CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: ROTATIONAL HAND CONTROLLER
SYSTEM: DaF SUBSYSTEM
ASS'Y P/N: 5T155E117
SHEET: 1

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	ROUR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
1480	0	VERNIER/ COARSE SWITCH QTY-1 P/N MS27717-23	MODE: CONTINUOUS COARSE COMMANDS. CAUSE(S): (1) SWITCH SHORT CIRCUIT. (2) POLE FAILS TO COARSE (10V).	CONTINUOUS 10V SIGNAL. COARSE WILL BE SELECTED IN GPC. IF IN VERNIER ARM WILL RESPOND IN COARSE INSTEAD OF VERNIER. COULD GET SUDDEN CHANGE TO COARSE WHEN DRIVING IN VERNIER. WORST CASE --- UNEXPECTED MOTION. UNEXPECTED COARSE RATES. UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS REMAINING --- N/A	DESIGN FEATURES --- THE VERNIER/COARSE SWITCH IS A TOGGLE - ACTUATED SWITCH, TYPE MS27717-23, QUALIFIED TO MIL-S-83731. REPRESENTATIVE SWITCHES AND ACTUATORS WERE LIFE TESTED FOR SRMS USE. THIS TEST WAS CONDUCTED BY MOUNTING THE SWITCHES IN A REPRESENTATIVE HAND GRIP FRAME. TESTING INCLUDED - RANDOM VIBRATION TO QVF LEVELS AND OPERATING LIFE TESTS TO 10000 CYCLES (5000 BEFORE VIBRATION, AND 5000 POST-VIBRATION) CONTACT RESISTANCE, AND ACTUATOR OPERATING FORCES. FOR SWITCH OPERATIONAL CYCLES REFER TO TABLE 13. SOLDERED CONNECTIONS TO THE SWITCHES ARE POTTED TO AFFORD STRAIN RELIEF, AND PROTECTION AGAINST SHORT CIRCUIT. THE PROCUREMENT SPECIFICATION FOR THE SWITCH INCLUDES THE REQUIREMENT FOR DPA ON SAMPLES FROM EACH DELIVERED LOT.

PREPARED BY: MFWG
SUPERCEDING DATE: 11 SEP 86
APPROVED BY: _____
DATE: _____

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: ROTATIONAL HAND CONTROLLER
SYSTEM: D&C SUBSYSTEM
ASS'Y P/N: ST155E117
SHEET: 2

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
1480	0	VERNIER/ COARSE SWITCH QTY-1 P/N MS27717-23	MODE: 1 CONTINUOUS COARSE COMMANDS. CAUSE(S): (1) SWITCH SHORT CIRCUIT. (2) POLE FAILS TO COARSE (10V).	CONTINUOUS 10V SIGNAL. COARSE WILL BE SELECTED IN GPC. IF IN VERNIER ARM WILL RESPOND IN COARSE INSTEAD OF VERNIER. COULD GET SUDDEN CHANGE TO COARSE WHEN DRIVING IN VERNIER. WORST CASE ---------- UNEXPECTED MOTION. UNEXPECTED COARSE RATES. UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS REMAINING ---------- N/A		ACCEPTANCE TESTS ---------- THE RHC IS SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING AS AN SRU. O VIBRATION: LEVEL AND DURATION REFERENCE TABLE 1 O THERMAL: +120 DEGREES F TO 20 DEGREES F (12 HRS PER CYCLE) 2 CYCLES TOTAL. THE RHC IS TESTED AS PART OF THE D&C SUBSYSTEM; WHICH CONSIST OF D&C PANEL, THC AND RHC; PER IP 347. THE TOTAL D&C SUBSYSTEM UNDERGOES RMS SYSTEM TESTING, (IP 518 RMS STRONGBACK, AND IP552 FLAT FLOOR TESTS) WHICH VERIFIES THE ABSENCE OF THE FAILURE MODE. QUALIFICATIONS TESTS ---------- THE RHC IS CERTIFIED BY SIMILARITY TO THE ORBITER USED RHC EXCEPT FOR FINGER OPERATED SWITCHES. THE BASIC DIFFERENCES IS THAT THE ORBITER RHC IS TRIPLE REDUNDANT AND THE RMS RHC IS SINGLE STRING. FLIGHT CHECKOUT ---------- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987

PREPARED BY: MFWG
SUPERCEDING DATE: 11 SEP 86
APP
DATE:

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: ROTATIONAL HAND CONTROLLER
SYSTEM: D&C SUBSYSTEM
ASS'Y P/N: 5T155E117
SHEET: 3

