CRITICAL ITEMS LIST

PROJECT: SRMS
ASS'Y NOMENCLATURE: FLIGHT RELEASABLE
SYSTEM: PAYLOAD GRAPPLE FIXTURE
ASS'Y P/N: 5145OF1-1
SHEET: 1

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
10000	0	GRAPPLE TIP RETAINING ASSEMBLY QTY-1 P/N NAS 1134E2	MODE: LOSS OF EE RIGIDIZE FORCE. CAUSE(S): FAILURE OF TIP RETAINING SCREW OR INSERT.	PAYLOAD RELEASED. WORST CASE --- UNCOMMANDED RELEASE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- N/A		DESIGN FEATURES --- THE GRAPPLE TIP RETAINING SCREW .250-28 UNF-3A P/N NAS 1134E2 IS A BOUGHT OUT PART AND MANUFACTURED FROM 160-180 KSI CORROSION RESISTANT STEEL PER AMS 5737 (A286). THE INTERNAL LOCKING HELICOIL INSERT P/N MS 21209-F4-10L IS A BOUGHT OUT PART AND MANUFACTURED FROM CORROSION RESISTANT STEEL MIL-I-6846. THE THREADS OF THE INSERT ARE DRY FILM LUBRICATED PER MIL-L-8937 TO PREVENT GALLING OF THE RETAINING SCREW THREADS. REF.TABLE 16 FOR FRGF MARGINS OF SAFETY.

PREPARED BY: NHNG
SUPERCEDING DATE: 11 SEP 86
APPROVED BY:
DATE:

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ASS'Y NOMENCLATURE: FLIGHT RELEASABLE

SYSTEM: PAYLOAD GRAPPLE FIXTURE
ASS'Y P/N: 51450F1-1

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
10000	0	GRAPPLE TIP RETAINING ASSEMBLY QTY-1 P/N NAS 1134E2	MODE: LOSS OF EE RIGIDIZE FORCE. CAUSE(S): FAILURE OF TIP RETAINING SCREW OR INSERT.	PAYLOAD RELEASED. WORST CASE --- UNCOMMANDED RELEASE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- N/A	ACCEPTANCE TESTS --- THE FRGF IS SUBJECTED TO THE FOLLOWING ACCEPTANCE TESTS. (REF.SPAR-ATP 1058) O VISUAL INSPECTION AND DIMENSIONAL VERIFICATION O PROOF LOAD TEST:THE FOLLOWING ACCEPTANCE LOAD TEST IS CONDUCTED ON ALL FLIGHT UNITS UNDER AMBIENT CONDITIONS.THIS TEST VERIFIES THE INTEGRITY OF THE GRAPPLE TIP ASSEMBLY. RETAINING SCREW AT DESIGN LIMIT LOAD. GRAPPLE SHAFT AXIAL LOAD = 2215 LBF. (RESULTING FROM 1200 FT.LBF.BENDING MOMENT. O DIMENSIONAL VERIFICATION (POST PROOF LOAD) O FULL FUNCTION TEST (AMBIENT) O DIMENSIONAL VERIFICATION (POST LOAD/FUNCTIONAL) O GROUND VERIFICATION TEST QUALIFICATION TESTS --- THE FRGF IS SUBJECTED TO THE FOLLOWING QUALIFICATION TEST ENVIRONMENTS (REF SPAR DIP. 902) O VIBRATION:LEVEL AND DURATION- REFERENCE TABLE 15 O SHOCK:20G/11 MS (3 AXES <6 DIRECTIONS) O THERMAL OPERATIONAL:+ 80 DEGREE C TO - 87 DEGREES C (2 CYCLES) O STRUCTURAL ADEQUACY TESTS : --- LOAD CASE A:(LOADS APPLIED SIMULTANEOUSLY) BENDING MOMENT = 1680 FT.LBF (1.4 X DESING LIMIT) CORRESPONDING GRAPPLE SHAFT RADIAL LOAD = 3101 LBF. TORSIONAL LOAD = 630 LBF. LOAD CASE B: (LOADS APPLIED SIMULTANEOUSLY) BENDING MOMENT = 1260 FT.LBF. CORRESPONDING GRAPPLE SHAFT AXIAL LOAD = 2325 LBF. TORSIONAL LOAD = 980 LBF. AMBIENT OPERATIONAL TESTS --- FLIGHT CHECKOUT ---

