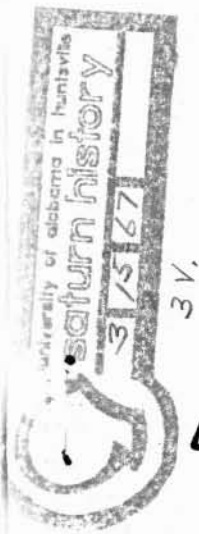


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Date ----- Doc. No. -----



PROGRAM SUBMISSION

FY-1968

HUMAN FACTORS SYSTEMS, SRT

CODE 127
(OART)

Prepared by
Research Program Office
R-EO-R

March 15, 1967

National Aeronautics and Space Administration



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CODE 127
(OART)

HUMAN FACTORS SYSTEMS, SRT
SUMMARY
(Thousands of \$)

<u>CODE</u>	<u>TITLE</u>	<u>FY-68 REQUIREMENTS</u>	<u>FY-68 GUIDELINES</u>
127	<u>Human Factors Systems, SRT</u>	<u>360</u>	<u>300</u>
127-51	Man-System Integration	360	300

<u>CODE</u>	<u>TITLE</u>	<u>LAB</u>	<u>FUNDS</u>	<u>PAGE</u>
127-51	<u>Man-System Integration</u>			
01	<u>Systems Research</u>			
03	Lunar Surface Scientific Mission Simulation (Phase II)	P&VE	0	1
05	Man-System Task Analysis for Lunar Surface Operations	P&VE	0	2

<u>CODE</u>	<u>TITLE</u>	<u>LAB</u>	<u>FUNDS</u>	<u>PAGE</u>
127-51	<u>Man-System Integration</u>			
03	<u>Simulation, Test and Evaluation</u>			
05	Man-System Locomotion Control and Display Criteria for Extraterrestrial Vehicles - Phase III	P&VE	80	3
06	Effect of Man's Appendage Motions on Control of Space Vehicles	AERO	30	4

<u>CODE</u>	<u>TITLE</u>	<u>LAB</u>	<u>FUNDS</u>	<u>PAGE</u>
127-51	<u>Man-System Integration</u>			
04	<u>Maintainability</u>			
01	Human Engineering Design for Maintenance and Repair of Advanced Space Systems	P&VE	100	5
02	Multi-Purpose Tooling Concept	ME	70	6
04	Development of Gas Actuated Impact Tools	ME	35	7
05	Mechanical Fastening Technique Development for Application in Space	ME	45	8

