

LI'L DOOZEY ...

Coming in! Here we see the little machine on a landing approach. Use of a telescope lens seems to bring the tree lined shoreline up real close.

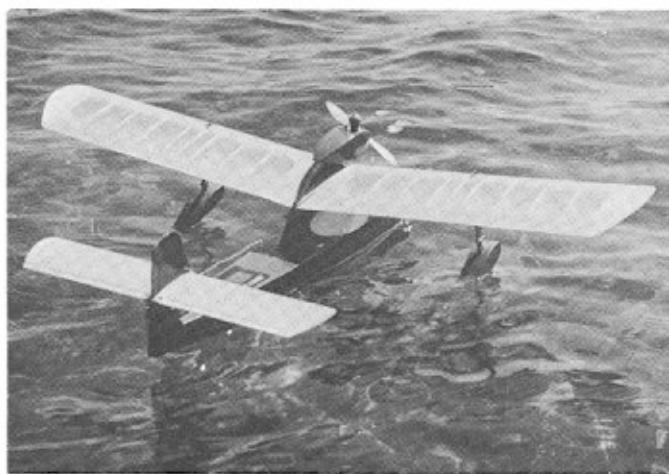
By GEORGE A. NEIL . . . why not join the present rush to hydro flying with this excellent little single channel plane that has a successful history of off-water flying. We were fortunate enough to see the first movies of the 'Li'l Doozey' and knew that this was the plane for our readers.

► If you fly radio-controlled model airplanes for the sheer joy of flying, don't deny yourself the pleasure of hydro flying. The thrill of seeing a model airplane leave the water and return for an unobstructed, smooth landing, is one which is questionably equalled in other areas of this fascinating and challenging hobby. The undeniable perfection of a body of water (when conditions are good), the relatively forgiving nature and abundance of this medium make it

extremely attractive. While the density of boats (pleasure) is ever increasing, they do not present the problem provided by that solid block of houses on or near a site that was once a group's prized flying area. There are only a few of the advantages. Come on, join the group (hydro) and get your feet wet.

The logical choice of configuration for maximum hydro flying success is the flying boat. The sealed hull is excellent protection for the equipment.

Vibration transfer to the equipment is reduced to a degree because of the distance and coupling between the engine and equipment. An effective spray shield is provided for the propeller and engine in an engine on center design; the merits of which are quite obvious. Due to the forced geometry of the flying boat outline, very definite aerodynamic 'net gain' for model purposes are also obtained. With reasonable care, a decided increase in (Continued on next page)



At rest with tip sponsons digging lightly into the water, bit choppy.



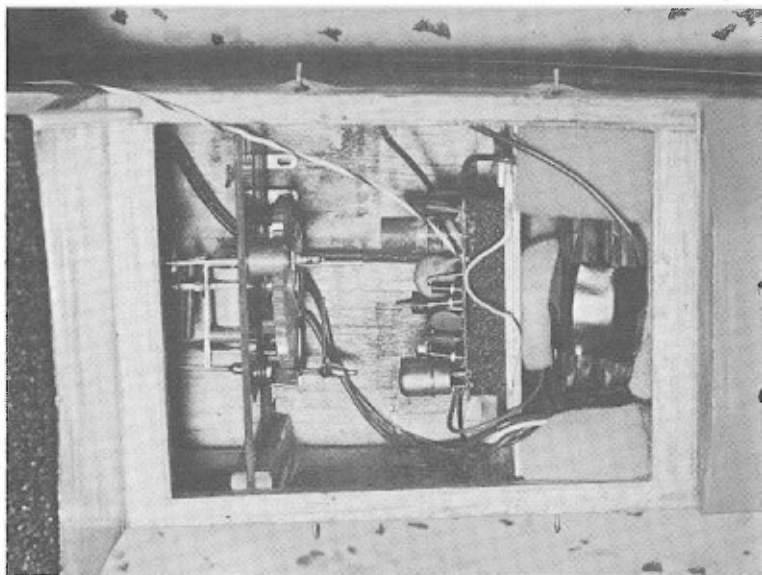
Another view of the Li'l Doozey at rest, rides real easy doesn't it!

