Eric Bell, a member of South Africa's Internationals Team in 1971, presents his Belaire, four-time winner of the Rhodesian National Championships and second place winner in the 1974 R/C Modeler Design Contest. This internationally renowned design is one of the finest competition aircraft in the world today. Photos by Lex Goldman.

BELAIRE

The author brings his Belaire by in a full speed, low pass for the photographer. Eric Bell's award winning design is one of the finest pattern ships in the world today.

INTRODUCTION

● The Belaire is a contest proven aerobatic design, which has won the Rhodesian National Championships 4 years running. It has been flown by both expert and novice, and is extremely docile on low speed handling characteristics. The new FAI aerobatic pattern is no problem, as it completes all maneuvers with ease.

The Belaire originated when I was selected to represent South Africa in the World Championships in Doylestown in 1971, which I unfortunately could not attend due to visa difficulties. Since the original model was designed, various design changes have taken place, and I feel that the Belaire can now compete with any of the top pattern aeroplanes available. Although we only fly the FAI schedule in Rhodesia, I am sure it would perform the AMA schedule without any difficulty.

The Belaire can be built with fixed landing gear and performance is satisfactory, however, acrobatic ability is certainly held back with the fixed undercarriage. My experience with retractable landing gears have shown that the rolling maneuvers are very accurate about the logitudinal axis — fewer pilot corrections are required, therefore the model is easier to fly, and is also easier to fly in strong wind conditions. The reduction of landing gear drag is very noticeable under these conditions.

The model stall turns extremely well, and performs the slow roll, and 4 point roll with ease. Entry and exit to the spin are good, with no tendency to overspin. 3 fast rolls are extremely axial, and the looping maneuvers can be executed with no tendency to drift off the intended flight path.

The Belaire has been kitted in Rhodesia, utilizing a fibreglass fuselage, and foam wings, and has proved very popular with pattern fliers in this country. Should anybody decide to build a Belaire, I would be very interested if you would drop me a line to Eric Bell, P.O. Box 2555, Salisbury, Rhodesia, as I would like to hear the views of other modelers on what I feel is one of the top competitive designs of today.

CONSTRUCTION

Fuselage:

Start construction of the fuselage by cutting out both balsa 1/8'' fuselage sides, and splicing accordingly to obtain the correct length. Cut out the ply doubler from 1/32'' ply, and balsa doubler from 3/32'' sheet. Glue together, and pin down allowing adequate time to dry. Next, cut out the main bulkhead from 1/4'' ply, and recess for fitting the maple engine bearers (3/8'' x 1/2''). Recess the bearing surface of the engine bearers 1/8'' and fit 1/8'' x 3/8'' x 4'' aluminum strips. This is to prevent crushing of the engine bearers when the engine is tightened up. Fit the engine, and drill the bearers to suit. At the same time the retract nosegear unit of your choice must also be installed, and the blind nuts fitted.

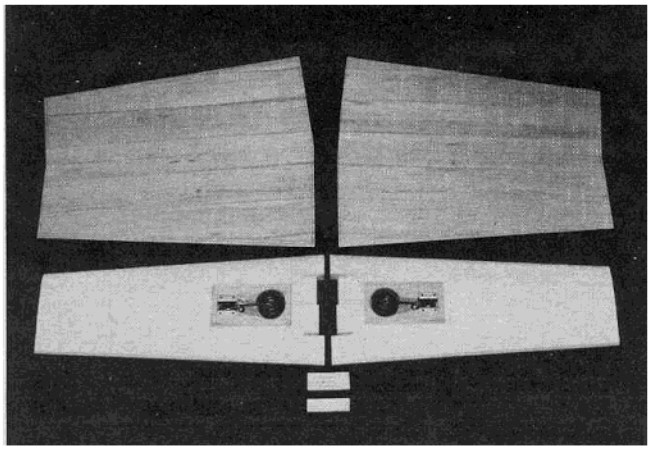
The next step is to make Formers F2 and F3. When they are completed, pin the starboard fuselage side down, and fit the main bulkhead F1, and Formers F2 and F3 using a set square to ensure that they are correctly in line. The false deck is now glued in place up to F3. The port fuselage side is now put into position, and checked for alignment, and then glued into place.

