RESCUE	WIND TUNNEL TEST + FLIGHT TEST (NASA)
MAXIMUM RESCUE CAPABILITY	CAPABILITY FOR 2 STOKES LITTERS PLUS CABIN ROOM FOR CREW MOVEMENT	RESCUE	AIRFRAME DESIGN

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE TECHNOLOGY AREA: VEHICLE DESIGN

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
VARIED MISSIONS NEED VARIED EQUIPMENT	EITHER SEPARATE CABIN MODULES OR QUICK DIS- CONNECT PALLETS (FLIR, SEARCH LIGHTS, ETC.)	SEARCH & RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
ALL-TERRAIN LANDING CAPABILITY	RETRACTABLE SKIDS, SELF LEVELING, SNOW SHOE PAD, OPTION FOR INTEGRAL FLOTATION GEAR	RESCUE	DESIGN PLUS DEVELOPMENT PLUS FIELD TESTING/EVALUATION (USER)
NEED REDUCED CREW SIZE FOR RESCUE OPERATIONS	VEHICLE CONFIGURED SO ONLY 2 CREW MEMBERS (PILOT + CO-PILOT) REQUIRED TO PERFORM HOIST RESCUE OPERA- TIONS	RESCUE BY HOIST	PRELIMINARY AIRFRAME DESIGN
REDUCE CREW SIZE AND COCKPIT WORKLOAD	PILOT OPERABLE SEARCH LIGHT	SEARCH & RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE TECHNOLOGY AREA: HUMAN FACTORS

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)
PILOT/CREW FATIGUE (SEATS)	COMFORTABLE/COOL SEATS, REMOVABLE, 4-WAY ADJUSTABLE	SEARCH/ RESCUE	DESIGN PLUS FIELD TEST (USER)
COMFORT	FILTER AIR, AIR CON- DITIONING/HEATING	SEARCH	DESIGN PLUS FIELD EVALUATION (USER)
NOISE AND VIBRATION	REDUCED NOISE & VIB- RATION	SEARCH	DESIGN PLUS FIELD EVALUATION (USER)
VISIBILITY, LACK OF	FORWARD/VERTICAL VIS- ABILITY FOR CREW, REDUCED COCKPIT PANEL SIZE FOR IMPROVED VISIBILITY	SEARCH/ RESCUE	DESIGN PLUS COCKPIT SIMULATION PLUS FIELD USER EVALUATION

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE      TECHNOLOGY AREA: SAFETY

PROBLEMS (TECHNICAL/OPERATIONAL)	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
SAFETY	20G MIN STRUCTURE CRASHWORTHINESS	RESCUE	EXPERIMENTAL TEST (NASA)
SAFETY	20G SEAT DESIGN	SAR	EXPERIMENTAL TEST (NASA)
SAFETY	CRASHWORTHY FUEL SYSTEM	RESCUE	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)
SAFETY	IMPROVED RESTRAINT SYSTEMS	SEARCH/ RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
SAFETY	LIGHTER, COOLER, MORE COMFORTABLE HELMETS. IMPACT RESISTANT.	SEARCH/ RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
SAFETY	EMERGENCY EGRESS SYSTEM	RESCUE	EXPERIMENTAL TEST (NASA)
SAFETY	RELIABLE FIRE DE- TECTION SYSTEM	SEARCH/ RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE      TECHNOLOGY AREA: AVIONICS & FLIGHT SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
ALL WEATHER OPERATION	O/O IFR CAPABILITIES	SAR	ANALYSIS/SIMULATION/FLIGHT TEST (NASA)
LOW VISIBILITY OBSTACLE CLEARANCE (WIRES, BUILDINGS, TERRAIN)	FORWARD LOOKING SENSOR(S) & DISPLAYS	RESCUE	ANALYSIS, COCKPIT SIMULATION, PROTOTYPE EVALUATION (NASA)
OTHER AIRCRAFT	FORWARD LOOKING SENSOR(S) & DISPLAYS	RESCUE	ANALYSIS, COCKPIT SIMULATION, PROTOTYPE EVALUATION (NASA)
SURVIVOR LOCATION	D.F. CAPABILITIES OF ALL FREQS.	SAR	OPERATIONAL FIELD EVALUATION (USER)
INADEQUATE COMMUNICATIONS	CAPABILITY TO TALK TO SURVIVORS, 2-WAY	SAR	OPERATIONAL FIELD EVALUATION (USER)
INADEQUATE COMMUNICATIONS	WIRELESS COMMS FOR CREW	SAR	OPERATIONAL FIELD EVALUATION (USER)
INADEQUATE COMMUNICATIONS	TOTAL INTERAGENCY FREQ. CAPABILITIES. NON-LINE OF SIGHT LIMITED	SAR	OPERATIONAL FIELD EVALUATION (USER)
INADEQUATE COMMUNICATIONS	AUTOMATIC I.D. AND FREQ. SELECTION OF CALLING AGENCY	SAR	OPERATIONAL FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE      TECHNOLOGY AREA: AVIONICS & FLIGHT SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
ALL WEATHER OPERATION	VOICE ACTUATED RADIO CALL-UP AND FREQ. CHANGE	SAR	OPERATIONAL FIELD EVALUATION (USER)
ALL WEATHER OPERATION	AUTOMATIC POSITION REPORT	SAR	OPERATIONAL FIELD EVALUATION (USER)
POOR RELIABILITY/MAIN- TAINABILITY	NO EXTERNAL ANTENNAS	SAR	PROTOTYPE EVALUATION (NASA) PLUS FIELD EVALUATION (USER)
WIND SHEAR ON CLIFFS IS HAZARDOUS	WIND SHEAR/DOWNDRAFT DETECTION SYSTEMS	SAR	ANALYSIS, DEVELOPMENT, PROTOTYPE TEST (NASA)
NEED TO DETECT SURFACE WINDS	SYSTEM TO DETECT SUR- FACE WIND AT LANDING SITE	SAR	ANALYSIS, DEVELOPMENT, PROTOTYPE TEST (NASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE TECHNOLOGY AREA: NAV/GUIDANCE/FLT CONTROL

