BRISTOL BEAUFIGHTER
by Ivan Pettigrew
Construction Notes

These plans are for an improved version of a model Beaufighter that was built in 1994. The first model had a span of 60 inches and wing area of only 530 sq ins. It was powered by racing car motors similar to the present model, but they were wired parallel, and ran off ten Sanyo 1700 SCRC cells. The model had good flight characteristics, but because of the smaller size, the wing loading was on the heavy side. In order to perform well, the motors had to be propped to draw about 20 amps each. Since they were wired parallel, this meant a total draw on the batteries of 40 amps, and resulted in flights a little on the short side in the five minute range. Part of the problem was that with the smaller wing area, the wing loading was higher and required a substantial amount of power for cruise flight. It has been found since then that larger models come out with a lighter wing loading which carries the weight of the motor and batteries much better. This allows operation from eighteen cells, and with the motors wired in series and propped for 30 amps, they give considerably more power. Performance is much better, especially in aerobatics, and flight time is longer. This model being larger, it can use larger propellers than the smaller model, and this too adds to the efficency of the power system. In order to use these larger props, a higher gear ratio needs to be used, but a 6:1 super box such as made by MEC in Seattle, Wash, is very suitable for the 15 x 10 props that are used on this model. APC electric props are very efficient and recommended. For a little more speed at the cost of a little drop in static thrust, 14 x 12 props can be tried, but since there is quite a bit of frontal area in the large radial engine cowlings, the 15 inch props really work well on this model.

It is expected that the builder of this model will have previous experience in constructing build up models, so these instructions will not dwell on the obvious, but deal with the items of special interest. The greatest challenge in building the model is the retracts. The layout of the nacelles behind the radial engines does not lend itself to the installation of retracts as easily as the nacelles of other models such as the DH Mosquito and Comet. Some builders may opt for commercial retracts or a simple fixed undercarriage.

FUSELAGE

The fuselage is a simple framed up box with bulkheads added to the top and bottom. First build the two sides of the fuselage over the plan, and join together. Note the sketch on the plan that shows how the nose section (cover) is removable, along in one piece with the upper section of the fuselage that covers the centre section of the wing. This makes for easy access to the batteries, which slide in from the front when the cover is removed. With this upper/nose section cover removed, wing removal, and access to the radio and servos is also simplified. When the lower/rear section of the fuselage is framed up, the bulkheads for the curved section on the top and bottom are added, longerons glued in place, and applicable parts sheeted with 1/16” balsa. If contest balsa is used for this sheeting, it will result in some weight saving, and will also be easier to work with. The removable front/upper section of the fuselage (cover) is built as a separate unit, but may be best left until the wing has been completed. Doing it this way makes it easier to get the correct fit where it covers the wing centre section.

TAIL SURFACES

These are of conventional construction. In making these, it is recommended that the spars for each of the surfaces is made, shaped, and hinged, before starting assembly of the rest of the tail surfaces. There are aerodynamic advantages to having a symmetrical section in the tail surfaces, besides which, the resulting deeper spar gives added strength over a flat surface. The result is that the tail surfaces can be built very light, and are also less prone to warping. The horizontal stab and elevator have dihedral, so it is necessary to run separate control rods to the elevators. Start construction of the stab by building up the spar, then prop one half up while building the other part on the board. Continue likewise for the other half. If using lightweight nyrods for the tail surfaces, be sure to brace them at the stations in the rear of fuselage in order to keep them from bowing when pressure is applied.

WING CONSTRUCTION

The wing construction is outlined on the plan. Flaps are shown on the plan, but are a considerable amount of work and add weight to the model. It has been found that flaps do not make a model like this any easier to land. Maybe the landing speed is slightly lower with flaps, but the stall comes more abruptly and with the more rapid deceleration speed of the model in the landing flare, it is harder to judge the point of stall and make a smooth landing. Because of the low wing loading of this model, the landing speed is quite low without flaps. The flare is more prolonged and a smooth three point landing is much easier without flaps than when using them. Hence they are not really necessary, and are a lot of work just for a novelty factor. The motor mounts and landing gear pedestal are made from bass or other hard wood such as spruce. The pieces are numbered on the plan, and construction starts with #1 which forms the motor mount. The hardwood strips that are added in sequence should be well glued with epoxy glue, since there is considerable stress in the area of the undercarriage. Gussets may be added as deemed necessary. The nacelles are built by starting with the round bulkhead at the front. A small ply plate should be glued to the rear of these bulkheads to accept the #4 screws that attach the cowlings. Sheeting of the lower section of the nacelles is best left until the gear is installed and operating.

COWLINGS

Start by making the nose section bulkhead which is several round pieces of balsa glued together and shaped. Then a round bulkhead is made for the back plate of the cowling, and small ply plates are attached where the two mounting screws will pass through. The rear bulkhead should have the large central hole in it cut out so that it will easily pass over the motor and gearbox when the cowling is fitted in place. One way to assemble the cowling is to estimate the size of the 1/16" sheet covering and make it into a sleeve. It is rather floppy but will firm up when the front nose ring and rear bulkheads are slid into plane. Size is important, so a narrow strip of the sheet covering may have to be added or removed from the cowling to get it to be a snug fit on the two bulkheads.

CONTROL THROWS

The control throws are shown on the plan. Aileron differential will really help with flight at slower speeds, especially as on approach to landing. In order to provide for this, the aileron servo arm should be made so that it is a 60 degree "V" as shown in the plan. This can be cut from the circular disk that comes with most servos.