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10000	0	GRAPPLE TIP RETAINING ASSEMBLY QTY-1 P/N NAS 1134E2	MODE: LOSS OF EE RIGIDIZE FORCE. CAUSE(S): FAILURE OF TIP RETAINING SCREW OR INSERT.	PAYLOAD RELEASED. WORST CASE --- UNCOMMANDED RELEASE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- N/A		QA/INSPECTIONS --- 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 ENVOKED ON THE SUBCONTRACTOR AT VARIOUS LEVELS OF ASSEMBLY AND TESTING. THE GRAPPLE TIP RETAINING SCREW PART NO. NAS1134E2 IS A STANDARD .25 .250-28UNF3A PAN HEAD TORQUE SCREW PROCURED TO NASA SPEC NAS-1134. 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. PARTS ARE INSPECTED THROUGHOUT MANUFACTURE, ASSEMBLY AND TEST AS APPROPRIATE TO THE MANUFACTURING STAGE COMPLETED. THESE INSPECTIONS INCLUDE: INSPECTION VERIFIES THAT KITTED PARTS ARE CORRECT PRIOR TO ASSEMBLY AND TRACEABILITY INFORMATION RECORDED. INSPECTION TO DRAWING IS CONDUCTED THROUGHOUT THE ASSEMBLY PROCESS, INCLUDING INSPECTION OF LOCKING, WITNESSING OF TORQUING AND APPLICATION OF TORQUE STRIPING. 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) ACCEPTANCE TESTING (ATP) INCLUDES DIMENSIONAL CHECKS, BREAKOUT AND RUNNING TORQUES, WITHDRAWAL AND INSERTION LOADS, PROOF LOADING, FUNCTIONAL TESTING AND GROUNDING TEST. (SPAR/GOVERNMENT REP.- MANDATORY INSPECTION POINT).

PREPARED BY: HIWG
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SYSTEM: PAYLOAD GRAPPLE FIXTURE
ASS'Y P/N: 51450F1-1

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10000	0	GRAPPLE TIP RETAINING ASSEMBLY QTY-1 P/N NAS 1134E2	MODE: LOSS OF EE RIGIDIZE FORCE. CAUSE(S): FAILURE OF TIP RETAINING SCREW OR INSERT.	PAYLOAD RELEASED. WORST CASE --- UNCOMMANDED RELEASE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- N/A	FAILURE HISTORY --- NONE	
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10000	0	GRAPPLE TIP RETAINING ASSEMBLY QTY-1 P/N NAS 1134E2	MODE: LOSS OF EE RIGIDIZE FORCE. CAUSE(S): FAILURE OF TIP RETAINING SCREW OR INSERT.	PAYLOAD RELEASED. WORST CASE --- UNCOMMANDED RELEASE. CREW ACTION REQUIRED. REDUNDANT PATHS REMAINING --- N/A		OPERATIONAL EFFECTS --- PAYLOAD WILL BE RELEASED WITHOUT AN OPERATOR COMMAND.UNCOMMANDED RELEASE WILL BE ANNUNCIATED.IF THIS OCCURS WHILE THE ARM IS BEING DRIVEN.THE PAYLOAD WILL TAKE AN UNEXPECTED TRAJECTORY.DURING CAPTURE SEQUENCE ARM REMAINS LIMP UNTIL EE MODE SWITCH SET TO OFF. CREW ACTION --- MANEUVER ARM AND ORBITER AWAY FROM PAYLOAD. CREW TRAINING --- THE CREW WILL BE TRAINED TO MANEUVER THE ORBITER AWAY FROM A FREE FLYING PAYLOAD AT ANY TIME DURING ARM OPERATIONS. MISSION CONSTRAINT --- OPERATE UNDER VERNIER RATES WITHIN 10 FT.OF STRUCTURE. THE ARM WILL NOT BE DRIVEN UNLESS THE CREW IS OBSERVING THE EXPECTED MOTION OF THE ARM/PAYLOAD STRUCTURE VIA WINDOW AND/OR CCTV VIEWS. EE MODE SWITCH SET TO OFF POSTION IMMEDIATELY AFTER SPEC DRIVE TIME HAS ELAPSED. WHEN CAPTURING A FREE FLYING PAYLOAD,THE EE MUST BE FAR ENOUGH AWAY FROM STRUCTURE TO PROHIBIT CONTACT REGARDLESS OF PAYLOAD ROTATIONS. SCREEN FAILURES --- N/A

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