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
DECREASED PILOT WORK- LOAD DESIRED	SIMPLIFIED FLIGHT CONTROL SYSTEM (SINGLE HAND, COMBINED CYCLIC/ COLLECTIVE CONTROL)	SAR	COCKPIT SIMULATION
IMPROVED HANDLING CHARACTERISTICS	ALL AXIS STABILIZA- TION	RESCUE	EXPERIMENTAL FLIGHT TEST (NASA)
NEED IMPROVED LOW VISI- BILITY NAVIGATION ORIENTATION	ELECTRONIC MAP DISPLAY (POSSIBLY COM- BINED WITH OBSTACLE SENSORS PLUS NAV AIDS)	SEARCH	COCKPIT SIMULATION PLUS FIELD EVALUATION (USER)
IMPROVED REMOTE APPROACH CAPABILITY	PRECISION APPROACH TO SPOT	RESCUE	EXPERIMENTAL FLIGHT TEST (NASA)
NEED BETTER KNOWLEDGE OF LANDING CONDITIONS AT REMOTE AREAS	ACCURATE LOW SPEED TRUE AIRSPEED SENSOR	RESCUE	EXPERIMENTAL FLIGHT TEST (NASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE TECHNOLOGY AREA: MONITOR/DIAGNOSTICS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
NEED TO IMPROVE MAIN- TAINABILITY & DECREASE MAINTENANCE DOWN TIME	TREND WARNING SYSTEMS	SAR	ANALYSIS PLUS EXPERIMENTAL EVAL- UATION (NASA)
NEED TO IMPROVE MAIN- TAINABILITY & DECREASE MAINTENANCE DOWN TIME	ON-LINE ENGINE CON- DITION MONITORING SYSTEM	SAR	ANALYSIS PLUS EXPERIMENTAL EVAL- UATION (NASA)
NEED TO REDUCE COCKPIT PANEL SIZE	COMPUTERIZED WARNING/ CAUTION SYSTEM	SAR	ANALYSIS PLUS FIELD EVALUATION OF PROTOTYPE (USER)
NEED TO REDUCE COCKPIT PANEL SIZE	COLOR-CODED ANNUNCI- ATION ON DEMAND ON CRT	SAR	ANALYSIS PLUS FIELD EVALUATION (USER)
NEED TO REDUCE COCKPIT WORKLOAD FOR MONITORING	AURAL WARNING SYSTEM	SAR	FIELD EVALUATION (USER)
NEED TO REDUCE COCKPIT WORKLOAD FOR MONITORING	HEAD-UP DISPLAY FOR WARNING & DIAGNOSTICS	SAR	COCKPIT SIMULATION PLUS FIELD EVALUATION (USER)
IMPROVE SAFETY AND NEAR-LIMIT OPERATIONS	AUTOMATIC AIRCRAFT PERFORMANCE/LIMITATION MONITOR	RESCUE	ANALYSIS, COCKPIT SIMULATION, EXPERIMENTAL FLIGHT TEST (NASA) PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE TECHNOLOGY AREA: PROPULSION

