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only one wing, you will force the model into a spin since the wing with the wire on it will lose lift earlier than the plain wing will. The wire acts as a lift spoiler. By placing a wire ahead of the wing about 10% you will make the flow over the wing turbulent. The flow line will no longer remain as a nice, smooth line but will spread like a diffuse jet. But you will notice that the flow does not separate as early as it does on a plain wing. This is the action of the wire as a turbulizer. A turbulent boundary layer does not separate as soon as a laminar one does.

On models having tip tanks if you place a small crystal right on the nose of the tip tank, you will see the tip vortex wind around the tank. A grey-colored model shows the contrast of the purple flow line best.

VI. *Reynolds Number and Mach Number*

In these days of high technology even in modeling one must know something about the regime in which his flight tests are taking place. In air, it is easy to compute the Reynolds number from the speed in miles per hour times the chord in feet times ten thousand. The Reynolds number gives the scale of the boundary layer flow around the airplane. Models usually run from about 4,000 for indoor models to over 10,000 for large outdoor models. At a Reynolds number of about 60,000 for most model airfoils there is an increase in drag causing poorer performance. If your model flies slightly below this number, you can improve its performance by adding a turbulizing wire or by roughening the leading edge.

In water, the Reynolds number is found by multiplying the speed in miles per hour by the chord in feet by 150,000. You will see that for the same sized model and the same speed, the Reynolds number is 15 times higher in water. But, of course, the models fly much more slowly under water than they would in the air.

Also, in this day and age of supersonic flight it would be interesting to know the Mach number at which our underwater aircraft fly. This is easy, for we know that the Mach number is simply the ratio of the speed of the flight to the speed of sound in the medium. In water the speed of sound is 5,000 feet per second. When our model flies at one foot per second, as the Grumman F9F, we get a Mach number of 1/5000 or 0.002. It appears from this computation that we shall not have to worry about shock effects from hitting the sound barrier on our underwater models!

VII. *Propulsion*

Although motorless flight is very fascinating, especially if *you* do the flying you will want before long to try some propulsion on your model. This you can do quite easily on the plastic P-51. All you need to do is install a small thrust bearing on the spinner and drill the prop spinner for a prop hook of piano wire. Then thread a double strand of 1/8 inch rubber through the fuselage hooking it to the rear with a wire clip. Now wind up your motor and release the model — off the bottom of the swimming pool preferably. You will get a nice flight, in some cases even reaching the ceiling, or surface of the pool, from a depth of six feet. Don't be surprised if the model pops to the surface, but if by some chance the model comes up through the surface and takes off into the air, let us know!

Now on the jet models you may want to try a little jet propulsion. This is easily done if you place a few pieces of dry ice inside the jet, then seal up the jet intakes with scotch tape, fill up the fuselage with water, and launch the model. The dry ice gives off carbon dioxide gas which exhausts under pressure from the jet exhaust and thus gives propulsion.

VIII. *Final Remarks*

The authors wish you many pleasant and interesting evenings with "Bathtub Aerodynamics." Archimedes long ago made a famous discovery in the bathtub which saved his life and at the same time advanced physics. Even if you do not make any great discoveries, you will at least enjoy learning a few aerodynamic fundamentals. We have found many people, from professors and scientists down to younger brothers, who find a lot of entertainment in this simple experiment. Perhaps you can even invent new tricks to demonstrate the fascination of aerodynamics.

We are impressed by the slogan used by the Surrey Gliding Club, at Lasham, in England.

COME GLIDING—*enjoy the sport which has no visible means of support.*

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The meteorological contributions read during the 4th Congress will soon appear as a Meteorological Monograph of the American Meteorological Society, whereas the papers dealing with aerophysics have been published in OSTIV publication No. 2.

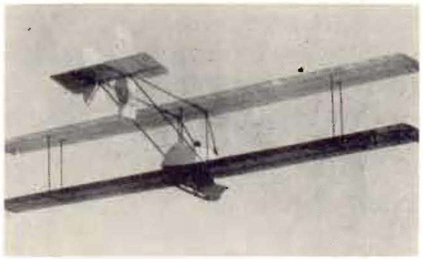
UNUSUAL GLIDERS

by PETER M. BOWERS

The two-place Fokker FG-II holds a unique place in glider history. As far as is known, it is the first biplane since the Wright Brothers' 1911 model to do any appreciable soaring, and it is also the last. In fact, at the first British glider meet, held at Itford Hill in 1922, this machine, with the designer, A.H.G. Fokker, piloting, and F. W. Seekatz as a passenger,

established a two-place duration record of over half an hour. This was one of the first records to be set using the "new" technique of slope soaring. Up to that time, most flights had been made by means of straightaway glides from a hilltop into the valley. Naturally, as soon as other pilots caught on to the technique, this record did not last long.

While it looks like a freak today, the FG-II and its smaller brother, the single-place FG-I, were rather conventional for the time. It had one great advantage over many of its contemporaries in that it was built by a world-famous designer of powered aircraft, and did not suffer from the handicap of cut-and-try fitting and scrounged materials. The wings were of wood, fabric covered, and the tail surfaces, booms and pod structure were steel tube. Lateral control was obtained by means of wing warping.



In spite of its size, 39′ 4″ wings with 386 square feet of area, the ship was amazingly light. Empty weight was only 204 pounds, and with two people aboard, the wing loading was only 1.04 pounds per square foot!