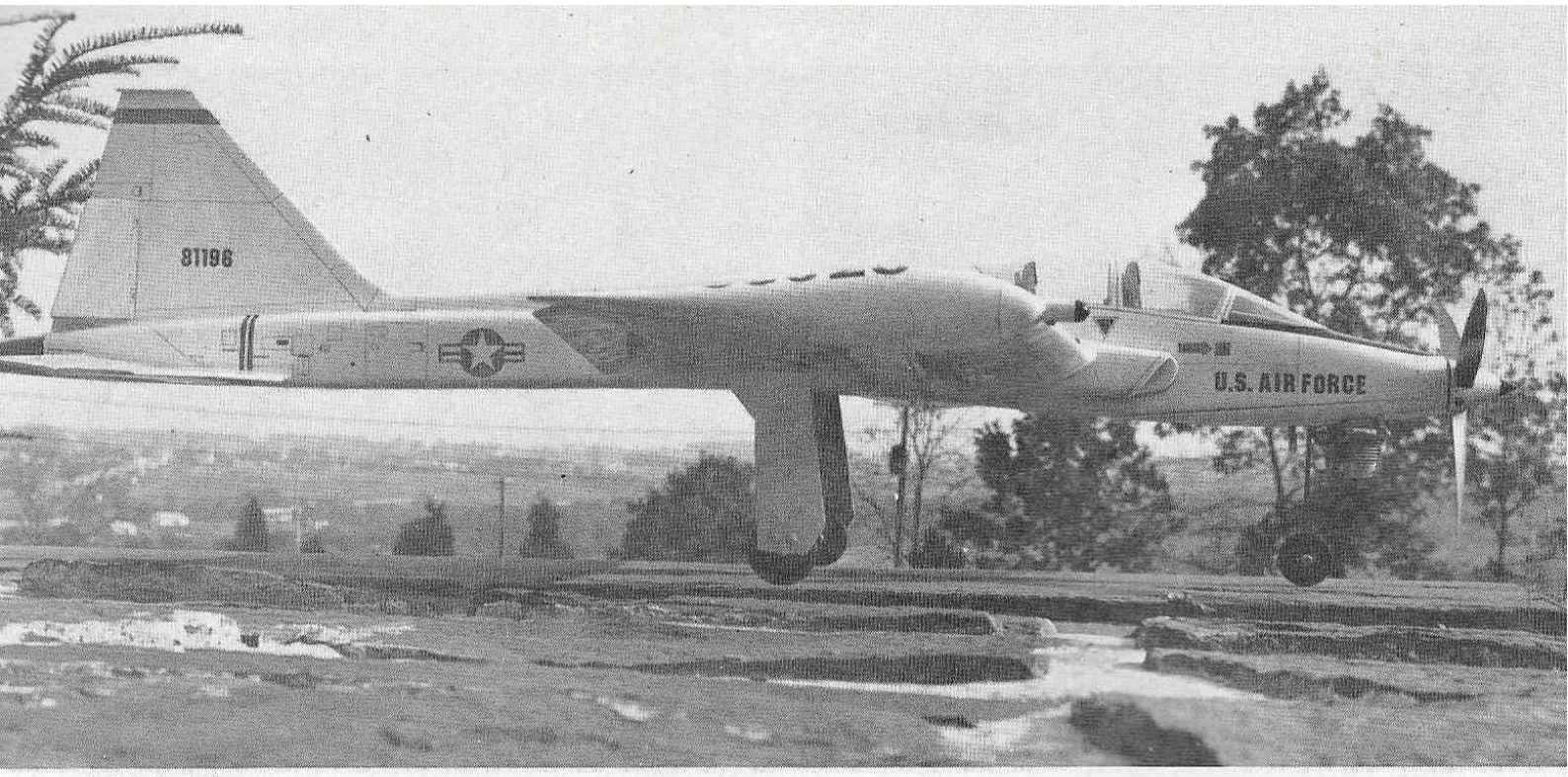


Photo by the Author

C/L Stunt "Talon"

by Dave Rees

A T-38 at the Reading Air Show was the inspiration for a very different looking C/L Stunter with intriguing lines and performance to hold its own flying with the experts.

The first *"Talon"* I had ever seen up close was at the '73 Reading Air Show where the Air Force put one on static display. As I walked up to it, the sleek, unusual profile struck me as an ideal one for a Semi-Scale Stunter. A week later I was busy at the drawing board trying to capture the flavor of the "*Talon*" while the memory was still fresh in my mind.

This plane is probably not going to be your first step up from a profile Stunter, so I am not going to write a "glue this to that" discourse. I am assuming you have built at least one *Nobler*, are fairly familiar with building a competitive Stunt plane, and know how they fly. I will thus give only such construction notes as are peculiar to this design, and present the rest under general headings which I hope you will find more informative.

Foam Wings

For those of you who are not flying foam winged Stunters, I wish to urge you strongly in that direction. In my mind they are unquestionably the best construction method for a model aircraft to be used in this event. I think fellows like Bob Hunt of Control Specialties Co. (Box 268, Middlesex, N.J. 08846) and any others who helped bring the foam Stunt wing to its present state of the art, deserve a great deal of credit for their efforts.