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	
4. DATE OF RESUME 15 03 67	5. KIND OF RESUME B. Completed (01 08 66)	6. SECURITY UN	7. REGRADING N/A	8. RELEASE LIMITATION GA FO	9. LEVEL OF RESUME A. Work Unit		
99. CURRENT NUMBER/RESUME 127-51-01-03-62				100. PRIOR NUMBER/CODE No Change			
(U) Lunar Surface Scientific Mission Simulation (Phase II)							
12. SCIENTIFIC OR TECH. AREA 002400 Bioengineering				13. START DATE 07 66	14. CRIT. COMPL. DATE 05 68	15. FUNDING AGENCY N/A 1	
16. PROCURE METHOD B. Contract	17. CONTRACT GRANT U. NUMBER NAS8-20405 DATE 07 66 C. TYPE M. CPFF d. AMOUNT \$105,704			18. RESOURCES EST. PRIOR FY-- 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS 1.0	b. FUNDS (In thousands) -	
19. GOVT LAB/INST/INSTALLATION/ACTIVITY NAME: Marshall Space Flight Center ADDRESS: Huntsville, Alabama 35812 RESP. INDIV: Grubbs, Haydon Y. (R-P&VE-VAH) Larson, Carl A. (R-P&VE-VAH) TEL: 205-876-8166 (FTS)				20. PERFORMING ORGANIZATION NAME: Grumman Aircraft Engineering Corporation ADDRESS: South Oyster Bay, Rd. Long Island, New York 11714 INVESTIGATORS PRINCIPAL: Stubbs, Gordon ASSOCIATE: TEL: 516-575-3275 TYPE:			
21. TECHNOLOGY UTILIZATION N/A				22. COORDINATION N/A			
23. KEYWORDS Human Behavior, Space Vehicles, Life Sciences							
24. (U) OBJECTIVE: The object of this investigation is to experimentally validate, under near operational mission simulation, man-system design criteria for lunar surface roving vehicles. This investigation is a follow-on to the studies, "Man-System Locomotion Control and Display Criteria for Extraterrestrial Vehicles (NAS8-20015)" and "Man-System Criteria for Extraterrestrial Vehicles (NAS8-20006)" and will combine design criteria from these studies, in addition to those developed in other separate studies, into a program which includes mission operational effects.							
26. (U) PROGRESS: The contractor has satisfactorily assembled the required test equipment for this contract. This includes: A4H pressure suits and ventilators (borrowed from the Manned Spacecraft Center (MSC), Houston, Texas; biomedical monitoring equipment for heart rate, ekg, and respiration rate; and the necessary equipment to conduct gas analyses for CO ₂ and O ₂ content. Two test subjects have been selected, and an initial calibration of subject O ₂ uptake/heart rate have been accomplished. A test plan utilizing a "building block" approach to facilitate starting with simple task elements and then building to more complex, longer duration missions has also been developed. The contractor has recently accomplished a complete systems checkout of all the equipment utilized in the study and is presently acquiring test data on the simplified task elements. A strong attempt has been made to keep this study integrated with all other related activities that NASA is pursuing in the lunar surface area.							
27.	28. REQUESTING AGENCY			29. PROJECT CROSS CODE		30. SRT CROSS CODE	
31. SPECIAL EQUIPMENT					32. FUNDS (\$ K)		
					PRIOR FY-- 67	IN HOUSE	CONTRACT
					CURRENT FY-- 68	-	10
					NEXT FY - 69	-	-
33. UNIQUE PROJECT	Human Factors Systems, SRT						
34. SUB PROGRAM	Man-System Integration						
35. TASK AREA	Systems Research						

William G. Johnson

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT. ACCESSION	3. AGENCY ACCESSION
4. DATE OF RESUME 15 03 67	5. KIND OF RESUME B. Completed (15 08 66)	6. SECURITY U. W.	7. REGRADING N/A	8. RELEASE LIMITATION FO GA	9. LEVEL OF RESUME A. Work Unit	
100. CURRENT NUMBER/DATE 127-51-01-05-62				10b. PRIOR NUMBER/CODE No Change		
11. TITLE (U) Man-System Task Analysis for Lunar Surface Operations						
12. SCIENTIFIC OR TECH. AREA 007500 Human Factors Engineering				13. START DATE 08 65	14. CRIT. COMPL. DATE 04 67	15. FUNDING AGENCY N/A
16. PROCURE. METHOD B. Contract	17. CONTRACT/GRANT b. NUMBER NAS8-20093 DATE: 08 65 c. TYPE M. CPFF d. AMOUNT \$112,661		18. RESOURCES EST. PRIOR FY - 67 CURRENT FY - 68	a. PROFESSIONAL MAN-YEARS 1.0	b. FUNDS (In thousands) -	
19. GOVT. LAB INSTALLATION/ACTIVITY NAME: Marshall Space Flight Center ADDRESS: Huntsville, Alabama 35812 RESP. INDIV: Nelson, Charles B. (R-P&VE-VAH) 205-877-8271 (FTS)			20. PERFORMING ORGANIZATION NAME: Hamilton Standard Division, United Aircraft ADDRESS: Windsor Locks, Conn. 06096 INVESTIGATORS PRINCIPAL: Lang, Ronald ASSOCIATE: Leonard, Ray TEL: NA3-1621, ext. 8306 TYPE:			
21. TECHNOLOGY UTILIZATION N/A			22. COORDINATION N/A			
23. KEYWORDS Human Factors Engineering Life Sciences						
24. (U) OBJECTIVE: To establish <u>man-system design criteria</u> to prepare mission and timeline profiles; and to establish energy requirements for erection and deployment of the optical astronomy package (OAP). (2) To provide human factors design criteria and energy requirements for a variety of earth orbital tasks applicable to the development of space systems such as the Apollo Telescope Mount (ATM) and Orbital Workshop.						
25.						
26. (U) PROGRESS: All objectives of the OAP program as outlined above have been accomplished. (2) In order to accomplish earth orbital oriented tasks, as described above, preliminary work has been necessary. This includes preparation of pressurization and telemetry systems to be used in conjunction with zero-gravity simulators, training of subjects in the simulators, and construction of mockups. This preliminary work is essentially complete.						
27.		28. REQUESTING AGENCY		29. PROJECT CROSS CODE		30. SRT CROSS CODE 981-20
31. SPECIAL EQUIPMENT				32. FUNDS (\$ K)		
				PRIOR FY - 67	IN HOUSE -	CONTRACT -
33. UNIQUE PROJECT Human Factors Systems, SRT				CURRENT FY - 68	-	-
34. SUB PROGRAM Man-System Integration				NEXT FY - 69	-	-
35. TASK AREA Systems Research						

