SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT. FMEA NO 06-1C -0166 -4 REV:01/09/88

ASSEMBLY :ATMOS MAKEUP CONTROL
P/N RI :MC276-0010-0380/0361
P/N VENDOR:76398000-0380/0361 FRCHLD.
QUANTITY :1

CRIT. FUNC: 1R
CRIT. HDW: 3

VEHICLE	102	103	104
EFFECTIVITY:	X	X	X

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

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

PREPARED BY:
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ITEM:
QUICK DISCONNECT/CAP - NITROGEN SUPPLY, AIRBORNE HALF

FUNCTION:
PROVIDES THE ATTACHMENT POINT SO THAT THE GSE NITROGEN SUPPLY UNIT CAN SERVICE THE NITROGEN TANKS AND CHECK OUT THE SYSTEM.

FAILURE MODE:
INTERNAL LEAKAGE

CAUSE(S):
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, SEAL MATERIAL DEGRADATION

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

(A) SUBSYSTEM DEGRADATION - SECOND ORDER LEAK PATH FOR LOSS OF NITROGEN SUPPLY. THERE IS NO MEANS TO ISOLATE LEAK AND RETAIN NITROGEN USAGE CAPABILITY.

(B) LOSS OF INTERFACE PRESSURIZATION FOR CABIN MAKEUP, WATER TANKS AND AIRLOCK REPRESSURIZATION.

(C) ABORT DECISION.

(D) NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECT - LOSS OF REDUNDANT SEAL (QD POPPET OR CAP) RESULTS IN COMPLETE LOSS OF NITROGEN SUPPLY CAPABILITY. RETURN REQUIRED ON CABIN VOLUME WITH CABIN PRESSURE FEED OF WATER TO FES. UNABLE TO SUPPORT AIRLOCK REPRESSURIZATION OR 8.0 PSI CONTINGENCY OPERATIONS. SCREEN A FAILS BECAUSE CAP SEAL CANNOT BE VERIFIED UNLESS QD LEAKS INTERNALLY. SCREEN B FAILS BECAUSE INTERNAL LEAKAGE OF THE QD POPPET IS NOT DETECTABLE UNTIL SECOND ASSOCIATED FAILURE (CAP LEAKAGE) OCCURS.

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

(A) DESIGN
THE BODY OF THE QUICK DISCONNECT IS MADE OF INCONEL 718, CORROSION RESISTANT, O2 COMPATIBLE STEEL. THE POPPET IS PASSIVATED 286 CRES AND THE POPPET SPRING IS OF ELGILOY RC55. ELGILOY IS SUPERIOR TO CARBON AND STAINLESS STEEL FOR COIL AND FLAT SPRINGS AND IS USED IN MANY APPLICATIONS REQUIRING HIGH FATIGUE STRENGTH, CORROSION RESISTANCE, AND DIMENSIONAL STABILITY. ALL MATERIALS AND PROCESSES USED ARE IN COMPLIANCE WITH RI SPEC MC999-0096.

(B) TEST
ACCEPTANCE TEST - PER ATP 76398002. PROOF PRESSURE IS 5000 PSIG, APPLIED FOR 5 MINUTES. INTERNAL LEAK RATE REQUIREMENT IS 2.7 SCCS OF GHE UNCAPPED, 0.005 SCCS CAPPED AT 3300 - 3400 PSIG.

QUALIFICATION TEST - PER QTP ER 76396-28. DESIGN SHOCK - 20G TERMINAL SAWTOOTH PULSE OF 11 MS DURATION IN EACH DIRECTION OF THREE ORTHOGONAL AXES. RANDOM VIBRATION SPECTRUM - 20 TO 90 HZ INCREASING AT 6 DB/OCTAVE TO 1.0 G**2/HZ, CONSTANT AT 1.0 G**2/HZ FROM 90 TO 300 HZ, DECREASING AT 6 DB/OCTAVE FROM 300 TO 2000 HZ FOR 34 MINUTES PER AXIS AND 20 TO 40 HZ INCREASING AT 6 DB/OCTAVE TO 0.5 G**2/HZ, CONSTANT AT 0.5 G**2/HZ FROM 40 TO 150 HZ, DECREASING AT 6 DB/OCTAVE FROM 150 TO 2000 HZ FOR 14 MINUTES PER AXIS. DISCONNECT IS PRESSURIZED TO 3300 - 3400 PSIG DURING RANDOM VIBRATION AND SHOCK TESTING. LIFE CYCLE TESTING - PASSED 4000 CYCLE REQUIREMENT PLUS AN ADDITIONAL 6000 CYCLES WHICH WERE PERFORMED DUE TO A GROUND HALF COUPLING PROBLEM.