LI'L DOOZEY . . . CONTINUED

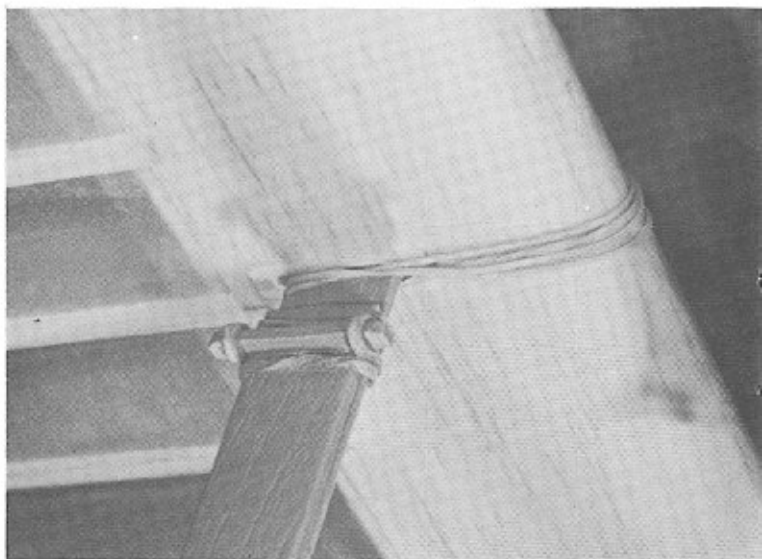
engine life is noted. This can be attributed to the reduction of abrasive intake. Providing the model is in a level lateral attitude, the turning (yaw) moments are comparatively small. This incorporates within the craft a superior hydrodynamic directional stability.

The model presented here represents a philosophy of carefully weighed compromise in the preliminary as well as in the final design. Result was a model which satisfied the highest expectations on its initial and subsequent flights. Prime requisite was that the model be somewhat realistic in appearance and performance. After all, the term 'model' implies that it should be a small representation of the man-carrying counterpart. Since provision for adequate visibility is a prime consideration in the design of man-carrying aircraft, the cabin area was designed as a predominately transparent enclosure. The resulting high cabin, first in a series of compromises, made it very evident that the floats, required for lateral stability on the water, would have to be supported by long struts and because of their length they would be subject to obvious damage. It seemed evident that a mechanical 'fuse' would reduce this problem. The 'fuse' was a strut which was designed to fracture at a predetermined point under a predetermined load. In practice this arrangement functioned very well. A quantity of expendable struts were on hand as replacements. This insured against the loss of flying time and reduced the possibility of deeper damage. Another design feature is the provision for inherent trim and alignment. Both are necessary considerations for optimum water performance. Ideal float setting is when the trailing tips of the floats are sufficiently immersed to position the model in level or near level lateral attitude. In order, at this point, is an explanation for the design of the float shape. Here, again, compromise dictated that the shape selected must first satisfy the hydrodynamic requirements and be compatible in an aerodynamic sense. The high lift section contributes to the total lift and the flat lower surface generates high corrective forces at low forward velocities (the critical phase of the pre-flight stage.)

