SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :CREW MODULE SEALS FMEA NO 01-4 -CS4 -1 REV:03/29/8

ASSEMBLY :WINDOW ASSEMBLY INSTALLATION CRIT. FUNC: 1
P/N RI :V070-331107, V070-331116 CRIT. HDW:
:V070-331556, V070-331706
P/N VENDOR:
QUANTITY : 2 V070-331107
: 4 V070-331116
: 2 V070-331556
: 2 V070-331706

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

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

PREPARED BY:			APPROVED BY:	APPROVED BY (NASA):
DES	W.	HENRY	DES W. R. Henry 7/28/88	SSM 8-22
REL	D.	MAYNE	REL D.M. Mayne	REL 8/22
QE	W.	SMITH	QE 7-25-88	QE 3/1/93

ITEM:
SEALS, WINDOW ASSEMBLY INSTALLATION

FUNCTION:
THESE SINGLE 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) FAILURES OF THE SINGLE SEAL WOULD RESULT IN LEAKAGE OF CREW MODULE CONSUMABLES INTO THE FORWARD FUSELAGE PLENUM.

(B) FAILURE OF THE SINGLE SEAL WOULD RESULT IN 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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SUBSYSTEM :CREW MODULE SEALS FMEA NO 01-4 -CS4 -1 REV:03/29/88

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

(A) DESIGN
THE SEAL IS INSTALLED IN DOVETAIL GROOVE ADJACENT TO PRIMARY STRUCTURAL ATTACH BOLTS WITH METAL TO METAL CONTACT AT THE INTERFACE. IF THE SEAL WAS CONSIDERED ABSENT THIS WOULD CAUSE AN EQUIVALENT LEAK HOLE SIZE LESS THAN THE .45 INCH DIAMETER HOLE WHICH THE ARPCS IS CAPABLE OF COMPENSATING AT 8 PSI FOR 165 MINUTES. SEAL MATERIAL, (FLUOROCARBON ELASTOMER [VITON]), CHARACTERISTICS ARE NOT ADVERSELY AFFECTED BY HUMIDITY, TEMPERATURE, OR PRESSURE EXTREMES EXPERIENCED DURING FLIGHT.

(B) TEST
QUALIFICATION TESTS: THE FORWARD FUSELAGE WINDOW BARRIERS, RETAINERS AND MOUNTING ASSEMBLIES WERE SUBJECTED, AS A FULL ASSEMBLY, TO PRESSURE, THERMAL AND DEFLECTION LOADING TESTS.

ACCEPTANCE TESTS: THE CREW MODULE HIGH PRESSURE LEAK TEST IS PERFORMED A 14.7 PSID. FINAL ACCEPTANCE TEST IS CONDUCTED AT 3.2 PSID AFTER TRANSFE TO ASSEMBLY AREA AND INSTALLATION OF AVIONICS EQUIPMENT IS COMPLETE. OMRSD: GROUND TURNAROUND INCLUDES A PRE-LIFTOFF PRESSURIZATION TEST AT 2 PSID; HOWEVER, IT IS UNLIKELY TO DETECT SEAL LEAKAGE.

(C) INSPECTION

RECEIVING INSPECTION
RECEIVING INSPECTORS CHECK FOR CORRECT IDENTITY AND FOR DAMAGE, VERIFY THAT SUPPLIER SUBMITTED REQUIRED REPORTS AND VERIFY PARTS ARE PROPERLY PACKAGED TO PREVENT DAMAGE DURING STORAGE.

CONTAMINATION CONTROL
CLEANLINESS IS MAINTAINED PER MA0110-311. WINDOWS ARE VERIFIED TO BE VISIBLY CLEAN PER MA0110-301 JUST PRIOR TO AND JUST SUBSEQUENT TO ASSEMBLY. THE INSPECTOR VERIFIES, BEFORE INSTALLATION, THAT THE SEALING SURFACE AND VITON SEAL ARE CLEAN, PER MA0106-328.

ASSEMBLY/INSTALLATION
SEALS ARE INSTALLED PER MA0106-328. PRIOR TO INSTALLATION AN INSPECTION IS PERFORMED TO VERIFY THAT THE SEALING SURFACE AND THE VITON SEAL ARE UNDAMAGED. IT IS ALSO VERIFIED THROUGH INSPECTION THAT THE VITON SEAL SURFACE IS FREE OF DEFECTS, BLEMISHES AND IRREGULARITIES PER DRAWING REQUIREMENTS, BEFORE INSTALLATION.

TESTING
THE ACCEPTANCE LEAK TEST IS WITNESSED AND VERIFIED THROUGH INSPECTION.

HANDLING/PACKAGING
THE SUPPLIER PACKAGES DETAIL SEALS PER MK0116-001 REQUIREMENTS AND IDENTIFIES THEM BY PART NUMBER.

(D) FAILURE HISTORY
SIMILAR SILICONE RUBBER AND VITON SEALS USED IN SPACE AND COMMERCIAL APPLICATION HAVE NO HISTORY OF LEAKAGE FAILURES. SIMILAR SEALS EXHIBITE 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.