Blanik L-13

A beautiful Stand-Off Scale soarer of the Czechoslovakian tow-place intermediate machine. It makes a great model with an optional power pod/**Bob Aberle**

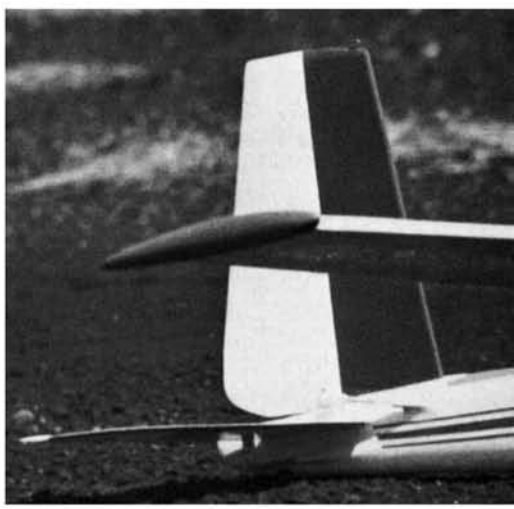
PHOTOGRAPHY: BOB ABERLE AND DON MC GOVERN

Why this particular model? I get asked that question quite often. Sometimes I will build up a new design strictly on impulse. On other occasions I'm looking for a suitable test bed to try out a new radio or accessory item. In this particular case I got interested in the Blanik L-13 glider thanks to FLYING MODELS, Editor, Don McGovern. Don enlisted for pilot training in the "big war" years. You can date Don by deciding what you think really was the big war. Although he has flown the typical powered light planes for years it was only last summer that he took a more active interest in full scale glider flying. The most active glider group on Long Island is the L.I. Soaring Association which is based at the Brookhaven Airport near Shirley, New York. Don has applied for membership in this club and has been taking transitional training flights in their Blanik L-13. As you probably have guessed by now, the R/C model presented in this article, is a duplicate of the full scale Blanik which Don has been soaring around in.

As it turned out the Blanik L-13 is ideally suited for modeling. The full size glider has been given the unofficial title of "World's Most Successful Sailplane". Although you might not initially recognize the name you will most likely see a Blanik at each glider facility throughout the country. The Blanik L-13 is actually built in Czechoslovakia by the L.E.T. National Aircraft Works. One of the U.S. distributors is the Aerosport Co. of 2680 East Wardlow Road, Long Beach, California 90807. They offer a complete brochure, with photos, of the full scale Blanik for those interested. The price of the basic Blanik, as of May 1977, was $14,950 P.O.E. It is a two place (tandem) configuration of basically all metal construction. Although employed quite often as a trainer it has full acrobatic capabilities when flown solo. Wing span is 53 feet, length is 27 feet and the wing aspect ratio is 13.7. Net weight is 644 pounds while the maximum flying weight with two persons on board is 1100 pounds. The Blanik employs a semi-retractable landing wheel and a special Fowler flap system on the wings. The most distinctive feature of this glider is the 5 degree of forward sweep in the wing panels. Normal finish is natural aluminum (polished) with an anodized coating plus some decorative stripe trim. The subject for our model happens to have been painted (more on this later). The flaps, ailerons, rudder and elevator are fabric covered, while the spoilers as might be expected are of metal construction.

Several years ago, Le Gray, presented a very detailed article on the full scale Blanik L-13 in his R/C soaring column (Model Builder, July, 1974). Le also described some R/C modeling possibilities for this glider. Surprisingly, I could not find a single reference of a construction article on the Blanik, up to the present time. I hope I haven't overlooked anyone. After the fine write up Le gave the Blanik I would have expected a design or even a kit to appear within a year's time. My R/C model version was scaled from the three view supplied in Le Gray's article. I might add that several Blanik glider models have appeared in Europe in recent years. Several good photos appeared in the Model Airplane News, March 1978 (page 8). These particular models were flown in the R/C Scale Glider Class at the 1976 U.S.S.R. National Championships. They are quite large (10 feet span and over 8 pounds total weight).

For my particular model application of the Blanik I specifically wanted a small size glider this time. I was not quite frankly looking forward to building another glider with plug-in wing panels and all their complexities. So as a starting point I picked a



72 inch wingspan which would permit me to fully use 36 inch length balsa sheet material. Working back from this selected wingspan the average chord came to 5.25 inches which set the wing area at 378 sq. in. The relatively low aspect ratio of 13.7 helps get a little more area into a shorter span, such as this. I generally like a glider wing loading of 10 oz./sq. ft. since it allows for a little better penetration in our prevailing Long Island winds. So at 378 sq. in. and 10 oz./sq. ft. design loading you end up with a model target weight of 26 ounces. Jumping ahead a little bit the finished model weighed exactly 17 ounces. The radio equipment weighed 5 ounces and I was forced to add 4 ounces of lead ballast in the nose. The 26 ounce total weight was therefore a reality.

