

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ORBITAL MANEUVER FMEA NO 03-3 -4002 -1 REV: 12/04/87
 ASSEMBLY : ENGINE SUBSYSTEM ABORT: CRIT. FUNC: 1R
 P/N RI : MC621-0009 TAL, RTLS CRIT. HDW: 2
 P/N VENDOR: 1186443 VEHICLE 102 - 103 104
 QUANTITY : 4 EFFECTIVITY: X X X
 : TWO EACH PER ENG SUBSYS PHASE(S): PL LO X OO DO X LS
 : 2 OX & 2 FU INLET LINES

PREPARED BY: V F ROZNOS APPROVED BY: REDUNDANCY SCREEN: A-PASS B-PASS C-PASS
 DES V F ROZNOS DES *[Signature]* APPROVED BY (NASA):
 REL C M AKERS REL *[Signature]* SSM *[Signature]*
 QE W J SMITH QE *[Signature]* REL *[Signature]* 12-9-87
 QE *[Signature]* 12-8-87

ITEM:

FILTER SCREEN, PROPELLANT, BI-PROP VALVE ENGINE INLET.

FUNCTION:

A 100 MICRON ABSOLUTE 321 S.S FILTER SCREEN IS PROVIDED TO LIMIT CONTAMINATION INTO DOWNSTREAM COMPONENTS (BI-PROPELLANT VALVES, ENGINE INJECTOR, COOLING CHANNELS).

FAILURE MODE:

FAILS OUT OF TOLERANCE, RESTRICTED FLOW, HIGH PRESSURE DROP.

CAUSE(S):

DIFFERENTIAL PRESSURE INCREASE DUE TO PROPELLANT RESIDUE OR CONTAMINATION, FLOW AREA INADEQUATE, OBSTRUCTION INTRODUCED DURING ASSEMBLY/REPAIR, SCREEN DAMAGE.

EFFECT(S) ON:

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

(A) SUBSYSTEM DEGRADATION-MIXTURE RATIO SHIFT, REDUCED ENGINE INLET PRESSURE. INADEQUATE CHAMBER COOLING.

(B) DEGRADATION OF INTERFACE SUBSYSTEM. REDUCED ENGINE PERFORMANCE (ISP). EXCESS PROPELLANT CONSUMPTION (MAY REQUIRE ENGINE SHUT-DOWN).

(C) POSSIBLE EARLY MISSION TERMINATION. REDLINE ADDITIONAL PROPELLANT FOR RCS BACKUP DEORBIT. MAY COMPROMISE MISSION OBJECTIVES. NEXT PLS DEORBIT IF SUFFICIENT PROPELLANT NOT AVAILABLE.

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(D) NO EFFECT. ENGINE CAN BE ISOLATED & PROPELLANT UTILIZED BY OTHER ENGINE. CRIT 1 FOR ABORTS. REDUCED FLOW RATE DURING DUMP COULD CAUSE LANDING WEIGHT, C.G. PROBLEMS.

(E) FUNCTIONAL CRITICALITY EFFECT - POSSIBLE LOSS OF CREW/VEHICLE-FAILURE OF OTHER ENGINE AND INADEQUATE PROPELLANT FOR RCS DEORBIT COULD RESULT IN INABILITY TO DEORBIT.

DISPOSITION & RATIONALE:

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

(A) DESIGN

FLOW AREA IS 2 1/2 TIMES THE BASE FLOW. TRIM ORIFICES ARE SEATED IN REGISTERS AT THE INTERFACE FLANGE. PROPER ORIENTATION IS ASSURED BY LOCATING PINS. FILTER REPLACEMENT IS REQUIRED WITH ANY DETECTABLE DELTA PRESSURE INCREASE. PROPELLANT COMPATIBLE MATERIALS ARE USED. PROPELLANTS ARE LOADED THROUGH 15 MICRON GSE FILTER. ALL WELDED CONSTRUCTION. PROPELLANT AND SYSTEM CLEANLINESS VERIFIED PRIOR TO USAGE. SHUTDOWN CRITERIA FOR OFF-NOMINAL ENGINE OPERATION IS DEFINED. REDUNDANT ENGINES ARE PROVIDED.

