CONSTRUCTION OF THE IBEX MODEL

Stan Hall, author of ***Homebuilder's Hall,*** a monthly feature in Soaring magazine and the creator of the popular a homebuilder's sailplane, is the designer builder of the ***IBEX.*** Mr. Hall started construction of the ***IBEX*** in 1962 and finished in 1967. It took him 5 years and 5000 hours to complete this project.

Mr. Hall, I'm sure, did not have the modeller in mind when he designed and built the ***IBEX***. The pod and boom design was to explore a fuselage concept featuring reduced wetted area. This, in theory, gives better response to the flying tail surfaces and it does. The gull wing was to learn more about hands-off stability while spiralling. The pod and boom, with a vee-tail, seems to be an excepted configuration in today's model sailplane, so the IBEX fits very well in current standard of good design. The gull wing has no advantage as far as I can tell, over polyhedral, but responds in turns and is more stable than straight dihedral.

The model employs a five channel radio, rudder, elevator, landing flaps, aileron, drop-able water ballast and wheel brake. Rudder and elevator on the right stick, aileron and flaps on left stick, the water ballast and wheel brake on the retract switch.

The reason for the rudder on the right stick is to reduce the possibility of doing a snap on launch. Rudder is less effective and thereby slower to get you into trouble. Keep the ailerons in mind if you want to turn more quickly. If the plane wants to spin off to one side on launch just a touch of opposite aileron will get you back on the "rails" faster than you can blink your eye. I use rudder almost 100% of the time while flying. Again, just a touch of opposite aileron if you want to get the ship out of a tight turn and level the wings in a hurry.

This is not going to be an anthology of how to build the ***IBEX*** by gluing part A to part B, then part B to part C, etc.; but rather the techniques I have found by 'trial and error, to complete an ***IBEX*** with minimum amount of frustrations and wasted time and materials. The ***IBEX*** is a relatively easy airplane to build but should not be attempted by the novice builder. However, if you could build one of the more popular open class ships, you will have no trouble with the ***IBEX***.

Let's start with the wings. As we proceed with the construction you will see why. The centre section is sheeted top and bottom and is built directly over the plans. If you . have a jig that can be set to the proper dihedral, build the centre section in one piece. Layout the bottom sheeting over the plan. Make sure you know where the ribs will be placed and glue in the bottom spar. The wing is a constant taper so you can stack the ribs and sand to proper shape from 3/32 balsa. Replace ribs with plywood as marked on the plan and glue in place. The tip ribs 0f this section should be drilled for the tubing that will hold the tip section to the centre section. Cut off trailing edge of ribs as required for flaps, building the flaps along with the centre section.

Install top spar, leading edge cap, trailing edge spar and shear webbing. This may seem like over construction and you may want to reduce the size of the spars and shear webbing, but I would urge you not to. The centre section of the first ***IBEX*** was much lighter and failed. The second centre section was over constructed to the point of being ridiculous. The last flight at the Nationals I ran into my timer on landing and struck him a near lethal blow with the leading edge, midway between his knee and foot. He was hobbling for days; the only

damage to the ***IBEX*** was two bent 3/16" wire wing rods. The construction of this section, as per plan is just about right.

Install brass tubing with slow drying epoxy. Use a length of wire in an electric drill to get the holes in the ribs for the aileron Ny-Rod hook up. Better yet, pre-drill these holes before they are glued in place; glue in outer Ny-Rod. The outer panels are held in place to the centre section much like the wings are held in on a Cirrus. These holes are drilled and plugs are put in place. The bell crank for the ailerons is glued in place. Install inner Ny-Rod. Glue in rear hold down plywood. Install front hold down ribs. Temporarily install flap and aileron servos making sure all linkages work smoothly.

If you are going to use dropable water ballast, and are a purist, build your tanks into the wing. It is very simple. Merely epoxy two rib bays and insert brass tubing for intake and outlet. When Red Gunning and I were fooling around with power endurance ships, a few years ago, we had tanks that would hold 60 ozs. of fuel in . the wings using this method, and never ran into problems. Of course, if you do not wish to go this route, a plastic bottle or fuel tank could be installed in the fuselage. There is ample room for it. After the wing tank is complete sheet top surface and add leading edge. Cut opening for access hatch to servos, and l/4 x 20 hold down screws.

