KIMBREL DORMOY BATHTUB

By HANK ILTZSCH . . . Giant Scale at its very best! This 1/3 exact scale replica of Mike Kimbrel's VW-powered homebuilt captures all of the flavor of the original 1924 machine, and doesn't need a monster chainsaw engine up front to fly in a realistic manner.

PHOTOS BY AUTHOR

• At the outset, let it be clear that this is a *model of a replica*. The plane that I present here is a model of Mike Kimbrel's replica of the 1924 Dormoy Bathtub. Although it may seem strange to model a replica, rather than the original, there are a number of practical reasons for this. First, there is the problem of documentation in the event the plane were to be entered into competition. Second, and related to the first reason, is the unavailability and lack of structural information on the subject to be modeled. The information available on the original 1924 Dormoy Bathtub is a bit sketchy, sufficiently so that most competition oriented scale builders would shy away from it because of the difficulty in documentation. Oh, there are three-views and a few black-and-white photos around, but certainly not the abundance of material needed (and in most cases required) in today's competition in Precision or Sport Scale.

But since Mike took this sketchy information and converted it into substance, complete with many available photos and complete sets of construction drawings, we now have a subject which can be authenticated to the nth degree, while still capturing all of the flavor and character of the original. Make sense?

It would seem that with today's great push into the building of full-scale replicas, we are opening many new vistas for the scale modeler. Of course, it does depend somewhat on how close to authentic-looking the replica is built, as some subjects I have seen lose something in the translation, but these appear to be in the minority.

Like many modelers, those with a bent toward scale in particular, I cannot look at an aircraft or picture thereof without envisioning it as a model. There is almost an inate sequence of assessments and calculations that run through my mind as I look through various books and publications. Wing shape and number, general configuration relative to ease of duplication, and moments and proportions are considered along with numerous other trivia. In the event most of the above comes out favorably, the subject is mentally filed as a possible.

Then there are the times, such as when I first saw the pictures of Mike's Tub in the September 1978 issue of *Sport Aviation*, when all reason leaves. You are smitten and the plane has to be built, no question. The subject may or may not be a good subject from the standpoint of competition, but then a vast number of scalers don't enter competition anyway, but work for their own inner satisfaction.

Recognize it? It's called "scale madness," and is cured only by frantic gathering of information, drawing many lines on a piece of paper, then feverishly slaving over the workbench until the subject is *fait accompli*. Unfortunately, it is like the flu. You can get it many times in your lifetime, or maybe only once, depending on your mental resistance and stability.

Now that the reasons for building the model are clear, let's look into some of the background on the original 1924 Dormoy Bathtub, which obviously gave Mike Kimbrel a case of "full scale" madness, a closely related affliction.

The original aircraft was designed and built by Etienne Dormoy. This illustrious Frenchman was one of those whose thread of works and genius was woven continuously through aviation history, from before WW-I, on through and beyond WW-II. In chronological order, the following is a listing of his accomplishments in, and contributions to, aviation.

He began in 1911 as a draftsman for Aeroplanes Deperdussin. He immigrated to America in 1913 and worked as a designer for Schmitt Aeroplanes in Paterson, New Jersey. After the outbreak of WW-I, he returned to France and enlisted in the flying corps, where he flew Caudron bombers. He returned to the U.S. in 1917 as liaison engineer for S.P.A.D. He contributed to the design of the Packard-LePere pursuit, went to work for the Air Service Engineering Division at McCook field. During the ensuing period he numbered among his colleagues, gifted men such as Ivan Driggs, producer of the famous Dart and instrumental in the organization of McDonnell Aircraft; John Dohse and Jean Roche, builders of the original Aeronca; Orville Snyder, designer of the Curtiss-Wright Jr.; and Harold Morehouse, lightplane engine specialist who was instrumental in perfecting the current Lycoming engine line.

Dormoy was an early advocate of ultralight aircraft, having envisioned a strap-on, propeller-driven craft similar to some of the earlier Lilienthal gliders, but equipped with controls and a motor. At this point in history, no ultralight engines were available, so the idea remained just that.

After designing a simplistic biplane in 1923, which flew utilizing an 18-hp Henderson engine, he culminated his minimum plane ideas in 1924, with the building of what was to become known as "Dormoy's Flying Bath Tub." He entered the plane in the 1924 National Air Races at Dayton, Ohio, in the first cross-country race for lightplanes to be held in the U.S. He won the race and the Rickenbacker Trophy with an average speed of 70 mph over a 140-mile course . . . quite a feat for what was described at the time as little more than a broomstick body with a pair of closet doors for wings, powered by a 20-hp Henderson engine.

If we stopped here, we would have what we need for the origins of the plane we are modeling, but I would like to take you on a bit, to see what else Mr. Dormoy begat.