First on the list of advantages to me would come accuracy of airfoil and permanent freedom from warps. A 1/16" one way or the other on an airfoil can mean the difference between an ultra-responsive superstunter, and one that won't fly right even if you put a .60 in it.

Next would be speed and convenience of construction, and the ability to rub up a better finish. They also stand much more abuse during a hard season of flying than a built-up wing will. It is possible to make a built-up wing which is lighter, but you really have to work at it, and you do so at the expense of some of the aforementioned advantages. Most Stunt flyers on the east coast that I have had the privilege of meeting are using them.

Whether you buy the foam cores or a finished skinned wing, follow the assembly instructions included with them explicitly. They were arrived at after lots of experimentation, and are necessary for the successful use of a foam wing. The laminar flow airfoil, used on this design to present a more undisturbed flow of the air to the flaps for sharper turns, would be difficult to achieve with a built-up wing construction.

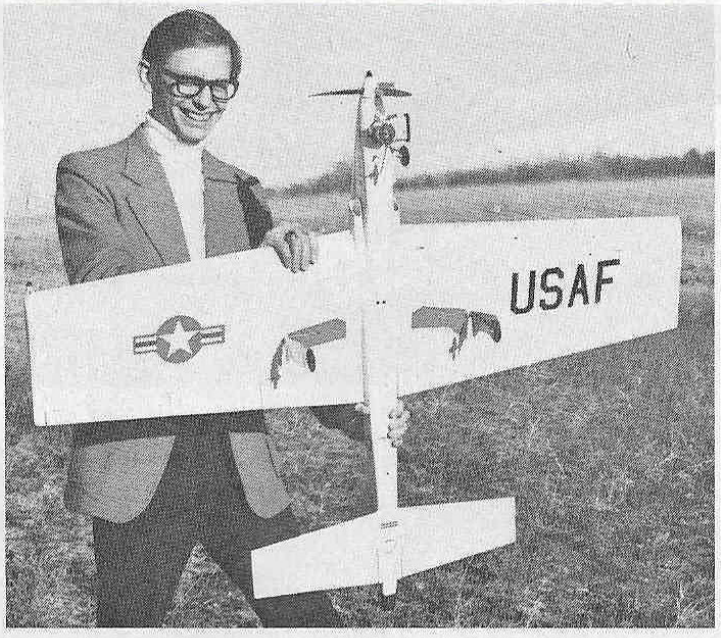
Cements

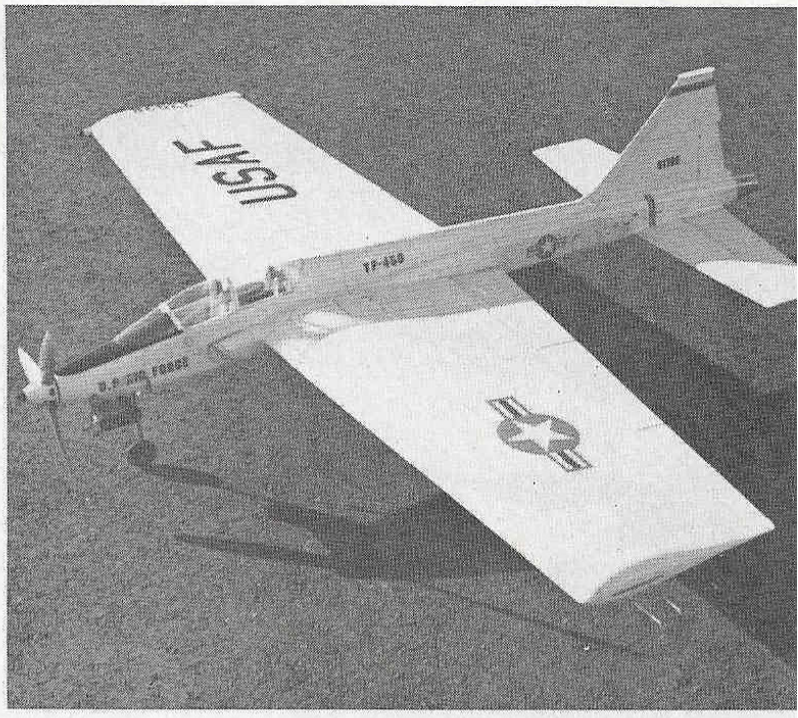
There is much to be written about the use of today's adhesives in an aerobatics model. Adhesives fall into two basic catagories: solvent release types that harden by exposure to the air, or "drying"; and chemical reaction types which harden after the two parts necessary to complete a chemical reaction are mixed together, air not being required. All cements must be used on clean bare wood for highest bond strength.

The principal advantages of the aromatic solvent glues such as Ambroid are their light weight and their ability to be sanded and carved easily. They do not form as strong a bond as other types, but they can be used in lower stressed joints. Any joint that will be presented directly to the finished surface of the model should be made with Ambroid. There is some tendency of this glue to bleed through light colored dopes, but this can easily be sealed by spraying a light undercoat of silver on first. Use for seams in wing skins, joining rudder parts, cementing top and bottom blocks to fuselage, and rear three bulkheads. Never use on foam as it dissolves it.

