WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12029	**In-Flight Anomaly Number** --	**Contractor Report Number** E-123-1	**JSC#** --	**KSC#** --
Problem Title LOX PRESSURE TRANSDUCER FAILED THE CALIBRATION TEST				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT 1R	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** LOX PRES TRANSDCR	**PART#** PD7400098-079	**SER/LOT#** 2224	**MANUFACTURER** GULTON
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE NCA	**NOMENCLATURE** LOX PRES TRANSDCR	**PART#** PD7400098-079	**SER/LOT#** 2224	**MANUFACTURER** GULTON
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** MT - P/T HI OR LO	**Cause** ETT - EI-TEST-EQUP
System ELECTRICAL	**Defect** XN - NA	**Material** C - EEE	**Work Contact** J. ADAMS	**Fail Date** 02/08/1989
Received at MSFC 02/13/1989	**Date Isolated** --	**FMEA Reference** 3.2.1.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location GULTON		**Symptom** ET - MEAS ANOMALY		**Time Cycle** N/A
Effectivity Text NONE				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary				
Last MSFC Update 05/07/1992	**CN RSLV SBMT** 05/02/1989	**Defer Date** --	**Add Date** 02/13/1989	**R/C Codes** 3 - F/TE -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** A. JACKMAN	**S & MA** R. JACKSON	**Project** M. PESSIN	**Project MGR** J. SMELSER
Approval				
Design	**Chief Engineer**	**S & MA**	**Project**	**Project MGR**

A. JACKMAN	J. NICHOLS	R. JACKSON	J. SMELSER	J. SMELSER
PAC Assignee J.EL-IBRAHIM	**PAC Review Complete** JE	**MSFC Closure Date** 05/30/1989	**Status** C - CLOSED	**F/A Completion** --
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Contractor Status Summary				
Reliability/Quality Assurance Concerns, Recommendations:				

Problem Description

```
A PRESSURE TRANSDUCER FAILED THE HIGH RESOLUTION CALIBRATION TEST
SEGMENT OF THE VENDOR ACCEPTANCE TEST PROCEDURE
PREVIOUS CAPS:  E-082, E-091, E-101, E-106, E-110, E-111, E-112, E-115,
E-119, E-120, E-121, E-122.  AND MARS T-35919
```

Contractor Investigation/Resolution

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4/3/89 - THIS PROBLEM REPORT HAS BEEN DEFERRED FOR STS-30 BASED ON
THE FOLLOWING RATIONALE:
THE LOX PRESSURE TRANSDUCER IS CRIT 1R.  THERE ARE FOUR UNITS INSTALLED
WHILE THREE ARE REQUIRED TO BE FUNCTIONAL IF ONE UNIT FAILS TO OPERATE
THE BACK-UP UNIT COULD BE SWITCHED TO UNTIL T-10 SECONDS
ALL EFFECTIVITIES CLEARED, SINCE THE FAILURE OCCURRED DURING VENDOR
ACCEPTANCE TESTING; ALL INSTALLED COMPONENTS HAVE SUCCESSFULLY PASSED
ACCEPTANCE TESTING
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET PROJECT
MANAGER, MR. J. SMELSER  _____SIGNED 4/21/89_____________________
CAUSE:  TEST EQUIPMENT MALFUNCTION
  R/C:  TEST EQUIPMENT HAS BEEN MODIFIED TO PREVENT APPLYING EXCESSIVE
        PRESSURE TO THE PRESSURE TRANSDUCER AND TO RECORD THE PRESSURE
        DURING TESTING
GENERAL
A.  PRESSURE TRANSDUCER S/N 2224 FAILED DURING VENDOR ACCEPTANCE TESTING
    AND WAS DOCUMENTED ON MARS T-35919.  DURING THE HIGH RESOLUTION
    CALIBRATION TEST THE UNIT DEVELOPED A LARGE OUTPUT VOLTAGE ERROR
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THE UNIT FUNCTIONED PROPERLY DURING PRESSURE RISE BUT ON PRESSURE FALL, AS THE PRESSURE PASSED A THROUGH APPROXIMATELY 24.7 PSIG, THE OUTPUT VOLTAGE DID NOT DECRESE LINEARLY WITH PRESSURE. THE TEST SEGMENT DURING WHICH FAILURE OCCURRED, ATP-3061-0000-87, PARAGRAPH 5.6, ALLOWS AN OUTPUT VOLTAGE ERROR OF +5% AND -3% OF FULL SCALE THE ACTUAL ERROR WAS FOUND TO BE APPROXIMATELY 20%. THIS TRANSDUCER HAD SUCCESSFULLY COMPLETED THE PREVIOUS ATP TEST SEGMENTS WHICH INCLUDE: PROOF PRESSURE; THREE-AXIS VIBRATION; AND PRECISION CALIBRATION OF LESS THAN +/-3% ERROR

TASK I FAILURE INVESTIGATION

A. FAILURE ANALYSIS T-35919 FOUND THAT THE TRANSDUCER FAILED DUE TO A MALFUNCTION IN THE TEST EQUIPMENT UTILIZED IN THE VENDOR ATP. HIGH PRESSURE, FAR EXCEEDING THE 45 PSI PROOF PRESSURE, WAS APPLIED TO THE TRANSDUCER. PHYSICAL DISTORTION OF THE PRESSURE PORT ANEROID CAPSULES WAS MEASURED. THE SECOND FAILURE, MARS T-34394, COMING AS IT DID AT THE SOME POINT IN THE VENDOR ATP, BACKS THE FAILURE ANALYSIS RESULTS (PROBLEM REPORTED NO A12096). THE AUTOMATED TEST EQUIPMENT WAS UNABLE TO DISCRIMINATE BETWEEN A TEST EQUIPMENT MALFUNCTION AND A TRANSDUCER FAILURE, RESULTING IN DAMAGE TO A TRANSDUCER

TASK II CORRECTIVE ACTION

THE CAUSE OF THE TEST EQUIPMENT MALFUNCTION IS UNDER INVESTIGATION BY GULTON SERVONICS' PERSONNEL

CLOSURE STATEMENT

GULTON SERVONICS HAS BEEN UNABLE AS YET TO IDENTIFY THE ROOT CAUSE OF THE TEST EQUIPMENT MALFUNCTION. IN LIEU OF CORRECTING THE CAUSE, SEVERAL MEASURES WERE TAKEN TO PREVENT DAMAGE TO THE TRANSDUCERS UNDER TEST. THE GAS PRESSURE SUPPLY TO THE TEST EQUIPMENT IS NOW LIMITED BY A PRESSURE REGULATOR TO THE PROOF PRESSURE RATING OF THE TRANSDUCER. A POWER LINER VOLTAGE TRANSIENT SUPPRESOR PLACED BETWEEN THE TEST EQUIPMENT AND THE AC POWER SOURCE. A STRIP CHART RECORDER WAS DIRECTLY CONNECTED TO THE TEST EQUIPMENT PRESSURE SENSOR, THUS BYPASSING THE COMPUTER IN THE DATA ACQUISITION LOOP. IN THE EVENT OF FUTURE TEST EQUIPMENT MALFUNCTIONS WHICH RESULT IN A HIGHER THAN INTENDED PRESSURE BEING APPLIED TO A TRANSDUCER, THE CHART RECORDER WILL PROVIDE A RECORD OF THE EVENT. THE CHART WILL BE APPENDED TO THE ATP RESULTS OF EACH TRANSDUCER. EFFORTS TO DETERMINE THE ROOT CAUSE OF THE TEST EQUIPMENT MALFUNCTIONS CONTINUE. SHOULD IT PROVE POSSIBLE, AT A LATER DATE, TO IDENTIFY THE TEST EQUIPMENT PROBLEMS, FURTHER CHANGES TO THE AUTOMATED TEST EQUIPMENT WILL BE MADE

TASK CLOSED

TASK III CLEARANCE OF EFFECTIVITIES

ALL ET'S CLEARED. THE FAILURE DURING VENDOR ACCEPTANCE TESTING AND ALL INSTALLED TRANSDUCERS HAVE SUCCESSFULLY PASSED THE ACCEPTANCE TEST

TASK CLOSED

TASK IV CAPS CLOSURE SUMMARY

THE VENDOR'S TEST EQUIPMENT MALFUNCTIONED AND DAMAGED A PRESSURE TRANSDUCER BY APPLYING EXCESSIVE PRESSURE. THE TEST EQUIPMENT FAILED TO RECORD THE PRESSURE EVENT. THE TEST EQUIPMENT HAS BEEN MODIFIED TO CORRECT BOTH PROBLEMS

TASK CLOSED

THIS PROBLEM REPORT IS SUBMITTED TO MSFC FOR CLOSURE REVIEW AND APPROVAL

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	IFA#	Contractor RPT#	JSC#	KSC#	EICN#
A12029	--	E-123-1	--	--	--

Asmnt Part#	Asmnt Part Name	Asmnt Serial/Lot#
PD7400098-079	LOX PRES TRANSDUCER	2224

HCRIT CD	FCRIT CD	CAUSE CD	FAIL MODE
--	1R	ETT - EI-TEST-EQUP	MT - P/T HI OR LO

Asmnt FMEA	Asmnt FM	FMEA CSE	FMEA SCSE
3.2.1.1	1	N/A	N/A
--	--	--	--
--	--	--	--

Correlated Part#	Correlated Part#	Correlated Part#
--	--	--

Associated LRU#	Associated LRU#	Associated LRU#
--	--	--

MAJOR DESIGN CHANGES

APRV DATE	DESCRIPTION OF CHANGES
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12096	**In-Flight Anomaly Number** --	**Contractor Report Number** E-123-2	**JSC#** --	**KSC#** --
Problem Title LOX PRESSURE TRANSDUCER FAILED DURING ATP				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT 1R	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** LOX PRESSURE TRND	**PART#** PD740098-079	**SER/LOT#** 2231	**MANUFACTURER** GULTON
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** LOX PRESSURE TRND	**PART#** PD7400098-079	**SER/LOT#** 2231	**MANUFACTURER** GULTON
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** MT - P/T HI OR LO	**Cause** ETT - EI-TEST-EQUP
System ELECTRICAL	**Defect** XN - NA	**Material** C - EEE	**Work Contact** J. ADAMS	**Fail Date** 03/10/1989
Received at MSFC 03/15/1989	**Date Isolated** --	**FMEA Reference** 3.2.1.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location GULTON		**Symptom** EE - RANDOM		**Time Cycle** LMTD LIFE
Effectivity Text NONE				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary				
Last MSFC Update 05/07/1992	**CN RSLV SBMT** 05/02/1989	**Defer Date** --	**Add Date** 03/16/1989	**R/C Codes** 3 - F/TE -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** A. JACKMAN	**S & MA** R. JACKSON	**Project** M. PESSIN	**Project MGR** J. SMELSER
Approval				
Design	**Chief Engineer**	**S & MA**	**Project**	**Project MGR**

A. JACKMAN	J. NICHOLS	R. JACKSON	J.SMELSER	J. SMELSER
PAC Assignee J.EL-IBRAHIM	**PAC Review Complete** JE	**MSFC Closure Date** 05/30/1989	**Status** C - CLOSED	**F/A Completion** --
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Contractor Status Summary				
Reliability/Quality Assurance Concerns, Recommendations:				

Problem Description

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LOX PRESSURE TRANSDUCER FAILED THE VENDOR ATP DURING THE HIGH
RESOLUTION CALIBRATION TEST (ATP NUMBER 3061000081).  THE UNIT DEVELOPED
A LARGE OUTPUT VOLTAGE ERROR ON THE PRESSURE RISE.  APPROXIMATELY AT 18
PSIG THE UNIT DEVELOPED A LARGE OUTPUT ERROR AND ITS FULL SCALE ERROR AT
ATMOSPHERIC PRESSURE WAS 17% HIGH
PREVIOUS CAPS:  E-082, E-091, E-101, E-106, E-110, E-111, E-113, E-115,
E-119, E-120, E-121, E-122 AND MSFC REPORT NO. A12029
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Contractor Investigation/Resolution