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSTS/SIMULATION/OPERATIONAL)
USE OF NON-PETROLEUM FUELS (LACK OF PET. FUELS BEYOND 2000)	CAPABILITY TO USE NON-PETROLEUM FUELS IN PROPULSION SYSTEMS	SAR	DEVELOPMENT PLUS EXPERIMENTAL TESTS (NASA)
USE OF MULTIPLE TYPE FUELS (ABILITY TO USE EXISTING TYPE FUELS AT RESCUE SITES, RATHER THAN HAVING TO TRUCK IN DIFFERENT FUELS FOR EACH TYPE VEHICLE)	ENGINE WITH MULTI-FUEL CAPABILITY	SAR	DEVELOPMENT PLUS EXPERIMENTAL TESTS (NASA)
EMERGENCY POWER/EMERGENCY THROTTLE (UP TO 100% POWER FOR SHORT TIME PERIOD TO COUNTER A LOSS OF ENGINE OR A LARGE INCREASE IN POWER DUE TO DOWNDRAFTS ON LEESIDE OF MOUNTAINS OR IN CANYONS)	SHORT PERIOD INCREASE IN POWER AVAILABLE SMOOTHLY ON DEMAND BY PILOT. A MONITORING SYSTEM THAT AURALLY ANNOUNCES EXCURSION BEYOND REGULAR CERTIFIED POWER LEVELS. ENGINES MAY BE INSPECTED OR REBUILT AFTER USE OF EMERGENCY POWER. THE IDEA IS TO SACRIFICE THE ENGINE TO SAVE AIRFRAME AND PAX LOAD	SAR	DEVELOPMENT PLUS EXPERIMENTAL TESTS (NASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE      TECHNOLOGY AREA: PROPULSION

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSTS/SIMULATION/OPERATIONAL)
PARTICLE SEPARATORS FOR ENGINES (TO ENABLE FLIGHT IN SAND, HEAVY RAIN, VOLCANIC ASH, ETC)	INTEGRAL SEPARATORS WITH MINIMUM POWER LOSS/FUEL FLOW PENALTY	SAR	FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: SEARCH AND RESCUE TECHNOLOGY AREA: AUXILIARY SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
LITTER REQUIRES TOO MUCH STORAGE SPACE	"BREAKDOWN" LITTER STRONG ENOUGH TO BE SAFE DURING HOIST	RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
LITTERS ARE TOO HEAVY	STRONG, LIGHTWEIGHT LITTER	RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
LITTERS DO NOT MEET ALL PICKUP REQTS; BASKETS ARE NEEDED IN SOME CASES	COMBINATION LITTER/ BASKET	RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
LITTER SPINS DURING HOIST	LITTER/SUSPENSION SYSTEM TO AVOID SPINNING WITHOUT NEED FOR RESTRAINING ROPE	RESCUE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
INADEQUATE ILLUMINATION	ADJUSTABLE FLOODLIGHT/ SEARCHLIGHT > 3.5M.C.P. (REMOVABLE & PORTABLE)	SAR	DEVELOPMENT PLUS FIELD EVALUATION (USER)
NEED FOR IMPROVED COMMUNICATION	T.V. TRANSMISSION CAPABILITIES	SAR	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS TECHNOLOGY AREA: VEHICLE DESIGN

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
300 K + AIRSPEED CAPABILITY	AERODYNAMIC DESIGN	ALL	PRELIMINARY DESIGN PLUS WIND TUNNEL TEST (NASA)
20,000 FEET ALTITUDE CAPABILITY	AIRFRAME AND ENGINE DESIGN	ALL	PRELIMINARY ANALYSIS PLUS SIMULATION
TWIN ENGINE REQUIREMENT SINGLE ENGINE HIGH CAPABILITY	AIRFRAME AND ENGINE DESIGN	ALL	PRELIMINARY ANALYSIS PLUS SIMULATION
RADIUS OF OPERATION 1 HOUR PLUS FUEL RESERVE (300 HM)	INCREASED FUEL EFFICIENCY	ALL	PRELIMINARY DESIGN PLUS OPERATIONAL TEST OF PROTOTYPE (NASA OR USER)
10,000 LB. WEIGHT LIMIT	COMPOSITE STRUCTURES DEVELOPMENT	ALL	DEVELOPMENT
CAPABLE OF LANDING ON SECONDARY ROADS (LIMITED SIZE OF MAIN ROTOR & FUSELAGE)	AERODYNAMIC AND AIRFRAME DESIGN	OAST	WIND TUNNEL TEST

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS      TECHNOLOGY AREA: VEHICLE DESIGN