Perhaps the strongest cement for balsa wood is the alphtatic resin glue such as Titebond. It soaks deep into the fibers and forms a tough, slightly flexible bond. It

FM photos: Jim Boyd

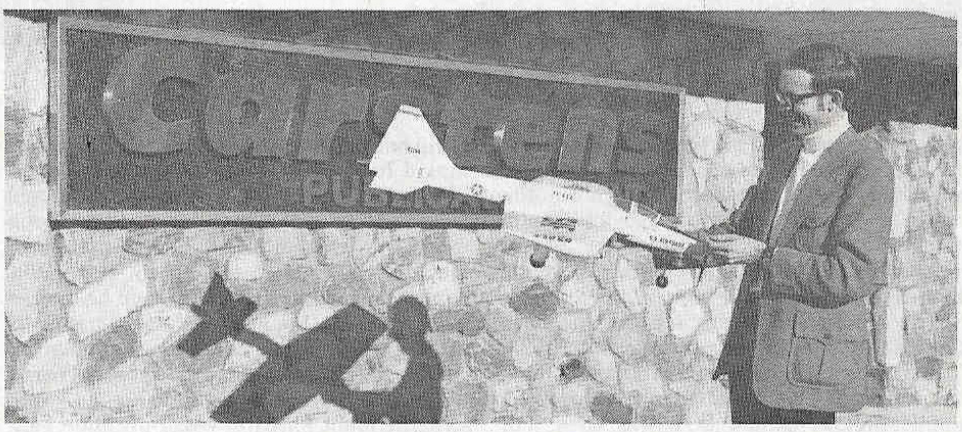




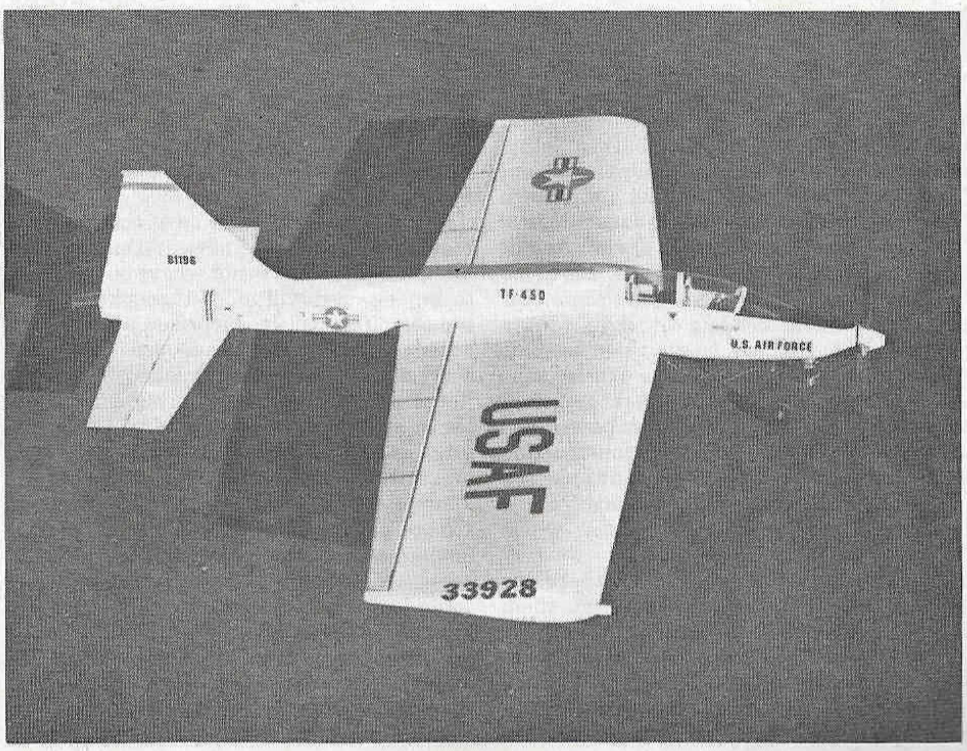
Lean in line with a fascinating profile, Dave Rees' stunter captures the feel of the T-38 "Talon." Clean work and fine ink line detailing, along with cockpit details make this an impressive ship, and it flies superbly.

