

**CRITICAL ITEMS LIST**

PROJECT: SRMS

ASS'Y NOMENCLATURE: RIGIDIZE SENSING G.F.

SYSTEM: PAYLOAD GRAPPLE FIXTURE

ASS'Y P/N: 51574F1-183

SHEET: 1

P/N REF.	REV.	NAME, QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RISK / FOMC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
10070	2	GRAPPLE SHAFT RETURN SPRING. QTY-1 SPAR 51573D110	MODE: SHAFT SEIZED IN RETRACTED POSITION.  CAUSE(S): DEBRIS IN SPRING HOUSING.	CARRIAGE WILL NOT REACH FULLY RIGIDIZED POSITION.ARM WILL REMAIN LIMPED DURING AUTO CAPTURE.  WORST CASE ..... UNEXPECTED MOTION. INCOMPLETE RIGIDIZATION. UNANNOUNCIATED. CREW ACTION REQUIRED.  REDUNDANT PATHS REMAINING ..... N/A	DESIGN FEATURES	THE COMPRESSION SPRING P/N 514040109 IS A BOUGHT OUT ITEM. MANUFACTURED FROM SAE 6150 STEEL IN ACCORDANCE WITH ASTM 232 SPECIFICATION. HEAT TREATMENT PER MIL-A-6875, SHOT PEENING PER MIL-F-13165 AND MAGMAFLUX INSPECTION TO MIL-I-6868 ARE OTHER CERTIFICATIONS UNDER WHICH THE SPRING IS PROCURED.

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SHEET: 2

FMEA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
10070	2	GRAPPLE SHAFT RETURN SPRING. QTY-1 SPAR 515730110	MODE: SHAFT SEIZED IN RETRACTED POSITION.  CAUSE(S): DEBRIS IN SPRING HOUSING.	CARRIAGE WILL NOT REACH FULLY RIGIDIZED POSITION. ARM WILL REMAIN LIMPED DURING AUTO CAPTURE.  WORST CASE ----- UNEXPECTED MOTION. INCOMPLETE RIGIDIZATION. UNANNUNCIATED. CREW ACTION REQUIRED.  REDUNDANT PATHS REMAINING ----- N/A		<p>ACCEPTANCE TESTS</p> <p>-----</p> <p>PRIOR TO ITS INSTALLATION TO THE GRAPPLE FIXTURE, EACH SHAFT RETURN SPRING IS SUBJECTED TO THE FOLLOWING WORK-IN TESTS UNDER AMBIENT CONDITIONS: 200 COMPRESSION CYCLES AT MAX OPERATION LOADS OF 675 LBF. FOLLOWING INSTALLATION OF THE SHAFT RETURN SPRING INTO THE GRAPPLE FIXTURE, THE FOLLOWING OPERATIONAL ACCEPTANCE TESTING IS CONDUCTED ON THE GRAPPLE FIXTURE.</p> <p>THE RSGF IS SUBJECTED TO THE FOLLOWING ACCEPTANCE TESTS (REF. SPAR ATP. 1004)</p> <ul style="list-style-type: none"> <li>○ WORK-IN AND INSTALLATION OF THE COMPRESSION SPRING</li> <li>○ VISUAL INSPECTION AND DIMENSIONAL VERIFICATION</li> <li>○ PREPROOF LOAD INSPECTION</li> <li>○ AMBIENT FUNCTIONAL</li> <li>○ PROOF LOAD TEST: AMBIENT CONDITIONS. BENDING MOMENT = 1200 FT.LBF. CORRESPONDING AXIAL LOAD = 2215 LBF. TORSIONAL LOAD = 450 FT.LBF.</li> <li>○ VISUAL INSPECTION AND DIMENSIONAL VERIFICATION (POST PROOF LOAD)</li> <li>○ THERMAL ADEQUACY: THERMAL +93 DEGREE C (200 DEGREE F) TO -80 DEGREE C (-112 DEGREE F). TWO CYCLES AMBIENT PRESSURE.</li> </ul> <p>OPERATIONAL TESTS ARE CONDUCTED AT THE EXTREMITIES OF THE ABOVE ENVIRONMENT AT THE FOLLOWING OPERATIONAL LOAD. AXIAL GRAPPLE SHAFT LOAD = 700 LBF. MAX.</p> <ul style="list-style-type: none"> <li>○ FUNCTIONAL EVA RELEASE TEST</li> </ul> <p>QUALIFICATION TESTS</p> <p>-----</p> <p>QUALIFICATION OF THE RSGF IS BY ANALYSIS SEE ANALYSIS REPORT SPAR-RMS-R 624</p> <p>OPERATIONAL TESTS</p> <p>-----</p> <p>FLIGHT CHECKOUT</p>