William G. Johnson

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT. ACCESSION	3. AGENCY ACCESSION	
4. DATE OF RESUME 15 03 67	5. KIND OF RESUME D. Changed (01-08-66)	6. SECURITY U HPT	C WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA FO	9. LEVEL OF RESUME A. Work Unit	
10a. CURRENT NUMBER/CODE 127-51-03-05-62				10b. PRIOR NUMBER/CODE N/A			
11. TITLE: (U) <u>Man-System Locomotion Control and Display Criteria for Extraterrestrial Vehicles - Phase III</u>							
12. SCIENTIFIC OR TECH. AREA HFE 007500, MMR009400, Astronautics 001900				13. START DATE 04 67	14. CRIT. COMPL. DATE 04 69	15. FUNDING AGENCY N/A	
16. PROCURE. METHOD B. Contract	17. CONTRACT/GRANT b. NUMBER Pending c. TYPE d. AMOUNT			18. RESOURCES EST. a. PROFESSIONAL MAN-YEARS b. FUNDS (In thousands)			
				PRIOR FY- 67		2.0	
				CURRENT FY- 68		2.0	
19. GOVT. LAB/INSTALLATION/ACTIVITY NAME: Marshall Space Flight Center ADDRESS: Huntsville, Alabama 38512 RESP. INDIV.: Larson, C. A., R-P&VE-VAH TEL.: 205-876-8166 (FTS)				20. PERFORMING ORGANIZATION NAME: ADDRESS: Not Selected INVESTIGATORS PRINCIPAL: ASSOCIATE: TEL.: TYPE:			
21. TECHNOLOGY UTILIZATION N/A				22. COORDINATION N/A			
23. KEYWORDS Lunar Roving Vehicle							
24. (U) OBJECTIVE: To derive crew station design criteria for a lunar roving vehicle; to validate the fixed base simulation results; and to determine the applicability of the simulation technique for astronaut training.							
25. (U) APPROACH: An experimental program, utilizing the optimized crew stations for open cockpit vehicles derived in Phase II, will be conducted utilizing a moving base simulation and wide angle projection system to investigate the validity of the results obtained in Phase II. Performance of the operator in the conduct of the locomotion control task will be the primary consideration for pressure-suited conditions.							
26. (U) PROGRESS: The FY-67 effort will yield locomotion and navigation control and display criteria for small open-cockpit lunar roving vehicles under normal operational conditions. Field tests utilizing the Mobility Test Articles (MTA) at MSFC will be used to validate the fixed base simulation results where possible.							
27.	28. REQUESTING AGENCY		29. PROJECT CROSS CODE		30. SRT CROSS CODE		
31. SPECIAL EQUIPMENT Lunar Surface Driving Simulator located at MSFC					32. FUNDS (\$ K)	IN-HOUSE	CONTRACT
					PRIOR FY- 67	-	10
33. UNIQUE PROJECT Human Factors Systems, SRT					CURRENT FY- 68	-	80
34. SUB PROGRAM Man-System Integration					NEXT FY- 69	-	-
35. TASK AREA Simulation, Test and Evaluation							

