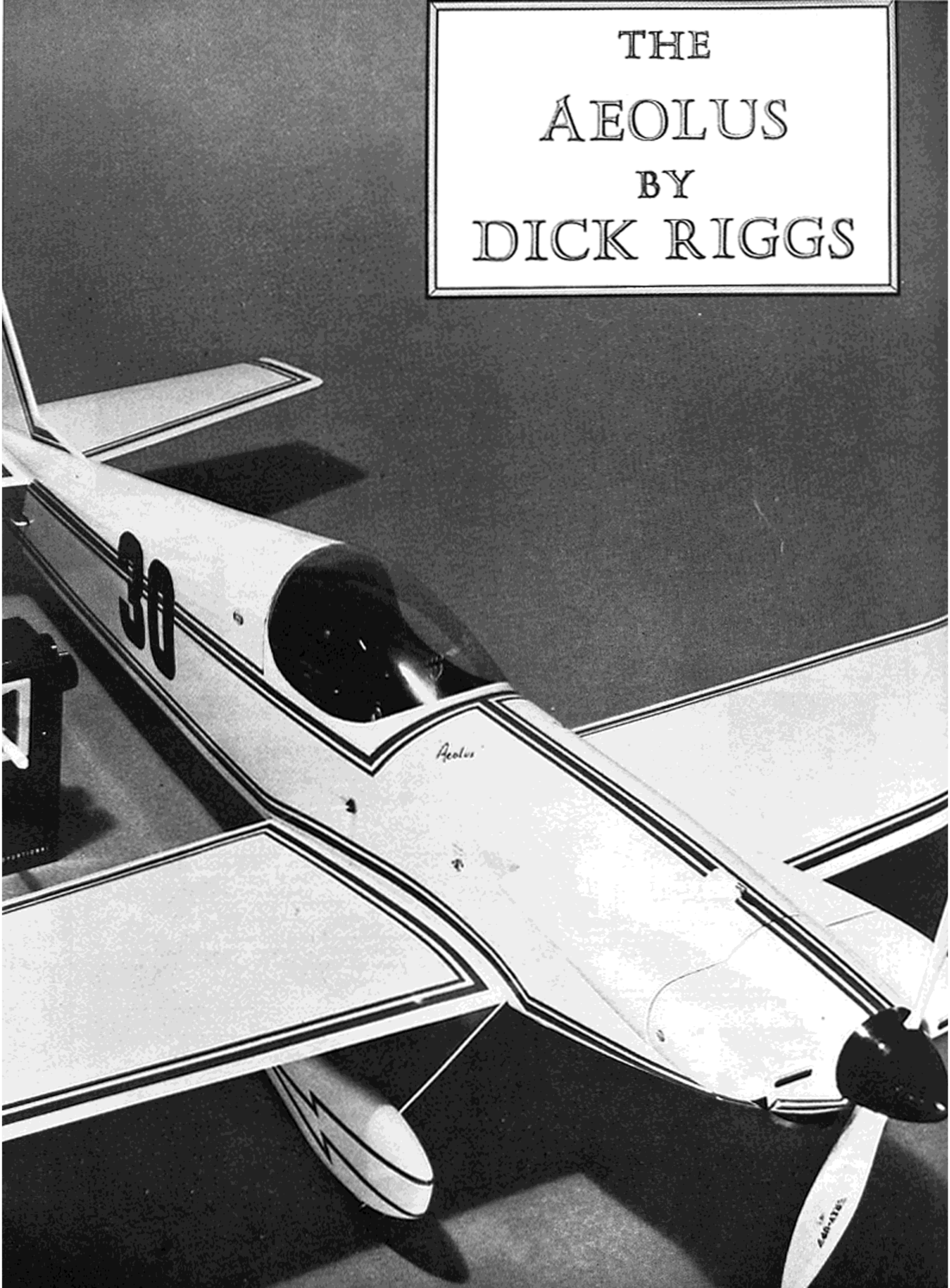
THE AEOLUS

BY

DICK RIGGS



As swift as the lengendary God of the Winds for which it was named, the Aeolus is a truly remarkable pylon racer — and a potential champion for the 1965 Goodyear Event. RCM selects Dick Riggs' low-winger as number one among the current N.M.P.R.A. designs.

