

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ORBITAL MANEUVER FMEA NO 03-3 -64011 -1 REV:11/14/8

ASSEMBLY : ENG SUBSYSTEM CRIT. FUNC: 1
 P/N RI : MC621-0009 CRIT. HDW: 2
 P/N VENDOR: 1106510 VEHICLE 102 103 104
 QUANTITY : 8 EFFECTIVITY: X X X
 : 4/EA ENG SUBSYSTEM PHASE(S): PL X LO X OO X DO X LS X

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

ITEM:
 MOUNTING PAD ENGINE AND GIMBAL RING.

FUNCTION:
 FOUR MOUNTING PADS ARE PROVIDED. TWO PADS ARE PROVIDED FOR ATTACHING THE GIMBAL RING TO THE POD AND TWO FOR ATTACHING THE ENGINE TO THE GIMBAL RING. STABILIZER STRUTS AND FOUR MONOBALL BEARINGS ACCOMMODATE 2-AXIS GIMBALLING. THE ENGINE THRUST LOAD IS TRANSMITTED TO THE GIMBAL RING AND VEHICLE THROUGH THESE PAD ASSEMBLIES.

FAILURE MODE:
 STRUCTURAL FAILURE

CAUSE(S):
 EXCESS WEAR OR FORCE, IMPROPER INSTALLATION OR MATERIAL DEFECTS, CORROSION, SHOCK, VIBRATION.

EFFECT(S) ON:
 (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
 (A) LOSS OF REDUNDANCY. MAY REQUIRE SHUTDOWN OF ONE ENGINE (INABILITY TO GIMBAL ENGINE).
 (B) DEGRADATION OR LOSS OF INTERFACE FUNCTION. POSSIBLE ENGINE SUBSYSTEM AND VEHICLE STRUCTURAL DAMAGE.
 (C) POSSIBLE EARLY MISSION TERMINATION. REDLINE ADDITIONAL PROPELLANT FOR RCS BACKUP DEORBIT. NEXT PLS DEORBIT IF SUFFICIENT PROPELLANT IS AVAILABLE.
 (D) POSSIBLE CREW/VEHICLE LOSS - RESULTANT POD AND STRUCTURE DAMAGE COULD RESULT IN LACK OF ENGINE RESTRAINT CAUSING POSSIBLE BREAKING

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OMS PROPELLANT LINES AND CONNECTORS.

DISPOSITION & RATIONALE:

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

(A) DESIGN

DESIGN FACTOR OF SAFETY IS 1.4. COMPLETE STRESS ANALYSIS PERFORMED (CORROSION RESISTANT MATERIALS USED). REDUNDANT ENGINES PROVIDE REDUNDANCY FOR NON-CATASTROPHIC FAILURES.

(B) TEST

QUALIFICATION TEST

USED ON STRUCTURAL TEST ARTICLE FOR POD ASSEMBLY. QUALIFIED AS PART OF ENGINE ASSEMBLY - 118 HOT-FIRE TESTS DURING ENGINE QUAL, 498 FIRING TESTS AT SYSTEM QUAL LEVEL AT WSTF. TESTS INDICATE A MINIMUM OF 2X ANTICIPATED 100 MISSION LIFE USAGE. VIBRATION TEST AT ENGINE LEVEL. ALSO SUBJECTED TO GIMBAL SPRING RATE AND ULTIMATE LOAD TESTS.

ACCEPTANCE TESTS

EXAMINATION OF PRODUCT, WELD INSPECTIONS.

GROUND TURNAROUND

V43CEO.030 PERFORMS DETAILED VISUAL INSPECTION EVERY 5 FLIGHTS OR WHENEVER POD IS REMOVED.

V79AZ0.010 AND V79AZ0.020 PERFORM COMPLETE TVC SYSTEM CHECKOUT FOR FIRST FLIGHT AND EVERY 5 FLIGHTS.

V79AZ0.030 AND V79AZ0.040 PERFORMS LEFT AND RIGHT TVC VERIFICATION (POD ONLY) FOR FIRST FLIGHT AND CONTINGENCY.

GIMBAL CHECK PERFORMED IN FLIGHT AFTER OMS-1,2, AND PRIOR TO DEORBIT.

SOCFA0.700 PERFORMS GIMBAL PROFILE CHECK IN VAB AND AT PAD DURING FINAL COUNT.

GIMBAL CHECKS PERFORMED IN FLIGHT PRIOR TO DEORBIT BURN.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS TO LEVEL 100A 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. PHYSICAL AND DIMENSIONAL INSPECTION OF ALL COMPONENTS

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DURING FABRICATION IS VERIFIED BY INSPECTION. DIMENSIONAL INSPECTION OF RING AFTER ASSEMBLY IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT AND RADIOGRAPHIC INSPECTION OF WELDS 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

NO FAILURE HISTORY.

(E) OPERATIONAL USE

PERFORM REMAINING MISSION REQUIREMENTS USING CROSSFEED FOR UTILIZATION OF PROPELLANT FROM POD WITH FAILED ENGINE. (PROPELLANT FROM AFFECTED POD NOT USABLE IF ENGINE LINES ARE BROKEN). REDLINE ADDITIONAL PROPELLANT FOR RCS BACKUP DEORBIT. NEXT PLS DEORBIT IF PROPELLANT FOR RCS BACKUP NOT AVAILABLE. POSSIBLE MISSION IMPACT. DECREASED PROPELLANT AVAILABLE FROM OMS TO RCS THROUGH INTERCONNECT FOR ON-ORB OPERATION.