SERVICE INFORMATION LETTER

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Revised: A

YMF WACO F5 SERIES

SUBJECT: Streamline Brace Wire Inspection and Maintenance

EFFECTIVITY: All

PURPOSE: To emphasize the importance of regular inspection and maintenance of the primary structure stainless steel streamline brace wires and to ensure that corrosion pitting is identified before it can progress to Stress Corrosion Cracking (SCC) and potentially result in brace wire failure. This emphasis follows a recent brace wire failure.

REFERENCE:
Classic Aircraft Service Letter Dated 5 Nov 1990
Classic Aircraft Service Letter Dated 27 Feb 1992
Classic Aircraft Service Alert Dated 3 Jun 1996
WACO Aircraft Safety Notice SN-041 Dated 23 Oct 2023

DISCUSSION: The structural design of the YMF WACO F5 Series aircraft incorporates an externally braced biplane wing cellule using a system of Grade 316 stainless steel streamline brace rods, commonly known as “Flying Wires”.

These brace rods support the wings, both in flight and on the ground, and direct the flight loads borne by the wings to the tubular steel fuselage frame. They are always in tension with a pre-load of between 1000 and 1300 LBF.

Although Grade 316 stainless steel is generally considered to be corrosion resistant, it is not entirely immune to corrosion. The key to its corrosion resistance lies in the addition of chromium, which forms a passive oxide layer on the steel's surface. This protects the underlying metal from corrosive agents such as oxygen, moisture and common air pollutants.

If this protection is compromised by a scratch or nick, and the metal is subjected to the combined action of mechanical stress, such as static or applied tensile load, and a corrosive environment, pitting corrosion of the metal can occur, potentially leading to Stress Corrosion Cracking (SCC).

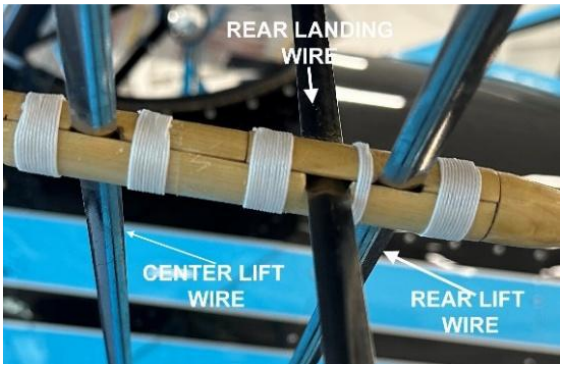
In the context of the structural design of the WACO YMF aircraft, the type of corrosion most detrimental to structural integrity is Stress Corrosion Cracking.

With the normal application of preload tension, cyclical flight loads and the presence of moisture, lift wires of the YMF airplanes can be subjected to environmental conditions consistent with the development of Stress Corrosion Cracking.

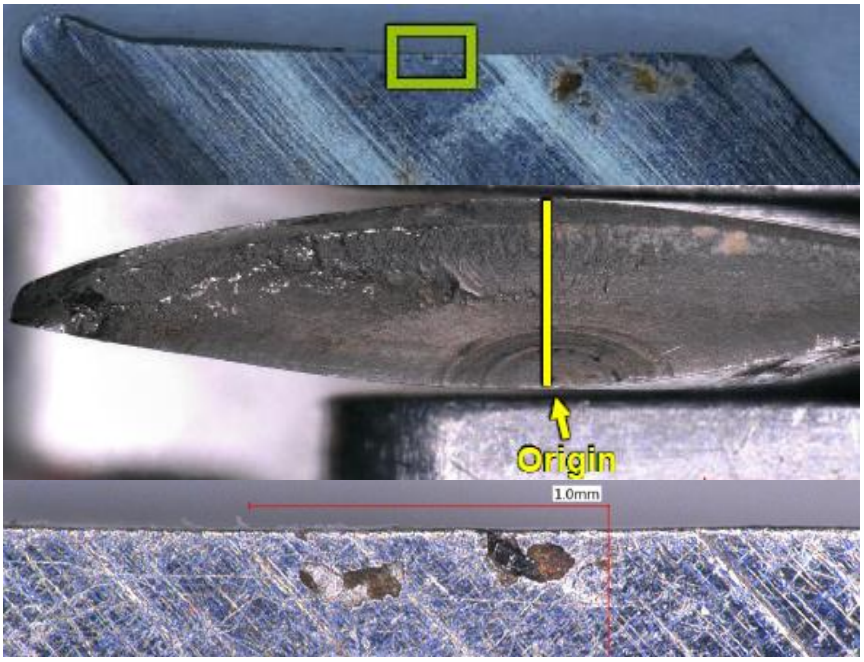
The brace wire separators on the WACO YMF are manufactured from varnished birch wood dowel stock with the streamline portion of the wire passing through the separator.

Moisture can be retained in the openings between the brace wire and separator. This condition can create an environment conducive to corrosion pitting on the streamline brace wire. Because the brace wires remain under significant tensile preload and are subjected to repeated flight loading, a corrosion pit can act as a localized stress concentration. If left undetected, this damage can progress to cracking and ultimately compromise the structural integrity of the brace wire. Early detection is therefore critical.

The purpose of the detailed inspection described in this Service Information Letter is to identify surface pitting and other damage while corrective action can still be taken, before corrosion-related damage progresses to Stress Corrosion Cracking and possible flying-wire failure.



Brace wire passing through the varnished birch wood separator.



Example of surface pitting corrosion on a streamline brace wire. Pitting may be small and difficult to identify during a routine visual inspection and may require magnification for detection.

ACTION:

In-service experience has shown that moisture can be retained in the openings between the brace wire separators and the streamline brace wires. This moisture retention can result in corrosion pitting of the streamline brace wire and may lead to Stress Corrosion Cracking.

In addition to routine pre-flight visual inspection of the flying wires for nicks, scratches, discoloration, pits, or other defects that can be detected by the naked eye or by touch alone, WACO Classic recommends that the flying wire separators be removed and the underlying surfaces of the streamline wires be inspected at least annually using 10X magnification or greater to reveal surface pits and other indications of corrosion that may not otherwise be visible.

This inspection is an important means of detecting corrosion damage before it progresses to cracking and potential flying-wire failure. A pit or other surface defect can create a localized stress concentration in a wire that is continuously subjected to significant tensile preload and cyclic flight loads. Identification and corrective action at the pitting stage can therefore prevent the progression of damage to Stress Corrosion Cracking and loss of structural integrity.

Particular attention should be given to the areas of the streamline wires that pass through or are immediately adjacent to the wooden separators, as these areas can retain moisture and may not be readily visible during a normal pre-flight inspection.

This inspection must be accomplished by a licensed FAA Airframe Mechanic or FAA Certified Repair Station and returned to service in accordance with 14 CFR Part 43.

Any pit, crack, nick, dent, discoloration, or other defect identified during inspection shall be evaluated by an appropriately qualified aircraft mechanic.