William G. Johnson

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT. ACCESSION	3. AGENCY ACCESSION		
4. DATE OF RESUME 15 03 67	5. KIND OF RESUME A New (Proposed)	6. SECURITY U _{NP} W _{NR}	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A Work Unit	
10a. CURRENT NUMBER/CODE 127-51-03-06-62			10b. PRIOR NUMBER/CODE N/A			
11. TITLE: Effect of Man's Appendage Motions on Control of Space Vehicles						
12. SCIENTIFIC OR TECH. AREA 015900 Spacecraft			13. START DATE 01 68	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY N/A	
16. PROCURE. METHOD. B. Contract	17. CONTRACT/GRANT		18. RESOURCES EST.	a. PROFESSIONAL MAN-YEARS	b. FUNDS (In thousands)	
	b. NUMBER	c. DATE	PRIOR FY- 67	-	-	
	c. TYPE Pending	d. AMOUNT	CURRENT FY- 68	0:1	-	
19. GOVT. LAB/INSTALLATION/ACTIVITY			20. PERFORMING ORGANIZATION			
NAME: Marshall Space Flight Center			NAME:			
ADDRESS: Huntsville, Alabama 35812			ADDRESS:			
RESP. INDIV.: Worley, H. Eugene R-AERO-DDS			INVESTIGATORS			
TEL.: 205 877-2278 (FTS)			PRINCIPAL:			
			ASSOCIATE:			
			TEL:			
			TYPE:			
21. TECHNOLOGY UTILIZATION N/A			22. COORDINATION N/A			
23. KEYWORDS appendage movement, control, human dynamics model						
24. (U) Objective: (a) Problem: To determine the forces and moments exerted on space vehicles as a result of appendage movement. (b) Application: Use in control studies of space vehicles and experiments where fine pointing accuracy is required or where minimum disturbances are allowed. (c) Provide for controlling or compensating for the effects of appendage movement, such as raising an arm. These effects can impart significant forces that could jeopardize missions requiring extreme pointing accuracy, such as the ATM, or orbital experiments requiring minimum disturbances, such as project thermo.						
25. (U) Approach: Dynamic model of man should be determined including masses and moments of inertia of various parts of the body. Using this model, typical motion should be simulated and the resulting forces and moments obtained. The impact on typical configurations should be evaluated.						
26. (U) Progress: A New						
27.	28. REQUESTING AGENCY	29. PROJECT CROSS CODE	30. SRT CROSS CODE			
31. SPECIAL EQUIPMENT				32. FUNDS (\$ K)	IN-HOUSE	CONTRACT
				PRIOR FY- 67	-	-
33. UNIQUE PROJECT Human Factors Systems, SRT				CURRENT FY- 68	-	30
34. SUB PROGRAM Man-System Integration				NEXT FY- 69	-	30
35. TASK AREA Simulation, Test and Evaluation						