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4/3/89 - THIS PROBLEM REPORT HAS BEEN DEFERRED FOR STS-30 BASED ON
THE FOLLOWING RATIONALE:
THE LOX PRESSURE TRANSDUCER IS CRIT 1R.  THERE ARE FOUR UNITS INSTALLED
WHILE THREE ARE REQUIRED TO BE FUNCTIONAL IF ONE UNIT FAILS TO OPERATE
THE BACK-UP UNIT COULD BE SWITCHED TO UNTIL T-10 SECONDS
ALL EFFECTIVITIES CLEARED, SINCE THE FAILURE OCCURRED DURING VENDOR
ACCEPTANCE TESTING; ALL INSTALLED COMPONENTS HAVE SUCCESSFULLY PASSED
ACCEPTANCE TESTING
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET PROJECT
MANAGER, MR. J. SMELSER  _______SIGNED 4/21/89_____________________
CAUSE:  TEST EQUIPMENT MALFUNCTION
  R/C:  TEST EQUIPMENT HAS BEEN MODIFIED TO PREVENT APPLYING EXCESSIVE
        PRESSURE TO THE PRESSURE TRANSDUCER AND TO RECORD THE PRESSURE
        DURING TESTING
GENERAL
```

PRESSURE TRANSDUCER S/N 2231 FAILED DURING VENDOR ACCEPTANCE TESTING AND WAS DOCUMENTED ON MARS T-34394. THE FAILURE WAS VIRTUALLY IDENTIFICAL TO THAT DESCRIBED IN PR A12096 EXCEPT THAT IT OCCURRED ON PRESSURE RISE AT APPROXIMATELY 18 PSIG
TASK I FAILURE INVESTIGATION
THE TRANSDUCER DOCUMENTED ON MARS T-35394 DOES NOT WARRANT A FORMAL FAILURE ANALYSIS. THE FAILURE IS IDENTICAL TO THAT ON MARS T-35919 FAILURE ANALYSIS T-35919 FOUND THAT THE TRANSDUCER FAILED DUE TO A MALFUNCTION IN THE TEST EQUIPMENT UTILIZED IN THE VENDOR ATP. HIGH PRESSURE, FAR EXCEEDING THE 45 PSI PROOF PRESSURE, WAS APPLIED TO THE TRANSDUCER. PHYSICAL DISTORTION OF THE PRESSURE PORT ANEROID CAPSULES WAS MEASURED. THE SECOND FAILURE, MARS T-34394, COMING AS IT DID AT THE SAME POINT IN THE VENDOR ATP, BACKS THE FAILURE ANALYSIS RESULTS. THE AUTOMATED TEST EQUIPMENT WAS UNABLE TO DISCRIMINATE BETWEEN A TEST EQUIPMENT MALFUNCTION, RESULTING IN DAMAGE TO A TRANSDUCER, AND TRANSDUCER FAILURE
TASK CLOSED
TASK II CORRECTIVE ACTION
THE CAUSE OF THE TEST EQUIPMENT MALFUNCTION IS UNDER INVESTIGATION BY GULTON SERVONICS' PERSONNEL
CLOSURE STATEMENT
GULTON SERVONICS HAS BEEN UNABLE AS YET TO IDENTIFY THE ROOT CAUSE OF THE TEST EQUIPMENT MALFUNCTION. IN LIEU OF CORRECTING THE CAUSE, SEVERAL MEASURES WERE TAKEN TO PREVENT DAMAGE TO THE TRANSDUCERS UNDER TEST. THE GAS PRESSURE SUPPLY TO THE TEST EQUIPMENT IS NOW LIMITED BY A PRESSURE REGULATOR TO THE PROOF PRESSURE RATING OF THE TRANSDUCER. A POWER LINE VOLTAGE TRANSIENT SUPPRESSOR WAS PLACED BETWEEN THE TEST EQUIPMENT AND THE AC POWER SOURCE. A STRIP CHART RECORDER WAS DIRECTLY CONNECTED TO THE TEST EQUIPMENT PRESSURE SENSOR, THUS BYPASSING THE COMPUTER IN THE DATA ACQUISITION LOOP. IN THE EVENT OF FUTURE TEST EQUIPMENT MALFUNCTIONS WHICH RESULT IN A HIGHER THAN INTENDED PRESSURE BEING APPLIED TO A TRANSDUCER, THE CHART RECORDER WILL PROVIDE A RECORD OF THE EVENT. THE CHART WILL BE APPENDED TO THE ATP RESULTS OF EACH TRANSDUCER. EFFORTS TO DETERMINE THE ROOT CAUSE OF THE TEST EQUIPMENT MALFUNCTIONS CONTINUE. SHOULD IT PROVE POSSIBLE, AT A LATER DATE, TO IDENTIFY THE TEST EQUIPMENT PROBLEMS, FURTHER CHANGES TO THE AUTOMATED TEST EQUIPMENT WILL BE MADE
TASK CLOSED
TASK III CLEARANCE OF EFFECTIVITIES
ALL ET'S CLEARED. THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE TESTING AND ALL INSTALLED TRANSDUCERS HAVE SUCCESSFULLY PASSED THE ACCEPTANCE TEST
TASK CLOSED
TSK IV CAPS CLOSURE SUMMARY
THE VENDOR'S TEST EQUIPMENT MALFUNCTIONED AND DAMAGED A PRESSURE TRANSDUCER BY APPLYING EXCESSIVE PRESSURE. THE TEST EQUIPMENT FAILED TO RECORD THE PRESSURE EVENT. THE TEST EQUIPMENT HAS BEEN MODIFIED TO CORRECT BOTH PROBLEMS
TASK CLOSED
THIS PROBLEM REPORT IS SUBMITTED TO MSFC FOR CLOSURE REVIEW AND APPROVAL

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	IFA#	Contractor RPT#	JSC#	KSC#	EICN#
A12096	--	E-123-2	--	--	--

Asmnt Part#	Asmnt Part Name	Asmnt Serial/Lot#	
PD7400098-079	LOX PRES TRANSDUCER	2231	
HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	ETT - EI-TEST-EQUP	MT - P/T HI OR LO
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.2.1.1	1	N/A	N/A
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Correlated Part#	**Correlated Part#**	**Correlated Part#**	
--	--	--	
Associated LRU#	**Associated LRU#**	**Associated LRU#**	
--	--	--	
MAJOR DESIGN CHANGES			
APRV DATE	**DESCRIPTION OF CHANGES**		
--	--		
ASSESSMENT TEXT			

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12135	**In-Flight Anomaly Number** --	**Contractor Report Number** P-063	**JSC#** --	**KSC#** --
Problem Title CONTAMINATION WAS DETECTED INSIDE AFT FEEDLINE LO2 ELBOW OF ET 29 & 31				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1
HCRIT 1	**Sys_Lvl** N	**Misc Codes** A **(X)** B C D E **(X)** F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** LO2 PROP LINES	**PART#** 80921011009-019	**SER/LOT#** 71	**MANUFACTURER** MMC
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** LO2 PROP LINES	**PART#** 80921011009-019	**SER/LOT#** 71	**MANUFACTURER** MMC
Test/Operation L - FLD	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** MS - STRUCT	**Cause** MAP - MFG-ASY-INST
System PROPULSION	**Defect** CN - CONTAM	**Material** M - LINK-G	**Work Contact** J. FINCHER	**Fail Date** 03/22/1989
Received at MSFC 04/03/1989	**Date Isolated** --	**FMEA Reference** 2.1.21.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location KSC		**Symptom** UC - UNSAT		**Time Cycle** N/A
Effectivity Text DEFERRED FOR STS-28, STS-34, STS-33				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary CAUSE: TAPE RESIDUE TRANSFER AS A RESULT OF USING FREON AS A PARTICLE BARRIER WIPE				
Last MSFC Update 02/10/1995	**CN RSLV SBMT** 07/24/1989	**Defer Date** --	**Add Date** 04/03/1989	**R/C Codes** 5 - TRNG -- --
Assignee				
Design P. MULLER	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** P. BRIDWELL
Approval				

Design	Chief Engineer	S & MA	Project	Project MGR
P. MULLER	M. PESSIN	R. JACKSON	--	P. BRIDWELL

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
J.EL-IBRAHIM	CM	08/16/1989	C - CLOSED	04/03/1989

Problem Type	SEV	Program Name	REVL	OPRINC
--	--	--	--	--

FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
--	-- -- -- -- --	--	--	--

RES PERSON L2	Approval Signature L3
--	--

Related Document Type	Related Document ID
--	--

Related Document Title
--

Related Document Type	Related Document ID
--	--

Related Document Title
--

Related Document Type	Related Document ID
--	--

Related Document Title
--

Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

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DURING BLACK LIGHT INSPECTION OF THE L02 AFT FEEDLINE ELBOW, INDICATIONS
WERE PRESENT WHICH CREATED A SUSPECT CONDITION RELATIVE TO NON-VOLATILE
RESIDUE.  A VISUAL INDICATION WAS PRESENT IN THE VICINITY WHICH WOULD
NORMALLY BE USED TO BUILD A PARTICAL BARRIER WHEN FLANGE LAPPING IS
REQUIRED TO PROVIDE A GOOD SEALING SURFACE.  A WIPE TEST WAS PERFORMED
AND THE NVR EXCEEDED THE REQUIREMENT OF ONE MILLIGRAM PER SQUARE FOOT
CRITICALITY:  FAILURE TO MEET LO2 CLEANLINESS REQUIREMENTS IS
              CRITICALITY 1 PER THE CIL.  REF. FMEA ITEM CODE 2.1.21.1
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Contractor Investigation/Resolution

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4/18/89 - THIS PROBLEM REPORT HAS BEEN DEFERRED FOR STS-30 BASED ON THE
FOLLOWING RATIONALE:
1 - CONTAMINATION INSIDE THE ELBOW AND THE DISCONNECT OF ET-29 WERE
ACCEPTED BASED ON BLACK LIGHT INSPECTION AFTER CLEANING
2 - CONTAMINATION LEVELS IN ET-31 AND TRANSFER TESTS WERE BELOW L02
IMPACT THRESHOLDS
3 - NO IMPACT SOURCES
4 - NO ALUMINUM IGNITION POSSIBLE
5 - IF CONTAMINANT IGNITION OCCURRED, IT WOULD NOT DEGRADE THE
PROPERTIES OF THE ALUMINUM
6 - CONTAMINANT STRONGLY ADHERES TO THE SIDE WALL
THE ABOVE DEFERRAL MEETS THE DEFERRAL REQUIREMENTS OF NSTS 07700 VOLUME
X1 ITEM C, WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE
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FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT CHECKOUT, OR SPECIAL TEST". THE SPECIAL TESTS PERFORMED WERE LOX COMPATIBILITY OF THE SAME CONTAMINATE LEVEL AS ET 31 AND SUBSEQUENT RESIDUE TRANSFER TESTS AS WELL AS WORST CASE LOX IMPACT TESTING WITH ALUMINUM SAMPLES. REF FRR CHARTS
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET PROJECT MANAGER, MR. J. SMELSER
_____J. SMELSER (SIGNED 4/24/89)_____
THIS PROBLEM REPORT HAS BEEN DEFERRED FOR STS-28, STS-34 AND STS-33 BASED ON THE ABOVE RATIONALE
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET ACTING PROJECT MANAGER, MR. G.P. BRIDWELL
_____G.P. BRIDWELL (SIGNED)_____
GENERAL
REFERENCE CAPS P-063A DATED 7/24/89 -
DURING NORMAL (OMRSD) BLACKLIGHT INSPECTION OF THE ET-29 LO2 ET/ORBITOR DISCONNECT, THE FLAPPER VALVE OF THE DISCONNECT FLUORESCED. THE SUBSEQUENT INVESTIGATION DISCOVERED THE AFT LO2 FEEDLINE ELBOW ALSO FLUORESCED ADJACENT TO THE INTERFACE WITH THE DISCONNECT. THE FLUORESCING MATERIAL IN BOTH AREAS WAS REMOVED WITH SOLVENTS, BUT THE NVR OF THE ELBOW WAS NOT VERIFIED. THE ELBOW AS WELL AS THE DISCONNECT WERE ACCEPTED BASED ON BLACKLIGHT INSPECTION AFTER CLEANING
IN FOLLOW-UP TO THE ET-29 BLACK LIGHT INSPECTION, THE ET-31 LO2 ELBOW WAS INSPECTED WITH A BLACK LIGHT AT KSC. THE ELBOW FLUORESCED ADJACENT TO THE INTERFACE WITH THE DISCONNECT AND CONTAMINATION/RESIDUE WAS VISUALLY APPARENT IN THE SAME AREA OF THE OBSERVED ON ET-29. THE SUBSEQUENT NVR TEST FAILED WITH A VALUE OF 3.4 MILLIGRAMS PER SQUARE FOOT (REF. WAD PR ET-31 - FP-0035) WITH THE REQUIREMENT BEING 1 MILLIGRAM PER SQUARE FOOT MAXIMUM. THE PURPOSE OF THIS CAPS IS TO PERFORM THE INVESTIGATION NECESSARY TO DETERMINE THE CAUSE OF THE CONTAMINATION, TO DETERMINE THE FLEET CLEARANCE TASKS AND TO OBTAIN CORRECTIVE ACTION
TASK I -FAILURE/PROBLEM INVESTIGATION
A WIPE TEST WAS PERFORMED TO DETERMINE THE NON-VOLATILE RESIDUE CONTENT ON ET-31 AT KSC. THIS FOLLOWED BLACK LIGHT AND VISUAL INDICATION ON THE INTERIOR OF THE QUICK DISCONNECT END OF THE LO2 AFT ELBOW CASTING. AS A RESULT OF THIS FINDING, THE FOLLOWING ACTIONS ARE REQUIRED TO DETERMINE THE CAUSE FOR THE ANOMALOUS CONDITIONS AND TO DETERMINE THE REQUIRED CORRECTIVE ACTION
1. CONTACT THE VENDOR WHO PROVIDES G02 PRESSURIZATION LINES AND L02 FEEDLINES TO DETERMINE IF PARTICLE BARRIERS ARE INSTALLED INSIDE OF CLEAN LINES WHEN WORK IS PERFORMED ON CLEANED HARDWARE
CLOSURE STATEMENT
NO PARTICULATE BARRIERS ARE INSTALLED IN LINES RETURNED TO THE SUPPLIER COMPLETE RECLEANING AND REPACKAGING IS ACCOMPLISHED. REF. MEMO 3761-89-037, DATED 5 APRIL 1989, FAULKNER TO FINCHER
2. REVIEW ALL G02 AND L02 LINE MAF BUILD RECORDS TO DETERMINE WHICH LINES HAD PARTICLE BARRIERS INSTALLED
CLOSURE STATEMENT
A REVIEW OF RECORDS IDENTIFIED ALL L02 FEEDLINES WHICH HAVE UTILIZED PARTICLE BARRIERS DURING REWORK ACTIVITIES. BY MANAGEMENT DECISION, ALL PRESSURIZATION LINES WERE NOT RESEARCHED. REF. MEMO 3741-89-048
3. PERFORM TESTS ON AN INDIVIDUAL L02 ELBOW (ET-55) TO DETERMINE THE ADEQUACY OF TAPE RESIDUE REMOVAL AND PERFORM NVR TEST
CLOSURE STATEMENT
INSPECTIONS WERE PERFORMED ON TWO UNINSTALLED L02 ELBOWS (ET-54 AND 55) THIS CONSISTED OF A VISUAL, BLACK LIGHT (ULTRA VIOLET) AND NON-VOLATILE RESIDUE WIPE. NO VISUAL INDICATIONS WERE OBSERVED IN EITHER ELBOW HOWEVER, ON ET-55, FOUR AREAS FLUORESCED BUT NO TRANSFER WAS OBTAINED WHEN WIPED WITH A PCA FREON SOAKED SWAB. ET-54 HAD NO FLUORESCENT AREAS. BOTH LINES WERE NVR WIPED AND WERE WITHIN THE ACCEPTABLE LIMITS OF LESS THAN ONE MILLOGRAM PER SQUARE FOOT. REF. LAB REPORTS 89A094 AND

89A095
4. DETERMINE IF VENDOR OF ET-29 AND ET-31 ELBOW CASTINGS UTILIZE ANY PROCESSES WHICH WOULD CONTRIBUTE TO BLACK LIGHT INDICATIONS INSIDE OF THE ASSEMBLY
CLOSURE STATEMENT
NO UNUSUAL CIRCUMSTANCES INVOLVING ET-29 OR 31 ELBOWS WERE REPORTED BY THE SUPPLIER (STADCO) WHICH WOULD CONTRIBUTE TO FLUORESCENT AREAS IN THE L02 ELBOW CASTING. REF. MEMO 3761-89-037, W. FAULKNER TO J FINCHER
5. INTERVIEW SHOP AND INSPECTION PERSONNEL TO DETERMINE IF CONSISTENCIES EXIST RELATIVE TO PARTICLE BARRIER INSTALLATION/REMOVAL AND SAMPLING FOR NVR PER THE STANDARD REPAIR INSTRUCTIONS M-004
CLOSURE STATEMENT
INTERVIEWS WITH SHOP, Q.C. AND LABORATORY PERSONNEL REVEALED THAT A GENERAL CONSISTENCY IN TECHNIQUE WAS UTILIZED IN CONJUNCTION WITH CLEANING, INSPECTION AND SAMPLING FOR NVR AFTER LAPPING FLANGES USING STANDARD REPAIR INSTRUCTION M-004
6. OBTAIN DATA FROM KSC RELATIVE TO PROCESSING DIFFERENCES IN THE AREAS OF THE L02 ELBOW AND QUICK DISCONNECT, IF ANY, ON ET-29 VS. ET-31
CLOSURE STATEMENT
NO DIFFERENCES ARE EVIDENT WHICH WOULD CONTRIBUTE THE THE ANOMALOUS CONDITIONS AFTER THE ET WAS DELIVERED TO KSC. REF. AR MK9061-MK1
7. COMPARE PROCESSING OF L02 AFT ELBOW CASTING AT MAF FOR ET-29 AND 31 WITH EMPHASIS ON ANY DIFFERENCES WHICH WOULD PRODUCE ANOMALOUS CONDITIONS INSIDE OF THE ELBOW
CLOSURE STATEMENT
NO DIFFERENCES WERE EVIDENT IN REVIEWING THE ELBOW PROCESSING WHICH WOULD CONTRIBUTE TO THE ANOMALOUS CONDITION. REF. TO MATRIX P-63-7
8. PERFORM LOX IMPACT TESTING TO DETERMINE SENSITIVITY OF TAPE/CLOTH RESIDUE
CLOSURE STATEMENT
LOX IMPACT TESTING WAS PERFORMED ON MATERIALS WHICH ARE USED IN CONJUNCTION WITH REWORK OF FLANGES. IT WAS DETERMINED THAT 155 MG/FT-SQUARED PASSED IMPACT TESTING. IT WAS ALSO DETERMINED THAT ANY CONCENTRATION OF ANTI-STATIC COMPOUND IS LOX COMPATIBLE. REF MATERIALS ENGINEERING TEST REPORT - ETTR-349
9. DETERMINE EFFECT (IF ANY) OF AGING OF TAPE/CLOTH RESIDUE
CLOSURE STATEMENT
TESTS INDICATE THAT WHEN J414 TAPE IS IN CONTACT WITH PCA FREON, THE AMOUNT OF ADHESIVE TRANSFER IS PROPORTIONAL TO THE CONTACT TIME WITH THE SOLVENT AND LENGTH OF TIME LEFT ON THE SURFACE OF THE METAL SUBSTRATE REF. TO MATERIALS ENGINEERING TEST REPORT ETTR-349
10. TEST SAMPLES OF TAPE/CLOTH RESIDUE ON MACHINED/CAST SURFACES WITH OSEE
CLOSURE STATEMENT
RESULTS OF THE OSEE WERE INCONCLUSIVE BECAUSE OF ELBOW CONFIGURATION AND DUE TO THE FACT THAT NO DATA WERE OBTAINABLE ON A357-T6 CASTINGS. REF MEMO 3573-89-062
11. KSC PROVIDE RESULTS OF TESTING ON ET HARDWARE AT KSC AS IT RELATES TO RESIDUE FOUND ON ET-31
CLOSURE STATEMENT
VISUAL AND BLACK LIGHT INDICATIONS WERE PRESENT. IN ONE AREA OF THE ELBOW A ONE SQUARE FOOT AREA WAS WIPED BY MAF PERSONNEL USING THE SAME METHOD THAT IS USED IN ET PRODUCTION. THE NVR WIPE REVEALED 3.4 MG/FT-SQUARED WHICH IS IN VIOLATION OF THE REQUIRED 1 MG/FT-SQUARED. REF WAD-PR-ET-31-FP-0035
TASK II - CORRECTIVE ACTIONS
1. IMPLEMENT TOOLING TO REPLACE ACLAR BARRIERS TO PRECLUDE USE OF TAPE INSIDE OF FEEDLINES AND PRESSURIZATION LINES
CLOSURE STATEMENT
TOOLING HAS BEEN PROVIDED TO PRECLUDE THE REQUIREMENT FOR TAPED IN

PARTICLE BARRIERS ON PROPULSION LINES AND THE APPLICABLE IMPLEMENTING PLANS AND SRIS HAVE BEEN REVISED. THIS IS EFFECTIVE FOR ET-55. REF SRI-M004 REV. 5 AND MEMO 3743-89-178
2. REVISE STPS 5008, 5009, 5011 AND 5017 TO INCLUDE CLARIFICATION OF VISUALLY CLEAN SURFACES TO AVOID MISINTERPRETATIONS. SUBSTITUE DEMINERALIZED WATER FOR PCA FREON AS A BARRIER WIPE TO PRECLUDE FREON CONTACT WITH J414 TAPE
CLOSURE STATEMENT
ALL STPS HAVE BEEN REVISED TO CLARIFY VISUAL INSPECTION REQUIREMENTS THIS REVISION ALSO INCLUDES DELETION OF PCA FREON WIPE ON ACLAR BARRIERS FOR TANK PENETRATION; I.E. MANHOLES, ELECTRICAL FEED THROUGHS, ETC. REF. JOB SHEET DCN-34809-305
3. IMPLEMENT ADHESIVE RESIDUE ACCEPTANCE TEST AND REVISE RECEIVAL ACCEPTANCE PLANS TO IMPOSE THE REQUIREMENT
CLOSURE STATEMENT
ADHESIVE ACCEPTANCE TEST REQUIREMENTS HAVE BEEN RELEASED AND THE RECEIVING ACCEPTANCE PLAN HAS BEEN REVISED TO IMPOSE THIS REQUIREMENT REF. RAP-J414
4. SCHEDULE AND INSPECT FIVE (5) ETS DURING THE MODIFICATION AND PRODUCTION PERIOD BY VISUAL, BLACKLIGHT AND NVR BY PERFORMING A DISCREPANCY CHECK AND REPORT (DC&R P89-001A & P-89-002)
NOTE: ET-27, 32, 33, 34 AND 53
CLOSURE STATEMENT
FIVE ETS WERE INSPECTED WITH BLACK LIGHT, VISUAL AND NVR (ETS 27, 32, 33, 34 & 53). VISUAL INDICATIONS ON ET-27 WOULD INDICATE SMALL AMOUNTS OF TAPE RESIDUE WAS PRESENT. THE TWO LARGEST OF SIX INDICATIONS WERE LESS THAN .3" INCH. ALL NVR SAMPLES PASSED THE 1 MG/FT-SQUARED REQUIREMENTS. REF. ATTACHEMENT 6
5. REVISE SRI M-004 TO PRECLUDE USE OF FREON OVER BARRIER TAPE
CLOSURE STETEMENT
SRI-M004 WAS REVISED TO DELETE THE USE OF FREON TO WIPE PARTICULATE FROM THE PARTICLE BARRIER. D.M. WATER IS USED TO PRECLUDE THE FREON FROM CONTACTING THE J414 TAPE. REF. SRI-M004
6. REVISE BARRIER MPP'S TO PRECLUDE USE OF FREON OVER TAPE
CLOSURE STATEMENT
MPPS FOR ETS 47 AND UP HAVE BEEN REVISED TO DELETE THE USE OF FREON ON PARTICLE BARRIERS AND USE D.M. WATER. REF. MEMO DATED 5-10/89 TO D WESTPHAL FOR R. CAMPBELL
7. ISSUE PRODUCTION TIPS FOR PRECLUDING SOLVENT OVER BARRIER TAPE
CLOSURE STATEMENT
A PRODUCTION TIP (NUMBER 102) WAS ISSUED TO MAKE ALL PERSONNEL AWARE OF THE REQUIREMENT TO NOT USE FREON WHICH WOULD CONTACT J-414 TAPE
TASK III CLEARANCE OF EFFECTIVITIES
ALL ET'S CLEARED:
THE L02 FEEDLINE ELBOWS ARE INSPECTED AT KSC IN CONJUNCTION WITH AN INSPECTION OF THE ET TO ORBITER QUICK DISCONNECT. THIS CAST ELBOW IS THE ONLY VISUALLY ACCESSIBLE SECTION OF THE L02 LINE DURING THIS INSPECITON. HOWEVER, ALL OTHER LINES IN THE L02 PROPELLANT FEED SYSTEM AND PRESSURIZATION SYSTEM ARE SMOOTH SURFACES WHICH LEND THEMSELVES TO VERIFICATION OF A CLEAN SURFACE. THE RESIDUE LEVELS ON ET-31 AND ALL OTHER TANKS INSPECTED TO DATE ARE BELOW L02 IMPACT THRESHOLDS. NO IMPACT SOURCES HAVE BEEN IDENTIFIED NOR IS THERE A POTENTIAL OF ALUMINUM IGNITION OR PROPERTY DEGRADATION DUE TO RESIDUE IGNITION. ADHERENCE PROPERTIES OF THE RESIDUE IS SUCH THAT VERY AGRESSIVE SOLVENTS AND PERSISTENT SCRUBBING IS REQUIRED TO REMOVE THE RESIDUE WHICH MINIMIZES THE POTENTIAL OF INTRUSION OF THIS MATTER INTO THE PROPELLANT FLOW. IN ADDITION, THE FLUORESCING AREAS ON THE ET-27, ET-29, AND ET-31 ELBOWS WERE CLEANED
TASK IV CAPS CLOSURE SUMMARY
LOX IMPACTS TESTS DETERMINED THAT THE VISUAL INDICATIONS ARE BELOW L02 IMPACT THRESHOLDS NOR HAVE ANY IMPACT SOURCES BEEN IDENTIFIED. ADHERENT PROPERTIES OF RESIDUE ARE SUCH THAT THE POTENTIAL OF THIS MATERIAL

INTRUSION INTO THE PROPELLANT LOW IS MINIMIZED. CORRECTIVE ACTIONS HAVE BEEN IMPLEMENTED TO ELIMINATE SOLVENT CONTACT WITH TAPE AND SPECIAL TOOLING FOR THE PROPELLANT LINES WILL ELIMINATE TAPE IN THESE APPLICATIONS
MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12135	--	P-063	--	--	--
Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**			
80921011009-019	L02 PROP LINES	71			
HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**		
--	1	MAP - MFG-ASY-INST	UC - UNSAT		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
2.1.21.1	1	A	1		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
--	--	--	--		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
--	--	--	--		
Correlated Part#	**Correlated Part#**	**Correlated Part#**			
--	--	--			
Associated LRU#	**Associated LRU#**	**Associated LRU#**			
--	--	--			
MAJOR DESIGN CHANGES					
APRV DATE	**DESCRIPTION OF CHANGES**				
--	--				
ASSESSMENT TEXT					

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12185	**In-Flight Anomaly Number** --	**Contractor Report Number** P-064	**JSC#** --	**KSC#** --
Problem Title A PIECE OF FOREIGN MATERIAL WAS FOUND IN THE 2 INCH Q.D. OF ET-38				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1
HCRIT 1	**Sys_Lvl** Y	**Misc Codes** A B C D E F **(X)** G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** ET-38	**PART#** 80901000000	**SER/LOT#** 31	**MANUFACTURER** MMC
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** QUICK DISCONNECT	**PART#** V527-415273-028	**SER/LOT#** DCN-03953-	**MANUFACTURER** ROCKEWELL DY
Test/Operation L - FLD	**Prevailing Condtion** P - PRESSURE	**F / U** UC	**Fail Mode** MS - STRUCT	**Cause** MAE - MFG-ASY-ENVR
System PROPULSION	**Defect** CE - EXTRA	**Material** S - STRUCT	**Work Contact** J. FINCHER	**Fail Date** 04/17/1989
Received at MSFC 04/20/1989	**Date Isolated** --	**FMEA Reference** 03-1-0513-2	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location KSC		**Symptom** UC - UNSAT		**Time Cycle** N/A
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary				
Last MSFC Update 02/10/1995	**CN RSLV SBMT** 06/05/1989	**Defer Date** --	**Add Date** 04/21/1989	**R/C Codes** 4 - TEST -- --
Assignee				
Design P. MULLER	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** G. LADNER	**Project MGR** G. BRIDWELL
Approval				

Design	Chief Engineer	S & MA	Project	Project MGR
P. MULLER	M. PESSIN	R. JACKSON	G. LADNER	G. BRIDWELL

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
J.EL-IBRAHIM	JE	07/14/1989	C - CLOSED	--

Problem Type	SEV	Program Name	REVL	OPRINC
--	--	--	--	--

FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
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RES PERSON L2	Approval Signature L3
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Type	Related Document ID
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Related Document Title
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Contractor Status Summary

CAUSE: MOST PROBABLE - THE PIECE OF TEFLON WAS LEFT IN A TOOLING
HOSE BY THE SUPPLIER. THIS HOSE IS USED TO PRESSURIZE THE
EXTERNAL TANK FOR DELIVERY
R/C: A BLOWDOWN TEST OF THE HOSES AT OPERATING PRESSURE PRIOR TO
CONNECTING TO THE ET HAS BEEN IMPLEMENTED INTO THE APPLICABLE
TEST PROCEDURE

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

AFTER REMOVAL OF THE TOOLING PLATE (GO 78-400010) FROM THE ET-38 2"
ORBITER TO ET PRESSURIZATION QUICK DISCONNECT, A PIECE OF MATERIAL
RESEMBLING TEFLON (APPROX. 3.37" LONG X 1.4 WIDE X .033 THICK) WAS
CAPTURED IN THE Q.D. POPPET. (REF. MARS T99906) AND A NONCOMPLIANCE
REPORT (GNC-ET-38-26) WAS WRITTEN TO TRAVEL THIS CONDITION TO KSC WHERE
IT WOULD BE CORRECTED. THIS CAPS IS ISSUED TO INVESTIGATE THIS ANOMALY
AND INITIATE CORRECTIVE ACTION AS DEEMED NECESSARY
CRITICALITY: THIS PROBLEM IS CRITICALITY 1 IN FMEA NUMBER 03-1-0513-2
OF THE MAIN PROPULSION SECTION OF THE SHUTTLE CRITICAL ITEMS LIST

Contractor Investigation/Resolution

4/24/89 - THIS PROBLEM REPORT HAS BEEN DEFERRED FOR STS-30 (ET-29)
BASED ON THE FOLLOWING RATIONALE:
THE MOST PROBABLE SOURCE OF THE PIECE OF TEFLON FOUND ON ET-38, IS THAT
IT WAS LOOSE INSIDE A HOSE USED TO PRESSURIZE THE LOX TANK IN THE
MODIFICATION CENTER AT MAF. A BLOW DOWN TEST WAS PERFORMED AND THE
RESULT CONFIRMED THE FINDING. AS FOR ET-29, (1) IT WAS NOT PROCESSED

THROUGH THE MODIFICATION CENTER, (2) THE QUICK DISCONNECT VALVE DID NOT LEAK DURING TESTING AT MAF AND (3) THE QUICK DISCONNECT WAS INSPECTED AT KSC VISUALLY AND FOUND TO BE ACCEPTABLE
THE ABOVE DEFERRAL RATIONALE MEETS DEFERRAL REQUIREMENTS OF NSTS 07700 VOLUME XI ITEM C, WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT CHECKOUT, OR SPECIAL TEST."
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET PROJECT MANAGER MR. J. SMELSER
_____JERRY SMELSER (SIGNED 4/24/89)_____
GENERAL: DURING PERFORMANCE OF PR ET-38-FP-0004 DISPOSITION ON THE GO2 TWO INCH DISCONNECT (REF. COFR EXCEPTION SHEET NUMBER GNC-ET-38-26) A PIECE OF MATERIAL SIMILAR TO TEFLON WAS FOUND IN THE Q. D. IT APPEARS THAT THE PIECE OF FOREIGN MATERIAL WAS CAPTIVE BETWEEN THE Q. D. POPPET AND THE VALVE SEAT WHICH RESULTED IN LEAKAGE OF THE Q. D. DURING MODIFICATION ACTIVITIES AT MAF. THIS ABNORMAL ACTIVITY WAS DOCUMENTED ON THE AFOREMENTIONED EXCEPTION SHEET WITH A DISPOSITION TO CORRECT THE CONDITION AT KSC
THE MATERIAL IN THE QUICK DISCONNECT WAS REMOVED AND SENT TO THE MALFUNCTION LABORATORY AT KSC
TASK I - FAILURE/PROBLEM INVESTIGATION
THE FOLLOWING ACTIONS SHALL BE ACCOMPLISHED TO DETERMINE THE ORIGIN OF THE MATERIAL AND TO EFFECT CORRECTIVE ACTIONS AS REQUIRED
1. RECEIVE THE MATERIAL AT MAF AND PERFORM DIMENSIONAL ANALYSIS AND MATERIAL COMPOSITION ANALYSIS. COMPLETE
FTIR AND XRT ANALYSIS INDICATES THAT THE KSC MATERIAL IS THE SAME MATERIAL (PTFE) TEFLON USED IN MAF MOD CENTER PRESSURIZATION HOSES (TOOLING). BY SEM/EDX BOTH SAMPLES INDICATE THEY ARE EXTRUDED TEFLON MATERIALS. THE ONLY NOTABLE DIFFERENCES IN SAMPLES IS THE BRAID IMPRINTS ON THE MAF SAMPLE, WHERE AS THE KSC SAMPLES IS SMOOTH ON THE OUTSIDE WHICH WOULD INDICATE NO STAINLESS STEEL BRAID HAS BEEN WOVEN ONTO THE MATERIAL. REF. LAB ANALYSIS 89A155
2. RESEARCH ALL BUILD PAPER AND TEST DOCUMENTATION TO DETERMINE IF ANY ABNORMAL CHARACTERISTICS DEVELOPED OR ACTIVITIES OCCURRED WHICH WOULD PRODUCE A CLUE AS TO THE ORIGIN OF THE MATERIAL
COMPLETE
CLOSURE STATEMENT: NO ANOMALIES WERE IDENTIFIED IN THE BUILD PAPER/TEST PROCEDURES THAT WOULD CONTRIBUTE TO THE PROBLEM. REF. MEMO 3741-89-046
3. LEAK TEST TEFLON LINED HOSES USED DURING THE ET-38 MODIFICATION ACTIVITIES TO DETERMINE IF A PIECE OF THE EXTRUDED LINER IS MISSING REMOVE END FITTING AND INSPECT FOR ANY EVIDENCE OF SHEDDING OF THE TEFLON LINES
COMPLETE
CLOSURE STATEMENT:
THE HOSE USED TO PRESSURIZE THE L02 TANK (F78-1359-6-102) WAS SCRAPPED AND REPLACED WITH A NEW HOSE PRIOR TO THE OPENING OF THE CAPS
THE HOSES USED ON THE PREVIOUS ET (ET-23) WERE LEAK TESTED AT 10 PSIG SUBMERGED IN WATER AND NO LEAKAGE OCCURRED. THE END FITTINGS WERE REMOVED AND NO SHEDDING OR DEGRADATION OF THE LINER WAS NOTED
4. REMOVE A SECTION OF THE PRESSURIZATION HOSES AND PERFORM I.R. SCAN FOR MATERIAL COMPOSITION COMPARISON. MEASURE TEFLON LINER THICKNESS AND OTHER DIMENSIONS FOR PHYSICAL COMPARISON OF MATERIAL EXTRACTED FROM ET-38 Q.D
COMPLETE
CLOSURE STATEMENT:
KSC SAMPLE WAS REPORTED TO BE .0327" (MEAN) THICK. SAMPLES TAKEN FROM THE PRESSURIZATION HOSE AT MAF WAS .0329" (MEAN) THICK. BY LAB ANALYSIS (SEE ITEM 1) THE WALL THICKNESSES AND MATERIAL COMPOSITIONS COMPARE FAVORABLY IN ALL RESPECTS. SEE SAMPLE "A" ON LAB REPORT 89A144 WHICH IS THE "1" HOSE ON LAB ANALYSIS REFERENCED IN ITEM 1
5. REVIEW TEST CONSOLES FOR POTENTIAL OF DISCHARGING TEFLON MATERIAL INTO THE SYSTEM

COMPLETE
CLOSURE STATEMENT:
NO MATERIAL OF THIS TYPE IS USED IN THE PRESSURIZATION CONSOLE (REF MEMO" 3611-89-053WC)
TASK II - CORRECTIVE ACTION
1. IMPLEMENTED A BLOW DOWN TEST OF HOSES AT OPERATING PRESSURING (250-300 PSI) PRIOR TO CONNECTING THEM TO THE EXTERNAL TANK, FOR BLDGS 420 AND THE MOD CENTER
COMPLETE
CLOSURE STATEMENT:
THE FOLLOWING TEST PROCEDURES WILL BE REVISED TO INCORPORATE A BLOWDOWN TEST PER TCN 47 OF TOOL DRAWING F78-1359 IN THE MOD CENTER

TP-5A150-MC	TP-8C211-MC	TP-5G250-MC
TP-5A151-MC	TP-8C212-MC	TP-5G251-MC

THIS REVISION WILL BE INCORPORATED FOR THE NEXT VEHICLES TO ENTER THE MOD CENTER. PRESENT VEHICLES IN THE MOD CENTER ET-33 AND 34 WILL BE ACCOMPLISHED VIA WORK AUTHORIZATION A39-083 FOR THE F78-1359-6-101 HOSE (FIRST TIME USAGE OF HOSE). THE F78-1359-6-102 HOSE HAS BEEN USED SIX TIMES AND WILL NOT REQUIRE A BLOWDOWN TEST FOR THESE TWO VEHICLES TEST PROCEDURE TP-5C101-AT FOR BOTH CELL 1 AND 2 IN BLDG. 420 HAS BEEN REVISED TO INCLUDE A BLOWDOWN TEST. (REF PCN 8 OF TP-5C101-AT)
2. RESEARCH ALL BUILD PAPER AND TEST DOCUMENTATION TO DETERMINE IF A NEW HOSE WAS USED TO PRESSURIZE ANY UNFLOWN VEHICLES IN THE MOD CENTER AFTER ET-38
COMPLETE
CLOSURE STATEMENT:
ET-32 WAS THE NEXT VEHICLE TO ENTER THE MOD CENTER. A NEW HOSE WAS USED TO PRESSURIZE THE L02 TANK. THE HOSE HAS NOT BEEN REPLACED SINCE THEN (REF. MEMO 3741-89-065)
3. INITIATE A MARS TO INSPECT THE L02 DIFFUSER AND THE L02 QD POPPET ON ET-32
COMPLETE
CLOSURE STATEMENT:
MARS T-107080 HAS BEEN ISSUED AND DISPOSITIONED BY ENGINEERING TO INSPECT THE L02 DIFFUSER AND THE L02 QD POPPET. (NOTE: INSPECTION REVEALED NO PARTICULATE)
4. ISSUE A GOVERNMENT-INDUSTRY ALERT ADDRESSING THIS PROBLEM
COMPLETE
TASK III - CLEARANCE OF EFFECTIVITIES
ALL UNFLOWN ET TANKS WITH THE EXCEPTION OF ET-32 L02 UTILIZED PREVIOUSLY USED HOSES. ET-32 RESOLVED BY MARS T-107080
TASK IV - CAPS CLOSURE SUMMARY
A SINGLE PIECE OF TEFLON (PTFE) WAS FOUND TRAPPED BETWEEN THE POPPET AND GUIDE OF ET-38 L02 ET PRESSURIZATION QUICK DISCONNECT. A THOROUGH INVESTIGATION WAS PERFORMED AND CONCLUDED THAT THE TEFLON WAS ORIGINALLY TRAPPED IN THE INNER LINER OF A TOOLING HOSE USED TO PRESSURIZE THE ET FOR DELIVERY. WHEN THE L02 TANK WAS PRESSURIZED FOR SHIPMENT, THE PIECE OF TEFLON WAS EJECTED FROM THE HOSE BY THE GAS FLOW. THIS WAS THE FIRST USAGE OF THE TOOLING HOSE. A BLOWDOWN TEST OF THE HOSES AT OPERATING PRESSURE PRIOR TO CONNECTING TO THE ET HAS BEEN IMPLEMENTED INTO THE APPLICABLE TEST PROCEDURES
THIS PROBLEM REPORT IS CONSIDERED CLOSED

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	IFA#	Contractor RPT#	JSC#	KSC#	EICN#

A12185	--	P-064	--	--	--

Asmnt Part# V527-415273-028	**Asmnt Part Name** QUICK DISCONNECT	**Asmnt Serial/Lot#** DCN-03953	
HCRIT CD --	**FCRIT CD** 1	**CAUSE CD** MAP - MFG-ASY-INST	**FAIL MODE** UC - UNSAT
Asmnt FMEA N/A	**Asmnt FM** N/A	**FMEA CSE** N/A	**FMEA SCSE** N/A
Asmnt FMEA --	**Asmnt FM** --	**FMEA CSE** --	**FMEA SCSE** --
Asmnt FMEA --	**Asmnt FM** --	**FMEA CSE** --	**FMEA SCSE** --
Correlated Part# --	**Correlated Part#** --	**Correlated Part#** --	
Associated LRU# --	**Associated LRU#** --	**Associated LRU#** --	

MAJOR DESIGN CHANGES

APRV DATE --	**DESCRIPTION OF CHANGES** --

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12208	**In-Flight Anomaly Number** --	**Contractor Report Number** E-124	**JSC#** --	**KSC#** --
Problem Title LOX PRESSURE TRANSDUCER FAILED DURING ATP				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT 1R	**Sys_Lvl** N	**Misc Codes** A **(X)** B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** LOX PRESSURE TRN	**PART#** PD7400098-079	**SER/LOT#** 2235	**MANUFACTURER** GULTON
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE NCA	**NOMENCLATURE** LOX PRESSURE TRN	**PART#** PD7400098-079	**SER/LOT#** 2235	**MANUFACTURER** GULTON
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** EV - NOT-TO-SPEC	**Cause** MAW - MFG-ASY-WORK
System ELECTRICAL	**Defect** XN - NA	**Material** H - WELD	**Work Contact** J. ADAMS	**Fail Date** 04/27/1989
Received at MSFC 04/28/1989	**Date Isolated** --	**FMEA Reference** 3.2.1.2	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location GULTON		**Symptom** ET - MEAS ANOMALY		**Time Cycle** N/A
Effectivity Text DEFERRED FOR STS-28, STS-34, STS-33				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary CAUSE: IMPROPERLY PERFORMED WELD DURING TRANSDUCER ASSEMBLY R/C: THE MANUFACTURER RETRAINED ITS PERSONNEL IN PROPER WELD PROCEDURE AND ADDED AN IN-PROCESS 1R TEST FOLLOWING WELDING TO THE SHOP TRAVELERS				
Last MSFC Update 02/13/1995	**CN RSLV SBMT** 08/03/1989	**Defer Date** --	**Add Date** 04/28/1989	**R/C Codes** 2 - MFG -- --
Assignee				
Design	**Chief Engineer**	**S & MA**	**Project**	**Project MGR**

A. JACKMAN	M. PESSIN	R. JACKSON	--	G. BRIDWELL

Approval

Design	**Chief Engineer**	**S & MA**	**Project**	**Project MGR**
A. JACKMAN	M. PESSIN	R. JACKSON	--	G. BRIDWLL
PAC Assignee	**PAC Review Complete**	**MSFC Closure Date**	**Status**	**F/A Completion**
C. MEYER	CM	08/17/1989	C - CLOSED	07/17/1989
Problem Type	**SEV**	**Program Name**	**REVL**	**OPRINC**
--	--	--	--	--

FUNC MOD	**Software Effectivity**	**Software Fail CD**	**SUBTYPE**	**Software Closure CD**
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RES PERSON L2	**Approval Signature L3**
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Related Document Type	**Related Document ID**
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Related Document Type	**Related Document ID**
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Related Document Type	**Related Document ID**
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Related Document Title
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Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

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THE PRESSURE TRANSDUCER FAILED THE INSULATION RESISTANCE TEST SEGMENT
DURING ATP
PREVIOUS CAPS:  E-082, E-091, E-101, E-106, E-110, E-111, E-112, E-115,
E-119, E-120, E-121, E-122, E-123
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Contractor Investigation/Resolution

```
4/28/89 - THIS PROBLEM REPORT HAS BEEN DEFERRED FOR STS-30 BASED ON THE
FOLLOWING RATIONALE:
THE LOX PRESSURE TRANSDUCER IS CRIT 1R.  THERE ARE FOUR UNITS INSTALLED
WHILE THREE ARE REQUIRED TO BE FUNCTIONAL. IF ONE UNIT FAILS TO OPERATE
THE BACK-UP UNIT COULD BE SWITCHED TO UNTIL T-10 SECONDS
ALL EFFECTIVITIES CLEARED, THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE
TESTING.  ALL INSTALLED COMPONENTS HAVE SUCCESSFULLY PASSED ACCEPTANCE
TESTING
THE ABOVE DEFERRAL MEETS THE DEFERRAL REQUIREMENTS OF NSTS 07700 VOLUME
XI, ITEM C, WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE
FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT
CHECKOUT, OR SPECIAL TEST"
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET PROJECT
MANAGER, MR. J. SMELSER
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_____JERRY W. SMELSER (SIGNED 5/1/89)_____
THIS PRBLEM REPORT HAS BEEN DEFERRED FOR STS-28, STS-34 AND STS-33 BASED ON THE ABOVE RATIONALE
THE ABOVE DEFERRAL HAS BEEN APPROVED BY THE ET ACTING PROJECT MANAGER, MR. G.P. BRIDWELL
_____G.P. BRIDWELL (SIGNED)_____
5/2/89 GENERAL
PRESSURE TRANSDUCER, S/N 2235, FAILED DURING VENDOR ACCEPTANCE TESTING AND WAS DOCUMENTED ON MARS T-34395. THE TEST, ATP-3061-0000-81, PARA 5.1., REQUIRES A MINIMUM RESISTANCE OF 50 MEGOHMS AT 50 VDC BETWEEN THE TRANSDUCER WIRING AND THE CASE. THE ACTUAL RESISTANCE WAS LOWER IN VALUE THAN THE MEASUREMENT CAPABILITIES OF THE METER USED, I.E. A NEAR ZERO READING
TASK I FAILURE INVESTIGATION
THE LOW INSULATION RESISTANCE WAS TRACED TO A SOLDER JOINT WHICH HAD BEEN REMELTED DURING AN IMPROPERLY PERFORMED TRANSDUCER CABLE RETAINER WELD. THE SOLDER BRIDGED ACROSS AN INSULATOR. REFERENCE: FAILURE ANALYSIS T-34395
TASK CLOSED
TASK II CORRECTIVE ACTION
A. GULTON-SERVONIC REEMPHASIZED THE IMPORTANCE OF ADHERING TO THE WELDING PROCEDURES TO THEIR WORKERS. REFERENCE: MRAS T-34395
B. GULTON-SERVONIC'S PERSONNEL, WHICH PERFORM INSULATION RESISTANCE TESTING DURING TRANSDUCER MANUFACTURE, WERE RETRAINED TO ASSURE PROPER USE OF THE EQUIPMENT DURING IN-PROCESS CONFIDENCE TESTS PRIOR TO ACCEPTANCE TESTING. REFERENCE: MARS T-34395
C. GULTON-SERVONIC REVISED THE SHOP TRAVELERS FOR BOTH THE -079 AND THE -089 TRANSDUCERS TO INCLUDE AN INSULATION RESISTANCE TEST IMMEDIATELY FOLLOWING THE CABLE RETAINER WELD. REFERENCE: MARS T-34395
D. GULTON-SERVONIC PERFORMED A SEARCH OF THE PRODUCTION RECORDS FOR ALL -089 TRANSDUCERS AND ALL CURRENT USAGE -079 TRANSDUCERS FOR CABLE RETAINER WELD PROBLEMS. NO -089 PART HAD BEEN DELIVERED TO MMC THAT HAD ANY CABLE RETAINER WELD DIFFICULTIES. ONE -079 PART HAD BEEN REWORKED FOR A CABLE RETAINER WELD PROBLEM. THE -079 SUBSEQUENTLY PASSED BOTH THE IN-PROCESS AND ACCEPTANCE INSULATION RESISTANCE TESTS. REFERENCE: GULTON MEMOS MS: 89-010 AND PEM89-089
TASK CLOSED
TASK III CLEARANCE OF EFFECTIVITIES
ALL ETS CLEARED. THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE TESTING AND ALL INSTALLED TRANSDUCERS HAVE SUCCESSFULLY PASSED THE ACCEPTANCE TEST
TASK CLOSED
TASK IV CAPS CLOSURE SUMMARY
ONE TRANSDUCER FAILED THE ACCEPTANCE TEST REQUIREMENT FOR INSULATION RESISTANCE. THE FAILURE WAS TRACED TO AN IMPROPERLY PERFORMED WELD WHICH REMELTED A SOLDER JOINT. THE MANUFACTURER RESTRAINED ITS PERSONNEL IN PROPER WELD PROCEDURES AND ADDED AN IN-PROCESS IR TEST FOLLOWING WELDING TO THE SHOP TRAVELERS
TASK CLOSED
THIS PROBLEM REPORT CLOSURE IS SUBMITTED TO MSFC FOR CLOSURE REVIEW AND APPROVAL

