

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1B -0611 -2 REV: 08/22/88
ASSEMBLY : AVIONICS COOLING
P/N RI : VO70-613XXX, ME276-0024, 26, 37, 38 CRIT. FUNC: 2
P/N VENDOR: VEHICLE 102 103 104 CRIT. HDW: 2
QUANTITY : EFFECTIVITY: X X X
: ONE SET PER BAY PHASE(S): PL LO X OO X DO LS
: THREE BAYS PER VEHICLE

PREPARED BY: DES N. K. DUONG
REL N. L. STEISSLINGER
QE D. STOICA
APPROVED BY: *[Signature]*
DES *[Signature]*
REL *[Signature]*
QE *[Signature]*
REDUNDANCY SCREEN: A- B- C-
APPROVED BY (NASA):
SSM
REL
QE

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:
RESTRICTED FLOW

CAUSE(S):
PHYSICAL DAMAGE, DEBRIS/CONTAMINATION

- EFFECT(S) ON:
- (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
 - (A) DECREASED COOLING AIR FLOW IN THE AFFECTED AVIONICS BAY.
 - (B) REDUCTION OF AIR FLOW THROUGH AFFECTED AVIONICS LRU'S. INCREASED TEMPERATURE OF AFFECTED LRU'S.
 - (C) POSSIBLE EARLY MISSION TERMINATION BASED UPON LOCATION AND MAGNITUDE OF RESTRICTION AND ITS EFFECT ON LRU'S BEING COOLED.
 - (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 PPM (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 CONTINUOUSLY MONITORED WHEN THE VEHICLE IS POWERED UP AND SERVES AS AN INDICATION OF RESTRICTED AIR FLOW.

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

(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 IN AVIONICS BAY DUCTING. THE FOLLOWING FAILURES HAVE OCCURRED IN CABIN RETURN AND SUPPLY DUCTING:

DR ECL2010337, 9/24/79: IN CHECKING DFI CONTAINER AIR FLOW, THE CABIN AIR SUPPLY FLOW BALANCE INDICATED REDUCED FLOW TO THE PLT DIFFUSER. A PLASTIC BAG WAS FOUND INSIDE THE DUCT. RETEST YIELDED ADEQUATE FLOW. THIS PROBLEM WAS NOT A CAR: CLOSED AS A PR, WITH NO CORRECTIVE ACTION.

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CAR AC2915-000, 9/13/83: DURING SUPPLY DUCT FLOW TESTS AT PALMDALE, REDUCED FLOW WAS NOTED AT AFT FLIGHT DECK DIFFUSER "A". A WHITE TAG WAS FOUND LODGED IN THE DIFFUSER. CORRECTIVE ACTION - AN "AWARE" WAS ISSUED TO HELP PROTECT DUCTS FROM DEBRIS. MANUFACTURING AND QUALITY AGREED TO APPLY INSPECTION SEALS ON ALL OPEN DUCT COVERS.

CAR AC8168-000, 5/24/84: WHILE WORKING A TPS AT KSC - REMOVING CAP TO VERIFY SUCTION LINE, A PARTS TAG (FORM 93-H) WAS FOUND TAPED INSIDE THE LINE. ACTION WAS TRANSFERRED TO CAR AD2016-000, ON WHICH SEVERAL OCCURRENCES OF DUCT/LINE CONTAMINATION WERE ACCUMULATED. CORRECTIVE ACTION - DUCT INSTALLATION PLANNING WAS REVISED TO REQUIRE A BUY-OFF OF VISUAL VERIFICATION THAT THERE IS NO DEBRIS IN DUCTS JUST PRIOR TO CLOSEOUT.

(E) OPERATIONAL USE
TBS.