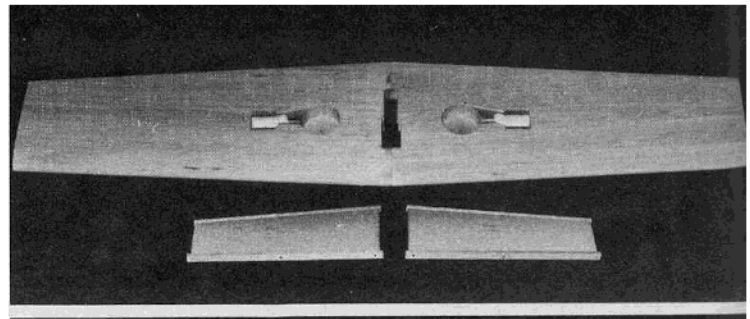
When the whole assembly has dried, remove and join the rear of the fuselage together, placing glue along the tapering false deck. This false deck ensures that an extremely accurate and precise fuselage may be constructed with the exact equal taper of both sides. The next step is to fit all triangular balsa stock as shown on the plans, and fit the selected balsa block around the nose section. The top and bottom balsa blocks may be tack glued in place, and the fuselage can now be planed and sanded to shape. When tackling the nose section, fit the engine and plug the exhaust outlet and the carburetor inlet to prevent damage and fit a 2½'' spinner (preferably an old one) in place. Sand and shape the entire nose unit following the contour of the spinner. I find that, when sanding the air scoop, extreme care must be taken to obtain the correct shape. I am sure that you will be able to obtain this from the plans, and from the photographs.

When the fuselage has been completely sanded to shape, remove all top and bottom balsa blocks, and hollow out to the desired lightness. The next step is to cut out the cockpit area, as shown, from the 1/2'' balsa nose block, and utilize the 3/32'' false deck, as the cockpit floor. Glue all top balsa blocks in place. To obtain a slightly deeper

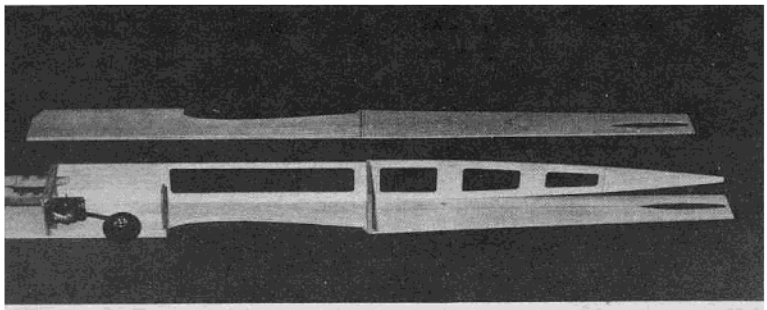
The author, center, with his first place win in 1971 Rhodesian Nationals. Dennis Hunt (2nd), right, Barry York (3rd), left. Belaire, first built in 1970, won first major win in this competition.

The author and 1974 version of the Belaire, as presented in this article, has now won the National Championships four consecutive years.

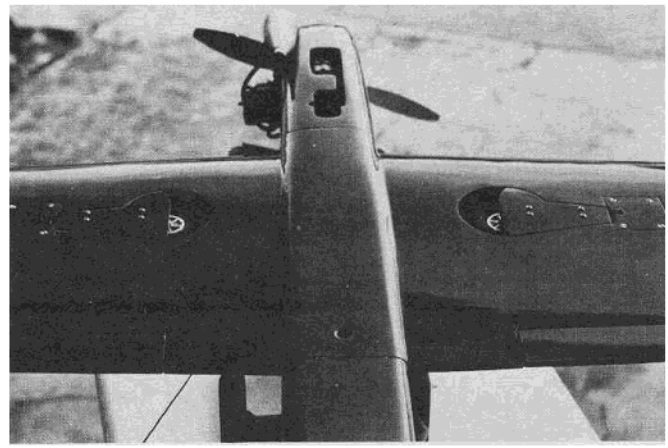


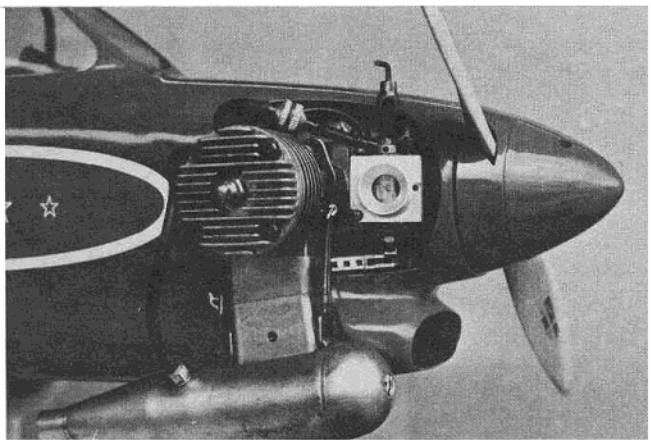


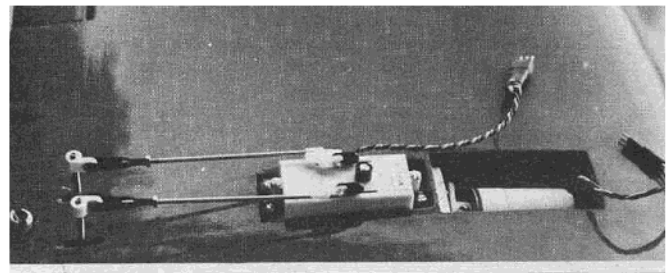
LEFT: Trial fit of retracts before covering wing cores. ABOVE: Covered wing cores and uncovered stab.