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	IFA#	Contractor RPT#	JSC#	KSC#	EICN#
A12208	--	E-124	--	--	--

Asmnt Part#	Asmnt Part Name	Asmnt Serial/Lot#	
PD7400098-079	LOX PRES TRANSDUCER	2235	
HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	MAW - MFG-ASY-WORK	EG - SIG HI OR LO
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.2.1.1	1	E	4
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Correlated Part#	**Correlated Part#**	**Correlated Part#**	
--	--	--	
Associated LRU#	**Associated LRU#**	**Associated LRU#**	
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MAJOR DESIGN CHANGES			
APRV DATE	**DESCRIPTION OF CHANGES**		
--	--		
ASSESSMENT TEXT			

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12210	**In-Flight Anomaly Number** --	**Contractor Report Number** E-125-1	**JSC#** --	**KSC#** --
Problem Title LOX PRESSURE TRANSDUCER FAILED WITH OPEN CIRCUIT DURING ATP				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT 1R	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** LOX PRESSURE TRN	**PART#** PD7400098-079	**SER/LOT#** 2237	**MANUFACTURER** GULTON
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE NCA	**NOMENCLATURE** LOX PRESSURE TRN	**PART#** PD7400098-079	**SER/LOT#** 2237	**MANUFACTURER** GULTON
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** EL - SHORT	**Cause** ETT - EI-TEST-EQUP
System ELECTRICAL	**Defect** ES - ELSTRS	**Material** C - EEE	**Work Contact** J. ADAMS	**Fail Date** 04/28/1989
Received at MSFC 05/01/1989	**Date Isolated** --	**FMEA Reference** 3.2.1.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location GULTON		**Symptom** EL - SHORT		**Time Cycle** N/A
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary THE TRANSDUCER WAS DAMAGED BY IMPROPERLY CONNECTING IT TO THE VENDOR ATP VIBRATION TEST STATION. THE TEST EQUIPMENT ELECTRICAL CONNECTIONS HAVE BEEN MODIFIED TO PREVENT A RECURRENCE				
Last MSFC Update 08/03/1989	**CN RSLV SBMT** 06/29/1989	**Defer Date** --	**Add Date** 05/02/1989	**R/C Codes** 3 - F/TE -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. BRIDWELL

Approval				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. BRIDWELL
PAC Assignee J.EL-IBRAHIM	**PAC Review Complete** JE	**MSFC Closure Date** 07/14/1989	**Status** C - CLOSED	**F/A Completion** 05/31/1980
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --

FUNC MOD	**Software Effectivity**	**Software Fail CD**	**SUBTYPE**	**Software Closure CD**
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RES PERSON L2	**Approval Signature L3**
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Related Document Type	**Related Document ID**
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Related Document Title
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Related Document Type	**Related Document ID**
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Related Document Title
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Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

DURING SETUP OF THE VIBRATION PORTION OF THE VENDOR ATP, AN OPEN
CIRCUIT CONDITION WAS DETECTED BETWEEN THE "WIPER" AND THE RETURN SIDE
OF THE POTENTIOMETER
REF. MARS T-34396, CAPS E-082, E-091, E-106, E-110, E-111, E-112,
E-115, E-119, E-120, E-121, E-122, E-123, AND E-124

Contractor Investigation/Resolution

5/1/89 - THIS PROBLEM REPORT HAS BEEM DEFERRED FOR STS-30 BASED ON
THE FOLLOWING RATIONALE
THE LOX PRESSURE TRANSDUCER IS CRIT 1R. THERE ARE FOUR UNITS INSTALLED
WHILE THREE ARE REQUIRED TO BE FUNCTIONAL IF ONE UNIT FAILS TO OPERATE
THE BACK-UP UNIT COULD BE SWITCHED TO UNTIL T-10 SECONDS
ALL EFFECTIVITIES CLEARED, SINCE THE FAILURE OCCURRED DURING VENDOR
ACCEPTANCE TESTING. ALL INSTALLED COMPONENTS HAVE SUCCESSFULLY PASSED
ACCEPTANCE TESTING
THE ABOVE DEFERRAL MEETS THE DEFERRAL REQUIREMENTS OF NSTS 07700 VOLUME
XI, ITEM C, WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE
FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT
CHECKOUT, OR SPECIAL TEST."
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET PROJECT
MANAGER, MR. J. SMELSER

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______MR. J. SMELSER (SIGNED 5/3/89)_____________________________
CAUSE:  THE TRANSDUCER RESISTIVE ELEMENT WAS BURNED OUT DUE TO
        IMPROPER CONNECTION TO THE VENDOR ATP TEST EQUIPMENT
R/C:    THE VENDOR TEST EQUIPMENT HAVE BEEN MODIFIED
GENERAL
THE TRANSDUCER HAD SUCCESSFULLY COMPLETED THE INSULATION RESISTANCE,
ROOM TEMPERATURE CALIBRATION, AND PROOF PRESSURE SEGMENTS OF THE VENDOR
ATP-3061-0000-81.  DURING SET-UP FOR THE VIBRATION TEST, PER PARAGRAPH
5.4, THE DEFECT WAS DISCOVERED.  THE FAILURE IS SIMILAR TO THOSE WHICH
HAVE RESULTED WHEN THE 5 VOLT POWER SUPPLY HAS INADVERTENTLY BEEN
APPLIED ACROSS THE WIPER TO "RETURN" LEADS OF THE TRANSDUCER
TASK I  FAILURE INVESTIGATION
FAILURE ANALYSES ARE TO BE PERFORMED ON THE TRANSDUCERS AT MAF
COMPLETED:  5/31/89
CLOSURE STATEMENT
FAILURE ANALYSIS OF THE TRANSDUCER FOUND THAT THE RESISTIVE ELEMENT
HAD BEEN BURNED OUT BY THE APPLICATION OF EXCESSIVE CURRENT.  THE
TRANSDUCER HAD BEEN INCORRECTLY CONNECTED TO THE TEST EQUIPMENT,
RESULTING IN THE HIGH CURRENT.  REFERENCE MARS T34396 AND MARS T34397
TASK CLOSED
TASK II  CORRECTIVE ACTION
THE VENDOR TEST EQUIPMENT, THE VIBRATION TEST STATION, WAS MODIFIED BY
THE ADDITION OF A JUNCTION BOX TO PREVENT IMPROPER CONNECTION OF THE
TRANSDUCERS
REFERENCE MARS T34396 AND MARS T34397
TASK CLOSED
TASK III  CLEARANCE OF EFFECTIVITIES
ALL ET'S CLEARED.  THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE TESTING
AND ALL INSTALLED TRANSDUCERS HAVE SUCCESSFULLY PASSED THE ACCEPTANCE
TEST
TASK CLOSED
TASK IV  CAPS CLOSURE SUMMARY
THE TRANSDUCER WAS DAMAGED BY IMPROPERLY CONNECTING IT TO THE VENDOR
ATP VIBRATION TEST STATION.  THE TEST EQUIPMENT ELECTRICAL CONNECTIONS
HAVE BEEN MODIFIED TO PREVENT A RECURRENCE
TASK CLOSED
THIS PROBLEM REPORT IS CONSIDERED CLOSED
```

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12210	--	E-125-1	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
PD7400098-079	LOX PRES TRANSDUCER	2237

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	ETW - EI-TEST-WORK	EG - SIG HI OR LO

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.2.1.1	1	N/A	N/A
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	Associated LRU#	Associated LRU#
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12211	**In-Flight Anomaly Number** --	**Contractor Report Number** E-125-2	**JSC#** --	**KSC#** --
Problem Title LOX PRESSURE TRANSDUCER FAILED WITH OPEN CIRCUIT DURING ATP				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT 1R	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** LOX PRESSURE TRN	**PART#** PD7400098-079	**SER/LOT#** 2239	**MANUFACTURER** GULTON
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE NCA	**NOMENCLATURE** LOX PRESSURE TRN	**PART#** PD7400098-079	**SER/LOT#** 2239	**MANUFACTURER** GULTON
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** EL - SHORT	**Cause** ETT - EI-TEST-EQUP
System ELECTRICAL	**Defect** ES - ELSTRS	**Material** C - EEE	**Work Contact** J. ADAMS	**Fail Date** 04/28/1989
Received at MSFC 05/01/1989	**Date Isolated** --	**FMEA Reference** 3.2.1.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location GULTON		**Symptom** EL - SHORT		**Time Cycle** N/A
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary THE TRANSDUCER WAS DAMAGED BY IMPROPERLY CONNECTING IT TO THE VENDOR ATP VIBRATION TEST STATION, THE TEST EQUIPMENT ELECTRICAL CONNECTIONS HAVE BEEN MODIFIED TO PREVENT A RECURRENCE				
Last MSFC Update 08/03/1989	**CN RSLV SBMT** 06/29/1989	**Defer Date** --	**Add Date** 05/02/1989	**R/C Codes** 3 - F/TE -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** G. LADNER	**Project MGR** G. BRIDWELL

Approval				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** G. LADNER	**Project MGR** G. BRIDWELL
PAC Assignee J.EL-IBRAHIM	**PAC Review Complete** JE	**MSFC Closure Date** 07/14/1989	**Status** C - CLOSED	**F/A Completion** 05/31/1989
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --

FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
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RES PERSON L2	Approval Signature L3
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Related Document Type	Related Document ID
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Related Document Type	Related Document ID
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Related Document Type	Related Document ID
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Related Document Title
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Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

DURING SETUP OF THE VIBRATION PORTION OF THE VENDOR ATP, AN OPEN
CIRCUIT CONDITION WAS DETECTED BETWEEN THE "WIPER" AND THE RETURN SIDE
OF THE POTENTIOMETER
REF. MARS T-34399, CAPS E-082, E-091, E-106, E-110, E-111, E-112, E-115,
E-119, E-120, E-121, E-122, E-123 AND E-124

Contractor Investigation/Resolution

5/1/89 - THIS PROBLEM REPORT HAS BEEM DEFERRED FOR STS-30 BASED ON
THE FOLLOWING RATIONALE
THE LOX PRESSURE TRANSDUCER IS CRIT 1R. THERE ARE FOUR UNITS INSTALLED
WHILE THREE ARE REQUIRED TO BE FUNCTIONAL IF ONE UNIT FAILS TO OPERATE
THE BACK-UP UNIT COULD BE SWITCHED TO UNTIL T-10 SECONDS
ALL EFFECTIVITIES CLEARED, SINCE THE FAILURE OCCURRED DURING VENDOR
ACCEPTANCE TESTING. ALL INSTALLED COMPONENTS HAVE SUCCESSFULLY PASSED
ACCEPTANCE TESTING
THE ABOVE DEFERRAL MEETS THE DEFERRAL REQUIREMENTS OF NSTS 07700 VOLUME
XI, ITEM C, WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE
FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT
CHECKOUT, OR SPECIAL TEST."
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET PROJECT
MANAGER, MR. J. SMELSER

```
______MR. JERRY SMELSER (SIGNED 5/3/89)_____________________
CAUSE:  THE TRANSDUCER RESISTIVE ELEMENT WAS BURNED OUT DUE TO
        IMPROPER CONNECTION TO THE VENDOR ATP TEST EQUIPMENT
  R/C:  THE VENDOR TEST EQUIPMENT HAVE BEEN MODIFIED
GENERAL
THE TRANSDUCER HAD SUCCESSFULLY COMPLETED THE INSULATION RESISTANCE,
ROOM TEMPERATURE CALIBRATION, AND PROOF PRESSURE SEGMENTS OF THE VENDOR
ATP-3061-0000-81.  DURING SET-UP FOR THE VIBRATION TEST, PER PARAGRAPH
5.4, THE DEFECT WAS DISCOVERED.  THE FAILURE IS SIMILAR TO THOSE WHICH
HAVE RESULTED WHEN THE 5 VOLT POWER SUPPLY HAS INADVERTENTLY BEEN
APPLIED ACROSS THE WIPER TO "RETURN" LEADS OF THE TRANSDUCER
TASK I  FAILURE INVESTIGATION
FAILURE ANALYSES ARE TO BE PERFORMED ON THE TRANSDUCERS AT MAF
COMPLETED:  5/31/89
CLOSURE STATEMENT
FAILURE ANALYSIS OF THE TRANSDUCER FOUND THAT THE RESISTIVE ELEMENT
HAD BEEN BURNED OUT BY THE APPLICATION OF EXCESSIVE CURRENT.  THE
TRANSDUCER HAD BEEN INCORRECTLY CONNECTED TO THE TEST EQUIPMENT,
RESULTING IN THE HIGH CURRENT.  REFERENCE MARS T34396 AND MARS T34397
TASK CLOSED
TASK II  CORRECTIVE ACTION
THE VENDOR TEST EQUIPMENT, THE VIBRATION TEST STATION, WAS MODIFIED BY
THE ADDITION OF A JUNCTION BOX TO PREVENT IMPROPER CONNECTION OF THE
TRANSDUCERS.  REFERENCE MARS T34396 AND T34397
TASK CLOSED
TASK III  CLEARANCE OF EFFECTIVITIES
ALL ET'S CLEARED.  THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE TESTING
AND ALL INSTALLED TRANSDUCERS HAVE SUCCESSFULLY PASSED THE ACCEPTANCE
TEST
TASK CLOSED
TASK IV  CAPS CLOSURE SUMMARY
THE TRANSDUCER WAS DAMAGED BY IMPROPERLY CONNECTING IT TO THE VENDOR
ATP VIBRATION TEST STATION.  THE TEST EQUIPMENT ELECTRICAL CONNECTIONS
HAVE BEEN MODIFIED TO PREVENT A RECURRENCE
TASK CLOSED
THIS PROBLEM REPORT IS CONSIDERED CLOSED
```

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12211	--	E-125-2	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
PD7400098-079	LOX PRES TRANSDUCER	2239

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	ETW - EI-TEST-WORK	EG - SIG HI OR LO

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.2.1.1	1	N/A	N/A
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	Associated LRU#	Associated LRU#
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12226	**In-Flight Anomaly Number** --	**Contractor Report Number** E-126-1	**JSC#** --	**KSC#** --
Problem Title 5% LH2 DEPLETION SENSOR CIRCUIT FAILED WITH LOW RESISTANCE AT KSC				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT 1R	**Sys_Lvl** Y	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** ET COMPLETE	**PART#** 80901010000	**SER/LOT#** LWT 24	**MANUFACTURER** MMC
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE NCA	**NOMENCLATURE** LH2 DEPLETION SYSTEM	**PART#** 74L4-2	**SER/LOT#** N/A	**MANUFACTURER** MMC
Test/Operation L - FLD	**Prevailing Condtion** E - ENVIRONMENT	**F / U** F	**Fail Mode** EV - NOT-TO-SPEC	**Cause** U - UNKNOWN
System ELECTRICAL	**Defect** CN - CONTAM	**Material** C - EEE	**Work Contact** J. ADAMS	**Fail Date** 04/29/1989
Received at MSFC 05/08/1989	**Date Isolated** --	**FMEA Reference** 3.6.1.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location KSC		**Symptom** ET - MEAS ANOMALY		**Time Cycle** N/A
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary CAUSE: THE PROBABLE CAUSE WAS SLIGHT MOISTURE/CONTAMINATION IN CONNECTOR 305W01P1 AS INDICATED BY THE CHANGE IN INSULATION RESISTANCE AFTER EXPOSURE TO THE ENVIRONMENT AND VOLTAGE FROM THE MEGOHMETER R/C: NONE				
Last MSFC Update 02/13/1995	**CN RSLV SBMT** 06/08/1989	**Defer Date** --	**Add Date** 05/08/1989	**R/C Codes** 0 - EXPL -- --

Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** D. BRIDWELL

Approval				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** D. BRIDWELL
PAC Assignee J.EL-IBRAHIM	**PAC Review Complete** JE	**MSFC Closure Date** 07/05/1989	**Status** C - CLOSED	**F/A Completion** 05/23/1989
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				

Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

```
LH2 LEVEL SENSOR CIRCUIT WAS FOUND TO HAVE LOWER THAN ACCEPTABLE
ISOLATION RESISTANCE VALUES DURING TEST OF LWT 24 AT KSC.  THE
AFFECTED CIRCUIT WAS NO. 3 LH2 DEPLETION
REF:  MSR MK8023, CAPS E-81, E-93 AND E-100
```

Contractor Investigation/Resolution

```
GENERAL
THE LEVEL SENSOR CIRCUITS ON LWT-24, AS WELL AS MOST OTHER CIRCUITS,
WERE BEING RETESTED AT KSC FOLLOWING MODIFICATION ACTIVITIES.  THE LEVEL
SENSOR CIRCUIT WHICH FAILED, HAD AN ISOLATION RESISTANCE TO STRUCTURE OF
LESS THAN 1 MEGOHM.  THE MINIMUM ACCEPTABLE VALUE IS 2 MEGOHMS AT 50
VDC, AS REQUIRED BY THE OMRSD, FILE 4, PARA. T75STA.640
TASK I  FAILURE INVESTIGATION
TEST AND REPAIR ACTIVITIES ARE IN PROGRESS AS PART OF AR MK8023
COMPLETE
CLOSURE STATEMENT
TROUBLESHOOTING OF THE SYSTEM WAS UNABLE TO POSITIVELY IDENTIFY THE ROOT
```

CASE OF THE FAILURE. ANALYSIS OF THE DATA INDICATES THAT THE PROBABLE
CAUSE WAS SLIGHT MOISTURE/CONTAMINATION OF THE EXTERNAL CONNECTOR ON THE
CRYOGENIC ELECTRICAL FEEDTHROUGH OF THE LH2 TANK. THE CONNECTOR WAS
DEMATED AND EXAMINED DURING THE TROUBLESHOOTING, AND THE CABLE ADJACENT
TO THE CONNECTOR WAS PARTIALLY DISASSEMBLED. NO DEFECTS WERE FOUND WITH
EITHER PART. ELECTRICAL TESTS OF THE SYSTEMS FOLLOWING THE
EXAMINATION/INSPECTION OF THE CABLE AND CONNECTOR FOUND THAT THE
ISOLATION RESISTANCE EXCEEDED TEN GIGOHMS (1.0 X 10 TO THE TENTH)
FURTHER TESTING OF THE LEVEL SENSOR SYSTEMS WAS UNABLE TO FURTHER
ISOLATE THE CAUSE OF THE ORIGINAL PROBLEM
TASK CLOSED
TASK II CORRECTIVE ACTION
NO CORRECTIVE ACTION IS REQUIRED. SUFFICIENT CONTROLS EXIST IN THE ET
BUILD CYCLE TO ASSURE CORRECT FABRICATION AND TESTING OF ELECTRICAL
SYSTEMS. NO ASSEMBLY DEFECT OR MATERIAL FLAW WAS FOUND IN THE LIQUID
LEVEL SENSOR SYSTEMS OF LWT-24
TASK CLOSED
TASK III CLEARANCE OF EFFECTIVITIES
THIS IS AN EXPLAINED CLOSURE OF THE CAPS
O LWT-24 THE FAILURE, WHICH LATER DISAPPEARED DURING THROUBLESHOOTING,
WAS ACCEPTED "USE AS IS" BY ACTION REQUEST MK8023K9 AND SENIOR
MATERIAL REVIEW BOARD ACTION
ALL OTHER ETS - THE FAILURES OCCURRED FOLLOWING MODIFICATION ACTIVITIES
SUFFICIENT TESTS EXISTS IN THE NORMAL PRODUCTION AND TEST ACTIVITIES AT
MAF AND KSC TO DETECT ANY SUCH FAILURE
TASK CLOSED
TASK IV CAPS CLOSURE SUMMARY
THIS IS AN EXPLAINED CLOSURE OF THE CAPS. TWO LH2 LIQUID LEVEL SENSOR
SYSTEMS ON LWT-24 WERE FOUND TO HAVE LOWER THAN ACCEPTABLE ISOLATION
RESISTANCE VALUES DURING TESTS AT KSC. FOLLOWING FURTHER TESTS,
DISASSEMBLY, EXAMINATION, AND REASSEMBLY OF THE SYSTEMS, THE ISOLATION
RESISTANCE INCREASED. THE FINAL VALUE OF THE RESISTANCE WAS MORE THAN
10 GIGOHMS, WHICH IS THREE ORDERS OF MAGNITUDE HIGHER THAN REQUIED
MINUMUM VALUE. THE CAUSE OF THE LOW RESISTANCE VALUE REMAINS UNCERTAIN
BUT IS BELIEVED TO BE MOISTURE/CONTAMINATION OF AN ELECTRICAL CONNECTOR
LWT-24 WAS ACCEPTED "USE-AS-IS" FOR THE TEST FAILURE BY ACTION REQUEST
MK8023K9 AND SENIOR MATERIAL REVIEW BOARD ACTION
TASK CLOSED
THIS PROBLEM IS CONSIDERED CLOSED

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12226	--	E-126-1	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
74L4-2	LH2 DEPLETION SENSOR	N/A

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	UU - UNK-UND	EV - NOT-TO-SPEC

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.6.1.1	1	A	1
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	Correlated Part#	Correlated Part#
--	--	--
Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12227	**In-Flight Anomaly Number** --	**Contractor Report Number** E-126-2	**JSC#** --	**KSC#** --
Problem Title 5% LH2 DEPLETION SENSOR CIRCUIT FAILED WITH LOW RESISTANCE AT KSC				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 3
HCRIT 3	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** ET COMPLETE	**PART#** 80901010000	**SER/LOT#** LWT 24	**MANUFACTURER** MMC
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE NCA	**NOMENCLATURE** LH2 DEPLETION SYSTEM	**PART#** 74L4-2	**SER/LOT#** N/A	**MANUFACTURER** MMC
Test/Operation L - FLD	**Prevailing Condtion** E - ENVIRONMENT	**F / U** F	**Fail Mode** EV - NOT-TO-SPEC	**Cause** U - UNKNOWN
System ELECTRICAL	**Defect** CN - CONTAM	**Material** C - EEE	**Work Contact** J. ADAMS	**Fail Date** 04/29/1989
Received at MSFC 05/08/1989	**Date Isolated** --	**FMEA Reference** 3.3.1.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location KSC		**Symptom** ET - MEAS ANOMALY		**Time Cycle** N/A
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary CAUSE: THE PROBABLE CAUSE WAS SLIGHT MOISTURE/CONTAMINATION IN CONNECTOR 305W01P1 AS INDICATED BY THE CHANGE IN INSULATION RESISTANCE AFTER EXPOSURE TO THE ENVIRONMENT AND VOLTAGE FROM THE MEGOHMETER R/C: NONE				
Last MSFC Update 02/13/1995	**CN RSLV SBMT** 06/08/1989	**Defer Date** --	**Add Date** 05/09/1989	**R/C Codes** 0 - EXPL -- --
Assignee				

Design	Chief Engineer	S & MA	Project	Project MGR
A. JACKMAN	M. PESSIN	R. JACKSON	--	P. BRIDWELL

Approval

Design	Chief Engineer	S & MA	Project	Project MGR
A. JACKMAN	M. PESSIN	R. JACKSON	--	P. BRIDWELL

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
J.EL-IBRAHIM	JE	07/05/1989	C - CLOSED	05/23/1989

Problem Type	SEV	Program Name	REVL	OPRINC
--	--	--	--	--

FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
--	-- -- -- -- --	--	--	--

RES PERSON L2	Approval Signature L3
--	--

Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

```
LH2 LEVEL SENSOR CIRCUIT WAS FOUND TO HAVE LOWER THAN ACCEPTABLE
ISOLATION RESISTANCE VALUES DURING TEST OF LWT 24 AT KSC.  THE
AFFECTED CIRCUIT WAS LH2 5% DEPLETION
REF:  MSR MK8023, CAPS E-81, E-93 AND E-100
```

Contractor Investigation/Resolution

```
GENERAL
THE LEVEL SENSOR CIRCUITS ON LWT-24, AS WELL AS MOST OTHER CIRCUITS,
WERE BEING RETESTED AT KSC FOLLOWING MODIFICATION ACTIVITIES.  THE LEVEL
SENSOR CIRCUIT WHICH FAILED, HAD AN ISOLATION RESISTANCE TO STRUCTURE OF
LESS THAN 1 MEGOHM.  THE MINIMUM ACCEPTABLE VALUE IS 2 MEGOHMS AT 50
VDC, AS REQUIRED BY THE OMRSD, FILE 4, PARA. T75STA.640
TASK I  FAILURE INVESTIGATION
TEST AND REPAIR ACTIVITIES ARE IN PROGRESS AS PART OF AR MK8023
COMPLETE
CLOSURE STATEMENT
TROUBLESHOOTING OF THE SYSTEM WAS UNABLE TO POSITIVELY IDENTIFY THE ROOT
CASE OF THE FAILURE.  ANALYSIS OF THE DATA INDICATES THAT THE PROBABLE
CAUSE WAS SLIGHT MOISTURE/CONTAMINATION OF THE EXTERNAL CONNECTOR ON THE
```

CRYOGENIC ELECTRICAL FEEDTHROUGH OF THE LH2 TANK. THE CONNECTOR WAS DEMATED AND EXAMINED DURING THE TROUBLESHOOTING, AND THE CABLE ADJACENT TO THE CONNECTOR WAS PARTIALLY DISASSEMBLED. NO DEFECTS WERE FOUND WITH EITHER PART. ELECTRICAL TESTS OF THE SYSTEMS FOLLOWING THE EXAMINATION/INSPECTION OF THE CABLE AND CONNECTOR FOUND THAT THE ISOLATION RESISTANCE EXCEEDED TEN GIGOHMS (1.0 X 10 TO THE TENTH) FURTHER TESTING OF THE LEVEL SENSOR SYSTEMS WAS UNABLE TO FURTHER ISOLATE THE CAUSE OF THE ORIGINAL PROBLEM
TASK II CORRECTIVE ACTION
NO CORRECTIVE ACTION IS REQUIRED. SUFFICIENT CONTROLS EXIST IN THE ET BUILD CYCLE TO ASSURE CORRECT FABRICATION AND TESTING OF ELECTRICAL SYSTEMS. NO ASSEMBLY DEFECT OR MATERIAL FLAW WAS FOUND IN THE LIQUID LEVEL SENSOR SYSTEMS OF LWT-24
TASK CLOSED
TASK III CLEARANCE OF EFFECTIVITIES
THIS IS AN EXPLAINED CLOSURE OF THE CAPS
LWT-24 THE FAILURE, WHICH LATER DISAPPEARED DURING THROUBLESHOOTING, WAS ACCEPTED "USE AS IS" BY ACTION REQUEST MK8023K9 AND SENIOR MATERIAL REVIEW BOARD ACTION
ALL OTHER ETS - THE FAILURES OCCURRED FOLLOWING MODIFICATION ACTIVITIES SUFFICIENT TESTS EXISTS IN THE NORMAL PRODUCTION AND TEST ACTIVITIES AT MAF AND KSC TO DETECT ANY SUCH FAILURE
TASK CLOSED
TASK IV CAPS CLOSURE SUMMARY
THIS IS AN EXPLAINED CLOSURE OF THE CAPS. TWO LH2 LIQUID LEVEL SENSOR SYSTEMS ON LWT-24 WERE FOUND TO HAVE LOWER THAN ACCEPTABLE ISOLATION RESISTANCE VALUES DURING TESTS AT KSC. FOLLOWING FURTHER TESTS, DISASSEMBLY, EXAMINATION, AND REASSEMBLY OF THE SYSTEMS, THE ISOLATION RESISTANCE INCREASED. THE FINAL VALUE OF THE RESISTANCE WAS MORE THAN 10 GIGOHMS, WHICH IS THREE ORDERS OF MAGNITUDE HIGHER THAN REQUIED MINUMUM VALUE. THE CAUSE OF THE LOW RESISTANCE VALUE REMAINS UNCERTAIN BUT IS BELIEVED TO BE MOISTURE/CONTAMINATION OF AN ELECTRICAL CONNECTOR
LWT-24 WAS ACCEPTED "USE-AS-IS" FOR THE TEST FAILURE BY ACTION REQUEST MK8023K9 AND SENIOR MATERIAL REVIEW BOARD ACTION
TASK CLOSED
THIS PROBLEM IS CONSIDERED CLOSED

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12227	--	E-126-2	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
74L4-2	LH2 DEPLETION SENSOR	N/A

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	UU - UNK-UND	EV - NOT-TO-SPEC

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.6.1.1	1	A	1
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	Associated LRU#	Associated LRU#
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12230	**In-Flight Anomaly Number** --	**Contractor Report Number** T-059	**JSC#** --	**KSC#** --
Problem Title VAPOR VENTING WAS DETECTED ON LH2 REC. LINE AFTER STS-30 ABORT				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 3
HCRIT 3	**Sys_Lvl** Y	**Misc Codes** A B C D E **(X)** F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** LH2 REC. LINE	**PART#** 80971028411-30	**SER/LOT#** 47	**MANUFACTURER** ARROWHEAD
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE NCA	**NOMENCLATURE** LH2 REC. LINE	**PART#** 80971028411-30	**SER/LOT#** 47	**MANUFACTURER** MCC
Test/Operation L - FLD	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** MV - EXT LEAK	**Cause** Z - NONE
System PROPULSION	**Defect** CX - VOID	**Material** N - HOLE	**Work Contact** K. KILLIAN	**Fail Date** 04/28/1989
Received at MSFC 05/10/1989	**Date Isolated** --	**FMEA Reference** N/A	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location KSC		**Symptom** MX - FLOW ANOM		**Time Cycle** N/A
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary CAUSE: CRYOPUMPING THROUGH AN INCOMPLETE GX6300 DAM R/C: THE ADDITION OF RTV TO EXPOSED SLA ON RAIN SHIELDS TO PREVENT CRYOPUMPING (ETS 21, 31-35, 37-47 AND 49)				
Last MSFC Update 01/10/1992	**CN RSLV SBMT** 06/03/1989	**Defer Date** --	**Add Date** 05/10/1989	**R/C Codes** 1 - DES -- --
Assignee				
Design F. HUNEIDI	**Chief Engineer** J. NICHOLS	**S & MA** R. JACKSON	**Project** J. CAVALARIS	**Project MGR** D. BRIDWELL

Approval				
Design P. MULLER	**Chief Engineer** J. NICHOLS	**S & MA** R. JACKSON	**Project** J. CAVALARIS	**Project MGR** D. BRIDWELL
PAC Assignee J.EL-IBRAHIM	**PAC Review Complete** JE	**MSFC Closure Date** 07/05/1989	**Status** C - CLOSED	**F/A Completion** --
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				

Contractor Status Summary

