



THIS BULLETIN IS FAA APPROVED FOR ENGINEERING DESIGN

SERVICE BULLETIN M20-282

DATE: October 30, 2003

SUBJECT: INSPECTION OF AVIONICS PRODUCTS, EATON, MOONEY OR VICKERS LANDING GEAR ACTUATORS [MAC P/N'S – 560254-501, -503, -505, AND –507; AVIONICS PRODUCTS AND EATON (OR VICKERS) P/N'S 102000-1, -2, -3, -4, -5, -7]

MODELS/ S/N AFFECTED: **M20M 27-0001 THRU 27-0318; M20R 29-0001 THRU 29-0300; ALL M20C, E, F, G, J, K, L, S** THAT HAVE AVIONICS PRODUCTS, EATON (OR VICKERS) AND MOONEY ELECTRIC LANDING GEAR ACTUATORS INSTALLED IN PRODUCTION OR SUBSEQUENTLY RETROFITTED IN THE FIELD PER MOONEY DRAWING 940007. **NOTE:** THIS INCLUDES ANY MANUAL GEAR SUBSEQUENTLY RETROFITTED TO AN AVIONICS PRODUCTS OR EATON OR MOONEY ELECTRIC LANDING GEAR ACTUATION SYSTEM PER 940007 OR OTHER APPROVED RETROFIT DRAWING(S). **NOTE: SEE PART II, INSTRUCTIONS, FOR SPECIFIC MODEL'S AFFECTED for other maintenance actions.**

TIME OF COMPLIANCE: 1) ONE TIME INSPECTION OF "NO BACK" CLUTCH SPRING AT NEXT SCHEDULED INSPECTION, NOT TO EXCEED 100 FLIGHT HOURS FROM DATE OF THIS SERVICE BULLETIN.
2) 1000 HOUR REPLACEMENT OF "NO BACK" CLUTCH SPRING
3) 100 HOUR OPERATIONAL INSPECTION AND INSPECTION FOR VISUAL DAMAGE.
NOTE: SEE PART II, INSTRUCTIONS, FOR SPECIFIC TIME OF COMPLIANCE for the aircraft affected by PART II.

INTRODUCTION: Mooney Airplane Company, Inc. received a report concerning failure of a landing gear (LDG) actuator. This failure rendered the landing gear inoperative in both normal (electrical) and emergency (manual) modes. Currently there are four (4) Mooney documents distributed to the field describing various inspections and/or maintenance to be performed on subject LDG actuator. **This Service Bulletin, when distributed to the field, will CANCEL Mooney SBM20-266 (all revisions), SBM20-279 (all revisions) and SIM20-52 (all revisions) and Special Letter 98-2 (all revisions).** The intent of each of these previous Service Bulletins and the Service Instruction will be incorporated into this one SB. The Kit P/N of this SB will include all components necessary for any currently known maintenance actions required for the actuator.

PART I -- Eaton has issued Service Instruction No. SI102000-1-901, Rev. 2, dated April 3, 2003 to be attached to this Mooney SB. The Eaton SI, SI102000-1-901, Rev. 2 supercedes all previous revisions to this Eaton Service Instruction. This Eaton SI will be included in the Kit components of this MAC SB. No inspections nor maintenance should be accomplished without this Eaton SI being referenced and complied with. Part I of this SB includes maintenance procedures for disassembly, inspection and replacement of the "No-back" Clutch Spring, Eaton P/N 203207-1 [previously included in Eaton Clutch Spring Kit, P/N A10-85]. The clutch spring has been included in MAC kit P/N's SI20-52-001 and SB20-279-000 under various vendor part numbers. Part I of this SB also includes inspections and maintenance procedures for proper assembly of the actuator after disassembly for "No Back" clutch spring replacement or other type of inspection or maintenance previously prescribed by the manufacturer.

PART II -- EATON personnel have requested that actuators within the same manufacturing lot as a certain S/N actuator and actuators within manufacturing lots on either side of the subject actuator lot be removed from the applicable aircraft listed in Part II, Models/S/N's Affected and returned to EATON for inspection.

INSTRUCTIONS:

GENERAL (A)

1. Place aircraft on jacks.
2. Remove the first two belly panels behind the nose wheelwell to gain access to actuator and bellcrank fittings.

