

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING/DECELERATION-LGC FMEA NO 02-1A -034 -1 REV:09/19/88

ASSEMBLY : MAIN LANDING GEAR (MLG)
 P/N RI : V070-510101
 P/N VENDOR:
 QUANTITY : 2
 : ONE L/H ASSY
 : ONE R/H ASSY

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

REDUNDANCY SCREEN: A- B- C-
 APPROVED BY: APPROVED BY (NASA):
 DES R. A. GORDON DES *R. Gordon 9/21/88* SSM *Charles Carroll*
 REL J. S. MULLEN REL *J. S. Mullen* REL *Eric Gray & John 9/27*
 QE W. J. SMITH QE *W. J. Smith*

ITEM:
 MAIN LANDING GEAR BOOSTER BUNGEE - DOOR EXTENSION ASSIST

FUNCTION:
 SPRING BUNGEE SYSTEM WHICH CONSISTS OF A COMPRESSION SPRING UNIT MOUNTED SO THAT THE ACTION WOULD BE RELEASED BY DOOR LATCH OPENING, EXERTING FORCE INTO ROLLERS WHICH CONTACT A STRIKER PLATE AND AUGMENTS GEAR DOOR OPENING OPERATION.

FAILURE MODE:
 BUNGEE FAILS TO RELEASE

CAUSE(S):
 STRUCTURAL FAILURE OF A PIECE PART WITHIN THE SPRING BUNGEE RELEASE LINKAGE.

EFFECT(S) ON:
 (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
 (A,B) GEAR FAILS TO EXTEND IN TIME, DUE TO ADVERSE PRESSURE DIFFERENTIAL ACROSS THE DOORS.
 (C,D) PROBABLE LOSS OF MISSION/CREW/VEHICLE IF MAIN GEAR FAILS TO EXTEND

DISPOSITION & RATIONALE:
 (A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN
 ALL PARTS WITHIN THE SPRING BUNGEE RELEASE LINKAGE ARE DESIGNED TO OPERATE FOR 400 CYCLES WITHOUT STRUCTURAL DEGRADATION. DESIGNED TO A SAFETY FACTOR OF 1.4 WITH STANDARD MATERIAL ALLOWABLES. RECENT DESIGN IMPROVEMENT VERIFIES CORRECT INSTALLATION/RIGGING WITH DESIGNATED TOOL.

(B) TEST
 THE BOOSTER BUNGEE WAS CERTIFIED AS AN INTEGRAL PART OF THE MLG MECHANIS INSTALLATION (LANDING GEAR OPERATION) - 32 CYCLES OF THE LANDING GEAR DURING ALT, 15 DEVELOPMENT CYCLES AND 353 QUALIFICATION LIFE CYCLES FOR TOTAL OF 400 CYCLES. (THE LANDING GEAR WAS CYCLED FROM UP AND LOCKED TO DOWN AND LOCKED EACH TIME).

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ENVIRONMENT:

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

ALL OTHER ENVIRONMENT TESTS WERE DONE BY SIMILARITY TO EXISTING HARDWARE

OMRSD: NLG/MLG DOOR BOOSTER BUNGEE INSPECTION, LH/RH WHEELWELL ZONAL
INTERNAL DETAIL INSPECTION: THESE INSPECTIONS VERIFY THE CONDITION AND
SECURITY OF THE BUNGEE AND IT'S ATTACHMENTS.

NLG/MLG RETRACT FOR FLIGHT: VERIFIES THAT THE BOOSTER BUNGEE IS COCKED
AND GROUND LOCK PINS AND BUNGEE TRIGGER PINS ARE REMOVED. FUNCTION IS
VERIFIED BY USING GSE TOOL.

FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL AND CORROSION PROTECTION PER MA0608-301 ARE
VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

INSTALLATION OF ALL BOOSTER ASSEMBLIES PER DRAWING VERIFIED BY INSPECT
ON MANUFACTURING ORDER BOOK. TOOLING FIXTURE USE FOR ASSISTING
MANUFACTURING IN ASSEMBLY VERIFIED. INSTALLATION OF COMPONENTS PLANNED
SEQUENTIALLY IN ORDER TO MAINTAIN ASSEMBLY CONFIGURATION, SATISFY SPEC
TORQUE REQUIREMENTS, AND CRITICAL DRAWING ASSEMBLY NOTES, INCLUDED
INSTALLATION OF THREADED FASTENERS PER APPLICABLE SPECIFICATION AFTER
FINAL ADJUSTMENTS HAVE BEEN MADE. BEARING, BUSHING AND BELLEVILLE WAS
INSTALLATION VERIFIED BY INSPECTION.

CRITICAL PROCESSES

HEAT TREAT AND INSTALLATION OF DRY FILM LUBE ARE VERIFIED BY INSPECTION
INSPECTION VERIFIES CADMIUM PLATING AND SUBSEQUENT BAKEOUT (TO PREVENT
HYDROGEN EMBRITTLEMENT) OF BELLEVILLE WASHERS.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION OF DETAIL PARTS PER MT0501-504 IS VERIFIED BY
INSPECTION.

TESTING

ACCEPTANCE TESTING IS VERIFIED BY INSPECTION.

PACKAGING/HANDLING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

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(D) FAILURE HISTORY

AD0297 -OV102 AT KSC - DURING ATTEMPTS TO COCK (LOAD) THE MLG DOOR EXTENSION BOOSTER ASSEMBLY, POPPING NOISES WERE HEARD WITHIN THE UNIT. TEARDOWN REVEALED SEVERAL FRACTURED BELLEVILLE WASHERS. ANALYSIS INDICATED FAILURE WAS DUE TO HYDROGEN EMBRITTLEMENT CAUSED BY A TOO DENSE CADMIUM PLATING PRECLUDING STRESS RELIEF DURING BAKEOUT. IT WAS DETERMINED THAT ALL PROBLEMS ASSOCIATED WITH FRACTURED WASHERS ARE ISOLATED TO THIS SINGLE BOOSTER ASSEMBLY. ACCORDINGLY, ALL FABRICATED WASHERS THAT HAD NOT BEEN STRESSED WERE STRIPPED OF CADMIUM PLATING AND REPROCESSED TO ACHIEVE RELIEF OF EMBRITTLEMENT.

(E) OPERATIONAL USE

NONE.