

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE**NUMBER: 03-1-0764 -X****SUBSYSTEM NAME:** MAIN PROPULSION**REVISION:** 1 02/22/01

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: VIB MOUNT, O2 HP PUMP HE PURGE TECHNETICS DIV.	ME196-0016-0001
LRU	: VIB MOUNT, O2 HP PUMP HE PURGE TECHNETICS DIV.	ME196-0024-0001

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

VIBRATION MOUNT, HIGH PRESSURE OXYGEN TURBOPUMP PURGE INSTALLATION.

ME196-0016-0001 (OV-102)

ME196-0024-0001 (OV-103/104)

REFERENCE DESIGNATORS:**QUANTITY OF LIKE ITEMS:** 62**FUNCTION:**

VIBRATION MOUNT SUPPORTS THE ENGINE HELIUM PURGE SUPPLY LINES FROM THE ENGINE HELIUM PURGE SUPPLY TANKS (6 IN MID BODY AND 3 IN AFT COMPARTMENT) TO THE ORBITER/SSME INTERFACE. VIBRATION MOUNTS ISOLATE THE SUPPLY LINES FROM HIGH ENERGY VIBRATION INDUCED BY THE ORBITER STRUCTURE.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 03-1-0764-01

REVISION#: 1 02/21/01

SUBSYSTEM NAME: MAIN PROPULSION

LRU: HELIUM PANEL VIBRATION ISOLATOR

ITEM NAME: HELIUM PANEL VIBRATION ISOLATOR

CRITICALITY OF THIS

FAILURE MODE: 1/1

FAILURE MODE:

FAILURE TO ISOLATE SUPPLY LINES FROM HIGH ENERGY VIBRATION

MISSION PHASE:

PL PRE-LAUNCH

LO LIFT-OFF

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:

PIECE PART STRUCTURAL FAILURE

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:

VIBRATION MOUNT FAILS CAUSING HIGH PRESSURE HELIUM LINE TO RUPTURE/LEAK. RESULTS IN LOSS OF HELIUM FROM THE ENGINE HELIUM SUPPLY. POSSIBLE OVERPRESSURIZATION OF THE AFT COMPARTMENT. POSSIBLE UNCONTAINED ENGINE SHUTDOWN. EXCESSIVE ENGINE HELIUM TANK AND/OR REGULATOR PRESSURE DECAY WILL BE INDICATED BY SM ALERT OR CAUTION AND WARNING.

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DURING ENTRY, VENT DOORS ARE CLOSED TO PREVENT INGESTION OF RCS AND APU GASES. RUPTURE DURING THE TIME PERIOD THAT THE VENT DOORS ARE CLOSED MAY RESULT IN OVERPRESSURIZATION OF AFT COMPARTMENT. VENT DOORS ARE OPENED WHEN VEHICLE VELOCITY DROPS BELOW 2400 FT/SEC.

EXCESSIVE HELIUM LEAKAGE WILL BE DETECTABLE ON GROUND USING HAZARDOUS GAS DETECTION SYSTEM (HGDS).

(B) INTERFACING SUBSYSTEM(S):

SAME AS A.

(C) MISSION:

POSSIBLE LOSS OF CREW/VEHICLE.

(D) CREW, VEHICLE, AND ELEMENT(S):

SAME AS C.

(E) FUNCTIONAL CRITICALITY EFFECTS:

NONE.

-DISPOSITION RATIONALE-

(A) DESIGN:

THE VIBRATION MOUNT CONSISTS OF 2 SPRINGS (NICKEL PLATED 304 STAINLESS STEEL), A STUD (A286 CRES, WHICH INCORPORATES A BASE SUPPORT), TOP CAP (ANODIZED 2024-T6 ALUMINUM), LOCK-NUT, AND 2 RETAINERS (ANODIZED 2024-T6 ALUMINUM). THE COMPONENTS ARE PLACED ON TOP OF THE STUD IN THE FOLLOWING ORDER: FIRST SPRING, FIRST RETAINER, SECOND RETAINER, SECOND SPRING, AND TOP CAP. THE STUD SHAFT IS SECURED ABOVE THE TOP CAP BY THE LOCK-NUT (TORQUED TO 5 TO 7 INCH-LBS ABOVE THE LOCK-NUT TORQUE), WHICH MAINTAINS A PRELOAD ON THE VIBRATION MOUNT. THE 2 RETAINERS POSITION AND HOLD THE MIDPOINT OF THE VIBRATION MOUNT TO A STAND-OFF, WHICH IS CONNECTED TO THE ORBITER STRUCTURE.