```
CAUSE:  CRYOPUMPING THROUGH AN INCOMPLETE GX6300 DAM
R/C:  THE ADDITION OF RTV TO EXPOSED SLA ON RAIN SHIELDS TO
PREVENT CRYOPUMPING (ETS 21, 31-35, 37-47 AND 49)
```

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

```
AFTER THE ABORT THE STS-30R (ET-29) UNUSUAL VAPOR VENTING WAS NOTED
DURING TERMINAL COUNTDOWN SAFEING FROM THE 4" RECIRCULATION LINE.  THIS
IS DOCUMENTED ON AR K9179K2.  THIS CAPS IS ISSUED TO INVESTIGATE THIS
ANOMALY AND INITIATE CORRECTIVE ACTION AS DEEMED NECESSARY
```

Contractor Investigation/Resolution

```
GENERAL
DURING THE TERMINAL COUNTDOWN SAFEING OF ET-29 ON 4/28/89 AFTER AN
ABORTED LAUNCH ATTEMPTED, UNUSUAL VENTING WAS NOTED COMING FROM THE 4"
RECIRCULATION LINE FROM THE TANK SIDE IN THE VICINITY OF THE BELLOWS
BURST DISK
ASSUMING A LEAK IN THE OUTER BELLOWS JACKET AND SUBSEQUENT BURST DISK,
THE LINE WAS REMOVED AND SENT TO ARROWHEAD FOR TESTING.  THIS TESTING
INCLUDED LEAK CHECKS AND ANALYSIS OF THE ARGON IN THE SUSPECT BELLOWS,
BOTH OF WHICH WERE ACCEPTABLE.  THE BELLOWS WAS REFILLED WITH ARGON AND
SHIPPED TO MSFC FOR CRYOGENIC TESTING
THE LINE WAS CRYOGENIC TESTED WITH LIQUID HYDROGEN AT MSFC.  THIS
TESTING DUPLICATED THE VENTING ON THE LAUNCH PAD DURING WARMUP
```

```
TASK I   FAILURE/PROBLEM INVESTIGATION
1.  DEVELOP, OBTAIN APPROVAL FOR AND IMPLEMENT A FAILURE ANALYSIS/TEST
    TO DETERMINE THE CAUSE OF THE CRYOPUMPING
    CLOSURE STATEMENT:
    ANALYSIS DISCLOSED CRYOPUMPING THROUGH AN INCOMPLETE GX6300 DAM
    (REF. 1V6-015365)
    TASK CLOSED
TASK II  CORRECTIVE ACTION
    DEVELOP RATIONALE FOR ACCEPTANCE/REWORK OF INSTALLED RECIRCULATION
    LINE
COMPLETE
    CLOSURE STATEMENT:
    DESIGN CHANGE (B01859A-008) TO SEAL EXPOSED SLA ON RAIN SHIELDS
    WITH RTV TO PREVENT CRYOPUMPING
    TASK CLOSED
TASK III    CLEARANCE OF EFFECTIVITIES
    ETS 27, 31-35, 37-47 AND 49 RESOLVED BY DESIGN REVISION TO COVER
    EXPOSED SLA ON BELLOWS RAIN SHIELDS WITH RTV (B01859A-008)
    ETS 48, 50 AND SUBSEQUENT ACCEPTABLE AS MANUFACTURED (NO EXPOSED SLA
    ON BELLOWS RAIN SHIELDS)
TASK IV   CAPS CLOSURE SUMMARY
    THE UNUSUAL VENTING FROM THE TANK END OF THE LH2 RECIRCULATION LINE
    IN THE VICINITY OF THE BELLOWS BURST DISC WAS THE RESULT OF
    CRYOPUMPING.  THE RECIRCULATION LINES WITH EXPOSED SLA ON THE
    BELLOWS RAIN SHIELDS (80971028411-030) WILL BE REWORKED BY ADDITION
    OF RTV TO THE EXPOSED SLA (ETS 21, 31-35, 37-47 AND 49) BY DESIGN
    CHANGE.  THE REMAINING RECIRCULATION LINES (80971028411-040) DO NOT
    HAVE EXPOSED SLA ON THE BELLOWS RAIN SHIELDS DUE TO A DIFFERENT TPS
    CONFIGURATION (ETS 48, 50 AND SUBSEQUENT)
THIS PROBLEM IS CONSIDERED CLOSED
```

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12230	--	T-059	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
80971028411-30	LH2 RECIRC LINE	47

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	3	U - UNKNOWN	MV - EXT LEAK

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
N/A	N/A	N/A	N/A
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12233	**In-Flight Anomaly Number** --	**Contractor Report Number** E-127	**JSC#** --	**KSC#** --
Problem Title RSS ANTENNA INSTALLATION FAILED THE VSWR REQUIREMENTS				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT 1R	**Sys_Lvl** Y	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** ET COMPLETE	**PART#** 80901010000	**SER/LOT#** N/A	**MANUFACTURER** MMC
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** RSS ANTENNA INSTA	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** MMC
Test/Operation L - FLD	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** EL - SHORT	**Cause** U - UNKNOWN
System ELECTRICAL	**Defect** --	**Material** E - EL C/W	**Work Contact** J. ADAMS	**Fail Date** 05/08/1989
Received at MSFC 05/11/1989	**Date Isolated** --	**FMEA Reference** N/A	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location MAF		**Symptom** ET - MEAS ANOMALY		**Time Cycle** N/A
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary				
Last MSFC Update 02/13/1995	**CN RSLV SBMT** 06/14/1989	**Defer Date** --	**Add Date** 05/11/1989	**R/C Codes** 0 - EXPL -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
Approval				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
T. HESTER	TH	05/07/1990	C - CLOSED	06/06/1989

Problem Type	SEV	Program Name	REVL	OPRINC
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FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
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RES PERSON L2	Approval Signature L3
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Contractor Status Summary

THE CAUSE OF THE FAILURE COULD NOT BE DETERMINED. AMONG THE
POSSIBLE CAUSES ARE: AN INTERMITTENT FAILURE IN THE RSS ANTENNA;
A LOOSE STRAND OF WIRE IN A COAXIAL CONNECTOR; OR A TEST EQUIPMENT
MALFUNCTION/PROCEDURE ERROR

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

THE RSS ANTENNA INSTALLATION NEAR THE +Z AXIS, ANTENNA "A", HAD A HIGHER
THAN ACCEPTABLE VOLTAGE STANDING WAVE RATIO DURING ACCEPTANCE TESTS
THE ACTUAL VSWR WAS 14.17 TO 1; THE REQUIREMENT IS LESS THAN 1.5 TO 1
CRITICALITY: THE ANTENNA "A" IS LISTED AS CRIT. 1R IN THE FMEA,
USBI-7300-RA-31, PAGE H-5, "FAILURE OF ANTENNA B OR A DUE TO OPEN OR
GROUNDED SIGNAL PATH."
NOTE: THE ANTENNA, P/N 10406-0093-102, IS LIMITED LIFE CONTROLLED

Contractor Investigation/Resolution

7/14/89 - THIS PROBLEM HAS BEEN DEFERRED FOR STS-28, STS-34, AND STS-33
BASED ON THE FOLLOWING RATIONALE: THE ANTENNA AND CABLE ASSOCIATED WITH
THE FAILURE WERE REPLACED. THIS WAS AN ISOLATED CASE. THE FAILURE
OCCURRED DURING ACCEPTANCE TESTING AND ALL COMPLETED ETS HAVE
SUCCESSFULLY PASSED THE ACCEPTANCE TEST
THE ABOVE DEFERRAL RATIONALE MEETS THE DEFERRAL REQUIREMENTS OF NSTS
07700 VOLUME XI, ITEM C, WHICH STATES "THE PROBLEM CONDITION DOES NOT
EXIST IN THE FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST,
PREFLIGHT CHECKOUT, OR SPECIAL TEST."
THE ABOVE DEFERRAL RATIONALE HAS BEEN APPROVED BY THE ET ACTING
MANAGER,MR. G.P. BRIDWELL
_____G.P. BRIDWELL (SIGNED)_____

GENERAL
ON LWT-46, THE RSS ANTENNA NEAR THE +Z AXIS, AND THE APPROXIMATELY 8-INCH LONG COAXIAL CABLE CONNECTED TO IT, WERE BEING TESTED FOR VOLTAGE STANDING WAVE RATIO (VSWR). THE TEST, TP-6C103-AT, IS THE FINAL ACCEPTANCE TEST FOR THE RSS ANTENNA SYSTEM AT MAF. THE TEST REQUIRES THAT THE ANTENNA AND CABLE TOGETHER HAVE A VSWR OF LESS THAN 1.5 TO 1 AT THE RSS OPERATING FREQUENCY. THE ACTUAL VSWR OBTAINED WAS 14.17 TO 1 THE FAILURE REPEATED TWICE. DURING TROUBLESHOOTING OF LWT-46, IN AN ATTEMPT TO ISOLATE THE CAUSE OF THE FAILURE, THE ANTENNA AND CABLE PASSED THE VSWR TEST BOTH AS AN ASSEMBLY AND AS COMPONENTS. REFERENCE MARS T-109385
TASK I FAILURE INVESTIGATION
THE ANTENNA AND CABLE THAT WERE PART OF THE TEST FAILURE WERE REMOVED FROM LWT-46. THE PARTS WILL HAVE FAILURE ANALYSES PERFORMED ON THEM
CLOSURE STATMENT:
FAILURE ANALYSIS OF THE CABLE WAS DOCUMENTED ON MARS T-109279. THE CABLE WAS FOUND TO BE ACCEPTABLE IN ALL RESPECTS. NEITHER ELECTRICAL TESTS NOR DETAILED DISSECTION AND EXAMINATION COULD FIND ANY DEFECT EXAMINATION OF THE ANTENNA IS TO BE PERFORMED BY USBI AND WILL BE TRACKED BY THE MSFC PROBLEM ASSESSMENT SYSTEM
TASK CLOSED
TASK II CORRECTIVE ACTION
NO CORRECTIVE ACTION IS REQUIRED. THIS IS THE FIRST OCCURRENCE OF THIS FAILURE. SUFFICIENT CONTROLS EXIST IN THE ET BUILD CYCLE TO ASSURE CORRECT FABRICATION AND TESTING OF THE RSS ANTENNA SYSTEM. NO FLAWS WERE FOUND IN THE CABLE. EXAMINATION OF THE ANTENNA IS BEING TRACKED BY THE MSFC PROBLEM ASSESSMENT SYSTEM
TASK CLOSED
TASK III CLEARANCE OF EFFECTIVITIES
THIS IS AN EXPLAINED CLOSURE OF THE CAPS
- LWT-46 CLEARED. THE ANTENNA AND CABLE ASSOCIATED WITH THE FAILURE WERE REPLACED
- ALL OTHER ETS CLEARED. THE FAILURE ON LWT-46 WAS AN ISOLATED CASE. THE FAILURE OCCURRED DURING ACCEPTANCE TESTING AND ALL COMPLETED ETS HAVE SUCCESSFULLY PASSED THE ACCEPTANCE TEST

TASK CLOSED
TASK IV CAPS CLOSURE SUMMARY
THIS IS AN EXPLAINED CLOSURE OF THE CAPS. A RANGE SAFETY SYSTEM ANTENNA AND CABLE ASSEMBLY FAILED THE VOLTAGE STANDING WAVE RATIO ACCEPTANCE TEST ON LWT-46. ATTEMPTS TO ISOLATE THE CAUSE OF THE FAILURE WERE UNSUCCESSFUL. THE ANTENNA, WHICH HAS NOT YET BEEN SUBJECTED TO A FAILURE ANALYSIS, IS BEING RETURNED TO USBI FOR EVALUATION. THE MSFC PROBLEM ASSESSMENT SYSTEM IS TRACKING THE ANTENNA. THIS FAILURE IS AN ISOLATED CASE
TASK CLOSED
THIS PROBLEM CLOSURE HAS BEEN SUBMITTED TO MSFC FOR REVIEW AND CLOSURE
11/28/89 - THIS PROBLEM HAS BEEN RE-DEFERRED FOR THE NEXT THREE SPACE SHUTTLE MISSIONS FOR THE FOLLOWING REASON: USBI SENT THE RSS ANTENNA TO THEIR SUB-CONTRACTOR, LA BARGE, FOR TEARDOWN AND FAILURE ANALYSIS AUTHORIZATION AND FUNDING DETAILS BETWEEN USBI AND LA BARGE HAVE TAKEN SEVERAL MONTHS IN PROCESSING; THEREFORE, LA BARGE WILL NOT BEGIN THE FAILURE ANALYSIS UNTIL DECEMBER 1989
THE ABOVE INVESTIGATION, ALONG WITH THE PREVIOUS DEFERRAL RATIONALE, IS SUFFICIENT TO DEFER THE NEXT THREE SPACE SHUTTLE MISSIONS, CURRENTLY DEFINED AS STS-32, STS-36, AND STS-31, PER NSTS 07700, VOLUME XI, PARAGRAPH 3.4.1, ITEM C AND NSTS 08126, PARAGRAPH 3.2, SUB-PARAGRAPH D, ITEM 3 WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT CHECKOUT, OR SPECIAL TEST."
THE ABOVE RE-DEFERRAL RATIONALE AND REASONING HAS BEEN APPROVED BY THE ET ACTING MANAGER, MR. G.P. BRIDWELL

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___________G.P. BRIDWELL (SIGNED 11/28/89)_____________________
05/03/90 - THIS PROBLEM HAS BEEN RE-DEFERRED FOR THE NEXT THREE SPACE
SHUTTLE MISSIONS FOR THE FOLLOWING REASON:  LABARGE HAS RECENTLY
COMPLETED FAILURE ANALYSIS OF THE RSS ANTENNA, HOWEVER THE CONTRACTOR
(MMC) HAS NOT CLOSED THE PROBLEM DUE TO INCOMPLETE INFORMATION, WHICH IS
NOW BEING PROVIDED
THE ABOVE INVESTIGATION, ALONG WITH THE PREVIOUS DEFERRAL RATIONALE, IS
SUFFICIENT TO DEFER THE NEXT THREE SPACE SHUTTLE MISSIONS, CURRENTLY
DEFINED AS STS-35, STS-38, AND STS-40, PER NSTS 07700, VOLUME XI,
PARAGRAPH 3.4.1, ITEM C AND NSTS 08126, PARAGRAPH 3.2, SUB-PARAGRAPH D,
ITEM 3 WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE FLIGHT
HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT CHECKOUT,
OR SPECIAL TEST."
05/07/90 * PAC NOTE:  DECISION MADE TO CLOSE INSTEAD OF DEFERRING
05/17/90 * PAC NOTE:  CONTRACTOR CLOSURE WAS RECEIVED AT PAC ON 05/17/
90.  PROBABLE CAUSE WAS STATED AS TEST EQUIPMENT MALFUNCTION/PROCEDURE
ERROR
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MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12233	--	E-127	--	--	--
Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**			
10406-0093-102	RSS ANTENNA	1000325			
HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**		
--	1R	ETW - EI-TEST-WORK	ZZ - NO PROBLEM		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
N/A	N/A	N/A	N/A		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
--	--	--	--		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
--	--	--	--		
Correlated Part#	**Correlated Part#**	**Correlated Part#**			
--	--	--			
Associated LRU#	**Associated LRU#**	**Associated LRU#**			
--	--	--			
MAJOR DESIGN CHANGES					
APRV DATE	**DESCRIPTION OF CHANGES**				
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ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12294	**In-Flight Anomaly Number** --	**Contractor Report Number** E-128	**JSC#** --	**KSC#** --
Problem Title WIRE HARNESS, 303W02, FAILED INSULATION TEST				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT 1R	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** ET COMPLETE	**PART#** 80901010000	**SER/LOT#** LWT 27	**MANUFACTURER** MMC
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** ET/SRB HARNESS	**PART#** 303 W02 J02/P42	**SER/LOT#** N/A	**MANUFACTURER** ITT CANON
Test/Operation L - FLD	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** EL - SHORT	**Cause** ETE - EI-TEST-ENVR
System ELECTRICAL	**Defect** CN - CONTAM	**Material** E - EL C/W	**Work Contact** J. ADAMS	**Fail Date** 06/13/1989
Received at MSFC 06/16/1989	**Date Isolated** 06/14/1989	**FMEA Reference** 3.12.2.2	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location MAF		**Symptom** ET - MEAS ANOMALY		**Time Cycle** N/A
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 NONE	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 NONE	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary CAUSE: CONTAMINATION ON THE CONNECTOR SHELL OF 303W02P42 WITH THE RESULTING CORROSION PRODUCTS SPREAD ACROSS THE FACE OF THE CONNECTOR R/C: NONE - CONSIDERED AN ISOLATED CASE				
Last MSFC Update 02/14/1995	**CN RSLV SBMT** 07/19/1989	**Defer Date** --	**Add Date** 06/19/1989	**R/C Codes** 0 - EXPL -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** P. BRIDWELL

Approval				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** C. REINECKE	**Project** --	**Project MGR** P. BRIDWELL
PAC Assignee J.EL-IBRAHIM	**PAC Review Complete** JE	**MSFC Closure Date** 07/25/1989	**Status** C - CLOSED	**F/A Completion** 07/06/1989
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** MARS T-107700			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Contractor Status Summary				
Reliability/Quality Assurance Concerns, Recommendations:				

Problem Description

```
WIRE HARNESS 303W02 ON LWT 27 FAILED THE INSULATION TEST REQUIREMENT ON
4 CIRCUITS DURING ACCEPTANCE TEST OF THE ET FOLLOWING THE MODIFICATION
CENTER WORK AT MAF
PREVIOUS CAPS:  E-024, E-068, E-080, E-107, E-114
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Contractor Investigation/Resolution

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GENERAL
THE MODIFICATIONS TO BE PERFORMED ON LWT-27 AT MAF HAD BEEN COMPLETED
AND THE ELECTRICAL "OPERATIONAL INSTRUMENTATION ALL SYSTEMS RETEST,
TP-6D101-FA" WAS BEING PERFORMED.  FOUR CIRCUITS IN CABLE 303W02 WERE
FOUND TO HAVE INSULATION RESISTANCE VALUES BELOW THE MINIMUM ACCEPTABLE
VALUE OF 100 MEGOHMS AT 500 VOLTS.  THE CABLE RUNS FROM THE ORBITER LH2
DISCONNECT TO THE -Y AFT SRB ATTACHMENT POINT.  THE CONNECTOR AT THE -Y
ATTACHMENT, P42, WAS FOUND TO HAVE CORROSION ON THE CONNECTOR SHELL
DIRECTLY ADJACENT TO ONE OF THE CONNECTOR CONTACTS ASSOCIATED WITH THE
FAILURES
TASK I  FAILURE INVESTIGATION
THE DEFECTIVE CABLE IS BEING REMOVED FROM LWT-27 AND A FAILURE ANALYSIS
WILL BE PERFORMED ON IT
CLOSURE STATEMENT
CABLE 303W02 WAS REPLACED WITH A NEW PART AND THE REMOVED, DEFECTIVE
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CABLE WAS DOCUMENTED ON COMPONENT LEVEL MARS T-107690. FAILURE ANALYSIS
OF THE CABLE FOUND THAT THE 303W02P42 CONNECTOR SHELL HAD BEEN
CONTAMINATED WITH A MATERIAL FOREIGN TO ANY OF THE WIRE HARNESS
COMPONENTS OR THE PROCESSES USED TO FABRICATE THEM. SPECIFICALLY,
SODIUM NITRATE AND POTASSIUM NITRATE WERE PRESENT ON THE NICKEL PLATED
CONNECTED SHELL. THE NITRATES, WHICH ARE POWERFUL OXIDIZERS, AND THE
NICKEL CORROSION PRODUCTS WHICH RESULTED, ARE HYGROSCOPIC. ONCE
PRESENT, THE CONTAMINANTS, COMBINED WITH THE DAMP ENVIRONMENT OF SEA
SHIPMENT OF THE ET, ASSURE CORROSION WILL OCCUR. THE TIME/PLACE AT
WHICH THE CONTAMINATION OCCURRED COULD NOT BE DETERMINED. A THIN LAYER
OF THE CORROSION PRODUCTS/CONTAMINANTS HAD COATED A PORTION OF THE FACE
OF THE CONNECTOR INSERT AND CAUSED THE LOW INSULATION RESISTANCE
TASK CLOSED
TASK OPEN
TASK II CORRECTIVE ACTION
NO CORRECTIVE ACTION IS REQUIRED FOR THE CORROSION PROBLEM AS THIS IS AN
ISOLATED CASE. THE PACKAGING AND SHIPPING METHODS NOW IN USE ARE
ADEQUATE. THE CORROSION WAS THE RESULT OF THE INTRODUCTION OF A
NON-AEROSPACE MATERIAL AT AN UNKNOWN TIME/PLACE
TASK CLOSED
TASK III CLEARANCE OF EFFECTIVITIES
- LWT-27 - CLEARED. THE CABLE IS BEING REPLACED WITH A NEW UNIT
- ALL OTHER ETS - CLEARED. THE FAILURE ON LWT-27 WAS DETECTED
DURING ACCEPTANCE TESTING AND ALL COMPLETED ETS
HAVE SUCCESSFULLY PASSED THE ACCEPTANCE TESTS
TASK CLOSED
TASK IV CAPS CLOSURE SUMMARY
THE 303W02 ELECTRICAL CABLE ON LWT-27 FAILED THE INSULATION RESISTANCE
TEST PERFORMED FOLLOWING MODIFICATION ACTIVITIES AT MAF. THE CAUSE WAS
CORROSION OF AN ELECTRICAL CONNECTOR DUE TO CONTAMINATION BY A FOREIGN,
NON-AEROSPACE, SUBSTANCE. THE DEFECTIVE CABLE WAS REPLACED AND THE
INSULATION RESISTANCE REST WAS PASSED. THIS IS AN ISOLATED CASE
TASK CLOSED
THIS PROBLEM REPORT IS CONSIDERED CLOSED

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12294	--	E-128	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
303 W02 J02/P42	ET/SRB HARNESS	--

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	EIC - EI-CONTAM	EL - SHORT

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.12.7.2	2	E	4
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE --	**DESCRIPTION OF CHANGES** --
ASSESSMENT TEXT	

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12302	**In-Flight Anomaly Number** --	**Contractor Report Number** E-129	**JSC#** --	**KSC#** --
Problem Title THE SWITCH MODULE FAILED TO ARM DURING ATP				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1
HCRIT 1	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** SWITCH MODULE	**PART#** PD7100082-009	**SER/LOT#** 120	**MANUFACTURER** BABCOCK
HARDWARE LRU	**NOMENCLATURE** SWITCH MODULE	**PART#** PD7100082-009	**SER/LOT#** 120	**MANUFACTURER** BABCOCK
HARDWARE NCA	**NOMENCLATURE** SWITCH MODULE	**PART#** PD7100082-009	**SER/LOT#** 120	**MANUFACTURER** BABCOCK
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** EL - SHORT	**Cause** ETT - EI-TEST-EQUP
System ELECTRICAL	**Defect** ES - ELSTRS	**Material** E - EL C/W	**Work Contact** J. ADAMS	**Fail Date** 06/16/1989
Received at MSFC 06/22/1989	**Date Isolated** 06/19/1989	**FMEA Reference** 3.5.1.2	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location SUPPLIER		**Symptom** EA - FAILS OFF		**Time Cycle** N/A
Effectivity Text DEFERRED FOR STS-28, STS-34, STS-33				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary TBD				
Last MSFC Update 02/13/1995	**CN RSLV SBMT** --	**Defer Date** --	**Add Date** 06/26/1989	**R/C Codes** 3 - F/TE -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** P. BRIDWELL
Approval				
Design	**Chief Engineer**	**S & MA**	**Project**	**Project MGR**

A. JACKSON	M. PESSIN	R. JACKSON	--	P. BRIDWELL
PAC Assignee C. MEYER	**PAC Review Complete** CSM	**MSFC Closure Date** 10/04/1989	**Status** C - CLOSED	**F/A Completion** 07/18/1989
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Contractor Status Summary				
Reliability/Quality Assurance Concerns, Recommendations:				

Problem Description

THE SWITCH MODULE FAILED TO ARM DURING ATP

Contractor Investigation/Resolution

THIS PROBLEM REPORT HAS BEEN DEFERRED FOR STS-28, STS-34, AND STS-33
BASED ON THE FOLLOWING RATIONALE: THE FAILURE OCCURRED DURING VENDOR
ACCEPTANCE TESTING AND ALL INSTALLED SWITCH MODULES HAVE SUCCESSFULLY
PASSED THE ACCEPTANCE TEST
THE ABOVE RATIONALE MEETS THE DEFERRAL REQUIREMENTS OF NSTS 07700 VOLUME
XI, ITEM C, WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE
FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT
CHECKOUT, OR SPECIAL TEST."
THE ABOVE DEFERRAL HAS BEEN APPROVED BY THE ET ACTING PROJECT MANAGER,
MR. G.P. BRIDWELL
_____G.P. BRIDWELL (SIGNED)_____
GENERAL
THE SWITCH MODULE WAS BEING TESTED FOR PERFORMANCE AT AN OPERATING
TEMPERATURE OF -85 DEGREES-F PER ACCEPTANCE TEST PLAN EEC-122872-ATP,
SECTION 3.3.8A. UPON APPLICATION OF "ARM" POWER TO THE MODULE, THE
"ARM" CONTACTS FAILED TO CLOSE. THE MODULE HAD PASSED EARLIER PORTIONS
OF THE ACCEPTANCE TEST WHICH PERFORMED CHECKS OF THE "ARM" FUNCTION AT
ROOM TEMPERATURE
TASK I FAILURE INVESTIGATION
FAILURE ANALYSIS WILL BE PERFORMED AT THE VENDOR
    RESPONSIBLITY: E. O'BRIEN/3830 - M. COMBS/3830

```
    ECD:  7/18/89    J. ADAMS/3741 - E. HARTLEY/3/40
TASK OPEN
TASK II  CORRECTIVE ACTION
PENDING THE COMPLETION OF THE FAILURE INVESTIGATION
TASK OPEN
TASK III  CLEARANCE OF EFFECTIVITIES
AT ET'S CLEARED.  THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE TESTING
AND ALL INSTALLED SWITCH MODULES HAVE SUCCESSFULLY PASSED THE ACCEPTANCE
TEST
TASK CLOSED
TASK IV  CAPS CLOSURE SUMMARY
PENDING THE COMPLETION OF THE OTHER TASKS
TASK OPEN
CLOSURE STATEMENT:
FAILURE ANALYSIS T-66985 FOUND THAT THE SEMICONDUCTOR DIODES, INTERNAL
TO THE SWITCH MODULE, HAD BEEN DAMAGED BY EXCESSIVE CURRENT.  THIS HAD
OCCURRED BECAUSE THE POLARIZING GUIDES HAD NOT BEEN INSTALLED ON THE
ELECTRICAL CONNECTOR USED BETWEEN THE SWITCH MODULE AND THE TEST
EQUIPMENT.  THE CONNECTOR COULD BE ROTATED 180 DEGREES AND MATED,
RESULTING IN REVERSED POLARITY POWER BEING APPLIED TO THE MODULE
CORRECTIVE ACTION
THE TEST EQUIPMENT ELECTRICAL CONNECTORS WERE MODIFIED BY THE ADDITION
OF POLARIZING GUIDES SO AS TO PREVENT IMPROPER MATING.  THE TEST
EQUIPMENT INVOLVED WITH THE FAILURE WAS MODIFIED TO PREVENT REVERSED
POWER SUPPLY CONNECTIONS CAUSING REVERSED POLARITY POWER BEING APPLIED
TO THE MODULE UNDER TEST.  REFERENCE: MARS T-66985
CLEARANCE OF EFFECTIVITIES
ALL ET'S CLEARED.  THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE
TESTING AND ALL INSTALLED SWITCH MODULES HAVE SUCCESSFULLY PASSED THE
ACCEPTANCE TEST
CAPS CLOSURE SUMMARY
THE ACCEPTANCE TEST FAILURE OF THE SWITCH MODULE WAS THE RESULT OF
IMPROPER ELECTRICAL CONNECTIONS ON THE TEST EQUIPMENT.  THE TEST
EQUIPMENT HAS BEEN MODIFIED TO PREVENT A RECURRENCE
```

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12302	--	E-129	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
PD7100082-009	SWITCH MODULE	120

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1	ETT - EI-TEST-EQUP	EN - OPEN

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.5.1.2	2	A	N/A
--	--	--	--
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE --	**DESCRIPTION OF CHANGES** --
ASSESSMENT TEXT	

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12481	**In-Flight Anomaly Number** --	**Contractor Report Number** E-132	**JSC#** --	**KSC#** --
Problem Title TRANSDUCER FAILED CALIBRATION ACCURACY TEST (HIGH OUTPUT VOLTAGE)				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 3
HCRIT --	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** N/A	**PART#** N/AN	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE LRU	**NOMENCLATURE** N/A	**PART#** N/A	**SER/LOT#** N/A	**MANUFACTURER** N/A
HARDWARE NCA	**NOMENCLATURE** DIFF. PRES. TRNSDCER	**PART#** PD7400239-009	**SER/LOT#** 7	**MANUFACTURER** TAVIS CORP
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** --	**Cause** Z - NONE
System ELECTRICAL	**Defect** --	**Material** C - EEE	**Work Contact** --	**Fail Date** 09/14/1989
Received at MSFC 09/19/1989	**Date Isolated** --	**FMEA Reference** N/A	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location TAVIS CORP		**Symptom** EG - SIG HI OR LO		**Time Cycle** --
Effectivity Text NONE				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary				
Last MSFC Update 09/10/1992	**CN RSLV SBMT** --	**Defer Date** --	**Add Date** 09/20/1989	**R/C Codes** 0 - EXPL -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
Approval				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** NOT REQUIRED

