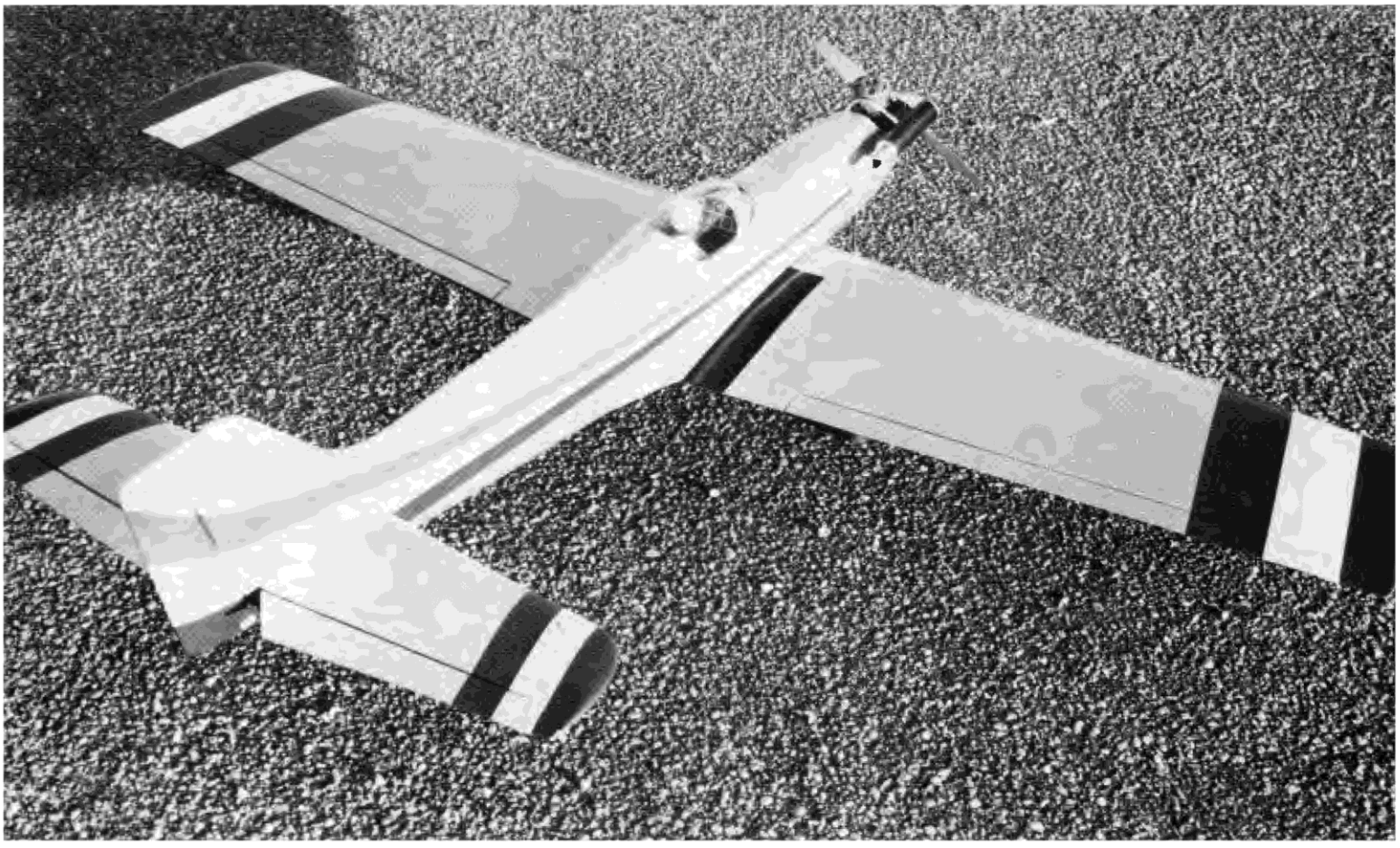


Gulfstream

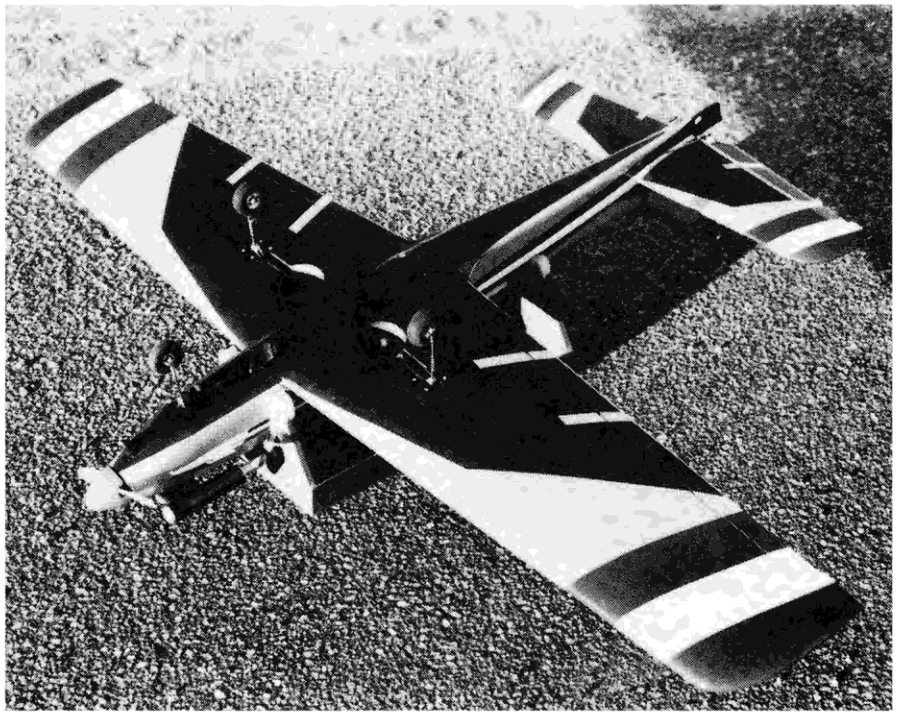
By Bruce R. Lund

This stylish 60 powered R/C Pattern ship has evolved from a proven design.

In sitting down to design a model to fly pattern most of the variables have already been established by trial and error over the years. Areas, moements, airfoils and general configuration of all pattern planes are pretty much standardized. Just look around at the popular pattern ships at a contest. If it wasn't for their individual paint jobs, it would be hard to tell one from another. This I don't like. I want my plane to stand out and be as individual, as I am. I want a design that meets all the established parameters but is easily recognizable as being different. Different, but not freakish. I will not try to build a canard, flying wing or some other weird contraption for pattern flying. What I will do is start with good sound designs and try to make them look better. I will not sacrifice any of the better flying characteristics just to make it look better. As an example, several years back, Don Coleman designed his Cutlass. I worked with Don and drew his plans for a magazine article. I was impressed with his plane's flying qualities, but not with the way it looked. I built one, but before I finished, I had changed the profile of the rudder, squared off the wing tips and used a different canopy. The overall appearance was dramatically changed. Many people came up to me to ask what design I was flying. This made me proud. I had a bird that was different, but, yet, one that flew with the best of them.

The Gulfstream II actually evolved over a period of four years. The first Gulfstream was a modified Cutlass. This time I moved the canopy back, added the turtle deck and changed the profile of the rudder. The wing and stabilizer were Cutlass except, at the last minute, I added some dihedral to the stabilizer. This was done only for looks, but you would be surprised how many people asked me about it. You would think that I had revolutionized aeronautical engineering by the type questions that were asked. I found that I had to come up with a better answer than "I did it just for looks". Now that I have had time to investigate it further, I find there is a very sound reason for the dihedral. If you will look around at some of the newer aircraft (and some old ones), you will find that many have dihedral in the stabilizer. The Cessna Citation Jet, Beechcraft King Air, and the old Globe Swift are just a few examples. I feel now that when flying near stall, with the nose high and the tail low, the airflow over the wing will blank out the effectiveness of the stabilizer. It will