

## ASSEMBLING WING PANELS - By Don Carter

Before using matched hole tooling on the outer wing panels I was concerned about two things. First, the technique described in the "How to Build" articles did not allow for tolerance build-up between the skin attaching holes in the nose ribs with respect to the holes in the center ribs. Variations from nominal dimensions which could contribute to this build-up include location of the rear flange of the nose rib and the front flange of the center rib, and thicknesses of the spar web, spar extrusions, and wing fitting. In addition, any variation between the rib skin attaching holes and the tooling holes would contribute to the build-up. Call me "Chicken", if you will, but when I saw a simple way of eliminating or minimizing these various tolerances at the assembly level, I took the easy way out. Before punching the skin attaching holes in the ribs, I assembled a short wing spar section (about 2" long) and cleco'd a nose and center rib to the spar section (3/8 wing fitting stock must be added to the spar section when punching the -3 nose rib.) Fortunately, I had extra extrusion so was able to avoid any variation in the extrusion thickness from nominal dimension. I then inserted this assembly into the appropriate overlay and punched the skin attaching holes. As an extra precaution, I kept the ribs paired for final assembly.

The second concern was with punching and drilling the holes in the skins. Again, because of tolerances I anticipated a problem in locating the main and rear spar attaching holes with respect to the rib attaching holes. To avoid this problem, I first punched only the rib attaching holes, excluding those holes which also went through the spars. These holes also were excluded in punching the ribs from the overlays. In punching the rib attaching holes in the skin, the spar template was used to space the rib skin template at the holes adjacent to the spar locations. After punching and drilling the holes for the ribs, the wing spar with ribs cleco'd in place was positioned under the skin and starting from the rear, either top or bottom, the skin was cleco'd to the ribs at a number of hole locations sufficient to position the ribs with respect to the skin. At this time, the outer holes in the spar are used to punch through into the two outside ribs. The nose ribs are then cleco'd in place. We now have the skin cleco'd to either top or bottom of the spar-rib assembly.

The wing spar template is now, properly oriented, placed on the skin at the main spar location and the holes at the inner rib locations are punched with the 1/8 diameter duplicating punch and drilled. If a fairly rigid template (about .050) were used and the template positioned with rivets at the outer holes, the drill should be accurately aligned with the hole in the spar below. The template can be further positioned with two more rivets as dowels and the remaining holes punched with the duplicating punch. The holes are drilled later in the flat. A similar technique is used to locate the holes on the opposite side and the lower set of holes in the rear spar. The upper set of holes for the rear spar can be punched when the skin is assembled to both sides of the ribs. I also found it desirable to locate the rear spar attaching holes in the ribs at the assembly.

With the above slight deviations from John Thorp's excellent articles, the outer wing panels went together beautifully.

## BILL WARWICK'S T-18 - By Don Carter

While on the west coast during the middle of March I had the opportunity to see Bill Warwick's pride and joy. I saw everything at least 90% complete except the horizontal tail. The front end had a 180 HP Lycoming with constant speed prop -- same as used in the Mooney. Bill has temporarily installed a straight-through exhaust system with individual pipes for each cylinder. He used auto parts for this system. Bill plans to add a cross-over system later to determine the performance merits of a cross-over system. I know many of us will be interested in

the results of these experiments.

Bill has done a beautiful job inside as well as outside with plush paneling and a striking paint job. He expected to get his T-18 into the air in late April or May. Although he will be flying initially open cockpit, he plans to add a bubble later. I'm sure many of us will be interested in the performance increase when the cockpit is closed. Here's hoping the next Newsletter will include flight data on Bill Warwick's beautiful airplane.

DEAR JOHN THORP

QUESTION: What do you think about lowering the turtle deck before adding a bubble canopy?

ANSWER: "Lowering the turtle deck with the canopy would aggravate the tendency of flow to separate behind the "bubble" with its attendant drag rise."

QUESTION: How about rounding the turtle deck?

ANSWER: "Rounding the turtle deck is desirable aerodynamically, but is harder to do because of the double skin contour produced. Layout wise this is easily done as you replace the 45° flats with a circular arc. Making the skins is the problem."

QUESTION: How do you get 140 hp out of an O-290-G engine?

ANSWER: "The O-290-G is rated at 125 hp at 2600 rpm. I am planning on turning my converted O-290-G at 3000 which with cleaned up valve parts and 28° ignition timing should give me more than 140 hp."

QUESTION: Why not eliminate the door on the fuselage side?

ANSWER: "Closing the side will only complicate getting in. The sill height will be approximately 26" instead of 18", a fairly long step."

QUESTION: What about flaps?

ANSWER: "In my opinion, plain flaps are not worth the bother. The span loading of the T-18 is fairly high so to keep sinking speeds reasonable, the better of the NACA slotted flap is desirable. I will eventually design slotted flaps for the T-18."

Fuselage Skin Templates

Dick Cavin now has two complete sets of fuselage skin templates which were copied from Thorp's originals. They include sides, top, bottom and quarter panel. They will be sold for \$37.50 to the first buyer. He will then sell them for \$3. less to the next guy. Write to Dick Cavin to get on the list.

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Bush Pilot - Anyone who can't afford a radio for his T-18.

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Wife: Dear, don't you think you should file out those scratches in your wing?

Slip Shod: Naw! I'll just put lots of paint on them so the FAA man won't see them.