

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ORBITAL MANEUVER                      FMEA NO 03-2   -2004   -1                      REV: 3/30/82

ASSEMBLY : PROPELLANT FEED				CRIT. FUNC:	2
F/N RI : MC621-0059				CRIT. HDW:	2
P/N VENDOR: 73A740067		VEHICLE	102		
QUANTITY : 4		EFFECTIVITY:	X	103	104
: 2 PER POD		PHASE(S):	FL	X	X
: ONE PER TANK				LO X	OO X DO X IS

PREPARED BY:		REDUNDANCY SCREEN:	A-	B-	C-
DES            D W CARLSON		APPROVED BY:			
REL            C M AKERS		DES <i>[Signature]</i>	SSM	APPROVED BY (NASA):	
QE             W J SMITH		REL <i>[Signature]</i>	SSM	<i>[Signature]</i>	8-26-82
		QE <i>[Signature]</i>	SSM	<i>[Signature]</i>	

ITEM:  
COLLECTOR MANIFOLD, PROPELLANT RETENTION AND ACQUISITION.

FUNCTION:  
MANIFOLDS THE 4 STUB GALLERIES TO A SINGLE PROPELLANT OUTLET. A GAS ARRESTOR SCREEN AND ANTI-VORTEX BAFFLE PREVENTS PREMATURE GAS INGESTION INTO TANK OUTLET DURING FINAL STAGES OF PROPELLANT DEPLETION WHEN THE LAST GALLERY SCREEN WINDOW IS UNCOVERED.

FAILURE MODE:  
STRUCTURAL FAILURE, ERRATIC OPERATION.

CAUSE(S):  
HIGH DIFFERENTIAL PRESSURE ACROSS SCREEN PORTS DUE TO CONTAMINATION, SCREEN FAILURE, CORROSION, FATIGUE, IMPROPER SERVICING PROCEDURES.

EFFECT(S) ON:

- (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
- (A) SUBSYSTEM DEGRADATION. GAS BUBBLES IN PROPELLANT CAUSING REDUCED THRUST OR ONE OMS ENGINE CUT-OFF.
- (B) INTERFACE DEGRADATION - INABILITY TO PROVIDE PROPELLANT FOR RCS INTERCONNECT.
- (C) LOSS OF MISSION OR SOME MISSION OBJECTIVES. (MISSION EFFECTS ARE LIMITED TO ON-ORBIT MANEUVER CAPABILITY).
- (D) NO EFFECT - STRUCTURAL FAILURE WILL NOT RESULT IN HARD START BUT WILL RESULT IN GAS INGESTION AFTER THE START HAS BEEN ACCOMPLISHED UTILIZING PROPELLANT IN THE FEEDLINES & THE AFT PROPELLANT ACQUISITION SYSTEM. FOLLOWING SUCH INITIAL OPERATION, GAS WOULD BE PASSED THROUGH THE ENGINE RESULTING IN A DECREASE IN CHAMBER PRESSURE. ANY DECREASE BELOW 100 PSI TRIGGERS FDI. MANUAL ENGINE SHUT-DOWN CAN THEN BE ACCOMPLISHED. SUBSEQUENT STARTS TO UTILIZE PROPELLANT IN THAT TANK MAY BE ACCOMPLISHED BY EMPLOYING SETTLING OF PROPELLANTS BY RCS.

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DISPOSITION & RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN

WELDS, GAS ARRESTOR SCREEN AND ATTACHMENT DEVICES ARE DESIGNED FOR MAXIMUM ANTICIPATED FLOW AND DYNAMIC LOADS. THE DESIGN ULTIMATE FACTOR OF SAFETY IS 1.4 AND THE MINIMUM MARGIN OF SAFETY (YIELD) IS 1.19.

(B) TEST

QUALIFICATION TEST

KC-135 ZERO-G TESTS WERE CONDUCTED DURING DEVELOPMENT. A LUCITE TANK WAS USED IN ORDER TO ALLOW VISUAL OBSERVATION OF DYNAMIC PERFORMANCE DURING ZERO-G. TESTS ARE ALSO CONDUCTED USING A FULL SCALE TANK. (BUBBLE POINT MUST BE AT LEAST 10 INCHES OF H<sub>2</sub>O.) RANDOM VIBRATION AT ANTICIPATED MISSION LEVELS, PROPELLANT EXPOSURE AND PRESSURE CYCLING WAS PERFORMED DURING QUALIFICATION OF THE TANK ASSEMBLY. ALSO QUALIFIED AS PART OF POD ASSEMBLY - VIBRO ACOUSTIC TESTING AT JSC, 100 EQUIVALENT MISSIONS. HOT-FIRE TEST PROGRAM AT WSTF, S17 TEST (24 EQUIVALENT MISSION DUTY CYCLES). APPROX, 7 YEARS PROPELLANT EXPOSURE.

ACCEPTANCE TEST

(EACH UNIT) - EXAMINATION OF PRODUCT, WELDS TESTS, BUBBLE POINT TESTS. ALSO TESTED AS PART OF PROPELLANT TANK.

GROUND TURNAROUND

V43CBO.120 PERFORMS IN-TANK BUBBLE POINT TESTS ON OMS SCREENS, EFFECTIVITY IS EVERY 10 FLIGHTS AND CONTINGENCY FOR LEAD TANKS.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESSES CERTIFICATION ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS TO LEVEL 200 FOR MMH AND 200 A FOR NTO AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION. CLEANLINESS AND DEW POINT VERIFICATION PER MDAC TCP-004 IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, ASSEMBLY AND INSTALLATION PROCEDURE ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

INSPECTION VERIFIES WELDS PER PS22240 ARE PENETRANT OR RADIOGRAPHIC INSPECTED. INSPECTION VERIFIES WELDS PER PS12307 ARE BUBBLE TESTED. INSPECTION VERIFIES WELDS ARE VISUAL AND LEAK TESTED. INSPECTION VERIFIES MACHINED PARTS ARE PENETRANT TESTED.

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**CRITICAL PROCESSES**

THE WELDING PROCESS AND VERIFICATION THAT WELDS MEET SPECIFICATION REQUIREMENTS ARE VERIFIED BY INSPECTION.

**TESTING**

TEST EQUIPMENT AND TOOL CALIBRATION IS VERIFIED BY INSPECTION. ACCEPTANCE TEST IS VERIFIED BY INSPECTION. BUBBLE POINT TESTS ARE PERFORMED AFTER CUTTING AND AFTER WELDING. BUBBLE POINT IS PERFORMED AFTER INSTALLATION INTO TANK.

**HANDLING/PACKAGING**

HANDLING, PACKAGING, STORAGE AND SHIPPING REQUIREMENTS ARE VERIFIED BY INSPECTION.

**(D) FAILURE HISTORY**

A FAILURE OF THE COLLECTOR MANIFOLD (SCREEN FAILURE) OCCURRED DURING TESTING AT WSTF DUE TO A HIGH FILL RATE IN EXCESS OF THAT PRESCRIBED BY PROCEDURE.

**(E) OPERATIONAL USE**

TERMINATE INTERCONNECT OPERATIONS UPON EVIDENCE OF GAS INGESTION, PRECEDE REMAINING OMS BURNS BY RCS PROPELLANT SETTling MANEUVER.