no longer be in clean air and the action of the elevator will be unpredictable. A flat stabilizer (no dihedral) will be blanked out all at once. With dihedral, the center section will blank out before the tips, leaving enough elevator control for good control. I have noticed this especially when entering spins and on landing approaches. You can bring the nose up and slow this plane down enough to where landings on the main gear alone are not uncommon. A higher placed flat stabilizer (T-Tail) would do the same thing but it would not be as structurally sound as when mounted on the wide fuselage. If you did make a T-Tail structurally sound I am sure that a lot of weight would be added to the tail and that means a whole lot of weight would have to be placed in the nose to bring the plane back into balance. Several other designs were built and each time I changed something. Occasionally I would build a kit exactly as the instructions called for. This gave me a benchmark with which to compare my designs. After I had built and flown a stock Tiger Tail, I built my own design Tiger Tail. I changed it so much that it would never be mistaken for what it was. Cheek cowls, no

Business end of Gulfstream II (**above**). Plane shows clean lines, with neat wing fillets and smooth nose Retract instalation (**below**). Note simple, clean underside. No frills. Practical pattern ship.



dorsal fin, new bubble canopy and swept back conventional gear with wheel pants made it look like an overgrown Formula I Racer. It actually flew better than my stock Tiger Tail. But that's another story.

Gulfstream II is a combination of known parameters and a sprinkling of my ideas. It expresses my feeling of what a pattern plane should look like. I think it flies better than any of the stock kit pattern planes around today, but I am prejudiced. I have confidence in my airplane, I am proud of it and it just has to fly better. The design has utilized airfoils from the Tiger Tail (wing tip) and Cutlass Supreme (wing root template-modified). The stabilizer uses Cutlass templates, but has 2" more span and dihedral. This fuselage is very similar to the original Gulfstream, but this time retracts have been added. The construction is convential with built up balsa fuselage, foam wing and stabilizer cores. You will note that I have utilized a solid ¼" wing leading edge. This acts like a spar and makes up for the strength lost when wheel wells are cut into the bottom of the wing. If any of you have built a Cutlass, Tiger Tail, Mach I, Compensator or any of the other large pattern machines do not hesitate to build the Gulfstream II. There are no problem areas and no special tools or jigs are required.

