BRISTOL FREIGHTER
by Ivan Pettigrew
Construction Notes

For ease of transportation, the model may be built with the wing in three sections, and the top section of the fin and rudder removable. The undercarriage can also be removed for transportation. All parts are held together with wire clips or nylon snap fasteners. Assembly at the field does not requite any tools, and set up time is only a few minutes. Assemble the wing upside down so that the nylon clips under the wing, and aileron clevises are easily accessible. If using a typical seven seat mini van, it is best to leave the middle and rear seats upright (without headrests,) and slide a six foot long sheet of thin plywood in from the rear, resting on top of the seat backrests. The centre panel of the wing will sit across the centre passenger seat, with the outer wing panels on top of it. The fuselage sits on the plywood sheet leaving room for other models and equipment. Don't forget to take the undercarriage along if it has been removed! The optional slotted flaps are very effective, but should be limited to 25 degrees. Take offs are normally done without flap, but half flap is good for an impressive short field take off.

FUSELAGE

The fuselage is of the basic box construction. All wood is balsa, except where indicated otherwise. The sides are built over the plan, the shaded part indicating the primary part of the airframe sides. When picked up from the plan, the sides may appear weak, and need careful handling. Do not use thicker sticks. When additional longerons and stringers have been attached, the fuselage will have adequate strength. Someone described airframes like this as being "spaghetti" in the early part of the construction, but they firm up as details are added. Join the two sides together using sticks at top and bottom. Bulkheads are then added to the sticks across the top of the fuselage. The top longerons are added, and then the 1/16" sheet at the upper corners from the trailing edge of the wing to the tail. Note that the entire top of the front section of the fuselage, including the flight deck, is detachable from the leading edge of the wing to the nose. Construction of this section is best left until the centre panel of the wing and the nose doors have been completed. With the nose doors closed and the wing panel fitted, build this top section in place, pinning the longerons and curved nose section together where they meet the completed part of the fuselage. Use thin plastic or saran wrap to keep the two sections from being glued together.

TAIL SECTIONS

Notice that the spars for the fin and rudder are tapered, being quite wide at the base in order to give added strength. It is best to start construction by making these spars first, and fitting the hinges. Then build the surfaces over the plan in the conventional manner. The same goes for the stab and elevator. Having a relatively thick cross section like those

used, means that the construction can be lighter, and it is easier to control warps in the flying surfaces.

WING CONSTRUCTION. The wing is built in three sections. The basic airfoil is an Eppler 197, but the plug in outboard sections use a NASA leading edge cuff to reduce tip stall tendencies.

The full depth 1/8" sheet balsa spar is continuous throughout the wing The ribs are cut and butted to the front and rear surfaces of the spar. Construction is as follows.

MAIN WING SECTION

Cut the main spars from 1/8" sheet balsa and join together over the plan so that the dihedral angle is correct. Note that the spar also sweeps back at the point where the taper begins. For maximum strength, avoid but joins in the spar, but make them angled as indicated in the drawings. Glue hardwood strips to the top and bottom edges of the wing spar as shown in the plan. At each end of this section of the main spar, build the boxes that will receive the tongues of the "plug in" outer wing sections. Before closing in these boxes, make the hardwood tongues that will be attached to the outer wing panels, and ensure that they will be a snug fit into the wing boxes. Before continuing with the construction of the main wing section, it is best to make the spars for the outer wing sections. The hardwood tongues should be glued to these outer spars, ensuring that the top and bottom surfaces of the spars are perfectly straight where the sections join. It is easier to make these fittings at this point than later in the construction.

Most of the wing ribs in the prototype were cut from 1/16 balsa which was on the hard side. If soft balsa is used, it would be better to go with 3/32" The rib at the end of each wing section where it joins with the adjacent section could be one step up in thickness so as to prevent curvature that sometimes results from shrinkage of the covering material. Also, the ribs that support the plates for the bellcranks that operates the flaps and ailerons could be thicker than the standard ribs. Cut all the ribs in two at the point where they join the spar. Assemble the central un-tapered section of the main wing section first. Notice that the leading edge consists of two strips of balsa. Only the first (inner) strip should be applied at this time. Then prop one end up at the correct dihedral angle and build the three remaining rib bays at the other end of this section. Repeat this for the other end. Sheeting is now applied from the leading edge to the main spar, but ONLY to the lower surface only of the wing. At this point the wiring should be installed for the motors. This wire should be #13 gauge. To reduce the danger of electrical interference to the radio, the wires should be kept close to each other, and twisted about one turn to the inch. It will be noted that the wing at this point is still not torsionally strong, meaning that it can easily be twisted. After the sheeting is applied to the upper surface of the area already covered, the wing will be very rigid and difficult to twist. Hence it is very important to weight the wing down on a surface that is perfectly flat while applying the sheeting to the top surface. The remaining leading edge strip is cut from sheet balsa and glued to the one in

place. It is then contoured to shape. Finally, cap strips are added to the rear sections of the ribs, and sheeting to the centre section where indicated.

The outer wing panels are built in a similar manner. When applying the sheeting to the upper surface of these panels, the trailing edge at the tip should be propped up ¼" to provide the correct washout. The tongue and box sections for the secondary spar need to be added to the outer wing panels as well as the main wing section.

The construction of the nacelles and cowlings is fairly basic. The nose ring of the cowling starts like a doughnut, and can be of one piece of thick balsa, or laminations.