IN-VEHICLE TESTING - CAPPED LEAK TEST IS PERFORMED AT 2900 - 3000 PSIG, 5 X 10 EXP -6 SCCS MAX LEAKAGE.

OMRSD - THE NITROGEN SYSTEM IS LEAK TESTED AFTER SERVICING. CAP SEAL AND MATING SURFACES ARE VISUALLY INSPECTED FOR DAMAGE PRIOR TO MATING TO QUICK DISCONNECT. BUBBLE LEAK CHECK IS PERFORMED ON CAP AFTER INSTALLATION. LONG TERM DECAY IS PERFORMED; 5 PSI/DAY MAX LEAKAGE. OMRSD CHANGE IS IN WORK TO VERIFY QD LEAKAGE IS WITHIN SPECIFICATION SUBSEQUENT TO DISCONNECT FROM GSE GROUND HALF.

C) INSPECTION

RECEIVING INSPECTION
RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL
CLEAN TO LEVEL 200A OF MA0110-301 VERIFIED.

ASSEMBLY/INSTALLATION
INSTALLATION AND ASSEMBLY VERIFIED BY MIPS. TORQUES AND SURFACE FINISH ARE VERIFIED. SEALS ARE VISUALLY EXAMINED, PRIOR TO INSTALLATION, FOR DAMAGE AND CLEANLINESS.

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CRITICAL PROCESSES
PARTS PASSIVATION AND WELDS ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
WELDS ARE RADIOGRAPHICALLY INSPECTED AND VERIFIED BY INSPECTION.

TESTING
ATP - POPPET INTERNAL LEAK TEST AND SPRING FORCE TEST VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING, PACKAGING, STORAGE AND SHIPPING PROCEDURES ARE VERIFIED.

(D) FAILURE HISTORY
TWO APPLICABLE FAILURES HAVE OCCURRED; BOTH FAILURES ON THE GROUND. QUICK DISCONNECTS WERE REMOVED AND REPLACED PRIOR TO FINAL GN2 TANK SERVICING.

(1) CAR AC7716-010, 3-5-84. QD LEAKED INTERNALLY AFTER N2 SYSTEM SERVICING. THE POPPET SEAT AND SEAL WERE FOUND TO BE DAMAGED. IT WAS CONCLUDED THAT DAMAGE OCCURRED DUE TO MISUSE DURING FIELD OPERATIONS. THE QD WAS REPAIRED. CORRECTIVE ACTION IS TO MONITOR FOR TREND OF THIS TYPE OF FAILURE.

(2) CAR AD2253-010, 12-10-84. QD LEAKED INTERNALLY DURING SYSTEM TESTING. LEAKAGE COULD NOT BE VERIFIED AT THE VENDOR; IT WAS CONCLUDED THAT A CONTAMINANT PARTICLE HAD BEEN PRESENT ON THE POPPET, WHICH CAUSED THE FAILURE. THE QD WAS CLEANED AND PASSED ATP. NO FURTHER CORRECTIVE ACTION WAS REQUIRED.

(E) OPERATIONAL USE
1. CREW ACTION
   NONE

2. TRAINING
   NONE

3. OPERATIONAL CONSIDERATION
   A. FAILURE IS NOT DETECTABLE IN FLIGHT UNLESS THERE IS A SECONDARY FAILURE.
   B. CABIN ATMOSPHERE REMAINS IF ALL N2 IS DEPLETED BY LEAK (REQUIRES TWO FAILURES).
   C. REAL TIME DATA SYSTEM ALLOWS FOR GROUND MONITORING OF N2 SUPPLY PRESSURES FOR LEAK DETECTION.