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE
1490	0	VERNIER/ COARSE SWITCH QTY-1 P/N MS27717-23	MODE: CONTINUOUS COARSE COMMANDS. CAUSE(S): (1) SWITCH SHORT CIRCUIT. (2) POLE FAILS TO COARSE (10V).	CONTINUOUS 10V SIGNAL. COARSE WILL BE SELECTED IN GPC. IF IN VERNIER ARM WILL RESPOND IN COARSE INSTEAD OF VERNIER. COULD GET SUDDEN CHANGE TO COARSE WHEN DRIVING IN VERNIER. WORST CASE ..... UNEXPECTED MOTION. UNEXPECTED COARSE RATES. UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS REMAINING ..... N/A		QA/INSPECTIONS ..... TOGGLE SWITCHES ARE PROCURED TO MS27717 AS REQUIRED BY HONEYWELL DRAWING NO. 10067199. SWITCHES ARE QUALIFIED AND SCREENED TO THE REQUIREMENTS OF MIL-S-83731 AND DRAWING NO. 10067199. QUALIFICATION TESTING OF SWITCHES WAS PERFORMED TO THE REQUIREMENTS OF HONEYWELL TEST PROCEDURE NO. SW-QTP-01. THE SWITCH MECHANISMS AND SWITCHES SUCCESSFULLY COMPLETED 10,000 CYCLES OF LIFE CYCLING. IN ADDITION TO THE 10,000 LIFE CYCLES, THE SWITCH MECHANISMS AND SWITCHES WERE SUBJECTED TO THE QAVT AND FLIGHT VIBRATION REQUIREMENTS OF CAE SPECIFICATION PS 87827.51. PRIOR TO ANY SWITCH CYCLING OR VIBRATION, SWITCH MECHANISM SUB ASSEMBLIES WERE GIVEN A FUNCTIONAL PERFORMANCE TEST ON THE SSHC TEST CONSOLE. DETAILED TEST RESULTS ARE COVERED IN HONEYWELL TEST REPORT NO. AEX-77-059. NASA APPROVAL OF SWITCHES IS UNDER NSPAR 4092 AND NSPAR 4093. WIRE IS PROCURED TO SPECIFICATION MIL-W-22759 OR MIL-W-81381 AND INSPECTED AND TESTED TO NASA JSCM8080 STANDARD NUMBER 95A. RECEIVING INSPECTION VERIFIES THAT SWITCHES RECEIVED ARE AS IDENTIFIED IN THE PROCUREMENT DOCUMENTS, THAT NO PHYSICAL DAMAGE HAS OCCURRED TO SWITCHES DURING SHIPMENT, THAT THE RECEIVING DOCUMENTS PROVIDE ADEQUATE TRACEABILITY INFORMATION AND ACCEPTANCE TEST DATA IDENTIFIES ACCEPTABLE PARTS. PARTS ARE INSPECTED THROUGHOUT MANUFACTURE AND ASSEMBLY AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED. THESE INSPECTIONS INCLUDE, COMPONENT MOUNTING INSPECTION FOR CORRECT SOLDERING, WIRE LOOPING, STRAPPING, ETC. OPERATORS AND INSPECTORS ARE TRAINED AND CERTIFIED TO NASA NHB 5300.4(3A) STANDARD, AS MODIFIED BY JSC 08800A. PRE-CLOSURE INSPECTION, WORKMANSHIP AND CLEANLINESS (CAE/GOVERNMENT REP. - MANDATORY INSPECTION POINT) A TEST READINESS REVIEW (TRR) WHICH INCLUDES VERIFICATION OF TEST PERSONNEL, TEST DOCUMENTS, TEST EQUIPMENT CALIBRATION/ VALIDATION STATUS AND HARDWARE CONFIGURATION IS CONVENED BY QUALITY ASSURANCE IN CONJUNCTION WITH ENGINEERING, RELIABILITY, CONFIGURATION CONTROL, SUPPLIER AS APPLICABLE, AND THE GOVERNMENT REPRESENTATIVE, PRIOR TO THE START OF ANY FORMAL TESTING (ACCEPTANCE OR QUALIFICATION). ACCEPTANCE TESTING (ATP) INCLUDES, AMBIENT, VIBRATION AND THERMAL TESTING (CAE/GOVERNMENT REP. - MANDATORY INSPECTION POINT) INTEGRATION OF D&C PANEL, RHC, THC AND MCIU, INSPECTIONS ARE PERFORMED AT EACH STAGE OF INTEGRATION, WHICH INCLUDES GROUNDING CHECKS, INTER CONNECT CABLE VERIFICATION, CONNECTOR INSPECTION FOR BENT OR PUSHBACK CONTACTS ETC. SUB-SYSTEM PERFORMANCE TESTING (ATP), INCLUDES AN AMBIENT PERFORMANCE TEST. (MANDATORY INSPECTION POINT).