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT. ACCESSION	3. AGENCY ACCESSION	
4. DATE OF RESUME 15 03 67	5. KIND OF RESUME D. Change (14 03 66)	6. SECURITY U HPT U WHK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit		
10a. CURRENT NUMBER/CODE 127-51-04-01-62				10b. PRIOR NUMBER/CODE No Change			
11. TITLE: (U) Human Engineering Design Data for Maintenance and Repair of Advanced Space System							
12. SCIENTIFIC OR TECH. AREA 007500 Human Factors Engineering				13. START DATE 08 66	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY N/A	
16. PROCURE. METHOD B. Contract	17. CONTRACT/GRANT b. NUMBER NAS8-18117 DATE 08 66 c. TYPE A. FPF d. AMOUNT 178,647			18. RESOURCES EST. PRIOR FY-- 67 CURRENT FY - 68		a. PROFESSIONAL MAN-YEARS 4.0 4.0	b. FUNDS (In thousands) 80 -
19. GOVT. LAB./INSTALLATION/ACTIVITY NAME: Marshall Space Flight Center ADDRESS: Huntsville, Alabama 35812 RESP. INDIV.: Grubbs, Haydon Y. Jr., R-P&VE-VA TEL: 205-876-7678				20. PERFORMING ORGANIZATION NAME: General Electric Company (GE) ADDRESS: Valley Forge Space Technology Center Philadelphia, Pennsylvania 19101 INVESTIGATORS PRINCIPAL: ASSOCIATE: Miller, Edward S. TEL: 215-969-5608 TYPE:			
21. TECHNOLOGY UTILIZATION N/A				22. COORDINATION N/A			
23. KEYWORDS Human Factors Engineering							
24. OBJECTIVE: (U) To determine man-system criteria relative to man's capability to maintain and repair advanced space systems. Applications include the analyzing, servicing, disassembly, replacement, repair, and realignment of space system modules, subsystems, and components by man. APPROACH: (U) Empirical investigations are planned utilizing neutral buoyancy techniques to simulate zero-gravity conditions. Experiments 84A and 1A will yield data for force emission capability as a function of force receiver orientation and restrain and subsystem maintenance as a function of mass and geometry, respectively. Planned experimental work subsequent to 84A and 1A will provide data for free mass manipulation ancillary equipment, torque emission in zero-gravity, modular disassembly, assembly, and replacement as a function of visual field, illumination, and accessibility. A "Human Engineering Experimental Handbook for Design Engineers" will be prepared. Critical factors include shortage of Apollo Block II pressure suits and availability of neutral buoyancy facilities.							
25. PROGRESS: (U) Experiments 84A and 1A have been designed for implementation in-house using a 35 foot tank 15 feet deep. Experimental equipment for 84A has been delivered and calibrated. Test subjects have been trained in Self-Contained Underwater Breathing Apparatus (SCUBA) and have received pressure suit indoctrination. Training for 84A is in progress, Preparation of the Human Engineering Experimental Handbook for Designers has begun.							
27.		28. REQUESTING AGENCY		29. PROJECT CROSS CODE		30. SRT CROSS CODE	
31. SPECIAL EQUIPMENT						32. FUNDS (\$ K)	
						PRIOR FY-- 67	IN-HOUSE -
						CURRENT FY-- 68	CONTRACT 80
						NEXT FY-- 69	100
33. UNIQUE PROJECT	Human Factors Systems, SRT						
34. SUB PROGRAM	Man-System Integration						
35. TASK AREA	Maintainability						

