

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING DECELERATION FMEA NO 02-1F -G09-SV-B02 REV:06/27/8

ASSEMBLY : MLG STRUT ACTUATOR
P/N RI : MC287-0034
P/N VENDOR: PARKER-BERTEA
QUANTITY : 2
: ONE PER MLG STRUT
:

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

CRIT. FUNC:
CRIT. HDW: 1
104 X
X X
DO X LS

PREPARED BY: DES N LEVERT
REL C NELSON
QE M SAVALA
REDUNDANCY SCREEN: A-N/A B-N/A C-N/A
APPROVED BY: DES N. Levert
REL C. Nelson
QE M. Savala
APPROVED BY (NASA): SSM R. Balaraman
REL R. Balaraman
QE R. Balaraman

ITEM:
VALVE, SHUTTLE

FUNCTION:
THE SHUTTLE VALVE IS A TWO-POSITION PRESSURE OPERATED VALVE. WHEN IN NORMALLY OPEN POSITION IT PERMITS FLOW FROM THE NET SIDE TO THE GROUND SIDE OF THE ACTUATOR PISTON THROUGH THE TIMING ORIFICE FOR THE GEAR EXTENSION PHASE. WHEN ACTUATED CLOSED, DURING GROUND OPERATIONS, THE VALVE PERMITS FLOW THROUGH THE RETRACT PORT TO ENTER THE NET SIDE OF THE PISTON TO ACHIEVE GEAR RETRACTION.

FAILURE MODE:
FAILS CLOSED

CAUSE(S):
BROKEN SPRING, CONTAMINATION

- EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
(A, B) GEAR WILL NOT EXTEND DUE TO HYDRAULIC LOCKUP.
(C) NONE, COMMITTED TO LAND.
(D) POSSIBLE LOSS OF CREW/VEHICLE IF GEAR DOES NOT DEPLOY.

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

(A) DESIGN
SPOOL/SLEEVE SAME MATERIAL/THERMAL EXPANSION LAPPED ASSEMBLY. HARD MATERIAL IS USED TO PREVENT GALLING. RELIEF GROOVES IN SPOOL LANDS ARE USED TO CLEAR SILTING. SPOOL LANDS DO NOT CROSS PORTS. COMBINED SPRING (500 POUNDS) AND EXTEND PRESSURE (2,260 PSI) EQUALS 3,480 POUNDS. RETURN SPRINGS ARE CORROSION RESISTANT WITH MODERATE STRESS AND ARE GUIDED. MICRON FILTRATION AT EXTEND/RETURN PORTS. VALVE POSITION (OPEN) FOLLOWING RAISING GEAR, IS MONITORED PRIOR TO LAUNCH. FLIGHT PROCEDURE AND SYSTEM OPERATING CONDITIONS, (SUBSEQUENT TO LAUNCH AND PRIOR TO DEPLOYMENT GEAR COMMAND), KEEP VALVE IN OPEN POSITION. (HYDRAULIC SYSTEM ISOLATION VALVE IS CLOSED UNTIL PRIOR TO LANDING.)

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(B) TEST

QUALIFICATION-RANDOM VIBRATION 0.4 G²/HZ, 12 MINUTES AT EACH AXIS
0.14 G²/HZ, 34 MINUTES AT EACH AXIS. ENDURANCE-100 DUTY CYCLES AT
TEMPERATURE: -35, 20, 90 AND 140 DEGREES F. ONE DUTY CYCLE EQUALS
DEPLOY/RETRACT SEQUENCE. 400 FULL STROKE CYCLES WERE CONDUCTED
LANDING GEAR TEST ARTICLE (SIMULATOR).

ACCEPTANCE-SPOOL/SLEEVE VERIFIED NO JAMMING AT -65 AND 275 DEGREES
THEN IDENTIFIED/CONTROLLED AS MATCHED SERIAL PART LEVEL ACCEPTANCE
ACTUATION AND RESEAT PRESSURE, FLOW/DELTA PRESSURE AND INTERNAL LEAK
ACTUATION/RESEAT PRESSURE REVERIFIED AT ASSEMBLY LEVEL.

OMRSD-EXTEND RIGHT AND LEFT MAIN LANDING GEAR FROM CREW STATION
PERFORMED PRIOR TO EACH MISSION. POST LANDING HYDRAULIC RESERVE
EFFLUENT SAMPLES, PERFORMED AFTER EVERY FLIGHT. VERIFY THAT RESULTS
FLUID SAMPLE CONTAMINATION MEET SPECIFICATION. GENERAL REQUIREMENT 5
VERIFY ALL HYDRAULIC FLUID USED TO SERVICE VEHICLE IS PER MIL-H-83282.

(C) INSPECTION

RECEIVING INSPECTION

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

CONTAMINATION CONTROL

SYSTEM CLEANLINESS IS VERIFIED TO LEVEL 220 PER MAO110-301. FLUID
CONTAMINATION PARTICLE COUNT CONDUCTED PRIOR TO ATP. AFTER ATP, A FLUID
SAMPLE IS DRAWN TO VERIFY FLUID CLEANLINESS. IF CONTAMINATED, ACTUATION
IS CYCLED AND FLUSHED UNTIL CONFIRMATION OF CLEANLINESS IS ATTAINED.
PORTS ARE CAPPED WITH CLOSURES CLEANED TO MEET CLEANLINESS REQUIREMENTS

CRITICAL PROCESSES

HEAT TREATING AND PASSIVATION ARE VERIFIED BY INSPECTION.

NDE

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

ASSEMBLY/INSTALLATION

STRICT COMPLIANCE WITH MACHINING SPECIFICATION AND CORROSION CONTROL PROCEDURES
REQUIRED, AND COPIES OF THESE SPECIFICATIONS ARE INCLUDED IN THE
PLANNING PACKAGE. QUALITY CONTROL WITNESSES SEAL AND BACKUP RING
INSTALLATION AND ALL TORQUES. "O" RING GROOVES AND SEAL FACES ARE
INSPECTED FOR PROPER FINISH. ALL SEALS ARE INSPECTED FOR DAMAGE PRIOR
INSTALLATION. TORQUES WITNESSED AND VERIFIED BY INSPECTION. INSPECTION
OF DIMENSIONS AT FINAL INSPECTION. SPRING DIMENSIONS ARE VERIFIED
INSPECTION.

TESTING

ATP IS VERIFIED BY INSPECTION.

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SUBSYSTEM : LANDING DECELERATION FMEA NO 02-1F -G09-SV-B02 REV:06/27/88

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