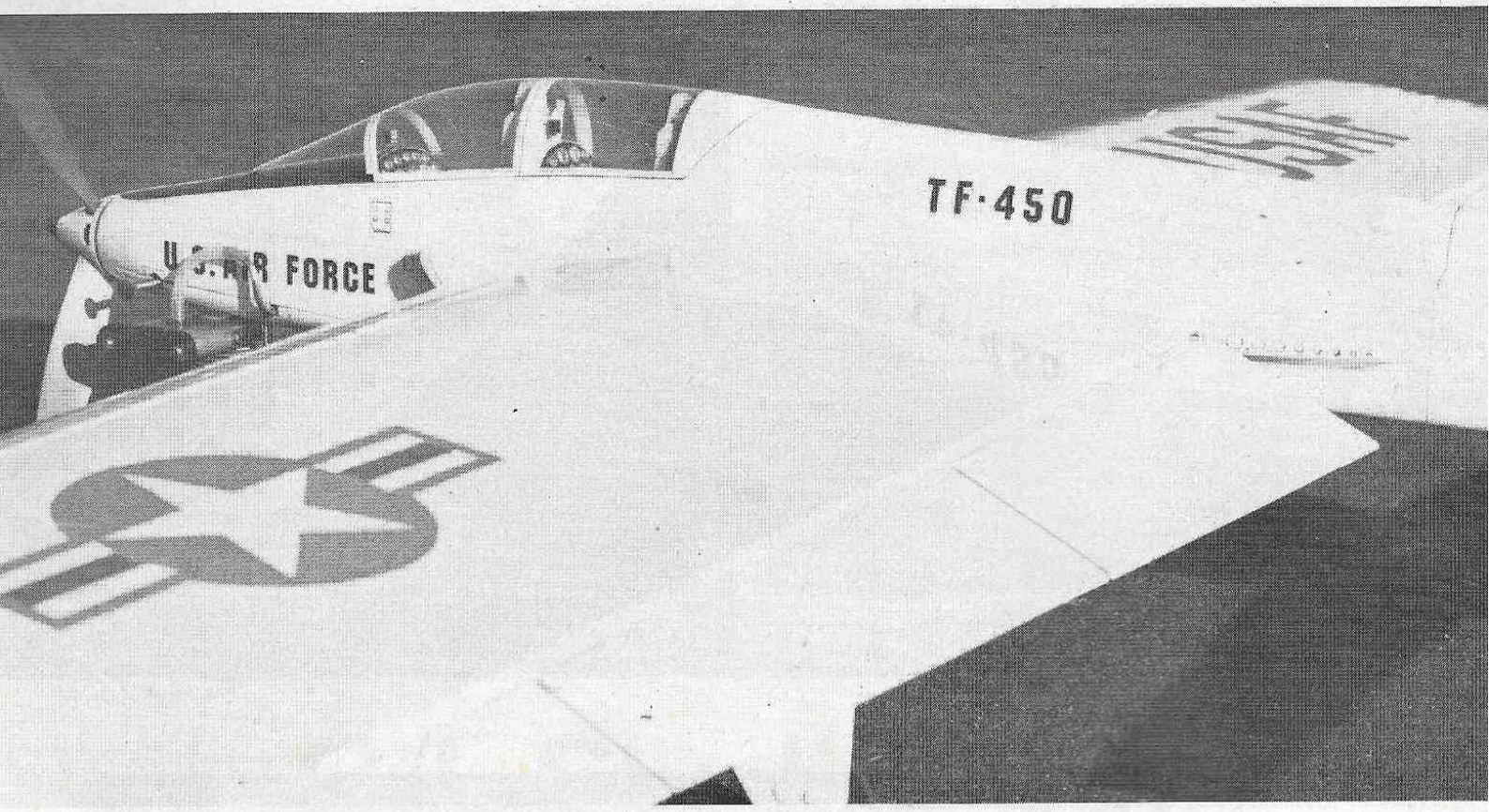
is so tough, in fact, that it's much more resistant to sanding and carving than the wood around it. Even if a seam is sanded smooth and finished, it will often return as a slight ridge when the wood gives up moisture and shrinks slightly. However, it should be used for highly stressed joints, joints that will be covered by fillets, and interior work. Also this glue will not dissolve foam, and can be used to advantage when cementing directly to wings—provided that sufficient air will reach the joint for the cement to harden. Use for cementing leading and trailing edges to wing, cementing gauze over a wing center joint, cementwing, tail, and side blocks to fuselage, and for cementing plywood doublers to fuselage side sheets. Dope finishes do not adhere well to Titebond, so never use it in a corner or fillet type condition that is to be painted. This glue tends to be heavy and care should be taken to fit joints well for minimum glue line. All excess should be wiped away with a damp paper towel. It takes a surprisingly small amount of Titebond to make a strong joint.

Unlike the aforementioned glues which are solvent release types, the epoxys harden in various times after two parts are mixed together. While this mixing is somewhat of a nuisance, they are very useful in special ways. I prefer the Devcon clear five minute hardening type. It forms a very strong bond with metal and plastic as well as hardwood balsa, and is insoluble in just about everything. It can be sanded and carved fairly well in thin glue lines. It does not attack foam and is most useful in joining to foam where no air can get to the joint. Foam will not allow solvents through as wood does. Use epoxy in making the structures around the engine which are likely to become fuel soaked. Most finishes do not adhere well to epoxy, however I find Aero Gloss clear will usually stick well enough, provided the epoxy has cured for a week or two, is well sanded, and the hardener washed off with thinner, Epoxy is heavy, so use it sparingly. Use for joining wings at center,



Dave Rees brought his "Talon" out to FM's new office where we photographed the builder with his plane, **above.** Ample control surfaces and effective stunter proportions show in the view of the "Talon" **below.**





cementing wing tips to foam, installing landing gear blocks in wings and gluing motor mounts to doublers. You might also use it to install the first three bulkheads, mounting the canopy (roughen plastic first with 400 sandpaper), and installing hinges and control horns.

The last cement on my shelf of specialty chemicals is 3M spray contact cement #8074. This I use only for applying skins to wings. It too can be heavy, so don't overdo the application. It should take less than half of a 17 ounce can to skin this wing. Spray in an open area as it makes everything in the shop sticky.