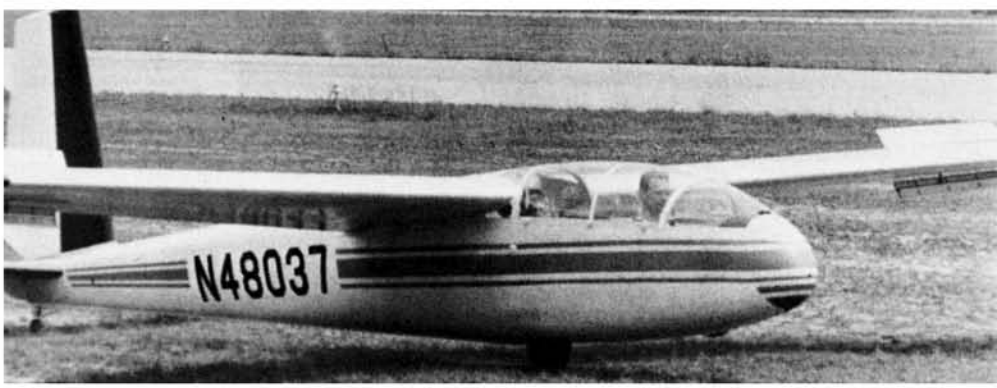
The remainder of the model design was straightforward. I did use the exact scale for the fuselage moments, cross-sections and the horizontal and vertical tail surface areas. Wing dihedral was increased from 3 degrees on the full scale to 5 degrees. I must admit it still gives the appearance of not being enough. This illusion is created, to a degree, by the forward sweep of the wing. Certain full scale features were retained, for example: the landing wheel (although it doesn't extend and retract in this application), the wing tip pods and a certain amount of dihedral in the horizontal stabilizer. No attempt was made to vacuum form a special canopy. Instead I just substituted a carved solid balsa block. Since the wingspan is a more reasonable 72 inches I decided on one piece construction eliminating the plug-in tube and wire system which is so common on model gliders these days. There is still enough flex in the wing structure to permit safe hi-start launching without the fear of structural failure. The resulting model is of very simple construction and is relatively inexpensive to build. Best of all it fits in my little Volkswagen without difficulty.

Construction

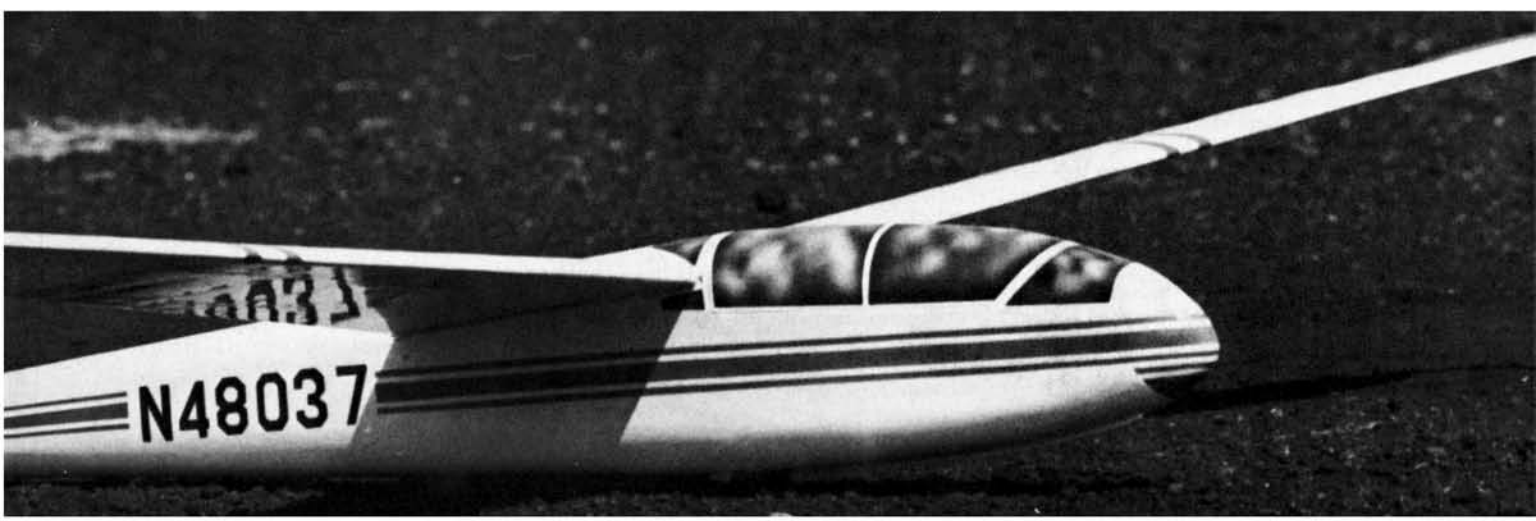
I don't feel this basic structure warrants a step by step narrative of the construction process. Instead I will touch base on all of the important items and details. The best place to start is the wing. Make up two wing rib templates from 1/16" plywood. One for the root rib pattern and the other for the tip rib. Place 13 pieces or blanks of 1/16" balsa between the two plywood templates. I spot glued these blanks together with Ambroid model cement (use sparingly). Cut the rib stack to the template outline. Mark and cut out the notches for the wing spars. When finished separate the blanks (now finished ribs) and number in sequence from root to tip. Repeat this process for the other wing half. Make duplicates of the center and tip ribs out of 1/16" balsa. Proceed now with the assembly. Because of the flat bottom airfoil no wing jig system is required. Just make sure you use a good flat building board. By the way I chose not to use any washout in the wing even though the full scale Blanik had 3 degrees at the tip. This was strictly my own personal preference. Place the bottom 1/16" balsa sheet material in place (including the bottom capstrips), followed by the leading edge and the bottom spar. Please note that the spars are 1/16" X 1/4" spruce. They must be spruce, not balsa. Insert all the ribs and proceed with the assembly. I greatly speeded up this process by using Satellite City, Hot-Stuff instant glue. The majority of my model was assembled with this glue without any problems.

It is important that the 1/16" balsa, vertical grain webs, are installed between the top and bottom spar, between each rib (all the way to the tips). Don't leave this out since it adds considerably to the overall strength of the wing. In my case I also place balsa shims or fill between the front edges of the trailing edge sheeting. If nothing else it prevents a sagging or scalloping effect after the covering material is applied. A partial lower rear spruce spar was added to provide an anchor point for the 1/8" diameter wire dihedral brace (designated WB-3). The main dihedral brace (WB-2) and the forward brace (WB-1) are both fabricated from 1/16" plywood. In both cases I wet the plywood and pre-bent them to roughly match the forward sweep angle of the wing panels. As stated before I chose a 5 degree dihedral angle for the wing. If you are close to a beginner in flying skill you might want to increase this angle to 6 or possibly 7 degrees (maximum). Use 5-minute epoxy glue around the wing braces and the center joint. Sand the wing with #150, 220 and 400 grit sandpaper (in that order) in preparation for the covering later on. Add a small 1/16" plywood insert over the trailing edge to act as a reinforcement for the rear nylon hold-down bolt. Without this, the bolt would easily pull through the soft balsa. I did not use any fibreglass cloth or tape reinforcement at the wing center-section. Put the finished wing aside for the moment.

