WACO Classic Aircraft Corp.
2850 Territorial Rd. West
Battle Creek, MI 49015

SERVICE BULLETIN

WACO CLASSIC CONSIDERS COMPLIANCE MANDATORY

SB10-01

SUBJECT: **ELEVATOR CABLE WEAR DUE TO CABLES BECOMING SLACK**

MODELS AFFECTED:	SERIAL NUMBERS AFFECTED:
YMF WACO F5A	F5001 thru F5009
YMF WACO F5B	F5010 thru F5036
YMF WACO F5C	F5C040 thru F5C122

COMPLIANCE TIME: Initial compliance before the next flight by inspection as described in Instruction #1 below. At the next 100 Hr or Annual Inspection, compliance with Instruction #2. Following compliance with Instruction #2, no further action is required.

APPROVAL: The technical content of this Service Bulletin has been shown to comply with the applicable Federal Aviation Regulations and is FAA approved.

PURPOSE: The down elevator cable of a YMF WACO F5C has been found to be worn and frayed resulting from a lack of adequate cable tension. It has been determined that due to the in flight forces on the elevator cable system, inadequate cable tension can result in the down cable becoming slack allowing it to come into contact with the stainless steel guard located below the pulley set at aircraft station 212 (see Fig. 1) located approximately 50 in forward of the rudder hinge line in the lower aft fuselage. Although, when properly tensioned, the cable is unlikely to come in contact with the guard, an unsafe condition can develop without the operator being aware. Because this is a possibility, all affected aircraft are to be inspected and modified in accordance with this service bulletin. To prevent possible damage to the elevator cables, a new pulley guard is available that incorporates a Delrin rub strip between the pulley rim and the stainless steel bracket. This rub strip will prevent cable wear should the cable tension not be properly maintained allowing the cables to sag.

Fig. 1
Elevator Cable Pulleys at Station 212

INSTRUCTIONS:

1. Determine if elevator cable tension is within safe limits. The simple test described by Instruction 1(a) can be accomplished by the owner or pilot to make a determination. A record of the test and the result is to be entered in the aircraft records and signed by the person making the finding.

(a) With the stabilizer trim in the full nose down position, clamp the elevator in the neutral position using small wooden blocks protected with foam or other suitable material to prevent marring the paint finish as shown in Fig. 2.

(b) Using a rule as shown in Fig. 3, gently move the control stick fore and aft to measure the amount of free play in the elevator control system taking care not to apply so much pressure as to move the elevator or to dislodge the clamp. The purpose is to determine if the cable system tension is adequate to prevent the elevator cables from contacting the pulley guards on the Station 212 pulleys (Fig. 1). Any movement that can be determined to be in the stick socket or torque tube linkage may be disregarded for the purpose of this test. If the free travel of the stick is in excess of one half (1/2) inch, not including the aforementioned movement, prior to further flight, compliance with Instruction 1(c) by a certified mechanic is required. If the free travel is less than ½ inch, no additional action is required prior to flight or before the next 100 Hr or Annual Inspection.

(c) If free travel exceeds that allowed by Instruction 1(b), the elevator cables must be inspected as described in paragraph 2(a) of this instruction. If no defect is found by inspection, set cable tension to 25 +/- 5 lbs and record compliance with this instruction in the aircraft maintenance record. If the inspection finds worn or frayed cables, installation of new cables (ref. Manual YMFAMM-1) and compliance with Instruction #2 is required prior to further flight.

Fig. 2

Fig. 3

INSTRUCTIONS: continued

2. **(a)** Access the aft fuselage by removing the saddle fairing forward of the vertical fin, inspect elevator cables in accordance with FAA AC 43.13-1B paragraph 7-149 and replace if necessary (ref. WACO Classic Maintenance Manual YMFAMM-1, paragraph 6.3).

(b) Remove the existing 50197-4 pulley guards (2) on the pulleys at station 212 as indicated in Fig. 4.

Fig. 4

(c) Install new one piece dual pulley guard Part Number 50197-7 as shown in Fig. 5.