PREPARED BY: MFWG
SUPERCEDING DATE: 11 SEP 86
APPROVED BY: _____ DATE: _____

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: ROTATIONAL HAND CONTROLLER
SYSTEM: D&C SUBSYSTEM
ASS'Y P/N: 51T55ET17
SHEET: 4

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR 7 FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
1480	"D	VERNIER/ COARSE SWITCH QTY-1 P/N MS27717-23	MODE: 1 CONTINUOUS COARSE COMMANDS. CAUSE(S): (1) SWITCH SHORT CIRCUIT. (2) POLE FAILS TO COARSE (10V).	CONTINUOUS 10V SIGNAL. COARSE WILL BE SELECTED IN GPC. IF IN VERNIER ARM WILL RESPOND IN COARSE INSTEAD OF VERNIER. COULD GET SUDDEN CHANGE TO COARSE WHEN DRIVING IN VERNIER. WORST CASE --------- UNEXPECTED MOTION. UNEXPECTED COARSE RATES. UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS REMAINING --------- N/A	1	SRMS SYSTEMS INTEGRATION, THE INTEGRATION OF MECHANICAL ARM SUBASSEMBLIES AND THE FLIGHT CABIN EQUIPMENT TO FORM THE SRMS. INSPECTIONS ARE PERFORMED AT EACH PHASE OF INTEGRATION WHICH INCLUDES GROUNDING CHECKS, THRU WIRING CHECKS, WIRING ROUTING, INTERFACE CONNECTORS FOR BENT OR PUSH BACK CONTACTS ETC. SRMS SYSTEMS TESTING - STRONGBACK AND FLAT FLOOR AMBIENT PERFORMANCE TEST. (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT)

PREPARED BY: MEUG
SUPERCEDING DATE: 11 SEP 86
APPROVE

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: ROTATIONAL HAND CONTROLLER
SYSTEM: D&C SUBSYSTEM
ASS'Y P/N: 51155E117
SHEET: 5

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE
1480	D	VERNIER/ COARSE SWITCH QTY-1 P/N MS27717-23	MODE: CONTINUOUS COARSE COMMANDS. CAUSE(S): (1) SWITCH SHORT CIRCUIT. (2) POLE FAILS TO COARSE (10V).	CONTINUOUS 10V SIGNAL. COARSE WILL BE SELECTED IN GPC. IF IN VERNIER ARM WILL RESPOND IN COARSE INSTEAD OF VERNIER. COULD GET SUDDEN CHANGE TO COARSE WHEN DRIVING IN VERNIER. WORST CASE --------- UNEXPECTED MOTION. UNEXPECTED COARSE RATES. UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS REMAINING ---------- N/A		FAILURE HISTORY ---------- THERE HAVE BEEN NO FAILURES ASSOCIATED WITH THIS FAILURE MODE ON THE SRMS PROGRAM.

PREPARED BY: MEWG
SUPERCEDING DATE: 11 SEP 86
APPROVED BY: _____
DATE: _____

CRITICAL ITEMS LIST

PROJECT: SAMS
ASS'Y NOMENCLATURE: ROTATIONAL HAND CONTROLLER
SYSTEM: D&C SUBSYSTEM
ASS'Y P/N: 51155CT17
SHEET: 10

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDWR / FUNC. I/I CRITICALITY	RATIONALE FOR ACCEPTANCE
1480	1.	VERNIER/ COARSE SWITCH QTY-1 P/N MS27717-23	MODE: CONTINUOUS COARSE COMMANDS. CAUSE(S): (1) SWITCH SHORT CIRCUIT. (2) POLE FAILS TO COARSE (10V).	CONTINUOUS 10V SIGNAL. COARSE WILL BE SELECTED IN GPC. IF IN VERNIER ARM WILL RESPOND IN COARSE INSTEAD OF VERNIER. COULD GET SUDDEN CHANGE TO COARSE WHEN DRIVING IN VERNIER. WORST CASE --- UNEXPECTED MOTION. UNEXPECTED COARSE RATES. UNANNUNCIATED. CREW ACTION REQ. REDUNDANT PATHS REMAINING --- N/A		OPERATIONAL EFFECTS --- THE ARM WILL OPERATE WITH COARSE RATES AT ANY TIME WHILE IN A COMPUTER SUPPORTED MODE. CREW INHERENTLY COMPENSATES FOR CHANGE IN RATE. CREW ACTION --- REDUCE HAND CONTROLLER COMMANDS FOR MANUAL AUGMENTED MODES. FOR SINGLE MODE, THE SWITCH MAY BE TOGGLED TO ACHIEVE REDUCED RATES. FOR AUTO MODES, APPLY BRAKES IF RATE EXCESSIVELY HIGH. CREW TRAINING --- THE CREW WILL BE TRAINED TO ALWAYS OBSERVE WHETHER THE ARM IS RESPONDING PROPERLY TO COMMANDS. IF IT ISN'T THE COMMAND SHOULD BE REMOVED. MISSION CONSTRAINT --- THE OPERATOR MUST BE ABLE TO DETECT THAT THE ARM IS RESPONDING PROPERLY TO COMMANDS VIA WINDOW AND/OR CCTV VIEWS DURING ALL OPERATIONS. SCREEN FAILURES --- N/A ONRSD OFFLINE --- SET VERNIER/COARSE SWITCH TO VERNIER VERIFY COARSE COMMAND CONTINUITY. ONRSD ONLINE INSTALLATION --- NONE ONRSD ONLINE TURNAROUND --- SET VERNIER/COARSE SWITCH TO VERNIER VERIFY RATE NIN TALKBACK ON

PREPARED BY: MWG
SUPERCEDING DATE: 06 OCT 87
APPROVED
DATE: