6 Veco Pursuit - Full Size Wing Geometry Development
1 message

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Developing the full size wing planform geometry from a small sketch can be quite involved, depending on a specific requirement. In the Veco Pursuit's case, the requirement is for the tapered wing to have an 8.00" chord at the outside edge of the 2.50" wide fuselage. This translates into having an 8.00" chord at a distance 1.25" inboard of the wing center line. It is a lot of detail, but I want to share with you the analytical process I used to develop the full size wing planform geometry subject to this specific requirement.
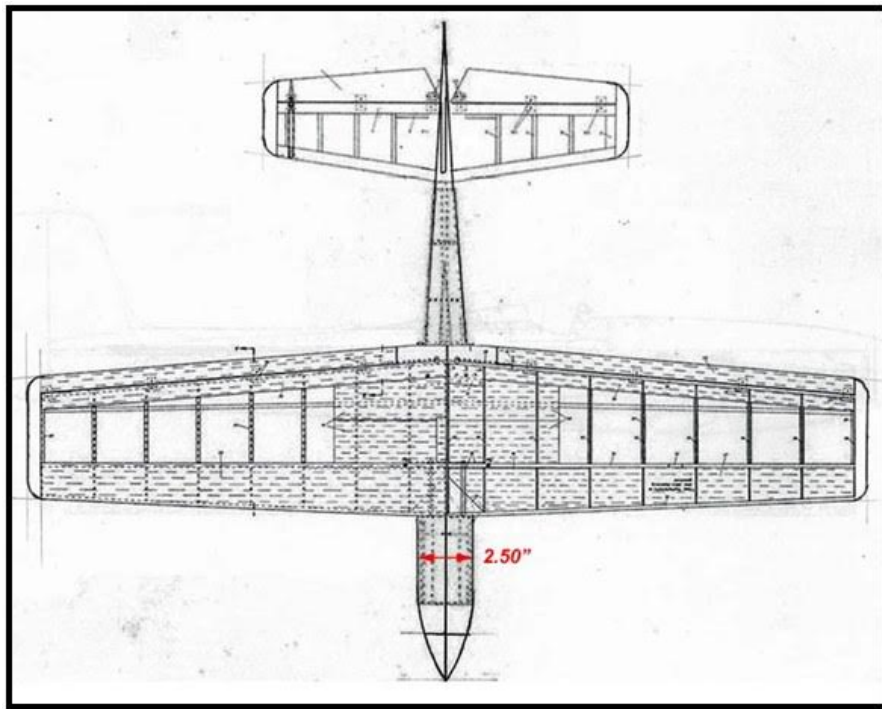
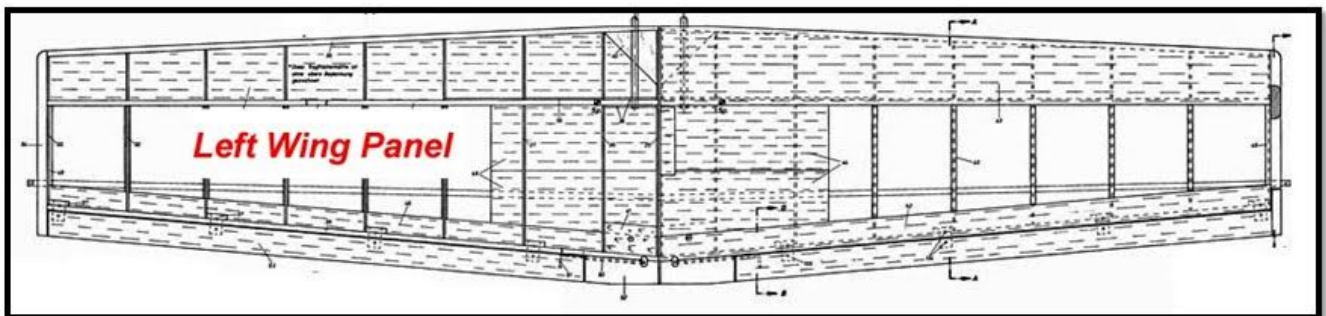************************

Report No. 5

*Veco Pursuit*

July 31, 2021

The planform for the Veco Pursuit shown below was developed in Report No. 1 by adjusting and superimposing the wing and stab from the Zlin-50 plans onto the 2.5" wide fuselage. The tips of the wing and stab were also modified.

The left wing panel shown below was enlarged and printed out on a 8-1/2" X 11" letter size page for measurements.

The measurements for the enlarged sketch of the left wing panel are shown below.

Wing Panel Geometry
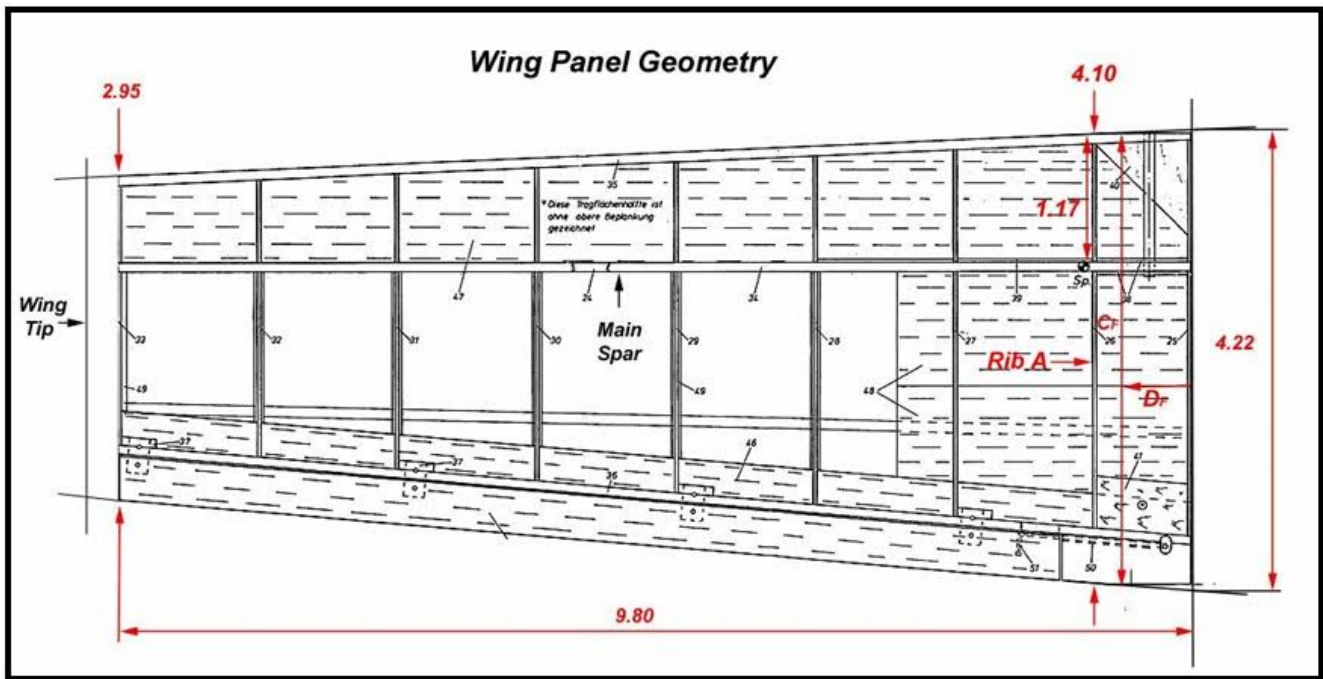
Cr = 4.22 ~ Root Chord

Ct = 2.95 ~ Tip Chord

$b/2$ = 9.80 ~ Panel Span

TR = (4.22-2.95)/9.8 = 0.12959 ~ Taper Ratio

The chord for Rib A is Ca = 4.10

The distance from the LE to the main spar for Rib A is 1.17"

The ratio for Rib A in front of the main spar is RR = 1.17/4.22 = 0.27725

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To recap the requirement, the wing is to have a chord (Cf) of 8.00" at a distance (Df) of 1.25" inboard of the wing center line. Both Df and Cf are shown on the figure above.

CALCULATIONS FOR ROOT CHORD (Cr)

The equation for a rib chord Cx = Cr - Taper Ratio X (d) ~ distance outboard from the root chord (Cr)

Cx = Cr - 0.12959 X d

　　　where Cx must be 8.0" at d = 1.25"

Therefore,

8.0 = Cr - 0.12959 X 1.25 = Cr - 0.16199

Cr = 8.16199" ~ 8.16" Full Size Root Chord

CALCULATIONS FOR TIP CHORD (Ct), PANEL SPAN (b/2), & WING SPAN (b)

The full size scaling factor (SF) is then 8.16199/4.22 = 1.93412

Ct = 2.95 X 1.93412 = 5.70566" ~ 5.71" Full size tip chord

$b/2$ = 9.80 X 1.93412 = 18.95438" ~ 18.95" Full size panel span without wing tip

　　with wing tip widths of 0.5",

b = (18.95438 + 0.5) X 2 = 19.45438 x 2 = 38.90876" ~ 38.91 Full size wing span

CLACULATIONS FOR ROOT CHORD FORWARD (Crf) AND AFT (Cra) OF MAIN SPAR

Crf = RR X Cr = 0.27725 X 8.16199 = 2.26292" ~ 2.26" Root chord in front of the main spar

Cra = 8.16199 - 2.26292 = 5.89907" ~ 5.90" Root chord aft of the main spar

Ctf = 0.27725 X 5.70566 = 1.58190" ~ 1.58" Tip chord in front of the main spar

Cta = 5.70566 - 1.58190 = 4.12376" ~ 4.12" Tip chord aft of the main spar

These full size calculated dimensions were used to develop the scale drawing of the wing panel shown below. Notice the accomplishment of the sizing requirement (8.00" at 1.25") illustrated in blue below. The" typical rib spacing" was calculated by having 7 rib bays in the exposed wing panel which is (18.95 -1.25)/7 = 2.53".

VECO PURSUIT WING PANEL
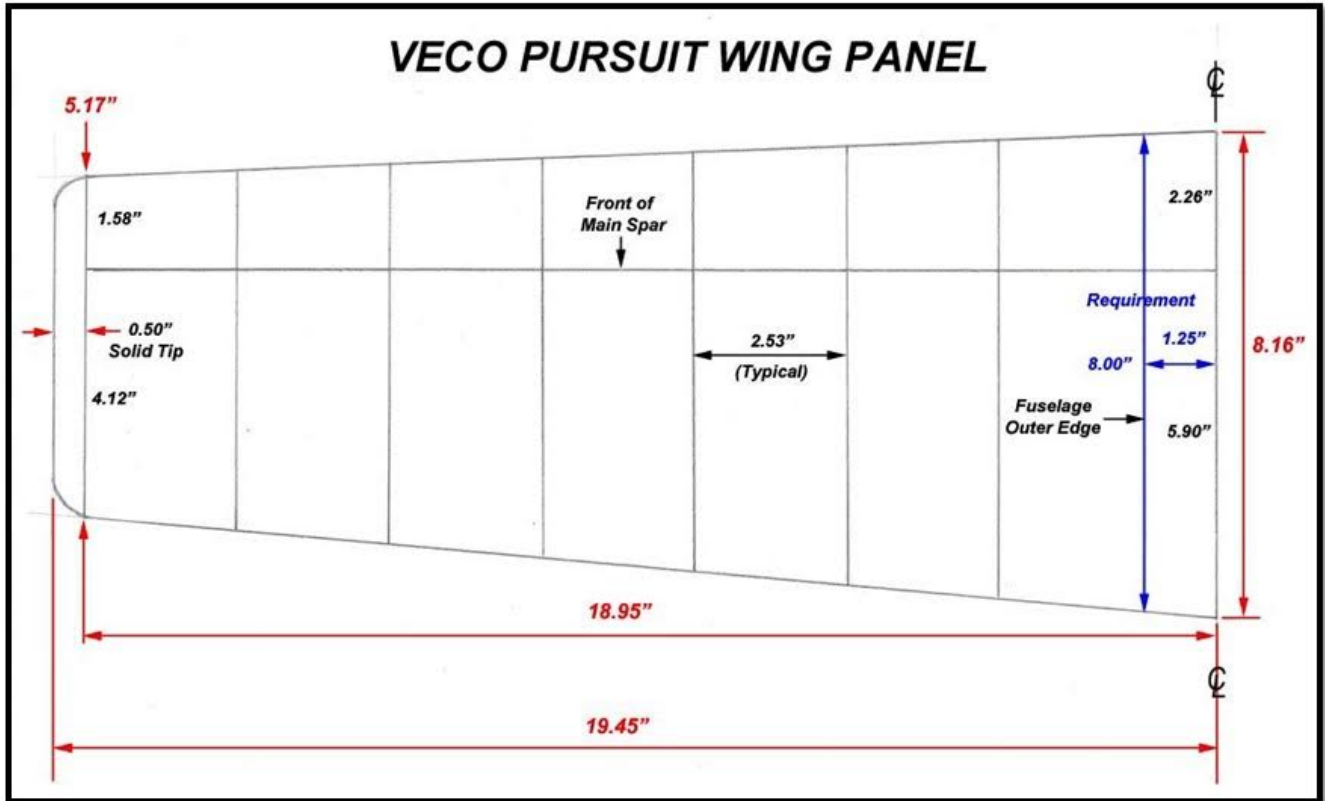
The next steps will be to draw the wing panel full size, finalize the airfoil, and design the structure of the wing. I am considering putting the main landing on the wing instead of on the fuselage. There use be hard wood strips with 1/8" slots available for mounting the wire landing gear………
Tandy