Briefly, our French genius went to work for the Buhl Aircraft Co. and numbered the Buhl "Bull Pup" among his several accomplishments from 1925 to 1930. This plane embodied, for the first time in a lightplane, an all-metal monocoque fuselage. During the '30s he spent several years with Boeing, where he was the dominant influence in what was then the Boeing Model 299, known by all today as the B-17 Flying Fortress. He had a later association with Reuben Fleet and Consolidated, where he helped engineer the PBY Catalina, as well as most of the later Convair models. So we see it was a rather extraordinary man who produced our rather unortho-

dox subject aircraft.

Some 50-odd years after the original Bathtub design, Mike Kimbrel, with his interest in ultralights stimulated by an association with the Sorrell boys (of Hiperbipe fame), fabricated the second, living, flying, 1924 Dormoy Bathtub.

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Be aware from the start, that although this looks like a rather simple craft, it is not. In its own way, it is one of the most complex subjects that I have ever built. A redeeming fact is that we are working in such a large scale, that 90% of the plane is simply a reduced size duplication of the full-scale. The remaining 10%, which is predominately the front section containing the powerplant, are minor concessions to the fact that this is a model.

Many construction articles can incorporate the phrase, "Construction is rather straightforward, embodying only basic model fabrication techniques." In this instance, we have anything but the usual, and as such, I recommend the plane only to those who are either well skilled in scale model construction, or who want a strong challenge to their developing skills.

The following text will only attempt to explain some of the major construction sequences and unusual details, and is certainly not a step-by-step type of chronicle. There are many areas where an alternate method or approach is possible, and I am sure some builders may favor their own methodology over my selections. It is my experience that no two scale builders will use all the same techniques for solving the various facets of construction. So do your own thing in areas where you disagree with my thinking.

If you are going to build this model, begin as I did, by acquiring the following items, sources for which are listed at the end of this article. Get a copy (or two) of the September 1978 issue of *Sport Aviation*. Then procure a set of Mike Kimbrel's drawings for the full-scale airplane. They are inexpensive, complete, and will answer many perplexing small questions which may not be immediately clear from my plans or text. Purchase a set of 6-5/8 inch wire wheels. Once having these, you will not be satisfied with just fondling them, but will want to view them affixed to the finished work. You could perhaps use a set of Williams Bros. vintage wheels in this size, but a lot of the flavor of the subject would be lost. In retrospect, these would be a good investment for use in initial flight testing to prevent damage to the spoked jewels. I did not, and really have no regrets.

The sequence of construction is of somewhat lesser importance when you are building from completed plans, than it is when starting from zip and working upward. I will narrate the following in the sequence in which I built the original plane, the reasons for which were merely my own logic.

Begin construction with the fabrication of the main landing gear struts. This will require much study of the plans, and the Kimbrel drawings will be a big help here as you go along, but once the general principle is grasped, you should have no problems. Brass tubing, steel, and silver solder are the instruments of construction. Once fabricated, keep them and the wheels around to look at, and they will provide a stimulus for completion of the rest of the project.

Using the appropriate plan section, construct two fuselage side structures. These are constructed mostly of 5/16-inch fiberglass pushrod material, into which 1/4-inch dowel has been inserted. Put a few drops of the gap filling type Hot Stuff inside the fiberglass rod, then insert a previously fitted section of 1/4-inch dowel. Leave room for insertion of fittings as shown on the plan. Fabricate the 1/4-inch steel rod pieces for the top of the fuselage struts, and Hot Stuff and pin as indicated.

All points of bonding to the fiberglass should be lightly sanded. Here again, we use the gap filling Hot Stuff at joints, both the main peripheral tube parts and the 5/16-inch balsa inner bracing. When each side is completed, drill about one inch or so through each joint with a 1/16-inch drill, then screw in a piece of 2-56 threaded rod, Hot Stuff in place, and cut off to the required length. We then have adhesive-bonded-and-bolted joint sections, and in some cases, attach points for further pieces or rigging connections.

Next we form a tent type structure with the two sides, over the top view, with the wing connector fittings over the appropriate spot. This alignment is rather critical to future construction, so measure and align carefully. Lock in place with pins, etc., then apply Hot Stuff down the middle junction point. A couple of temporary inner braces, side to side, should be added to help keep the structure somewhat rigid.

Fabricate the main (lower) boom, including the landing gear and wing strut fittings. Fit carefully into the "V" shaped groove at the bottom of the fuselage. This groove should be rounded out some in order to more readily fit the lower boom. Now epoxy the boom into place. Use plenty of epoxy, smoothing the squeezout so that the boom is faired into the lower fuselage with the surplus epoxy.

