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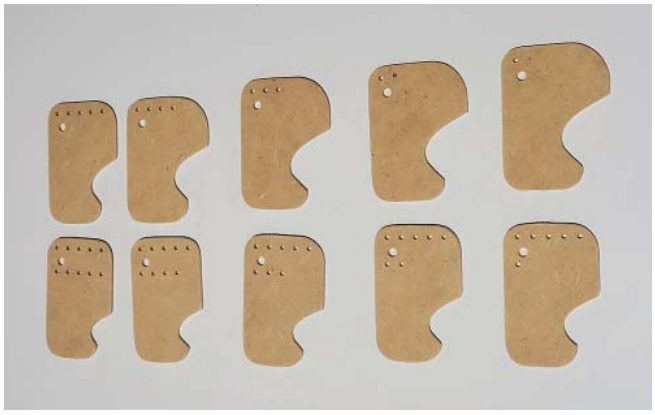
Mustang II & Midget Mustang Service Letter

Date: June 8, 2020 rev March 24,2021

Subject: Stall Speed and Wing Leading Edge Shape

The airfoil used on both the Midget Mustang and Mustang II is a fairly thin laminar flow airfoil. It is optimized to reduce drag. The maximum thickness at the root is about 6 inches and the maximum thickness at the tip is 3 inches. Fabricating the leading edge skins by hand can take some work to get the proper airfoil shape at the leading edge. This is critical for proper stall speeds and characteristics. In the kits now supplied by Mustang Aeronautics leading edge skins are supplied which have the proper leading edge radius formed into them. Many older Mustangs have wings that were fabricated entirely by the builder. On these scratch built Mustangs the leading edge skins were made by hand and the leading edge radius is sometimes too small (or sharp). This is because when the skins were folded over and flattened to get the desired airfoil thickness most of the bending occurs in a very small section at the leading edge. Some follow up work is required to achieve the proper airfoil shape and thus the proper flight characteristics. Robert Bushby published an article in the January 1991 issue of the Mustang Newsletter detailing the procedures to fine tune the wing leading edge shape to get the best stall characteristics. We have heard from builders in the field that they have reduced their stall speeds by 15 mph using this technique. A Mustang with a stall speed over 65mph at our recommended gross weights almost certainly has the wrong leading edge shape.

Wing leading edge radius templates can be made from the wing rib drawing or purchased from Mustang Aeronautics (p/n 230.0009). These can be used to check the wing at each rib location for the proper leading edge radius and to verify that both wings are the same. Keep in mind that the intermediate wing ribs do not have a full nose section and stop about 7/16” short of the leading edge so it is fairly easy to reshape the leading edge. The procedures detailed in the following article by Robert Bushby can be used to correct the wing leading edge shape and improve the stall characteristics.



Wing Leading Edge Radius Template Set
p/n 230.0009

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IMPROVING STALL CHARACTERISTICS

by Bob Bushby

Although the majority of Mustang aircraft have a straight forward stall at modest airspeeds, there are still some that will stall one wing first, and sometimes at a higher than desired air speed. In most cases this undesirable stall is brought about because of a wing leading edge radius that is too sharp, or is caused by one wing leading edge having a radius different than the other. There have also been reports of poor stall characteristics because one wing had a different wash-out than the other. If your aircraft has a characteristic similar to the above, then this article will help to correct it. The procedure is based on the fact that a sharp leading edge radius will cause a higher stall speed.

The wing leading edge modification was prompted by a phone call from a Midget Mustang flyer in Michigan. He reported that the right wing was stalling at an unreasonably high speed of approximately 80 M.P.H. His correction was to reshape the wing leading edge radius to obtain a larger radius, and therefore, a lower stall speed. The leading edge modification was relatively simple, using a mallet to push the nose of the wing back thereby producing a larger radius.

The plastic mallet used should be less than one pound weight. A scrap of 0.032" aluminum approximately 4" wide is to be held on the leading edge as a buffer, and the mallet pounded on the aluminum piece. Numerous light blows are used as the work progresses down the leading edge. It is important to progress down the leading edge slowly, checking the newly formed radius frequently. The rate at which the work was performed by the builder was about 2' per hour, which did not cause marring of the paint.

For checking the leading edge contour, a tool may be purchased from Sears or any other hardware store called a "Copycat". This is a tool consisting of many small wires in a holder that are pushed in when pressed against the wing. Using this method the builder reworked the entire leading edge of the wing, and lowered the stall to where the other wing was stalling first, at about 60 M.P.H. At last report, the builder was going to rework the other wing, expecting an even stall at a lower speed.

To substantiate this rework, the same technique was performed by Bushby Aircraft on the prototype Mustang II, N1117M. This aircraft had a "right wing first" stall that was corrected by installation of a stall strip on the left wing during the early '70's. This resulted in a straight stall at 64 M.P.H. Examination of the wings showed the right wing having a sharper leading edge at the tip section. The stall strip was removed and flight tested again (solo), which showed a "right wing stall" still at 64 M.P.H. Using the rework method, the outer 6" of the wing leading edge was modified to obtain a nice looking radius. Another test flight showed some improvement so this treatment was extended inward, with more testing. After reworking the outer 18" of the wing, a nice even stall was obtained at 55 M.P.H. Thinking it desirable to have a slight left stall when solo, a little more rework was accomplished. This added work proved to be slightly undesirable because it placed the stall characteristic back to where it had been originally. The rework performed by Bushby Aircraft was also done quickly, without the aluminum buffer piece, and with a heavier mallet. The actual time that it took to work 18" of the leading edge was 15 minutes, which resulted in chipping the paint off. As is true with most things related to aircraft, the slow and easy way is best.

Increasing the radius of the entire leading edge will reduce the cruise speed somewhat. As only 18" was modified on the prototype N1117M, there was no noticeable change. It is reported that Mustang II builders obtain a stall about 55 to 60 M.P.H. with a nice pair of wings. If your Mustang cannot achieve this, try reworking the leading edge. Be aware that other factors such as a heavy empty weight also add to a higher stall speed, so be aware!

3/2021:
Before reworking the wing leading edge, the first step should be to verify the accuracy of the airspeed indicator. Errors in the static port can cause an erroneous airspeed reading and the airplane may not be stalling as fast as you think.
The next step would be to check the wing leading edges with profile radius templates.
If the problem is one wing stalling before the other and the leading edges are fairly close the next step would be to check the wing angles of attack at the root and tip with a full profile board. Verify the left wing and right wing angles match. Of course a heavy wing at cruise would be the main indicator of dissimilar wing angles. Is there a fixed trim tab on an aileron?