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
B. HURST	BH	12/21/1989	C - CLOSED	--

Problem Type	SEV	Program Name	REVL	OPRINC
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FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
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RES PERSON L2	Approval Signature L3
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

REFERENCE: THIS PROBLEM DUPLICATED ON DEVELOPMENTAL DATABASE #D00001
THE TRANSDUCER FAILED A CALIBRATION ACCURACY TEST OF THE VENDOR
ACCEPTANCE TEST PLAN. THE TRANSDUCER HAD A HIGHER OUTPUT VOLTAGE THAN
SPECIFIED FOR AN APPLIED PRESSURE OF 2 PSID
CRITICALITY: THE TRANSDUCER TYPE IS BEING PROCURED TO REPLACE THE
PD7400098-079 TRANSDUCER WHICH IS CRIT. 1R; FMEA ITEM CODE 3.2.1.1;
"FAILS WITH HIGH READING."
NOTE: THE TRANSDUCERS ARE LIMITED LIFE CONTROLLED
GENERAL
THE TRANSDUCER FAILED TO MEET THE ACCURACY REQUIREMENTS OF VOLTAGE
VERSUS PRESSURE AT 2 PSID AND A TEMPERATURE OF -65 DEGREES FAHRENHEIT
THE ACTUAL OUTPUT VOLTAGE, ON PRESSURE RISE, WAS .385 VOLTS AND THE
MAXIMUM ALLOWABLE IS .383 VOLTS. THE TEST IS CONTAINED IN, "ACCEPTANCE
TEST PROCEDURE 10345, PARAGRAPH 4.6.3."
THE PD7400239 TRANSDUCERS ARE BEING DEVELOPED UNDER CHANGED SUMMARY
B01773 AS REPLACEMENTS FOR PD7400098 TRANSDUCERS. AT THIS TIME, THE
QUALIFICATION TESTING HAS BEEN COMPLETED BUT THE TEST REPORT IS STILL
BEING PREOPARED. THE COQ AND FMEA/CIL CHANGES HAVE NOT BEEN SUBMITTED
FOR REVIEW/APPROVAL. B01773 AUTHORIZES THE FABRICATION AND ACCEPTANCE
OF PRODUCTION PARTS PRIOR TO COQ APPROVAL

Contractor Investigation/Resolution

TASK I FAILURE INVESTIGATION
MARS T-17875 HAS BEEN WRITTEN FOR THE FAILURE. A DECISION ON THE
FAILURE INVESTIGATION IS AWAITING DISPOSITION OF THE MARS

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   RESPONSIBILITY:       J. ADAMS/3741 - E. HARTLEY/3740
   ECD:   9/22/89        L. COLON/3513 - W. BOURGEOIS/3513
TASK OPEN
TASK II  CORRECTIVE ACTION
PENDING THE RESULTS OF THE FAILURE INVESTIGATION
TASK OPEN
TASK III  CLEARANCE OF EFFECTIVITIES
ALL ETS CLEARED.  THERE IS NO AUTHORIZED USE OF PD7400239 PARTS ON ETS
AT PRESENT
TASK CLOSED
TASK IV   CAPS CLOSURE SUMMARY
PENDING THE COMPLETION OF OTHER TASKS
TASK OPEN
DUE TO THE NON-FLIGHT STATUS OF THIS HARDWARE CALSPAN HAS ASSIGNED
THIS PROBLEM A FUNCTION CRITICALITY OF 3.  C.S. MEYER 9/29/89
TASK I  FAILURE INVESTIGATION (SUBMITTED BY MCC ON 10/4/89)
THE FAILURE WAS DOCUMENTED ON MARS T-17875.  THE FAILURE OCCURRED DURING
THE PRE-VIBRATION -65 DEGREES-F CALIBRATION CHECK AND DID NOT RECUR
DURING THE POST-VIBRATION -65 DEGREES-F CHECK.  IT IS PROBABLE THAT THE
FAILURE IS THE RESULT OF A PERSONNEL ERROR IN RECORDING THE DATA ON THE
ACCEPTANCE TEST DATA SHEETS.  THE MARS HAS BEEN DISPOSITIONED TO SUBJECT
THE TRANSDUCER TO A SERIES OF PRESSURE AND TEMPERATURE CYCLES AND RECORD
THE OUTPUT VOLTAGE.  THE TESTING WILL AID IN THE DETERMINATION OF
WHETHER OR NOT THE TRANSDUCER IS STABLE.  FURTHER DISPOSITION WILL BE
PROVIDED BASED ON THE RESULTS OF THE TEMPERATURE AND PRESSURE CYCLING
RESPONSIBILITY:     L. COLON/3513 - W. BOURGEOIS/3513
                    R. RAMSEY/3830 - M. COMBS/3830
ECD:  10/13/89
CAPS CLOSURE SUMMARY
THE TRANSDUCER "FAILED" THE VENDOR ATP DUE TO AN ERROR IN RECORDING
THE TEST DATA.  THE ERROR WAS NOT DISCOVERED UNTIL REVIEW OF THE DATA
AS THE GO-NO GO VALUES WERE NOT LISTED ON THE DATA SHEETS FOR EACH
TEST.  THE DATA SHEETS WERE CHANGED TO INCLUDE THE TEST REQUIREMENTS
FOR EACH DATA POINT
PAC NOTE:  THE CAPS CLOSURE SUMMARY INDICATES THE PROBLEM FALLS
INTO THE CATEGORY OF A "NON-PROBLEM" IN ACCORDANCE WITH PRACA
SYSTEM REQUIREMENTS AS DEFINED IN NSTS 08126.  B. HURST 12/18/89
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MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12481	--	E-132	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
PD7400239-009	DIFF PRES TRANSDUCER	7

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	3	Z - NONE	ZZ - NO PROBLEM
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
N/A	N/A	N/A	N/A
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	Associated LRU#	Associated LRU#
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12525	**In-Flight Anomaly Number** --	**Contractor Report Number** P-065	**JSC#** --	**KSC#** --
Problem Title LH2 PROPELLANT FEEDLINE LEAKS IN THE OUTER ARGON JACKET				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 3
HCRIT 1	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
Test/Operation A - ATP	**Prevailing Condtion** E - ENVIRONMENT	**F / U** F	**Fail Mode** MS - STRUCT	**Cause** MA - MFG-ASY
System PROPULSION	**Defect** CR - CORROD	**Material** S - STRUCT	**Work Contact** --	**Fail Date** 10/03/1989
Received at MSFC 10/11/1989	**Date Isolated** --	**FMEA Reference** 2.5.8.2	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location ARROWHEAD		**Symptom** MV - EXT LEAK		**Time Cycle** --
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary				
Last MSFC Update 02/10/1995	**CN RSLV SBMT** --	**Defer Date** --	**Add Date** 10/12/1989	**R/C Codes** 2 - MFG -- --
Assignee				
Design W. PATTERSON	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
Approval				
Design W. PATTERSON	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
T. HESTER	TH	05/07/1990	C - CLOSED	--

Problem Type	SEV	Program Name	REVL	OPRINC
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FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
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RES PERSON L2	Approval Signature L3
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

DURING A PRE-ATP LEAK TEST ON A LH2 PROPELLANT FEEDLINE (PD4800184), A LEAK WAS DETECTED IN THE OUTER ARGON JACKET. THIS LEAK TEST IS THE LAST ONE PERFORMED PRIOR TO ARGON FILLING AND PRIOR TO ATP. REPLACEMENT PARTS WERE TESTED AT SUB-ASSEMBLY LEVELS AND LEAKAGE OCCURRED. THIS PROMPTED AN INVESTIGATION BY ARROWHEAD TO PERFORM A FAILURE ANALYSIS ON THESE PARTS TO DETERMINE THE CAUSE FOR THE LEAKING CONDITION. IT WAS DETERMINED THAT THE LEAK OCCURRED FROM CORROSION THROUGH THE THREE PLIES OF THE 21-6-9 STAINLESS STEEL PART. FURTHER ANALYSES WERE PERFORMED BY MAF PERSONNEL AND CONFIRMED THE CONDITION OF STRESS CORROSION CRACKING THE CORROSIVE CONDITION WAS SUSPECTED TO BE CAUSED BY THE INTRUSION OF CHLORIDE BEARING WATER INTO THE PLIES DURING A SEAM WELD PROCESS AND OTHER CONTRIBUTING FACTORS
OTHER BELLOWS LINES CONSTRUCTED BY ARROWHEAD OF 21-6-9 STAINLESS STEEL ARE:
   PD4800178 LH2 RECIRCULATION LINE (1)
   PD4800175 L02 PROPELLANT FEEDLINE (3)
   PD4800180 G02 PRESSURIZATION LINES (3)
   PD4800205 GH2 PRESSURIZATION LINES (3)
THE ABOVE LINES ARE PROCESSED SIMILARLY TO THE LH2 FEEDLINE. HOWEVER, THE ABOVE LINES DO NOT HAVE INCONEL 718 AS PRESSURE CARRIERS. THE ONLY LINE (OTHER THAN THE LH2 FEEDLINE) THAT HAS AN ARGON-FILLED ANNULUS IS THE RECIRCULATION LINE

Contractor Investigation/Resolution

TASK I. FAILURE/PROBLEM INVESTIGATION:

1. PROCUREMENT QUALITY (3760) REVIEW ALL VENDOR PROCESS PLANS TO
DETERMINE WHICH LINES WERE SUBJECTED TO A PROCESS WHICH PRODUCES A
POTENTIAL FOR WATER INTRUSION INTO THE INNER PLIES OF BELLOWS
CONSTRUCTED OF 21-6-9 STAINLESS STEEL
     RESPONSIBILITY: M. TAYLOR/3761 - C. COYAN/3760
     COMPLETED 11/10/89
CLOSURE STATEMENT:
A REVIEW OF PROCESSES RELATING TO BELLOWS FABRICATION HAVE BEEN
COMPLETED FOR FLOWN AND UNFLOWN ETS THROUGH ET-62. FIVE PLANNING LEVELS
WERE UTILIZED. ADDITIONALLY, 96 TYPE TWO BELLOWS ARE IN PROCESS AT
ARROWHEAD
2. RELIABILITY ASSURANCE (3741) AND MATERIALS ENGINEERING (3573)
PUBLISH FAILURE ANALYSIS RESULTS ON ALL MATERIALS AND SOLUTIONS ANALYZED
DURING THE INVESTIGATION OF THE PROPULSION HARDWARE IN QUESTION
     RESPONSIBILITY: B. MATTHEESSEN/3741 - E. HARTLEY/3740
                      P. HINKELDEY/3573 - C. GRAY/3570
     COMPLETED 11/16/89
CLOSURE STATEMENT:
IT WAS DETERMINED THAT STRESS CORROSION CRACKING RESULTED IN LEAKAGE OF
THE BELLOWS. METALLURGICAL ANALYSIS DETERMINED THAT THE 21-6-9
MATERIALS MET ALL SPECIFICATION REQUIREMENTS. THE MOST PROBABLE CAUSE
FOR STRESS CORROSION CRACKING WAS THE INDUCEMENT OF CHLORIDE LADEN WATER
USED FOR COOLANT DURING THE SEAM WELDING PROCESS
3. SYSTEMS ENGINEERING (3530) ANALYZE LINE CONFIGURATIONS AND DETERMINE
ALLOWABLE LEAKAGE ON LH2 FEEDLINE OUTER JACKET, LH2 RECIRCULATION LINE
INNER AND OUTER JACKET, GH2 PRESSURIZATION LINE FLEXIBLE BELLOW AND G02
PRESSURIZATION SYSTEM FLEXIBLE BELLOWS. PROVIDE TECHNICAL ASSESSMENT
RELATIVE TO POTENTIAL CRACK GROWTH, MISSION LIFE CAPABILITY, STRUCTURAL
ANALYSIS, ICE POTENTIAL AND EFFECTS, AND FRACTURE MECHANICS ANALYSIS
     RESPONSIBILITY: E. ZISK/3531 - J. JOHNSON/3530
     COMPLETED: 10/26/89 - INITIAL TECHNICAL ASSESSMENT (SEE TASK III
                            FLEET CLEARANCE)
                 03/23/90 - FINAL ENGINEERING REPORT (DATED 1/30/90)
CLOSURE STATEMENT:
A TECHNICAL ASSESSMENT WAS MADE RELATIVE TO LEAKAGE POTENTIAL, CRACK
GROWTH POTENTIAL, MISSION LIFE CAPABILITY, BELLOWS FABRICATION HISTORY
ICE POTENTIAL AND EFFECTS, STRUCTURAL ANALYSIS AND A FRACTURE MECHANICS
ANALYSIS, ETC. THIS TECHNICAL ASSESSMENT WAS PRESENTED OCTOBER 26, 1989
IN THE STS-33R FLIGHT READINESS REVIEW AND FLEET CLEARANCE RATIONALE WAS
DEVELOPED (SEE TASK III)
TASK II CORRECTIVE ACTIONS:
1. PROCUREMENT QUALITY (3760) OBTAIN CORRECTIVE ACTIONS FROM THE VENDOR
(ARROWHEAD) RELATIVE TO PROCESSES AND PROCEDURES WHICH WILL PRECLUDE A
RECURRENCE OF MOISTURE INTRUSION INTO INNER PLIES OF BELLOWS ASSEMBLIES
     RESPONSIBILITY: M. TAYLOR/3761 - C. COYAN/3760
     COMPLETED 2/12/90
CLOSURE STATEMENT:
ALL ARROWHEAD PLANNING HAS BEEN REVISED TO PERVENT WATER INTRUSION INTO
FAYING SURFACES. FURTHER PRECAUTIONS ARE TAKEN BY CONTROLLING THE WATER
USED DURING RESISTANCE WELDING OF BELLOWS. THIS IS ACCOMPLISHED BY
TESTING THE DI. WATER TWICE DAILY, MAINTAINING RECORDS OF CHLORINE
CONTENT, AND CHANGING WATER SAMPLES IF CHLORINE CONTENT EXCEEDS 20 PARTS
PER MILLION. THE PRACTICE OF "COURTESY CLEANING" IS NOW PROHIBITED
ONLY CLEANING OPERATIONS AUTHORIZED ON SHOP TRAVELERS SHALL BE
ACCOMPLISHED
2. PROCUREMENT QUALITY (3760) PROVIDE PLAN FOR REVALIDATING PROCESSES
TO PRECLUDE MOISTURE INTRUSION INTO THE INNER PLIES OF BELLOWS
     RESPONSIBILITY: M. TAYLOR/3761 - C. COYAN/3760
     COMPLETED 11/09/89
CLOSURE STATEMENT:
A PLAN WAS FORMULATED TO PREVENT MOISTURE INTRUSION INTO THE BELLOWS
ASSEMBLIES. IMPLEMENTATION OF THIS PLAN WAS ACCOMPLISHED ON ITEM 1,

TASK II
3. RELIABILITY ASSURANCE (3741) GENERATE A GENERIC ALERT ADDRESSING THE FABRICATION OF 21-6-9 BELLOWS WITH MOISTURE INTRUSION
RESPONSIBILITY: J. FINCHER/3741 - E. HARTLEY/3740
CANCELLED
CLOSURE STATEMENT:
LEAKAGE OF THE INITIAL GROUP OF BELLOWS (LOT F) WAS NOT DEFINITELY AND SOLELY ATTRIBUTABLE TO WATER INTRUSION INTO THE INNER PLIES. IT WAS SUSPECTED BY ALL COGNIZANT PARTIES THAT THIS GROUP OF BELLOWS WAS UNIQUE IN THEIR CONSTRUCTION AND PROCESSING. THEREFORE, BY MANAGEMENT DIRECTION, THE ALERT WAS NOT ISSUED
4. RELIABILITY ASSURANCE, PROCUREMENT QUALITY AND ENGINEERING DEVELOP RATIONALE FOR CLEARANCE OF ET-38 AND SUBSEQUENT LAUNCHES (SEE ATTACHED PLAN)
RESPONSIBILITY: J. FINCHER/3741 - E. HARTLEY/3740
A. LISTEMA/3515 - R. ROGERS/3510
M. TAYLOR/3761 - C. COYAN/3760
COMPLETED 10/26/89
CLOSURE STATEMENT:
SEE TASK III FOR CLEARANCE OF FLEET
TASK III CLEARANCE OF EFFECTIVITIES:
IT HAS BEEN DETERMINED THE THREE OF FIVE BELLOWS FABRICATION SEQUENCES USED BY THE VENDOR PREVENTS WATER INTRUSION INTO THE INNER PLIES WHICH DOES NOT CREATE A SUSPECT CONDITION OF STRESS CORROSION CRACKING HOWEVER, TWO OF THE SEQUENCES ARE SUSPECTED OF HAVING HAD WATER INTRUSION INTO THE BELLOWS PLIES WHICH MAY RESULT IN STRESS CORROSION CRACKING. CRACKING IS SUSPECTED TO BE A RESULT OF CHLORIDE BEARING WATER OR OTHER CHLORIDE SOLUTION BEING PRESENT ALONG WITH RESIDUAL STRESSES IN THE MATERIAL DURING THE PROCESS RESISTANCE WELDING AND BAKING OF THE BELLOWS ASSEMBLIES
A TECHNICAL ASSESSMENT WAS MADE OF THE SUSPECT CONDITION AND THE FOLLOWING ASSESSMENTS WERE DOCUMENTED:
1. PARTS THAT PASS ACCEPTANCE PROOF LEAK TESTS ARE ACCEPTABLE
A. SIZING OPENS UP AND BLUNTS ANY CRACKS
B. STRESS CORROSION CRACKS DO NOT GROW AFTER ACCEPTANCE TESTING
C. BELLOWS HAVE HIGH STRENGTH FACTORS OF SAFETY
D. FRACTURE ANALYSIS SHOWS LARGE CRITICAL FLAW SIZE AND MISSION LIFE CAPABILITY
E. SYSTEM IS TOLERANT TO LEAKAGE
ALL ENGINEERING ANALYSES HAVE DETERMINED THAT IF LEAKAGES DID OCCUR, IT WOULD BE LESS THAN THE ALLOWABLES PER THE TM04 REQUIREMENTS. NO SIGNIFICANT CRACK GROWTH IS EXPECTED AFTER THE LINES HAVE BEEN SIZED, PASSED LEAK AND PROOF TEST. ALL AS-BUILT HARDWARE IS ACCEPTABLE
TASK IV CAPS CLOSURE SUMMARY
A THOROUGH ANALYSIS OF ALL ASPECTS OF BELLOWS FABRICATION INDICATED THAT THE MOST PROBABLE CAUSE FOR THE STRESS CORROSION CRACKING WAS THE MIGRATION OF CHLORINE LADEN WATER INTO THE BELLOWS PLIES. ALL BELLOWS PROCESSING PAPER HAS BEEN REVISED AT ARROWHEAD TO PROTECT THE BELLOWS FROM SOLUTION INTRUSION INTO THE PLIES. ADDITIONALLY, DE-IONIZED WATER IS NOW PUMPED ONTO THE SEAM WELDS AND THE WATER IS MONITORED TWICE DAILY FOR CHLORINE CONTENT
IT WAS DETERMINED BY ENGINEERING ANALYSIS THAT ALL LINES THAT PASS PROOF TEST ARE FLIGHT WORTHY DUE TO THE FACT THAT NO MECHANISM IS PRESENT TO PROPAGATE THE CRACK

MSFC Response/Concurrence

MSFC Report#	IFA#	Contractor RPT#	JSC#	KSC#	EICN#
A12525	--	P-065	--	--	--

Asmnt Part#	Asmnt Part Name	Asmnt Serial/Lot#
PD-4800184	LH2 PROP. FEEDLINE	N/A

HCRIT CD	FCRIT CD	CAUSE CD	FAIL MODE
1	1	MA - MFG-ASY	MS - STRUCT

Asmnt FMEA	Asmnt FM	FMEA CSE	FMEA SCSE
2.5.8.2	2	A	N/A

Asmnt FMEA	Asmnt FM	FMEA CSE	FMEA SCSE
--	--	--	--

Asmnt FMEA	Asmnt FM	FMEA CSE	FMEA SCSE
--	--	--	--

Correlated Part#	Correlated Part#	Correlated Part#
--	--	--

Associated LRU#	Associated LRU#	Associated LRU#
--	--	--

MAJOR DESIGN CHANGES

APRV DATE	DESCRIPTION OF CHANGES
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12722	**In-Flight Anomaly Number** STS-32-T-1	**Contractor Report Number** T-060A	**JSC#** --	**KSC#** --
Problem Title LOSS OF SOFI FOAM DURING ASCENT				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1
HCRIT --	**Sys_Lvl** --	**Misc Codes** A B C D E F G **(X)** H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** ET COMPLETE	**PART#** 80901010000-070	**SER/LOT#** ET-32	**MANUFACTURER** MMC
Test/Operation F - FLT	**Prevailing Condtion** F - FUNCTIONAL	**F / U** UC	**Fail Mode** MSI - INSULATION	**Cause** DHP - DES-HDW-INST
System TPS	**Defect** CX - VOID	**Material** F - INSUL	**Work Contact** --	**Fail Date** 01/09/1990
Received at MSFC 02/09/1990	**Date Isolated** --	**FMEA Reference** 5.6.2.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location KSC		**Symptom** MI - INSULATION		**Time Cycle** --
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary				
Last MSFC Update 02/13/1995	**CN RSLV SBMT** --	**Defer Date** --	**Add Date** 02/11/1990	**R/C Codes** 0 - EXPL -- --
Assignee				
Design C. BRAMON	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
Approval				
Design	**Chief Engineer**	**S & MA**	**Project**	**Project MGR**

C. BRAMON	M. PESSIN	R. ZAGRODZKY	--	G. LADNER
PAC Assignee B. HURST	**PAC Review Complete** BH	**MSFC Closure Date** 02/16/1990	**Status** C - CLOSED	**F/A Completion** --
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Contractor Status Summary				
Reliability/Quality Assurance Concerns, Recommendations:				

Problem Description

A. THE EXTERNAL TANK'S INTERTANK TPS APPLICATION INVOLVES TWO DIFFERENT SOFI CONFIGURATIONS. THE +/-Y THRUST PANELS AND AN AREA OF THE +Z PANELS HAVE BX-250 FILLING THE VALLEY BETWEEN THE STRINGERS WITH ISOCHEM APPLIED OVER THE BX-250. CPR IS APPLIED OVER THE BX-250 AND ISOCHEM DURING THE SPRAY OF THE INTERTANK. THE FINAL TPS CONFIGURATION INCLUDES TWO-TONE AREAS (CPR OVER BX) AND CPR-488 OVER THE PRIMED SUBSTRATE. VENT HOLES ARE DRILLED IN THE TWO-TONE AREAS AT KSC. THESE EIGHTH-OF-AN-INCH DIAMETER HOLES ARE LOCATED IN THE VALLEYS BETWEEN THE STRINGERS AND PENETRATE THROUGH THE CPR-488/ISOCHEM INTERFACE TO ALLOW VENTING OF ANY LOCALIZED VOIDS THAT MAY EXIST
FOUR DIVOTS (18"-24" DIAMETER) AND ONE DIVOT (6" DIAMETER) OCCURRED IN THE TWO-TONE SOFI AREA IN THE +Z PANELS OF THE INTERTANK FORWARD OF THE BIPOD ATTACH POINTS. PHOTOGRAPHS OF THESE DIVOTS INDICATE THAT THE FOAM PROBABLY CAME OFF AT THE CPR-488/ISOCHEM INTERFACE
B. SEPARATION PHOTOS OF A PREVIOUS FLIGHT (ET-31) SHOWED AN INTERTANK TPS DIVOT IN THE +Z TWO-TONE AREA. IT WAS DIFFERENT THAN THE ET-32 DIVOTS IN THAT IT APPEARED SHALLOW AND NOT RELATED TO ISOCHEM DEBOND PROBLEM
INVESTIGATION CONCLUDED THAT THE DIVOT WAS POSSIBLY THE RESULT OF A COMBINATION OF COMPRESSIVE LOADS UNDER MATS IN FINAL ASSEMBLY, A MOMENTARY SPRAY GUN PROBLEM OR LOCAL SEVERE FLIGHT ENVIRONMENT

Contractor Investigation/Resolution

TASK I - FAILURE/PROBLEM INVESTIGATION:
A. RELIABILITY ASSURANCE - REVIEW ET-31, 32 AND 33 INTERTANK TPS
APPLICATION BUILD RECORDS AND NONCONFORMANCES
RESPONSIBILITY: K. KILLIAN/3741 - E. HARTLEY/3740
COMPLETED: 2/2/90
STATEMENT: A REVIEW OF THE MPP'S ASSOCIATED WITH THE TPS APPLICATION OF ETS 31, 32 AND 33 DISCLOSED THAT A DIFFERENT LOT OF ISOCHEM AND CPR-488 FOAM WAS USED FOR EACH INTERTANK. ET-32 AND ET-33 INTERTANKS WERE MANUFACTURED WITH THE SAME LOT OF BX-250 FOAM TO FILL THE VALLEYS BETWEEN THE STRINGER. THERE IS NOT A LOT MATERIAL PROBLEM. 2997 MARS/DRS WERE REVIEWED AND DISCLOSED NO SIGNIFICANT ANOMALIES
B. MATERIAL SCIENCES (TPS ENGINEERING) - REVIEW ORBITER TILE DAMAGE AND COMPARE WITH PREVIOUS FLIGHTS
RESPONSIBILITY: S. COPSEY/3571 - C. GRAY/3570
COMPLETED: 2/2/90
STATEMENT: MATERIAL SCIENCES REVIEW HAS DETERMINED THAT THE ORBITER TILE DAMAGE ON THE FLIGHT OF ETS 31 AND 32 ARE WITHIN NOMINAL/BASELINE LEVELS; ANY MATERIAL LOST FROM THE INTERTANKS ON THESE FLIGHTS DID NOT RESULT IN SIGNIFICANT ORBITER TILE DAMAGE. REFERENCE MATERIAL SCIENCE ET-8 AND SUBSEQUENT ORBITER TILE DAMAGE REPORT
C. DESIGN ENGINEERING (3510) TO ISSUE INSPECTION REQUEST TO KSC TO VERIFY THE VENT HOLE DEPTH
RESPONSIBILITY: G. SWEET/3512 - R. ROGERS/3510
COMPLETED: 2/6/90
STATEMENT: AN INSPECTION REQUEST WAS ISSUED TO VERIFY THREE RANDOMLY SELECTED VENT HOLES PER +Z STRINGER VALLEY. (REF. AR MK0021) NINETY HOLES WERE CHECKED AND ALL WERE ACCEPTABLE
TASK II - CORRECTIVE ACTION: NONE REQUIRED - ISOLATED CASE
TASK III - CLEARANCE OF EFFECTIVITIES:
ET-33, 34, 35, 37, 39 THROUGH 50 ARE CLEARED FOR FLIGHT BY ACTION OF B01736 INTERTANK FOAM VENT INSTALLATION AND THE FOLLOWING RATIONALE:
A. THE SHAPE AND DEPTH OF THE DIVOTS OBSERVED ON ET-32 ARE VERY SIMILAR TO DIVOTS CAUSED BY NON-VENTED AREAS ON EARLIER FLIGHTS. ETS 31, 32, 33 BUILD PAPER REVIEW FOUND NO MATERIAL OR PROCESSING CONCERNS
B. THE VENT HOLES ON ET-33 WERE VERIFIED PER ACTION REQUEST MK0021 BY SAMPLE INSPECTION. SINCE ALL 90 HOLES WERE CORRECT, THE ET-32 PROBLEM WAS AN ISOLATED CASE
(REFERENCE LEVEL II STS-32-T-1 IFA PRESENTATION)
ET-51 AND SUBSEQUENT ARE CLEARED BY DESIGN CHANGE THAT ELIMINATED THE TWO-TONE SOFI CONFIGURATION
TASK IV - CAUSE/CORRECTIVE ACTION SUMMARY:
AN INVESTIGATION HAS CONCLUDED THAT THE DIVOTS WERE PROBABLY THE RESULT OF UNVENTED LOCALIZED VOIDS AT THE ISOCHEM CPR-488 INTERFACE. THESE VOIDS CONTAINED GAS AT ONE ATMOSPHERE PRESSURE. AS THE ET ASCENDED, THE DIFFERENTIAL PRESSURE BETWEEN THE VOIDS AND THE TPS EXTERIOR INCREASED AND CAUSED THE FOAM TO SEPARATE
NINETY VENT HOLES ON ET-33 WERE VERIFIED TO THE CORRECT DEPTH
THIS IS AN ISOLATED CASE; THEREFORE, NO CORRECTIVE ACTION IS NECESSARY

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12722	STS-32-T-1	T-060A	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
80901010000-070	ET COMPLETE	ET-32

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**

--	1	DHP - DES-HDW-INST	MI - INSULATION
Asmnt FMEA 5.6.2.1	**Asmnt FM** 1	**FMEA CSE** B	**FMEA SCSE** 3
Asmnt FMEA --	**Asmnt FM** --	**FMEA CSE** --	**FMEA SCSE** --
Asmnt FMEA --	**Asmnt FM** --	**FMEA CSE** --	**FMEA SCSE** --
Correlated Part# --	**Correlated Part#** --	**Correlated Part#** --	
Associated LRU# --	**Associated LRU#** --	**Associated LRU#** --	
MAJOR DESIGN CHANGES			
APRV DATE --	**DESCRIPTION OF CHANGES** --		
ASSESSMENT TEXT			

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12740	**In-Flight Anomaly Number** --	**Contractor Report Number** E-133	**JSC#** --	**KSC#** --
Problem Title TRANSDUCER FAILED PRESSURE CAVITY LEAKAGE TEST				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT --	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** DIFF PRES TRANSDUCER	**PART#** PD7400239-009	**SER/LOT#** 103	**MANUFACTURER** TAVIS CORP
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** UC	**Fail Mode** ZZ - NO PROBLEM	**Cause** Z - NONE
System ELECTRICAL	**Defect** --	**Material** C - EEE	**Work Contact** --	**Fail Date** 02/14/1990
Received at MSFC 02/20/1990	**Date Isolated** --	**FMEA Reference** 3.2.1.3	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location TAVIS CORP		**Symptom** MV - EXT LEAK		**Time Cycle** --
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary				
Last MSFC Update 12/02/1991	**CN RSLV SBMT** --	**Defer Date** --	**Add Date** 02/21/1990	**R/C Codes** 0 - EXPL -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
Approval				