Balsa Wood

This is one of my favorite subjects. I have found almost without exception that the best Stunt flyers are connoisseurs of fine balsa wood. The selection of the lightest possible wood is crucial to the way a Stunt ship performs. We are building a structure almost entirely of wood, so the most logical place to concentrate on when saving weight is in the wood itself. If you don't have one already, start by buying a good scale that has a maximum reading of eight to ten ounces. The balance beam type is most accurate, but the spring type can be used if you calibrate it first using a good set of weights. An ounce error can be critical. Some time before beginning a construction project, start making the rounds of the closest hobby shops looking for wood. Taking along your scale, go through the whole pile, and if you're lucky a piece or two may be found in the size required. If there are several, buy them anyway and store them away, because you may not find any next time you need it. The way wood prices go up, it is always a good investment. Look for that pale fine textured wood with a straight, constant grain that will be easier to fill and finish. Straightness, too, is important. I find some wood has the nasty habit of twisting or bowing after I have it home for a week or two. The tight stacking along with the air conditioner tend to make the stuff look perfect in the hobby store. But don't be fooled, let it set in your basement several weeks before deciding to use it. If warping does occur, use it for propping the window open and get another sheet. Warps always go in one direction: worse, and non-straight stunt ships develop peculier handling problems. There are enough problems to this game when everything goes well, without adding structural ones. Edgewise bowing is usually not a problem except for wing skins. It will make the job of making good seams much easier if the sheets have straight edges. If not straight, they should all be cut from the same slab, so at least the curves all match. Trimming sheets is difficult at best, and can be avoided by careful selection.

Of course weight must be at the absolute minimum. If you are new at this type of building, this wood is not what you are used to buying, and will more than likely seem too soft. You will be surprised at how soft a piece of wood can be used, once it has been correctly assembled and finished. This ship, like most Stunt planes, is designed so that the lightest wood you can find will still perform satisfactorily. Lightening can only make it fly still better. But we need to know exactly how light is light enough, when we are pawing through the pile under the anxious eye of the shopkeeper. The lightest balsa weighs about four to six pounds per cubic foot. Heavier than six should not be bought, and less than four I'm still looking for myself. By calculating the volume of standard stock sizes, a chart can be made to pinpoint the weights. You may cut this out and hang it on the shop wall as your guiding light. Other sizes and lengths can be extrapolated.

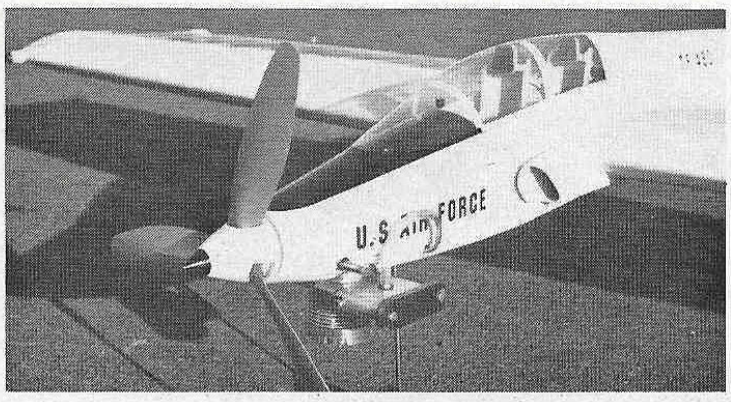
Balsa Stock Size	Weight-Oz. (4 lb/ft3)	Weight-Oz. (6 lb/ft3)
1"x3"x36"	4.00	6.00
½"x3"x36"	2.00	3.00
⅜"x3"x36"	1.50	2.25
¼"x3"x36"	1.00	1.50
⅛"x3"x36"	.50	.75
1/16"x3"x36"	.25	.37
1/32"x3"x36"	.12	.18
1"x4"x36"	5.33	8.00
½"x4"x36"	2.67	4.00
⅜"x4"x36"	2.00	3.00
¼"x4"x36"	1.33	2.00
⅛"x4"x36"	.67	1.00
1/16"x4"x36"	.33	.50
1/32"x4"x36"	.16	.25
1"x4"x48"	7.11	10.67
½"x4"x48"	3.55	5.33
⅜"x4"x48"	2.65	3.99
¼"x4"x48"	1.77	2.66
⅛"x4"x48"	.88	1.33
1/16"x4"x48"	.44	.66
1/32"x4"x48"	.22	.33

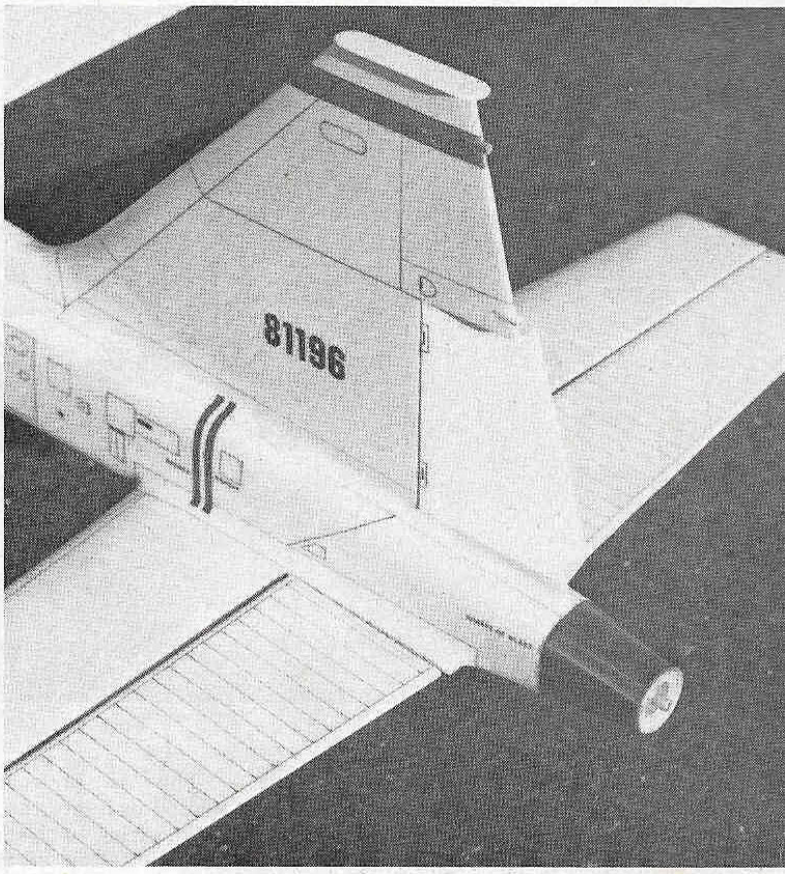
If six pounds per cubic foot wood is used, about 20 ounces are required for this plane; if four pound per cubic foot wood is used, only 15 ounces are needed. Try saving five ounces by another means and see how difficult it is.