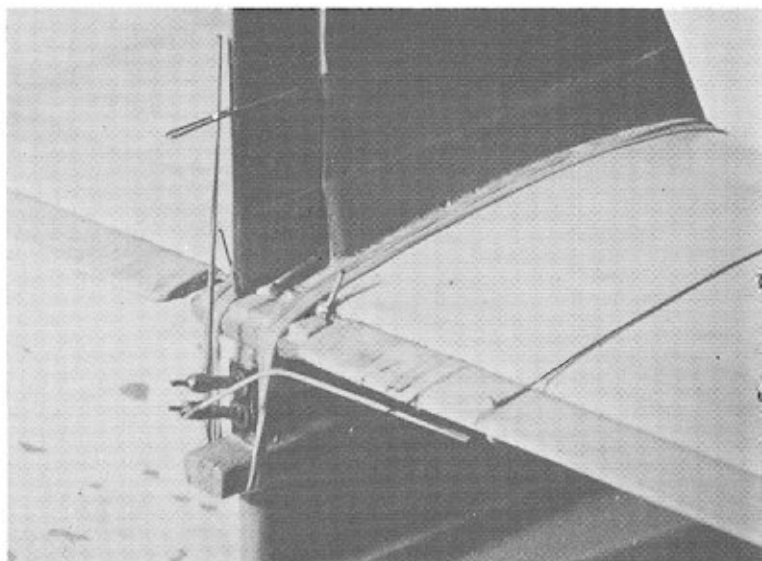
Next to be considered is perhaps the most controversial part of the design. The hull with all the aura of 'mystery' surrounding the design considerations involved can, usually, provide substance for a lengthy discussion. It represents the largest absorber and dissipator of energy at certain attitudes and velocities. In some areas it has led to the mistaken belief that excess power is a prime factor for successful hydro flying. It is true that excess power will, in some cases, force a poorly designed or trimmed (or a combination of both) model to become airborne. This design can be recognized by the characteristic long run at full engine output with the very steep, un-scale like, climb after 'break-away' from the water. The hull, along with other functions, should, through the various stages of transition, maintain the correct relationship of the aerodynamic surfaces to their element. It must also achieve a degree of compatibility with the forces involved. Without getting into a text book type discourse, we can say that a low beam-loading in conjunction with a minimum dead-rise angle is essential. The dead-rise angle is a factor in generating the lateral wave; the greater the dead-rise angle, to a point, the greater the lateral wave. Wave generation represents energy and in this case this energy must be supplied by the engine. It is, in some respects, as simple as that. Some dead-rise is, however, desirable for hydrodynamic directional stability. The angle in this design is comparatively small. Since the after body section does not totally remain in contact with water, the flat surface was found to provide no problem. The large, lifting longitudinal stabilizer in combination with other forces plus the design angle of the after body, keeps this surface from water contact at low velo- (Continued on page 85)



Look inside cabin area discloses Compound escapement, Rcv'r, batteries.



Tip sponsons are inserted in slot in wing and held with rubber bands.



Aft end of the fuselage shows rudder and kick-up elevator linkage.

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cities. This type of surface permits an accurately constructed hull with less effort. Why? It also provides a considerable amount of drag at high angles of attack which favorably reduces the airspeed in the 'flair-off' attitude prior to touching down. It is very important that the spray rails are not omitted and that they are at 90° to the side of the hull. The foregoing covers the high points of the hydrodynamic design and the reasoning involved.

Improper sealing, particularly in the control system area, will undoubtedly lead to trouble. The flat type of mating surfaces were found to be very satisfactory. In this design the gasket, which was fabricated from 1/8" O.D. rubber tubing, effectively sealed the forward hatch area. The tubing joint was accomplished by cutting the tubing to develop a diagonal joint approximately 1/2" in length and joined by employing a contact type cement. While the tubing form of gasket is favored, sponge rubber (weather stripping) with a light coating of rubber cement on the outer surface to form a membrane, was also found to be good. Although a 'bit messy', sponge rubber impregnated with a light silicone grease, is excellent. The rear hatch was sealed with plastic electrical tape (Scotch #33 or equivalent). This method effected a positive seal without complicating the structure and increasing the weight. This seal is replaced periodically. It is suggested that the surface

be thoroughly cleaned with alcohol to prepare the surface for proper adhesion of the tape. While on the subject of sealing, some mention should be made in reference to the wing and tail group. It is strongly felt that every effort should be made to seal these surfaces from water entry. If a rupture occurs, the surface should be repaired and sealed after having removed all moisture. Discreet use of a hair-dryer is recommended for this operation. Water, entering and remaining trapped, can cause other serious complications (warps, structural failures).

CONSTRUCTION:

Construction of the model is conventional, however, there are some points which should be emphasized.

