

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING DECELERATION FMEA NO 02-1F -H01-CC-J01 REV:06/27/80

ASSEMBLY : NLG STRUT ACTUATOR
P/N RI : MC287-0034
P/N VENDOR: PARKER-BERTEA
QUANTITY : 1
: ONE PER ACTUATOR
:

VEHICLE	102	103	104
EFFECTIVITY:	X	X	X
PHASE(S):	PL LO	OO	DO X LS

CRIT. FUNC: 1R
CRIT. HDW: 2

PREPARED BY:		REDUNDANCY SCREEN:	A-PASS B-FAIL C-PASS
DES	N LEVERT	APPROVED BY:	APPROVED BY (NASA):
REL	C NELSON	DES	SSM R. Balceras
QE	M SAVALA	REL	REL [Signature]
		QE	QE [Signature]

ITEM:
CHECK VALVE, CAVITATION

FUNCTION:
PERMITS FLUID FROM SUPPLY TO ENTER THE PISTON END OF THE CYLINDER DURING GEAR EXTENSION PHASE TO PREVENT CAVITATION. PREVENTS REVERSE FLOW (BACKWASHING) THROUGH THE EXTEND PORT FILTER DURING GEAR RETRACT PHASE AND MAINTAINS FLUID IN THE ACTUATOR IN THE EVENT OF UPSTREAM LINE FAILURE.

FAILURE MODE:
FAILS OPEN

CAUSE(S):
CONTAMINATION, BROKEN SPRING

EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
(A) AT DOWN GEAR COMMAND - LOSS OF ACTUATOR DAMPING FUNCTION.
(B) POTENTIAL FOR LANDING GEAR DAMAGE DUE TO EXCESSIVE DEPLOYMENT VELOCITY.
(C,D) POTENTIAL FOR LOSS OF CREW/VEHICLE WITH TWO FAILURES, RUPTURE OF RETURN LINE BETWEEN ACTUATOR AND RETURN LINE CHECK VALVE AND ACTUATOR CHECK VALVE FAILING OPEN PERMITTING EXCESSIVE VELOCITY OF GEAR DEPLOYMENT WHICH MAY RESULT IN DAMAGE/LOSS OF LANDING GEAR.
(E) FUNCTIONAL CRITICALITY EFFECTS-SEE ITEM (D) ABOVE. "B" SCREEN : FAILED BECAUSE THERE IS NO INFLIGHT INSTRUMENTATION AND THIS FAILURE WOULD ONLY MANIFEST ITSELF UNDER A RUPTURED LINE CONDITION.

DISPOSITION & RATIONALE:
(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE-HISTORY (E) OPERATIONAL USE
(A) DESIGN
ANTICAVITATION ORIFICE UPSTREAM OF CHECK VALVE HAS AN 80 MICRON FILTER AT EACH END. SYSTEM CLEANLINESS IS TO LEVEL 220 PER MA0110-301. EXTEND & RETRACT PORTS ARE PROTECTED WITH AN 80 MICRON FILTER. CHECK VALVE

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INCORPORATES INNER AND OUTER (DUAL) NESTED SPRINGS. THE SPRINGS ARE MADE FROM CORROSION RESISTANT MATERIAL (17-7PH) WITH MODERATE STRESS AND GUIDED.

(B) TEST

QUALIFICATION-RANDOM VIBRATION 0.5 G²/HZ, 14 MINUTES AT EACH AXIS AND 0.07 G²/HZ, 34 MINUTES AT EACH AXIS. ENDURANCE TESTS, 100 DUTY CYCLES EACH TEMPERATURE: -40, 20, 90 AND 160 DEGREES F. ONE DUTY CYCLE EQUALS 10 DEPLOY/RETRACT SEQUENCE. ACTUATOR EXTEND TIME TEST, PROOF PRESSURE TEST, PERFORMANCE RECORD TEST INCLUDING HIGH PRESSURE STATIC EXTERNAL LEAKAGE TEST, LOW PRESSURE STATIC EXTERNAL LEAKAGE TEST AND DYNAMIC SEAL LEAKAGE TEST. POST TEST PROCEDURE INCLUDES DISASSEMBLY AND INSPECTION OF WORKING COMPONENTS. 400 FULL STROKE CYCLES WERE CONDUCTED ON LANDING GEAR TEST ARTICLE (SIMULATOR).

ACCEPTANCE-ACTUATOR EXTEND TIME TEST, PERFORMANCE RECORD TEST INCLUDING HIGH PRESSURE STATIC EXTERNAL LEAKAGE TEST, LOW PRESSURE STATIC EXTERNAL LEAKAGE TEST AND DYNAMIC SEAL LEAKAGE TEST. CHECK VALVE IS TESTED AT INDIVIDUAL COMPONENT LEVEL FOR CRACK, RESEAT AND PROPER FLOW. UT CLEANLINESS TEST.

OMRSD-TIMED LANDING GEAR EXTENSION EVERY TURNAROUND.

(C) INSPECTION

RECEIVING INSPECTION

CERTIFICATION RECORDS AND CERTIFIED TEST REPORTS ARE MAINTAINED ON CERTIFYING MATERIAL AND PHYSICAL PROPERTIES.

CONTAMINATION CONTROL

SUPPLIER TEST STAND FLUID PARTICLE COUNT CHECKED TWICE A DAY, WHERE APPLICABLE. FLUID CONTAMINATION PARTICLE COUNT CONDUCTED PRIOR TO ATP. AFTER ATP, A FLUID SAMPLE IS DRAWN TO VERIFY FLUID CLEANLINESS. IF CONTAMINATED, ACTUATOR IS CYCLED AND FLUSHED UNTIL CONFIRMATION OF CLEANLINESS IS ATTAINED.

CRITICAL PROCESSES

HEAT TREATMENT IS VERIFIED BY INSPECTION.

NDE

INSPECTION VERIFIES THAT SPRINGS ARE BOTH MAGNETIC PARTICLE AND PENETRATION TESTED. OTHER DETAIL PARTS ARE MAGNETIC PARTICLE OR PENETRATION TESTED, DEPENDING ON THE ALLOY, AND VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

INSPECTION OF SPRING DIMENSIONS AND OTHER DIMENSIONS IS VERIFIED BY QUALITY CONTROL WITNESSES SEAL AND BACKUP RING INSTALLATION. O-RING GROOVES AND SEAL FACES INSPECTED FOR PROPER FINISH. ALL SEALS INSPECTED PRIOR TO INSTALLATION. COMPONENT PARTS VERIFIED UNDAMAGED PRIOR TO CLEANING AND PACKAGING.

TESTING

ATP IS VERIFIED BY INSPECTION.

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HANDLING/PACKAGING

PARTS PROTECTION TO PRECLUDE CONTAMINATION DURING SHIPMENT IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

THERE IS NO HISTORY OF FAILURE FOR THIS FAILURE MODE.

(E) OPERATIONAL USE

NONE