Alignment

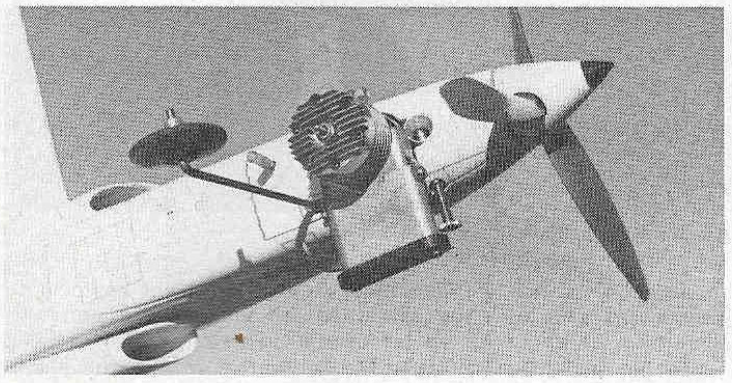
This subject, too, is of great importance. It may sound like each part of the construction of a stunt ship is critical. It is. Good performance is no accident.

Each person must be inventive and develop his own little tricks to insure perfect alignment. My favorite one is to draw lines on both sides of the fuselage before they are assembled. It is always difficult to find a good centerline on the wing and stab, so





As can be seen at **left**, details make the difference, especially around the canopy. Inked lines make the austere tail area at **right** seem to be teeming with detail. Note the mounting of the engine **above** and **below**.



centerline them also before carving leading edges to shape. Then, if all lines are lined up with the ones on the fuselage, you have the profile alignment taken care of. Front view alignment is usually not difficult. By sighting head-on to the plane, the eye can easily detect differences here. Plan view alignment is tricky. The fuselage must be perpendicular to the rear edge of the wing. Measure out 20" from the center wing seam and draw a pencil line on the trailing edge of the wing. Ignore the flaps. Now, with the wing loose in the body, center the wing seam and measure from each of the pencil lines to the tip of the rear of the fuselage. Both distances must be equal before cementing fast. Next, measure equally from wing trailing edge to stab trailing edge on both sides to position stab parallel to wings. There are many other ways, too, but whichever you use, keep checking continuously during all phases of construction. Measure, measure, measure.

Control Mechanism

It is desirable that the control surfaces move with as complete freedom as possible. Free control response allows for a lot of feedback or "feel" to the handle; particularly necessary during landings when there is less line tension. A good way to check their floppiness is to see how they hang when the model is sitting on its gear with no lines attached. The flaps should hang down with their own weight and perhaps blow in the breeze.

To achieve this smoothness requires attention to all the pivots in the system during construction. I stress the word "during." Don't wait for the controls to loosen up from flying. They may not. They should be loose before you've finished construction, too. All pushrod holes in horns should be brass-bushed. I use thin-walled brass eyelets peened over tightly. Take care to insure that pushrods do not drag on anything through the full 45° travel and fairlead the bulkhead with nylon tubing. Do not let any epoxy get in the horn pivot tubes when cementing horns in place.

An important point to remember is that all hinges and horns must rotate about exactly the same axis or binding will result. I find that a rotary slotting saw is most effective in making sure all hinges fall in line. Cut the slots in the trailing edges and control surfaces before shaping them. Adjust the stop on the saw to place the slot exactly in the center of these blanks and cut all the slots, always referencing from the same side of the part. Cut slots for the horn keeper straps at the same time. Then taper and shape the parts before cementing hinges and horns permanently. Apply approximately a pinhead sized drop of STP to each pushrod pivot for permanent lubrication.

During painting, there is a considerable build-up of dope on the hinges. Using the tip of a knife, chip this away completely from the hinge barrels at two points in the finishing process: just before color is applied and after all painting is done. The reason for the earlier step is to prevent chipping away a large piece of undercoat with color on it, perhaps leaving unsightly bare wood.