(B) TEST

QUALIFICATION TESTS

QUALIFIED AS PART OF ENGINE ASSEMBLY, INCLUDING WSTF SYSTEM EVALUATION TESTS UNDER SIMULATED MISSION USAGE CONDITIONS, RANDOM VIBRATION, THERMAL CYCLES, ENGINE FIRING TESTS.

ACCEPTANCE TEST

EXAMINATION OF PRODUCT, FLOW TEST, DELTA P-20 PSID (4 X MAX), BUBBLE POINT, WELD EXAMINATION, CLEANLINESS. POD FEEDLINES ARE INSPECTED VIA BORESCOPE PRIOR TO FINAL CLOSEOUT.

GROUND TURNAROUND

V43CEO.035 PERFORMS INSPECTION OF FILTER BASED ON DETECTION OF ABNORMAL OPERATION FROM FLIGHT DATA & IS ALSO PERFORMED DURING ANY MAINTENANCE ON ENGINE AND EVERY 20 FLIGHTS.

SECTION V43 12.1.1 OF OMRSD REQUIRES BORESCOPE INSPECTION OF LINES AFTER OPENING FOR MAINTENANCE/REPAIR.

V43CEO.090 PERFORMS PROPELLANT SAMPLING 2ND FLIGHT.

V43CFO.010 PERFORMS PROPELLANT SERVICING TO FLIGHT LOAD AND VERIFIES CONFORMANCE TO SE-S-0073 EVERY FLIGHT.

FLIGHT DATA ANALYZED FOR INDICATIONS OF ABNORMAL PRESSURE DROP.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESSES CERTIFICATIONS ARE VERIFIED BY INSPECTION.

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CONTAMINATION CONTROL

CLEANLINESS TO LEVEL 200 FOR MMH AND 200 A FOR NTO AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, ASSEMBLY AND INSTALLATION PROCEDURES ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION. VISUAL AND DIMENSIONAL INSPECTIONS DURING FABRICATION ARE VERIFIED BY INSPECTION.

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

CAR 01F060 RECORDS A PARTIALLY CLOGGED FILTER ON STS-1 (RH OX). DETECTED BY PRESSURE DROP FROM FLIGHT DATA. MINOR EFFECT ON ENGINE PERFORMANCE. CONTAMINANT IDENTIFIED AS DECOMPOSED PLASTIC MATERIAL LEFT IN POD FEED SYSTEM. REQUIREMENT IMPOSED FOR BORESCOPE INSPECTION AND CLEANLINESS VERIFICATION OF FEEDLINES AT MDAC PRIOR TO ENGINE INSTALLATION.

(E) OPERATIONAL USE

ENGINE SHUTDOWN PERFORMED (OMS ENGINE FAIL), BASED ON OMS ENGINE RM, CHAMBER PRESSURE < 80% . ENGINE INLET PRESSURES OFF-NOMINAL AND VERIFIED BY CHAMBER PRESSURE AND/OR REGION JACKET TEMPERATURE. FAILURE INTERPRETED AS PROPELLANT SYSTEM FAILURE VIA MISSION RULES. MALFUNCTION PROCEDURES REQUIRE NEXT PLS (PRIMARY LANDING SITE) DEORBIT USING MIXED CROSSFEED DEORBIT BURN WITH ENGINE IN OTHER POD. IF PROPELLANT IS INSUFFICIENT OR IF RESULTING YCG IS UNACCEPTABLE USE OF PROPELLANT FROM FAILED SYSTEM POD THROUGH RCS FOR PERIGEE ADJUST BURN WILL BE ATTEMPTED BEFORE PERFORMING DEORBIT BURN WITH GOOD POD.