The first of the new Goodyear Event ships that I had an opportunity to fly was Jerry Nelson's little Cosmic Wind. This plane actually surprised me by its capabilities, flying much better than one would expect. Subsequently, I watched Jerry fly his Bonzo many times — watching being just as good as flying, in many cases, when trying to evaluate design and performance characteristics. Following these flying sessions in Northern California, I attempted to put down on paper the characteristics I had seen that were desirable for incorparation into a Goodyear Event contender.

Both the Bonzo and Cosmic Wind (Little Toni) were somewhat sensitive in control response — not overly so, but probably a bit more than one would desire. There are several ways to overcome this factor. For instance, the Bonzo has an extremely high roll rate due to the very low aspect ratio. So when designing the Aeolus, a slightly higher aspect ratio was used. The Cosmic Wind has a "fair-to-middling" AR, but still suffered from sensitivity due to the coupled ailerons and rudder. When you go the coupled aileron and rudder route, you must keep the control throw way down, remembering that these pylon ships move along at quite a pace and the controls can be quite sensitive. Elevator response in all of these designs seemed to be perfectly adequate as long as the Center of Gravity is kept well forward. This is due, in part, to the flat bottom wing, and only becomes particularly critical when you approach a stall point.

I do not feel that a symmetrical, or semi-symmetrical airfoil would have any particular advantage for these Goodyear racers, except that you could probably get away with an airplane that is a little less longitudinally stable. In other words, it wouldn't be quite as critical in the C.G. location. The tapered planform of the Aeolus was used not only for the additional structural strength it provides, but to aid in increasing the aspect ratio. This increased AR slows down the roll rate, but at the same time, increases the rolling torque effect of the ailerons. This, then, gives us the desired control response with less variation from high to low speed. In other words, in the glide approach the aileron is still relatively effective due to their excellent generation of torque. Washout was incorporated in the wing to overcome one disadvantage of tapered planforms — they are notoriously laterally unstable as the stall point approaches.

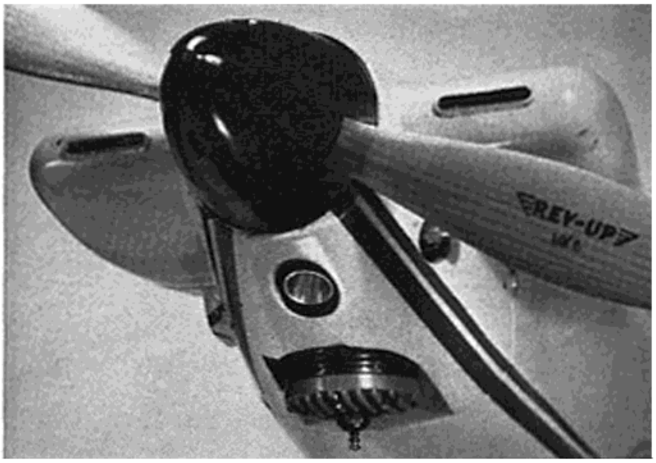
The first test flights on the Aeolus indicated that the CG must be much further forward than one normally uses on a symmetrical, or semi-symmetrical, wing. As it was originally located — at 35% of the chord — it was practically impossible to find the trim condition. In other words, it was either climbing or diving all the time. After the CG was moved forward to approximately 20%, we found a condition that is probably superior to the symmetrical wing. That is, when you set your elevator trim for a normal glide approach, and as the speed increases, the center of pressure travel moves back and accentuates the nose down condition. At the same time, however, the lift generated through the increased speed cancels this factor out, so you end up without having to worry about your elevator trim setting. This same condition was noted in both the Bonzo and Little Toni, so perhaps the flat bottomed airfoil has some advantage for our use in this pylon event.

