FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 03-1-0727 -X

SUBSYSTEM NAME: MAIN PROPULSION

REVISION: 1 02/20/01

PART DATA

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

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
TRANSDUCER, LO2 17 INCH FEEDLINE MANIFOLD DISCONNECT TEMPERATURE "A".

REFERENCE DESIGNATORS: V41T1528A

QUANTITY OF LIKE ITEMS: 1

FUNCTION:
MEASURES TEMPERATURE OF LO2 IN THE FEEDLINE MANIFOLD NEAR THE 17-INCH DISCONNECT. THE TEMPERATURE DATA IS USED FOR GEYSER PREVENTION DURING LOADING AND FOR POST FLIGHT DATA ANALYSIS.

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REVISION#: 1 10/30/01

SUBSYSTEM NAME: MAIN PROPULSION
LRU: LO2 17" FEEDLINE TEMP "A" TRANSDUCER **CRITICALITY OF THIS**
ITEM NAME: LO2 17" FEEDLINE TEMP "A" TRANSDUCER **FAILURE MODE:** 1R3

FAILURE MODE:
ERRONEOUS INDICATION.

MISSION PHASE: PL PRE-LAUNCH

VEHICLE/PAYLOAD/KIT EFFECTIVITY:
102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:
PIECE PART STRUCTURAL FAILURE, CONTAMINATION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN
A) PASS
B) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)

B)
FAILS SCREEN B BECAUSE SIGNAL FROM FAILED TRANSDUCER IS INDISTINGUISHABLE FROM THE SIGNAL OF A PROPERLY FUNCTIONING TRANSDUCER.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
NO EFFECT, MEASUREMENT USED FOR GEYSER PREVENTION DURING LOADING. MEASUREMENT IS REDUNDANT TO V41T1527A, WHICH IS LOCATED IN APPROXIMATELY THE SAME POSITION.

(B) INTERFACING SUBSYSTEM(S):

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SAME AS A.

(C) MISSION:
NO EFFECT. LOSS OF BOTH MEASUREMENTS WILL RESULT IN THE TERMINATION OF PROPELLANT LOADING CAUSING A POSSIBLE LAUNCH SCRUB.

(D) CREW, VEHICLE, AND ELEMENT(S):
SAME AS C.

(E) FUNCTIONAL CRITICALITY EFFECTS:
1R/3 3 SUCCESS PATHS. TIME FRAME - PROPELLANT LOADING.
1) ONE OF TWO MEASUREMENTS (V41T1528A OR V41T1527A) FAILS WITHIN LOADING LIMITS.
2) SECOND MEASUREMENT FAILS WITHIN LOADING LIMITS.
3) LO2 TEMPERATURE INCREASES CAUSING GEYSER (ASSUMES GROUND CREW IS NOT WARNED IN TIME TO START SAFING ACTIONS).

GEYSER FORMATION WILL RESULT IN LO2 FEEDLINE RUPTURE. FIRE/EXPLOSION HAZARD BOTH INTERIOR AND EXTERIOR TO THE VEHICLE. POSSIBLE AFT COMPARTMENT OVERPRESSURIZATION AND LOSS OF ADJACENT CRITICAL COMPONENTS DUE TO CRYO EXPOSURE. POSSIBLE LOSS OF VEHICLE.

-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 THE ONE PIECE HEX NUT AND THREADED SECTION WHICH IS TUNGSTEN-INERT GAS (TIG) WELDED TO AN EXTENDED MANDREL. THE PLATINUM SENSING WIRE IS COILED AROUND THE MANDREL. IT IS INSULATED FROM THE MANDREL BY PLASMA DEPOSITED ALUMINUM OXIDE (AL_2O_3). 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 1X10-6 SCC/SEC.

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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)

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 400A 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

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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 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:
FAILURE OF SINGLE TRANSDUCER OUTSIDE OF LOADING LIMITS WILL RESULT IN STOP FLOW / LAUNCH SCRUB.

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