The fuselage is constructed basically from two pieces of 1/8" X 3" X 36" medium grade balsa. At one point, by the wing leading edge, you will have to splice in a small amount of wood since this area is a little wider than the 3" balsa. Use some of the scrap (or leftover) from the tail portion for this purpose. I generally spot glue the two side pieces together. Using a paper or card stock template I cut both sides out at the same time. Then you can separate them and be assured that both are nearly identical. Make one right and one left side (don't think I'm being funny). Add the 1/2" triangular shaped corner supports to the bottom and top of both sides. You may have to make a series of small saw cuts (with a razor saw) to get this triangular shaped balsa to bend properly up at the nose section. Next add the 1/16" X 1/4" spruce reinforcement strips in the hatch cover area and directly beneath the wing saddle. Use 5-minute epoxy glue for this portion. Cut out all three main fuselage



Long Island Soaring Association's Blanik L-13 touches down at Brookhaven Airport. Notice dive brakes/spoilers extended. **Facing page:** Bob's model replica, Wing is swept forward a few degrees, visible when overhead. **Below:** A like-angle on model Dihedral increased 2 degrees, canopy simulated. It spans 72".



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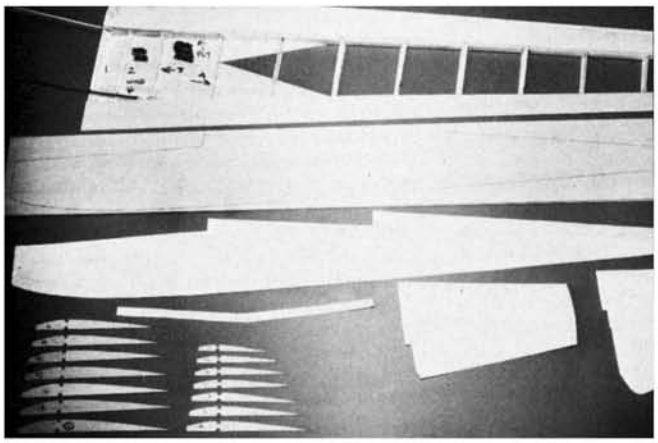
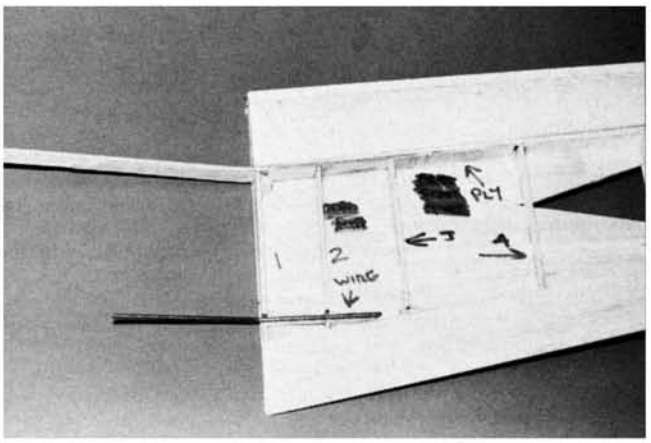
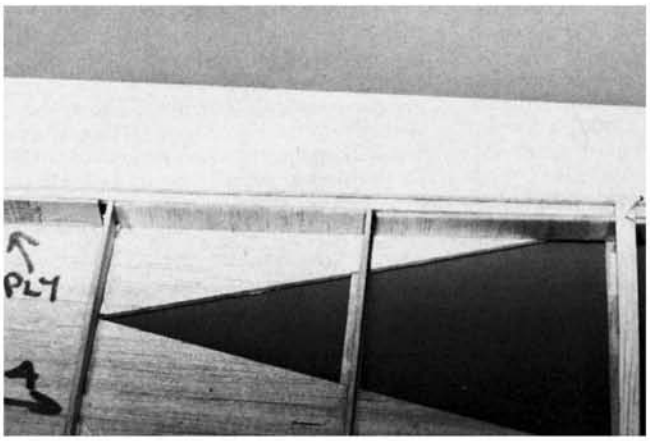
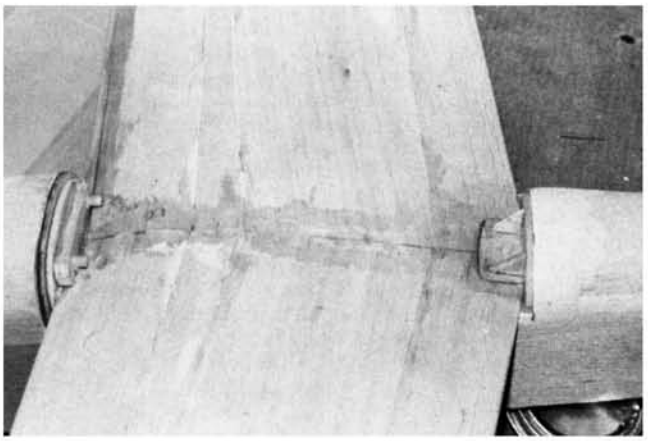


The basic wing structure. Fuselage sides are cut from a card stock pattern. Wing ribs ready for construction of other panel. **Below:** Vertical grained 1/16" balsa between spars is absolutely essential for wing's structural strength. Hi-start launches place great stress upon a glider's wings. Web is visible.



The plywood main wing brace. 1/8" dia. wire is used as a brace at the rear of wing. Bob later added a ply brace at the leading edge as well. **Beneath:** Wing hold-down system before adding the 1/8" sheeting. Two 3/16" dia. dowels lock the leading edge, and a single 8-32 nylon bolt to secure the trailing edge.

