

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE

NUMBER: 03-1-0726 -X

SUBSYSTEM NAME: MAIN PROPULSION

REVISION: 1 02/20/01

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: TRANSDUCER, LO2 TEMPERATURE RDF	ME449-0013-0020 21034

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
TRANSDUCER, LO2 ENGINE INLET TEMPERATURE.

REFERENCE DESIGNATORS: V41T1131C
V41T1231C
V41T1331C

QUANTITY OF LIKE ITEMS: 3
ONE PER ENGINE

FUNCTION:
MEASURES TEMPERATURE OF THE LO2 AT EACH OF THE SSME INLET FEEDLINES. THE DATA IS USED FOR MONITORING OF PROPER LO2 THERMAL CONDITIONING PRIOR TO SSME START AND POST FLIGHT DATA ANALYSIS.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 03-1-0726-03

REVISION#: 1 10/30/01

SUBSYSTEM NAME: MAIN PROPULSION

LRU: LO2 SSME INLET TEMPERATURE TRANSDUCER

CRITICALITY OF THIS

ITEM NAME: LO2 SSME INLET TEMPERATURE TRANSDUCER

FAILURE MODE: 1/1

FAILURE MODE:

PROBE STRUCTURAL FAILURE

MISSION PHASE:

PL PRE-LAUNCH
LO LIFT-OFF

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

FATIGUE, MATERIAL DEFECTS

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:

FAILURE RESULTS IN PROBE ENTERING THE LO2 LOW PRESSURE OXIDIZER TURBOPUMP (LPOTP) CAUSING STRUCTURAL FAILURE. RESULTS IN UNCONTAINED ENGINE DAMAGE. POSSIBLE AFT COMPARTMENT OVERPRESSURIZATION AND FIRE/EXPLOSION HAZARD. POSSIBLE LOSS OF ADJACENT CRITICAL FUNCTIONS DUE TO CRYO EXPOSURE.

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(B) INTERFACING SUBSYSTEM(S):

SAME AS A.

(C) MISSION:

POSSIBLE LOSS OF CREW/VEHICLE. PROBE FAILURE DURING CHILLDOWN AND INITIAL PHASES OF LOADING HAS NO EFFECT, POSSIBLE LAUNCH SCRUB.

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

SAME AS C.

(E) FUNCTIONAL CRITICALITY EFFECTS:

NONE.

-DISPOSITION RATIONALE-

(A) DESIGN:

THE TRANSDUCER IS HERMETICALLY SEALED AND IS DESIGNED AND CONSTRUCTED TO WITHSTAND THE STATIC AND DYNAMIC LOADS IMPOSED BY OPERATIONAL SERVICE AND ALL OTHER HANDLING ASPECTS. THE PROBE IS CYLINDRICAL CONSISTING OF A ONE PIECE HEX NUT AND THREADED SECTION WHICH IS TUNGSTEN-INERT GAS (TIG) WELDED TO AN EXTENDED MANDREL. THE PROBE FROM THE SEALING SURFACE TO THE TIP IS 4.0 INCHES IN LENGTH. THE SENSING WIRE AND MANDREL IS CONTAINED WITHIN AN OUTER STAINLESS STEEL SHEATH THAT IS TIG WELDED TO THE THREADED PART AND ALSO AT THE TIP OF THE MANDREL. THE STRUCTURE IS ALL STAINLESS STEEL. THE PROBE IS DESIGNED AND CONSTRUCTED TO WITHSTAND 3,000 PSIA WITHOUT ANY STRUCTURAL FAILURE.

(B) TEST:

ATP

EXAMINATION OF PRODUCT

LEAKAGE TEST

LEAK TESTING PRECLUDES LEAKAGE GREATER THAN 4×10^{-6} SCC/SEC.

INSULATION RESISTANCE TEST

USING 100 VOLTS DC AND AN ELECTRIFICATION TIME OF 2 MINUTES BEFORE MEASUREMENT THE RESISTANCE SHALL BE LESS THAN 50 MEGOHMS WHEN MEASURED BETWEEN INSULATED TERMINALS AND BETWEEN THE TERMINAL AND THE CASE.

CALIBRATION

CALIBRATED AT 5 POINTS (-450, -410, -320, +32, AND +212 DEG F)

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CERTIFICATION

CALIBRATION

CALIBRATED AT 5 POINTS (-450, -410, -320, +32, AND +212 DEG F)

THERMAL SHOCK

10 CYCLES FROM +75 TO -320 DEG F

RANDOM VIBRATION AND LOW TEMPERATURE TEST:

13.3 HOURS OF RANDOM VIBRATION AT -320 DEG F IN EACH OF THE 2 AXES.

BURST PRESSURE TESTING

NO LEAKAGE SHALL OCCUR WHEN SUBJECTED TO 3000 PSI.

OMRSD

ANY TURNAROUND CHECKOUT IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

RECEIVING INSPECTION

RECEIVING INSPECTION PERFORMS VISUAL AND DIMENSIONAL EXAMINATION OF ALL INCOMING PARTS. CERTIFICATION RECORDS/TEST REPORTS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES.

CONTAMINATION CONTROL

CLEANLINESS LEVEL 800A IS MAINTAINED AND VERIFIED IN ACCORDANCE WITH APPLICABLE REQUIREMENT.

ASSEMBLY/INSTALLATION

MANDATORY INSPECTION POINTS ARE INCLUDED IN MANUFACTURING PROCESS. TOOL CALIBRATION IS VERIFIED TO THE REQUIREMENT. PARTS ARE INSPECTED VISUALLY, DIMENSIONALLY, AND INCREMENTALLY IN ACCORDANCE WITH SPECIFICATION.

CRITICAL PROCESSES

DRY FILM LUBRICANT APPLIED TO THREADS IS VERIFIED PER DRAWING SPECIFICATION. TIG WELDING IS VERIFIED BY INSPECTION AND LEAK CHECK.

NONDESTRUCTIVE EVALUATION

HELIUM LEAK TEST IS VERIFIED BY INSPECTION. RADIOGRAPHIC INSPECTION IS CONDUCTED TO VERIFY THE EXISTENCE OF STRAIN RELIEF ON THE WINDING ELEMENT AND TO DETECT METALLIC CONTAMINATION IN THE HOUSING WHERE THE CONNECTOR IS WELDED.

TESTING

ATP AND PROOF PRESSURE TESTS ARE OBSERVED AND VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGING AND PROTECTION ARE VERIFIED BY INSPECTION TO APPLICABLE REQUIREMENTS. SPECIAL HANDLING PER DOCUMENTED INSTRUCTIONS IS VERIFIED TO

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PRECLUDE DAMAGE, SHOCK, AND CONTAMINATION DURING COMPONENT HANDLING/TRANSPORTING/ PACKAGING BETWEEN WORK STATIONS.

(D) FAILURE HISTORY:

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	: L. DANG	:/S/ L. DANG
S&R ENGINEERING ITM	: P. A. STENGER-NGUYEN	:/S/ P. A. STENGER-NGUYEN
DESIGN ENGINEERING	: HERB WOLFSON	:/S/ HERB WOLFSON
MPS SUBSYSTEM MGR.	: TIM REITH	:/S/ TIM REITH
INSTRUMENTATION	: BILL MCKEE	:/S/ BILL MCKEE
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