Fillets

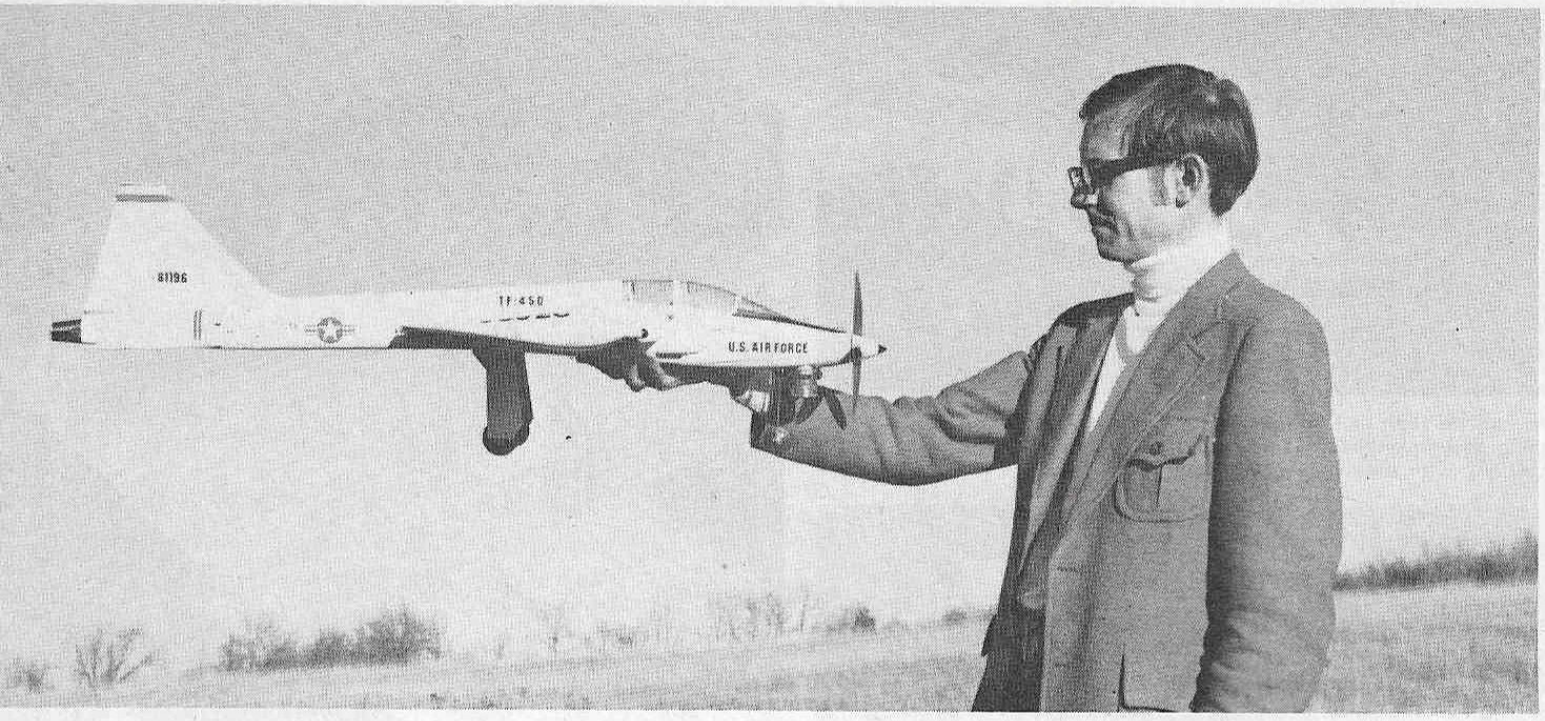
Few people realize that fillets are one of the most significant parts of the aerobatics airplane. Almost all judges are "fillet-feelers," and nothing knocks your score faster than bad fillets. I would never presume to say that I have the foolproof fillet method, if such a method does exist. There are several good materials available, the most successful for Stunt models being the epoxy or polyester based ones. They are at best difficult and tedious to apply. I find the micro-ballons/polyester mix the easiest to sand, but still somewhat harder than the light balsa used for a Stunt ship. For best results, fillets should be applied carefully so that a minimum of sanding is required after hardening. Any major shaping will only result in gouged or uneven balsa adjoining the fillets. The most insidious part of fillets is that the finish adherance to them is unreliable. Perfectly gorgeous fillets can suddenly lift in the middle of the season after the sun gets to them for a while. Aero Gloss clear dope sticks best and should be used as an undercoat for this reason, no matter what dope you follow it with.

This design is a good one to show off your fillet prowess. There are not only fillets around the wing and stab, but two of them run along the fuselage from the center of the wing to the rudder. Make a small fillet under the UHF antenna atop the rudder to keep the finish from lifting there. A small amount of fillet material should also be used to smooth up the area around the canopy inletting.

When you see a high luster finished Stunter with perfect fillets, you know the man who made it has learned the craft of model building well. So spend the time and learn to make good fillets if you expect to gain high appearance scores.