The hull is built on a flat board (preferably soft pine) to a center line with the frame or bulkhead positions drawn in. The assembly on the jig board are made such that the top side of the hull is in contact with the board (facing down). The frames are assembled separately and checked for squareness and dimension before placing them in their proper positions. Allow the cemented frame and sides to harden (cement) before cementing the lower sheets in place. *Be sure to remove all retention pins which would be trapped prior to placing these sheets.* The nose block is cemented in position after removing the hull from the jig board. The shaping and contour blending should be one of the final operations performed on the hull. It is advisable to install the bearing supports for the control rods, the escapement and the rods, before the top decking is completed. Start the decking (top) from the rear and proceed to a point that provides sufficient area to permit the mounting of the vertical fin. The off-set linkage can now be installed. It is necessary to follow this sequence for ease of

installation. The balance of the construction is straight-forward and can be easily completed.

The wing, hull and the tail group, are covered with silk and given four coats of clear dope. The original model's color scheme is as follows: wing: yellow silk, four coats of clear dope; engine nacelle: one coat of balsa filler, four coats of clear, two coats of light blue; hull: four coats of clear, two coats of light blue; vertical fin and rudder: three coats of clear, two coats of light blue; longitudinal stab.: four coats of clear; elevator: four coats of clear, two coats of yellow.

SYSTEM (EQUIPMENT):

The receiver employed, at the present time, is the MIN-X SH-1. Unfailing performance has been characteristic of this receiver. Three 225 M.A.H. cells supply the receiver and three 225 M.A.H. cells drive the Bonner Varicomp (with 'kick-up') escapement. It is good practice to carefully bench-check the escapement regardless of manufacture. Escapements, though limited, can be extremely reliable. If at all possible, the use of U.S. T-56 is strongly recommended for driving the escapement. A rubber motor, consisting of 4 strands—1/30" x 1/8" x 18" long, is required. The rubber should be lubricated and stretch wound to 400 turns. For those who are interested in numbers, the torque at this number of turns is approximately 0.66 in.-oz. The normal fatigue characteristics of the rubber, in this application, is desirable. An occasional inspection is made for 'breaks' along the edges of the rubber strands; this is, really, the criterion for replacement. It should be mentioned that a slight modification of the Bonner escapement is necessary. Space limitations require the removal of 1/8" from the height of the bearing plate. The smoothness of action in all linkages

can not be over-stressed. They should not, however, be down right loose with loss in effectiveness. For additional insurance against R.F. noise generation, it is advisable to Teflon sleeve all metal to metal contact in the system. A final check is made with the escapement rubber wound to operating capacity *without the engine running and at a reasonable range.*

RELAY-LESS SYSTEM:

Any judicious reduction in weight will, naturally, pay dividends in terms of increased performance. It is cautioned that weight reduction be carefully considered against reliability. Should you elect to explore this possibility, be sure that the location of the C.G. is preserved.

BALANCE:

This model should balance or be trimmed to balance at the point indicated on the drawing. The vertical location of the C.G. is not critical, however, the fore and aft location is extremely important. Provision in the design permits the shifting of the battery to arrive at proper balance. 'Dope trimming' is also a feasible approach. This method can be utilized to clean-up small amounts of lateral unbalance.

FLYING:

Undoubtedly, this is the most exciting phase of your total effort. The craft can be tested on land. Do not attach the floats for the test on land (possibility of damage). The C.G. shift when the floats are removed is insignificant. As a precaution, a high grass covered field is recommended. Should you decide to go 'all the way', good weather and lake (or river) of ample size are the requirements. The model is released, slightly to the right of the wind direction, with immediate application of right rudder. Some practice will be required to obtain a reasonably straight line on take-off: do not be discouraged. Several commands are usually necessary on take-off. Depending on engine performance, the craft will become airborne in approximately 50'. While the model tolerates relatively rough conditions, pleasure of operation will decrease as roughness increases!!! The lack of an engine speed control materially reduced the utility of the water rudder which was installed on the original craft, however, it did provide better control through the initial stages of the take-off phase. The landings, when properly executed, fully justify the 'kick-up' feature; it is well worth the additional effort.

Although this model does not represent 'Instant Construction' in this era of 'Instants', it does represent 'Instant Hydro Success'. Good flying!!!!