

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-1E-110 -X**

**SUBSYSTEM NAME: LANDING DECELERATION - WHEEL, BRAKE & TIRE
REVISION: 0 03/07/88**

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: CHASSIS ASSY NOSE LANDING GEAR	MC194-0007
	: NOSE LANDING GEAR TIRES B. F. GOODRICH	006-836

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
NOSE LANDING GEAR TIRES**

REFERENCE DESIGNATORS:

**QUANTITY OF LIKE ITEMS: 2
TWO**

**FUNCTION:
PROVIDE SUPPORT AND ROLLING CAPABILITY.**

FAILURE MODES EFFECTS ANALYSIS FMEA - CIL FAILURE MODE

NUMBER: 02-1E-110-01

REVISION#: 1 08/03/97

SUBSYSTEM NAME: LANDING DECELERATION - WHEEL, BRAKE & TIRE

LRU: NOSE LANDING GEAR TIRES

CRITICALITY OF THIS

ITEM NAME: NOSE LANDING GEAR TIRES

FAILURE MODE: 1/1

FAILURE MODE:

RUPTURE - TIRE RUPTURES AT NLG TOUCHDOWN.

MISSION PHASE: DO DE-ORBIT

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

CAUSE:
EXCESSIVE LOADING, CUTS, POOR FABRICATON.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN	A) N/A
	B) N/A
	C) N/A

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

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:

-DISPOSITION RATIONALE-

(A) DESIGN:
TIRE DESIGNED AND MANUFACTURED TO MEET MIL-T-5041F AND MIL-A-8862.
OPERATING PRESSURE 300 PSI, MINIMUM BURST PRESSURE 960 PSI, TIRE WHEEL
ASSEMBLY HAS OVER PRESSURE SAFETY DIAPHRAGM SET TO RELIEVE AT 520 +/- 60
PSI. DESIGNED TO WITHSTAND A RADIAL LOAD OF 23,700 LBS WITHOUT DAMAGE DUE
TO DEFLECTION.

(B) TEST:
QUALIFICATION TESTS INCLUDE - DEFLECTION TEST, DYNAMIC TESTS, CORNERING
TESTS, ON-ORBIT LEAK TEST AND BURST TESTS.

DEFLECTION TEST: TIRE SATISFIED THE DEFLECTION REQUIREMENTS WHEN A RADIAL
LOAD OF 23,700 LBS WAS APPLIED PER MIL-T-5041F.

DYNAMIC TESTS: THE TIRE WAS PRESSURIZED TO 300 PSIG AND SUBJECTED TO A
LOAD - TIME - SPEED PROFILE WHILE STABLE AT 200 DEGREES F, MINUS 30 DEGREES
F, AND 70 DEGREES F. A TOTAL OF SIX RUNS WERE PERFORMED . THE TIRE
WITHSTOOD THE TESTS WITHOUT FAILURE AND SATISFIED THE SPECIFIED
REQUIREMENTS.

ON-ORBIT LEAK TEST:
THE TIRE WAS CYCLED FROM AMBIENT TO 100 DEGREES F TO MINUS 60 DEGREES F
AND BACK TO AMBIENT OVER A PERIOD OF 18 HOURS. TEN CYCLES WERE PERFORMED
- TIRE PRESSURE LOSS WAS BELOW THE 5% MAXIMUM REQUIREMENT.

BURST TEST:

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THE TIRE WAS PRESSURIZED TO 960 PSIG (3.2 TIMES THE NORMAL PRESSURE) AND HELD AT THIS PRESSURE FOR THE REQUIRED 10 SECONDS WITHOUT FAILURE.

ACCEPTANCE TESTS:

SAMPLES AND LOT, COMPOUND BATCH, WIRE TEST, BEAD INSULATION STOCK AND FABRIC ADHESION TESTING CONDUCTED TO MEET THE REQUIREMENTS OF MIL-T-5041F.

GROUND TURNAROUND TEST:

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD. THE OMRSD DATA PROVIDED BELOW IS NO LONGER BEING KEPT UP-TO-DATE. IF THERE IS ANY DISCREPANCY BETWEEN THE GROUND TESTING DATA PROVIDED BELOW AND THE OMRSD, THE OMRSD IS THE MORE ACCURATE SOURCE OF THE DATA.

NLG WHEEL AND TIRE INSPECTION:

NLG WHEELS AND TIRES ARE INSPECTED FOR DAMAGE PER THE REQUIREMENTS OF THE ML0308-0028 SPECIFICATION. NLG TIRE RE-USE CRITERIA IS ALSO VERIFIED.

FLIGHT TIRE PRESSURE CHECKS:

THIS CHECK VERIFIES THE TIRE PRESSURE FOR EACH FLIGHT TIRE/WHEEL ASSEMBLY, PER THE REQUIREMENTS OF THE ML0308-0143 SPECIFICATION, IF MORE THAN 30 DAYS HAVE ELAPSED SINCE THE LAST FLIGHT TIRE PRESSURE CHECK.

FLIGHT TIRE DECAY RATE:

THIS TEST DETERMINES THE DECAY RATE FOR EACH FLIGHT TIRE/WHEEL ASSEMBLY PER THE REQUIREMENTS OF THE ML0308-0143 SPECIFICATION.

TIRE PRESSURES FOR FLIGHT:

TIRE PRESSURES ARE VERIFIED FIVE DAYS BEFORE FINAL RETRACTION FOR FLIGHT. NLG TIRES FLIGHT PRESSURE REQUIREMENT IS 345 PSIG TO 350 PSIG.

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. THIS INCLUDES TORQUING THE INFLATION VALVE CAP TO A VALUE OF 8 TO 10 IN-LBS.

FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND.

(C) INSPECTION:

RECEIVING INSPECTION
RAW MATERIALS ARE VERIFIED ACCEPTABLE BY IN-HOUSE LABORATORY AT RECEIVING INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS AND CORROSION PROTECTION REQUIREMENTS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

BASIC COMPONENTS AND ASSEMBLIES ARE INSPECTED AND VERIFIED THROUGHOUT ASSEMBLY. GREEN TIRE VERIFIED CORRECT BY WEIGHT. CURED TIRE 100% VISUALLY INSPECTED.

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CRITICAL PROCESSES
CURING VERIFIED BY INSPECTION. CURING MOLD GAUGES AND INDICATORS ARE PERIODICALLY VERIFIED CORRECT.

TESTING
ATP IS VERIFIED BY INSPECTION.

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

(D) FAILURE HISTORY:
NONE

(E) OPERATIONAL USE:
TIRE/WHEEL FAILURE AT (OR SHORTLY AFTER) NLG TOUCHDOWN - CREW WILL USE AERO RUDDER AND DIFFERENTIAL BRAKING IN AN ATTEMPT TO MAINTAIN DIRECTIONAL CONTROL.

- APPROVALS -

EDITORIALLY APPROVED	: BNA	: <u>J. Kimura 8/3/97</u>
EDITORIALLY APPROVED	: JSC	: <u>[Signature]</u>
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 96-CIL-011_02-1E