Design	Chief Engineer	S & MA	Project	Project MGR
A. JACKMAN	M. PESSIN	R. JACKSON	--	G. LADNER

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
B. HURST	BH	04/06/1990	C - CLOSED	--

Problem Type	SEV	Program Name	REVL	OPRINC
--	--	--	--	--

FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
--	-- -- -- -- --	--	--	--

RES PERSON L2	Approval Signature L3
--	--

Related Document Type	Related Document ID
--	--

Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Contractor Status Summary

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

THE TRANSDUCER FAILED THE "PRESSURE CAVITY LEAKAGE" TEST SEGMENT OF ACCEPTANCE TEST PLAN 10345, PARAGRAPH 4.3.1. THE TEST REQUIRES THE TRANSDUCER PRESSURE PORT TO BE CONNECTED TO A 45 PSID HELIUM SUPPLY WHILE CHECKING FOR LEAKS USING A HELIUM MASS SPECTROMETER. THE REQUIREMENT IS THAT THE EXTERIOR WELDS AND BRAZE JOINTS SHALL NOT EXHIBIT A LEAKAGE RATE GREATER THAN 1 X 10 TO THE 6TH SCC/SEC. THERE WAS A GAS LEAK AT THE BRAZED JOINT BETWEEN THE PRESSURE PORT MALE TUBE FITTING AND THE TRANSDUCER CASE. THE LEAKAGE RATE WAS SO HIGH AT THE BRAZED JOINT BETWEEN THE TUBE FITTING AND THE CASE THAT IT EXCEEDED THE MEASUREMENT CAPABILITIES OF THE MASS SPECTROMETER. A SOAPY LEAK CHECK FLUID APPLIED TO THE JOINT PRODUCED A STEADY STREAM OF GAS BUBBLES. THE TRANSDUCER HAD PREVIOUSLY PASSED THE MANUFACTURER'S TWO IN-PROCESS LEAK TESTS WHICH ARE PERFORMED IN A SIMILAR MANNER
THE PD7400239 TRANSDUCERS ARE BEING DEVELOPED UNDER CHANGE SUMMARY B01773 AS REPLACEMENTS FOR THE PD7400098 TRANSDUCERS, WHICH ARE CRIT 1R AT THIS TIME THE C0Q AND THE FMEA/CIL CHANGES HAVE NOT YET BEEN SUBMITTED FOR REVIEW/APPROVAL. B01773 AUTHORIZES THE FABRICATION AND ACCEPTANCE OF PRODUCTION PARTS PRIOR TO C0Q APPROVAL. NOTE: THE TRANSDUCERS ARE LIMITED LIFE CONTROLLED

Contractor Investigation/Resolution

TASK I FAILURE INVESTIGATION
THE FAILURE WAS DOCUMENTED ON MARS T-17877. THE VENDOR IS SUBMITTING A

FAILURE ANALYSIS PLAN WITH THE MARS. SCHEDULE IS DEPENDENT UPON RECEIPT
OF THE MARS, DISPOSITION OF THE MARS, AND APPROVAL OF THE FAILURE
ANALYSIS PLAN
RESPONSIBLITY: R. RAMSEY/3830 - M. COMBS/3830
L. COLON/3513 - W. BOURGEOIS/3513
J. ADAMS/3741 - E. HARTLEY/3740
ECD: 3/30/90
TASK I STATUS: OPEN
TASK II CORRECTIVE ACTION
PENDING THE RESULTS OF THE FAILURE INVESTIGATION
TASK II STATUS: OPEN
TASK III CLEARENCE OF EFFECTIVITIES
ALL ETS CLEARED. THERE IS NO AUTHORIZED USE OF PD7400239 PARTS ON ETS
AT PRESENT
TASK III STATUS: CLOSED
TASK IV CAPS CLOSURE SUMMARY
PENDING THE COMPLETION OF OTHER TASKS
TASK IV STATUS: OPEN
PAC NOTE (2/21/90): THIS PROBLEM IS CLASSIFIED AS A CRIT. 3 BECAUSE IT
HAS NOT YET BEEN APPROVED FOR THE ET, NOR IS IT ON ANY ET'S
PAC NOTES (3/16/90): (1) THIS PROBLEM IS RE-CATEGORIZED TO A CRIT 1R
TO CORRESPOND TO THE CRITICALITY IT WOULD HAVE IF IT WERE APPROVED
FOR FLIGHT; (2) THIS PR IS BEING CLOSED IN PRACA AND TRANSFERRED AS AN
OPEN PROBLEM TO AN INTERNAL PAC DATA BASE (#D00002) USED IN STORING
RECORDS FOR "DEVELOPMENTAL" HARDWARE WHICH ARE NOT YET APPROVED FOR
FLIGHT. DEVELOPMENTAL/NON- FLIGHT HARDWARE PROBLEMS SUCH AS THIS HAVE
NO REQUIREMENT TO BE IN THE PRACA DATABASE

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12740	--	E-133	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
PD7400239-009	DIFF PRES TRANSDUCER	--

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	Z - NONE	ZZ - NO PROBLEM

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.2.1.3	3	N/A	N/A
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--

MAJOR DESIGN CHANGES

APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12934	**In-Flight Anomaly Number** --	**Contractor Report Number** S-075	**JSC#** --	**KSC#** --
Problem Title UNUSUAL ALIGNMENT - OV 102 TO ET 35				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 3
HCRIT --	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** STRUCTURAL ASSY	**PART#** 80911031780	**SER/LOT#** ET-40	**MANUFACTURER** MMC
Test/Operation L - FLD	**Prevailing Condtion** N - INSPECTION	**F / U** UC	**Fail Mode** MU - MECH TOLRNCE	**Cause** MPT - MFG-PRC-EQUP
System STRUCTURAL	**Defect** MD - M SIZE	**Material** S - STRUCT	**Work Contact** D. WESTPHAL	**Fail Date** 05/04/1990
Received at MSFC 05/11/1990	**Date Isolated** 05/04/1990	**FMEA Reference** N/A	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location KSC		**Symptom** MU - MECH TOLRNCE		**Time Cycle** --
Effectivity Text ET35, ET37, ET39 AND ET40 THRU ET60; CLOSED, 12/11/90				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date 05/25/1990	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary - MOST PROBABLE CAUSE WAS THE INTERCHANGE OF THE BALL FITTING HAT SECTION BETWEEN THE (3) UNITS OF THE ALIGNMENT TRUSS T12A7393				
Last MSFC Update 02/09/1995	**CN RSLV SBMT** 09/19/1990	**Defer Date** --	**Add Date** 05/16/1990	**R/C Codes** 2 - MFG -- --
Assignee				
Design O. MOON	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER

Approval				
Design O. MOON	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
PAC Assignee T. HESTER	**PAC Review Complete** TH	**MSFC Closure Date** 12/11/1990	**Status** C - CLOSED	**F/A Completion** 09/01/1990
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** DC&R S-90-006			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				

Contractor Status Summary

CLOSURE RATIONALE SUBMITTED, 9/19/90

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

PROBLEM DESCRIPTION: AS A RESULT OF UNUSUAL ALIGNMENT OF THE OV 102 (COLUMBIA) WITH ET-35 DURING STACKING ACTIVITIES, A SUSPECT CONDITION WAS REVEALED WHICH COULD AFFECT OTHER ETS RELATIVE TO THE BIPOD (FORWARD) ATTACH POINTS AS IT RELATES TO THE AFT ORBITER ATTACHING HARDWARE ON THE ET. FURTHER INVESTIGATIONS INCLUDED A RE-VERIFICATION OF THE ORBITER ATTACH POINTS ON ET-40 WHICH WAS THE NEXT ET SCHEDULED FOR SHIPMENT TO KSC. IT WAS DETERMINED THAT THE ORBITER CROSS BEAM ON THE E02 (-Y SIDE) WAS .125"FWD OF E03 (+Y SIDE), WHICH VIOLATES THE ICD OF +/-.090. THE E03 (+Y SIDE) BALL FITTING WAS CONFIRMED TO BE WITHIN .001" OF EB3 (UPPER SRB ATTACH FITTING). THIS CAPS IS ISSUED TO INVESTIGATE THESE OCCURRENCES AND TO IMPLEMENT CORRECTIVE ACTIONS AS REQUIRED
NOTE: THIS IS A DISCRETIONARY CAPS (REFERENCE PARAGRAPH 1.6.2.3C OF MMC-ET-RA03) AND DOES NOT SPECIFICALLY RELATE TO ANY CIL ITEM

Contractor Investigation/Resolution

MSFC Response/Concurrence

OTHER ITEMS CONTRIBUTING TO THE TOLERANCE VARIATION IN THE ALIGNMENT PROCEDURE INCLUDE:

- MANUFACTURING PROCESS
  - INITIAL TOOL SET UP ALIGNED E02 & E03 INDEPENDENT OF EO1
  - MANUFACTURING TOLERANCES PLUS TOOL TOLERANCES EXCEEDED ENGINEERING FOR E02 AND E03
- TOOLING
  - ALIGNMENT OF SCOPE MOUNT ON T12A7393 TOOL
  - OPTICS MOUNT ON T12A7393 TOOL
- OPTICS ACCURACY
  - OPTICS TRANSIT SQUARE ALIGNMENT

GENERAL:
AFTER SOME DIFFICULTY IN MATING ET-35 WITH OV-102 COLUMBIA ORBITER, IT WAS OBSERVED THAT ONE THREAD PROTRUDED FROM THE ADJUSTABLE (+Y) END OF THE BIPOD CLEVIS WHICH IS THE MINIMUM ALLOWED BY OMRSD. THIS UNUSUAL CIRCUMSTANCE PROMPTED AN INVESTIGATION WHICH INCLUDED OPTICAL AND CALCULATED DIMENSIONS RELATIVE TO THE POSITION OF THE ORBITER IN RELATIONSHIP TO THE CENTER LINE OF THE ET. THE DATA INDICATED THAT THE ORBITER WAS 1.47" IN THE +Y DIRECTION AT THE FORWARD BIPOD ATTACH POINT WHICH IS .400" MORE THAN THE ICD REQUIREMENT. FURTHER OPTICAL MEASUREMENTS WERE MADE ON THE ORBITER CROSS BEAM ON ET-35 AND IT WAS REPORTED THAT THE EO-2 FITTING WAS LOCATED .200" FORWARD OF THE E03 THE ICD REQUIREMENT IS +/- .090"
TO FURTHER UNDERSTAND THE CONDITION EXPERIENCED ON ET-35, A DECISION WAS MADE TO RE-VERIFY THE AFFECTED DIMENSIONS ON ET-40 PRIOR TO SHIPMENT TO KSC. MEASUREMENTS WERE MADE ON EO-2 AND EO-3 (ORBITER ATTACH POINTS) IN RELATIONSHIP TO EB-3 AND EB-4 (UPPER SRB FITTINGS). THE UPPER SRB FITTINGS ARE IN PLANE WITH THE 2058 RING FRAME AND THE ORBITER ATTACH POINTS (EO-2 RELATIVE TO EO-3), BY ICD REQUIREMENT, SHOULD BE WITHIN +/- .090". ONCE THIS DIMENSION IS ESTABLISHED, THE CROSS BEAM MID-POINT (BETWEEN EO-2 AND EO-3) IS DETERMINED AND OPTICAL ALIGNMENTS AND CHECKS ARE MADE TO DETERMINE THE POSITION OF EO-1 BIPOD YOKE ATTACH POINT. IT WAS DETERMINED THAT AN OUT-OF-TOLERANCE CONDITION EXISTED AT POSITION EO-2 ON ET-40
TASK I: PROBLEM/FAILURE INVESTIGATION
1. MANUFACTURING ENGINEERING AND TOOL DESIGN EVALUATE THE AFT ET/ORBITER INTERFACE STRUCTURE ASSEMBLY/ALIGNMENT PROCESSES TO DETERMINE POSSIBLE CONTRIBUTORS TO THE ET-40 NONCONFORMANCE
   COMPLETED: 5/31/90
CLOSURE STATEMENT
A POTENTIAL PRIME CONTRIBUTION TO THE OUT-OF-TOLERANCE CONDITION IS THE POSSIBLE INTERCHANGING OF HAT SECTIONS ON THE T12A7393 TOOL. HAT SECTIONS DID NOT HAVE CONTROLLED INTER-CHANGEABILITY BETWEEN THE THREE UNITS OF THE T12A7393 UNTIL FEBRUARY, 1986. OTHER DATA IS BEING ACCUMULATED UNDER TASK 8 OF THIS CAPS. REF. MEMO 3614-90-111
2. MANUFACTURING ENGINEERING AND TOOL DESIGN ANALYZE THE T12A7021 ASSEMBLY TOOL TO DETERMINE WHETHER THE TOOL'S STIFFNESS/TOLERANCES WERE ADEQUATE TO ENSURE INSTALLATION/ALIGNMENT OF THE AFT INTERFACE HARDWARE WITHIN DRAWING REQUIREMENTS
   COMPLETED: 5/31/90
CLOSURE STATEMENT
ALL DEFLECTIONS AND LOCATION DIFFERENCES INDICATE THAT TOOL DEFLECTION DID NOT CAUSE THE OUT-OF-PLANE CONDITION OF EO2 AND EO3 FOUND ON ET-40 REF. ATTACH. III TO MEMO 3614-90-111
3. ENGINEERING PUBLISH DATA RELATIVE TO ENGINEERING REQUIREMENTS AND TOLERANCE VARIATIONS AFFECTING THE EO1 ICD REQUIREMENTS AND MANUFACTURING TOLERANCE AFFECTS (SIC) ON THESE ICD DIMENSIONS
   COMPLETED: 5/9/90
CLOSURE STATEMENT:
A CAD STUDY WAS PERFORMED ON THE EO-1 WORST CASE TOLERANCE. USING WORST CASE DRAWING TOLERANCES AND WORST CASE TOOLING TOLERANCES, DATA INDICATES THAT POSITIVE THREAD EXPOSURE ON THE BIPOD CLEVIS CAN BE ACHIEVED IN WORST CASE CONDITIONS. REFERENCE MEMO 3511-90-005
4. RELIABILITY ASSURANCE REVIEW BUILD DATA WHICH WOULD AFFECT ALIGNMENT

ON ET-40 TO DETERMINE IF ANY ABNORMAL CONDITIONS (MRBS, DRS, ETC.)
EXISTS WHICH WOULD CONTRIBUTE TO THE OUT-OF-TOLERANCE CONDITION AT EO-1
AND EO-2
   COMPLETE: 5/7/90
CLOSURE STATEMENT:
THE FOLLOWING BUILD AND ALIGNMENT DATA WAS REVIEWED TO DETERMINE IF AN
EVENT OCCURRED WHICH WOULD CONTRIBUTE TO THE ORBITER CROSS BEAM
MIS-ALIGNMENT ON ET-40
1. 80900209002-999   VERTICAL ALIGNMENT -- CELL A
2. 80914151910-M009 LH2 FWD DOME MECH. ASSY
3. 80911051124-010   FTG. INSTL. ET/SRB
4. 80911051109   BI-POD FTG. INSTL
5. 80911071790   STRUCTURE ASSY ET/ORBITER ACT
6. 80911009190   BI-POD FIT CHECK ALIGNMENT VERIFICATION
NO MARS OR DRS WERE PROCESSED WHICH WOULD CONTRIBUTE TO THE OUT-OF-SPEC
CONDITION OF ET-40
5. RELIABILITY ASSURANCE ISSUE DC&R TO RE-VALIDATE ICD DIMENSIONS ON
ETS AS IDENTIFIED ON DC&R S-90-006
   COMPLETED: 5/14/90
CLOSURE STATEMENT:
DC&R WAS ISSUED TO INSPECT ET-41 THROUGH ET-55 AND ET-57 THROUGH ET-60
TO VERIFY THE RELATIONSHIP OF EO-3 TO THE 2058 RING FRAME. EO-2
RELATIONSHIP TO EO-3 AND RELATIONSHIP OF EO-1 TO EO-2 AND EO-3
NOTE: ET-40 AND ET-56 WERE CHECKED AT MAF BY O.D. ET-MGT.082
       ET-37 AND ET-39 WERE CHECKED BY KSC TPS #5525A-274
6. MANUFACTURING ENGINEERING AND QUALITY ENGINEERING PROVIDE RATIONALE
FOR ACCEPTING ALL ETS ASSEMBLED USING THE NEW EO1/EO2/EO3 ALIGNMENT
FIXTURE, T12A7428, BASED ON THE DESIGN, RESOLUTION OF DISCREPANCIES AND
SUBSEQUENT DESIGN CHANGES
   ECD: CANCELLED DUE TO PROGRAM DECISION TO REVERIFY ALL POST DD250
         ETS AND ET-56 THROUGH ET-60 BY DC&R AT MAF OR TPS AT KSC
7. MANUFACTURING ENGINEERING AND STRUCTURES DESIGN REVIEW ALL ET
STRUCTURAL ALIGNMENT (EO1-EO5, EB1-EB8) INTERFACE DESIGN REQUIREMENTS
(ICDS), ENGINEERING DRAWING REQUIREMENTS AND MANUFACTURING BUILD
PROCESSES FOR PROPER FLOW DOWN OF REQUIREMENTS TO BUILD. THIS SHOULD
INCLUDE, BUT NOT BE LIMITED TO, SUCH ITEMS AS, (1) CONSISTENCY OF
REQUIREMENTS, (2) TOLERANCE STUDY, (3) MANUFACTURING PROCESS, AND (4)
MANUFACTURING BUILD PROCESS ADEQUACY. PROVIDE A FLOW-DOWN MATRIX THAT
DISPLAYS THE REQUIREMENTS AND CONCLUSIONS OF THE REVIEW
   COMPLETED: 9/1/90
CLOSURE STATEMENT:
A REVIEW OF ALL STRUCTURAL ALIGNMENT INTERFACE DESIGN REQUIREMENTS,
ENGINEERING DRAWING REQUIREMENTS, AND MANUFACTURING ALIGNMENT PROCESSES
WERE EVALUATED. ALSO A TOLERANCE STUDY WAS PERFORMED. THIS STUDY HAS
SHOWN THAT ENGINEERING REQUIREMENTS MEETS ICD REQUIREMENTS AND THAT THE
MANUFACTURING BUILD TOLERANCES MEET THE ENGINEERING REQUIREMENTS WITH
ONE EXCEPTION. THE BUILD TOLERANCES EXCEEDS THE ENGINEERING
REQUIREMENTS FOR THE X-X ALIGNMENT OF EO2 AND EO3 BY 0.002 AND 0.003
RESPECTIVELY. THESE TOLERANCES HAVE BEEN ADJUSTED TO MEET ENGINEERING
REQUIREMENTS. REFERENCE MEMO 3614-90-142, ATTACHED
8. MANUFACTURING ENGINEERING DEVELOP A STATISTICAL APPROACH FOR
ANALYZING THE BUILD TOLERANCE (TOOLING, OPTICS, ETC.) STACK-UPS AND
EVALUATE THE AS-BUILT DATA FROM THE DC&R RE-VERIFICATION MEASUREMENTS TO
DEVELOP A PROBABILITY ASSESSMENT. THIS TASK IS BEING PERFORMED TO
PROVIDE SUPPORTING RATIONALE FOR THE PROBABLE CAUSE IDENTIFIED IN ITEMS
1 AND 2
   COMPLETED: 9/1/90
CLOSURE STATEMENT:
A STATISTICAL ANALYSIS WAS PERFORMED USING DATA GATHERED FROM THE BUILD
PROCESS. ALL ASPECTS INCLUDING REQUIREMENTS, PROCESSES, TOOLING AND
HISTORICAL DATA HAVE BEEN REVIEWED. AREAS WERE FOUND THAT ARE PRESENTLY
MARGINAL. TO ENHANCE THE ALIGNMENT PROCESS CORRECTIVE ACTIONS HAVE BEEN

IMPLEMENTED. ALSO A COMPUTERIZED DATA SYSTEM IS BEING IMPLEMENTED WHICH WILL ENHANCE THE STATISTICAL ANALYSIS. REFERENCE MEMO 3614-90-157, ATTACHED

TASK II CORRECTIVE ACTIONS:

- AS A RESULT OF TASK I. ITEM 8 THE FOLLOWING CORRECTIVE ACTIONS HAVE BEEN IMPLEMENTED:
  - IMPROVED MANUFACTURING PROCESS
    - IMPROVED INITIAL SET UP OF ALIGNMENT TOOL
    - IMPROVED METHOD FOR LOCATION OF BIPOD AT NOMINAL
    - RECORDING OF BUILD INFORMATION
    - IMPLEMENTED LAMINATED SHIM AT THRUST STRUT TO BALL FITTINGS
    - ADJUSTED VERTICAL SHIM THICKNESS WITH STRUT INSTALLED
    - TIGHTENED BUILD TOLERANCES FOR X-X ALIGNMENT FOR EO2 AND E03
  - IMPROVED AND REWORKED TOOLING
    - SCALE ON BIPOD FIXTURE
    - REVERIFIED TOOLING TO ICT
    - IMPLEMENT ALIGNMENT TOOL T12A7428 IN PLACE OF T12A7021
    - INSTALLED TOOL STABILIZER STRUTS
    - REPLACE OPTICS MEASUREMENT MOUNTS ECD: 1-2-91
  - IMPROVED OPTICS ACCURACY
    - REPLACE OPTICS SQUARE SET-UP WITH DIRECT OPTICAL LINE
- IMPLEMENT STATISTICAL ANALYSIS AND TRACKING CHARTS, ECD: 12/1/90

NOTE: ALL CORRECTIVE ACTIONS ARE COMPLETED. THE TWO ITEMS WITH ECD'S ARE PROCESS ENHANCEMENTS AND DO NOT REQUIRE IMPLEMENTATION PRIOR TO CAPS CLOSURE

TASK III CLEARANCE OF EFFECTIVITIES:

NO CONSTRAINTS TO FLIGHT. THE ACCEPTABILITY OF THE POSITIONS OF E02/E03 RELATIVE TO EO1 IS VERIFIED DURING ORBITER/ET MATE IN THE KSC VAB FOR ALL ETS. THE VERIFICATIONS REQUIRED BY THIS CAPS WILL ASSURE A SUCCESSFUL ORBITER MATE FOR ALL ETS

TASK IV   CAPS CLOSURE SUMMARY

FOLLOWING THE IDENTIFICATION OF THE ET-35 ALIGNMENT CONCERN AND THE SUBSEQUENT DETERMINATION OF THE OUT-OF-TOLERANCE CONDITION ON ET-40, SEVERAL INVESTIGATIONS WERE CONDUCTED TO DETERMINE THE CAUSE OF THE EO1, EO2, EO3 ALIGNMENT PROBLEM AND ASSURE THAT THE OTHER ICD STRUCTURAL ALIGNMENT REQUIREMENTS WERE ACHIEVED

THROUGH THE CAPS INVESTIGATION, THE ET/ORBITER INTERFACE STRUCTURAL ASSEMBLY/ALIGNMENT PROCESS, THE ALIGNMENT TOOLS, ENGINEERING BUILD TOLERANCE VARIATIONS, THE BUILD DATA, AND A REQUIREMENTS FLOW DOWN (ICD, DRAWING AND BUILD TOLERANCES) WERE EVALUATED

DURING THE INITIAL INVESTIGATION THE INTERCHANGEABILITY OF THE HAT SECTIONS ON TOOL T12A7393 WAS IDENTIFIED AS A POTENTIAL PRIME CONTRIBUTOR TO THE ALIGNMENT OUT-OF-TOLERANCE CONDITION FOR ET-35 THROUGH ET-42. THE HAT SECTION ON THE THREE UNITS OF T12A7393 ALIGNMENT TRUSS WERE NOT FUNCTIONALLY CO-ORDINATED UNTIL ET-43. HAT SECTIONS INTERCHANGED BETWEEN UNITS OF THE T12A7393 COULD HAVE CAUSED MISALIGNMENT OF THE BALL FITTINGS UP TO 0.250 INCH. SUBSEQUENT INVESTIGATIONS HAVE NOT BEEN ABLE TO ASCERTAIN WHICH UNITS OF THE HAT SECTIONS WERE USED WITH THE OUT OF TOLERANCE ET-35, ET-37, AND ET-40; HOWEVER, THE HAT SECTIONS WERE USED INTERCHANGEABLY DURING THE PERIOD AND ARE THE MOST PROBABLE CAUSE FOR THE OUT OF TOLERANCE CONDITION. THE DEFLECTION AND ASSOCIATED LOCATION DIFFERENCES INDICATE THAT THE TOOL (T12A7021) DID NOT CAUSE THE OUT-OF-PLANE CONDITION. A CAD STUDY WAS PERFORMED ON EO-1 WORST CASE TOLERANCES. USING WORST CASE DRAWING TOLERANCES AND WORST CASE TOOLING TOLERANCES THE DATA INDICATED THAT THE POSITIVE THREAD EXPOSURE ON THE BIPOD CLEVIS CAN BE ACHIEVED IN WORST CASE CONDITION. THE BUILD DATA REVIEW INDICATED THAT NO MARS OR DRS WERE PROCESSED THAT COULD CONTRIBUTE TO THE OUT-OF-SPEC. CONDITION. THE FLOW DOWN TOLERANCE STUDY HAS SHOWN THAT THE ENGINEERING REQUIREMENTS MEETS THE ICD AND THE MANUFACTURING BUILD TOLERANCES MEETS THE ENGINEERING WITH ONE EXCEPTION. THE EXCEPTION BEING THE BUILD TOLERANCES EXCEEDED THE ENGINEERING REQUIREMENTS FOR THE X-X ALIGNMENT

OF EO2 AND EO3 BY 0.002 AND 0.003 RESPECTIVELY
THROUGHOUT THE STUDIES, A VARIABILITY IN LOCATION OF THE BALL FITTINGS
HAS BEEN SHOWN THAT CANNOT BE ATTRIBUTED SOLELY TO THE INTERCHANGE OF
THE HAT SECTIONS. THIS VARIABILITY AND RESULTING EXCURSION OF THE BIPOD
DURING ORBITER MATE IS A RESULT OF CONTRIBUTIONS FROM THE MANY VARIABLES
ENCOMPASSING THE TOTAL ORBITER INTERFACE ALIGNMENT PROCESS
REFERENCE CAPS-075 ET/ORBITER ALIGNMENT PRESENTATION, ATTACHED
IN ORDER TO ENHANCE THE ALIGNMENT PROCESS, IMPROVEMENTS TO THE
MANUFACTURING PROCESS INSTRUCTION, TOOLING AND OPTICS ACCURACY WERE
REQUIRED. THE MANUFACTURING PROCESS INSTRUCTIONS WERE IMPROVED BY
MODIFYING; THE INITIAL SET UP OF THE ALIGNMENT TOOL, METHOD FOR
LOCATION OF BIPOD AT NOMINAL AND BY TIGHTENING THE BUILD TOLERANCES FOR
X-X ALIGNMENT OF EO2 AND EO3. THE TOOLING HAS BEEN IMPROVED BY
MODIFYING THE SCALES ON THE BIPOD FIXTURE, REVERIFYING THE TOOLS TO THE
ICT AND BY IMPLEMENTING ALIGNMENT TOOL T12A7428 IN PLACE OF T12A7021
THE OPTICS ACCURACY HAS BEEN IMPROVED BY REPLACING THE OPTICS SQUARE
WITH DIRECT OPTICAL LINE OF SIGHT. FURTHER ENHANCEMENT TO THE OPTICS
ACCURACY WILL BE ACHIEVED BY REPLACING THE SPHERICAL MOUNTS WITH "V"
MOUNTS BY ET-61. IN ADDITION TO THE ABOVE, MANUFACTURING ENGINEERING
WILL IMPLEMENT STATISTICAL ANALYSIS AND TRACKING CHARTS BY 12-1-90
ET 59 AND 60 WILL BE ALIGNED WITH ALL OF THE ENHANCEMENT IN PLACE
(EXCEPT FOR OPTICS MOUNTS). THESE ETS WILL BE REVERIFIED BY DC&R
S-90-006. THE ACCEPTANCE OF THE REVERIFICATION RESULTS AND VERIFICATION
BY ALIGNMENT CHECK TOOL INDICATES THAT THE ALIGNMENT PROCESS IS UNDER
CONTROL. ALSO THE ALIGNMENT CHECK TOOL USED FOR REVERIFICATION PER DC&R
WILL BE USED UP TO ET-63
ALL PREVIOUSLY BUILT ETS I.E. ET-35, 37, 39 AND 40 THROUGH 60 SHALL BE
REVERIFIED TO ASSURE ET/ORBITER ALIGNMENT MEET THE ENGINEERING
REQUIREMENTS

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12934	--	S-075	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
80911031780	STRUCTURAL ASSY	ET-40

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	3	MPT - MFG-PRC-EQUP	MU - MECH TOLRNCE

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
N/A	N/A	N/A	N/A

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--

MAJOR DESIGN CHANGES

APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A12995	**In-Flight Anomaly Number** --	**Contractor Report Number** E-135	**JSC#** --	**KSC#** --
Problem Title TUMBLE VALVE SWITCH MODULE FAILED TO ARM				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1
HCRIT --	**Sys_Lvl** --	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** SWITCH MODULE	**PART#** 80933003704-239	**SER/LOT#** 1489	**MANUFACTURER** MAF
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** EAN - OUTPUT LOSS	**Cause** UF - UA-FLIGHT
System ELECTRICAL	**Defect** --	**Material** C - EEE	**Work Contact** L. COLON	**Fail Date** 07/02/1990
Received at MSFC 07/09/1990	**Date Isolated** 07/05/1990	**FMEA Reference** 3.5.1.2	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location MAF		**Symptom** EA - FAILS OFF		**Time Cycle** --
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary THE CAUSE OF THE FAILURE COULD NOT BE DETERMINED				
Last MSFC Update 12/02/1991	**CN RSLV SBMT** 07/31/1990	**Defer Date** --	**Add Date** 07/11/1990	**R/C Codes** 0 - EXPL -- --
Assignee				
Design A. JACKMAN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER

