

CRITICAL ITEMS LIST

PROJECT: SRMS
 ASS'Y NOMENCLATURE: MECHANICAL ARM

SYSTEM: MECHANICAL ARM SUBSYSTEM
 ASS'Y P/N: 51160J1585

SNFET: 1

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HW/R / FUNC. 2/TRA CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-PASS, C-PASS
4040	3	OPTICAL POSITION ENCODER QTY-5 P/N 51160F680-3 AND QTY-1 P/N 51160D231-3	<p>MODE: ERRONEOUS ANGLE OUTPUT.</p> <p>CAUSE(S): (1) TORQUE ARM RESTRAINED BY CABLE HARNESS OR THERMAL BLANKETS.</p>	<p>THE POSITION INFORMATION TO COMPUTER IS UNRELIABLE AND NOT REPRESENTATIVE OF JOINT POSITION. AUTO MODE WILL BE INOPERATIVE. CONSISTENCY CHECK WILL INITIATE AUTO BRAKES. IN AUTO ARM WILL STOP. O RATE COMMAND TO ALL JOINTS. ENCODER CHECK. DIRECT, BACKUP AND SINGLE MODES OPERATIVE. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.</p> <p>WORST CASE ----- UNEXPECTED MOTION. INCORRECT POSITION DATA. AUTO BRAKES.</p> <p>REDUNDANT PATHS REMAINING ----- AUTOBRAKES</p>	<p>DESIGN FEATURES -----</p> <p>THE ENCODER TORQUE ARM, WHICH HOLDS THE ROTOR FIXED TO ONE SIDE OF JOINT, IS INTENTIONALLY MADE OF LIGHT SECTION ALUMINIUM, SO AS TO MINIMIZE ANY IMPARTED STRESS/FORCES INTO THE ENCODER ROTOR ASSEMBLY.</p> <p>CONSEQUENTLY CARE MUST BE TAKEN AT ALL TIMES TO AVOID INTERFERENCE BETWEEN WIRE HARNESSES AND/OR THERMAL BLANKETS WITH THE TORQUE ARM.</p>	

PREPARED BY: MFWG

SUPERCEDING DATE: 24 NOV 86

APPROVED BY:

DATE: 24 JUL 91

CIL REV: 3

CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: MECHANICAL ARM

SYSTEM: MECHANICAL ARM SUBSYSTEM
ASS'Y P/N: 5114011565

SHEET: 2

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDMR / FUNC. 2/1RA CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-PASS, C-PASS
4040	3	OPTICAL POSITION ENCODER QTY-5 P/N 51140F680-3 AND QTY-1 P/N 51140D231-3	<p>MODE: ERRONEOUS ANGLE OUTPUT.</p> <p>CAUSE(S): (1) TORQUE ARM RESTRAINED BY CABLE HARNESS OR THERMAL BLANKETS.</p>	<p>THE POSITION INFORMATION TO COMPUTER IS UNRELIABLE AND NOT REPRESENTATIVE OF JOINT POSITION. AUTO MODE WILL BE INOPERATIVE. CONSISTENCY CHECK WILL INITIATE AUTO BRAKES. IN AUTO ARM WILL STOP, O RATE COMMAND TO ALL JOINTS. ENCODER CHECK, DIRECT, BACKUP AND SINGLE MODES OPERATIVE. LOSS OF LIMPING DURING END EFFECTOR CAPTURE.</p> <p>WORST CASE ----- UNEXPECTED MOTION. INCORRECT POSITION DATA. AUTO BRAKES.</p> <p>REDUNDANT PATHS REMAINING ----- AUTOBRAKES</p>		<p>ACCEPTANCE TESTS ----- THE SHOULDER, ELBOW AND WRIST JOINTS ARE SUBJECTED TO THE FOLLOWING ACCEPTANCE ENVIRONMENTAL TESTING.</p> <p>O VIBRATION: LEVEL AND DURATION - REFERENCE TABLES 9, 10 AND 11.</p> <p>O THERMAL: +70 DEGREES C TO -25 DEGREES C (2 CYCLES) 1 X 10**6 TORR.</p> <p>THE JOINTS ARE INTEGRATED INTO THE RMS SYSTEM (PER TP532) WHICH IS FURTHER TESTED IN (TP516 RMS STRONGBACK AND TP552 FLAT FLOOR). THESE TESTS VERIFIES THE ABSENCE OF THE FAILURE MODE.</p> <p>QUALIFICATION TESTS ----- THE SHOULDER AND WRIST JOINTS WERE SUBJECTED TO THE LISTED BELOW ENVIRONMENTS. THE ELBOW JOINTS WAS NOT EXPOSED THE QUALIFICATION ENVIRONMENTS WAS CERTIFIED BY SIMILARITY TO THE SHOULDER JOINT.</p> <p>O VIBRATION: LEVEL AND DURATION REFERENCE TABLES 9 AND 10</p> <p>O SHOCK: 20G/11 MS - 3 AXES (6 DIRECTIONS)</p> <p>O THERMAL VACUUM: +81 DEGREES C TO -36 DEGREES C (6 CYCLES) 1 X 10**6 TORR.</p> <p>O EMC: MIL-STD-461 AS MODIFIED BY SL-E-0002 (TESTS CE01, CE03, CS01, CS02, CS06, RE02 (N/B).</p> <p>O HUMIDITY: ONLY SHOULDER JOINT WAS TESTED, 95% RH (65 DEGREES C MAINTAINED FOR 6 HRS.) (65 DEGREES C TO 30 DEGREES C IN 16 HRS) 10 CYCLES 240 HRS.</p> <p>O LOAD TEST: SHOULDER JOINT STRUCTURAL LOAD TEST REFERENCE TABLE 12.</p> <p>NOTE: ELBOW JOINT (S/N 302 AND UP) INCORPORATES NON-WELDED TRANSITIONS WHICH WAS LOAD TESTED TO LOAD IN REFERENCE TABLE 18S.</p> <p>FLIGHT CHECKOUT ----- PDRS OPS CHECKLIST (ALL VEHICLES) JSC 16987</p>