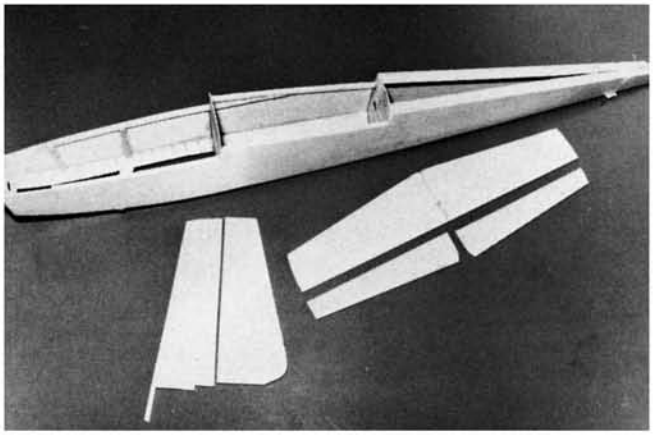




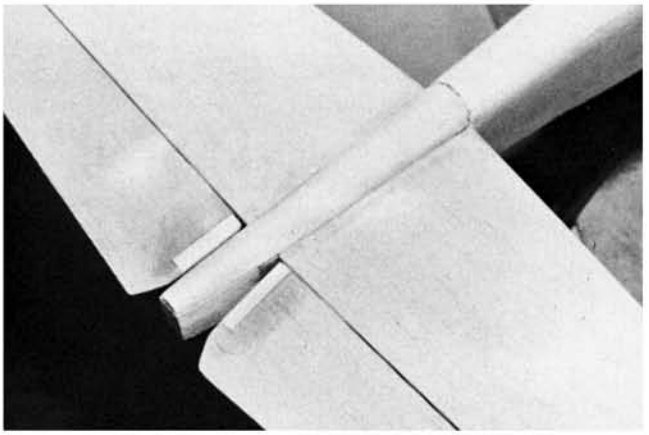
formers from 1/16" plywood. Cut 3/16" slots in formers F-2 and F-3 for passage of the control rods later on. I simply assemble the fuselage using rubber bands and tape to hold the sides with the formers in position. Hot-Stuff helps again in this process. Fabricate the special wheel and tow hook former from 1/4" plywood as shown on the plans. This is epoxy glued to the bottom of former F-2 and also to a scrap piece of spruce (forward position). The axle of the wheel should line up directly under the former F-2 so that the former can absorb the entire landing load. A good detailed photo should help to explain this step. Add the top 1/4" soft balsa sheeting at this time plus the forward lower sheeting (from the nose block back to approximately mid-wing location). It is best to sheet this area cross-grained so that the balsa will bend a little easier. Cut out the top hatch (canopy) and forward block from a piece of 2" X 3" X 12" soft balsa. I make the cross cuts (parting line of the canopy) with a radial arm saw for greater accuracy. If you don't have a saw, such as this, try to dorrow the service of one from a friend. Spot glue the blocks in place and proceed to rough out the canopy shape using a long modeling knife carving blade and a sanding block with #80 grit paper. Add the nose block and carve it to shape as well. Install the hardwood block which will accept the forward nylon bolt. This block is drilled and tapped for the 8-32 nylon bolt.

Now you are ready for the wing installation process. First place some 1/16" X 1/4" vinyl seating tape on each wing saddle (Flite-Lite by Sonic-Tronics Inc.). Temporarily rubber band the wing to the fuselage. Install the partial formers F-2A and F-3A to the wing structure (not the fuselage). When the glue is dry drill and tap the hardwood block for the rear 8-32 nylon hold-down bolt (located by the wing trailing edge). Drill two 3/16" diameter holes through formers F-2 and F-2A as shown. Hold the balsa canopy (hatch cover) in place and mark the location of the two holes, then drill two more 3/16" diameter holes into the canopy block and insert a dowel in each hole. The dowels are actually cemented to the canopy block. They hold the leading edge of the wing in position. The finishing process involves the sheeting of the fuselage top above the wing between the two formers (F-2 and F-3). Use 1/8" soft balsa for this. Sand to a smooth contour finish.

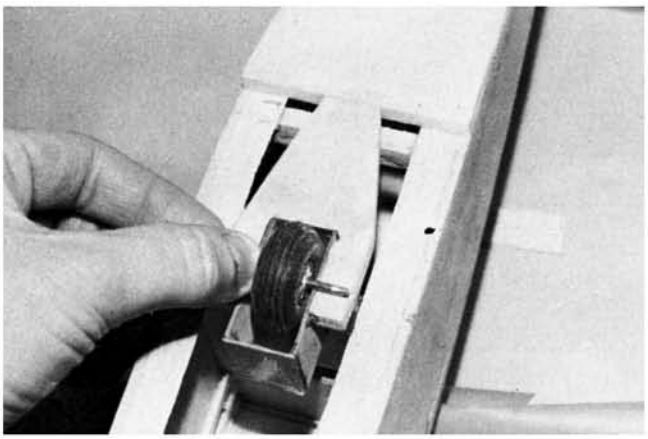
Leave this assembly aside for a moment and proceed with the tail feathers. Both the horizontal and vertical tail surfaces are constructed from medium grade 1/8" balsa. Simply cut them to the outline shown on the plans. Don't forget that 1/8" X 3/16" spruce leading edge on the fixed vertical fin. This piece of hardwood actually extends down to the bottom fuselage sheeting providing an additional anchor for that large fin. Pre-fit the rudder hinges at this time. I used three small Klett nylon hinges for this application. Don't glue any of the hinges at this time. Pin the fixed vertical fin in position at the rear of the fuselage and align it with respect to the wing. Spot glue with Hot-Stuff and then follow this with an application of 5-minute epoxy cement. Pre-fit the Gold N' Rod control tube to the rudder at this time. Prepare the horizontal stabilizer by first setting the proper dihedral angle. Once the glue dries install the stab in position. Align it with respect to the wing and the vertical fin and epoxy in place. The elevators were hinged with 5 mil drafting mylar (in strips approximately 3/8" wide X 3/4" long). Cut the hinge slots with an ordinary model knife blade. Pre-fit the hinges, but do not apply any glue until after the model is completely finished. Epoxy two inserts (1/8" X 3/16" spruce) to the inside edge of each elevator to support the elevator control horns. The control horns in this case are actually 4-40