Construction Notes

You probably will notice that the space between doublers is too narrow for the lugs of the OS MAX .35S. The lugs were cut down slightly as follows. With a scriber, draw a line on the underside of the lugs .062 inches in from the outer edge. Grind lugs off to this line. Close all openings to the



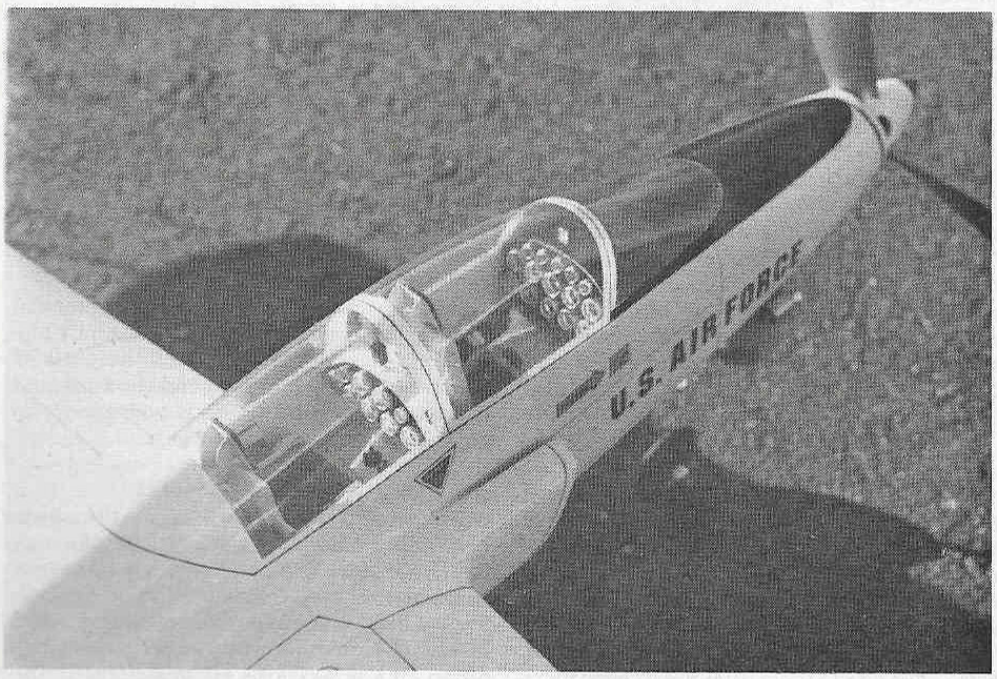
engine with masking tape to keep filings out. The edges of the lugs should now be just tangent to the mounting screw holes. Using a 1/8" diameter mouse-tail file, file straight in from the edges of the lugs until the present holes are 1/16" closer to the crankcase. A smooth, U-shaped slot should be made for each 4-40 mounting screw that is 1/8" wide and 1/8" deep. This should place the blind nuts exactly in the center of the 5/16" wide motor mounts.

The peculiar looking tube sticking out of the outboard wing tip like a radar boom is a container for tip weight. It will allow experimenting with tip weight at the flying field and is easier to make than a hatch type. Make up a few lead weights and a few balsa spacers to keep them from rattling back and forth. The original needed about one ounce for final trim.

The 1/16" plywood doublers were extended well into the center of the wing to tie the wing to the fuselage better and reduce vibration of the nose portion. The motor mounts also were extended and cemented to the leading edge of the wing. These were necessary because the larger-then-normal canopy and removable tank tend to reduce the structural integrity around the nose.

The octagon tank required to fit within the fuselage shape is not as difficult to make as it looks. Carve a pine block the shape shown and, using .006" thick steel or brass, wrap it around the block and solder one end on. Remove the block and install tubes and final closing end. Fill with lacquer thinner and let set overnight to dissolve soldering fluxes. Finished weight should be less than one ounce.

People seeing Dave's "Talon" invariable comment on two things, its unique profile and the detailed cockpit area. Dave shows that profile **above**, and the cockpit stands up to close examination **below**.



The canopy shape does not conform to any standard stock item and you will have to form it yourself. Carve a balsa block to the contour shown on the plans, carefully sanding it to as smooth a surface as possible. Make a female half for the mold by tracing around the balsa form onto a piece of 5/8" thick plywood. Saw this out so that about 1/16" clearance exists all around. Tack a sheet of .030" thick acetate-buterate sheet to the underside of the female mold using thumb tacks spaced 1½" apart. Place this assembly in an oven at 250° to 275° F until it visibly softens. Quickly remove from oven and press down over form and hold until cool.

Do not cut out the fuselage sides below the wing when installing the wing. If this is done, the fuselage becomes too flexible and profile view alignment will be next to impossible to control. Instead, assemble the fuselage on the wing. Begin with the wing completed except for flaps and tips. The control horn for the flaps and the push-rod are in place and connected to the bell-crank and leadouts. Glue the doublers and motor mounts to each fuselage side and cut a 3/32"x1½" long slot in them directly behind the airfoil cutout. This is to permit the sides to be slid onto the wing over the flap horn tails. These slots will be covered by the short balsa flap fillets anyway. Now cement all bulkheads in place and let dry. The fuselage is now complete, but loose on the wing. It can now be carefully aligned and cemented fast.

The only place I would recommend anything but ultra light balsa to be used is the wing leading edges. The reason such small leading edges were designed into the airfoil was to permit use of a medium hard piece without adding a lot of weight. This saves a lot of dents in the leading edge from a long season of flying.

There have been many fine articles written on finishing techniques, so I will leave this up to the reader's preference. The original was painted using polyester resin, Aero-Gloss filler and color, with the final coats being Sig Lite Coat Clear. No tissue covering was required.