

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE**  
**NUMBER: 02-1E-072 -X**

**SUBSYSTEM NAME: LANDING DECELERATION - WHEEL, BRAKE & TIRE**  
**REVISION: 1 08/03/97**

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**PART DATA**

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	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	: NOSE LANDING GEAR	MC521-0050
SRU	: NLG WHEEL TPDMS B. F. GOODRICH	49-293

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
NOSE LANDING GEAR WHEEL TPDMS

**REFERENCE DESIGNATORS:**

**QUANTITY OF LIKE ITEMS: 2**  
ONE PER WHEEL

**FUNCTION:**  
DUAL PRESSURE SENSOR USED TO MONITOR NLG TIRE PRESSURE DECAY RATES ON THE PAD AND ORBIT (REPLACES THE OVERINFLATION PLUG).

**FAILURE MODES EFFECTS ANALYSIS FMEA - CIL FAILURE MODE**

**NUMBER: 02-1E-072-01**

**REVISION#: 1 08/03/97**

**SUBSYSTEM NAME: LANDING DECELERATION - WHEEL, BRAKE & TIRE**

**LRU: NOSE LANDING GEAR**

**CRITICALITY OF THIS**

**ITEM NAME: NLG WHEEL OVERINFLATION PLUG**

**FAILURE MODE: 1/1**

**FAILURE MODE:**

**RUPTURED TIRE PRESSURE DECAY MONITORING SYSTEM (TPDMS) - RESULTING IN LANDING WITH A FLAT TIRE.**

**MISSION PHASE: DO DE-ORBIT**

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

**CAUSE:**

**DEFECTIVE MATERIAL, CORROSION**

**CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO**

<b>REDUNDANCY SCREEN</b>	A) N/A
	B) N/A
	C) N/A

**PASS/FAIL RATIONALE:**

A)

B)

C)

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:**

**LOSS OF ROLLING AND LOAD CARRYING CAPABILITY ON THE AFFECTED TIRE/WHEEL ASSEMBLY AND FAILURE OF ADJACENT TIRE/WHEEL ASSEMBLY DURING ROLLOUT. PROBABLE FAILURE OF NLG STRUT OR IT'S ATTACHMENTS.**

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**(B) INTERFACING SUBSYSTEM(S):**  
SAME AS A.

**(C) MISSION:**  
PROBABLE LOSS OF MISSION/CREW/VEHICLE DUE TO NLG COLLAPSE (IF BOTH  
TIRE/WHEEL ASSEMBLIES FAIL).

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

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**  
DESIGNED TO WITHSTAND EXPECTED CORROSIVE ENVIRONMENTS (SALT FOG,  
FUNGUS, SAND AND DUST). MATERIALS AND PROCESSES ARE IN ACCORDANCE WITH  
MC999-0096 MINIMUM FACTOR OF SAFETY IS 1.4.

**(B) TEST:**  
QUALIFICATION TESTS: THE TPDMS IS CERTIFIED BY SIMILARITY TO THE  
OVERINFLATION PLUG AS PART OF THE WHEEL ASSEMBLY. APPLICABLE WHEEL  
TESTING INCLUDES WHEEL PRESSURE TEST, THERMAL TEST, DIFFUSION TEST AND  
EXPOSURE TO SALT FOG ENVIRONMENT.

**PRESSURE TEST:** THE WHEEL/TIRE ASSEMBLY WAS PRESSURIZED TO 520 PLUS OR  
MINUS 60 PSIG AT AMBIENT TEMPERATURE. PRESSURE WAS RELIEVED WITHIN THE  
SPECIFIED LIMITS.

**THERMAL TEST:** THE WHEEL/TIRE ASSEMBLY WAS PRESSURIZED TO 300 PLUS OR  
MINUS 20 PSIG AND HEATED TO 283 DEGREES F. PLUS OR MINUS 10 DEGREES F.  
PRESSURE WAS RELIEVED WITHIN THE SPECIFIED LIMITS.  
**DIFFUSION TEST:** THE WHEEL/TIRE ASSEMBLY WAS INFLATED TO 300 PSIG AND  
THERMALLY CYCLED FROM AMBIENT TEMPERATURE TO 100 DEGREES F., TO MINUS 60  
DEGREES F. AND BACK TO AMBIENT OVER A 18 HOUR PERIOD. THERE WAS A ONE  
HOUR MINIMUM DWELL AT EACH TEMPERATURE EXTREME. TEN CYCLES WERE  
PERFORMED.

