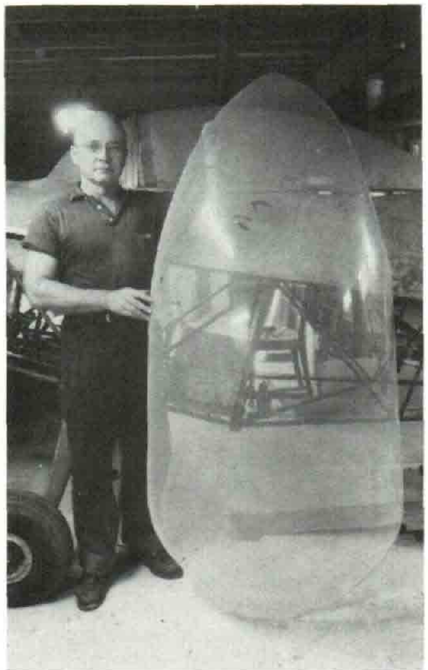

Relative height of plexiglass bubble. Author is 5 ft. 8 in.

How To Make A Plexiglass Bubble Canopy

By Otto Kolisnyk, EAA 2494
80 Lillian St., Feasterville, Pa.

(Photos by Bill Selby)

MANY PILOTS have looked at sleek plexiglass canopies with more than just a touch of envy. I suspect that more than one, myself included, wished his own aircraft equipped with one. Nothing else offers such unexcelled vision with complete protection from the elements.

When I first decided to build my two-place Stits "Playboy," I was determined to have a go at making a canopy. After some research and advice from the Rohm and Haas Co. in Bristol, Pa., I decided to give it the old college try.

Selection of the plexiglass is quite important. There are a number of grades offered, and type IV of the pre-shrunk variety is also ultra-violet resistant. It has a working temperature of approximately 325 deg. F, and offers about three minutes working time before it cools off and takes a permanent set.

I selected two sheets of ¼ in. thick plexiglass, 4 x 7 ft. long. I thought the second sheet would be a little added insurance in case something went wrong. Of course, if everything went well, I would wind up with a "spare."

I designed the canopy so that the windshield and the canopy would be blown in one piece — the windshield to be separated later. This simplifies the design of the form and eliminates an extra jig. An extra bonus is derived because blowing the windshield — cum canopy assures uninterrupted symmetrical lines.

I determined the bubble dimensions by carefully measuring the fuselage and arriving at approximate figures for length, width and height. I say "approximate" because this was to be a one-shot affair and economy was an important consideration. As a one-shot affair, there

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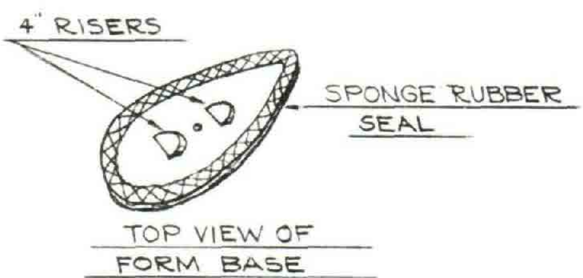
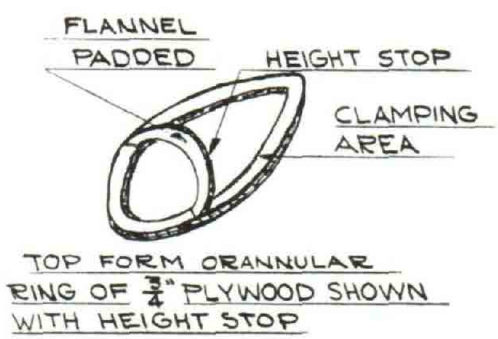
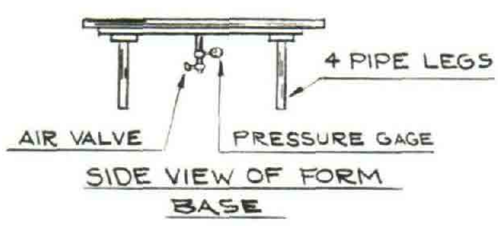
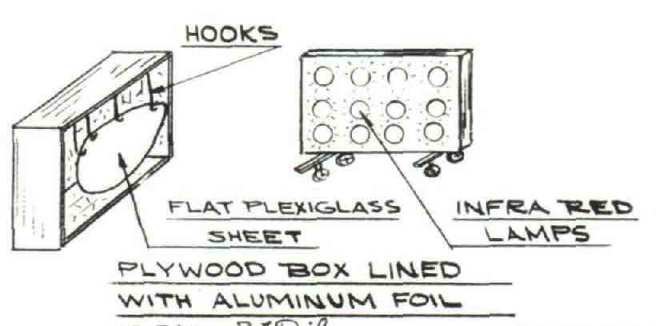
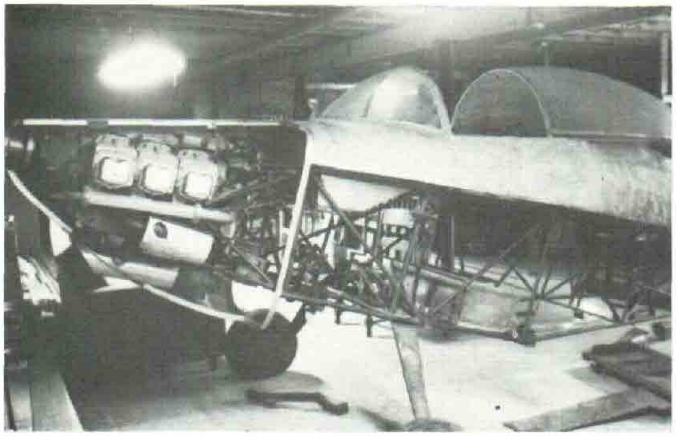