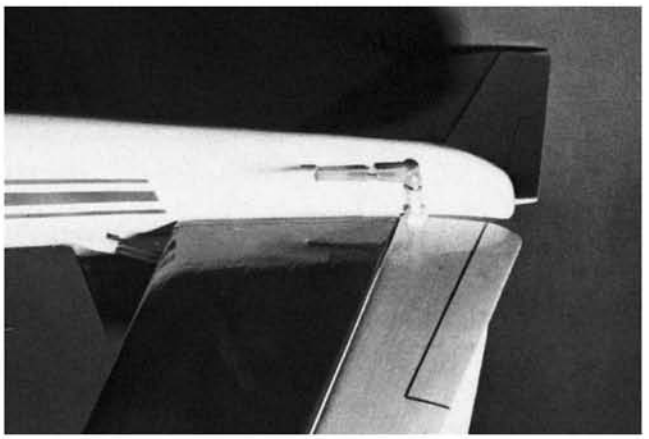


Fuselage partly assembled. Note saw cuts in ½" triangular shaped balsa to achieve the necessary bends up to nose section. Note balsa tail feathers. **Beneath:** Detail of the structural support (¼" ply) of the wheel and the 1/32" ply wheel well box. A tow hook mounts directly in front of the belly wheel.



Spruce insert pieces in each elevator provide solid anchor for 4-40 machine screw control horns. **Below:** Two elevator connections are required because of the dihedral angle in the horizontal stabilizer. Control horns are really 4-40 machine bolts. The Du Bro ball links work very nicely in this application.





socket head screws (¾" in length). They are fastened to the elevators with a single 4-40 nut. On the other end I fastened Du Bro bolt-on ball links. Remember, you must make separate connections to the elevators because of the slight dihedral angle in the stabilizer (for scale appearance). I made a small yoke or "Y" connection in the fuselage approximately 6 inches in front of the vertical fin. Two separate Gold N' Rods were run out each side to the appropriate elevator ball link. A snap-on ball was used for each connection. Make sure that both elevators are aligned at the exact same level. Any misalignment between the two elevator halves can impart a roll motion to the model.

With the controls all pre-fitted you can proceed to finish off all the remaining bottom fuselage sheeting using ¼" soft balsa. Sand the fuselage to its final shape as shown in several of the section views on the plans. You are trying to achieve somewhat of an oval shape. Pre-fit the EK Products model ATH-1 adjustable tow hook to the ¼" plywood mount. Remove it then until the finishing is complete. Do the same with the 1¼" diameter Perfect balloon wheel (Model #63). Cut the .078" dia. wire axle to length. Insert the wheel on the axle and then place a small brass grommet on either side of the wheel. Solder these grommets to the axle leaving just enough clearance for the wheel to rotate freely. Try installing the axle in the slot cut out in the ¼" ply mount. Build up a small box around the wheel to prevent dirt from entering the lower fuselage. I constructed this little wheel well out of 1/32" ply. Install a small ⅛" X 3/16" spruce skid forward of the tow hook location. You may also want to put another skid in the rear as well to protect the finish. The simulated balsa canopy was not hollowed out since weight was required in the nose for balancing anyway. You could also install at this time the radio system and the servo mounts. My particular Blanik employed the new Kraft lightweight airborne components which were described in detail in the April 1978 FLYING MODELS. The receiver was a Kraft KPR-7L. Battery pack was a small 225 mah type which still provides over two hours of flying time between charges. As you can see in the photographs the servos are the new Kraft KPS-18 micro variety. Their extremely small size did produce some mounting problems. For this application I prepared a small plywood tray (⅛" thick). I then mounted ¼" square spruce servo bearers to this tray. The tray in turn is cemented to the fuselage sides. I first attached the two servos together with double sided (1/16") tape. Then the servo "brick" was attached to the spruce rails with #2 sheet metal screws. The switch and charger jack was simply mounted on the fuselage side. You could place this inside if you wish with an external switch actuator. Total radio weight, in this case, was 5 ounces. Try out the controls at this point to make sure they work properly. If you experience any difficulty it's much easier to correct it now before the model is finished. Remove the radio system now to keep it clean while the model is being painted.

Finishing Notes

Before priming I did apply some Sig Epoxolite filet material around the horizontal and vertical tail surface joints (at the fuselage). I also used this product to obtain smooth fillets on the upper wing surface which fairs into the fuselage. The Epoxolite not only adds to the appearance but to the strength of the joint as well. It is actually a filled epoxy material.

The entire fuselage, tail surfaces and the wing center-section were first primed with K&B Super Poxy primer. Two coats were brushed on in this case. Sand with #320 and 400 paper between each coat. Next comes

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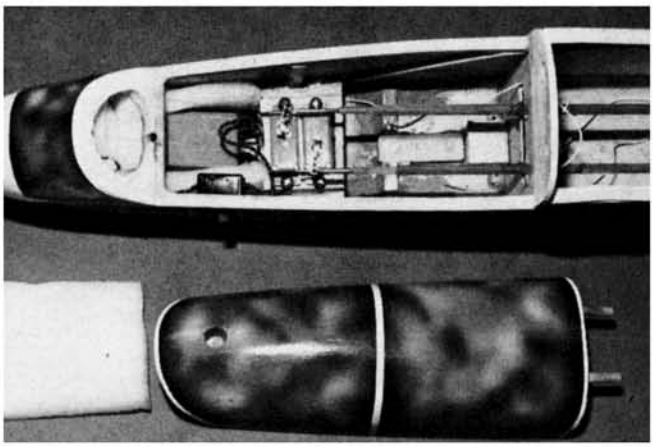
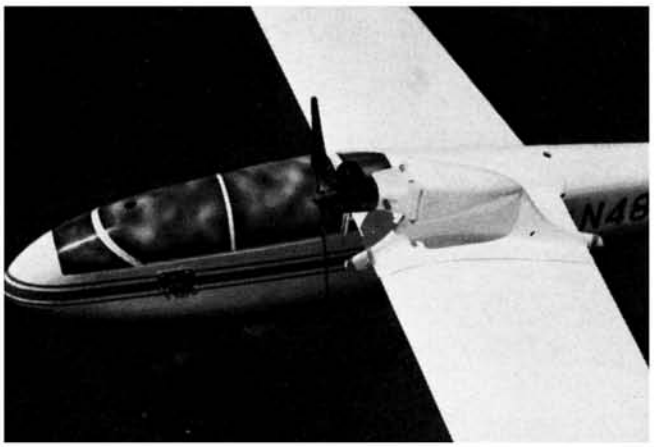
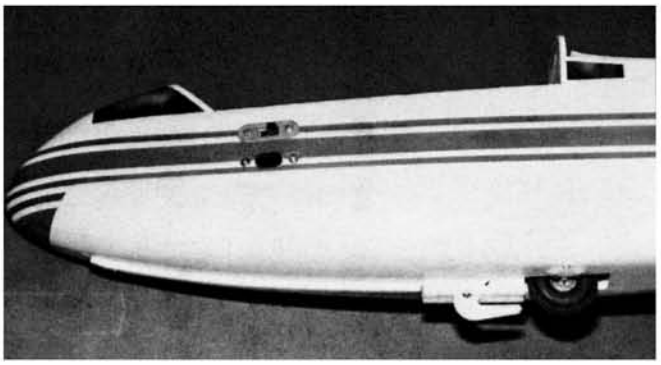
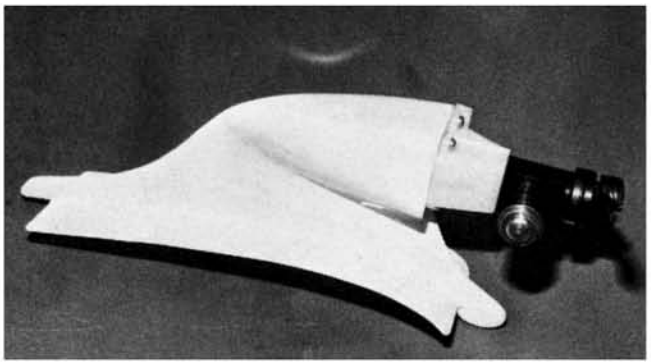


Inside the big R/C compartment. Any two-channel radio will go easily in this body. Kraft KPS-18 micro servos are lost in this case. **Below:** EK Products ATH-1 Adjustable Tow Hook. See text regarding it should you try a Blanik.



This type power pod (not scale) tries to keep ship cleaner, removes easily. **Below:** Quick flights when hi-start is not practical. Testor's 8000 (.049). **Page at right:** Bob's Blanik L-13, Kraft Signature transmitter. It performs.





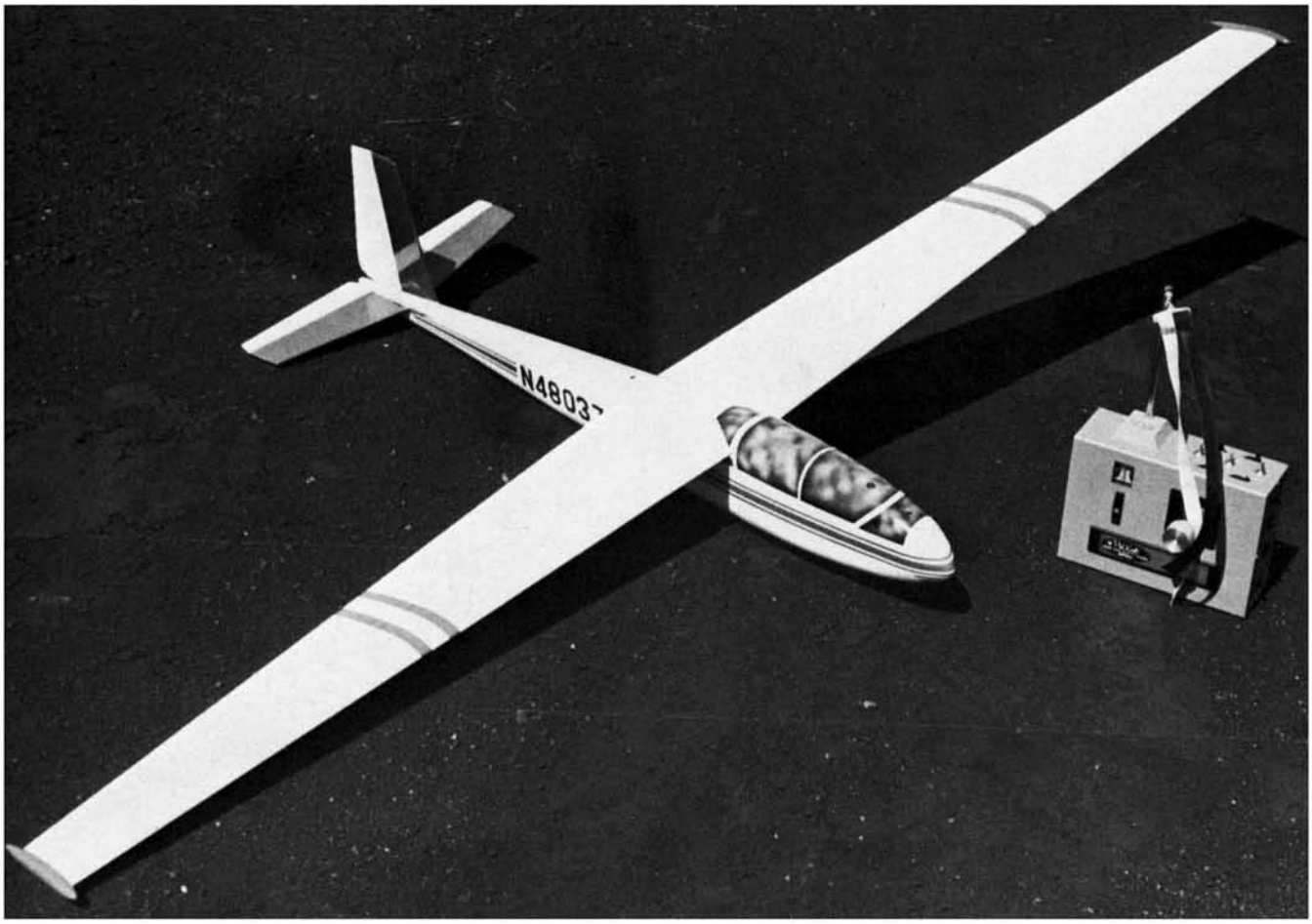
the color coats. Again I used K&B Super Poxy paints. Although I only had the spray type catalyst on hand I was still able to brush the paint on reasonably well using fast strokes with a good quality brush (½" Ox-Hair $4.00 variety). I wanted to spray but the winter weather here in the northeast didn't lend itself to outdoor spraying. Two coats of paint were brushed on over the primer. Everything is white except as follows: the horizontal stabilizer is blue and the vertical fin is red. I might add that most full size Blanik gliders have a natural aluminum finish. This particular one owned by the L.I. Soaring Association had a problem with the original factory finish (do to the salty seashore atmosphere). As a result the glider was completely painted last year. My model duplicates the present paint job of N48037.

