

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING/DECELERATION-LGC FMEA NO 02-1A -077 -1 REV:09/19/88

ASSEMBLY : NOSE LANDING GEAR (NLG)	CRIT. FUNC:	1
P/N RI : MC621-0012	CRIT. HDW:	1
P/N VENDOR: 1170800 MENASCO	VEHICLE	102 103 104
QUANTITY : 2	EFFECTIVITY:	X X X
: ONE UPPER	PHASE(S):	PL LO OO DO LS X
: ONE LOWER		

PREPARED BY:	REDUNDANCY SCREEN:	A-	B-	C-
DES R. A. GORDON	APPROVED BY:	APPROVED BY (NASA):		
REL J. S. MULLEN	DES <i>R.A. Gordon 7/21/88</i>	SSM <i>Charles Campbell</i>		
QE W. J. SMITH	REL <i>W. J. Smith</i>	REL <i>W. J. Smith 7/21/88</i>		
	QE <i>W. J. Smith</i>	QE <i>W. J. Smith</i>		

ITEM:
NOSE LANDING GEAR DRAG BRACE

FUNCTION:
UPPER AND LOWER MOUNTED DRAG BRACE ASSY WHICH INCORPORATES THE GEAR DOWNLOCK AND IS THE MAIN SUPPORT BRACE FOR THE NOSE LANDING GEAR AND FUSELAGE ATTACH POINT.

FAILURE MODE:
STRUCTURAL FAILURE

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

EFFECT(S) ON:

- (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
- (A) LOSS OF LOAD CARRYING CAPABILITY.
- (B) DAMAGE TO VEHICLE STRUCTURE.
- (C,D) PROBABLE LOSS OF MISSION/CREW/VEHICLE IF NOSE GEAR COLLAPSES.

DISPOSITION & RATIONALE:

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

(A) DESIGN
DESIGNED TO FATIGUE LOAD SPECTRUM FOR LANDING, TAXI, AND GROUND HANDLING CONDITIONS. DESIGNED TO LANDING IMPACT LOADS (SPIN-UP AND SPRING BACK INCLUDING CROSSWIND DRIFT CONDITIONS) USING A MINIMUM FACTOR OF SAFETY 1.0 TO YIELD STRENGTH OF MATERIAL IN ACCORDANCE WITH ESTABLISHED CRITERIA FOR COMMERCIAL AND MILITARY AIRCRAFT. DESIGNED TO A MINIMUM FACTOR OF SAFETY OF 1.4 FOR TAXI AND GROUND HANDLING LOADS FOR 32K AND 65K PAYLOAD CONFIGURATIONS. MATERIAL PROCESSES-BARE PARTS ARE NOT EXPOSED TO CORROSIVE ACID ENVIRONMENT IN PLATING SHOP MORE THAN 30 DAYS AND PARTS ARE SHOT PEENED AFTER MACHINE OPERATIONS TO PREVENT STRESS CORROSION ON 300 M MATERIALS.

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(B) TEST

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QUALIFICATION TESTS:

CERTIFICATION INCLUDES ULTIMATE STRENGTH TEST, SHOCK STRUT DROP TESTS, STATIC LOADS TEST, DYNAMIC TESTS AND 400 DEPLOYMENT CYCLES. THE DRAG BRACE ASSEMBLY WAS 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 LIT CYCLES FOR A TOTAL OF 400 CYCLES. (THE LANDING GEAR WAS CYCLED FROM UP AND LOCKED TO DOWN AND LOCKED EACH TIME).

ENVIRONMENT:

HIGH TEMP TESTS; 3 CYCLES AT 140 DEG F
COLD TEMP TESTS; 3 CYCLES AT -35 DEG F TO -40 DEG F

THE DRAG BRACE ASSEMBLY WAS ALSO TESTED AS AN INTEGRAL PART OF THE NLG SHOCK STRUT ASSEMBLY DURING DROP TESTS - TEN DROP TESTS WERE PERFORMED TO SATISFY THE DESIGN REQUIREMENTS FOR THE SHOCK STRUT ASSEMBLY. MAXIMUM VERTICAL LOAD WAS 109,400 LBS. MAXIMUM SINK SPEED WAS 13.6 FPS.

FATIGUE LOAD SPECTRUM TESTS WERE CONDUCTED FOR LANDING, LANDING ROLLOUT, BRAKING AND TURNING LOAD CONDITIONS - THE STRUT WAS SUBJECTED TO CYCLIC APPLICATION OF VERTICAL, FORE/AFT AND SIDE LOADS IN EACH CONDITION.

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; THE UPPER AND LOWER DRAG BRACE ASSEMBLIES ARE INSPECTED FOR CONDITION AND SECURITY.

FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND.

(C) INSPECTION

RECEIVING INSPECTION

INSPECTION VERIFIES ALL RAW MATERIALS TO COMPLY WITH MATERIAL REQUIREMENTS THROUGH PERIODIC COUPON ANALYSIS.

CONTAMINATION CONTROL

CLEANLINESS LEVEL IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

ALL MATERIAL PROCESSES VERIFIED BY MIP'S PRIOR TO NEXT MANUFACTURING OPERATIONS. TORQUE VALUES SPECIFIED ON DRAWINGS VERIFIED AT THE TIME OF ACCOMPLISHMENT. INSTALLATION OF COTTER PIN AND LOCK WIRE VERIFIED AT ASSEMBLY LEVEL.

CRITICAL PROCESSES

INSPECTION VERIFIES HEAT TREATMENT AND SHOT PEENING PER MIL-S-13165.

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NONDESTRUCTIVE EVALUATION

MATERIAL SURFACE DEFECTS ARE VERIFIED BY MAGNETIC PARTICLE, NITAL ETCH AND FLUORESCENT PENETRANT INSPECTION.

TESTING

ATP IS VERIFIED BY INSPECTION.

PACKAGING/HANDLING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NONE.

(E) OPERATIONAL USE

NONE.