The rudder frame is constructed right on the plans and then covered with 1/16 sheet balsa. The stahilizer cores are cut from foam, rear spars glued in place and then covered with 1/16 sheet balsa. Sand the leading edge of the foam and glue the leading edge into place. Sand the root of each stabilizer half for the correct dihedral angle. Slot the foam at the trailing edge and midpoint to accept the 1/16 plywood dihedral braces. Cover the plywood braces with glue along with the root of each stabilizer half and join together. Block each tip up 1½" and allow to dry. Add a ¾" strip of fiberglass on top and bottom of this joint for strength. Note that a ⅛" square spruce strip is glued to the trailing edge of the rudder and elevators. If you have never done this before, I would recommend that you try it. It sure strengthens the trailing edge, makes sanding the sheet balsa control surfaces easier, gives a good straight trailing edge, and helps prevent hanger rash later.

The fuselage construction is straight forward. The two sides are cut from ⅛" balsa. Lay them on your work table with the outside of each side facing down. This will insure that you end up with a right and a left side. Glue a ¼"x¼" balsa stringer along the top of each side. Add the plywood and balsa, doublers F-9, F-12, and F-13. The ½" triangular stock can be added along the bottom edge of each fuselage half. The ⅛"x¼" diagonal bracing can be added between the top stringer and the bottom triangular piece. While all of this is drying, cut out your fuselage formers F-2, F-3, F-5A, and F-8. When the sides are dry, mark the location of each former. This will be a great aid when gluing the two sides together over the formers. Sand the required taper in the tail end of each side. Now place the sides over the top view of the plans and install F-5A and F-8 while holding the tail together with clothes-pins or clamps. You will note that the top of the fuselage is not a straight line. You will have to form the fuselage in two steps. First, from F-5A to the tail and then from F-2, to F-5A. At all times keep the fuselage lined up with the center line on the plans. Make sure that you have the firewall F-2 offset for the two degrees of right thrust. While waiting for this to dry, hollow out the 1 inch block that forms the top of the nose. As soon as the fuselage is removed from the plans glue this top block into place. Add the ⅛" turtle deck formers and sheet cover with ⅛" soft balsa. When dry, block sand the top of the turtle deck to accept the top 3/16" sheet. Note! Do not cover the bottom of the fuselage till you have installed the split elevator pushrod. The ½" inch side

nose blocks and the chin block can now be installed. Sand the nose true and glue plywood former F-1 into place. The plywood tank bottom F-10 and balsa F-11 are now glued into place. This completes the main fuselage framing. The wing fillets must wait till you have the wing made and aligned with the fuselage.

The wing is made using light weight foam cores. The trailing edge is glued to the cores first. When dry, sand them to contour and cover the wings with 1/16" sheet balsa. Sand the leading edge till the balsa skins meet the foam and then glue the 3/8" leading edges into place. When dry, carve the leading edge to shape. Now join the two wing halves and install the aileron torque rods. I use 1/8" piano wire with brass tubing bushings. The trailing edge and wing tips can be glued on now. Be sure to add a 1/8" square spruce strip along the trailing edge. This will be a great aid in trimming the trailing edge to shape and prevent hanger rash in the future. Carve the tips and sand the entire wing. Cover the center section with a 4 inch wide strip of fiberglass for strength. Add the landing gear mounting and F-3A. You are now ready to fit the wing to the fuselage. Be sure of your alignment as this is a most important step. When you are sure that the wing fits the fuselage correctly, cut out 1/32" more balsa so the wing fillet base F-14 will slide between the wing and fuselage. When you are satisfied with the fit, slip some wax paper or saran wrap under the plywood base and glue it to the fuselage. Leave the wing in place. Now mix your Epoxolite or Micro balloons and form the fillet. While the wing is still on the fuselage this is a good time to glue the tail into position. Be sure of your alignment. Check everything several times.

Gulfstream II and author's Christen Eagle (**top**). The Gulfstream shows off its turtle deck and dihedral stab. Buce R. Lund starts engine and prepares the Gulfstream for another flight (**above**).

The model may be finished in your normal manner. Take your time, as this is what shows from here on. I have taken a step backwards and do not use any of these so called super finishing methods. I use old fashioned silk span and dope. It works very well, is cheap, and I get a finish that is much better than average.

The model must balance at the CG shown on the plans, even if you have to add lead to the nose. Also check your wing tips for balance. If one wing is heavier than the other, add lead till it balances.

Good luck building the Gulfstream II.