SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT. FMEA NO 06-1B -0611 -1 REV:09/08/88

ASSEMBLY :AVIONICS COOLING CRIT. FUNC: 2
P/N RI :VO70-613XXX,ME276-0024,26,37,38 CRIT. HDW: 2
P/N VENDOR: VEHICLE 102 103 104
QUANTITY : EFFECTIVITY: X X X
:ONE SET PER BAY PHASE(S): PL LO X OO X DO LS
:THREE BAYS PER VEHICLE

REDUNDANCY SCREEN: A- B- C-

PREPARED BY: APPROVED BY: APPROVED BY (NASA):
DES N. K. DUONG DES SSM
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ITEM:
DUCT SECTIONS, RETURN AIR

FUNCTION:
PROVIDE AIR FLOW PATH FROM THE AIR-COOLED AVIONICS BAY EQUIPMENT TO THE FAN INLET PLENUM. DUCT ASSEMBLY P/N'S VO70-613401, 402, 403, 404, 405, 406, 407, 416, 417, 418, 419, 759, 922, 982, 991, 992.

FAILURE MODE:
EXTERNAL LEAKAGE

CAUSE(S):
PUNCTURE, ABRASION, MATERIAL DEFECT, BROKEN CLAMP, VIBRATION

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

(A) DECREASED COOLING AIR FLOW IN THE AFFECTED AVIONICS BAY.

(B) INCREASED TEMPERATURE OF AIR-COOLED AVIONICS IN THE BAY.

(C) POSSIBLE EARLY MISSION TERMINATION BASED UPON MAGNITUDE OF LEAK.

(D) NO EFFECT. EARLY MISSION TERMINATION WILL PRECLUDE LOSS OF CREW/VEHICLE.

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

(A) DESIGN
THE DUCTS ARE RIGID EPOXY/ARAMID SECTIONS. THE SECTIONS ARE HARD MOUNTED TO STRUCTURE BY A BRACKET/BAND CLAMP ASSEMBLY. A 0.50 INCH STRESS RELIEF GAP IS PROVIDED BETWEEN DUCT SECTIONS. THIS GAP IS BRIDGED BY FLEXIBLE SILICONE/ FIBERGLASS SLEEVES HELD IN PLACE BY BAND CLAMPS AND GROOVES THAT ARE PREFORMED INTO EACH DUCT SEGMENT. DUCT BRANCHES LEADING TO AVIONICS BOXES ARE PREFORMED INTO THE MAIN DUCT SECTIONS. DUCTS ARE PROTECTED FROM DAMAGE BY CLOSEOUT PANELS.

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(B) TEST
QUALIFICATION TEST - TESTS OF SIMILAR MATERIAL SHOW THAT RIGID EPOXY/ARAMID DUCTS ARE UNAFFECTED BY HUMIDITY AND TEMPERATURE WITHIN THE LIMITS IMPOSED BY THE CABIN ATMOSPHERE. TENSILE STRENGTH (500 KSI) REMAINED UNCHANGED AFTER EXPOSURE TO 100 PHM (PARTS PER HUNDRED MILLION) OZONE AT 70 F FOR 1000 HOURS. TOLERANCE TO SALINITY WAS DEMONSTRATED BY ANALYSIS BASED ON TESTS OF SIMILAR MATERIAL IN SALT WATER FOR 125 DAYS. TRANSIENT VIBRATION, RANDOM VIBRATION, AND CRASH LOADS WERE CERTIFIED BY ANALYSIS. QUALIFICATION ANALYSIS AND TEST PER LEVELS SPECIFIED IN MF0004-014.

IN-VEHICLE TESTING - AVIONICS BAY FAN DELTA-P IS MONITORED CONTINUOUSLY WHEN THE VEHICLE IS POWERED UP AND SERVES AS AN INDICATION OF EXTERNAL LEAKAGE.

OMRSD - AVIONICS BAY FAN DELTA-P IS MONITORED CONTINUOUSLY WHEN THE VEHICLE IS POWERED UP DURING EACH TURNAROUND AND SERVES AS AN INDICATION OF EXTERNAL LEAKAGE.

(C) INSPECTION

RECEIVING INSPECTION
CERTIFICATION OF MATERIALS AND PROCESSES IS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL
CLEANLINESS REQUIREMENTS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
INSPECTION VERIFIES THE FOLLOWING: PROCESS REQUIREMENTS RELATIVE TO MATERIALS PREPARATION, FABRICATION OF DUCT SECTIONS (INCLUDING DUCT LENGTH AND WALL THICKNESS) AND CURE CYCLES IN ACCORDANCE WITH REQUIREMENTS, INSTALLATION OF CURED SECTIONS INTO THE DUCT SYSTEM (BONDING, SPLICING, SEAL COATING, INSTALLATION OF CLAMPS, FASTENERS, TAPE AND INSULATION) IN ACCORDANCE WITH DRAWING AND SPECIFICATION REQUIREMENTS.

CRITICAL PROCESSES
CURING IS VERIFIED BY INSPECTION.

TESTING
THE ATP, WHICH INCLUDES LEAK AND PROOF TESTING, EXAMINATION FOR WORKMANSHIP, FINISH AND DIMENSIONAL FEATURES IS VERIFIED BY INSPECTION.

PACKAGING AND HANDLING
PARTS PROTECTION AND HANDLING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY
NO FAILURE HISTORY APPLICABLE TO EXTERNAL LEAKAGE FAILURE MODE. THE HARD DUCTS HAVE SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE
TBS.