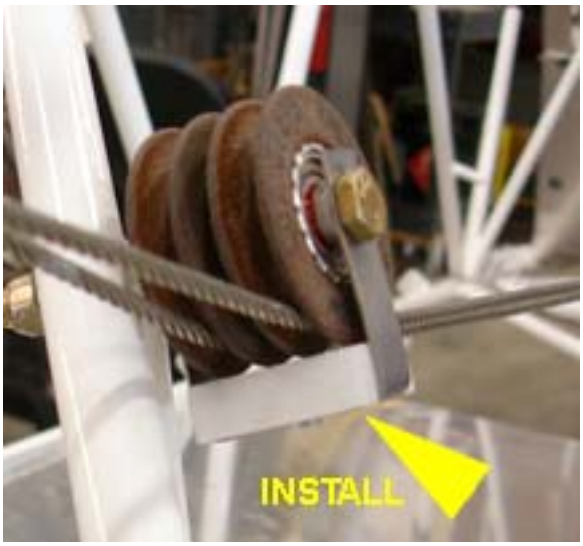

Fig. 5

(d) Set cable tension to 25 +/- 5 lbs. in accordance with WACO Classic Maintenance Manual YMFAMM-1.

(e) Record compliance with this Service Bulletin in the aircraft maintenance record.

MATERIAL REQUIRED:

50197-7 Dual Pulley Guard (1)
50191-9 Elevator Cable (as required)
50893 Elevator Cable Pulley (as required)

AVAILABILITY of PARTS:

The 50197-7 Dual Pulley Guard is available at no cost (shipping charges apply) from WACO Classic Aircraft Corporation by visiting our web site at www.wacoclassic.com and selecting the Parts and Accessories link.

EFFECTIVE DATE:

This Service Bulletin is effective as of the date released.

CONTACT INFORMATION:

Please direct all inquiries to:
Customer Service
(269) 565-1000 Voice
(269) 565-1100 Fax
flywaco@wacoclassic.com email
Please include this Service Bulletin Number with your inquiry

NOTE: Please notify the factory of any corrections to address or ownership. Changes should include aircraft model, serial number, registration number and current owner's name and address.

APPENDIX A

EXCERP FROM FAA AC 43.13-1B
PARAGRAPH 7-149 – CABLE SYSTEM INSPECTION

7-149. CABLE SYSTEM INSPECTION. Aircraft cable systems are subject to a variety of environmental conditions and deterioration. Wire or strand breakage is easy to visually recognize. Other kinds of deterioration such as wear, corrosion, and/or distortion are not easily seen; therefore, control cables should be removed periodically for a more detailed inspection.

a. At each annual or 100 hour inspection, all control cables must be inspected for broken wires strands. Any cable assembly that has one broken wire strand located in a critical fatigue area must be replaced.

b. A critical fatigue area is defined as the working length of a cable where the cable runs over, under, or around a pulley, sleeve, or through a fair-lead; or any section where the cable is flexed, rubbed, or worked in any manner; or any point within 1 foot of a swaged-on fitting.

c. A swaged-on fitting can be an eye, fork, ball, ball and shank, ball and double shank, threaded stud, threaded stud and turnbuckle, compression sleeve, or any hardware used as a termination or end fitting on the cable. These fittings may be attached by various swaging methods such as rotary swaging, roll swaging, hydraulic pressing, and hand swaging tools. (See MIL-T-781.) The pressures exerted on the fittings during the swaging process sometimes pinch the small wires in the cable. This can cause premature failure of the pinched wires, resulting in broken wires.

d. Close inspection in these critical fatigue areas, must be made by passing a cloth over the area to snag on broken wires. This will clean the cable for a visual inspection, and detect broken wires if the cloth snags on the cable. Also, a very careful visual inspection must be made since a broken wire will not always protrude or stick out, but may lie in the strand and remain in the position of the helix as it was manufactured. Broken wires of this type may show up as a hairline crack in the wire. If a broken wire of this type is suspected, further inspection with a magnifying glass of 7 power or greater, is recommended. Figure 7-16 shows a cable with broken wires that was not detected by wiping, but was found during a visual inspection. The damage became readily apparent when the cable was removed and bent as shown in figure 7-16.