As I mentioned earlier, both the Bonzo and Cosmic Wind utilized the coupled rudder and aileron configuration, which is more than adequate, but greatly increases the control sensitivity. In order to overcome this one undesirable feature, control throw **must be kept to a minimum.** One distinct advantage to the coupled aileron and rudder set-up is that at low speed on the landing approach, the rudder remains quite effective, approximating the same degree of control in the glide approach as you have at high speed.

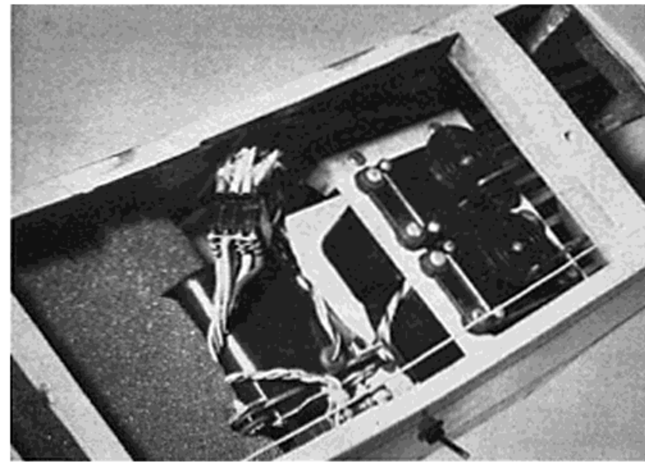
The Aeolus is set up with the Orbit 3+1 Proportional system wherein, at high speed, the rudder is de-coupled. I feel that I, personally, prefer this particular arrangement since you don't get the nose pitch down as the airplane rolls into the vertical bank to the pylon. Actually, however, this is no particular problem if you remember to allow an additional ten feet of altitude to complete the turn when using coupled ailerons and elevator. The Aeolus rolls into a vertical bank, and when you pull back on the elevator, it will complete the turn with practically no altitude loss.

The speed capabilities of these Goodyear Pylon racers are excellent, and with a good .35 or .40, approach 80 m.p.h. in level flight. It is well to remember that at this speed, control response is a critical factor. It is all too easy to overcontrol these ships, and even though it goes against the grain of most modelers, **keep the control throw down to a minimum** on the Aeolus! It is important to remember that these are small airplanes, needing only small surfaces and minimum throw.

The Aeolus weighs five pounds, dead on the nose, when completed. I really feel that a good .25 would fly the airplane quite adequately, and probably with nearly as much speed as an average .35. The original conception of the N.M.P.R.A. event, along with the present rules, specifies a .40 maximum displacement in order to include the greatest possible number of powerplants. There are, in fact, twenty-one different engines that can be used for this event. If you throw in the .29's, this number becomes staggering! So, you pay your money and take your choice of power. A number of prospective Goodyear pilots have wondered why the rules were not set up to include the many idle .45's that are collecting dust on the shelves of most Class III fliers.



Clean cowling, thin apple cheeks add to streamlined appearance.



Inside the radio compartment—the Orbit 3+1 proportional.

Limiting this event to a maximum displacement of .40 was done for a purpose. The .45 will not create that much additional speed, while most .35's operate at a higher RPM than the .45's we have used in Class III. For instance, the average K&B .45 on an 11/6 prop will turn right around 10,000 — a good K&B .35 on a 10/6 will turn 13,000. This begins to stir a mighty breeze because your air speed is actually a function of RPM versus pitch. If you have any efficiency in your Goodyear design at all, that .35 powered airplane will run the tail right off a .45 powered job. The major disadvantage, however, in sticking a .45 and 11/6 prop on one of these little airplanes is that the takeoff torque would be fantastic — the plane would probably revolve around the prop before you got airborne! The .45's are lungers, rather than screamers — designed to handle larger and heavier loads. They operate in a higher torque and lower RPM range. So, don't by any means, underestimate the power of the .29 through .40 class — you'll not only have your hands full, but may well be surprised at the speed your model attains.