The wing (3 inches out from the center to the tip) was covered with Hobby Loggy's new Superkote, iron on plastic material. Frank Schwartz of Hobby Lobby has been after me for some time to try this new material that they import from Europe. For this Blanik I had to use white. At $3.99 a roll he price is certainly right. It requires very low heat for good adhesion. The plastic protective backing material separates easily (thank goodness!). The built in adhesive backing has a certain tacky feel to it. As such the material stays in place readily while you apply the heat. The joints seal easily and permanently. Shrink rate is considerable but is also quite easily controlled. The resulting finish is realistic in the sense that it is not too shiny or dull. Just right for a Stand-Off scale project such as this. I recommend this product without any reservation.

After covering I added the two wing tip pods (or Salmons as I believe they are called). These pods are simply carved from hard balsa and finished in red epoxy paint. Tiny tip wheels can be added to them. Two red stripes were cut from MonoKote trim sheet material and applied on both wing panels (top and bottom). Scale license numbers (N48037) were cut from black MonoKote trim sheet material and applied to both sides of the fuselage. Scale appearance outlines of the ailerons, spoilers and trim tabs were accomplished with the help of a new paneling tape distributed by J&Z Products (that's the Zinger prop people) of Torrance, California. This tape is only .020" wide and black in color. It appears quite durable although I haven't had much experience with fuel exposure at this time. The trim striping on the fuselage, both fore and aft of the license numbers, was achieved with the help of some masking tape and an airbrush (color is blue). I was afraid to use trim tape for this application because of the sharp curves up at the nose section. The simulated canopy was another Howie Applegate special air brush job. This technique has been described before in several of Howie's design articles appearing in FM. A detailed article covering this technique has been prepared for separate publication in FLYING MODELS so I won't repeat it again at this time. I might add that when I masked off for the canopy I made a slight mistake at the parting line. As a result the forward windshield brace is at an incorrect angle. It should be more vertical (similar to the rear brace). You could, of course, make up your own vacuum formed canopy for better scale appearance. However, if you did, the canopy/wing hold down system would have to be revised somewhat.

Final Assembly

Install the elevators and rudder as mentioned before. This time use epoxy cement on the nylon hinges and Hot-Stuff on the mylar film hinges. Install the radio system and the control rods. You should check the balance at this point. My particular glider, as mentioned earlier, required a 4 ounce fishing sinker (lead weight) in the nose to achieve the correct balance. But remember, my radio system only weighed 5 ounces complete. Since this fuselage is quite large you could easily install a heavier and physically larger R/C system with little sacrifice in total weight. My main purpose in using such a small radio was to get a chance to try out the new Kraft KPS-18 micro servos. In any event you must get the model to balance as shown on the plans



which is almost at the wing leading edge (at the root). Remember, this C.G. location is quite unusual and is solely attributed to the forward sweep of the wing. Don't attempt to balance this model at the main spar, it will never fly. Set your control surface movements initially for a good 1" either side of neutral on the rudder and ⅜" either side of neutral on the elevators. If you have a dual rate transmitter, set the lower rate to approximately 25% less control movement for a start. These new "Super" radio systems really come into their own when checking out a new model. Install the EK Products, ATH-1 adjustable tow hook. It was unfortunate that I received this tow hook from EK's Bill Haga, just as the model was completed. Had I to do it over again I would have devised a scheme to make the tow hook come out flush with the bottom fuselage sheeting. In its present location the hook almost projects lower than the wheel itself. Install the wheel and axle assembly using Goldberg's ⅜" long landing gear straps (Model LGS-38). I chose not to photograph the Blanik with the radio antenna showing. It does in fact exit through a hole in the fuselage side near the wing trailing edge and then extends out to the top of the vertical fin. If you have a removable antenna system I would suggest that you make provision to mount it in the wing while it is under construction, thereby eliminating a lot of drag.