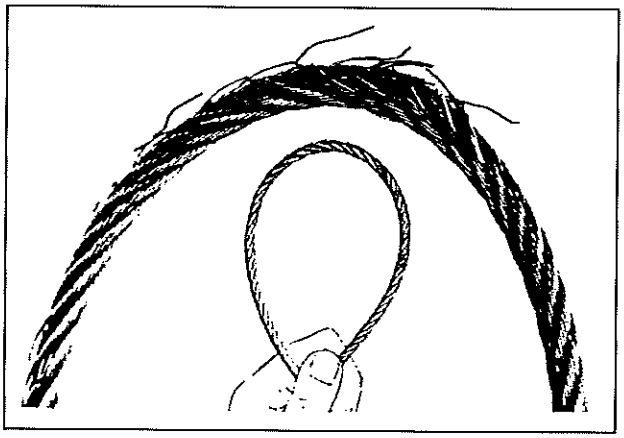

FIGURE 7-16. Cable inspection technique.

e. Kinking of wire cable can be avoided if properly handled and installed. Kinking is caused by the cable taking a spiral shape as the result of unnatural twist. One of the most common causes for this twist is improper unreeling and uncoiling. In a kinked cable, strands and wires are out of position, which creates unequal tension and brings excessive wear at this part of the cable. Even though the kink may be straightened so that the damage appears to be slight, the relative adjustment between the strands has been disturbed so that the cable cannot give maximum service and should be replaced. Inspect cables for a popped core or loose strands. Replace any cable that has a popped core or loose strands regardless of wear or broken wires.

f. Nylon-jacketed cable with any cracks or necking down in the diameter of the jacket shall be replaced. Usable cable life is over when these conditions begin to appear in the nylon jacket.

g. External wear patterns will extend along the cable equal to the distance the cable moves at that location and may occur on one side of the cable or on its entire circumference. Replace flexible and nonflexible cables when the individual wires in each strand appear to blend together (outer wires worn 40 to 50 percent) as depicted in figure 7-17. Actual instances of cable wear beyond the recommended replacement point are shown in figure 7-18.

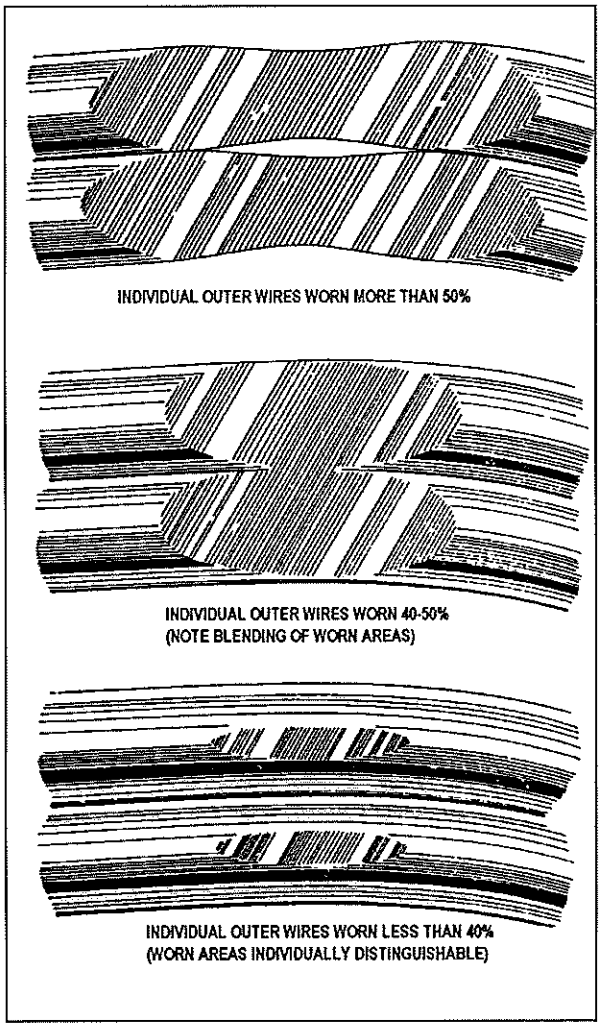

FIGURE 7-17. Cable wear patterns.

h. As wear is taking place on the exterior surface of a cable, the same condition is taking place internally, particularly in the sections of the cable which pass over pulleys and quadrants. This condition (shown in figure 7-19) is not easily detected unless the strands of the cable are separated. This type of wear is a result of the relative motion between inner wire surfaces. Under certain conditions, the rate of this type of wear can be greater than that occurring on the surface.