NOTE: Later aircraft have fiberglass belly skins and will require either the entire belly skin to be removed, M20J, M20K, or the forward piece to be removed, M20L, M20M, M20R, M20S to gain access.

3. Refer to the applicable MAC Service & Maintenance Manual, SECTION 32-30-05 to locate landing gear actuator. Verify that actuator is the P/N referenced by this Service Bulletin. If not, proceed to **GENERAL (B)**, steps 17 through 24 to conclude PART I, the R & R of the "No Back" Clutch Spring.
4. Refer to the applicable MAC Service & Maintenance Manual, SECTION 32-30-05 for procedures to remove from and/or install the actuator into the aircraft.
5. Remove actuator from aircraft. Disconnect electrical connections, Heim bearing linkage and fuselage attach point bolt.
6. Remove the two (2) nuts, (1) that retain the cable support bracket (2); remove the bracket and disengage cable intact from actuator body and disengage arm.
7. Refer to and comply with procedures within Enclosure 1 (EATON SERVICE INSTRUCTION SI102000-1-901, Rev. 2, dated April 3, 2003 or subsequent revisions).
8. As necessary, proceed to **PART I** and/or **PART II** of INSTRUCTIONS.

PART I

INSPECTION AND REPLACEMENT OF "NO BACK" CLUTCH SPRING IN AVIONICS PRODUCTS, MOONEY, OR EATON (VICKERS) ACTUATORS

DISASSEMBLY OF ACTUATOR: [Reference **Figure SB M20-282-1**]

1. To avoid stripping screw heads, use impact screwdriver to break Loctite thread seals and remove two (2) long screws (Item 3) and two (2) short screws (4).
2. With razor or similar tool, slice through identification plate and remove recoiler assembly (5) and Clutch Housing Mount Assembly (5A).

NOTE: Care should be taken not to allow bearings to drop out of clutch housing mount assembly.

3. Remove input gear assembly (6) from clutch housing (8) by pulling with slight force.
10. Remove two (2) screws (7) and remove clutch housing (8), "No-Back" Clutch Spring (9), and output gear assembly (10) from actuator body.
4. Remove "No-Back" Clutch Spring (9) from clutch housing using input gear assembly (6) as removal tool. Insert input gear assembly (6) into "No-Back" Clutch Spring from flanged end of housing (8). Remove "No-Back" Clutch Spring by rotating gear CCW and pulling slightly.

NOTE: DO NOT TURN CW. Spring can be damaged.

GENERAL:

After disassembly, clean clutch, gears, "No Back" Clutch spring and housing thoroughly. Discard screws (3 & 4). Discard old "No-Back" Clutch Spring if crack is found after compliance with INSPECTION OF "NO BACK" CLUTCH SPRING below or if 1000 Hour Removal & Replacement is being accomplished.

INSPECTION OF "NO BACK" CLUTCH SPRING

1. The inspection will require the use of a magnifying glass in the 16X to 40X power range. This inspection should be conducted in a clean room environment with good lighting.
2. If a maintenance shop has any "No Back" Clutch Springs in inventory, it is recommended that these also be visually inspected by qualified shop QA personnel in accordance with the criteria of Step 3 below and tagged as approved with a NOTE or Date Stamp documented by the maintenance shop QA personnel.
3. All clutch springs, either from the actuator or from shop inventory, must be visually inspected at the bend radius of both "tang ends" for evidence of any type of crack or stress fracture in the outboard, bend radius [reference **Figure SB M20-282-2** for additional inspection criteria]

4. If any evidence of a crack or stress is found, the clutch spring must be discarded.
5. An approved, new clutch spring that has been inspected and documented as inspected and approved either by a maintenance shop's QA personnel per Step 2 above or a clutch spring received from Mooney Airplane Company, Inc., which has been inspected by MAC Quality Inspection Department personnel are eligible for installation into the actuator removed from the aircraft.
6. These new springs from MAC will have a discrete "Date Stamp" located on the identification tag attached to the clutch spring, and identified by a MAC QA stamp to signify that it has been approved from current stock inventory. These "Date Stamped" replacement clutch springs will be dated **August 20, 2003 or later**.
7. Install any approved clutch spring described above in Steps 2, 5 or 6 above in accordance with the REASSEMBLY procedures below.
8. A specific log book entry is necessary to document inspection and approval of any installed clutch spring from a maintenance shop's inventory that does not have the discrete MAC QA Department "Date Stamp" on the identification tag,
9. Complete any service response paper work received from MAC Service Parts Dept. to document information requested.