The 1/2-inch firewall may now be cut out and fitted. Epoxy this into place after making saw cuts through the fiberglass shaft into the inner dowels at about 1/2-inch intervals in the area to be bonded.

The fuselage structure can now be removed from the board, and the rear structure of dowel and aluminum tubing built up. The temporary brace between the rear main booms can be left intact until almost all of the construction is completed. This will give a good amount of extra rigidity while handling and working with further construction details.

Construct the rudder and fin and add the fin to the main boom, aligning it vertically with the center of the "V" structure. Sand the fiberglass boom flat, and through to the inner dowel in the area where the fin is bonded. Epoxy bond this area.

Fabricate the rear fin post fitting and loosely fit it to the fin dowel, but do not bond yet. With the structure upside down, carefully measure and fit the two upper booms. You will note that a section of threaded rod was left sticking out rearward at the top of each of the rear fuselage main wing struts. Drill a 3/32-inch or slightly larger hole in the front of each top boom, to fit over the projecting rods. Now, using epoxy in the rear fittings and predrilled front holes, put in the top booms.

The main skeletal structure is now completed; we just add to it from here on out. Make up the stab and elevator and fit per plan. The front or engine bearing section can now be made, consisting primarily of a 1/4-inch ply inner structure. This is a removable piece and is ultimately held in place with six 6-32 bolts, threaded into blind nuts in the main firewall. Epoxy all joints in this construction. Note that a hole must be cut on the right side through the rear front former and the firewall to accommodate the fuel tank. When completed, the entire inner front structure is epoxy coated.

Finish the rest of the landing gear pieces now, and leave these mounted on the fuselage. This will enable you to finally keep the fuselage assembly sitting in an upright position as you work along. The fairings on the landing gear and fuselage struts should be made up and added now.

Make up the step type servo mounting as outlined on the plan, and mount inside the fuselage. Make up a ply plate for the top inside front on both fuselage sides. One of these will mount the engine servo, and the other is for the receiver.

The front cockpit cowl is a removable structure, made up with formers and 1/32 ply. Form this in place over the front of the fuselage, tack gluing the formers in place until the ply skin is formed and trimmed to shape. This piece is to be held in place at the front with two short 1/2-inch dowels which also align the engine section to the firewall. At the rear, use a couple of small "L" shaped metal pieces attached to the underside of the dash and fastened with a couple of No. 2 x 3/8 sheet metal screws into the side dowels.

Now build the wing. Make it either in one piece, or in two sections and join at the center. There is no dihedral, so you need a good eight-foot flat surface to build or join on. When completed, the wing must be mated to the fuselage booms. Take plenty of time here. Make up the attach fittings, which go on either side of the main wing spars at two locations on each side. The inner two are done first. Bolt the fittings to the top of the fuselage booms. Put the wing on so

that the fittings are on either side of the front and rear wing spars, on an outward slant. There are 1/4-inch ply plates between the spars at each of these locations. With the main lower boom level with the building surface, hold the wing temporarily with small clamps at each attach point. Center the wing by measuring the wing-tip-to-fin-post distances, and at the same time, set in a 3° positive incidence in the wing, measured at the bottom of the wing. This gives an effective net incidence of around 5°, relative to the stab and thrust line. When you are sure all is right, drill through the mounting brackets and the ply mounting plates with a 9/64-inch drill. Then, using 4-40 bolts, secure the mounting brackets permanently to the wing.

Leave the wing in place, and make up the lift struts from streamlined aluminum tubing, dowel, brass, and steel, as per plan. Bolt the lower end of each strut to the fuselage fitting on each side, then repeat the previously used technique to fix the outboard end of the strut to the wing. Watch to see that you do not have any difference in wing incidence from center to tip, as well as being certain that the entire wing is level.

Make up the jury struts. These must also be watched for effect on wing alignment. They attach at the wing with removable clevis ends. With this arrangement, the lift struts will ultimately stay attached to the wing at their outboard mounting, thus removal or installing the wing involves four jury strut clamps, two strut-to-fuselage bolts, and four wing-to-fuselage bolts. The struts are folded back into the wing center for storage and transportation.

After completion of these and all remaining obvious small items, you are ready to cover and finish. Super Coverite was my choice. This is used on all open structures, as well as wrapped around the fairings on the fuselage struts and the landing gear. Give everything to be covered a good coat of Balsarite. If you used the aluminum tubing around the tail surfaces, buff the aluminum with No. 240 sandpaper before coating with the Balsarite. Lap inside of the tubing with the first surface covered, then a good overlap with the second. This has proven to give very good bonding at these points.

Cover the aileron gap with fabric, at least on the upper surface. I did not do this initially, and aileron response was sluggish. After covering the gap, aileron response was substantially improved, becoming quicker and more positive.