ONE HAT (A BOX STRUCTURE) CONNECTS TWO VIBRATION MOUNTS TO THE LINE HOLDDOWN CLAMPS.

PIECE PART STRUCTURAL FAILURE OF THE VIBRATION MOUNT MAY CAUSE FATIGUE FAILURE OF THE SUPPLY LINES. STRUCTURAL ANALYSIS INDICATES POSITIVE MARGINS OF SAFETY FOR ALL CONDITIONS OF OPERATIONS.

(B) TEST:

ATP

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EXAMINATION OF PRODUCT
DIMENSIONS AND FINISH
CERTIFICATION OF MATERIALS

CERTIFICATION

THE VIBRATION MOUNTS WERE CERTIFIED WITH THE MAIN PROPULSION TEST ARTICLE (MPTA) WHICH INCORPORATES ALL CONFIGURATIONS UTILIZED IN THE MPS SYSTEM. MPTA EXPERIENCED NUMEROUS FULL DURATION STATIC FIRINGS OF THE MAIN ENGINE AT DIFFERENT PERFORMANCE LEVELS. THESE STATIC FIRINGS IMPARTED WORST CASE ENVIRONMENTS AT MAXIMUM OPERATING TEMPERATURES AND PRESSURES.

VIBRATION MOUNTS WERE VERIFIED BY ANALYSIS. FOR OV103/OV104 REFER TO REPORT STS85-0254 (STRUCTURAL ANALYSIS FOR 6.0 LOADS, DATED APRIL 1988), VOLUME 10 (THRUST STRUCTURE, MPS, AND SECONDARY STRUCTURE). FOR OV102 REFER TO REPORT SD77-SH-0178 (DESIGN STRESS ANALYSIS OV102), DATED JULY 1988), VOLUME 10; AND REPORT SOD80-0173 (OV102 STRESS ANALYSIS AND 5.4 LOADS ASSESSMENT, DATED JULY 1980), VOLUME 10.

OMRSD
ANY TURNAROUND CHECKOUT IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
PARTS ARE VERIFIED FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL
INSPECTION VERIFIES PARTS TO ENSURE THEY ARE FREE FROM DEBRIS, GREASE AND OTHER CONTAMINATION ITEMS.

ASSEMBLY/INSTALLATION
PARTS ARE VISUALLY AND DIMENSIONALLY INSPECTED. THICKNESS OF NICKEL PLATING ON SPRINGS AND SURFACE FINISH ARE VERIFIED. MANDATORY INSPECTION POINTS ARE INCLUDED IN THE ASSEMBLY PROCESS.

CRITICAL PROCESSES
HEAT TREATMENT OF SPRINGS IS VERIFIED. INSPECTION VERIFIES PART PASSIVATION AND ANODIZE.

NONDESTRUCTIVE EVALUATION
N/A

TESTING
ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING, PACKAGING, STORAGE AND SHIPPING REQUIREMENTS ARE VERIFIED.

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CURRENT DATA ON TEST FAILURE, FLIGHT FAILURE, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATABASE.

(E) OPERATIONAL USE:

NO CREW ACTION CAN BE TAKEN.

- APPROVALS -

S&R ENGINEERING	: W.P. MUSTY	:/S/ W.P. MUSTY
S&R ENGINEERING ITM	: P. A. STENGER-NGUYEN	:/S/ P.A. STENGER-NGUYEN
DESIGN ENGINEERING	: LEE DURHAM	:/S/ LEE DURHAM
MPS SUBSYSTEM MGR.	: TIM REITH	:/S/ TIM REITH
MOD	: JEFF MUSLER	:/S/ JEFF MUSLER
USA SAM	: MIKE SNYDER	:/S/ MIKE SNYDER
USA ORBITER ELEMENT	: SUZANNE LITTLE	:/S/ SUZANNE LITTLE
NASA SR&QA	: ERICH BASS	:/S/ ERICH BASS