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 ASS'Y P/N: 51574F1-1A3

SHEET: 3

ITEM REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	HDMR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
10070	2	GRAPPLE SHAFT RETURN SPRING. QTY-1 SPAR 515730-110	MODE: SHAFT SEIZED IN RETRACTED POSITION.  CAUSE(S): DEBRIS IN SPRING HOUSING.	CARRIAGE WILL NOT REACH FULLY RIGIDIZED POSITION.ARM WILL REMAIN LIMPED DURING AUTO CAPTURE.  WORST CASE  UNEXPECTED MOTION. INCOMPLETE RIGIDIZATION. UNANNUNCIATED. CREW ACTION REQUIRED.  REDUNDANT PATHS REMAINING  N/A	QA/INSPECTIONS	<p>GRAPPLE FIXTURES ARE MANUFACTURED UNDER DOCUMENTED QUALITY CONTROLS BY A SPAR APPROVED SUBCONTRACTOR.THESE CONTROLS ARE EXERCISED THROUGH DESIGN PROCUREMENT, PLANNING, PROCESSING, FABRICATION, ASSEMBLY, TESTING, SHIPPING AND RECEIVING OF UNITS.SPAR/GOVERNMENT REPRESENTATIVE MANDATORY INSPECTION POINTS ARE ENVOCKED ON THE SUBCONTRACTOR AT VARIOUS LEVELS OF ASSEMBLY AND TESTING.</p> <p>RECEIVING INSPECTION VERIFIES THAT ALL PARTS RECEIVED ARE AS IDENTIFIED IN THE PROCUREMENT DOCUMENTS,THAT NO PHYSICAL DAMAGE TO PARTS HAS OCCURRED DURING SHIPMENT AND THAT APPROPRIATE DATA HAS BEEN RECEIVED WHICH PROVIDES ADEQUATE TRACEABILITY INFORMATION AND IDENTIFIES ACCEPTABLE PARTS.</p> <p>PARTS ARE INSPECTED THROUGHOUT MANUFACTURE,ASSEMBLY AND TEST AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED. THESE INSPECTIONS INCLUDE:</p> <p>INSPECTION VERIFIES THAT KITTED PARTS ARE CORRECT PRIOR TO ASSEMBLY AND TRACEABILITY INFORMATION RECORDED.</p> <p>INSPECTION TO DRAWING IS CONDUCTED THROUGHOUT THE ASSEMBLY PROCESS, INCLUDING INSPECTION OF LOCKING, WITNESSING OF TORQUING AND APPLICATION OF TORQUE STRIPING.</p> <p>VISUAL INSPECTION AND CRITICAL DIMENSIONAL VERIFICATION IS PERFORMED TO SPAR INSPECTION TEST PROCEDURE SPAR-RMS-ITP 306 WHICH INCLUDES GROUNDING VERIFICATION, WORKMANSHIP, DIMENSIONAL, WEIGHT, (SPAR/GOVERNMENT REP.-MANDATORY INSPECTION POINT)</p> <p>ACCEPTANCE TESTING (ATP) INCLUDES DIMENSIONAL CHECKS,BREAKOUT AND RUNNING TORQUES,WITHDRANAL AND INSERTION LOADS,PROOF LOADING,FUNCTIONAL TESTING AND GROUNDING TEST. (SPAR/GOVERNMENT REP.- MANDATORY INSPECTION POINT).</p>