Prime the fairings and any uncovered parts such as the front cockpit cowling with automotive primer, sanding between coats till smooth. For the final finish, I used Aerogloss silver with a small amount of flatting agent added, and sprayed it on. A couple of final coats of sprayed-on, slightly flatted clear dope will make the finish more resistant to smears from fuel and cleaning. Numbers and letters are flat black.

After finishing, assemble the parts and you are ready for the rigging. This

Operating oleo-type landing gear involves a bit of metalwork . . . not too big a job. Hungerford wheels really add class.

consists of a number of 1/32-inch stranded steel cables or solid wire, all indicated on the plans. Several brass fittings will have to be procured or made up for the various attachment points.

The lift strut wires run parallel to the lift strut, from the fittings at the fuselage to the outboard ends of the struts. These are the only removable pieces of the wire rigging. These wires are attached permanently to the fuselage fittings, but at the outboard ends, a small loop of about 1/4-inch diameter is made and fitted over the end of No. 2 sheet metal screws projecting about 1/8 inch out of the fore and aft ends of the upper spar attachment piece. Rig these just snug. Removal is accomplished by taking out the fuselage-to-strut bolt and dropping it out of the bottom of the fitting. This relaxes the tension on the lift wires, enabling you to lift the loop over the head of the screw. Remember, on reassembly, to loop these over the screw heads first, then put the strut and wires under slight tension while fitting the attach bolt.

The front cowling is sheet aluminum, the kind found in most hardware stores. It is rather inexpensive and one sheet will make parts for several planes. Make up cardboard templates or patterns for these pieces and fit before cutting out the finished part from the sheet aluminum. These pieces are held in place with a number of No. 2 x 1/2-inch sheet metal screws.

The dummy engine is made up and fitted at this time. This is a removable component and serves as an access hatch to the engine and the fuel system.

The control cables run under the seat, directly from the servo arms, through pieces of nylon tube (which serve as guide pieces), then on to the various control horns. I suggest using extended length arms at the servos in order to assure sufficient throw at the control surfaces. The aileron connector wire runs through a simulated fuel line of rubber tubing, up into the aileron servo housed in the fuel tank. The fuel tank is removable, giving access to the servo for connection and service.

Get yourself a 1/3-scale pilot to fill that cockpit, as the plane looks very lonesome in the air without one.

The total weight, balanced, with pilot, should come out in the 12-13 lb. range, giving a wing loading of around 20 oz., a very respectable figure for a plane this size. A balance point favoring the 25% mark seems to be the best, even though the full-scale flies at 29-33% of the chord.

Flying the Bathtub is a bit different than I had expected. I have been flying a 1/4-scale Aeronca C-3 with about the same overall specs as this model and had looked for very similar flying characteristics.

The plane tracks nicely without much rudder correction. The tail comes up fairly fast (it doesn't have far to move), then it will run all day on the mains until you give a touch of up. It does take a good 100-150 feet of run to get flying speed when winds are light. All those wires and struts have a considerable drag penalty.

Once airborne, its behavior is unlike anything I have flown. It is slow, and sensitive to all controls except rudder (?). To execute a good turn requires coordinated rudder, elevator, and ailerons. Initial attempts to turn only with rudder produced only a slow deviation from course; when full rudder is applied, the plane may do a fast spin. It appears that the lack of fuselage side area contributes to the somewhat unusual flight characteristics. Because it is draggy, landings are best made with some power on until very close to the ground, then flare and chop the throttle. Rollout is surprisingly short.

In any event, in the air the plane is a sight to behold. Just fly it around and enjoy it. The full-scale, after all, is not too swift, and is not considered to be aerobatic in any sense.

If you build the plane, feel free to write with any questions regarding the model. Let me know how yours came out and how it looks. Let's communicate, you guys out there, it's how we scalers progress in the art. Ideas, both positive and negative, are what we thrive on.

I would like to thank Mike Kimbrel for his wonderful cooperation on this project, supplying me with an abundance of information with which to design and build this replica of a replica.

My thanks also to my many friends of the South Shore RCC, for their help and encouragement during early flight testing of the bird.

Thanks to Fulton Hungerford for his marvelous wheels, without which the plane would not have come to pass.

REFERENCES:

Historical: Air Progress, Spring and Fall 1959, Spring 1960, February 1968.

Full-Scale Drawings: Mike Kimbrel, 1333 Garrard Creek Rd., Oakville, WA 98568.

Wheels: F.H. Wheels, 1770 Lilac Circle, Titusville, FL 32780.

Steel Rigging Cable (1/32): Balsa USA, P.O. Box 164, Marinette, WI 54143. •