William G. Johnson

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT. ACCESSION	3. AGENCY ACCESSION	
4. DATE OF RESUME 15 03 67	5. KIND OF RESUME D. CHANGE (10 02 67)	6. SECURITY U NPT	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit
10. CURRENT NUMBER/CODE 127-51-04-02-62			10b. PRIOR NUMBER/CODE No Change		
11. TITLE: (U) Multi-Purpose Tooling Concept					
12. SCIENTIFIC OR TECH. AREA 009400 Man Machine Relation 009200 Machinery & Tools 007500			13. START DATE 07 66	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY N/A
16. PROCURE. METHOD N/A	17. CONTRACT/GRANT b. NUMBER c. TYPE N/A d. AMOUNT		18. RESOURCES EST. PRIOR FY-- 67 CURRENT FY--68	a. PROFESSIONAL MAN-YEARS 0.2 0.5	b. FUNDS (In thousands) - -
19. GOVT LAB/INSTALLATION/ACTIVITY NAME: Marshall Space Flight Center ADDRESS: Huntsville, Alabama 35812 RESP. INDIV: Yost, V. H. Wilson, W. A. R-ME-MMP R-ME-MM TEL: (FTS)205-876-3559 (FTS)205-876-1917			20. PERFORMING ORGANIZATION NAME: ADDRESS: Same as 19. INVESTIGATORS PRINCIPAL: ASSOCIATE: TEL: TYPE:		
21. TECHNOLOGY UTILIZATION Manufacturing Technology			22. COORDINATION N/A		
23. KEYWORDS Tooling, Flight Testing					
24. (U) OBJECTIVE - a. <u>Problem</u> : To design, fabricate, test, and evaluate multi-purpose space tools. b. <u>Application</u> : To assist the operator in performing assembly, disassembly, and maintenance and repair tasks. c. This effort will result in recommendations for the development of prototypes for subsequent flight testing.					
25. (U) APPROACH - The work is to be accomplished in the following phases: Phase I - Review all available data on operator performance with tools specially designed for the environment and operator's apparel. Tool use requirements will be delineated insofar as possible; Phase II - Design and fabrication of tools including some but not all of the following ideas: scissor type cutters, nibbler, porta power, punch, flyball inertia tool, gauntlet type tool, conventional hand tools modified for use in environment. Design suitable experiments for evaluation of the prototype tools selected for fabrication; Phase III - Utilizing simulators, both mechanical and water immersion, and tools available at MSFC, evaluate the test articles; and Phase IV - Fabricate flight test prototype tools and evaluate them as above. Tools and related elements will be fabricated by AEC & Hayes - Single Support Contractor.					
26. (U) PROGRESS - (20 07 66 thru 15 03 67) Two prototype tools, flyball inertial tool and gauntlet type tool, have been manufactured. Martin tool evaluation completed.					
27.		28. REQUESTING AGENCY	29. PROJECT CROSS CODE	30. SRT CROSS CODE	
31. SPECIAL EQUIPMENT Standard and Special Vendor Items-Materials (Small Cost)			(48)	(2)	
33. UNIQUE PROJECT Human Factors Systems, SRT			32. FUNDS (\$ K) PRIOR FY-- 67 CURRENT FY--68 NEXT FY-- 69		
34. SUB PROGRAM Man-System Integration			IN-HOUSE - 35 50		
35. TASK AREA Maintainability			CONTRACT - 35 50		

William G. Johnson

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT. ACCESSION	3. AGENCY ACCESSION	
4. DATE OF RESUME 15 03 67	5. KIND OF RESUME A. NEW (PROPOSED)	6. SECURITY U HPT	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit
10a. CURRENT NUMBER/CODE 127-51-04-04-62		10b. PRIOR NUMBER/CODE N/A			
11. TITLE: (U) Development of Gas Actuated Impact Tools					
12. SCIENTIFIC OR TECH. AREA 009400 Man Machine Relations			13. START DATE 07 67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY N/A
16. PROCURE METHOD B. Contract	17. CONTRACT/GRANT b. NUMBER c. TYPE Pending j. DATE d. AMOUNT		18. RESOURCES EST. PRIOR FY- 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS - 0.1	b. FUNDS (In thousands) - -
19. GOVT. LAB/INSTALLATION/ACTIVITY NAME: Marshall Space Flight Center ADDRESS: Huntsville, Alabama 35812 RESP. INDIV.: Blaise, H. T. Schuerer, P. H. R-ME-MMP R-ME-MMP TEL (FTS) 205-876-6068 (FTS)205-876-8596			20. PERFORMING ORGANIZATION NAME: ADDRESS: INVESTIGATORS PRINCIPAL: ASSOCIATE: TEL: TYPE:		
21. TECHNOLOGY UTILIZATION Manufacturing Technology			22. COORDINATION N/A		
23. KEYWORDS Impact Tools, Space Assembly					
24. (U) OBJECTIVE - a. <u>Problem</u> : - To design, fabricate, test, and evaluate the gas activated impact tool concept as a multi-purpose driving unit for hand operated tools. b. <u>Application</u> : - To assist the space worker in performing various space tasks such as assembly, disassembly, maintenance, and repair tasks. c. The study will result in recommendation for development of a special operational prototype for subsequent flight testing.					
25. (U) APPROACH - The work is to be accomplished in three phases: PHASE I: Design Study - Review of all available data on electrical power and gas operated, hand-held impact tools. Select and combine pertinent data for designing tools for space utilization by subjects wearing pressurized space suits. PHASE II: Design, fabricate, and proof test; utilizing gas activation as a driving force which would omit the possibilities of flash electrical arcing, thus providing a safer space working environment for the suited space worker. PHASE III: Utilizing the space simulators, tread mills, and neutral buoyancy facility available at this center, evaluate the test tools in order to design a prototype for subsequent flight testing.					
26. (U) PROGRESS - MSFC has maintained a continuous awareness of the state-of-the-art in space tool development. This center's long in-house and contract experience in special tools and fabrication techniques constitutes a solid base of departure for research in the area of advanced space-tool technology.					
27.	28. REQUESTING AGENCY	29. PROJECT CROSS CODE	30. SRT CROSS CODE		
31. SPECIAL EQUIPMENT			32. FUNDS (\$ K)	IN-HOUSE	CONTRACT
			PRIOR FY- 67	-	-
33. UNIQUE PROJECT Human Factors Systems, SRT			CURRENT FY-68	-	35
34. SUB PROGRAM Man-System Integration			NEXT FY- 69	10	30
35. TASK AREA Maintainability					

