

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 06-1C-1502-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 7 01/24/91

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER	
LRU :	QUICK DISCONNECT	F361-2660-3	RI TO VERI. P/N.
	RT TO ADD VENDOR NAME		
	PART DATA		

QUANTITY OF LIKE ITEMS: 8
ONE PER STATION

FUNCTION:
QUICK DISCONNECT, LES BREATHING STATION

PROVIDES THE INTERFACE FOR CONNECTING THE LAUNCH/ENTRY SUITS (LES) TO
THE OXYGEN SUPPLY SYSTEM.

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LRU :QUICK DISCONNECT
ITEM NAME: QUICK DISCONNECT

CRITICALITY OF THIS
FAILURE MODE:1/1

FAILURE MODE:
FAILS CLOSED; RESTRICTED FLOW

MISSION PHASE:
LO LIFT-OFF
OO OE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
: 103 DISCOVERY
: 104 ATLANTIS
: 105 ENDEAVOUR

CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, PHYSICAL
BINDING/JAMMING

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN A) N/A
B) N/A
C) N/A

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
ONE LES QD CANNOT BE USED TO PROVIDE OXYGEN FOR CREW.

(B) INTERFACING SUBSYSTEM(S):
ONE INTERFACE UNAVAILABLE FOR LES HOOKUP.

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(C) MISSION:
NO EFFECT.

(D) CREW, VEHICLE, AND ELEMENT(S):
LOSS OF O2 FLOW TO ONE LES COULD RESULT IN LOSS OF CREW/VEHICLE IF LES IS REQUIRED DURING A MISSION PHASE THAT PREVENTS CREWMEMBER FROM SWITCHING TO AN ALTERNATE LES QD.

(E) FUNCTIONAL CRITICALITY EFFECTS:
NONE

- DISPOSITION RATIONALE -

(A) DESIGN:

THE QUICK DISCONNECT IS A MECHANICAL CONNECTOR WHICH INCLUDES A MALE COUPLING WHICH IS THE FLIGHT HALF. THE FITTING IS MADE OF 304 CRES CORROSION RESISTANT, O2 COMPATIBLE STAINLESS STEEL. THE SPRING IS MADE OF 302 CRES STAINLESS STEEL. BOTH THE FITTING AND THE SPRING ARE PASSIVATED, WHICH FORMS A PROTECTIVE COATING ON THEIR SURFACES AND REDUCES THEIR CHEMICAL ACTIVITY.

(B) TEST:

ACCEPTANCE TEST - PROOF PRESSURE 225 PSIG APPLIED FOR 5 MINUTES. LEAK RATE REQUIREMENT IS 0.001 LB/HR O2 MAX AT 40 PSID.
ENGAGED AND DISENGAGED LEAKAGE TESTS: 100 +/- 10 PSIG APPLIED; ZERO LEAKAGE INDICATED ON THE 0 TO 100 CC/MIN FLOWMETER.
PRESSURE DROP: 3 PSID MAX AT 15 LB/HR O2 FLOW AT 70 F AND 40.7 PSIA INLET PRESSURE.
DISCONNECT FORCE: 10 LB MAX AT 40 PSID.

QUALIFICATION TEST - BURST PRESSURE: 300 PSIG APPLIED FOR 5 MINUTES.
LIFE CYCLE: 1000 CONNECT/DISCONNECT CYCLES. RANDOM VIBRATION FOR 48 MIN/AXIS AT +6DB/OCT FROM 20 TO 150 HZ, 0.03 G**2/HZ CONSTANT AT 150 TO 1000 HZ, AND -6 DB/OCT FROM 1000 TO 2000 HZ. TRANSIENT VIBRATION TESTED IN SINUSOIDAL VIBRATION ENVIRONMENTS IMPOSED IN THE FREQUENCY RANGE FROM 5 TO 35 HZ AT AN ACCELERATION AMPLITUDE OF + OR - 0.25 G PEAK. DESIGNED TO WITHSTAND A 20 G TERMINAL SHOCK. SHOCK TESTED USING A TERMINAL SAWTOOTH SHOCK OF 11 MILLISECOND DURATION IN EACH OF THE 3 ORTHOGONAL AXES (6 DIRECTIONS).

IN-VEHICLE TESTING - FLOW TEST AT EACH OF THE EIGHT QD'S VERIFIES FULLY OPEN FLOW PATH.

OMRSD - LES MANUAL VALVES CHECKOUT VERIFIES FLOW THROUGH QD PRIOR TO THE FIRST REFLIGHT OF EACH ORBITER AND EVERY FIVE FLIGHTS. MAX RE-

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REQUIRED FLOW OF 5.5 LB/HR VERIFIED AS A CONTINGENCY FOR LRU REPLACEMENT. EACH CREWMAN'S QD IS CONNECTED AND OPEN FOR LAUNCH; FLOW IS VERIFIED AT CREW INGRESS AND AT APPROXIMATELY T-2 MINUTES IN EACH COUNTDOWN WHEN VISORS ARE CLOSED.

(C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

CORROSION PROTECTION PROVISIONS VERIFIED BY INSPECTION. CLEANLINESS LEVEL 200A PER MA0110-301 VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING PROCESSES, INSTALLATION AND ASSEMBLY VERIFIED BY INSPECTION. CRITICAL DIMENSIONS VERIFIED BY INSPECTION. TORQUES AND SURFACE FINISH ARE VERIFIED BY INSPECTION. SEALS ARE VISUALLY EXAMINED PRIOR TO INSTALLATION FOR DAMAGE AND CLEANLINESS.

NONDESTRUCTIVE EVALUATION

X-RAY AND FLUORESCENT PENETRANT INSPECTION VERIFIED BY INSPECTION.

CRITICAL PROCESSES

PARTS PASSIVATION AND WELDS ARE VERIFIED BY INSPECTION.

TESTING

ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING, PACKAGING, STORAGE AND SHIPPING PROCEDURES ARE VERIFIED.

(D) FAILURE HISTORY:

NO FAILURE HISTORY APPLICABLE TO FAILED CLOSED/RESTRICTED FLOW FAILURE MODE. THE QUICK DISCONNECT HAS SUCCESSFULLY BEEN USED THROUGH THE SHUTTLE PROGRAM FOR THIS FAILURE MODE.

(E) OPERATIONAL USE:

NONE.

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- APPROVALS -

RELIABILITY ENGINEERING:	D. R. RISING <i>DRR</i>	:	<i>DRR</i>
DESIGN ENGINEERING	: K. KELLY <i>KK</i>	:	<i>KK</i>
QUALITY ENGINEERING	: M. SAVALA	:	<i>M. Savala for OJD 2/10/91</i>
NASA RELIABILITY	:	:	<i>DRR 4-2-91</i>
NASA SUBSYSTEM MANAGER	:	:	<i>DRR 4/3/91</i>
NASA QUALITY ASSURANCE	:	:	<i>DRR 3/14/91</i>