FIGURE 7-18. Worn cable (replacement necessary).

i. Areas especially conducive to cable corrosion are battery compartments, lavatories, wheel wells, etc.; where a concentration of corrosive fumes, vapors, and liquids can accumulate. Carefully examine any cable for corrosion, when it has a broken wire in a section that is not in contact with a wear-producing airframe component, such as a pulley, fair-lead, etc. If the surface of the cable is corroded, relieve cable tension and carefully force the cable open by reverse twisting and visually inspect the interior. Corrosion on the interior strands of the cable constitutes failure, and the cable must be replaced. If no internal corrosion is detected, remove loose external rust and corrosion with a clean, dry, coarse-weave rag, or fiber brush. Do not use metallic

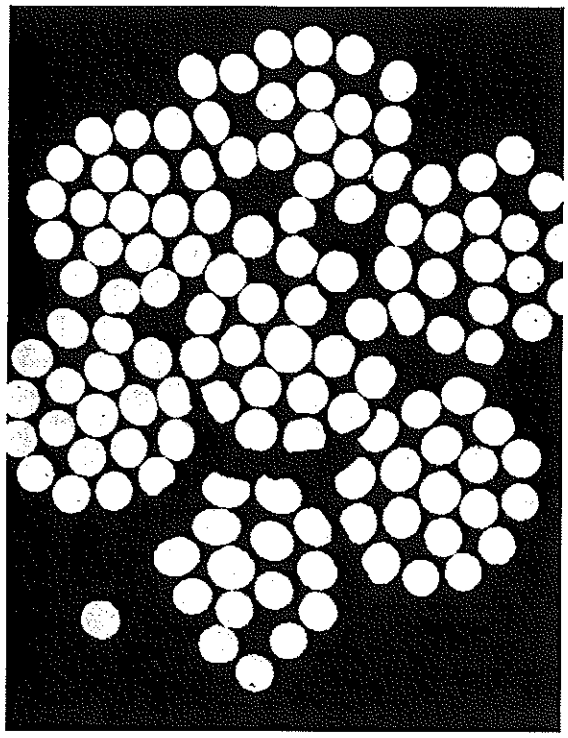

FIGURE 7-19. Internal end view of cable wear.

wool or solvents to clean installed cables. Use of metallic wool will embed dissimilar metal particles in the cables and create further corrosion problems. Solvents will remove internal cable lubricant allowing cable strands to abrade and further corrode. After thorough cleaning, sparingly apply specification MIL-C-16173, grade 4, corrosion-preventive compound to cable. Do not apply the material so thick that it will interfere with the operation of cables at fair-leads, pulleys, or grooved bellcrank areas.

j. Examine cable runs for incorrect routing, fraying, twisting, or wear at fair-leads, pulleys, antiabrasion strips, and guards. Look for interference with adjacent structure, equipment, wiring, plumbing, and other controls. Inspect cable systems for binding, full travel, and security of attaching hardware. Check for slack in the cable system by attempting to move the control column and/or pedals while the gust locks are installed on the control surfaces. With the gust locks removed, actuate the controls and check for friction or hard movement. These are indications that excessive cable tension exists.

NOTE: If the control movement is stiff after maintenance is performed on control surfaces, check for parallel cables twisted around each other, or cables connected in reverse.

k. Check swaged terminal reference marks for an indication of cable slippage within the fitting. Inspect the fitting assembly for distortion and/or broken strands at the terminal. Ensure that all bearings and swivel fittings (bolted or pinned) pivot freely to prevent binding and subsequent failure. Check turnbuckles for proper thread exposure and broken or missing safety wires/clips.

l. Inspect pulleys for roughness, sharp edges, and presence of foreign material embedded in the grooves. Examine pulley bearings to ensure proper lubrication, smooth rotation; and freedom from flat spots, dirt, and paint spray. During the inspection, rotate the pulleys, which only turn through a small arc, to provide a new bearing surface for the cable. Maintain pulley alignment to prevent the cable from riding on the flanges and chafing against guards, covers, or adjacent structure. Check all pulley brackets and guards for damage, alignment, and security.

m. Various cable system malfunctions may be detected by analyzing pulley conditions. These include such discrepancies as too much tension, misalignment, pulley bearing problems, and size mismatches between cables and pulleys. Examples of these condition are shown in figure 7-20.