**ACCEPTANCE/TURNAROUND (FOR ALL WHEEL/TIRE ASSEMBLIES) CONSISTS OF;**  
(1) INFLATION PRESSURE VERIFICATION.

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- (2) STORAGE AT ROOM TEMPERATURE FOR 2 DAYS (TO ALLOW FOR TIRE STRETCH).
- (3) REINFLATE AND PERFORM 5 DAY COLD TEMP FOLLOWED BY 7 DAY AMBIENT TEMP LEAK TESTS.
- (4) STORAGE AT ROOM TEMP FOR 2 WEEKS.
- (5) INFLATION PRESSURE VERIFICATION (USING SAME GAUGE USED IN (1)).

**GROUND TURNAROUND TEST**  
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCY WITH OMRSD.

**NLG WHEEL/TIRE CERT:**  
VERIFIES NLG WHEEL/TIRE ASSEMBLY HAS BEEN BUILT UP AND TESTED PER THE VO70-510502 DRAWING, ML0308-0028 NOSE LANDING GEAR RIGGING SPECIFICATION AND ML0308-0143 NLG WHEEL/TIRE INSTALLATION AND INSPECTION SPECIFICATION.

FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND.

**(C) INSPECTION:**  
**RECEIVING INSPECTION**  
RECEIVING INSPECTION VERIFIES 6061-T6 ALUM., 304 CRES, 316L CRES, 200 NICKEL, ACRYLIC-BASED ADHESIVE AND PARKER O-RING. B. F. GOODRICH RECEIVING INSPECTION CHECKS DIMENSIONS AND CERTIFICATIONS.

**CONTAMINATION CONTROL**  
CLEANLINESS AND CORROSION PROTECTION REQUIREMENTS VERIFIED BY INSPECTION.

**ASSEMBLY/INSTALLATION**  
INSPECTION VERIFIES DIMENSIONS, AND FABRICATION AND ASSEMBLY PROCEDURES.

**CRITICAL PROCESSES**  
ANODIZATION PER MIL-A-8625A TYPE II VERIFIED BY INSPECTION.

**NONDESTRUCTIVE EVALUATION**  
CONTINUITY OF ANODIZATION VERIFIED BY B. F. GOODRICH INSPECTION.

**TESTING**  
B. F. GOODRICH AND THE PLUG SUPPLIER EACH CONDUCT BURST TESTS (EACH LOT OF PLUGS; HALF OF SAMPLES AT LOWER TEMPERATURE LIMIT AND HALF AT HIGHER TEMPERATURE LIMIT) FOR RUPTURE WITHIN REQUIRED RANGE, VERIFIED BY INSPECTION. B. F. GOODRICH AND THE PLUG SUPPLIER EACH CONDUCT 100% PRESSURE LEAK TESTS (HALF OF PLUGS AT EACH OF THE TEMPERATURE LIMITS), VERIFIED BY INSPECTION.

**PACKAGING/HANDLING**  
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

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(D) FAILURE HISTORY:  
NONE.

(E) OPERATIONAL USE:  
FAILURE DETECTED ON ORBIT - AN ABORT DECISION IS REQUIRED TO SELECT A  
SUITABLE LANDING PROFILE/SITE. CREW WILL USE AERO RUDDER AND DIFFERENTIAL  
BRAKING IN AN ATTEMPT TO MAINTAIN DIRECTIONAL CONTROL.

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- APPROVALS -

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EDITORIALLY APPROVED	: BNA	: <u>J. Kumura 8/3/97</u>
EDITORIALLY APPROVED	: JSC	: <u>D. Kearney 7-16-97</u>
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 96-CIL-011_02-1A