BATTERY LOCATION

The battery packs that are shown in the plan are two nine-cell packs of standard RC 1700 nicads. Each pack is made from a flat seven cell pack , with
two additional cells added on top of each pack. This is a matter of convenience for this builder, since these packs are used in several other single motor models. Another way of arranging the batteries is to use three "six cell" packs taped together sitting on edge. There is ample length available for the battery pack, so this provides plenty of space for moving the packs forward or backwards to achieve the correct C of G location. It has been found that performance can be really enhanced by using the newer Sanyo CP-1700 SCR cells which are considerably lighter than the original 1700 SCRC cells. The lighter weight gives a much better rate of climb and slower landing speed. If using the lighter cells, the battery packs will likely have to be a bit forward of the location shown on the plans. The packs are secured to the platform with Velcro strips, but a back stop should be made so that they do not move backward under acceleration on a rough strip.

ELECTRICAL INTERFERENCE

In multi motor electric models, there is an increased risk of problems with radio interference from motor brush noise and also the increased length of wiring used for the motors. Schotky diodes should be placed across the terminals of each motor when they are wired in series such as in this model. This is in addition to the normal capacitors, which should of course be used across the motor terminals. The wires carrying current to the motor should be kept touching each other, and twisted at least one turn to the inch. The radio and servos should be kept as far as possible from the motors and motor wiring, but this is taken care of with the layout shown in the plans. Servo leads must be kept short. Do not use outboard servos for the ailerons. These would require long leads running along the wing, and they would be very prone to picking up interference from the parallel wiring that carries power to the motors. At the low airspeed of this model, one standard servo is ample to operate the ailerons. Weight can be saved by using micro servos for the rudder and elevator, but it is recommended that a standard servo be used for the aileron. The ailerons require more force than the elevator and rudder, and apart from being stronger, a standard servo draws less current under high load conditions.

COVERING AND FINISHING

The prototype is covered mostly with low temperature film. It is slightly lighter than high temp film, and less likely to shrink the balsa covering of the fuselage into undesirable hollow panels. Some of the new lite films now available would be even better than the low temp film available when this model was built. In the prototype, mica film was used for the lower surface of the wing and horizontal tail surfaces. It is lighter and stronger than film. Its appearance is not as good, but that is not so important underneath. The windows of the prototype are covered with clear monokote on the flat panels and mylar film as used for overhead transparencies is used for the curved sections. This should be applied before the regular film covering.

UNDERCARRIAGE

Instructions are written separately for the retracts that are used in this model. A very simple adaptation can be made if a fixed gear is preferred. The same undercarriage mounting pedestal is built from hardwood strips. The gear leg is made up similar to the one used for retracts, but the “U” shaped slot at the top end should not be formed. Rather than this, leave the wire straight, and angle it differently so that it runs up the full length of the #2 hardwood rail. This wire should be bound and glued to the #2 rail. Making the gear in this manner gives the same torsion bar springing to the undercarriage that is provided for with the retracts.

FLYING

There is nothing unusual about flying this model. It is a delight to fly. But there is one word of warning regarding the take off. With those large propellers, there is enormous thrust and a certain amount of torque. High speed taxiing prior to the first test flight is NOT recommended. The model is likely to take off unexpectedly at low speed and catch the pilot unawares. Previous builders of models like this have warned about this feature. By all means practice some taxiing, but keep it fairly slow. On take off, apply power VERY slowly. If the grass is long, keep back pressure on the stick until the model is rolling. Otherwise a small amount of back pressure is all that is needed throughout the take off. Just apply about 25% power at first until the model is rolling straight, and rudder control is positive. Then slowly apply more power. The model is usually in the air by the time the throttle is little more than half open. Once airborne, full power can be applied and the gear retracted. Landings can be done with no power, but are more realistic, and safer under windy conditions, if a little power is carried. A powered approach should be somewhat flatter, and power kept on through the flare. All landings should be three point at minimum speed. There is no fear of tip stall if the wing has the correct washout. If there is any indication of tip stall just prior to a full stall landing, a little more washout should be added to the wing that stalled.

Good luck flying your Beaufighter.

SUMMARY

Bristol Beaufighter (1999) 1/10 scale. Span 73 ins. Wing area 765 sq. ins
Airfoil is Eppler 374 with NACA leading edge cuff outboard. Length 49 ins. Weight with eighteen RC-1700 cells is 124 ozs giving wing loading of 23.4 oz / sq. ft. Slotted flaps and retracts, (own design). Trinity "Speed Gem" 16 turn Ruby car motors drive 15 x 10 APC Electric props through 6.2:1 ratio superbox.
Props turn 4,400 RPM static at 30 amps giving 85 ozs thrust. Motors in series.
Suggestions are available on request for mail order houses in the States that supply the specialized equipment that may be needed for this model. Most of them will ship overseas.

September 2005. The Trinity Gem series motors now have a different name. The updated Ruby motor is the Trinity Speed Gem Chromium 16 turn double wind motor available from Tower Hobbies and other sources. The MEC Superbox was available from Pete Peterson are MEC in Seattle at a ratio of 6:1 which would be suitable if you can still find them. Other options are brushless motors of course, but try to use a large 14 or 15 inch prop with coarse pitch. Anything less in prop diameter or pitch will be less efficient. The use of li-poly batteries will reduce the flying weight considerably and enhance the performance of the model.