

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : CREW MODULE SEALS FMEA NO 01-4 -CS15 -1 REV: 03/29/88

ASSEMBLY : CREW MODULE BULKHEAD, AFT & FORWARD CRIT. FUNC: 11
P/N RI : CRIT. HDW: 2
P/N VENDOR: M83248/1-334, -342, -357, -375 VEHICLE: 102 103 104
QUANTITY : 12 ON FORWARD BULKHEAD EFFECTIVITY: X X X
: 1 PER FEEDTHROUGH PLATE PHASE(S): PL LO X OO X DO X LS
: 37 ON THE AFT BULKHEAD
: 1 PER FEEDTHROUGH PLATE

REDUNDANCY SCREEN: A-FAIL B-FAIL C-PASS
PREPARED BY: APPROVED BY: APPROVED BY ANASM:
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ITEM:
SEAL, FEEDTHROUGH PLATES, BULKHEADS

FUNCTION:
THESE SEALS PREVENT LEAKAGE OF CREW MODULE ATMOSPHERE.

FAILURE MODE:
LEAKAGE

CAUSE(S):
CRACKS, LOW TEMPERATURE, MATERIAL DEGRADATION, FLUID CONTACT

EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) FAILURE OF THE SINGLE SEAL WOULD RESULT IN THE LOSS OF CREW MODULE CONSUMABLES.

(B) FAILURE OF THE SINGLE SEAL WOULD RESULT IN THE LOSS OF CREW MODULE CONSUMABLES.

(C) FAILURE OF THE SINGLE SEAL WOULD RESULT IN LOSS OF CREW MODULE CONSUMABLES, HOWEVER, THIS WOULD NOT EXCEED THE MAKEUP CAPABILITY OF THE ARPCS BUT WOULD POSSIBLY RESULT IN EARLY TERMINATION OF MISSION.

(D) FAILURE OF THE SINGLE SEAL AND AN ADDITIONAL SEAL FAILURE WITHIN THE CREW MODULE COULD RESULT IN A LEAK RATE EXCEEDING THE ARPCS MAKEUP CAPABILITY RESULTING IN LOSS OF CREW/VEHICLE.

REDUNDANCY SCREENS: SEAL FAILS SCREENS "A" AND "B" BECAUSE LEAK TEST OF EACH SEAL INDIVIDUALLY IS NOT FEASIBLE.

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DISPOSITION & RATIONALE:

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

(A) DESIGN

SEALS ARE STANDARD O-RINGS USED AS FACE SEALS WITH PLATE ATTACH BOLTS ADJACENT TO SEAL. EACH SEAL PROVIDES INTERFACE SEALING BETWEEN FEEDTHROUGH PLATES AND THE XCM200 FORWARD BULKHEAD AND THE X576 AFT BULKHEAD AFT FACE. THERE ARE TWELVE FEEDTHROUGH PLATES ON THE FORWARD BULKHEAD AND 37 PLATES ON THE AFT BULKHEAD WHICH ACCOMMODATE FLUID LINE FITTINGS AND ELECTRICAL CONNECTORS. A SINGLE O-RING FACE SEAL IS INSTALLED IN A GROOVE IN EACH FEEDTHROUGH PLATE. MATERIAL OF SEALS, FLUOROCARBON ELASTOMER (VITON), IS RESISTANT TO FLUIDS. DIFFERENTIAL PRESSURE ACROSS BULKHEAD IS IN DIRECTION OF SEAL COMPRESSION.

(B) TEST

ACCEPTANCE TESTS: TESTS CONSIST OF CREW MODULE HIGH PRESSURE TEST TO 1. PSID AND LOW PRESSURE TESTS TO 3.2 PSID.

QUALIFICATION TESTS: QUALIFICATION TESTS WERE NOT PERFORMED - CERTIFICATION IS BASED ON ACCEPTANCE TESTS AND SEAL MATERIALS DATA. OMRSD: GROUND TURNAROUND INCLUDES PRE-LIFTOFF PRESSURIZATION TEST AT 2 PSID; HOWEVER, IT IS UNLIKELY TO DETECT FEEDTHROUGH PLATE SEAL LEAKAGE.

(C) INSPECTION

RECEIVING INSPECTION

RECEIVING INSPECTORS INSPECT FOR DAMAGE AND WORKMANSHIP AND VERIFY THAT IT IS OF SINGLE PIECE MOLDED CONSTRUCTION. RECEIVING INSPECTORS CHECK IDENTIFICATION AND WALL CROSS-SECTIONAL DIAMETER ON A S-3 SAMPLING BASIS AND THAT SUPPLIER SUBMITTED REQUIRED REPORTS.

CONTAMINATION CONTROL

THE RECEIVING INSPECTOR VISUALLY INSPECTS SEAL FOR CLEANLINESS. THE INSPECTOR VERIFIES, BEFORE INSTALLATION, THAT THE VITON SEAL AND SEALING SURFACE ARE CLEAN, PER MAO106-328.

ASSEMBLY/INSTALLATION

THE SEALS ARE INSTALLED PER MAO106-328. PRIOR TO INSTALLATION AN INSPECTION IS PERFORMED TO VERIFY THAT THE SEALING SURFACES ARE NOT DAMAGED. THE THREADED FASTENERS ARE INSTALLED PER MAO101-301.

TESTING

THE CREW MODULE HIGH PRESSURE TEST TO 14.7 PSID AND LOW PRESSURE TESTS TO 3.2 PSID ARE VERIFIED BY INSPECTION.

HANDLING/PACKAGING

THE RECEIVING INSPECTOR VERIFIES THAT THE SEAL IS INDIVIDUALLY PACKAGED WITH PART NUMBER, MANUFACTURER NAME, COMPOUND NUMBER AND CURE DATE AND THAT THE SEAL IS PACKAGED IN A WAY THAT IT WILL BE PROTECTED DURING STORAGE.

(D) FAILURE HISTORY

EXTENSIVE USE OF FLUOROCARBON ELASTOMER SEALS IN AEROSPACE AND COMMERCIAL APPLICATIONS WITH NO FAILURE HISTORY.

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(E) OPERATIONAL USE

IF LEAKAGE OCCURS, LOSS OF CREW MODULE CONSUMABLES CAN BE MONITORED AND ASSESSED FOR FEASIBILITY OF CONTINUING THE MISSION PER CABIN LEAK PROCEDURES AND FLIGHT RULES.