Approval				
Design J. MCEUEN	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
PAC Assignee T. HESTER	**PAC Review Complete** TBH	**MSFC Closure Date** 08/16/1990	**Status** C - CLOSED	**F/A Completion** --
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				

Contractor Status Summary

CLOSED EXPLAINED

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

THE SWITCH MODULE FAILED TO "ARM" DURING TESTING IN THE MAF HARNESS
FABRICATION SHOP. TEST PROCEDURE 80933003704-239 CHECKS ELECTRICAL
FUNCTION OF THE MODULE FOLLOWING INSTALLATION OF TWO ELECTRICAL
CONNECTORS ON THE WIRE LEADS OF THE MODULE
CRITICALITY: THE SWITCH MODULE IS CRIT. 1; FMEA ITEM CODE 3.5.1.2;
"FAILS TO ARM"
NOTE: THE SWITCH MODULE IS LIMITED LIFE CONTROLLED

Contractor Investigation/Resolution

THE SWITCH MODULE IS PART OF THE ELECTRICAL SYSTEM THAT CONTROLS THE
FIRING OF THE TUMBLE VALVE ON THE ET. THE MODULE IS CONVERTED TO THE
809 SERIES PART NUMBER BY THE INSTALLATION OF TWO ELECTRICAL CONNECTORS
ONTO THE WIRE LEADS OF THE PD PART. THE FAILURE OCCURRED DURING
IN-PROCESS TESTING THAT VERIFIES PROPER INSTALLATION OF THE CONNECTORS
THE FAILURE INDICATION WAS THE INTERNAL RELAY OF THE MODULE DID NOT
ACTUATE UPON APPLICATION OF POWER TO THE COIL. IN SERVICE ON AN ET
THE FAILURE WOULD HAVE PREVENTED THE "FIRE" SIGNAL FROM REACHING THE
TUMBLE VALVE EXPLOSIVE INITIATOR
TASK I FAILURE INVESTIGATION: A FAILURE ANALYSIS WILL BE PERFORMED ON
THE SWITCH MODULE

RESPONSIBILITY: J. ADAMS/3741 - E. HARTLEY/3740
COMPLETED: 7/26/90
CLOSURE STATEMENT:
DESPITE DETAILED TESTING, IT WAS NOT POSSIBLE TO DETERMINE THE CAUSE OF THE FAILURE. THE ORIGINAL FAILURE HAD OCCURRED UPON INITIAL APPLICATION OF POWER TO THE MODULE FOLLOWING INSTALLATION OF THE ELECTRICAL CONNECTORS ON THE WIRE HARNESS. THE TEST HAD BEEN DISCONTINUED DUE TO THE END OF THE SHIFT AND THE POWER HAD BEEN TURNED OFF. AT THE START OF THE NEXT WORK DAY, POWER WAS APPLIED AND THE RELAY IMMEDIATELY "ARMED" FAILURE ANALYSIS INVOLVED ELECTRICAL TESTS OF CONTINUITY, INSULATION RESISTANCE, AND RELAY OPERATING VOLTAGES AS WELL AS DISASSEMBLY AND EXAMINATION OF THE COMPONENTS. NO DEFECT COULD BE FOUND. REFERENCE: FAILURE ANALYSIS REPORT T-110192
TASK CLOSED
TASK II CORRECTIVE ACTION
NO CORRECTIVE ACTION IS REQUIRED. THIS IS AN ISOLATED CASE. THERE ARE THREE SEPARATE SERIES OF TESTS PERFORMED ON THE SWITCH MODULE AFTER INSTALLATION ON AN ET. AT MAF THE TEST REQUIREMENT IS MMC-ET-TM04K-B, NO. 2.2.11 AS CARRIED OUT BY TEST PROCEDURE 6C108/208-AT. AT KSC TESTS ARE REQUIRED BY BOTH OMRSD FILE IV AND FILE II. THE FILE IV REQUIREMENT IS NO. T75STA.850 AS CARRIED OUT BY OMI NO. T1160, STEPS 05-043 THROUGH 05-058. THE FILE II REQUIREMENT IS NO. S00000.135 AS CARRIED OUT BY OMI T1160, STEPS 15-000 THROUGH 15-035. ALL THREE SETS OF TESTS CHECK OPERATION INCLUDING "FIRING" AN EXPLOSIVE SQUID SIMULATOR
TASK CLOSED
TASK III   CLEARANCE OF EFFECTIVITIES:
ETS 35 AND 37 CLEARED. THE TUMBLE VALVE CIRCUITS HAVE BEEN DEACTIVATED ALL OTHER ETS CLEARED. THIS FAILURE WAS AN ISOLATED CASE. THERE ARE SUFFICIENT TESTS ON THE COMPLETED ETS TO ASSURE PROPER OPERATION
TASK CLOSED
TASK IV   CAPS CLOSURE SUMMARY
THIS IS AN EXPLAINED CLOSURE OF THE CAPS FOR AN INTERMITTENT FAILURE
A TUMBLE VALVE SWITCH MODULE FAILED TO "ARM" DURING AN IN-PROCESS TEST AT MAF. THE FAILURE DID NOT REPEAT. FAILURE ANALYSIS WAS UNSUCCESSFUL IN DETERMINING THE CAUSE OF THE FAILURE. THERE ARE SUFFICIENT TESTS OF THE MODULE AFTER INSTALLATION ON AN ET TO ASSURE OPERATION. THIS IS AN ISOLATED CASE
TASK CLOSED
8/20/90 PAC NOTE: CHIEF ENGINEERS OFFICE FEELS THAT THIS IS AN UNEXPLAINED CLOSURE

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A12995	--	E-135	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
80933003704-239	SWITCH MODULE	1489

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1	UA - UNK-ONE	EA - FAILS OFF

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.5.1.2	2	A	N/A
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**

--	--	--	--
Correlated Part# PD7100082-009	**Correlated Part#** --	**Correlated Part#** --	
Associated LRU# --	**Associated LRU#** --	**Associated LRU#** --	
MAJOR DESIGN CHANGES			
APRV DATE --	**DESCRIPTION OF CHANGES** --		
ASSESSMENT TEXT			

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A13067	**In-Flight Anomaly Number** --	**Contractor Report Number** P-066	**JSC#** --	**KSC#** --
Problem Title L02 FEEDLINE OVERPRESSURIZATION				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1
HCRIT --	**Sys_Lvl** N	**Misc Codes** A **(1)** B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** L02 FEEDLINE	**PART#** 80921011900-010	**SER/LOT#** 0000361	**MANUFACTURER** AIRITE
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** MT - P/T HI OR LO	**Cause** ETW - EI-TEST-WORK
System PROPULSION	**Defect** --	**Material** S - STRUCT	**Work Contact** J. FINCHER	**Fail Date** 07/10/1990
Received at MSFC 07/13/1990	**Date Isolated** 07/12/1990	**FMEA Reference** 2.1.9.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location NTS		**Symptom** MT - P/T HI OR LO		**Time Cycle** --
Effectivity Text DEFERRED, 8/14/90; REDEFERRED, 1/17/91; REDEFERRED, 7/9/91; CLOSED, 8/26/91				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary CAUSE: TEST PERSONNEL ERROR - OPERATOR OPENED INCORRECT VALVE WHICH APPLIED ADDITIONAL WATER PRESSURE TO LINE IN LIEU OF RELIEVING PRESSURE. PRESSURE RELIEF CAPABILITY WAS INADEQUATE				
Last MSFC Update 11/04/1991	**CN RSLV SBMT** 08/22/1991	**Defer Date** --	**Add Date** 07/23/1990	**R/C Codes** 3 - F/TE -- --
Assignee				

Design	Chief Engineer	S & MA	Project	Project MGR
W. PATTERSON	M. PESSIN	R. JACKSON	--	G. LADNER

Approval

Design	Chief Engineer	S & MA	Project	Project MGR
W. PATTERSON	M. PESSIN	R. JACKSON	--	G. LADNER

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
T. HESTER	TH	08/26/1991	C - CLOSED	07/25/1990

Problem Type	SEV	Program Name	REVL	OPRINC
--	--	--	--	--

FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
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RES PERSON L2	Approval Signature L3
--	--

Related Document Type	Related Document ID
--	MARS T-112065

Related Document Title
--

Related Document Type	Related Document ID
--	--

Related Document Title
--

Related Document Type	Related Document ID
--	--

Related Document Title
--

Contractor Status Summary

CLOSED, 08/22/91

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

DURING PROOF LOAD TESTING OF THIS L02 FEEDLINE STRAIGHT SECTION PER PARAGRAPH 7.1.2.6 OF ACCEPTANCE TEST PROCEDURE PTP-068, REVISION L., THE LINE WAS SUBJECTED TO AN INADVERTENT OVERPRESSURIZATION IN EXCESS OF 500 PSIG. THE PROOF PRESSURE REQUIREMENT WAS 281 +/- 5 PSIG
---------- ET
L02 FEEDLINE TEST FAILURE: A FAILURE OCCURRED DURING ATP TESTING OF AN L02 FEEDLINE AT NATIONAL TECHNICAL SYSTEMS (NTS), A SUB TO SARGENT AIRITE. AN APPARENT OPERATOR ERROR OCCURRED DURING PROOF LOAD TESTING THE OPERATOR OPENED THE PRESSURE CONTROL VALVE INSTEAD OF THE WATER DUMP VALVE, CAUSING OVERPRESSURIZATION OF THE 20-FOOT (2219) ALLOY FEEDLINE THE REQUIREMENT WAS TO REDUCE INTERNAL WATER PRESSURE TO 168 + 0, -30 PSIG FROM 281, +/-5 PSIG. THE VISUAL READING OF THE GAUGE SHOWED APPROXIMATELY 500 PSIG. INVESTIGATION IS CONTINUING TO DETERMINE CAUSE/CORRECTIVE ACTION. MMMSS SOURCE SURVEILLANCE OBSERVED THE TEST; GOVERNMENT AGENCY DID NOT COVER THIS OPERATION. APPARENTLY, NO OTHER ITEMS PREVIOUSLY DELIVERED ARE AFFECTED. NEVERTHELESS, TEST RECORDS AND TEST EQUIPMENT ARE BEING INVESTIGATED. -BOB JACKSON, 7/12/90

Contractor Investigation/Resolution

MSFC Response/Concurrence

GENERAL:
DURING PROOF TEST OF A 20' SECTION OF A L02 FEEDLINE AT NTS, AN OPERATOR ERROR CREATED AN OVERPRESSURE CONDITION WHICH YIELDED THE LINE TO THE EXTENT THAT IT IS NOT SERVICEABLE
THE OVER-PRESSURE EVENT OCCURRED AFTER THE WATER PRESSURE OF 281 +/- 5 PSIG HAD BEEN ATTAINED AND HYDRAULIC PRESSURE REACHED THE REQUIRED 3240 +180/-0. AT THIS POINT, THE TWO CONSOLE OPERATORS STARTED TO REDUCE PRESSURE SIMULTANEOUSLY. HYDRAULIC PRESSURE IS REDUCED TO 0 PSIG AND WATER PRESSURE TO 168 +0/-30. DURING THIS SEQUENCE THE HYDROSTATIC TEST CONSOLE OPERATOR OPENED A WATER PRESSURIZATION VALVE INSTEAD OF THE REQUIRED VENT VALVE. THE WATER PRESSURE REACHED MORE THAN 500 PSIG WHICH IS THE MAXIMUM CAPACITY OF THE GAGE. THE RELIEF VALVE IN THE SYSTEM HAD INADEQUATE CAPACITY TO RELIEVE THE WATER INPUT VOLUME
TASK I. PROBLEM/FAILURE INVESTIGATION:
A VENDOR VISIT BY PROPULSION DESIGN AND RELIABILITY ASSURANCE CONFIRMED THAT AN OPERATOR ERROR WAS THE CAUSE FOR THE OVER-PRESSURIZATION CONDITION. ADDITIONALLY, IT WAS DETERMINED THAT AN INADEQUATELY SIZED RELIEF VALVE WAS INSTALLED IN THE HYDROSTATIC SYSTEM
COMPLETED: 7/25/90
TASK II. CORRECTIVE ACTIONS:
A. PROPULSION DESIGN AND RELIABILITY ENGINEERING
- EVALUATE THE LIMITED RISK ANALYSIS AND PUBLISH A MATRIX RELATING TO WHICH ITEMS WERE ACCOMPLISHED AND WHICH ITEMS HAVE NOT BEEN ACCOMPLISHED AT AIRITE
COMPLETED: 8/30/90
CLOSURE STATEMENT
ENGINEERING EVALUATED THE REFERENCED LIMITED RISK ANALYSIS AND PREPARED A MATRIX IDENTIFYING THOSE ITEMS THAT HAVE BEEN COMPLETED AT NTS, AS WELL AS THOSE THAT HAVE YET TO BE ACCOMPLISHED. A "STATEMENT OF WORK" WAS PREPARED SUMMARIZING THOSE ITEMS CONSIDERED TO BE A REQUIREMENT FOR FURTHER TESTING. (REFERENCE IOM 3515-90-030)
B. RELIABILITY ASSURANCE AND PROPULSION DESIGN
- DISPOSITION MARS T112065 FOR SUPPLIER TO RE-EVALUATE TEST EQUIPMENT TO PRECLUDE OVER TEST (INCLUDING ADEQUATE RELIEF CAPABILITY), DAMAGING HARDWARE, AND TO PROVIDE CONFIGURATION CONTROL OF TEST EQUIPMENT
COMPLETED: 7/24/90
CLOSURE STATEMENT
MARS T-112065 WAS DISPOSITIONED TO REQUIRE THE SUPPLIER TO RE-EVALUATE THE TEST EQUIPMENT RELATIVE TO PREVENTING FUTURE OCCURRENCES OF THIS TYPE DISCREPANCY AND PROVIDING CONFIGURATION CONTROL OF THE TEST EQUIPMENT
C. MATERIAL - OBTAIN VENDOR RECOMMENDATIONS IN RESPONSE TO MARS T-112065
COMPLETED: 10/19/90
CLOSURE STATEMENT
VENDOR RECOMMENDATIONS WERE RECEIVED IN RESPONSE TO THE REQUIREMENTS OF TASKS II. B. THE TEST EQUIPMENT SETUP HAS BEEN RECONFIGURED TO PROVIDE ADEQUATE SYSTEM RELIEF CAPABILITY AND PTP-068 HAS BEEN REVISED TO PROVIDE VALIDATION OF SYSTEM RELIEF CAPABILITY AND EQUIPMENT CONFIGURATION CONTROL. (REFERENCE MARS T-112065 AND PTP-068 REV. "N")
D. Q.E. AND TEST OPERATIONS - REVIEW IN-HOUSE PROOF PRESSURE TEST AREAS WITH EMPHASIS ON RELIEF CAPABILITY TO PROTECT PERSONNEL AND HARDWARE
COMPLETED: 8/20/90
CLOSURE STATEMENT
QUALITY ENGINEERING AND TEST OPERATIONS REVIEWED IN-HOUSE PROOF PRESSURE TEST AREAS AND FOUND NO CONCERN REGARDING PROPER RELIEF CAPABILITY

(REFERENCE IOM 3613-90-193)
E. PROCUREMENT QUALITY - IDENTIFY ALL VENDORS WHO PERFORM
PROOF TESTING ON MARTIN PROCURED HARDWARE
COMPLETED: 8/3/90
CLOSURE STATEMENT
PROCUREMENT QUALITY HAS IDENTIFIED 17 VENDORS WHO PERFORM PROOF TESTING ON MARTIN PROCURED HARDWARE. (REFERENCE IOM 3761-90-109)
F. ENGINEERING AND RELIABILITY ENGINEERING - REVIEW THE
TEST PROCEDURES AND TEST EQUIPMENT OF ALL SUPPLIERS THAT PERFORM PROOF TEST TO ASSURE POSITIVE SAFEGUARDS FOR PREVENTING DAMAGE TO FLIGHT HARDWARE (INCLUDING ADEQUATE RELIEF CAPABILITY) AND ADEQUATE PROVISIONS ARE MADE FOR EQUIPMENT CONFIGURATION CONTROL
COMPLETED: 9/21/90
CLOSURE STATEMENT
ENGINEERING'S REVIEW OF THE SUPPLIER ATPS CONCLUDED THAT NO SINGLE ATP CONTAINED ALL THE PROVISIONS NECESSARY FOR SAFEGUARDING HARDWARE (SYSTEM RELIEF CAPABILITY/VERIFICATION) OR PROVIDING CONFIGURATION CONTROL ON THE TEST EQUIPMENT. (REFERENCE: IOM 3515-90-029)
NOTE: DUE TO THE CONCERN RAISED FROM THIS REVIEW, MATERIAL OPERATIONS CONTACTED EACH SUPPLIER AND REQUESTED THAT A REVIEW OF THEIR TEST SETUPS BE PERFORMED TO ENSURE THAT NO POSSIBILITY OF OVERTEST CONDITIONS EXISTED. (REFERENCE AP-1190-JLG-1762) THE RESPONSES RECEIVED WERE INCONCLUSIVE
G. PROCUREMENT QUALITY TO INSPECT EACH SUPPLIER'S PROOF PRESSURE TEST
SETUPS TO ENSURE ADEQUATE SAFEGUARDS EXIST FOR HARDWARE PROTECTION
COMPLETED: 3/22/91
CLOSURE STATEMENT
PROCUREMENT QUALITY REVIEWED EACH OF THE 17 IDENTIFIED SUBCONTRACTORS AND DETERMINED THAT NOT ALL OF THE SUPPLIERS PROVIDE FULL PROTECTION FOR FLIGHT HARDWARE DURING ATP. INFORMATION RELATIVE TO PRESSURE RELIEF CAPABILITY AND TEST SYSTEM CONFIGURATION WAS ROUTED TO ENGINEERING FOR TECHNICAL EVALUATION. REFERENCE IOM 3761-91-042
H. ENGINEERING TO EVALUATE EXISTING SUPPLIER TEST SETUPS AND DETERMINE
ADEQUACY FOR PROTECTING FLIGHT HARDWARE DURING ATP
COMPLETED: 6/24/91
CLOSURE STATEMENT
AFTER AN EVALUATION OF EACH SUBCONTRACTOR'S TEST SYSTEMS RELATIVE TO THERE BEING AN ACTUAL RISK OF DESTROYING OR YIELDING THE HARDWARE UNDER TEST, ONLY THREE SUPPLIERS WERE FOUND TO BE OF SIGNIFICANT CONCERN THESE SUPPLIERS WERE PREECE AND TITEFLEX, MANUFACTURERS OF METALLIC AND NON-METALLIC FLEX HOSES, AND PARKER METAL BELLOWS WHICH MANUFACTURES GH2 AND GO2 VENT LINES. IN ALL THREE CASES THE TEST SYSTEM CONFIGURATIONS WERE SUCH THAT THE ARTICLES UNDER TEST COULD POTENTIALLY SEE FULL SYSTEM (SOURCE) PRESSURE IF EMPLOYEE ERROR OR EQUIPMENT FAILURES OCCURRED. NO PRESSURE RELIEF SAFEGUARDS WERE INCLUDED IN THE TEST SYSTEM DESIGNS. THESE HIGH RISK SUPPLIERS WERE IDENTIFIED THROUGH DATA OBTAINED PER TASKS II. F. AND G. AND BY A FACT FINDING TRIP TO THE WEST COAST
ALL THE OTHER SUBCONTRACTORS WERE DETERMINED TO BE AT NO OR LOW RISK FOR OVERPRESSURIZING HARDWARE TO THE POINT OF DAMAGE. THIS CONCLUSION WAS BASED UPON THE PRESENCE OF RELIEF VALVES WITHIN THE TEST SYSTEM, THE LOWER PRESSURE EXERTED ON THE PART AS COMPARED TO THE QUALIFIED STRUCTURAL STRENGTH OF THE PART, THE PRECISION CONTROL OF THE PRESSURE SOURCE DURING TEST OR IN SOME CASES, THE TYPE OF TEST PERFORMED (VACUUM VS PRESSURE FOR LEAK TESTING, FOR EXAMPLE). (REFERENCE IOM 3741-91-171)
MMMSS NOTE: AT THIS POINT OF THE INVESTIGATION IT WAS DECIDED, WITH MANAGEMENT CONCURRENCE, THAT LIMITING THE ACTUAL RISK TO FLIGHT HARDWARE WAS THE OBJECTIVE AND OTHER SUBJECTIVE CONSIDERATIONS SUCH AS THE SUPPLIERS' TEST EQUIPMENT CONFIGURATION CONTROL SYSTEMS WOULD BE ADDRESSED OUTSIDE OF THE CAPS
I. MATERIAL OPERATIONS TO OBTAIN COST ESTIMATES FOR IMPLEMENTATION OF

PRESSURE RELIEF VALVES (PREECE, TITEFLEX AND PARKER METAL BELLOWS)
COMPLETED: 8/15/91
CLOSURE STATEMENT
MATERIAL OPERATIONS CONTACTED EACH OF THE THREE SUPPLIERS AND REQUESTED FROM THEM COST ESTIMATES FOR INSTALLING PRESSURE RELIEF VALVES IN THEIR TEST SYSTEMS. ENGINEERING PROVIDED A "STATEMENT OF WORK" AS A GUIDELINE OF REQUIREMENTS. THE SUPPLIERS EVENTUALLY RESPONDED WITH ESTIMATES ACCEPTABLE TO MATERIAL. (REFERENCE IOMS 3515-91-045 AND 3515-91-051)
J. MATERIAL TO DIRECT THE EFFORT TO REQUIRE THE AFFECTED SUBCONTRACTORS TO INSTALL PRESSURE RELIEF CAPABILITY ON THEIR ATP PRESSURE TEST SYSTEMS (PREECE, TITEFLEX AND PARKER METAL BELLOWS)
COMPLETED: 8/22/91
CLOSURE STATEMENT
CONTRACTS HAS ISSUED AN OPERATIONS DIRECTIVE AUTHORIZING MATERIAL OPERATIONS TO DIRECT THE SUBCONTRACTORS TO PROVIDE PRESSURE RELIEF CAPABILITY IN THEIR ATP TEST SYSTEMS. (REFERENCE OPERATIONS DIRECTIVE NO. 91/OD/0510)
TASK III. CLEARANCE OF EFFECTIVITIES:
NO CONSTRAINTS TO FLIGHT. PRIOR TO JUNE 1990 ALL ATP PRESSURE TESTS WERE WITNESSED BY AIRITE, MARTIN MARIETTA, NTS AND GOVERNMENT REPRESENTATIVES. HISTORICAL RECORDS INDICATE THAT THE HYDRAULIC PRESSURE, THE APPLIED FORCE, WATER PRESSURE AND THE TIME (IN SECONDS) THAT THE LINE IS SUBJECTED TO THE PROOF PRESSURE ARE ALL MANUALLY RECORDED AND STAMPED OFF IN THE ATP DATA SHEETS. THE CURRENT TEST CONFIGURATION CONSISTS OF A DATA RECORDER AND PRESSURE GAGE MEASUREMENTS WHICH BECOME A PART OF THE DATA PACK
DEFERRAL RATIONALE:
THIS REPORT HAS BEEN DEFERRED FOR THE NEXT THREE SPACE SHUTTLE MISSIONS, THESE THREE MISSIONS ARE CURRENTLY DEFINED AS STS-35, STS-41, & ONE SUBSEQUENT MISSION, PER NSTS 07700, VOLUME XI, PARAGRAPH 3.4.1, ITEM C AND NSTS 08126, PARAGRAPH 3.2, SUB-PARAGRAPH D, ITEM 3 WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT CHECKOUT, OR SPECIAL TEST."
* DEFERRED, 8/16/90
REDEFERRAL RATIONALE:
THIS REPORT HAS BEEN DEFERRED FOR THE NEXT SIX MONTHS PER NSTS 07700, VOLUME XI, PARAGRAPH 3.4.1, ITEM C AND NSTS 08126, PARAGRAPH 3.3.10.1, ITEM D WHICH STATES "THE PROBLEM CONDITION IS CLEARLY SCREENED BY PREFLIGHT CHECKOUT OR SPECIAL TESTS."
* REDEFERRED, 1/17/91
REDEFERRAL RATIONALE SUBMITTED 7/9/91:
THIS REPORT HAS BEEN DEFERRED FOR ONLY ET-47/STS-43 PER NSTS 07700, VOLUME XI, PARAGRAPH 3.4.1, ITEM C AND NSTS 08126, REV. D PARAGRAPH 3.3.10.1, ITEM D, WHICH STATES "THE PROBLEM CONDITION IS CLEARLY SCREENED BY PREFLIGHT CHECKOUT OR SPECIAL TESTS (I.E., FAILURE MODE SHOULD NOT OCCUR FOLLOWING THE TEST)
APPROVED BY ET PROJECT MANAGER, GERALD C. LADNER 7/9/91
* REDEFERRED FOR ET-47/STS-43 ONLY, 7/9/91
TASK IV. CLOSURE SUMMARY
THE CAUSE OF THE AIRITE LO2 FEEDLINE TEST FAILURE OCCURRING DURING ATP TESTING AT NTS WAS DUE TO A COMBINATION OF FACTORS - EMPLOYEE ERROR AND THE PRESENCE OF AN INADEQUATELY SIZED PRESSURE RELIEF VALVE IN THE TEST SYSTEM. THIS TEST SYSTEM HAS SINCE BEEN MODIFIED BY ADDING AND RELOCATING A RELIEF VALVE OF THE REQUIRED SIZE SUFFICIENT TO RELIEVE FULL SYSTEM PRESSURE. THIS MODIFICATION WILL PREVENT FUTURE OCCURRENCES OF THIS TYPE FAILURE
BECAUSE OF THE FAILURE AT AIRITE/NTS, OTHER SUBCONTRACTORS THAT PERFORM PROOF PRESSURE TESTING ON CRITICAL 1 HARDWARE DURING ATP WERE ALSO EVALUATED. RELATIVE TO THE RISK OF DAMAGING HARDWARE DUE TO OVERPRESSURIZATION ONLY THREE SUPPLIERS WERE FOUND TO BE OF SIGNIFICANT CONCERN. THESE SUPPLIERS ARE NOW REQUIRED TO INSTALL ADEQUATE RELIEF CAPABILITY IN THEIR TEST SYSTEMS. THE OTHER SUPPLIERS, IN LIGHT OF

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THEIR SYSTEM DESIGNS OR THE TYHPE OF TESTING PERFORMED, ARE CONSIDERED
TO BE AT NO OR LOW RISK FOR DAMAGING HARDWARE DURING TEST
*  CLOSURE RATIONALE SUBMITTED TO MSFC 08/23/91. *
*  CLOSURE RATIONALE APPROVED BY MSFC 08/26/91.  *
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ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A13067	--	P-066	--	--	--
Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**			
80921011900	L02 FEEDLINE	0000361			
HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**		
--	1	ETW - EI-TEST-WORK	MT - P/T HI OR LO		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
2.1.9.1	1	A	N/A		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
--	--	--	--		
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**		
--	--	--	--		
Correlated Part#	**Correlated Part#**	**Correlated Part#**			
--	--	--			
Associated LRU#	**Associated LRU#**	**Associated LRU#**			
--	--	--			
MAJOR DESIGN CHANGES					
APRV DATE	**DESCRIPTION OF CHANGES**				
--	--				
ASSESSMENT TEXT					

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A13078	**In-Flight Anomaly Number** --	**Contractor Report Number** P-067	**JSC#** --	**KSC#** --
Problem Title G02 PRESSURIZATION LINE LEAK				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1
HCRIT --	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** ET COMPLETE	**PART#** 80901006000-059	**SER/LOT#** ET-58	**MANUFACTURER** MMMSS
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** MV - EXT LEAK	**Cause** ES - EI-SHIP
System PROPULSION	**Defect** DA - ROUGH	**Material** P - SEAL	**Work Contact** J. FINCHER	**Fail Date** 07/17/1990
Received at MSFC 07/20/1990	**Date Isolated** 07/17/1990	**FMEA Reference** 2.2.7.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location MAF		**Symptom** MV - EXT LEAK		**Time Cycle** --
Effectivity Text --				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary INVESTIGATION REVEALED PROBABLE FAIL MODE; SCUFF MARKS ON THE PRIMARY SEAL				
Last MSFC Update 11/04/1991	**CN RSLV SBMT** 08/07/1990	**Defer Date** --	**Add Date** 07/23/1990	**R/C Codes** 0 - EXPL -- --
Assignee				
Design W. PATTERSON	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER

Approval				
Design W. PATTERSON	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
PAC Assignee T. HESTER	**PAC Review Complete** TBH	**MSFC Closure Date** 08/16/1990	**Status** C - CLOSED	**F/A Completion** --
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --
FUNC MOD --	**Software Effectivity** -- -- -- -- --	**Software Fail CD** --	**SUBTYPE** --	**Software Closure CD** --
RES PERSON L2 --	**Approval Signature L3** --			
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				
Related Document Type --	**Related Document ID** --			
Related Document Title --				

Contractor Status Summary

CLOSED 8/7/90

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

THE G02 PRESSURIZATION LINE FLANGE AT FLANGE H, JOINT 9 LEAKS 420 SCCM AT 6 PSIG AND EXCEEDS THE ALLOWABLE LEAKAGE RATE OF 10 SCCM PER TP 8C 102 FA. A DEFECTIVE PRIMARY SEAL WAS CONFIRMED USING A SPECIAL TEST FIXTURE IN CONJUNCTION WITH THE LEAK TEST PRESSURIZATION SYSTEM

Contractor Investigation/Resolution

GENERAL:
DURING THE SEAL CAVITY LEAK TEST OF JOINT 9, FLANGE H, A 420 SCCM LEAK WAS DETECTED. ALLOWABLE LEAKAGE IS 10 SCCM PER TEST PROCEDURE TP8C102FA
TROUBLESHOOTING STEPS WERE IMPLEMENTED WHICH CHECKED THE TORQUE ON THE BOLTS AND INSPECTED THE FLANGE SURFACES FOR FINISH AND WAVINESS. ALL DESIGN REQUIREMENTS WERE MET ON THE BOLT TORQUE AND FLANGE FLATNESS. A SPECIAL FIXTURE TEST WAS MADE ON THE 55L6-1S AND THE PRIMARY SEAL LEAKED. A SMALL SCUFF MARK WAS DETECTED ON THE PRIMARY SEAL SURFACE
TASK I. PROBLEM/FAILURE INVESTIGATION
TROUBLESHOOTING WAS ACCOMPLISHED TO DETERMINE THE SOURCE OF THE LEAK SINCE THIS IS A SEAL CAVITY LEAK TEST, THE BOLTS IN THE FLANGE WERE TORQUED TO THE HIGH END OF THE TOLERANCE TO ADD CLAMPING FORCE TO THE SEAL. AT THE MAXIMUM ALLOWABLE TORQUE VALUE, THE LEAKAGE RATE REDUCED