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)
<p>INTERNAL CAPACITY</p> <p>2 PATIENTS, 2 ATTENDANTS</p> <p>60" FLOOR TO CEILING CLEARANCE</p> <p>ACCESS TO PATIENT 16" A + HEAD AND SIDE</p> <p>LITTERS 72" - 80" LONG</p> <p>PATIENTS NOT STACKED</p> <p>FUNCTIONAL MODULE DESIGN PLUS QUICK MODULE CHANGE CAPABILITY</p> <p>SIMPLE BASIC OPERATIONAL DESIGN</p>	<p>LIGHTWEIGHT CONSTRUCTION MATERIALS PLUS AIRFRAME DESIGN</p> <p>AIRFRAME DESIGN</p>	<p>CPR, IHT</p> <p>OST</p> <p>CPR</p> <p>ALL</p> <p>ALL OST</p> <p>ALL</p>	<p>PRELIMINARY AIRFRAME DESIGN</p> <p align="center">ORIGINAL PAGE IS OF POOR QUALITY</p> <p>DEVELOPMENT PLUS FIELD EVALUATION (USER)</p>





SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS TECHNOLOGY AREA: VEHICLE DESIGN

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)
LOW NOISE LEVELS (FOR STETHOSCOPE USE IN CABIN)	ENGINE DESIGN/ ROTOR DESIGN/ INSULATION	IHT, OST	EXPERIMENTAL TEST (NASA)
POWER OFF CAPABILITY (BATTERY PACK)	ELECTRICAL SYSTEMS	IHT, CPR	ANALYSIS/OPERATIONAL
QUICK ACCESS MAINTENANCE CAPABILITY	VEHICLE DESIGN	ALL	AIRFRAME DESIGN

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS TECHNOLOGY AREA: HUMAN FACTORS

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)
FATIGUE REDUCING COCKPIT SEATING	NONE	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
SWIVEL SEATS FOR OBSERVER AND ATTENDANTS	NONE	ALL	
VIBRATION SHOULD NOT INCREASE	ROTOR DESIGN	ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)
INTEGRATED FLIGHT INSTRUMENTED COCKPIT	IMPROVED AVIONICS	ALL	COCKPIT SIMULATION (NASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS                      TECHNOLOGY AREA: SAFETY AND RELIABILITY

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
CRASH SURVIVABILITY CABIN - MIL SPEC	NONE	ALL	ANALYSIS PLUS EXPERIMENTAL TEST (NASA)
FUEL SYSTEM MIL SPEC			
ANTI-DYNAMIC ROLLOVER	AERODYNAMIC DESIGN	ALL	ANALYSIS PLUS EXPERIMENTAL TEST (NASA)
MAIN ROTOR CLEARANCE IN VERTICAL OF 8 FEET	NONE	ALL	AIRFRAME DESIGN
ELIMINATE TAIL ROTOR HAZARD	AERODYNAMIC DESIGN	ALL	WIND TUNNEL TEST PLUS OPERATIONAL TEST OF PROTOTYPE (NASA OR USER)
BIRD STRIKE PROTECTION	STRUCTURAL DESIGN	ALL	EXPERIMENTAL TEST (NASA)

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SUMMARY OF WORKING GROUP RESULTS.

WORKING SESSION: EMS TECHNOLOGY AREA: AVIONICS AND FLIGHT SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSTS/SIMULATION/OPERATIONAL)</u>
NEAR GROUND PROTECTION (WIRE STRIKE)		ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)
2-WAY GROUND TO AIR COMMUNICATION W/O RADIOS	AVIONICS	OST	DEVELOPMENT PLUS FIELD EVALUATION (USER)
VOICE ACTUATED COMPUTER	COMPUTER AND INPUT DESIGN	ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS TECHNOLOGY AREA: NAVIGATION, GUIDANCE & CONTROL SYS.

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
AUTOMATIC T/O TO LANDING CONTROL	AVIONICS	ALL	ANALYSIS PLUS COCKPIT SIMULATION PLUS EXPERIMENTAL TEST (NASA)
ALL WEATHER CAPABILITY	DE-ICING, AVIONICS COMPUTERIZATION	ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS TECHNOLOGY AREA: MONITOR AND DIAGNOSTIC SYSTEM

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
COMPUTERIZED PERFORMANCE MONITORING SYSTEM	COMPUTER DESIGN	ALL	ANALYSIS/COCKPIT SIMULATION PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS TECHNOLOGY AREA: PROPULSION