The outer panels are built over the plans and the construction is the same as centre section. These panels are not fully sheeted but glue the bottom cap strips in place prior to spars and ribs. Pre-drill the ribs to set the proper dihedral for these sections. The dihedral is obtained by placement of wing wires in outer panel ribs, rather than bending the wires to the proper angle. The ailerons are spring loaded down and are adjusted to neutral when joined to centre section. When the right aileron is pushed up, the left aileron is spring loaded down and vice versa for left aileron. This method of connecting linkage on removable outer panels has never failed. Jerry Merlik uses a method similar to this for spoilers on his Astro-Jeff and it is from Jerry I got the idea.

The tail surfaces are also built over the plans and the ribs are sandwiched and sanded just like the wing ribs. The centre ribs are replaced with plywood as per plan. Pin directly .over plan leading and trailing edge, tip and centre sheeting and cap strips. While you are at it you might as well make four of these; two right and two left. After dry, shim leading and trailing edge to proper angles and glue the ribs and leading edge hardwood in place. Glue the brass tubing in place with slow drying epoxy. Make sure the right and left panels line up. This is kinda important. Sheet top. There are many ways to handle the tips. The method I used is a lazy mans way and adds little weight for the strength gained. (Who needs strength at the tips?) Mix micro-balloons with your favourite finishing resin to a consistency of putty and fill in the tips. When dry sand to shape, or use balsa.

Another advantage of a full flying vee-tail is that there is one less part to build, and no hinging to cope with. If you have proceeded this far, and the construction is complete, all that remains is t he fuselage, linkage to the flying tail and finishing. So lets get on with it. The fuselage: In all your modelling years have you ever seen anything seemingly more out of size? When Don Drury, the man who scaled t he plans for me, brought to the 1974 GDSHS snow fly contest a foam pod' of the IBEX, I flipped! No one in their right mind would build a model with this size fuselage. I must admit I had second thoughts on the project.

There were several approaches to the construction open to me. I chose the fibreglass s route. A plug was made from 25 board feet of pattern-maker's pine by Jim Reilly. A fibreglass mould was then made f rom the plug and a fibreglass fuselage then cast from the mould. The completed fuselage is in three parts. The main pod , cabin-cockpit section and the boom. If you wish, I will cast the main pod and cabin section of fibreglass for a reasonable amount. Contact me through AAM. There is always t he balsa, built up method, but frankly, I wouldn't know where t o start. The boom on the first IBEX model was made by laminating two 1/16" balsa sheets rolled to a l-1/4"0.D . The boom was then glass covered. equally strong boom can be made. The boom is inserted in the pod and held in place with two bulkheads using a liberal amount of resin. Fill the seam where the boom joins the pod with glass cloth and resin. Fill boom seam with balloons and resin. Sand to shape.

By this time you will note the top of the fuselage at the wing saddle is flat. If the proper dihedral is built into the fuselage in the m01ding process I'm told you could not get the fuselage out of the mould. Position the fuselage in such a manner that the top is perfectly level and there is enough room to set the centre section in place. Use wide trailing edge stock epoxied to the top of the fuselage to get the proper wing saddle angle. After these pieces have dried, mix up a batch of resin and micro-balloons and slop (try as I might I can't think of a more descriptive word) this over the entire fuselage top at the saddle. Place a piece of mono-kote backing, or the like, on top of this mess. Press the wing down firmly and hold in place until the resin is cured. When this has dried you can sand in the proper fillets.

