

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : CREW MODULE SEALS FMEA NO 01-4 -CS19 -1 REV:03/29/8

ASSEMBLY : CREW MODULE/ETS BLANKING PLUGS CRIT. FUNC: 1
P/N RI : CRIT. HDW:
P/N VENDOR: M83248/1-214, 223 VEHICLE 102 103 104
QUANTITY : 4 EFFECTIVITY: X X X
:TWO SEALS PER PLUG PHASE(S): PL LO X OO X DO X LS
:TWO PLUGS PER VEHICLE

REDUNDANCY SCREEN: A-FAIL B-FAIL C-PAS
PREPARED BY: APPROVED BY: APPROVED BY (NASA):
DES W. HENRY DES *W.A. Henry 7/2/87* SSM *KSE [Signature]*
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ITEM:
SEALS, CREW MODULE, ETS FEEDTHROUGH BLANKING PLUGS (OV-102 ONLY)

FUNCTION:
THESE SEALS PREVENT LEAKAGE OF CREW MODULE ATMOSPHERE.

FAILURE MODE:
LEAKAGE

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

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

- (A) FAILURE OF SINGLE SEAL HAS NO EFFECT. LOSS OF REDUNDANT SEAL WOULD RESULT IN THE LOSS OF CREW MODULE CONSUMABLES.
- (B) FAILURE OF A SINGLE SEAL HAS NO EFFECT. LOSS OF REDUNDANT SEAL WOULD RESULT IN THE LOSS OF CREW MODULE CONSUMABLES.
- (C) FAILURE OF A SINGLE SEAL HAS NO EFFECT. LOSS OF THE REDUNDANT 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 SINGLE SEAL HAS NO EFFECT. LOSS OF THE REDUNDANT 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

DUAL O-RING FACE SEALS ARE INSTALLED IN SEPARATE GROOVES IN THE ETS FEEDTHROUGH BLANKING PLUGS. ETS FEEDTHROUGH BLANKING PLUGS CLAMP RING/NUT COMPRESSES THE SEALS. THE ETS FEEDTHROUGH BLANKING PLUG CLAMP RING OR NUT ENSURES UNIFORM COMPRESSION AROUND THE SEALS PERIPHERY, WITH METAL TO METAL CONTACT AT SEALED INTERFACE. EITHER SEAL CAN PREVENT LEAKAGE. DIRECTION OF PRESSURE DIFFERENTIAL ASSISTS SEALS. SEAL MATERIAL IS FLUOROCARBON ELASTOMER (VITON).

(B) TEST

ACCEPTANCE TESTS: NOT APPLICABLE BECAUSE BLANKING PLUGS WERE INSTALLED ON OV-102 AT KSC AFTER FLIGHT 4.

QUALIFICATION TESTS: CERTIFICATION BASED ON SIMILARITY WITH OV-103 AND OV-104 CREW MODULE UPPER FUSELAGE STRUCTURE ETS PYRO LINE FITTING SEALS. CERTIFICATION OF OV-103 AND OV-104 CREW MODULE UPPER FUSELAGE STRUCTURE ETS PYRO LINE FITTING SEALS IS BASED ON CREW MODULE HIGH PRESSURE TEST TO 14.7 PSID AND LOW PRESSURE TEST TO 3.2 PSID.

OMRSD: PRE-LIFTOFF CREW MODULE LEAK TEST AT 2 PSID UNLIKELY TO DETECT DUAL SEAL LEAKAGE.

(C) INSPECTION

RECEIVING INSPECTION

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

CONTAMINATION CONTROL

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

ASSEMBLY/INSTALLATION

THE SEALS ARE INSTALLED PER MAO106-328. INSPECTORS VERIFY THAT THE SEAL AND THE SEALING SURFACE ARE NOT DAMAGED BEFORE INSTALLATION.

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 INSPECTORS VERIFY THAT THE SEAL IS INDIVIDUALLY PACKAGED WITH PART NUMBER, MANUFACTURER NAME, COMPOUND NUMBER AND CURE DATE. RECEIVING INSPECTORS ALSO VERIFY THAT THE SEAL IS PACKAGED IN A WAY THAT WILL PROTECT IT DURING STORAGE.

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(D) FAILURE HISTORY

SIMILAR FLUOROCARBON ELASTOMER SEALS USED IN SPACE AND COMMERCIAL APPLICATIONS HAVE NO HISTORY OF LEAKAGE FAILURES. SIMILAR SEALS EXHIBITED NO FLIGHT FAILURES DURING APOLLO CSM PROGRAM.

(E) OPERATIONAL USE

IF INTERFACE 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.