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)
MAIN ROTOR CLUTCH MINIMAL WARM-UP TIME	NONE ENGINE DESIGN	ALL OST	EXPERIMENTAL TEST (NASA) DEVELOPMENT PLUS FIELD EVALUATION (USER)  ORIGINAL PAGE IS OF POOR QUALITY

SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS TECHNOLOGY AREA: AUXILIARY EQUIPMENT (1)

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)
HOIST IMPROVEMENT  PILOT OPERATED WITH DIRECT VISUAL CONTACT  6000 POUND CAPA- BILITY  250 FOOT LINE LENGTH VARIABLE SPEED HOIST	WEIGHT AND BALANCE PLUS MECHANICAL DESIGN   NONE	OST   OST	DEVELOPMENT PLUS FIELD EVALUATION (USER)   DEVELOPMENT PLUS FIELD EVALUATION (USER)  DEVELOPMENT PLUS FIELD EVALUATION
NIGHT VISION CAPABILITY WITHOUT VISION OBSTRUCTION	ADVANCED LIGHTING TECHNOLOGY	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
ELIMINATION OF "WHITE-OUT" DUE TO INTENSE LIGHT SOURCES	ADVANCED LIGHTING TECHNOLOGY	ALL	DEVELOPMENT PLUS FIELD EVALUATION

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: EMS TECHNOLOGY AREA: AUXILIARY EQUIPMENT (I)

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
MAINTENANCE SUPPORT  QUICK CONNECT TOW GEAR  EXTERNAL LIGHTING	NONE  NONE	ALL  ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)  DEVELOPMENT PLUS FIELD EVALUATION (USER)  ORIGINAL PAGE IS OF POOR QUALITY

SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT TECHNOLOGY AREA: VEHICLE DESIGN

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
MAXIMUM SPEED OF HELICOPTER AT LEAST 200 MPH	AT LEAST 200 MPH MAX SPEED	POLICE	PRELIMINARY DESIGN PLUS WIND TUNNEL TEST (NASA)
TWIN ENGINES OR BETTER SINGLE ENGINES	ENGINE DEVELOPMENT	ALL	PRELIMINARY ANALYSIS PLUS SIMULATION
NEED INCREASED ENDURANCE	FUEL CONSUMPTION/ENGINE DESIGN/FUEL CAPACITY TO PROVIDE 4.5 HRS ENDURANCE	POLICE	PRELIMINARY DESIGN PLUS OPERATIONAL TEST OF PROTOTYPE (NASA OR USER)
ROTOR SYSTEMS SHOULD BE SMALLER & MORE EFFICIENT	ROTOR/AIRFRAME DESIGN	ALL	WIND TUNNEL TEST PLUS FLIGHT TEST (NASA)
ELIMINATE TAIL ROTOR	ROTOR/AIRFRAME DESIGN	ALL	WIND TUNNEL TEST PLUS FLIGHT TEST (NASA)
INADEQUATE STORAGE FOR EQUIPMENT; I.E., MAPS, FLASHLIGHT, SHOTGUN, SPECIALIZED EQUIPMENT SUCH AS STABILIZED BINOCULARS, INFRARED VIEWER, ETC.	AIRCRAFT DESIGN	PATROL	AIRFRAME DESIGN

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT TECHNOLOGY AREA: VEHICLE DESIGN

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
SKID GEAR THAT CAN BE LOWERED OR RAISED FOR SLOPE LANDINGS	AIRFRAME DESIGN	POLICE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
FLOTATION EQUIPMENT BUILT INTO THE LANDING GEAR	LANDING GEAR DESIGN	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
AUTOROTATION ENGINE FAILURE	ROTOR/TRANSMISSION DESIGN	POLICE	PRELIMINARY DESIGN PLUS SIMULATION
REDUCE THE SOUND HELICOPTER A. ENGINE B. MAIN ROTOR C. TAIL ROTOR	AERODYNAMIC/ACOUSTIC RESEARCH PLUS TRANS-MISSION RESEARCH	POLICE	SIMULATION/OPERATIONAL FIELD TESTING (USER)
SEATING MINIMUM OF 4 SEATS, MAX OF 8 SEATS	NONE	POLICE PATROL	PRELIMINARY AIRFRAME DESIGN  <b>ORIGINAL PAGE IS OF POOR QUALITY</b>

SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT

TECHNOLOGY AREA: HUMAN FACTORS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSTS/SIMULATION/OPERATIONAL)</u>
BACK AND NECK PROBLEMS, INJURY PROTECTION IN CRASH, LONG TERM COM- FORT	IMPROVED SEATS	2-4 HR PATROL	PHYSIOLOGY, SEAT DESIGN, DEVELOP- MENT, PLUS FIELD EVALUATION
SMOG, TOXIC CASES, CREW COMFORT	ENVIRONMENTAL CONTROL & AIR FILTRATION	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
HEARING LOSS, CREW FATIGUE & COMMUNICATION	REDUCTION OF COCKPIT NOISE	PATROL	NOISE ATTENUATION, ANALYSIS PLUS FIELD EVALUATION (USER)
COMPLEXITY OF CONTROLS CREATING HIGH PILOT WORKLOAD	CONTROL SIMPLIFICA- TION	PATROL	HANDS-OFF CONTROL, AUTO-PILOT, SAS-SINGLE HAND CONTROL ANALYSIS, COCKPIT SIMULATION PLUS FIELD EVALUATION (USER)
TRAINING & TWO PILOT OPERATION	DUAL CONTROLS	PATROL	
POOR GROUND & FLIGHT COCKPIT VISIBILITY	MINIMUM BORDERS OF MAXIMUM FIELD OF VISION FOR 2 SEATS	PATROL	COCKPIT ARRANGEMENTS, INSTRUMENT DISPLAYS ANALYSIS, COCKPIT SIM- ULATION PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT      TECHNOLOGY AREA: SAFETY & RELIABILITY

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
CREW AND MAJOR COMPONENT PROTECTION FROM GROUND FIRE  HAZARDOUS MATERIALS	PROTECTIVE AREA FOR TRANSPORTATION OF TOXIC MATERIALS; I.E., TEAR GAS	POLICE PATROL  PATROL	DEVELOPMENT PLUS EXPERIMENTAL TEST (HASA)  ANALYSIS PLUS AIRFRAME DESIGN PLUS EXPERIMENTAL TEST (HASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT TECHNOLOGY AREA: AVIONICS & FLT SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
IFR FLIGHT	STAGE III	ALL	COCKPIT SIMULATION (NASA) PLUS FIELD EVALUATION (USER)
WIRE STRIKES	DETECTION & PROTECTION	ALL	ADVANCE DETECTION SYSTEMS AND ONBOARD EXTERNAL CUTTERS, DEVELOP- MENT PLUS EXPERIMENTAL TEST (NASA)
NEAR & MIDAIR COLLI- SIONS	COLLISION AVOIDANCE SYSTEMS	PATROL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)
ABILITY TO COMMUNICATE WITH VICTIMS	AVIONICS DESIGN	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USERS)
NUMBER & LOCATION OF RADIOS	REDUCE NUMBER BY AVIONIC DESIGN	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USERS)
LACK OF SYNTHESIZED HIGH & LOW BAND RADIOS	AVIONICS DESIGN (STATE-OF-THE-ART NOW)	PATROL	FIELD EVALUATION (USER)
PRIVATE COMM- (SCRAMBLER)	AVIONICS DESIGN	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
SPEED OF RECEIVING INFORMATION	COMPUTERIZED DIS- PATCHING FROM ALARM CALLS	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT                      TECHNOLOGY AREA: GUID/NAV/CONTROL SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
LOCATION OF CALL	COMPUTERIZED GUIDANCE SYSTEM X-Y COORDINA- TION	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT TECHNOLOGY AREA: MONITORING & DIAGNOSTIC

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
ENGINE LIFE OF COMPONENTS	MONITORING OF THE ENGINE & COMPONENTS	ALL	ANALYSIS AND FIELD EVALUATION (USER)
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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT

TECHNOLOGY AREA: PROPULSION

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
MULTIPLE FUEL USE FOR TURBINES	MULTIPLE FUEL CON- TROLS AND IGNITERS	ALL	SIMULATION WITH CURRENT POWER PLANTS PLUS DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)
POWER	LIGHTWEIGHT WITH IN- CREASED SHAFT HORSE- POWER	ALL	ANALYSIS PLUS EXPERIMENTAL TEST (NASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: LAW ENFORCEMENT TECHNOLOGY AREA: AUXILIARY SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSTS/SIMULATION/OPERATIONAL)</u>
NIGHT VISION	FLIR FOR PILOT & OBSERVER	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
OPTICAL EQUIPMENT	IMPROVED OPTICS FOR LONG-RANGE OBSERVA- TIONS	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
ON-BOARD PHOTO	IMPROVED CAPABILITY TO CARRY & USE ON- BOARD STILL AND MOVIE CAMERAS	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
ABILITY TO I.D. A VEHICLE FROM THE AIR	ELECTRONIC TECHNOLOGY	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
IMPROVED ABILITY TO LOCK ONTO OR FOLLOW A MOVING VEHICLE BY TRACKING	AVIONICS/OPTICAL TECHNOLOGY	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
ABILITY TO STOP A CAR FROM THE AIR	ELECTRONIC TECHNOLOGY	PATROL	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCE MGT TECHNOLOGY AREA: VEHICLE DESIGN CONSID.

