

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING/DECELERATION-LGC FMEA NO 02-1A -008 -1 REV:09/19/8

ASSEMBLY : MAIN LANDING GEAR (MLG)
P/N RI : MC62I-0011
P/N VENDOR: 1170350 MENASCO
QUANTITY : 2
 : LEFT HAND
 : RIGHT HAND

VEHICLE	102	103	104	
EFFECTIVITY:	X	X	X	
PHASE(S):	PL	LO	OO	DO LS X

CRIT. FUNC: 1R
CRIT. HDW: 2

PREPARED BY: DES R. A. GORDON
REL J. S. MULLEN
QE W. J. SMITH

REDUNDANCY SCREEN: A-PASS B-FAIL C-PAS:
APPROVED BY: DES *R.A. Gordon 7/2/88*
REL *J.S. Mullen*
QE *W.J. Smith*

APPROVED BY (NASA):
SSM *Carolyn C. Campbell*
REL *John J. ... 9/21*
QE *...*

ITEM:
MAIN LANDING GEAR OVERCENTER DOWNLOCK BUNGEE

FUNCTION:
THE MAIN LANDING GEAR DOWNLOCK ASSEMBLY IS PROVIDED WITH A SPRING BUNGEE WITH SUFFICIENT FORCE TO HOLD THE DOWN LOCK MECHANISM (LOCKING TOGGLE) SECURELY LOCKED DURING LANDING AND GROUND OPERATIONS.

FAILURE MODE:
STRUCTURAL FAILURE

CAUSE(S):
OVERLOAD, FAILURE OF INTERNAL PART, FATIGUE.

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

(A) LOSS OF BUNGEE FUNCTION

(B) POSSIBLE LOSS OF OVERCENTER LOCK FUNCTION.

(C,D) POSSIBLE LOSS OF MISSION/CREW/VEHICLE WITH TWO FAILURES, LOSS OF BUNGEE AND LOSS OF EXTEND ACTUATOR.

FAILS SCREEN "B" BECAUSE THERE IS NO INDICATION OF THIS FAILURE PRIOR TO LANDING.

DISPOSITION & RATIONALE:

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

(A) DESIGN

DESIGNED TO A MINIMUM OF 1.4 FACTOR OF SAFETY WITH STANDARD MATERIAL ALLOWABLES. SPRING BUNGEE IS DESIGNED TO FUNCTION WITH A SINGLE SPRING FRACTURE.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING/DECELERATION-LGC FMEA NO 02-1A -008 -1 REV:09/19/88

(B) TEST

QUALIFICATION TESTS: CERTIFICATION INCLUDES ULTIMATE STRENGTH TEST, SHOCK STRUT DROP TESTS, STATIC LOADS TEST, DYNAMIC TESTS AND 400 DEPLOYMENT CYCLES.

THE DOWNLOCK BUNGEE ASSEMBLY WAS CERTIFIED AS AN INTEGRAL PART OF THE 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 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 DOWNLOCK BUNGEE WAS ALSO TESTED AS AN INTEGRAL PART OF THE MLG SHOCK STRUT ASSEMBLY DURING DROP TESTS - ELEVEN DROP TESTS WERE PERFORMED TO SATISFY THE DESIGN REQUIREMENTS FOR THE SHOCK STRUT ASSEMBLY.

MAXIMUM VERTICAL LOAD WAS 179,817 LBS.

MAXIMUM SINK SPEED WAS 11.69 FPS.

FATIGUE LOAD SPECTRUM TESTS WERE CONDUCTED FOR LANDING, LANDING ROLLOUT, BRAKING AND TURNING LOAD CONDITIONS - THE SHOCK STRUT ASSEMBLY 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: MLG ZONAL DETAIL VISUAL INSPECTION; THE OVERCENTER DOWNLOCK BUNGEE AND ITS ATTACHMENTS 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

ALL CLEANLINESS LEVELS VERIFIED BY INSPECTION. CORROSION CONTROL REQUIREMENTS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

ALL MATERIAL PROCESSES VERIFIED BY MIP'S PRIOR TO NEXT MANUFACTURING OPERATIONS. TORQUE VALUES SPECIFIED ON DRAWINGS ARE VERIFIED AT THE TIME OF ACCOMPLISHMENT. INSTALLATION OF COTTER PIN AND LOCK WIRE PER MS33540 VERIFIED.

CRITICAL PROCESSES

SOLID FILM LUBE VERIFIED BY INSPECTION. INSPECTION VERIFIES SPRING IS HEAT TREATED, SHOT PEENED AND PASSIVATED. INSPECTION VERIFIES ALUMINUM DETAIL PARTS ARE ANODIZED.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING/DECELERATION-LGC FMEA NO 02-1A -008 -1 REV:09/19/88

NONDESTRUCTIVE EVALUATION

INSPECTION VERIFIES FLUORESCENT PENETRANT INSPECTION OF 17-7CH 900
SPRING AND OF ALUMINUM DETAIL PARTS.

TESTING

TORSIONAL OVERLOADS ARE VERIFIED BY DYNAMIC AND STATIC TESTS PERFORMED
DURING QUALIFICATION TESTING.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NONE.

(E) OPERATIONAL USE

NONE.