ABOVE: Basic fuselage construction. Check gear for clearance. RIGHT: UC in "up" position.

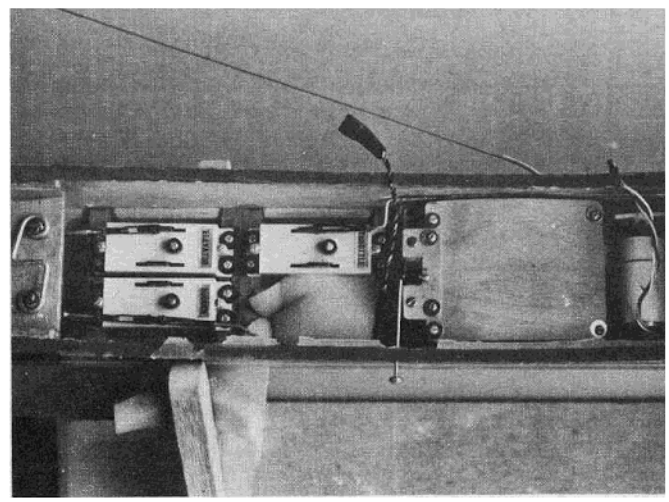






LEFT: H.P. .61, Kavan carb, Enya #5 plug, Rev-Up 11/7 prop. ABOVE: Aileron servo installation. Two servos used on retracts.

ABOVE: The Belaire empennage. RIGHT: Radio compartment — note Dzus fastener.



cockpit effect I use a piece of 1/16" balsa cut to a semi-circular shape which is fitted over the instrument panel. As the instrument panel is 3/4" high, this will raise the front of the cockpit 1/4" enabling more detail to be placed in the cockpit area. When dry, remove the instrument panel and sand the cockpit area to a proper shape (see photos). Using clear dope, give the cockpit area 2 coats, and when dry, apply a further 2 coats of talcum powder, and dope as a filler. Sand to a smooth finish, and spray the whole cockpit area matte black, and install the instrument panel, pilot, seat, etc.

The next step is to fit the canopy. I usually fit the canopy in place with Sellotape, and place a film of Sig Epoxy around the base. As the epoxy dries, move the canopy slightly from side to side to enable the glue to penetrate beneath the canopy and hold it firmly in place. When dry, mask off the entire canopy and, after removing the high spots from the epoxy glue, make a fillet from plastic putty or equivalent. This will ensure an extremely durable and good looking finish.

The bottom nose block may now be cut away to accept the retracting nosegear of your choice. This may now be securely glued in place along with the rear bottom balsa block. The fuselage is now virtually finished apart from the fitting of the fin and tailplane.

Wing:

The wings, tailplane, and fin, as shown on the plan, are all made utilizing styrofoam. I prefer styrofoam mainly because I believe a much stronger and truer airfoil can be built. Cut out the foam cores, using the templates shown on the plan. The next step is to make the 3/32" plywood undercarriage mounting plates, and reinforce as shown on the plan around the mounting screws. Lay the plates on the side of the cores and mark out the area to be fitted. Recess the foam 3/32" to allow the plywood plates to sit flush in the wing core. If recessed properly, the ply plate will bend to the contour of the foam. Fit the blind nuts and plug threads with plasticene. This is done to stop the epoxy glue getting into the threads.

Using Devcon 5-Minute Epoxy, glue the plates to the foam cores, pressing down on them until the glue has set. You will discover that this type of installation is extremely strong, even with the heaviest type of landing, as the shock load is distributed over a large area. The next step is to hollow out the retract wells by using a small hot wire cutter, then clean up the wells afterwards using a Dremel drum sander. All exposed styrofoam in well wheels and servo wells should be coated with Titebond to prevent damage from dope and paint.

Next, glue the 1/4" balsa trailing edge in place with Titebond glue, and trim with a razor plane when dry. Cut out the recesses in the styrofoam for the dihedral braces, ailerons, and retract servo wheels. Glue together 1/16" balsa sheeting for covering the wing cores. Using the correct contact glue spread evenly and thinly with a sponge (do not use spray adhesives unless a face mask is used), to the cores and the balsa sheeting. You will find no trouble bending the leading edge sheeting as long as ammonia is used. The wings can now be completely covered using Titebond glue on the trailing edge.

