DE HAVILLAND DHC-1 CHIPMUNK
by Ivan Pettigrew
Construction Notes

This model of the Chipmunk is considerably larger than most models that use an equivalent power system. Because of the light weight of the airframe and large wing area, the model flies on very little power, and performs adequately on the racing car 05 motor that is used. When first built, the prototype flew on two motors geared to the one propeller shaft, and used 16 cells with the motors wired in series. The performance was more akin to that of a Mustang fighter than a Chipmunk. Maybe some model flyers like it that way, but this one prefers the slower more scale like graceful flight of the present set up with much lower wing loading. One of the impressive characteristics of this model is the excellent glide ratio, possibly because of the clean design and the large tapered wing. It is no doubt because of this that the Chipmunk flies on so little power. In spite of the relatively low wing loading, it handles windy conditions well, and can be flown in rough conditions with more confidence than is the case with most models. The tapered wing gives a good roll rate which contributes to the impressive aerobatics that the model is capable of performing. If built correctly, this model is not prone to tip stall, and this is another factor that gives confidence when flying in a gusty wind. At the same time, the model will do spins and snap rolls with the best of them when called on to do them, so it is really a beautiful model for scale like aerobatics. The loops are large if the model is dived to gain speed in the same fashion as it was in the full scale Chipmunks and other light planes of the era. There is one note of caution though. For some reason, this design will not fly on rudder only. In other words, if the pilot forgets to hook up the ailerons and takes off with them disconnected, it will likely end up in short lived knife edge flight, no matter how much opposite rudder is used. Ask one pilot who knows. So double check the ailerons before taking off. I have had an aileron failure in other models without any major problem, and even with my DH Mosquito twin have been able to land safely with just rudder and elevator, but for some unknown reason, the Chipmunk can not be flown without aileron.

FUSELAGE CONSTRUCTION
This is of traditional box type construction. All wood is balsa unless otherwise shown. Two sides are built over the shaded sticks shown in the plan using 3/16” x 3/16” strips, and 3’16” sheet for the wing saddle. Join the sides together with 3/16 x 3/16” sticks to make the basic “box.” Note that at the first two bulkheads at positions #1 and #2, the upper longerons are wider apart than the lower ones. From there to the tail, the width is the same. Next the upper, lower and side bulkheads are glued in place, the top and bottom longerons (1/8” x 3/16”) attached. The fuselage can then be sheeted, but it is best to leave the side sheeting until final assembly has been done and the control pushrods for the tail surfaces have been installed. The top of the fuselage from the nose to bulkhead #8 is removable, so is best built in place after putting “cling wrap” over the main part of the fuselage to prevent the removable cover being glued to the main airframe. .

TAILPLANE
Notice that the tailplane has a symmetrical airfoil section. This results in a deeper spar which is stronger than it would be if a flat surface was built. It also means that the tail surfaces can be built lighter, and the resulting tail section is less prone to warping. Make the spars first and hinge

carefully to get good alignment before proceeding with building the tail surfaces in the usual manner.

WING

A full depth balsa spar runs the length of the wing, with ribs being cut, and glued to the front and back surfaces of the spar. The top and bottom surfaces are then sheeted from the leading edge back to the spar. This makes for a very strong, yet light, "D" box. Besides being strong, a wing built like this is very resistant to twisting. Start construction by cutting out the wing spar from 1/8" balsa. Assemble the full length spar over the plan so that the correct dihedral angle is built in. Next attach the hardwood spars that run part way out the wing. These may be bass or spruce. To start assembly of the wing, pin one half of the spar to the building board with the other half propped up to the correct dihedral angle. Glue the rear part of each rib to the rear surface of the spar, and attach the trailing edge and aileron spar. The front parts of the ribs are next attached. Notice that the leading edge consists of two strips of balsa. At this stage, just glue the first (inner) strip to the nose of each rib. When one wing has been assembled to this point, the opposite one can be built by propping up the completed section to the correct dihedral angle. Pin the spar of the second panel to the building board and complete the construction similar to the first one. Next the landing gear blocks should be installed after making sure that the ply doublers are in place on ribs #2 and #4. These plywood doublers keep the L/G blocks from twisting. When completed, the sheeting is applied to the lower surface of the wing from the leading edge to the main spar. Notice that the wing is still not torsionally strong, meaning that it can be twisted quite easily. Some people call this "Ivan's Spaghetti." Don't be fooled by this. It will become very rigid when the sheeting is applied to the upper surface. Hence it is very important to have the wing set in the correct position while applying the top sheeting. This is done by weighting the wing panel down on a perfectly flat surface. There is 3/16" washout at the tip at the point indicated on the plans, but washout should only start at the aileron break. Hence the wing should be weighted down on the flat surface from the root to the point where the aileron starts. From there to the tip there is the slight twist that gives the correct washout. With the wing firmly weighted down, glue the upper sheeting in place from the leading edge to the main spar. When this has been done, the remaining outer strip of the leading edge is added and shaped to the correct contour. Many modellers wait until a wing is covered before they check for undesirable warps, or wrong washout. Then they heat the covering to twist the wing to correct the problem. This is very difficult to do with a wing built in this manner. It is just too strong and resistant to twisting. If the wing is not true at this point, dampen the sheet covering and weight it down overnight in the correct position. Make sure that opposite panels match so that one wing does not have any more angle of attack than the other. Often an error creeps in at the centre section and the model will never fly right with this problem. The ailerons are next built. One way to get an accurate fit is to hinge the aileron spar in place first, and then build the aileron with the wing weighted down over the plan. Attention to getting the ailerons to fit flush with the wing surfaces pays off in reducing drag.