TO 370 SCCM WHICH IS STILL OUT OF SPECIFICATION. THE FLANGE JOINT WAS DISASSEMBLED AND A PRECISION FLAT BAR (TC-0019-1-18) USED IN CONJUNCTION WITH A LIGHT DETERMINED THAT THE FLANGE FACES WERE FLAT
THE SEAL WAS PLACED IN A SPECIAL TEST FIXTURE TO ISOLATE THE LEAK TO A PRIMARY OR SECONDARY SEAL. WHEN THE SEAL CAVITY WAS PRESSURIZED, THE PRIMARY SEAL INDICATED LEAKAGE. THE SEAL WAS REMOVED FROM THE FIXTURE FOR INSPECTION. NO DEFECT WAS VISUALLY DETECTABLE WITH THE NAKED EYE HOWEVER, WITH MAGNIFICATION (30X), A SLIGHT SCUFF MARK WAS EVIDENT ON THE PRIMARY SEAL
A DIMENSIONAL EVALUATION WAS MADE OF THE PRIMARY SEAL TO ASCERTAIN THAT THE SEAL CONFORMED TO THE REQUIREMENTS. NO OUT-OF-SPECIFICATION MEASUREMENTS WERE REPORTED
A REPLACEMENT SEAL WAS INSTALLED AT FLANGE H, JOINT 9, AND LEAK TESTED THE JOINT MET THE REQUIREMENTS OF TM04
TASK II. CORRECTIVE ACTIONS
THIS IS THE FIRST OCCURRENCE OF THIS TYPE LEAK SINCE JUNE 1986 AND WAS ADDRESSED BY CAPS P-055A. APPROXIMATELY 136 SEALS HAVE BEEN TESTED SINCE THAT TIME WITH NO LEAKAGE OF THE SILVER COATED PRIMARY SEAL
THIS IS CONSIDERED AN ISOLATED CASE OF A SLIGHT IMPERFECTION DUE TO DAMAGE TO THE PRIMARY SEAL. THE MOST PROBABLE CAUSE OF DAMAGE IS HANDLING AT AN UNDETERMINED TIME. THIS ITEM IS COVERED AS PART OF THE CRYOGENIC SEAL HANDLING AND INSTALLATION CERTIFICATION TRAINING COURSE X-535 WHICH REQUIRES ANNUAL RECERTIFICATION. NO OTHER ACTION IS DEEMED NECESSARY AT THIS TIME
TASK III. CLEARANCE OF EFFECTIVITIES
NO CONSTRAINT TO FLIGHT. ALL FLANGE JOINTS ARE REQUIRED TO PASS TM04 TEST REQUIREMENTS. THE PURPOSE OF LEAK TESTING IS TO FILTER OUT SUCH DISCREPANCIES
TASK IV.   CAPS CLOSURE SUMMARY
THIS OCCURRENCE IS CONSIDERED AN ISOLATED CASE OF A DAMAGED SEAL FOR WHICH THERE IS NO EXPLANATION AS TO WHERE THE DAMAGE MAY HAVE OCCURRED SINCE WE HAVE TESTED ET-42 THROUGH ET-58 (136 JOINTS) WITH NO PRIMARY SEAL LEAKS, IT IS CONCLUDED THAT SPECIFIC CORRECTIVE ACTIONS ARE NOT WARRANTED
* 9/10/90 ERRATA: THE FOLLOWING IS INFORMATION RECEIVED FROM VENDOR POST MSFC CLOSURE
* REVISED TO INCLUDE ADDITIONAL FAILURE INVESTIGATION INFORMATION, MODIFY CAUSE CONCLUSIONS AND CORRECTIVE ACTIONS, AND CLOSES CAPS
CAUSE:
AN AREA ON PRIMARY SEAL LIP BELOW SEAL HEIGHT REQUIREMENTS. SEAL HAD BEEN REWORKED ON THIS AREA BY VENDOR FOR DAMAGES OF UNKNOWN ORIGIN
TASK I. PROBLEM/FAILURE INVESTIGATION
TROUBLE SHOOTING WAS ACCOMPLISHED TO DETERMINE THE SOURCE OF THE LEAK SINCE THIS IS A SEAL CAVITY LEAK TEST, THE BOLTS IN THE FLANGE WERE TORQUED TO THE HIGH END OF THE TOLERANCE TO ADD CLAMPING FORCE TO THE SEAL. AT THE MAXIMUM ALLOWABLE TORQUE VALUE, THE LEAKAGE RATE REDUCED TO 370 SCCM WHICH WAS STILL OUT OF SPECIFICATION. THE FLANGE JOINT WAS DISASSEMBLED AND A PRECISION FLAT BAR (TC-0019-1-18) USED IN CONJUNCTION WITH A LIGHT DETERMINED THAT THE FLANGE FACES WERE FLAT
THE SEAL WAS PLACED IN A SPECIAL TEST FIXTURE TO ISOLATE THE LEAK TO A PRIMARY OR SECONDARY SEAL. WHEN THE SEAL CAVITY WAS PRESSURIZED, THE PRIMARY SEAL INDICATED LEAKAGE. THE LOCATION OF THE LEAK WAS NOTED ON THE SEAL AND THE SEAL WAS REMOVED FROM THE FIXTURE FOR INSPECTION
A DIMENSIONAL INSPECTION OF THE PRIMARY SEAL FOUND A LOW AREA ON ONE SIDE OF THE SEAL AT THE LEAK LOCATION ALONG APPROXIMATELY A 0.5 INCH ARC OF THE SEAL LIP; THE LOWEST POINT BEING .0064 INCHES. THE PRIMARY SEAL HEIGHT REQUIREMENT RELATIVE TO THE BASIC SEAL SURFACE IS .011 +.000/-.002 INCHES. ONCE KNOW, REWORK ACTIVITY AS EVIDENCED BY BLENDING MARKS (MINOR DISRUPTIONS OF SURFACE FINISH) COULD BE VISUALLY DETECTED AT THE DEFECT AREA
A REVIEW OF VENDER DATA REVEALED THAT THIS SEAL WAS "RETURNED TO VENDER" IN APRIL 1989 FOR AN "INDENTATION" ON THE PRIMARY SEAL LIP AT THE

LOCATION OF THE PRESENT DEFECT. MMMSS RECEIVED THIS SEAL AFTER REWORK
IN MARCH 1990
NOTE: THIS IS ONLY THE SECOND INCIDENT EVER OF A PRIMARY SEAL LEAK
OCCURRING ON A 55L6-1S SEAL DURING LEAK TEST AND THE ONLY ONE TO HAVE
OCCURRED SINCE 1986 - THE CORRECTIVE ACTION OF THE 1986 FAILURE HAVING
BEEN ADDRESSED BY CAPS P-055. APPROXIMATELY 136 SEALS HAVE BEEN TESTED
SINCE THAT TIME WITH NO LEAKAGE OF THE SILVER COATED PRIMARY SEAL
THIS IS CONSIDERED AN ISOLATED CASE OF AN INADEQUATE INSPECTION OF A
REWORKED SEAL AND NOT A GENERIC CONCERN. NO FURTHER ACTION IS DEEMED
NECESSARY AT THIS TIME
A REPLACEMENT SEAL WAS INSTALLED AT FLANGE H, JOINT 9, AND LEAK TESTED
THE JOINT MET THE REQUIREMENTS OF TM04
TASK II. CORRECTIVE ACTIONS
PROCUREMENT QUALITY (3761) TO ISSUE A SCAD TO THE SUPPLIER FOR
CORRECTIVE ACTIONS TO PRECLUDE THIS TYPE OF DEFECT FROM PASSING THROUGH
THEIR INSPECTION PROCESS UNDETECTED
   RESPONSIBILITY: M. TAYLOR (3761) - C. COYAN (3760)
   COMPLETED   8/29/90
CLOSURE STATEMENT:
PROCUREMENT QUALITY HAS ISSUED A SUPPLIER CORRECTIVE ACTION DIRECTIVE
(SCAD-90-228) TO THE LANGLEY CORPORATION TO ACQUIRE POSITIVE CORRECTIVE
ACTION TO PRECLUDE THIS TYPE DEFECT. IN ADDITION, PROCUREMENT QUALITY
PERSONNEL HAVE BEEN DIRECTED TO INPSECT WITH A FINE POINT DIAL INDICATOR
ANY SEAL EXHIBITING UNUSUAL SURFACE CONDITIONS DETECTED DURING FINAL
VISUAL INSPECTIONS. (REFERENCE I.O.M. 3761-90-126)
TASK III. CLEARANCE OF EFFECTIVITIES
NO CONSTRAINT TO FLIGHT. ALL FLANGE JOINTS ARE REQUIRED TO PASS TM04
TEST REQUIREMENTS. THE PURPOSE OF LEAK TESTING IS TO FILTER OUT SUCH
DISCREPANCIES
TASK IV. CAPS CLOSURE SUMMARY
THIS OCCURRENCE IS CONSIDERED AN ISOLATED CASE OF AN INADEQUATE VENDOR
INSPECTION OF A REWORKED SEAL AND NOT A GENERIC CONCERN. PROCUREMENT
QUALITY IS ACQUIRING POSITIVE CORRECTIVE ACTION FROM THE VENDOR TO
PRECLUDE RECURRENCES AND IN ADDITION, HAS DIRECTED THEIR PERSONNEL TO
PERFORM ADDITIONAL INSPECTIONS ON SEALS WITH ANY UNUSUAL SURFACE
CONDITIONS DETECTED DURING FINAL INSPECTIONS
****
*PLEASE INDICATE BY INITIALING THAT YOU HAVE REVIEWED THIS REVISED
REPORT

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A13078	--	P-067	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
55L6-1S	NAFLEX SEAL	N/A

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1	MNW - MFG-ISP-WORK	MV - EXT LEAK

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
2.2.7.1	1	A	1
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	Correlated Part#	Correlated Part#
--	--	--
Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--
MAJOR DESIGN CHANGES		
APRV DATE	**DESCRIPTION OF CHANGES**	
--	--	
ASSESSMENT TEXT		

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A13148	**In-Flight Anomaly Number** --	**Contractor Report Number** E-137	**JSC#** --	**KSC#** --
Problem Title ULLAGE PRESSURE TRANSDUCER FAILED ATP WITH HIGH READING				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT --	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** ULLAGE PRESS. XDUCER	**PART#** PD7400098-089	**SER/LOT#** 1618	**MANUFACTURER** GULTON
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** UC	**Fail Mode** EG - SIG HI OR LO	**Cause** MA - MFG-ASY
System ELECTRICAL	**Defect** EM - ELADJ	**Material** B - CIRCBD	**Work Contact** J. ADAMS	**Fail Date** 08/24/1990
Received at MSFC 08/29/1990	**Date Isolated** --	**FMEA Reference** 3.4.1.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location GULTON		**Symptom** EG - SIG HI OR LO		**Time Cycle** --
Effectivity Text DEFERRED FOR STS-35, STS-41 AND STS-38 (8/29/90). ALL ETS CLEARED (10/05/90)				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date --	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary VENDOR ERROR - NORMAL PRODUCTION FALLOUT				
Last MSFC Update 02/10/1995	**CN RSLV SBMT** 09/12/1990	**Defer Date** --	**Add Date** 08/29/1990	**R/C Codes** 0 - EXPL -- --
Assignee				
Design R. MOYE	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER

Approval				
Design R. MOYE	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
PAC Assignee T. HESTER	**PAC Review Complete** TBH	**MSFC Closure Date** 10/05/1990	**Status** C - CLOSED	**F/A Completion** --
Problem Type --	**SEV** --	**Program Name** --	**REVL** --	**OPRINC** --

FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
--	-- -- -- -- --	--	--	--

RES PERSON L2	Approval Signature L3
--	--

Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
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Related Document Title
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Related Document Type	Related Document ID
--	--

Related Document Title
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Contractor Status Summary

CLOSED, 09/12/90

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

AN ULLAGE PRESSURE TRANSDUCER FAILED VENDOR ACCEPTANCE TESTING DURING
THE 0 DEGREES F, CALIBRATION TEST SEGMENT. THE TRANSDUCER EXHIBITED
AN OUTPUT OF 2.551 VOLTS AT 32 PSI INPUT PRESSURE. AN OUTPUT VOLTAGE
OF 2.550 VOLTS IS THE MAXIMUM ALLOWED
NOTE: THE TRANSDUCERS ARE LIMITED LIFE CONTROLLED

Contractor Investigation/Resolution

GENERAL:
THE TRANSDUCER FAILED A TEST OF THE ACCURACY OF THE TRANSDUCER OUTPUT
VOLTAGE VERSUS APPLIED PRESSURE AT AN OPERATING TEMPERATURE OF 0 DEGREES
F. THE TEST IS SPECIFIED IN GULTON DOCUMENT ACCEPTANCE TEST PLAN
3031-13803, PARAGRAPH 5.5
TASK I. FAILURE INVESTIGATION
THE FAILURE WAS DOCUMENTED ON MARS T-34411. FAILURE ANALYSIS IS NOT
WARRANTED BY THIS TYPE OF DEFECT. THE TRANSDUCER FAILED TO MEET THE
ALLOWABLE ERROR BAND BY ONE (1) MILLIVOLT. THIS IS EQUIVALENT TO .02%
OF FULL SCALE. THE ALLOWABLE ERROR IS +/- 1% OF FULL SCALE. THE
RESOLUTION OF THE TRANSDUCER IS LIMITED TO TEN (10) MILLIVOLTS AS THERE
ARE APPROXIMATELY FIVE HUNDRED (500) TURNS IN THE WIREWOUND
POTENTIOMETER WITHIN THE UNIT. THE OUT-OF-TOLERANCE CONDITION IS,

THEREFORE, INSIGNIFICANT AND WOULD BE UNDETECTABLE IN SERVICE ON AN ET
THE ONE (1) MILLIVOLT ERROR IS EQUIVALENT TO A POSITIONAL ERROR OF THE
TRANSDUCER INTERNAL ANEROID PRESSURE CAPSULES OF TEN MICROINCHES. NO
ANALYSIS IS POSSIBLE
TASK CLOSED
TASK II. CORRECTIVE ACTION
NO CORRECTIVE ACTION IS REQUIRED
TASK CLOSED
TASK III. CLEARANCE OF EFFECTIVITIES
ALL ETS CLEARED. ALL INSTALLED TRANSDUCERS HAVE SUCCESSFULLY PASSED THE
VENDOR ACCEPTANCE TEST
TASK CLOSED
TASK IV. CAPS CLOSURE SUMMARY
THE TRANSDUCER FAILED A CALIBRATION TEST SEGMENT OF THE VENDOR
ACCEPTANCE TEST. THE ERROR WAS QUITE SMALL. SUCH FAILURES ARE
CONSIDERED TO BE NORMAL PRODUCTION FALLOUT. NO CORRECTIVE ACTION IS
REQUIRED
TASK CLOSED
8/29/90 - THIS REPORT HAS BEEN DEFERRED FOR THE NEXT THREE SPACE SHUTTLE
MISSIONS, THESE THREE MISSIONS ARE CURRENTLY DEFINED AS STS-35, STS-41,
AND STS-38, PER NSTS 07700, VOLUME XI, PARAGRAPH 3.4.1, ITEM C AND NSTS
08126, PARAGRAPH 3.2, SUB-PARAGRAPH D, ITEM 3 WHICH STATES "THE PROBLEM
CONDITION DOES NOT EXIST IN THE FLIGHT HARDWARE AND IS CLEARLY SCREENED
BY ACCEPTANCE TEST, PREFLIGHT CHECKOUT, OR SPECIAL TEST."
****
8/29/90 - DEFERRAL RATIONALE APPROVED BY ET PROJECT MANAGER,
GERALD LADNER
****
9/17/90 - CLOSURE RATIONALE RECEIVED FROM CONTRACTOR

MSFC Response/Concurrence

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A13148	--	E-137	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
PD7400098-089	LH2 ULL PRES TRNSDCR	1618

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	MA - MFG-ASY	EG - SIG HI OR LO

Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.4.1.1	1	AB	N/A
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
--	--	--

Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--

MAJOR DESIGN CHANGES

APRV DATE	**DESCRIPTION OF CHANGES**
--	--

ASSESSMENT TEXT

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # A13149	**In-Flight Anomaly Number** --	**Contractor Report Number** E-138	**JSC#** --	**KSC#** --
Problem Title L02 LEVEL SENSOR FAILED ISOLATION RESISTANCE TEST				
EICN# --	**ELEMENT** ET	**Contractor** MMMSS	**FSCM#** --	**FCRIT** 1R
HCRIT --	**Sys_Lvl** N	**Misc Codes** A B C D E F G H I J K L M N O		
HARDWARE EIM	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE LRU	**NOMENCLATURE** --	**PART#** --	**SER/LOT#** --	**MANUFACTURER** --
HARDWARE NCA	**NOMENCLATURE** L02 LEVEL SENSOR	**PART#** 74L4-1	**SER/LOT#** 1477	**MANUFACTURER** SIMMONDS
Test/Operation A - ATP	**Prevailing Condtion** F - FUNCTIONAL	**F / U** F	**Fail Mode** EL - SHORT	**Cause** U - UNKNOWN
System ELECTRICAL	**Defect** --	**Material** B - CIRCBD	**Work Contact** J. ADAMS	**Fail Date** 08/27/1990
Received at MSFC 08/29/1990	**Date Isolated** 08/28/1990	**FMEA Reference** 3.6.1.1	**IFA: Mission Phase** --	**Mission Elapsed Time** --
Location SIMMONDS		**Symptom** EL - SHORT		**Time Cycle** --
Effectivity Text DEFERRED, 8/29/90; CLOSED 12/11/90				
Vehicle Effectivity Codes				
Vehicle 1 --	**Vehicle 2** --	**Vehicle 3** --	**Vehicle 4** --	**Vehicle 5** --
Mission Effectivity Codes				
Mssn 1 --	**Mssn 2** --	**Mssn 3** --	**Mssn 4** --	**Mssn 5** --
Estimated Completion Dates				
MSFC Approved Defer Until Date 09/28/1990	**Contractor Req Defer Until Date** --	**LVL 3 Close** --	**Remark / Action** --	
Investigation / Resolution Summary ROOT CAUSE COULD NOT BE DETERMINED. NO MECHANICAL DEFECT WAS FOUND IN THE SENSOR COMPONENTS				
Last MSFC Update 12/12/1990	**CN RSLV SBMT** 11/09/1990	**Defer Date** --	**Add Date** 08/29/1990	**R/C Codes** 0 - EXPL -- --
Assignee				
Design R. MOYE	**Chief Engineer** M. PESSIN	**S & MA** R. JACKSON	**Project** --	**Project MGR** G. LADNER
Approval				

Design	Chief Engineer	S & MA	Project	Project MGR
R. MOYE	M. PESSIN	R. JACKSON	--	G. LADNER

PAC Assignee	PAC Review Complete	MSFC Closure Date	Status	F/A Completion
T. HESTER	TH	12/11/1990	C - CLOSED	11/02/1990

Problem Type	SEV	Program Name	REVL	OPRINC
--	--	--	--	--

FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
--	-- -- -- -- --	--	--	--

RES PERSON L2	Approval Signature L3
--	--

Related Document Type	Related Document ID
--	MARS T-53580

Related Document Title
--

Related Document Type	Related Document ID
--	--

Related Document Title
--

Related Document Type	Related Document ID
--	--

Related Document Title
--

Contractor Status Summary

CLOSURE RATIONALE SUBMITTED, 11/09/90

Reliability/Quality Assurance Concerns, Recommendations:

Problem Description

A LIQUID LEVEL SENSOR FAILED TO SATISFY THE ISOLATION RESISTANCE REQUIREMENTS STIPULATED IN THE VENDOR ACCEPTANCE PLAN. SUBSEQUENT TO THERMAL SHOCK TREATMENT, THE TRANSDUCER FAILED TO MEET AN ISOLATION RESISTANCE OF 500 MEGOHMS AT 500 VDC. A RESISTANCE OF 400 MEGOHMS WAS OBTAINED. PREVIOUS CAPS: E-071, E-073, E-075, E-081, E-100, E-116PF AND E-126 ARE RELATED

Contractor Investigation/Resolution

MSFC Response/Concurrence

GENERAL:
THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE TESTING PER ATP 946 REV M PARAGRAPH 6.5.2. THE COMPONENT HAD BEEN SUBJECTED TO SIX CYCLES OF LIQUID NITROGEN TEMPERATURES AT HALF HOUR INTERVALS BAKED AT 130 DEGREES FAHRENHEIT AND COOLED PRIOR TO THE ISOLATION RESISTANCE TEST. AN ISOLATION RESISTANCE OF 400 MEGOHMS WAS NOTED AFTER IMPRESSING 500 V.D.C. MISSING THE 500 MEGOHM REQUIREMENT
TASK I. FAILURE INVESTIGATION
THE FAILURE WAS DOCUMENTED ON MARS T-53580. A FAILURE ANALYSIS WILL BE PERFORMED, A PLAN FOR WHICH IS IN PROCESS BY THE VENDOR. SCHEDULING FOR THE TASK DEPENDS UPON FINAL APPROVAL OF THE F/A PLAN

ECD: 9/28/90
TASK OPEN
TASK II. CORRECTIVE ACTION
PENDING THE RESULTS OF THE FAILURE INVESTIGATION
TASK OPEN
TASK III. CLEARANCE OF EFFECTIVITIES
ALL EFFECTIVITIES ARE CLEARED SINCE INSTALLED TRANSDUCERS HAVE SUCCESSFULLY PASSED THE ACCEPTANCE TEST PROCEDURE
TASK CLOSED
TASK IV. CAPS CLOSURE SUMMARY
PENDING THE COMPLETION OF THE OTHER TASKS
TASK OPEN
8/29/90 - THIS REPORT HAS BEEN DEFERRED FOR THE NEXT THREE SPACE SHUTTLE MISSIONS, THESE THREE MISSIONS ARE CURRENTLY DEFINED AS STS-35, STS-41, & STS-38, PER NSTS 07700, VOLUME XI, PARAGRAPH 3.4.1, ITEM C AND NSTS 08126, PARAGRAPH 3.2, SUB-PARAGRAPH D, ITEM 3 WHICH STATES "THE PROBLEM CONDITION DOES NOT EXIST IN THE FLIGHT HARDWARE AND IS CLEARLY SCREENED BY ACCEPTANCE TEST, PREFLIGHT CHECKOUT, OR SPECIAL TEST."
****
8/29/90 - DEFERRAL RATIONALE APPROVED BY ET PROJECT MANAGER, G. LADNER
****
9/17/90 - REV. A RECEIVED FROM CONTRACTOR, SUPERCEDES PREVIOUS REPORT
11/13/90 - REV. B RECEIVED FROM CONTRACTOR, SUPERCEDES PREVIOUS REPORT
PROBLEM DESCRIPTION:
A LIQUID LEVEL SENSOR FAILED TO SATISFY THE INSULATION RESISTANCE REQUIREMENTS STIPULATED IN THE VENDOR ACCEPTANCE PLAN. THE TRANSDUCER FAILED TO MEET AN INSULATION RESISTANCE OF 500 MEGOHMS AT 500 VDC. A RESISTANCE OF 400 MEGOHMS WAS OBTAINED
CRITICALITY: THE 74L4-1 SENSOR IS VIRTUALLY IDENTICAL TO THE 74L4-2 SENSOR WHICH IS CRIT. 1R; FMEA ITEM CODE 3.6.1.1; "FAILS WITH FALSE WET SIGNAL."
REVISION B - CLOSED ALL TASKS
GENERAL:
THE FAILURE OCCURRED DURING VENDOR ACCEPTANCE TESTING PER ATP 946, REV M, PARAGRAPH 6.5. AN INSULATION RESISTANCE OF 400 MEGOHMS WAS OBTAINED DURING THE 500 VDC TEST. THE REQUIREMENT IS A MINIMUM OF 500 MEGOHMS
THE LEVEL SENSOR UTILIZES THE DECREASE IN THE ELECTRICAL RESISTANCE OF A METAL WHEN COOLED TO DETECT THE PRESENCE OF A CRYOGENIC FLUID. THE SENSOR USES A GOLD FLASHED PLATINUM WIRE, .0005 INCH IN DIAMETER, AS THE SENSING ELEMENT. THE LEVEL SENSOR SIGNAL CONDITIONER, WHICH IS MOUNTED IN THE ORBITER, PROVIDES A CONSTANT CURRENT TO THE SENSOR ELEMENT WHICH CAUSES IT TO RISE IN TEMPERATURE. THE TEMPERATURE AND RESISTANCE OF THE ELEMENT DECREASE RADICALLY WHEN IMMERSED IN A CRYOGENIC LIQUID. THE SIGNAL CONDITIONER DETECTS THE DECREASE IN RESISTANCE AND CONVERTS IT TO A "WET" OUTPUT SIGNAL
THE SENSOR HAS AN ALUMINUM CASE WHICH IS PRODUCED BY INVESTMENT CASTING VERY FEW OF THE INTERNAL SURFACES, AND NONE OF THE EXTERNAL SURFACES, ARE FINISH MACHINED FOR DIMENSIONAL CONTROL. THE INTERNAL SURFACES OF THE CASE AND THE COVER ARE PAINTED WITH A SPRAYED-ON, BAKED, TEFLON PAINT. THE PAINT PREVENTS WETTING OF THE CASE (RETENTION OF CRYOGENIC FLUIDS) AND ALSO PROVIDES SOME ELECTRICAL INSULATION BETWEEN THE CASE AND THE SENSOR ELEMENT. THE ELEMENT IS SUPPORTED BY A CERAMIC SUBSTRATE. THE SUBSTRATE HAS FIRED-ON GOLD CIRCUIT PATHS WHICH PROVIDE A MEANS TO TERMINATE THE ELEMENT WIRE BY WELDING. THE SENSOR OUTPUT WIRES ARE ATTACHED TO THE SUBSTRATE BY STEEL TERMINALS HELD IN PLACE WITH RIVETS AND SPRING WASHERS
TASK I. FAILURE INVESTIGATION
THE FAILURE WAS DOCUMENTED ON MARS T-53580. A FAILURE ANALYSIS WILL BE PERFORMED
COMPLETE: 11/02/90
CLOSURE STATEMENT

THE ELECTRICAL FAILURE WOULD NOT REPEAT DURING FAILURE ANALYSIS
DISASSEMBLY AND EXAMINATION OF THE INTERNAL COMPONENTS FOUND NO
MECHANICAL FLAWS OR DEFECTS. THE ROOT CAUSE OF THE FAILURE COULD NOT BE
DETERMINED. REFERENCE FAR T53580
TASK CLOSED
TASK II. CORRECTIVE ACTION
NO CORRECTIVE ACTION IS REQUIRED. NO DEFECT COULD BE FOUND IN THE
SENSOR COMPONENTS. THE SENSOR DESIGN DOES NOT PROVIDE POSITIVE
MECHANICAL SEPARATION BETWEEN THE GOLD CIRCUIT PATH ON THE INTERNAL
SENSING ELEMENT AND THE TEFLON COATED METAL CASE. THE RESULTANT
SUSCEPTIBILITY OF THE SENSOR TO ISOLATION RESISTANCE PROBLEMS DUE TO THE
CLOSE PROXIMITY OF THE GOLD CIRCUIT PATH TO THE TEFLON COATED CASE UNDER
VARYING HUMIDITY CONDITIONS WAS RECOGNIZED IN CAPS E-100 AND RESOLVED
THROUGH CHANGE SUMMARY BO1806. THE CHANGE SUMMARY ENHANCED THE
SUPPLIER'S TEST REQUIREMENTS TO ENSURE THE OCCASIONAL SENSOR SUSCEPTIBLE
TO HUMIDITY INDUCED I.R. FAILURE WOULD BE DETECTED AT THE SUPPLIER AND
THEREBY PREVENTED FROM BECOMING AN I.R. FAILURE DURING CHECK OUT AT MAF
THERE WAS NO CONCERN FOR FLIGHT DUE TO THE DRY ENVIRONMENT IN WHICH THE
SENSORS OPERATE AND THEIR LOW OPERATING VOLTAGE. CONSIDERING THAT THE
SUPPLIER HAS PRODUCED 80 SENSORS SINCE THE LAST FAILURE HIS PROCESSES
ARE STILL IN GOOD CONTROL AND NO CORRECTIVE ACTION IS REQUIRED
TASK CLOSED
TASK III. CLEARANCE OF EFFECTIVITIES
ALL ETS CLEARED. ALL INSTALLED TRANSDUCERS HAVE SUCCESSFULLY PASSED THE
VENDOR ACCEPTANCE TEST PROCEDURE AS WELL AS ACCEPTANCE TESTS ON
COMPLETED ETS
TASK CLOSED
TASK IV. CAPS CLOSURE SUMMARY
THE SENSOR FAILED THE INSULATION RESISTANCE TEST REQUIREMENT OF THE
VENDOR ACCEPTANCE TEST. THE VENDOR ACCEPTANCE TEST PROVIDES AN ADEQUATE
SCREEN FOR FAILURES OF THIS TYPE. NO CORRECTIVE ACTION IS REQUIRED
TASK CLOSED

ASSESSMENT ADDENDUM REPORT

MSFC Report#	**IFA#**	**Contractor RPT#**	**JSC#**	**KSC#**	**EICN#**
A13149	--	E-138	--	--	--

Asmnt Part#	**Asmnt Part Name**	**Asmnt Serial/Lot#**
74L4-1	L02 LEVEL SENSOR	1477

HCRIT CD	**FCRIT CD**	**CAUSE CD**	**FAIL MODE**
--	1R	UU - UNK-UND	EL - SHORT
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
3.6.1.1	1	A	1
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--
Asmnt FMEA	**Asmnt FM**	**FMEA CSE**	**FMEA SCSE**
--	--	--	--

Correlated Part#	**Correlated Part#**	**Correlated Part#**
74L4-2	--	--

Associated LRU#	**Associated LRU#**	**Associated LRU#**
--	--	--

MAJOR DESIGN CHANGES	
APRV DATE	**DESCRIPTION OF CHANGES**
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ASSESSMENT TEXT