REASSEMBLY:

1. Lubricate clutch housing and new spring with lubricant supplied [MIL-G-81322].
2. Use gear assembly (6) as insertion tool; place new "No-Back" Clutch Spring on cam end of assembly and while rotating CCW, install "No-Back" Clutch Spring into clutch housing to about mid-point. **DO NOT FORCE SPRING**. While rotating CCW, gently push "No-Back" Clutch Spring into housing bore until fully seated.
3. Withdraw gear assembly (6).
4. Insert clutch gear assembly (10) into "No-Back" Clutch Spring and housing from cylindrical end of housing, insuring that "No-Back" Clutch Spring tangs fit into recesses in cam.

NOTE: When "No-Back" Clutch Spring is properly seated, large gear (6) can be rotated in either direction and small output gear (10) will follow rotation direction.

5. Lubricate output gear teeth (10) (lubricant supplied in kit) and install clutch housing, gear and spring assembly into actuator body by mating gear (10) to the output gear train assembly. To engage gear teeth and fully seat hub into bearing, rotation of gear assembly may be required.
6. Re-install screws (7) to secure clutch housing into actuator body. Use Loctite, Grade A, on threads.
7. Re-insert input gear assembly (6) into clutch housing and "No-Back" Clutch Spring assembly until fully seated. Lubricate gear teeth (6) with lubricant supplied in kit.

NOTE: Clutch assembly can now be verified for proper installation by rotating input gear (Item 6) both CW & CCW. Gears should turn with moderate friction to hand torque. Observe that output screw jack rotates in both directions.

CAUTION: In some instances, the new "No-Back" Clutch Spring chatters during electrical extension or retraction cycle. Proper shimming of the "No-Back" Clutch Spring/housing assembly, (items #6, 7, 8, 9 & 10), and bearing (11) with shims (12) is necessary, according to Eaton personnel, to eliminate the chatter.

8. Disassemble Clutch Housing Mount Assy., (5A) from Recoiler Assembly (5).

DO NOT ALLOW BEARINGS OR SHIMS TO DROP OUT OF CLUTCH HOUSING MOUNT ASSEMBLY.

9. Normally, the existing shims (12) already installed behind bearing (11) will be correct for the new clutch spring. However, due to manufacturing tolerances, it may be necessary to change shim thickness for proper spring adjustment.
10. Three different thickness of shims are available through MAC Service Centers: EATON P/N 110117-1 (.003 in. Thk), 110117-2 (.005 in. Thk), & 110117-3 (.010 in. Thk). Any combination of these shim thickness are allowed to obtain correct rotational torque (inch pounds of torque) of input gear shaft after clutch housing mount assembly is installed and torqued into place.

11. Install housing mount assembly (5A). Tighten housing screws. Check rotational torque of the no-back clutch drive with a modified socket & torque wrench. Rotational torque should be no greater than 4 inch pounds (per Eaton SI 102000-1-901, Rev. 2) in both CCW & CW directions. The objective is to remove endplay without applying a preload on the bearings. If rotational torque is greater than 4 inch pounds, remove housing mount (5A) and add or remove the least amount of shims (12) necessary to obtain proper rotational torque.

12. When correct rotational torque has been obtained, re-install recoiler assembly (5).

NOTE: Flats on gear shaft (6) must line up with Brass manual drive clutch (13) for proper assembly. Pull manual drive cable slightly to position Brass clutch to align with flats on gear shaft (6).

13. Install new bolts (3) [ADS145-10-43] (2 ea.) & (4) [ADS145-10-38] (2 ea.) supplied in kit and torque bolts to 20 - 25 inch pounds. Use Loctite Grade A (Catalog number 88-31) on bolt threads.

14. Re-install cable support bracket and lock nuts on -43 bolts. Torque lock nuts to 20 – 25 inch pounds.

15. Install modification plate as shown (at first 1000 hrs. only). Mark the first block of modification plate with the figure "1" using metal stamp or etching tool. Mark each succeeding clutch spring re-placement with the next consecutive number.