GENERAL

Clear mylar as used for overhead transparencies has been found to be good for windshields of models like this. It can be used for windshield and rear panel, and also the curved overhead panel. The flat surfaces of the side windows can be of the same material, or simply covered with clear transparent Monokote. Low temperature film, or mica film, has been found to be best for lightweight airframes such as used in this model.

The 16 turn Trinity Ruby motor specified on the plans gives a very sparkling performance. Some builders may have difficulty in getting a 6:1 ratio gearbox and they tend to be rather expensive. A more economical option is to use a 22 turn Magnetic Mayhem racing car motor which can be used with one of the readily available 3.5:1 gearboxes and a 15x10 prop. The Magnetic Mayhem may not be quite as powerful as the Ruby, but is very efficient. It has a slightly longer armature than most car motors and will invariably give longer flight times. The longer armature of the Magnetic Mayhem, together with advanced timing, makes it very efficient, and it can be operated on nine or ten cells. However, it comes with two options on the timing, (normal or reverse) and for use with one of the single stage gear reductions which reverse the direction of rotation, it is important to use the motor with "reverse" timing. Economical gear reductions available are the Master Airscrew or Great Planes GD-600. These come in ratios up to 3.5 and 3.8 respectively. The GD-600 is cheaper than the Master gearbox and has the advantage that the ratio can be changed by simply changing the motor pinion which is held on with a set screw instead of being pressed on. It is good to be able to experiment with gear ratios and props. The model may perform slightly better with a 3.5 ratio than the 3.8, but performance will be adequate with the 3.8 and flights may be longer. When doing such tests, be sure to read the static amperage drawn. With nine of ten cells the Magnetic Mayhem is OK up to about 28 amps whereas the Ruby can be run at 35. The ultimate test is that the motor is not too hot at the conclusion of the flight.

If operating from grass fields with bumps, use the softest wheels available. The Chipmunk is a beautiful flyer, but one undesirable characteristic is the way it taxis at low speed on a bumpy surface. Any low wing model with this kind of undercarriage is the same. The landing gear legs spring backward a little each time the wheels meet a bump. If the legs are raked forward as in this design, this springing backwards has the effect of lengthening the struts which is just the opposite to what they should do in order to absorb the bump. The result is that the model kind of "bunny hops" when being taxied slowly. Lightweight oleos would be a wonderful addition to this model. Otherwise use the softest wheels available and keep the taxi speed up. It seems to taxi better at a higher speed.

Good luck with your Chipmunk.

De Havilland Chipmunk
(1998) Scale 1/5.6 Span 74 ins. Wing area 820 sq.ins. Length 55 ins. Weight 83 ozs Wing loading: 14.6 oz/sq.ft. Any ESC that can handle 10 cells or more, and up to 35 amps is suitable. The Castle Creation Pegasus P-35 is a good choice. Airfoil: Eppler 205. For the Ruby motor, a suitable high ratio gearbox called "Superbox" is available from MEC, Seattle, WA. The Magnetic Mayhem uses a 3.5:1 gearbox turning a 15 x 10 APC-E prop 4,800 RPM at 28 amps on nine cells.

Ivan Pettigrew

Feb 2009. This came from Al Gross in WA. He is flying the 11 year old Chipmunk prototype and has come up with a brushless motor that seems to be a good match for the Chipmunk. It likely would be suitable for other models that used to fly on the 05 racing car, or Speed 600 type motors from 9 nicads. Examples are the Auster, Shoestring 62 and 58, Seagull, Mosquito, Beaufighter, Albatross, Sealand 600, Twin Otter 600 and PBY-5A. Ivan

From Al, “I flew the Pettigrew Trust Chipmunk yesterday, third or fourth motor, now brushless since Fall with an RC Hot Deals 2820/6 motor, 3s 2100 Li-po, 12X6 prop. Still a delight to fly in a scale manner