William G. Johnson

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT. ACCESSION	3. AGENCY ACCESSION		
4. DATE OF RESUME	5. KIND OF RESUME	6. SECURITY	7. REGRADING	8. RELEASE LIMITATION	9. LEVEL OF RESUME			
15 03 67	A. NEW (PROPOSED)	U HPT U WRK	N/A	GA	A. Work Unit			
10a. CURRENT NUMBER/CODE				10b. PRIOR NUMBER/CODE				
127-01-04-05-02				N/A				
11. TITLE: (U) Mechanical Fastening Technique Development for Application in Space								
12. SCIENTIFIC OR TECH. AREA				13. START DATE	14. CRIT. COMPL. DATE	15. FUNDING AGENCY		
004700 Couplings, Fittings, Fasteners, and Joints				07 67	06 69	N/A		
16. PROCURL. METHOD	17. CONTRACT/GRANT			18. RESOURCES EST.		a. PROFESSIONAL MAN-YEARS	b. FUNDS (In thousands)	
B. Contract	b. NUMBER	c. DATE	d. AMOUNT	PRIOR FY-- 67	-	-	-	
	c. TYPE	Pending		CURRENT FY - 68	0.2	-	-	
19. GOVT. LAB/INSTALLATION/ACTIVITY				20. PERFORMING ORGANIZATION				
NAME: Marshall Space Flight Center ADDRESS: Huntsville, Alabama 35812				NAME: ADDRESS: Not selected.				
RESP. INDIV. Wood, C. M. Schuerer, P. H. R-ME-MMP R-ME-MMP				INVESTIGATORS PRINCIPAL: ASSOCIATE: TEL: TYPE:				
TFL (FTS) 205-876-8596(FTS)205-876-5445								
21. TECHNOLOGY UTILIZATION				22. COORDINATION				
Manufacturing Technology				N/A				
23. KEYWORDS Mechanical Fasteners, Space Application								
24. (U) OBJECTIVE - a. <u>Problem:</u> - To identify fasteners, fastening methods, and tools which can be used most effectively by pressure suited operator in a zero or reduced gravity environment. b. <u>Application:</u> - To enable an operator to perform extra-vehicular assembly, disassembly, maintenance, and repair tasks. c. To determine optimum parameters for space repair techniques because of limited experience with space tools.								
25. (U) APPROACH - Fastener head configurations, fastening methods, and tools will be tested and evaluated for usage in space environments by utilizing simulators and neutral buoyancy tanks. (U) PROGRESS - N/A								
26.								
27.		28. REQUESTING AGENCY		29. PROJECT CROSS CODE		30. SRT CROSS CODE		
31. SPECIAL EQUIPMENT						32. FUNDS (\$ K)	IN-HOUSE	CONTRACT
Fasteners (5)						PRIOR FY-- 67	-	-
33. UNIQUE PROJECT		Human Factors Systems, SRI				CURRENT FY--68	5	40
34. SUB PROGRAM		Man-System Integration				NEXT FY-- 69	50	60
35. TASK AREA		Maintainability						

William G. Johnson