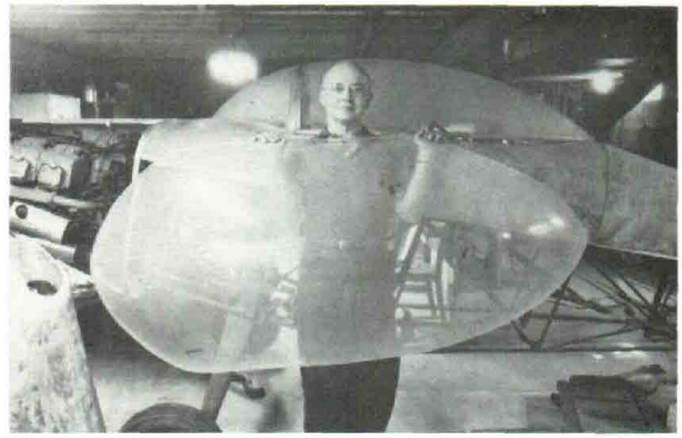








Bubble shown in open position fastened to tubular rails riding in linear ball bearings. Engine is 150 hp Franklin.



"Spare" canopy shown before windshield section is separated from rear canopy. ¼ in. thick, type four, ultraviolet resistant plexiglass was used.

PLEXIGLASS BUBBLE CANOPY . . .

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was no opportunity to correct the form dimensionally if my allowance for shrinkage was off. This situation could only be determined by trial and error on a production basis.

One of the most critical factors involved in blowing a plexiglass bubble is the heat problem. Care must be taken that the plexiglass is raised to the proper temperature, and that enough heat is absorbed to make the plexiglass thoroughly limber and flexible.

For my purpose, I constructed a plywood box 6 ft. high and 8 ft. long. The box was 18 in. deep, and I lined it with aluminum foil to reflect the heat. Hooks were arranged to hold the plexiglass sheet lengthwise and on edge. The hooks were actually extra large spring clips, using a ¼ in. dowel and faced with emery cloth to grip the plexiglass. The plexiglass sheet is heavy and becomes quite quite slippery, especially when hot.

The next step in the process is constructing the base of the form with which the bubble itself is to be blown. For this I used two pieces of ¾ inch plywood. The upper part of the base consisted of ¾ in. plywood cut out so that it was 2 in. larger on its periphery than the exact dimensions and shape of the base of the plexiglass bubble in the finished state. The 2 in. margin represents the clamping area for "C" clamps.

The other piece of ¾ in. plywood is nailed and glued to the bottom of the form base. Four pipe legs were fitted to raise the base to a convenient height off the floor. A half-inch air valve and an air pressure gauge is fitted on the bottom of the form base so that they are easily accessible.

Sponge rubber approximately 3/16 in. thick and 2 in. wide is carefully glued in place all around the top of the form base, and then the entire base is covered with a soft cotton flannel. The sponge rubber acts as an air seal between the hot plexiglass and the form base. The flannel helps insulate the latent heat of the plexiglass and helps to prevent marring of the glass.

Now we come to the form ring which is also known as the annular ring. This ring is constructed of ¾ in. plywood and determines to a large extent the finished plexiglass bubble cum windshield. The form ring must be cut to match the top of the base form.

The center section of the form ring is cut out to the exact dimensions of the windshield-canopy combination. Here you must estimate the approximate shrinkage of the glass; allow for the thickness of the glass, and determine the inside or outside dimensions of the bubble. The bottom of the form ring must have all sharp corners rounded and greased with a tallow to prevent rupturing the plexiglass.

Ken Anderson of Kenroy Sign Co. in Langhorne, Pa., very generously offered me the use of his bank of infrared lamps. These lamps were of the high wattage type.