16. Re-install actuator in aircraft and verify rigging per appropriate Service and Maintenance Manuals, [M20C, E, F, G, S & M No. 106, SECTION 5-6A; M20J, M20K, M20L, M20M, M20R, & M20S, S & M manuals, SECTION 32-30-02].

Caution should be observed during installation for placement of washers and bushings.

GENERAL-(B)

17. Re-install actuator in accordance with procedures in the applicable MAC Service & Maintenance Manual, SECTION 32-30-05. Verify Landing Gear Rigging and proper operation is in accordance with all of SECTION 32-30-00 procedures.

18. Test landing gear operation by cycling gear several times. Allow approximately 1 minute between cycles to avoid overheating motor.

19. Remove electrical power, reinstall belly skins per appropriate MAC Service and Maintenance Manual. Remove aircraft from jacks.

20. Perform functional test flight to ensure normal landing gear and warning system operation (extension and retraction). Perform tests in both normal (electrical) and emergency (manual) extension modes.

21. Add the **CAUTION** as shown, FIGURE M20-282-3, to the AFM/POH of the applicable aircraft being worked on.

22. Re-install belly panels.

23. Return aircraft to service after Logbooks entries have been completed.

PART II

IF SPECIAL LETTER 98-2 or (A) or (B) or SB M20-266 or (A) HAVE NOT BEEN COMPLIED WITH THE FOLLOWING PROCEDURES ARE REQUIRED.

MODELS- S/N'S AFFECTED:

M20J -- 24-3414, 24-3418 THRU 24-3423

M20K -- 25-2017, 25-2024 THRU 25-2029

M20M -- 27-0241, 27-0245 THRU 27-0249

M20R -- 29-0136, 29-0141 THRU 29-0152

TIME OF COMPLIANCE: **BEFORE NEXT FLIGHT**

NOTE: THIS ACTION SHOULD HAVE BEEN ACCOMPLISHED IN LATE 1998 OR EARLY 1999. CHECK LOG BOOK FOR COMPLIANCE BEFORE PROCEEDING WITH THE FOLLOWING PROCEDURES

INSTRUCTIONS

1. For removal of actuator from aircraft, refer to the GENERAL (A) procedures of these INSTRUCTIONS on page 2 of SB.
2. When Actuator has been removed from aircraft proceed with the following Steps.

3. Send actuator, freight prepaid, to Eaton Corporation, Aerospace Controls Division, 3675 Patterson Ave., Grand Rapids, MI 49588, Attn. Product Support Dept.; Reference MAC Special Letter 98-2 Revision A or B and Service Bulletin M20-266A, dated 1 December, 1998 (or if done per this SB) SB M20-282, September, 2003]
4. When repaired actuator has been received from Eaton, refer to GENERAL (B) , page 4 of SB, for installation of repaired actuator into the aircraft.

WARRANTY: Mooney Airplane Company, Inc. recommends that all affected aircraft be taken to an authorized Mooney Service Center for removal of the actuator, inspections, disassembly , reassembly and reinstallation of actuator as depicted in Instructions of this SB.

Mooney Airplane Company, Inc. will warrant labor and parts on aircraft S/N's 27-0317 thru 27-0318, & 29-0280 thru 29-0300 when done in accordance with procedures of this Service Bulletin by an authorized Mooney Service Center.

REFERENCE DATA: MAC SB M20-266(A); SB M20-279(C); SI M20-52(C); SPECIAL LETTER 98-2(B); EATON SI 102000-1-901, REV. 2, MAC Service & Maintenance Manuals (applic. A/C)

PARTS LIST: KIT P/N –SB 20-282-001			
ITEM	PART NUMBER	DESCRIPTION	QTY
1.	203207-1	SPRING, CLUTCH "NO BACK"	1
2.	102052	METALCAL, MAINTENANCE RECORD	1
	102049	DATA PLATE (ALTERNATE FROM EATON)	1
3.	MIL-G-81322	GREASE (POLY-LUBE)	1
4.	ADS145-10-43	BOLT	2
5.	ADS145-10-38	BOLT	2
6.	MS20365-1032	LOCKNUT	4 *
7.	EATON SI 102000-1-901, Rev. 2 (April 3, 2003)		1

* Only 2 MS20365-1032 Locknuts are required when using two ADS145-10-38 Bolts. Older version of kit contained four ADS145-10-43 Bolts for all four locations.