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MFVG

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DATE: 24 JUL 91

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CRITICAL ITEM LIST

LINE: SRMS
 ASS'Y Nomenclature: MECHANICAL ARM

SYSTEM: MECHANICAL ARM SUBSYSTEM
 ASS'Y P/N: 51140J1565

SHEET: 3

FMEA REF.	FMEA REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HOWR / FUNC. 2/1RA CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-PASS, C-PASS
4040	3	OPTICAL POSITION ENCODER QTY-5 P/N 51140F680-3 AND QTY-1 P/N 51140D231-3	MODE: ERRONEOUS ANGLE OUTPUT. CAUSE(S): (1) TORQUE ARM RESTRAINED BY CABLE HARNESS OR THERMAL BLANKETS.	THE POSITION INFORMATION TO COMPUTER IS UNRELIABLE AND NOT REPRESENTATIVE OF JOINT POSITION. AUTO MODE WILL BE INOPERATIVE. CONSISTENCY CHECK WILL INITIATE AUTO BRAKES. IN AUTO ARM WILL STOP, O RATE COMMAND TO ALL JOINTS. ENCODER CHECK. DIRECT, BACKUP AND SINGLE MODES OPERATIVE. LOSS OF LIMPING DURING END EFFECTOR CAPTURE. WORST CASE ----- UNEXPECTED MOTION. INCORRECT POSITION DATA. AUTO BRAKES. REDUNDANT PATHS REMAINING ----- AUTOBRAKES	QA/INSPECTIONS ----- PARTS ARE INSPECTED THROUGHOUT MANUFACTURE AND ASSEMBLY AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED. THESE INSPECTIONS INCLUDE, WIRE HARNESSES ARE INSPECTED DURING ASSEMBLY PROCESSES TO SPAR-ITP.251 AS REQUIRED BY SPECIFICATION SPAR-SG420. INSPECTIONS INCLUDE CONTINUITY, LEAKAGE RESISTANCE, WIRE ROUTING, STRAIN RELIEF, LACING AND TIEDOWN ETC. THERMAL BLANKETS ARE INSPECTED AND TESTED TO SPAR DRAWINGS AND SPECIFICATION, AND TO THE REQUIREMENTS OF SPAR INSPECTION TEST PROCEDURE ITP. 256 WHICH INCLUDES THE FOLLOWING INSPECTION LEVELS, INPROCESS, INSTALLATION, PRE-TEST, IN-TEST, POST-TEST AND FINAL INSPECTION. THESE INSPECTIONS INCLUDE: BLANKETS ARE INSPECTED FOR OUTER LAYER DAMAGE, CONTAMINATION, LOOSE OR DAMAGED THREADS, CORRECT STITCHING, PROPER ALIGNMENT AND MATING OF VELCRO, GROUNDING RESISTANCE, SECURE ENGAGEMENT OF SNAP FASTENERS, ETC. INSTALLATION INSPECTION VERIFIES BLANKETS ARE FITTED IN THE CORRECT LOCATION AND ORIENTATION, GOOD CONTACT BETWEEN VELCRO HOOK AND LOOP PADS, CORRECT NUMBER OF GROUNDING LOCATIONS BETWEEN BLANKETS AND STRUCTURE AND ENVELOPE CHECK WHICH IS PERFORMED TO THE APPLICABLE JOINT/END EFFECTOR INSPECTION TEST PROCEDURE. IN-TEST INSPECTION VERIFIES THAT THERE IS NO INTERFERENCE OR OBSTRUCTIONS BETWEEN BLANKETS, GROUNDING WIRES AND ANY MOVING PARTS OF THE SRMS JOINTS AND THAT THERE IS NO EXCESSIVE RUBBING BETWEEN BLANKETS AND SURROUNDING CABLE HARNESSES. PRE-ACCEPTANCE TEST INSPECTION, WHICH INCLUDES AN AUDIT OF LOWER TIER INSPECTION COMPLETION, AS BUILT CONFIGURATION VERIFICATION TO AS DESIGN ETC., (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). JOINT LEVEL ACCEPTANCE TESTING (ATP) INCLUDES AMBIENT, VIBRATION AND THERMAL-VAC TESTING. (SPAR/GOVERNMENT REP. - MANDATORY INSPECTION POINT). 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	

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SHEET: 4

FMEA REF.	FMEA REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. Z/IRA CRITICALITY	RATIONALE FOR ACCEPTANCE SCREENS: A-FAIL, B-PASS, C-PASS
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PREPARED BY: MFNG

SUPERSEDING DATE: 24 NOV 86

RMS/MECH - 224

DATE: 24 JUL 91

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SHEET: 5

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