The slotted flaps enhance the slow speed performance, but are in no way essential. They do add weight. The flaps are built like miniature wings, but the fit to the secondary spar of the wing is critical. Construction of these should only be attempted by experienced builders.

In multi motor electric models, there is an increased risk of problems with radio interference from motor brush noise. This is especially so when the motors are wired in series, as is the case in this model. It is always recommended to put a good quality Schotky diode across the terminals of each motor in addition to the usual capacitors. 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 parallel to the motor wiring, and they would be very prone to picking up interference. At the low airspeed of this model, one standard servo is ample

The CG location and control throws are indicated on the plan. If it is desired to keep the cargo bay completely clear, the motor batteries may be located directly above the location indicated on the plans. A battery platform can be built at the level of the ceiling of the cargo hold. The cargo area is huge and can hold two or three "shoe box size" dummy containers. A novel idea for one of these would be a *passenger capsule. In either case, allowance should be made for the need of moving the battery forward or backward in order to make a small change in the location of the CG. A convenient way to make an eighteen cell battery back is to tape three 6-cell packs together side by side.

Opening of the cargo doors is optional. They need to be very well secured. The first time a full power static test was tried on the prototype of this model, the cargo doors were sucked open into the props! Free sawdust anyone! The remedy for that was using the "U" shaped wire clip shown in the front view of the fuselage. It would be easier and safer to build the doors permanently attached. Some imagination has to be used in attaching the upper nose section. The method used depends on whether or not the nose doors are made operational. In the case of the prototype, with the cargo doors open, the upper section slides backwards into place, with dowel locating pins at the back sliding into holes in the

T-5 bulkhead. The front of the top removable section is held to the top of the cargo door with a nylon fastener. Small blocks are fitted under the front upper lip of this removable section, and serve as stops for the door, also preventing the top section from inadvertently sliding forward when the doors are closed. Wherever these snap fasteners are used, a small plywood plate should be used for receiving the locating screws that are used of securing them.

Good luck in flying your two-story house from the upstairs bathroom.

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SUMMARY

Bristol Freighter. (June 2000) 1/12 scale Span 108 ins Wing area 1480 sq. ins Airfoil Eppler 197 with NACA leading edge cuff outboard. Length 71 ins. Weight with sixteen RC-1700 cells is 157 ozs giving wing loading of 15.2 oz/sq. ft. Motors are Kyosho 17 turn Atomic Force car motors running in series driving four blade 15 x 10 Zinger wood props through 7.2:1 ratio super box. Current is 25 amps static, and props turn 3,200 RPM giving static thrust 86 ozs. Slotted flaps to Andy Lenon design are very effective.

* Passenger capsule. Most Bristol Freighters were used for carrying cargo, and often it was carried on “roll on, roll off” pallets, or in containers, allowing for a very fast turn around between flights. In New Zealand, where a large fleet of Freighters was operated by Safe Air, the passenger capsule was developed for occasionally carrying passengers. It was like an old fashioned electric tram, or "Street car.” They wheeled it in, complete with seats and insulation, tied it down securely, hooked up the pipes for ventilation, and in a few minutes the aircraft was converted from a freighter to a passenger plane. I'm not sure if the passengers were in the capsule when it was loaded, but all the windows matched up with the ones in the plane. I did a search on the web just now. There are loads of pages under "Bristol Freighter" but the only reference I could find to Safe Air was regarding the Chatham Island operation that they operated. It was just a minor part of the total flying that Safe Air did. I'll paste in what was there.

The Chatham Islands archipelago consists of about ten islands within a forty kilometre radius, of which the three main islands are Chatham, Pitt and South-East. It is located at 44 Degrees South and 176 Degrees West, roughly 800 kilometres to the east of New Zealand, to which the islands belong.

First human inhabitation came from migrating Polynesian tribes, which settled on the islands approximately one thousand years ago. The name "Chatham Islands" comes from the ship HMS Chatham which landed on the November 29, 1791 and claimed possession. Sealers and whalers soon made the islands a centre of their activities. Fishing activities continue to be a significant aspect of the economy, although sealing and whaling industries closed many years ago.

The current population of about six to seven hundred individuals is of European (60%), Maori and Moriori origin, the Moriori being the indigenous inhabitants. The main settlement is at Waitangi.

The international date line lies to the east of the Chathams, even though the islands are east of 180 degrees of longitude. Consequently, the Chatham Islands observe their own time, which is nominally 45 minutes ahead of New Zealand time. (New Zealand time being the time observed at 180 degrees longitude.)

The Chatham Islands are accessible by air and sea. While freight generally arrives by ship, the journey is too slow for passengers. For many years the islands were served by a Bristol Freighter, a slow and noisy freight aircraft that was converted to carrying passengers by installing a passenger container, equipped with airline seats and a toilet, in part of the cargo hold. The prime reason for the air service was to ship high value export crayfish products.

The grass landing field at Waitangi was a limiting factor as the Bristol Freighter was one of a few aircraft that had the range to fly to the islands and then rugged enough to land on the grass airstrip. Although other aircraft did use the landing field occasionally, they would often require repairs to fix damage resulting from the rough landing. In the early 1990s(?), after many years of requests by locals and the imminent demise of the aging Bristol Freighter aircraft, a sealed runway was constructed to allow more modern aircraft to land safely.

Visitors to the islands are expected to have prearranged accommodation before visiting.