

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :FLT CONT MECH-R/SB & BF FMEA NO 02-2A-011108-2 REV:02/02/88

ASSEMBLY :RUDDER/SPEEDBRAKE (R/SB)				CRIT. FUNC:	1
P/N RI :MC621-0053-0068				CRIT. HDW:	1
P/N VENDOR:SUN 5004918B		VEHICLE	102	103	104
QUANTITY :6		EFFECTIVITY:	X	X	X
:3 PER RUDDER &		PHASE(S):	PL	LO	OO DO X LS
:SPEEDBRAKE					

		REDUNDANCY SCREEN:	A-	B-	C-
PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):		
DES P. B. REESE		DES <i>[Signature]</i>	SSM	<i>[Signature]</i>	
REL J. S. MULLEN		REL <i>[Signature]</i>	REL	<i>[Signature]</i>	4/8/88
QE W. J. SMITH		QE <i>[Signature]</i>	QE	<i>[Signature]</i>	

ITEM:

HYDRAULIC MOTOR

FUNCTION:

THREE HYDRAULIC MOTORS PROVIDE RPM/TORQUE INPUTS INTO FIRST AND SECOND STAGE RUDDER OR SPEEDBRAKE SUMMER DIFFERENTIALS.

FAILURE MODE:

NO RPM/TORQUE OUTPUT, OPEN DRIVE LINE

CAUSE(S):

SHEARED SHAFT/SPLINE, DAMAGED OR WORN CYLINDER BARREL/VALVE PLATE, CONTAMINATION

EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) REMAINING TWO HYDRAULIC MOTOR RPM/TORQUE OUTPUTS BACKDRIVE FAILED HYDRAULIC MOTOR, RESULTING IN LOSS OF RUDDER OR SPEEDBRAKE FUNCTIONS.

(B) NONE.

(C,D) LOSS OF MISSION, CREW/VEHICLE.

DISPOSITION AND RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN

SHEAR SECTION ON HYDRAULIC MOTORS SIZED 3X OPERATING. SEQUENTIAL HYDRAULIC DEPRESSURIZATION 1-2,1-3,2-3 CHECKS ALL COMBINATIONS AND DETECTS FAILURE. CONSERVATIVE DESIGN 3X ON SHAFTS AND SPLINES. DESIGNED TO MEET MIL-H-5440. HYDRAULIC MOTOR DESIGNED FOR 250 HRS VS SHUTTLE USE OF 16 HOURS. VALVE PLATE AND CYLINDER BARREL SURFACES ARE SURFACE TREATED AND MICRO FINISHED TO NEAR OPTICAL FLATNESS TO MINIMIZE WEAR. CYLINDER BARREL SUPPORT BEARINGS DESIGNED TO STABILIZE BARREL IN OPERATION. 5 MICRON HYDAULIC SYSTEM FILTRATION FOR POTENTIALLY DAMAGING CONTAMINANTS.

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(B) TEST

QUALIFICATION TESTS: QUALIFICATION TESTED OVER 250 HRS - BURST TEST 7,500 PSI. PERFORMANCE, OPERATING LIFE, ULTIMATE LOAD AND IMPULSE CYCLING. POWER DRIVE UNIT (PDU) QUALIFICATION TEST - THERMAL CYCLE -40 DEG F TO +275 DEG F.

ACCEPTANCE TESTS: SHAFT AND SPLINES STRENGTH VERIFIED 1.5 X OPERATING PRESSURE DURING MOTOR ACCEPTANCE TEST PROCEDURE (ATP) AND DURING PDU ATP. PROOF PRESSURE, PROOF LOW PRESSURE, QUIESCENT LEAKAGE, FAILURE MODE TEST AND FUNCTIONAL TEST.

OMRSD: RUDDER INDIVIDUAL MOTOR 1 DRIVE TEST, RUDDER INDIVIDUAL MOTOR 2 AND 3 DRIVE TEST, SPEEDBRAKE INDIVIDUAL MOTOR 1 DRIVE TEST, SPEEDBRAKE INDIVIDUAL MOTOR 2 AND 3 DRIVE TEST. FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND.

(C) INSPECTION

RECEIVING INSPECTION

MATERIAL AND PROCESSES CERTIFICATIONS VERIFIED. CERTIFICATION OF HEAT TREAT HARDNESS IS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCEDURES AND PRACTICES VERIFIED. CLEANLINESS OF WETTED SURFACES TO LEVEL 190 VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

TORQUE VALUES VERIFIED AND RECORDED. ASSEMBLY AND INSTALLATION OPERATIONS VERIFIED BY SHOP TRAVELER MANDATORY INSPECTION POINTS. SHAFT AND SPLINE MATERIAL VERIFIED PER DRAWING. MICRO FINISH OF VALVE PLATE AND CYLINDER BARREL SURFACES IS VERIFIED BY INSPECTION. SURFACE TEMPER INSPECTION (NITAL ETCH TO VERIFY MICROSTRUCTURE) IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

MAGNETIC PARTICLE INSPECTION AND ULTRASONIC INSPECTION ARE VERIFIED.

CRITICAL PROCESSES

HEAT TREAT, ELECTROLESS NICKEL PLATING, DRY FILM LUBRICANT, SHOT PEENING, AND GRIT BLASTING ARE VERIFIED.

TESTING

CERTIFICATIONS OF ACCEPTANCE TESTS VERIFIED.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NONE.

(E) OPERATIONAL USE

NONE.