

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ORBITAL MANEUVER FMEA NO 03-3 -2005 -1 REV: 4/20/8

ASSEMBLY : PROPELLANT FEED CRIT. FUNC: 2R
P/N RI : MC621-0059 CRIT. HDW: 3
P/N VENDOR: 73B740004 VEHICLE 102 103 104
QUANTITY : 4 EFFECTIVITY: X X X
: 2 PER POD PHASE(S): PL LO X OO X DO X LS
: ONE PER TANK

PREPARED BY: DES D W CARLSON APPROVED BY: REDUNDANCY SCREEN: A-PASS B-FAIL C-PAS.
REL C M AKERS DES *[Signature]* APPROVED BY (NASA):
QE W J SMITH REL *[Signature]* SSM *[Signature]*
QE *[Signature]* RE *[Signature]* OF 8-26-8
QE *[Signature]*

ITEM:

STUB GALLERY, PROPELLANT RETENTION AND ACQUISITION.

FUNCTION:

ACQUIRES WALL BOUND PROPELLANT AT OMS START-UP OR RCS OPERATION AND FEEDS TO COLLECTOR MANIFOLD THROUGH 3-IN. SQ. SCREEN WINDOWS LOCATED ALONG THE OUTER SURFACE OF EACH GALLERY LEG. FOUR 2 X 4 IN. GALLERIES IN THE APT COMPARTMENT EXTEND THE LENGTH OF THE RESERVOIR. THEY ARE LOCATED IN THE VEHICLE X-Y AND X-Z PLANES FOR PROPELLANT CONTACT.

FAILURE MODE:

STRUCTURAL FAILURE, ERRATIC OPERATION

CAUSE(S):

GAS ENTRAPMENT - IMPROPER FILL PROCEDURE SCREEN FAILURE, CONTAMINATION, CORROSION, VIBRATION, SHOCK.

EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) SUBSYSTEM - LOSS OF REDUNDANCY. COLLECTOR GAS ARRESTOR SCREEN PREVENTS GAS FROM ENTERING FEED LINE.

(B) INTERFACES - NO EFFECT.

(C) MISSION - NO EFFECT.

(D) CREW/VEHICLE - NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECT - POTENTIAL LOSS OF MISSION. OMS PROPELLANT UNAVAILABLE FOR RCS USAGE THROUGH INTERCONNECT. RCS SETTLE BURNS MAY BE REQUIRED FOR OMS ENGINE START. NO FLIGHT INSTRUMENTATION AVAILABLE TO DETECT FAILURE.

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SYSTEM : ORBITAL MANEUVER FMEA NO 03-3 -2003 -1 REV: 4/20

POSITION & RATIONALE:

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

(A) DESIGN

STRUCTURAL DESIGN FACTOR (YIELD) IS 4.5. TWO OF THE FOUR STUB GALLERIE ARE ADEQUATE FOR PROPELLANT FEED. WELDS, SCREENS & ATTACHMENT DEVICE ARE DESIGNED FOR MAX ANTICIPATED FLOW & DYNAMIC LOADS. ONLY PROPELLANT COMPATIBLE MATERIALS ARE USED IN THE DESIGN. FILL PROCEDURES ARE DESIGNED TO ELIMINATE GAS ENTRAPMENT WITHIN INITIALLY RETAINED PROPELLANT.

(B) TEST

QUALIFICATION TESTS

A LUCITE TANK WAS USED IN ORDER TO ALLOW VISUAL OBSERVATION OF DYNAMIC PERFORMANCE DURING KC-135 ZERO-G DEVELOPMENT TESTS. KC-135 TESTING WAS ALSO CONDUCTED ON FULL-SCALE APT TANK COMPARTMENT/SCREENS. QUAL TEST INCLUDING VIBRATION, PROPELLANT EXPOSURE; AND PRESSURE CYCLING WAS ALSO CONDUCTED USING A FULL SCALE TANK. ALSO QUALIFIED AS PART OF POD ASSEMBLY - VIBRO-ACOUSTIC TESTING AT JSC, 100 EQUIVALENT MISSIONS HOT-FIRE TEST PROGRAM AT WSTF, 517 TEST (24 EQUIVALENT MISSION DUT CYCLES). APPROX. 7 YEARS PROPELLANT EXPOSURE.

ACCEPTANCE TESTS

(EACH UNIT) - EXAMINATION OF PRODUCT, WELD TESTS, BUBBLE POINT TESTS CONDUCTED.

GROUND TURNAROUND

V43CB0.120 PERFORMS IN-TANK BUBBLE POINT TESTS ON OMS SCREENS FOR ONE FUEL AND ONE OXIDIZER TANK FOR PODS AT EACH 10TH FLIGHT INTERVAL AND ON A CONTINGENCY BASIS IF FLIGHT DATA IS ANOMALOUS.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESSES CERTIFICATIONS ARE VERIFIED BY INSPECTION. PROCUREMENT DOCUMENTS REQUIRE RAW MATERIAL FABRICATION CONTROL AND VERIFICATIONS.

CONTAMINATION CONTROL

THE ASSEMBLY IS CLEANED PER AN IN-HOUSE PROCEDURE. THE CLEANLINESS IS MAINTAINED DURING INSTALLATION INTO TANK. CLEANLINESS TO LEVEL 200 FOR 12MH AND 200A FOR NTC AND CORROSION PROTECTION PROVISION ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, ASSEMBLY AND INSTALLATION PROCEDURES ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION. SCREEN MATERIAL IS BUBBLE POINT TESTED PRIOR TO CUTTING DETAIL PARTS TO AVOID HOLES. BUBBLE POINT TESTS ARE ALSO CONDUCTED AFTER CUTTING, AFTER WELDING, AFTER REPAIRS, AND AFTER INSTALLATION INTO THE TANK.

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SUBSYSTEM : ORBITAL MANEUVER

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NONDESTRUCTIVE EVALUATION

PENETRANT AND RADIOGRAPHIC INSPECTION OF WELDS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

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

TESTING

TEST EQUIPMENT AND TOOL CALIBRATION ARE VERIFIED BY INSPECTION. ACCEPTANCE TEST IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

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

(D) FAILURE HISTORY
NONE.

(E) OPERATIONAL USE

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