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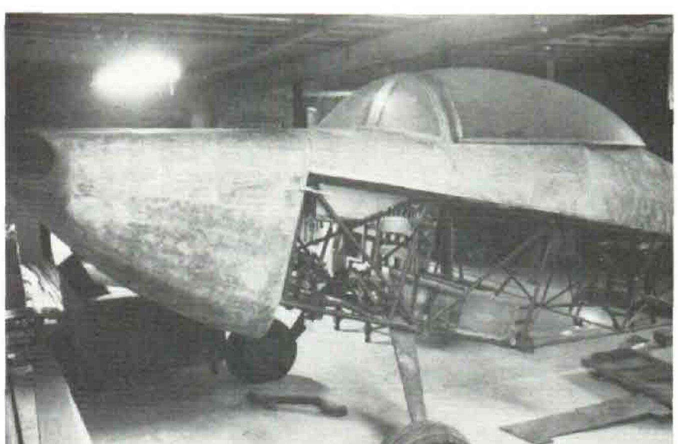
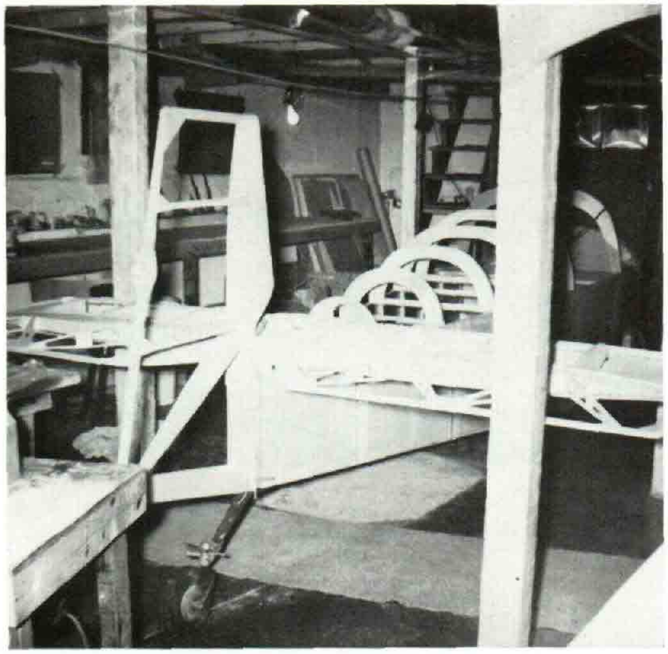
Rear view of canopy and ship.



View showing symmetrical lines of fiberglas cowling and bubble canopy.



Bill Eliason's Jodel D-11

By Rem Walker, EAA 11640
Estevan, Saskatchewan

BILL ELIASON, EAA 18287, 223 River St. E., Moose Jaw, Saskatchewan, has made great progress on his Jodel D-11 as these pictures show. Bill is an airframe technician in the RCAF. He has been a private pilot for six years and interested in ultra-lights for some time. He started building the D-11 in November, 1962 in a small two-bedroom apartment. He is now living in a house and construction is going on in the basement, which means that a wall will have to be knocked out upon completion.

Bill's D-11 will have a complete blind flying group of instruments and be equipped for night flying. Canadian regulations now permit the flying of ultra-lights at night. A Continental C-90-8F, with only 500 hrs. on it has been obtained to power the aircraft, but unfortunately, it is not equipped with the starter and generator. This will be procured later.

Bill has done a nice job on the plane and had hoped to get a Certificate of Airworthiness as the DOT inspector felt that workmanship and materials were worthy of a C. of A. However, since it is an ultra-light project, Bill cannot get a C. of A. This is his first experience at building an ultra-light.

Bill has completed the ailerons except for cover, has the fuselage complete except for covering, has some of the instruments installed and has the tail group ready for cover. At present he is finishing the spar. The wing ribs are nearly all done and it should not be too long before a wing takes shape in his basement workshop.

A Cessna spring gear with 6.00 x 6 tires will be used along with a steerable tailwheel. Dacron will be used on the plywood surfaces and Irish linen will be used on the balance of the plane. Plasti-glo will be the finish for the Dacron covered parts with dope on the linen. Bill is hoping to have the Jodel ready for the air during this year. The Jodel D-11 is a popular two-seater and when Bill has his flying it will give sport aviation in Canada another boost.

The pictures show the plane in the basement. One shows Bill as he installed the tail light on the rudder. Note the partially completed spar in the background.

PLEXIGLASS BUBBLE CANOPY . . .
(Continued from preceding page)

There were a total of 35 lamps set in rows of seven mounted on a vertical frame which was set on casters. The lamps were brought to within 2 ft. of the plexiglass sheet in the plywood box. Cardboard sheets were banked around all openings to help prevent heat loss.

The plexiglass sheet was trimmed to roughly conform to the top of the base form and all paper backing removed. The sheet was then placed in the oven and in about 45 min. it was hot enough. Ken and I walked into the makeshift oven, lifted the plexiglass off the hooks and laid it on the form base. The outer ring was set in place and clamped at 3 in. intervals along its entire periphery. There were five volunteers for this job and as soon as the clamps were down tight, I slowly turned on the air pressure.

Under these conditions, the plexiglass becomes as a living, breathing entity. This is due to inevitable air leakage around the form, and to compensate for this, one must adjust or "ride" the air valve to keep the height of the bubble to the desired level. I used a padded wood stop at the windshield junction set for 18 in. At this height, or apex of the "bubble," the plexiglass loses 1/16 in. in thickness.

The method of blowing a plexiglass bubble just described is known as the "free blown" method. Another method, equally effective, is very much the same but a vacuum box and pump is substituted for air pressure. In either case, the end result is the same. The plexiglass bubbles are crystal clear* and there is no optical distortion or marring of the surface.

*Canopies were dusted with talc in order to photograph.