

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING/DECELERATION-LGC FMEA NO 02-1A -082 -1 REV:09/19/88

ASSEMBLY : NOSE LANDING GEAR (NLG)			CRIT. FUNC:	1
P/N RI : V070-510601			CRIT. HDW:	1
P/N VENDOR:				
QUANTITY : 1	VEHICLE	102	103	104
: ONE	EFFECTIVITY:	X	X	X
:	PHASE(S):	PL LO	OO	DO X LS

PREPARED BY:		REDUNDANCY SCREEN:	A-	B-	C-
DES R. A. GORDON	APPROVED BY:				
REL J. S. MULLEN	DES <i>R. Gordon 9/21/88</i>	APPROVED BY (NASA):			
QE W. J. SMITH	REL <i>[Signature]</i>	SSM <i>[Signature]</i>			
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ITEM:  
NOSE LANDING GEAR UPLOCK HOOK ASSEMBLY.

FUNCTION:  
UPLOCK HOOK ASSEMBLY ENGAGES THE UPLOCK ROLLER AND LOCKS THE NLG IN THE UP POSITION WHEN IT GOES OVERCENTER.

FAILURE MODE:  
STRUCTURAL FAILURE

CAUSE(S):  
OVERLOAD, DEFECTIVE PART/MATERIAL.

EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) GEAR UPLOCK RELEASED - POSSIBLE GEAR DEPLOYMENT.

(B) POSSIBLE GEAR DOOR OPEN AND/OR GEAR DEPLOYMENT. PROBABLE LOSS OF DOOR ASSEMBLY INTEGRITY TO SEAL COMPARTMENT FROM HIGH TEMPERATURE FLOWS

(C,D) POSSIBLE LOSS OF MISSION/CREW/VEHICLE, DUE TO RE-ENTRY OVERHEATING

DISPOSITION & RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN

DESIGNED TO A MINIMUM FACTOR OF SAFETY OF 1.4 WITH STANDARD MATERIAL ALLOWABLES. MATERIALS USED ARE NOT SUSCEPTIBLE TO CORROSION DUE TO EXPOSURE TO EXPECTED ORBITER ENVIRONMENT.

(B) TEST

QUALIFICATION TESTS: UPLOCK HOOK ASSEMBLY VERIFIED FOR STRUCTURAL INTEGRITY AND PROOF LOADS, WITH FUNCTIONAL/KINEMATIC/ENDURANCE CYCLING IN SIMULATOR. DOOR LOADS (AERO) VERIFIED IN SIMULATOR FOR WORST CASE CONDITION. CERTIFICATION INCLUDES A FATIGUE LOAD TEST SPECTRUM REPRESENTING THE EQUIVALENT LOADING FOR THE LIFE OF THE NOSE GEAR. A SCATTER FACTOR OF 4.0 WAS APPLIED SUCH THAT THE SPECTRUM WAS REPEATED FOR

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A TOTAL OF FOUR TIMES.

THE UPLOCK HOOK ASSEMBLY WAS ALSO CERTIFIED AS AN INTEGRAL PART OF THE NLG/MLG MECHANISM INSTALLATION (LANDING GEAR OPERATION) - 32 CYCLES OF THE LANDING GEAR DURING ALT, 15 DEVELOPMENT CYCLES AND 353 QUALIFICATION LIFE CYCLES FOR A TOTAL OF 400 CYCLES. (THE LANDING GEAR WAS CYCLED UP AND LOCKED TO DOWN AND LOCKED EACH TIME). THESE TESTS WERE PERFORMED WITH MAXIMUM DOOR OPENING AIR LOADS ON THE DOOR WITH THE APPROPRIATE AIR LOADS ON THE SHOCK STRUT ASSEMBLY. THE GEAR ACTUATOR LOAD WAS LIMITED TO 25,000 LBS. WHILE RESTRICTING THE DOWN MOTION OF THE GEAR. THE MAXIMUM TENSION LOAD IN THE RETRACT LINK WAS 10,100 LBS AND MAXIMUM COMPRESSIVE LOAD WAS 8,300 LBS.

**ENVIRONMENT:**

HIGH TEMP TESTS; 3 CYCLES AT 140 DEG F

COLD TEMP TESTS; 3 CYCLES AT -35 DEG F TO -40 DEG F

ACCEPTANCE TESTS: ACCEPTANCE INCLUDES VERIFICATION THAT CERTIFIED MATERIALS AND PROCESSES WERE USED. ACCEPTANCE TESTS ALSO VERIFY DIMENSIONS, WEIGHTS AND FINISHES.

OMRSD: NLG ZONAL DETAIL VISUAL INSPECTION; A DETAILED VISUAL INSPECTION OF THE NLG WHEELWELL IS PERFORMED TO VERIFY THE CONDITION AND SECURITY OF THE UPLOCK HOOK.

FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND.

**(C) INSPECTION**

**RECEIVING INSPECTION**

MATERIAL AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION.

**CONTAMINATION CONTROL**

CORROSION PROTECTION PER MA0608-301 IS VERIFIED BY INSPECTION.

**ASSEMBLY/INSTALLATION**

ALL PARTS AND COMPONENTS MADE TO DRAWING REQUIREMENTS ARE VERIFIED BY INSPECTION ON MANUFACTURING ORDERS. APPLICATION OF FILM LUBE PRIOR TO ASSEMBLY AND ASSEMBLY COMPLETE ARE VERIFIED BY INSPECTION. BUSHING INSTALLATION VERIFIED BY INSPECTION. INSTALLATION OF THREADED FASTENERS PER MA0101-301 VERIFIED BY INSPECTION BUSHING INSTALLATION.

**CRITICAL PROCESSES**

HEAT TREATMENT AND CHROME PLATING ARE VERIFIED BY INSPECTION.

**NONDESTRUCTIVE EVALUATION**

PENETRANT INSPECTION OF DETAIL PARTS IS VERIFIED BY INSPECTION.

**TESTING**

ATP IS VERIFIED BY INSPECTION.

**PACKAGING/HANDLING**

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

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(D) FAILURE HISTORY  
NONE.

(E) OPERATIONAL USE  
NONE.

02-1A-70