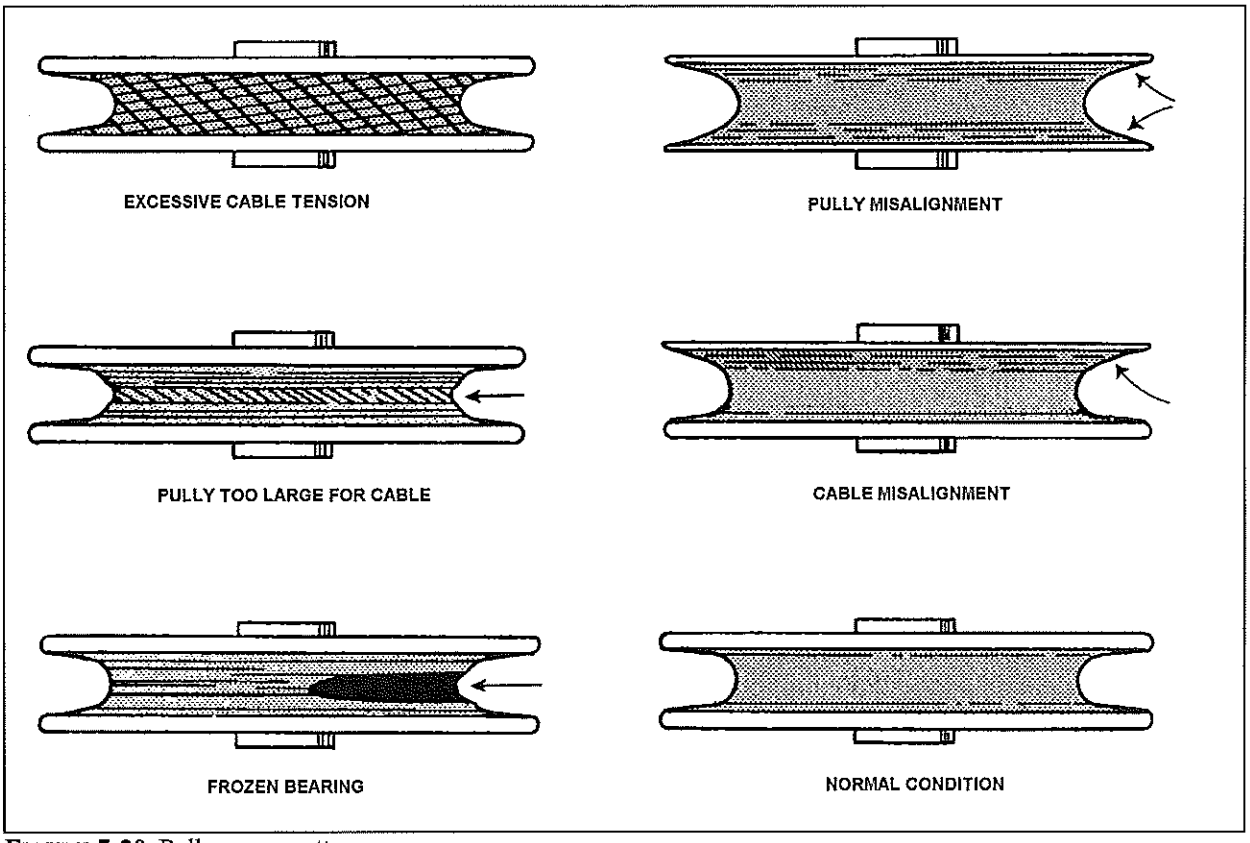

FIGURE 7-20. Pulley wear patterns.

n. Inspect fair-leads for wear, breakage, alignment, cleanliness, and security. Examine cable routing at fair-leads to ensure that defection angles are no greater than 3° maximum. Determine that all guides and anti-abrasion strips are secure and in good condition.

o. Examine pressure seals for wear and/or material deterioration. Seal guards should be positioned to prevent jamming of a pulley in case pressure seal fails and pieces slide along the cable.