TOOLS REQUIRED:
 3/8 INCH WRENCH [BOX END]
 SCREWDRIVER, COMMON
 MACHINIST HAMMER
 K-D1141 IMPACT SCREWDRIVER or EQUIVALENT **
 TORQUE DRIVER, 1/4 INCH DRIVE, 0 TO 15 (APPROXIMATELY) INCH LBS.
 (SPECIAL MADE "SOCKET" TO FIT TORQUE DRIVER AND FLATS ON INPUT GEAR SHAFT (ITEM 6)

** KD TOOLS, Lancaster, PA 17604

EATON CORPORATION, Grand Rapids, MI --- TELEPHONE: (616) 831-8325

FIGURE/TABLES: SEE FIGURES ON FOLLOWING PAGES

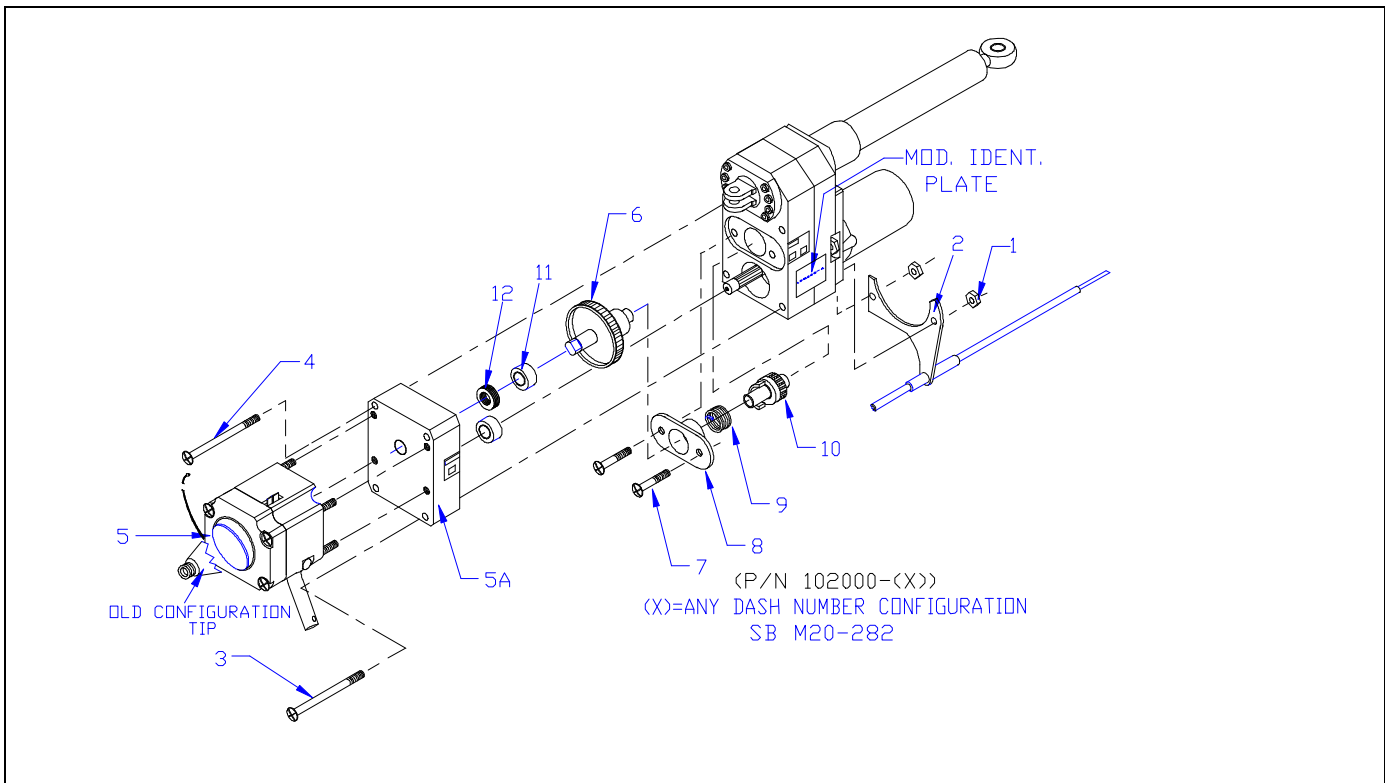


FIGURE SB M20-282-1

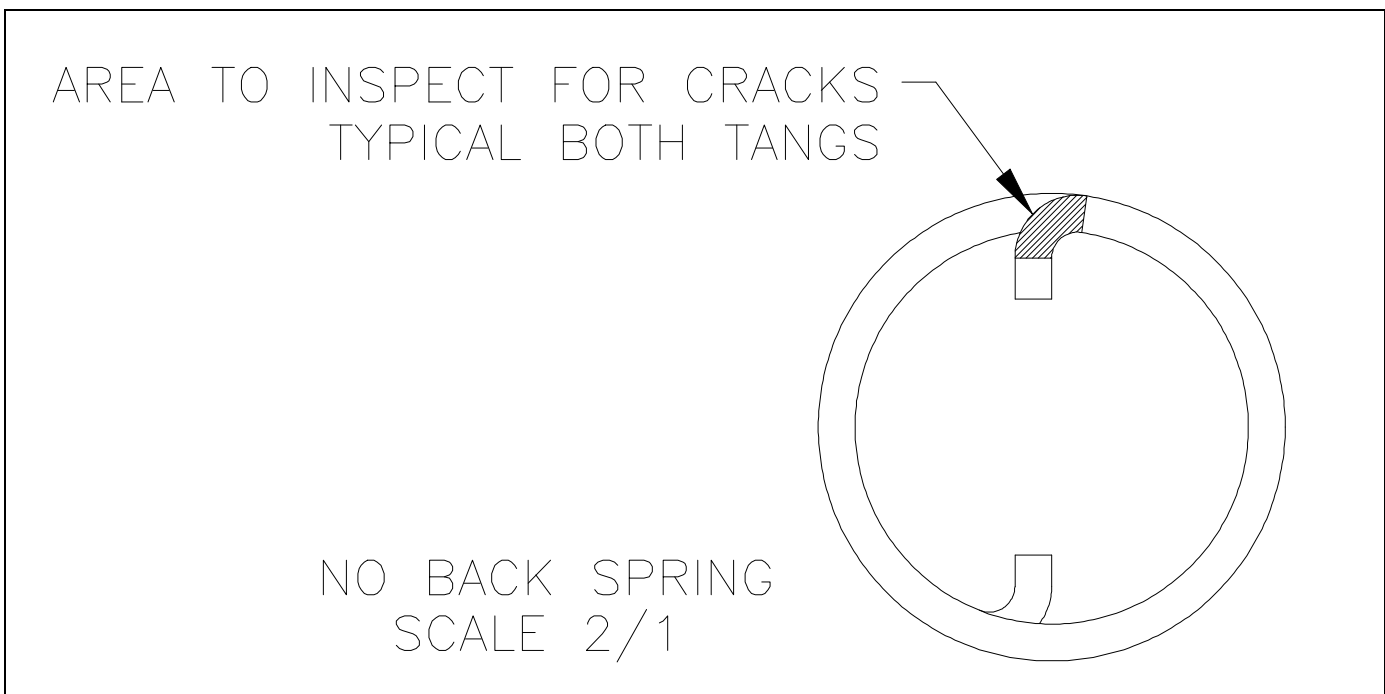


FIGURE SB M20-282-2

Make a copy and cut along outline, punch holes and place into the Airplane Flight Manual, SECTION VII, **LANDING GEAR**, as a page facing the **WARNING SYSTEM** paragraph:

MOONEY
M20C/E/F/G/J/K/L/M/R/S

SECTION VII
AIRPLANE AND SYSTEM DESCRIPTION

Addendum to:

LANDING GEAR

WARNING SYSTEM

~~~~~  
~CAUTION~  
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The absence of any of the above described indications in their Normal sequence may represent a potential failure in the Landing Gear or Indicator system. The floor mounted visual gear position Indicator presents a mechanical indication of gear status.

The Visual gear position indicator shall be verified to be in the **DOWN** Position (indicator marks aligned with the word **DOWN** fully visible) prior to **ALL** landings.

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