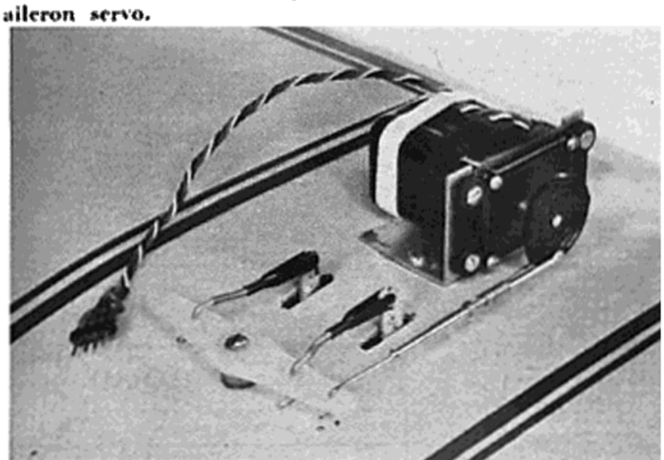
Since we are discussing torque, you will find that you will have to momentarily hold full right on takeoff with the Aeolus until it starts to gain ground speed. This is to overcome this takeoff torque, and results in the model clearing the ground with the right wing low due to the blast of right. The most effective takeoff procedure is to turn the power on full, hold full right and about half-up elevator. As soon as the wheels clear the ground, let the stick pop back to neutral and it's on its way. There doesn't seem to be any advantage at all to accelerating on the ground. Get it in the air and it will go the fastest, quickest! Your acceleration rate will be higher when your wheels are off the ground.

Insofar as the pylon turns are concerned, no one can actually **tell** you how to do it — it's simply a matter of practice. I prefer an altitude that approximates 60 feet. At this height the airplane is visible at all times and you are well above the twenty-five foot minimum altitude specified in the N.M.P.R.A. rules. Let's face it — I'm chicken! At 25 feet above the ground I'm punching controls furiously in order to gain some altitude. In addition, if there are three or four other planes in there at the same time, somebody is going to have to be high, and someone low. Therefore, it wouldn't be a bad idea to practice flying at the various altitudes — say, from thirty feet to one hundred fifty feet.

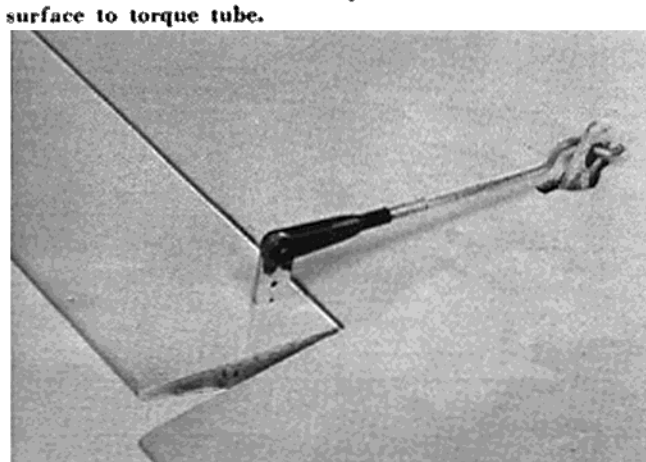
Construction

Construction of the Aeolus is strictly straightforward, following almost to a "T" the construction principles involved in almost any good Class III stunt ship. I'm not going to list a whole series of "Glue A to C" type of thing, but rather, give a few general notes on the construction in general. About the only particular deviation is the torque aileron drive which is best explained by studying the plans. The crank arms, themselves, are affixed to the aluminum tubing torque rod. These are single legs of Williams Bros. bell cranks. The other

Center section of the wing — note aluminum bracket for aileron servo.



A Du-Bro Kwik Link and simple connection from aileron surface to torque tube.



leg, of course, is cut off and the center bearing bored out for a reasonably tight fit over the aluminum tubing. Since this is nylon, it is difficult to find a material that will glue it well. Most epoxy cements will work satisfactorily, but for added insurance I drilled a small hole through the nylon and tubing, then ran a standard modeler's steel pin through the hole, gluing the whole thing with the epoxy. I feel that the torque tube is completely adequate for the very small aileron used on the Aeolus, but would not be recommended for the general Class III stunt ship.