7-150. CORROSION AND RUST PREVENTION. To ensure a satisfactory service life for aircraft control cables, use a cable lubricant to reduce internal friction and prevent corrosion.

a. If the cable is made from tinned steel, coat the cable with rust-preventive oil, and wipe off any excess. It should be noted that corrosion-resistant steel cable does not require this treatment for rust prevention.

b. Lubrication and corrosion preventive treatment of carbon steel cables may be effected simultaneously by application of compound MIL-C-16173, grade 4, or MIL-C-11796, Class I. MIL-C-16173 compound should be brushed, sprayed, or wiped on the cable to the extent it penetrates into the strands and adequately covers the cable surfaces. It will dry "tack free" in 24 hours at 77 °F. MIL-C-11796 compound is applied by dipping the cable for 1/2 minute into a tank of compound heated to 77 ° ± 5 °C (170 ° ± 9 °F) for 1/2 minute then removing it and wiping off the excess oil. (An example of cable corrosion, attributable to battery acid, is shown in figure 7-21.)

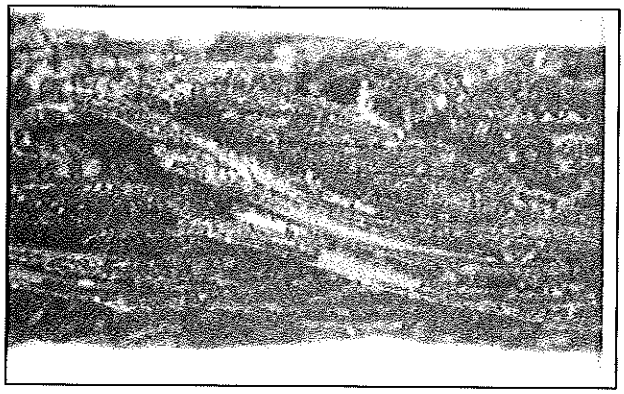

FIGURE 7-21. Corrosion.

7-151. WIRE SPLICES. Standard manufacturing splices have been mistaken for defects in the cable because individual wire end splices were visible after assembly of a finished cable length. In some instances, the process of twisting outer strands around the core strand may also slightly flatten individual outer wires, particularly in the area of a wire splice. This flattening is the result of die-sizing the cable, and does not affect the strength of the cable. These conditions (as shown in figure 7-22) are normal, and are not a cause for cable rejection.

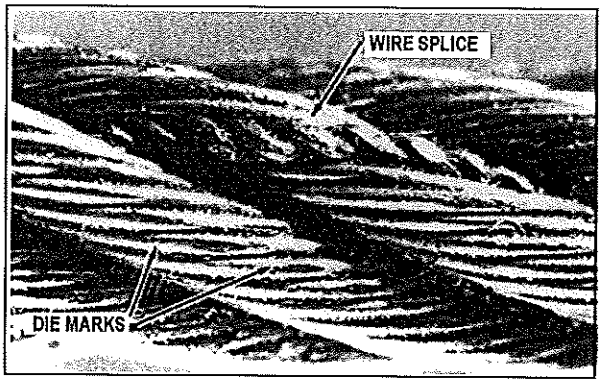

FIGURE 7-22. Manufacturer's wire splice.

7-152. CABLE MAINTENANCE. Frequent inspections and preservation measures such as rust-prevention treatments for bare carbon steel cable areas, will help to extend cable service life. Where cables pass through fair-leads, pressure seals, or over pulleys, remove accumulated heavy coatings of corrosion-prevention compound. Provide corrosion protection for these cable sections by lubricating with a light coat of grease or general-purpose, low-temperature oil.

7-153. CABLE TENSION ADJUSTMENT. Carefully adjust, control cable tension in accordance with the airframe manufacturer's recommendations. On large aircraft, take the temperature of the immediate area into consideration when using a tension meter. For long cable sections, use the average of two or three temperature readings to obtain accurate tension values. If necessary, compensate for extreme surface temperature variations that may be encountered if the aircraft is operated primarily in unusual geographic or climatic conditions such as arctic, arid, or tropic locations. Use rigging pins and gust locks, as necessary, to ensure satisfactory results. At the completion of rigging operations, check turnbuckle adjustment and safetying in accordance with section 10 of this chapter.

7-154.—7-164. [RESERVED.]