The most difficult part to explain is next. This is making the stab roots, bell crank mechanism and stab wire hookup. Be sure the tail boom is perfectly level. Cut out the top section of the boom at the stab position. Save this piece. Bend to 100 degrees a piece of 3/16" music wire, cut to the proper length. Make a disc the same as the inside diameter of By soaking in hot ammonia water a 1/32" plywood sheet then rolling to a 1-1/4"O.D. around a tube or dowel a lighter and the boom from 1/4" hard balsa, and epoxy in place. The 3/16" wire is then tack epoxied with 5 minute epoxy to this bulkhead. It is very important that this is done accurately as the proper angle to the fuselage is set by this wire. After this has cured, mix up another batch of slow dry epoxy and micro-balloons. Hold the fuselage nose up and fill in around the wire with this epoxy mixture. Add plywood tail wheel block. The bell crank system is then epoxied in place. Alignment is accomplished by positioning the stabs on the main wire and moving the crank assembly .to line up the forward pins with the forward tubing in the stab. Epoxy the inner root and outer root ribs in place. Use your favourite push rod method. I used Ny-Rod. If you use this system, a bulkhead of 1/4" balsa is made to secure the outer Ny-Rods. This is installed with the outer rods in place prior to installation of bell cranks. Sheet the stab roots and cover access hole. Glue on tail cone, fill around root ribs with micro-balloons and resin to make fillets. I have found this method of fillets is very simple to make, fast to dry, strong and easy to sand.

The radio installation is next. I have used three mixers, Airtronics, Kraft and EKi however the Kraft is not well suited for this application. I used the EK and it worked fine. The sliding servo method, I'm sure, would work acceptably. The retract servo is used if wheel brakes and/or dropable water ballast are employed. You are going to need extra nose weight so you might just as well make part of that weight a serve for these two functions. You will never find a more easy and foolproof way to pick up scale points.

The cockpit detail is next. Remove the windshield area and cap the opening with plastic, cut to size, and held in place with alpha-type glue. Sheet the bottom and back and paint the inside area with flat .tan paint. The instrument panel is cut from plastic and instrument openings cut out and is painted a flat brown. I beams of plastic and in different shapes can be purchased at your local hobby shop for the interior detail. The seat is made from balsa and covered with cloth. You must use your imagination to get the small details to look right. The real test of your abilities will be seen in your creativeness. It is very difficult to explain what must go into the cabin detail and about the only way to succeed is just to do it. After the seat and the stick assembly are installed the instrument panel and console go in next. The parts that are not covered in the text can be picked off the plans. The remainder of the construction is the small details that can also be taken from the plans.

Finish: I used K&B Superpoxy and MonoKote numbers.

Colour scheme: Wing and top of fuselage, above the pin stripe is white, lower fuselage, boom and tail surfaces are golden rod (yellow). The pin stripe is brown. On the model that I flew at the Nats the pin stripe was DJ's 1/8" black, and if you are building the ***IBEX*** for serious competition, don't use a black pin stripe. I was marked down in points for deviating from scale finish, and deserved to be, for this infraction. The lettering is transfer type and can be obtained at most artist supply houses. A thin coat of clear varnish over these letters will protect them.

There are no special instructions on flying. If you would build a plane like the IBEX, I must assume you would know how to fly it. One word on the landing flaps. They work differently than do spoilers. When they are dropped, be prepared to give plenty of down elevator. A point I should make: There is a tendency for the tail to flutter when speed builds up. It is not excessive, and quite frankly I haven't figured out how to cure it.

This is a quote from Homebuilders Hall, September 1974, Soaring magazine. "THE EVILS OF FLUTTER AND HOW TO DEAL WITH THEM - PART I. I'll not soon forget The Day I Learned About Flutter - - the hard way. I had made several low-altitude auto-tow test flights in my brand-new, pod-and-boom sailplane ***IBEX***, and, after a breather, called for the sailplane's first aero-tow. At fifty feet altitude I felt the tail oscillating heavily around the boom's torsional axis. The whoLe ship was flexing - tail, wings, everything! Instinctively, I yanked the release be~ore running out of field and rode the bird to a landing. The tail was still oscillating during the rollout. Ted Nelson, who had run the wingtip, stated later that the boom was twisting at least 10 degrees in either direction at a frequency on the order of 2 to 3 cycles per second. Needless to say, I put the ship back in the hangar, drove home in stony silence and took a long nap."

Sources of pictures and specifications for the ***IBEX*** can be found in the following issues of Soaring magazine: March 1970, July 1973, June 1974, August 1974, September 1974, and October 1974. Also in Jane's All World Aircraft 1970-71. I hope you will enjoy your IBEX as much as I have enjoyed mine. The response I received from my peers after the first flight at the 1974 Soaring Nats was worth every bit of effort put forth.