Power Pod

The Blanik glider is at home with both hi-starting and winch towing. Although never tried it would also be a good subject for towing by a larger R/C powered model. Because I do a lot of lunch hour flying I still like a power pod since it saves me the time required to set up a hi-start. The plans show a very simple pod which is fastened, with rubber bands, to the *left* wing panel just far enough out to have the prop clear the fuselage. I have used an assymmetric pod mount like this on my big Long Islander glider (FLYING MODELS, December 1973) for over three years now without any problems. For this application I chose a new Testors 8000 (.049) engine which if anything has a little too much power. You might want to put the prop on backwards for the first few flights to reduce the thrust somewhat until you get familiar with the flight characteristics. This type pod keeps the engine fuel off the model, for the most part, and also permits easy clean up at the end of the flying session.

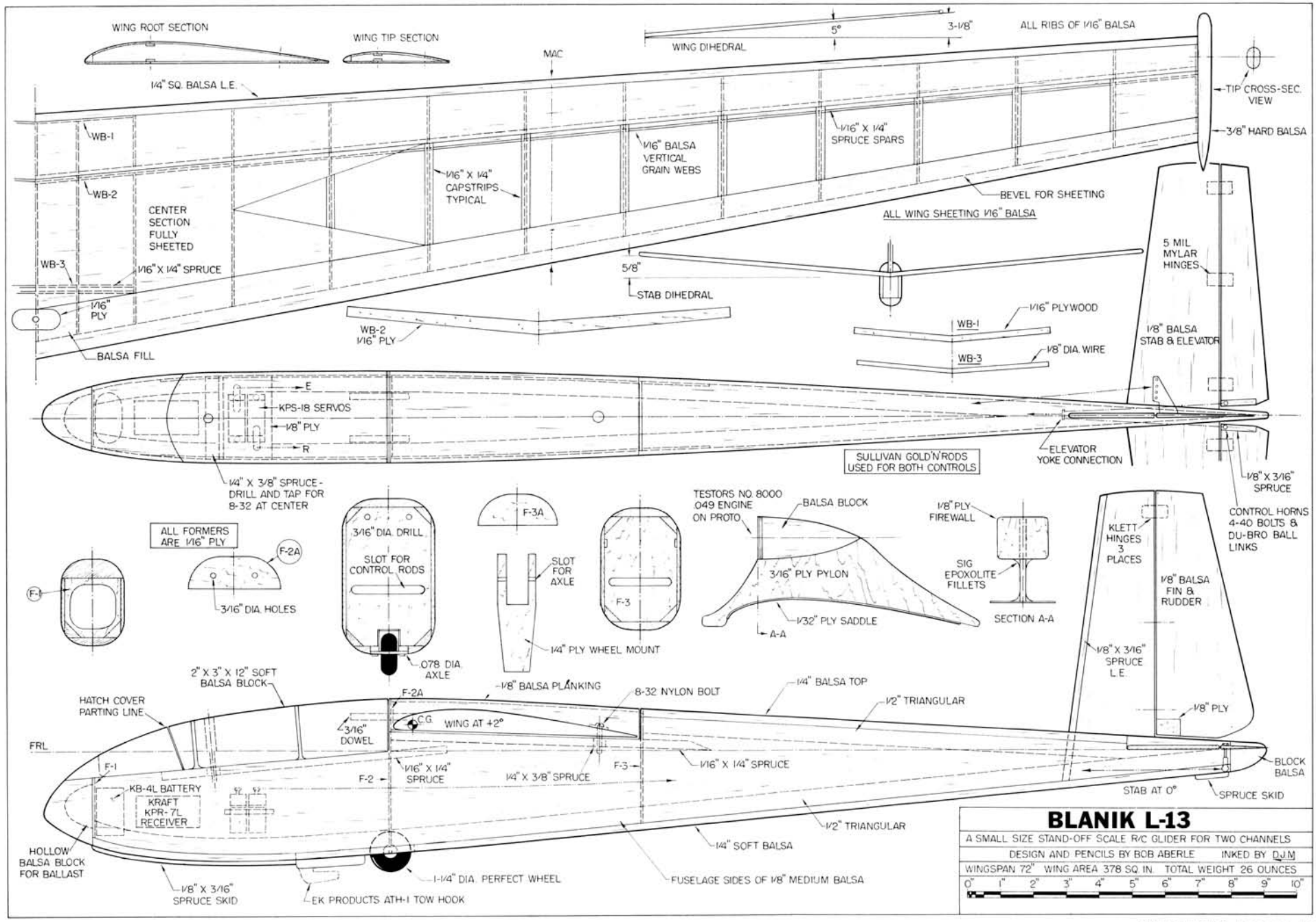
Flying

I have already eluded to much of the flying qualities during the course of this article. The tow hook location is about right, as shown, although I haven't fully explored too many variations at this writing. I would not suggest a heavy duty hi-start for this size model. At 26 ounces total weight, it is still very light. The smaller hi-starts using 3/16" diameter surgical tubing would be a better choice. You might also try some slope soaring with the Blanik. Ballast weight can easily be added at the C.G. directly behind fuselage former F-2. This is accessible with the wing removed. Limit your engine run when using the power pod for the first time. If you get into any trouble you can't shut the engine off so you will be forced to fly it out.

Other Possibilities

The Blanik is a good subject for an exact scale model since all the moments are about right. A larger model (as already flown in Europe) would be more appropriate if you decided to add ailerons, spoilers and a retract landing wheel. Another possibility is a sport version of my design employing a non-scale fuselage. The present scale fuselage is quite large and contributes a great deal of drag. A streamlined fuselage would certainly add to the model performance, but it would no longer be scale. You may want to consider some of these suggestions for future building.

I wish to thank all the members of the Long Island Soaring Association for their help during the preparation of this article and in the actual photography sessions which took away so much of their valuable flying time. They did this willingly and with great enthusiasm.



BLANIK L-13

A SMALL SIZE STAND-OFF SCALE R/C GLIDER FOR TWO CHANNELS

DESIGN AND PENCILS BY BOB ABERLE INKED BY DJM

WINGSPAN 72" WING AREA 378 SQ. IN. TOTAL WEIGHT 26 OUNCES

0" 1" 2" 3" 4" 5" 6" 7" 8" 9" 10"