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
200 KNOTS MAX SPEED	AERODYNAMIC DESIGN	ALL	PRELIMINARY DESIGN PLUS WIND TUNNEL TEST (NASA)
HUGE 10000' PRESSURE-ALTITUDE	AERODYNAMIC DESIGN	ALL	SIMULATION
4 HR TOTAL FUEL CAP. + ENDURANCE, 2 HR FUEL + 4000 LBS PAYLOAD	FUEL CONSUMPTION/ENGINE DESIGN/FUEL CAPACITY	ALL	PRELIMINARY DESIGN + OPERATIONAL TEST OF PROTOTYPE (NASA OR USER)
CARGO SPACE	NONE	ALL	PRELIMINARY AIRFRAME DESIGN
EGRESS & ACCESS TO CARGO/CABIN	NONE	ALL	PRELIMINARY AIRFRAME DESIGN
ROUGH TERRAIN LANDING CAPABILITY + LANDING GEAR DESIGNS FOR ALL MISSIONS	LANDING GEAR DESIGN	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
IMPROVED VISIBILITY	REDUCED PANEL SIZE	ALL	COCKPIT SIMULATION PLUS FIELD EVALUATION (USER)
MANEUVERABILITY (QUICK REACTION). INTERNAL AND EXTERNAL NOISE	AERODYNAMIC DESIGN, ACOUSTIC DESIGN	ALL (FIRE)	WIND TUNNEL TEST AND EXPERIMENTAL TEST (NASA)

SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCE MGT TECHNOLOGY AREA: VEHICLE DESIGN CONSID.

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
TWO SPARE 50 HP ACCESSORY PADS ON TRANSMISSION. TWO SPARE CUSTOMER PORTS OR BLEED AIR	NONE	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
SPACE 24 VOLT DC OUTLETS. 2 IN COCKPIT, 4 IN CABIN	NONE	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
WATER/RETARDANT CAP. A. MIN 400 GAL B. SELF FILLING C. SIMUL. TRANSPORT OF FF AND TOOLS D. NO SPEED PENALTY E. SIMUL. EXT. LOAD CAP. F. DOUBLE UTILIZED AS CARGO/TOOL STORAGE WHEN NOT USED FOR WATER/RETARDANT G. CAPABLE OF SPLIT DROPS	AIRFRAME DESIGN	FIRE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
INEXPENSIVE METHOD OF DELIVERING LARGE AMOUNTS OF RETARDANT	AIRFRAME DESIGN	FIRE	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCE MGT.      TECHNOLOGY AREA: VEHICLE DESIGN CONSID.

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)
REDUCED TURN AROUND TIME	HOT REFUELING CAPABILITY	FIRE	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCE MGT.

TECHNOLOGY AREA: HUMAN FACTORS

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<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSTS/SIMULATION/OPERATIONAL)</u>
BETTER PILOT & OBSERVER SEAT A. SAFETY B. COMFORT (7 HRS CONT) C. ADJUSTABLE D. SIDE/SIDE E. OBSERVER SWIVEL	NONE	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
ENVIRONMENTAL CONTROLLED COCKPIT A. FILTERED AIR B. POSITIVE PRESSURE C. TEMP. CONTROLLED	NONE	FIRE	DEVELOPMENT PLUS FIELD EVALUATION (USER)
BETTER CONTROL SYSTEM, STANDARDIZED CONTROLS & SWITCHES, PILOT CAN FLY ALL MISSIONS AND OPERATE ALL SUBSYSTEMS (RADIOS, AUX EQUIP)	DETAILED COCKPIT DESIGN	ALL	COCKPIT SIMULATION (NASA) PLUS FIELD EVALUATION (USER)
IMPROVED LIGHTING AND GLARE REDUCTION	DISPLAY/OPTICS TECHNOLOGY	ALL	COCKPIT SIMULATION (NASA) PLUS FIELD EVALUATION (USER)

SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCE MGT.

