

SHUTTLE FAILURE MODE AND EFFECTS ANALYSIS - PAYLOAD INTEGRATION HARDWARE

SUBSYSTEM : GALILEO/IUS INTG HW FMEA NO. PD-762-116-1 REV: 09/08,
 ASSEMBLY : VALVE PANEL ASSY. CRIT. FUNC: :
 P/N RI : MC250-0002-0200 CRIT. HDW: :
 P/N VENDOR: VEHICLE 102 103 104 105
 QUANTITY : ONE VALVE PER ASSY EFFECTIVITY: X X
 PHASE(S): PL LO OO X DO LS
 NUMBER OF SUCCESS PATHS REMAINING
 AFTER FIRST FAILURE: 1

REDUNDANCY SCREEN: A-~~FAIL~~ B-FAIL C-PASS

APPROVED BY: APPROVED BY (NASA):
 DESIGNED BY: W. B. McElroy SSM [Signature]
 REL W. B. McElroy REL [Signature]
 QE [Signature] QE [Signature]

ITEM:

CHECK VALVE, GN₂/COOLANT, RTG PURGE.

FUNCTION:

PREVENTS THE BACKFLOW OF GN₂/COOLANT INTO THE ORBITER AND PAYLOAD GN₂ LINES.

FAILURE MODE:

FAILS OPEN, UNABLE TO CHECK BACKFLOW.

CAUSE(S):

MECHANICAL SHOCK, CORROSION, CONTAMINATION, HANDLING, VIBRATION.

EFFECT(S) ON:

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

(A) UNABLE TO PREVENT BACKFLOW OF GN₂/COOLANT.

(B) NO EFFECT.

NO EFFECT FIRST FAILURE. SUBSEQUENT
 (C) FAILURE OF DUMP/ISOLATION VALVE RESULTS IN CONTAMINATION OF SCIENTIFIC INSTRUMENTS AND ASSOCIATED COMPONENTS WHICH WILL CAUSE LOSS OF INSTRUMENT AND MISSION OBJECTIVES. THIS FAILURE IS A 2 1/2% LOSS ONLY FOR LOSS OF G-VAL SUPPLY PRIOR TO RTG COOLANT PURGE.
 (D) NO EFFECT.

NOTE: FAILA SCREEN "B" BECAUSE NO INSTRUMENTS EXIST BETWEEN PYPD VALVES TO DETECT LEAKAGE.

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FAILURE DETECTION METHOD:
NONE

CORRECTING ACTION:
NONE.

TIMEFRAME:
N/A

TIME TO EFFECT:
MINUTES

REMARKS/HAZARDS:
FAILURE IS UNDETECTABLE DURING ALL MISSION PHASES. CHECK VALVE IS FUNCTIONALLY CHECKED PRIOR TO FLIGHT.

SHUTTLE CRITICAL ITEMS LIST - PAYLOAD INTEGRATION HARDWARE

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DISPOSITION & RATIONALE:

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

(A) DESIGN

VALVE HAS A 17-4 PH CONDITION A POPPET PER AMS5643 SLIDING ON A SILASTIC 675 SILICONE RUBBER RING SEAL. THE HELICAL/BELLEVILLE SPRING COMBINATIO. PROVIDES LOW SPRING RATE AND SMOOTH OPERATION. INLET AND OUTLET PORTS AR PROTECTED AGAINST CONTAMINATION BY FILTERS TO 10 MICRONS.

(B) TEST

QUALIFICATION TESTS ARE PERFORMED TO SATISFY THE REQUIREMENTS SPECIFIED IN MC250-0002 AS FOLLOWS: TEMPERATURE, VIBRATION, ACCELERATION, SHOCK, HUMIDITY, SALT-FOG, SAND & DUST, BURST, AND OPERATING LIFE TESTS.

ACCEPTANCE TESTS ARE PERFORMED ON ALL DISCONNECTS AS FOLLOWS: PRODUCT EXAMINATION, PROOF PRESSURE, FLOW AND PRESSURE DROP, AND REVERSE AND EXTERNAL LEAKAGE TESTS.

(C) INSPECTION

RECEIVING INSPECTION

MATERIAL AND PROCESS CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION AND CORROSION CONTROL REQUIREMENTS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

DIMENSIONS, CONSTRUCTION, WORKMANSHIP, AND SURFACE FINISHES ARE VERIFIED

NONDESTRUCTIVE EVALUATION

LEAK TEST IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

PRESSURE TESTS ARE VERIFIED BY INSPECTION.

TESTING

ACCEPTANCE TEST PROCEDURE IS APPROVED BY QUALITY ASSURANCE.

HANDLING/PACKAGING

HANDLING AND PACKING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO GENERIC FAILURES.

(E) OPERATIONAL USE

NONE REQUIRED FOR FIRST FAILRE.

QUALIFICATION TESTS ARE PERFORMED TO SATISFY THE REQUIREMENTS OF MC250-0002 INCLUDING: TEMPERATURE ENVIRONMENT OF -200°F TO +250°F; RANDOM VIBRATION LEVEL OF .07 g/HZ FOR 34 MIN/AXIS; SHOCK OF +/- 20 g PEAK AMPLITUDE IN EACH OF 3 AXES; BURST TEST OF 2500 PSIG; OPERATING LIFE OF 2000 HOURS; AND EXPOSURE TO HUMIDITY, SALT FOG, AND SAND & DUST ENVIRONMENTS

ACCEPTANCE TESTS ARE PERFORMED ON ALL CHECK VALVES, INCLUDING PROOF PRESSURE OF 1875 PSIG, REVERSE LEAKAGE OF ≤ 0.2 SCCM AND EXTERNAL LEAKAGE OF ≤ 0.2 SCCM. PO-762 - 3

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