

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING/DECELERATION-LGC FMEA NO 02-1A -021 -1 REV:09/19/8

ASSEMBLY : MAIN LANDING GEAR (MLG)	CRIT. FUNC:
P/N RI : V070-510301	CRIT. HDW:
P/N VENDOR:	VEHICLE 102 103 104
QUANTITY : 2	EFFECTIVITY: X X X
: LEFT HAND	PHASE(S): PL LO X OO DO X LS
: RIGHT HAND	

PREPARED BY:	REDUNDANCY SCREEN:	A-	B-	C-
DES R. A. GORDON	APPROVED BY:	APPROVED BY (NASA)		
REL J. S. MULLEN	DES <i>R. Gordon 9/21/88</i>	SSM <i>Carl S. Campbell</i>		
QE W. J. SMITH	REL <i>J. S. Mullen</i>	REL <i>W. J. Smith 9/19/88</i>		
	QE <i>W. J. Smith</i>	QE <i>W. J. Smith</i>		

ITEM:  
MAIN LANDING GEAR UPLOCK HOOK ASSEMBLY

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

FAILURE MODE:  
STRUCTURAL FAILURE

CAUSE(S):  
FATIGUE, STRESS CORROSION, OVERLOAD

EFFECT(S) ON:  
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) GEAR UPLOCK RELEASED - POSSIBLE GEAR DEPLOYMENT.

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

(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.

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(B) TEST

QUALIFICATION TESTS: UPLOCK HOOK ASSEMBLY VERIFIED FOR STRUCTURAL INTEGRITY AND PROOF LOADS, WITH FUNCTIONAL/KINEMATIC/ENDURANCE CYCLING SIMULATOR. DOOR LOADS (AERO) VERIFIED IN SIMULATOR FOR WORSE CASE CONDITION.

THE UPLOCK HOOK ASSEMBLY WAS ALSO CERTIFIED AS AN INTEGRAL PART OF THE MLG MECHANISM INSTALLATION (LANDING GEAR OPERATION) - 32 CYCLES OF THE LANDING GEAR DURING ALT, 15 DEVELOPMENT CYCLES AND 353 QUALIFICATION LI CYCLES FOR A TOTAL OF 400 CYCLES. (THE LANDING GEAR WAS CYCLED FROM 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 AI LOADS ON THE SHOCK STRUT ASSEMBLY. THE GEAR ACTUATOR LOAD WAS LIMITED 66,800 LBS. WHILE RESTRICTING THE DOWN MOTION OF THE GEAR. THE MAXIMUM TENSION LOAD IN THE RETRACT LINK WAS 22,700 LBS AND MAXIMUM COMPRESSION LOAD WAS 15,500 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: LH/RH WHEELWELL ZONAL INTERNAL DETAIL INSPECTION; A VISUAL DETAILED INSPECTION OF THE MLG WHEELWELLS IS PERFORMED TO VERIFY THE CONDITION AND SECURITY OF THE UPLOCK HOOK.

FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CORROSION PROTECTION CLEANLINESS REQUIREMENTS AND IN-PROCESS CORROSION CONTROL VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

CRITICAL DIMENSION AND MACHINING SPECIFICATION ARE VERIFIED BY INSPECTION. INSPECTION VERIFIES ASSEMBLY OF COMPONENTS ON SEQUENTIALLY PLANNED MANUFACTURING ORDERS TO MAINTAIN DRAWING CONFIGURATION. INSPECTION VERIFIES ADJUSTMENT COMPLETE PER APPLICABLE SPECIFICATIONS AND DRAWING TOLERANCES. BEARING AND BUSHING INSTALLATION PER DRAWING REQUIREMENTS, AND INSTALLATION OF THREADED FASTENERS PER DRAWING AND SPECIFICATION REQUIREMENTS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

HEAT-TREAT FOR MAXIMUM CRYOGENIC PROPERTIES PER APPLICABLE HEAT TREAT SPECIFICATION.

02-1A-40

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NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION IS VERIFIED BY INSPECTION.

TESTING

ACCEPTANCE TESTING IS VERIFIED BY INSPECTION.

PACKAGING/HANDLING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NONE.

(E) OPERATIONAL USE

NONE.