TECHNOLOGY AREA: SAFETY & RELIABILITY

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
FAIL SAFE DESIGN OF STRUCTURES & COMPONENTS	STRUCTURAL DESIGN	ALL	ANALYSIS PLUS EXPERIMENTAL TEST (NASA)
CRASH SURVIVABILITY - MIL. STD.	NONE	ALL	ANALYSIS PLUS EXPERIMENTAL TEST (NASA)
ROTOR SAFETY (GROUND CLEARANCE, PERSONNEL AND OBSTRUCTION CLEARANCE)	AIRFRAME/ROTOR DESIGN	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
ANTI-TORQUE SAFETY (GROUND CLEARANCE, PERSONNEL AND OBSTRUCTION CLEARANCE)	AIRFRAME/ROTOR DESIGN	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
EMERGENCY RAPID FUEL DUMP CAPABILITY	AIRFRAME/SYSTEM DESIGN	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

ENVIRONMENTAL CONTROL, FIRE  
 FIGHTING, RESOURCE MGT

TECHNOLOGY AREA: AVIONICS & FLT SYSTEMS

WORKING SESSION:

PROBLEMS (TECHNICAL/OPERATIONAL)	TECHNOLOGY REQUIRED	MISSION TYPE	PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)
PASSIVE CONTINUOUS REPORTING SYSTEM WITH EMERGENCY LOCATING SYSTEM	AVIONICS DESIGN	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCES MGT.

TECHNOLOGY AREA: GUID/NAV/CONTROL SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
"HANDS-OFF" FLIGHT CONTROL CAPABILITY	SEMI-AUTO PILOT (SAS) TO ALLOW TEMPORARY "HANDS-OFF" CONTROLS	ALL	ANALYSIS PLUS SIMULATION (NASA) PLUS EXPERIMENTAL TEST (NASA)
STABILITY (HANDS OFF)	AERODYNAMIC DESIGN	ALL	ANALYSIS PLUS WIND TUNNEL TEST (NASA)
RELATIVE WIND/SLOW INDICATING SYSTEM	AIRSPEED SENSOR DESIGN	ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCE MGT

TECHNOLOGY AREA: MONITORING AND DIAGNOSTIC SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
<p>RELIABILITY SYSTEMS &amp; PERFORMANCE ANALYSIS            COMPUTER WITH EASY MEANS OF RELAYING INFO TO PILOT WITH MINIMUM DISTRACTION</p>	<p>COMPUTER TECHNOLOGY</p>	<p>ALL</p>	<p>ANALYSIS PLUS SIMULATION (NASA)</p>

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SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCES MGT.

TECHNOLOGY AREA: PROPULSION

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<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSIS/SIMULATION/OPERATIONAL)</u>
USE OF WIDE VARIETY OF FUELS	PROPULSION SYSTEM DESIGN	ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)
LOW SPECIFIC FUEL CONSUMPTION	PROPULSION SYSTEM DESIGN	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
DUAL POWER BAND FOR GREATER FUEL ECONOMY AND EFFICIENCY	PROPULSION SYSTEM DESIGN	LOITER ECONOCRUISE MAX POWER APPLICA- TIONS	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)
ECONOMICAL LIGHTWEIGHT MULTI ENGINE POWER PLANT	PROPULSION SYSTEM DESIGN	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
EMERGENCY RESERVE POWER OF 50% ABOVE NORMAL RATED	PROPULSION SYSTEM DESIGN	ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)
PROTECTION AGAINST FOREIGN OBJECT DAMAGE	NONE	ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (NASA)

SUMMARY OF WORKING GROUP RESULTS

WORKING SESSION: ENVIRONMENTAL CONTROL, FIRE FIGHTING, RESOURCE MGT

TECHNOLOGY AREA: AUXILIARY EQUIP & SYSTEMS

<u>PROBLEMS (TECHNICAL/OPERATIONAL)</u>	<u>TECHNOLOGY REQUIRED</u>	<u>MISSION TYPE</u>	<u>PROPOSED RESEARCH AND TECHNOLOGY (ANALYSTS/SIMULATION/OPERATIONAL)</u>
HOIST CAPABILITY, EFFICIENT & MINIMAL EFFECT ON HANDLING	NONE	ALL	FIELD EVALUATION (USER)
NIGHT FLYING VISION CAPABILITY, NOT AFFECTED BY FIRE OR MOONLIGHT, QUICK CHANGE CAPABILITY, PROVIDED 180°-1/2 MI ON CRUISE 360° IN HOVER	DISPLAY/OPTICS TECHNOLOGY	ALL	DEVELOPMENT PLUS EXPERIMENTAL TEST (USER)
ONBOARD, SELF-CONTAINED APU FOR BLEED AIR AND DRIVE PADS	NONE	ALL	DEVELOPMENT PLUS FIELD EVALUATION (USER)
IMPROVED AIRCRAFT IDENTIFICATION (BOTH DAY AND NIGHT)	NONE	ALL	FIELD EVALUATION (USER)  <b>ORIGINAL PAGE IS OF POOR QUALITY</b>

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