

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :SEPARATION MECHANISMS-PYRO FMEA NO P2-3A -F3 -1 REV:10/09/87

ASSEMBLY :FORWARD SEPARATION BOLT
P/N RI :SKD26100098-245
P/N VENDOR:
QUANTITY :1

	VEHICLE	102	103	104	
CRIT. FUNC:					1
CRIT. HDW:					1
EFFECTIVITY:		X	X	X	
PHASE(S):	PL X	LO X	OO	DO	LS

PREPARED BY:	DES	R. H. YEE	APPROVED BY:	DES	<i>R. H. YEE</i>	REDUNDANCY SCREEN:	A-	B-	C-
REL	M. B. MOSKOWITZ	REL	<i>John J. ...</i>	SSM	<i>John J. ...</i>	APPROVED BY (NASA):			
QE	E. M. GUTIERREZ	QE	<i>John J. ...</i>	QE	<i>John J. ...</i>				

10/11/87
Run for T. Graves
10-27-87

ITEM:
FORWARD ATTACH SHEAR BOLT

FUNCTION:
STRUCTURALLY TIES TOGETHER THE ORBITER/EXTERNAL TANK (ET) AT FORWARD ATTACH POINT. FRACTURES UPON RECEIVING A PRESSURE OUTPUT FROM EITHER OR BOTH CARTRIDGES.

FAILURE MODE:
PREMATURE BOLT FRACTURE

CAUSE(S):
IMPROPER MACHINING AT SEPARATION AREA, MATERIAL DEFECT, INTERNAL CORROSION, EXCESSIVE PRELOAD/LOW PRELOAD, EXCESSIVE FRICTION IN MULTIPIECE SPHERICAL BEARING (FMEA/CIL G2-3A-F4-1), PREMATURE PYRO FIRING (FMEA/CIL P2-3A-F1-2)

EFFECT(S) ON:
(A)SUBSYSTEM (B)INTERFACES (C)MISSION (D)CREW/VEHICLE
(A,B,C,D) LOSS OF FUNCTION - POSSIBLE LOSS OF CREW/VEHICLE DUE TO LOSS OF ORBITER/ET STRUCTURAL INTEGRITY.

DISPOSITION & RATIONALE:
(A)DESIGN (B)TEST (C)INSPECTION (D)FAILURE HISTORY (E)OPERATIONAL USE

(A) DESIGN
SAFETY FACTOR EQUAL OR GREATER THAN 1.4. BREAKOUT TORQUE OF 100 INCH-LB MAXIMUM WHILE IN MULTIPIECE SPHERICAL BEARING, BOLT SHANK STRAIN GAUGES PROVIDE ACCURATE PRELOAD READOUT DURING ORBITER/EXTERNAL TANK MATE. BOLT IS INCONEL 718 FOR CORROSION PROTECTION (ULTIMATE TENSILE 180-200 KSI).

(B) TEST
COMPONENT QUALIFICATION TESTS: TENSION/SHEAR-LIMIT, ULTIMATE LOADS, AND SALT FOG. CERTIFICATION REQUIREMENTS (CR) 45-325-0014.

SYSTEM QUALIFICATION TESTS: 9 FIRINGS AT AMBIENT (6 UNDER LOAD), STATIC LIMIT AND ULTIMATE LOADS TESTS. CR-45-362001.

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ACCEPTANCE TESTS: 100% DYE PENETRANT, 100% ULTRASONIC TEST ON SHANKS AND HOUSINGS, 100% HOUSINGS HYDROSTATICALLY PROOF PRESSURE TESTED. 100% SHANK HARDNESS TEST, 100% SHANK PROOF LOAD, TENSILE TEST COUPONS FOR HOUSING, PISTON, AND SHANKS VERIFIES MATERIAL INTEGRITY. PROOF TEST ACCEPTANCE CRITERIA IS NO EVIDENCE OF CRACKS, DEFORMATION, OR PERMANENT SET. CR-45-325-0014, ATP 8664; SKD26100098, ATP 8875.

OMRSD: TURNAROUND TESTS INCLUDE - SPHERICAL BEARING ASSEMBLY BREAKOUT TORQUE VERIFICATION AFTER EACH FLIGHT, BOLT/BEARING ASSEMBLY VERIFICATION FOR NO BINDING DURING BUILD-UP, POST-TORQUE EXPOSED THREAD CHECK, FORWARD SEPARATION BOLT/NUT THREAD INSPECTION, AND BOLT PRELOAD TORQUE VERIFICATION AFTER 12 HOUR HOLD PER MLO302-0016. NEW HARDWARE INSTALLED EACH FLIGHT.

) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL IS VERIFIED BY INSPECTION TO ASSURE SPECIFIC SHUTTLE REQUIREMENTS ARE SATISFIED.

CONTAMINATION CONTROL

CONTAMINATION CONTROL AND CORROSION PROTECTION PROCESSES VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

SHANKS 100% DIMENSIONALLY VERIFIED AT SEPARATION CROSS SECTION. SELECTED MANUFACTURING/ASSEMBLY STEPS ARE IDENTIFIED BY NASA AND QUALITY ASSURANCE AND VERIFIED BY GOVERNMENT INSPECTION MANDATORY INSPECTION POINTS (MIPS).

NONDESTRUCTIVE EVALUATION

ONE HUNDRED PERCENT VISUAL INSPECTION, IDENTIFICATION PERFORMED, PARTS PROTECTION VERIFIED BY INSPECTION.

CRITICAL PROCESSES

ALL MANUFACTURING PROCESSES SUCH AS WELDING, PLATING, HEAT TREATING, PASSIVATION AND ANODIZING ARE VERIFIED BY INSPECTION.

STORAGE

STORAGE ENVIRONMENT VERIFIED BY INSPECTION.

FAILURE HISTORY

NONE.

OPERATIONAL USE

NONE.