Trim the sheeting when dry, and cut out areas such as the wheel and servo wells. Fit the dihedral braces, and join the wings using Sig Epoxy. When dry, recess the leading edge 1" x 3" and fit balsa block to that size. Drill and fit a 3/8" dowel into this block. The next step is to fit the aileron horns, and trailing edge. The ailerons may now be made. When making the tip blocks, hollow out only the starboard tip block as wing tip weight in the port wing will be required to counter balance the side mounted engine. I have always used a Dzus fastener on my wing installations, but camlocks, nylon bolts, etc., will be equally acceptable. The center section can now be fibreglassed using fibreglassed bandage cloth. The wing is now ready for final sanding and finishing.

BELAIRE
Designed by: Eric Bell

TYPE AIRCRAFT
Competition Pattern
WINGSPAN
58"
WING CHORD
11" (Average)
TOTAL WING AREA
638 Square Inches.
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
3/8"
O.A. FUSELAGE LENGTH
53¼ Inches (Incl. Spinner)
RADIO COMPARTMENT AREA
(L) 11" X (W) 2⅝" X (H) 2½"
STABILIZER SPAN
25½ Inches
STABILIZER CHORD (incl. elev.)
6½ Inches (Average)
STABILIZER AREA
165¾ Inches
STAB. AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-fuselage
VERTICAL FIN HEIGHT
6⅝ Inches
VERTICAL FIN WIDTH (incl. rudder)
8 Inches
REC. ENGINE SIZE
.60 to .61 Cu. In.
FUEL TANK SIZE
12 Ounce
LANDING GEAR
Tricycle Gear
REC. NO. OF CHANNELS
6
CONTROL FUNCTIONS
Rudder, Elevator, Throttle, Ailerons, Retract Gears
BASIC MATERIALS USED IN CONSTRUCTION:
Fuselage .....Balsa and Ply
Wing .....Balsa Covered Foam
Empennage .....Balsa Covered Foam

Fin And Tailplane:

Both the fin and tailplane are made from styrofoam, and the process is self-explanatory. They are both covered with 1/16" balsa sheeting and the tip blocks are made from 5/8" x 3/4" balsa block. The elevator horn I utilize is an MK differential horn. The elevators and rudder are made from 1/2" sheet balsa, and care must be taken to ensure that, when fitting the elevator horn to the elevators, that they be set in dead neutral position, and do not oppose one another.

Before fitting the tailplane to the fuselage, ensure that the wing and tailplane incidences are correct. The wing and tail must be at 0° incidence. When completely satisfied, glue the tailplane to the fuselage, ensuring that the tailplane is dead square. The fin can now be fitted, and the fuselage may now have a final sanding before covering.

The entire construction of the model is now complete, and ready for the finishing process.

FINISHING

Give the entire model 2 coats of clear dope, and sand lightly. The fuselage may be covered with silk or tissue, although I prefer to silk the fuselage as it gives additional strength. The wing, tailplane, fin, and control surfaces are covered with heavyweight silkspan. The entire model now has 4 coats of clear dope, sanding lightly between each coat.

The next step is to apply 2 coats of talcum powder and dope over the entire model. When dry, sand carefully and, when an acceptable finish has been obtained, apply an additional 2 coats of clear dope. The next step is optional, as I believe in obtaining the best possible surface before spraying. I use a coat of very thin Hobbypoxy "Stuff" sprayed over the entire airframe, and this is then lightly sanded. This gives a perfect surface and is extremely light. A further coat of Clear dope is required, and must be sprayed on. This is to enable the paint to have a better bonding surface. The model is now ready for the paint of your choice. I prefer a polyurethane or epoxy based paint as they provide an extremely hard and durable finish.

CONTROL MOVEMENTS

No hard and fast rules can be laid down as each pilot will require different control movements to suit his style of flying. The Belaire is set as follows: Ailerons 5/16" up and down movement, elevator 15° up and down movement, rudder 12° left and right movement.

GENERAL

Although I will not bore you with radio installation details, I feel that the retract gear system that I have utilized in the present Belaire is extremely successful. I feel that the usage of 2 M.K. retract servos to operate the nosegear and the main gear give far less problems than having all 3 undercarriage legs connected to just one servo. It is optional whether an amplifier or micro switches are used to operate the retracts system, although I am using, at the

present time, a Proline Amplifier. With this system I have had over 200 flights without the slightest malfunction. One of the most important features is to ensure that the C.G. is correct, and that the model is balanced correctly. Also, ensure that the port wing tip is weighted accordingly to counter balance the side mounted motor.

FLYING

With the aircraft checked out for nil warps, and after ensuring that the 1001 items have been attended to, bang open the throttle, and enjoy your flying! □

From RCModeler Nov. 1974