SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :COMMUNICATION & TRACKING FMEA NO 05-2F -22601 -2 REV:11/10/87

ASSEMBLY :BAY 1, 2 & NOSE COMP
P/N RI :ME413-0038-0016 THRU
P/N VENDOR:0018 & 0034 THRU 0036
QUANTITY :3
:THREE SYSTEMS
:

CRIT. FUNC: 1R
CRIT. HDW: 2

VEHICLE EFFECTIVITY:	102	103	104
	X	X	X

PHASE(S): PL LO X OO X DO X LS

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

PREPARED BY:
DES R E DAVIS
REL A L MASAI 11/10/87
QE J T COURSEN

APPROVED BY:
DES 11/11/87
REL 11-12-87
QE 11/24/87

APPROVED BY (NASA):
SSM 11/19/87
REL 11/24/87
QE 11/24/87

ITEM:
KU BAND WAVEGUIDE ASSEMBLY

FUNCTION:
RECTANGULAR (SECTIONAL) TUBING WHICH GUIDES AND CHANNELS THE KU BAND HIGH FREQUENCY ELECTROMAGNETIC WAVES TO MICROWAVE SCAN BEAM LANDING SYSTEM (MSBLS) RECEIVER WITHIN CREW COMPARTMENT. 82V74W431,82V74W432, 82V74W433.

FAILURE MODE:
LEAKAGE. BROKEN WAVEGUIDE.

CAUSE(S):
VIBRATION, PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, MISHANDLING OR ABUSE.

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

(A) MAY CAUSE LOSS OF ASSOCIATED MSBLS OUTPUT.

(B) AFTER THE LOSS OF AN EXTERNAL WAVEGUIDE, THERE WOULD BE A LEAK THROUGH THE DESICCANT FILTER, A 0.00019 SQ. IN. HOLE, THE ECLSS CAN MAINTAIN CABIN PRESSURE FOR ABOUT 95 DAYS. AFTER A SECOND FAILURE (1 EXTERNAL AND 1 INTERNAL WITHIN 1 INCH OF THE BULKHEAD) THERE WOULD BE A LEAK THROUGH THE WAVEGUIDE ITSELF, A 0.1934 SQ. IN. HOLE, THE ECLSS CAN MAINTAIN CABIN PRESSURE FOR ABOUT 135 MINUTES.

(C) MISSION ABORT AFTER A SECOND FAILURE DUE TO LOSS OF CABIN PRESSURIZATION.

(D) POSSIBLE LOSS OF CREW/VEHICLE IF LEAK RATE DOES NOT ALLOW TIME TO LAND BEFORE LOSS OF CABIN PRESSURE.

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

(A) DESIGN
WAVEGUIDE IS A PASSIVE, STRUCTURAL ELEMENT, INSTALLED INTERNALLY TO THE FORWARD FUSELAGE. THE WAVEGUIDE IS INTERNAL AND EXTERNAL TO THE CREW MODULE STRUCTURE. EACH WAVEGUIDE IS KEPT INTERNALLY DRY BY A DESICCANT FILTER. THE DESICCANT FILTER IS PORTED THROUGH A 0.0156 INCH DIAMETER WAVEGUIDE PRESSURE PORT. PRESSURE TIGHT WAVEGUIDE WINDOWS SEAL THE WAVEGUIDE AT THE ANTENNA AND WITHIN 1-INCH OF THE INTERNAL CREW MODULE PRESSURE PORT.

(B) TEST
ACCEPTANCE TESTING INCLUDES - EXAMINATION OF PRODUCT, PRESSURE/LEAK TEST AND FUNCTIONAL TESTING (RETURN LOSS AND INSERTION LOSS). STRUCTURAL INTEGRITY OF WAVEGUIDES IS VERIFIED DURING ACCEPTANCE TEST BY LEAK RATE AND RADIOGRAPHIC INSPECTION OF ALL BRAZED JOINTS. QUAL TEST INCLUDES-EXAMINATION OF PRODUCT, RADIOGRAPHIC INSPECTION, THERMAL (QTT), VACUUM, LEAK RATE, DESIGN SHOCK, AND QVT. VIBRATION TESTING WAS PERFORMED AT THE WORST-CASE WAVEGUIDE LEVEL. VIBRATION TESTING INCORPORATED SECTION OF WAVEGUIDE, BOTH INSIDE AND OUTSIDE THE CREW COMPARTMENT, CONNECTED TO THE BULKHEAD FEEDTHROUGH AND MOUNTED PER THE VEHICLE DRAWINGS. THE WAVEGUIDE SECTION WAS VIBRATED TO VERIFY 100 MISSION LIFE. RADIOGRAPHIC INSPECTION BEFORE AND AFTER VIBRATION. STRESS ANALYSIS PERFORMED ON CABIN BULKHEAD FEEDTHROUGHS (ADAPTER PLATE WITH BRAZED WAVEGUIDE PENETRATION) TO VERIFY STRUCTURAL SAFETY. GROUND TURNAROUND TEST - VERIFY MSBLS WAVEGUIDE INTEGRITY USING PRESSURE DECAY MEASUREMENT-PERFORMED EVERY FLIGHT.

(C) INSPECTION

RECEIVING INSPECTION
VISUAL AND DIMENSIONAL EXAMINATION IS PERFORMED ON ALL INCOMING PARTS. CERTIFICATION RECORDS AND TEST REPORTS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES.

CONTAMINATION CONTROL
ENVIRONMENTALLY CONTROLLED AREAS ARE MONITORED WEEKLY (AT A MINIMUM) BY QUALITY ASSURANCE (QA) TO VERIFY CONFORMANCE TO CONTAMINATION CONTROL PROCEDURES. RECORDS OF THIS MONITORING ARE MAINTAINED.

ASSEMBLY/INSTALLATION
DETAILED INSPECTION IS PERFORMED ON ALL PARTS PRIOR TO NEXT ASSEMBLY. ALL CRITICAL DIMENSIONS ARE VERIFIED BY INSPECTION, AND INSTRUMENTATION ACCURACY VERIFICATION IS PERFORMED PRIOR TO ACCEPTANCE INSPECTION. CORROSION PROTECTION IS VERIFIED BY INSPECTION. QA VERIFIES THAT FINISHED ASSEMBLIES ARE FREE OF PITS, CORROSION, CRACKS, CHIPS, ROUGH EDGES, AND FOREIGN MATERIAL.

CRITICAL PROCESSES
CRITICAL PROCESSES AND CERTIFICATIONS ARE MONITORED AND VERIFIED BY INSPECTION. CRITICAL PROCESSES ARE BRAZING, HEAT TREATMENT, AND PLATING.

NONDESTRUCTIVE EVALUATION
RADIOGRAPHIC INSPECTION OF ALL JOINTS IS PERFORMED.

TESTING
LEAK TESTING BY THE MASS SPECTROMETER METHOD IS OBSERVED AND VERIFIED BY QA.

HANDLING/PACKAGING
IN-PROCESS OPERATIONS ARE VERIFIED BY QA TO PROTECT PARTS AND PRECLUDE MISHANDLING. PARTS PACKAGING IS VERIFIED BY INSPECTION TO APPLICABLE REQUIREMENTS.

(D) FAILURE HISTORY
THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD, OR FLIGHT (AIR) "LEAKAGE" FAILURES TO DATE APPLICABLE TO THE CURRENT FLIGHT CONFIGURATION.

(E) OPERATIONAL USE
NO CREW CORRECTIVE ACTION AVAILABLE - THE WAVEGUIDE RUNS ARE IN-ACCESSIBLE.