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SHEET: 4

PMA REF.	REV.	NAME, QTY, & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	NDR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
10070	2	GRAPPLE SHAFT RETURN SPRING. QTY-1 SPAR 51573D110	MODE: SHAFT SEIZED IN RETRACTED POSITION.  CAUSE(S): DEBRIS IN SPRING HOUSING.	CARRIAGE WILL NOT REACH FULLY RIGIDIZED POSITION. ARM WILL REMAIN LIMPED DURING AUTO CAPTURE.  WORST CASE UNEXPECTED MOTION, INCOMPLETE RIGIDIZATION. (UNANNUNCIATED, CREW ACTION REQUIRED).  REDUNDANT PATHS REMAINING ..... N/A	FAILURE HISTORY ----- NONE	

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SHEET: 5

PNEA REF.	REV.	NAME QTY & DRAWING REF. DESIGNATION	FAILURE MODE AND CAUSE	FAILURE EFFECT OR END ITEM	RDWR / FUNC. 1/1 CRITICALITY	RATIONALE FOR ACCEPTANCE
10070	2	GRAPPLE SHAFT RETURN SPRING. QTY-1 SPAR 515730110	MODE: SHAFT SEIZED IN RETRACTED POSITION.  CAUSE(S): DEBRIS IN SPRING HOUSING.	CARRIAGE WILL NOT REACH FULLY RIGIDIZED POSITION.ARM WILL REMAIN LIMPED DURING AUTO CAPTURE.  WORST CASE  UNEXPECTED MOTION. INCOMPLETE RIGIDIZATION. UNANNUNCIATED. CREW ACTION REQUIRED.  REDUNDANT PATHS REMAINING  N/A	1/1	<p><b>OPERATIONAL EFFECTS</b></p> <p>UNABLE TO FULLY RIGIDIZE PAYLOAD.ARM WILL REMAIN LIMP IF IN AUTO MODE,OPERATOR WILL DETECT OFF NOMINAL OPERATION OF THE EE.</p> <p><b>CREW ACTION</b></p> <p>THE EE MODE SWITCH SHOULD BE TURNED OFF.CREW SHOULD OBSERVE THE CAPTURE SEQUENCE AND DETERMINE THAT THE GRAPPLE FIXTURE HAS BEEN DRAWN FAR ENOUGH INTO THE EE TO PROHIBIT PAYLOAD ROTATIONS.IF THE INTERFACE DOES NOT APPEAR RIGID,ATTEMPT TO RIGIDIZE IN THE ALTERNATE MODE.IF RIGIDIZE IS UNSUCCESSFUL,ATTEMPT TO RELEASE USING A PRIMARY EE MODE.IF SNARES DON'T OPEN,ATTEMPT TO RELEASE IN BACK-UP MODE.IF SNARES OPEN,MANEUVER ARM AWAY FROM THE PAYLOAD.IF SNARES CANNOT BE OPENED IN ANY MODE,THEN THE ARM/PAYLOAD COMBINATION CAN BE JETTISONED.</p> <p><b>CREW TRAINING</b></p> <p>CREW TO BE TRAINED TO RECOGNIZE OFF NOMINAL OPERATION OF THE EE AND TO TURN MODE SWITCH TO OFF AFTER SPEC TIME AND MANEUVER THE ORBITER AWAY FROM A FREE FLYING PAYLOAD AT ANY TIME DURING ARM OPERATIONS.</p> <p><b>MISSION CONSTRAINT</b></p> <p>WHEN CAPTURING A FREE FLYING PAYLOAD,THE EE MUST BE FAR ENOUGH AWAY FROM STRUCTURE TO PROHIBIT CONTACT REGARDLESS OF PAYLOAD ROTATIONS.</p> <p><b>SCREEN FAILURES</b></p> <p>N/A</p>