When the entire construction of the prototype was first finished, the total structure weight was 1 pound 6 ounces, complete with landing gear, engine mounts, speed fairings and wheels. I felt that this was indicative of the fact that the airplane could easily be built at the 4½ pound minimum weight requirement. In fact, I felt for a while, that the plane was going to come out too light, so I applied glass cloth and resin to the entire fuselage from the rear of the canopy clear through the nose. Fibreglass was also used in two layers, first a narrow strip, then a wide one, over the center section of the wing. This fibreglassing, alone, added an additional ten ounces, which I now feel is prohibitively dense. I had never before checked the weight of applied fibreglass since I had not used it in such a quantity before. The amount used on the wing is acceptable, but a 2" wide strip from the firewall back would be more than sufficient for the fuselage.

The overall finish of the Aeolus is a minor variation from Jerry Nelson's technique. I used a couple of coats of regular aircraft **nitrate** dope over the bare wood to seal the pores prior to covering. The wing is covered with silk, although silkspan is completely adequate for this type of all-sheet construction. Two more coats of nitrate dope was used to seal the silk. This was followed by spraying on three full flow coats of lacquer base automobile primer. Some caution should be exercised at this point, since this primer is very dense and can build up weight quite rapidly. If you're looking for a super finish, let the plane set for about two weeks before sanding and applying the color finish, although this can be done after a 24 hour waiting period. Be sure to sand **dry**, so that you can see what you're doing without unknowingly sanding all the way through the silk!

All that remains now is to shoot the color — again, with nitrate dope. Jerry uses synthetic enamel (DuPont Dulux is one of the better brands), but this should be allowed to dry for about two weeks before being exposed to fuel. Nitrate dope, in various colors, and in large or small quantities, can be purchased at most airports.

The finish coat on the Aeolus is the fuel-proofer and final gloss. This is Fuller's Plast, technically speaking, a catalyzing varnish. Chemically, it is akin to fibreglass resin in that it utilizes a sulfuric acid catalyst. Mixed in proper proportions and thinned slightly, Plast dries very rapidly, so don't lose any time in spraying. Flow on one wet coat and let it dry for three days. This will give you an extremely high gloss coat plus needed fuel proofing qualities.

Epilogue

As mentioned previously, I use the Orbit 3+1 Proportional system and find it completely convenient insofar as weight and installation procedures are concerned. The minimal battery complement necessary, plus the very lightweight servos and a reasonably small receiver, gives an all up installation weight of only 17 ounces. To the builder, this means you can concentrate on building for more strength without worrying too much about the whole hodgepodge coming out excessively heavy.

In actual flying, I use the 3+1 function whereby the rudder servo is referenced back to neutral at full throttle, preferring to fly without the coupled ailerons and rudder. Nudging the throttle arm just slightly off the full throttle position switches in the rudder servo so that it travels swiftly in conjunction with the ailerons. The coupled aileron installation was kept in mind during the design of the Aeolus, accounting for what appears to be an extremely small rudder. You will recall, however, that the rudder is always in the high speed frame of the propeller, which accounts for its extreme effectivity.

A few notes on the N.M.P.R.A. and the Goodyear event in general might be in order. The response to this new event has been overwhelming. Why? First of all, the models **do** look like airplanes. They are simple to build and use the same construction techniques as used in Class III designs. And, you end up with a real sharp little machine. Another reason for the surge of interest, in my opinion, is that you can use an engine which is much easier to handle than one of those little "hot dog" .15's or .19's, giving you enough power to handle sufficient weight so that you don't have to be a premium indoor-type builder in order to build a featherweight little nothing in order to do a good job of flying. The minimum N.M.P.R.A. weight is set at 4½ pounds — the premium builders who are interested in this event will probably come up with 4½ pound airplanes.

Another attraction of the Goodyear even is that all you really have to do, flight-wise, is to turn left real good! You don't have to worry about squares and inverted flying, or keeping that airplane tracking through insides and outsides, or three consecutive rolls and all that. All you have to do is turn left and keep from hitting the ground. And there are going to be quite a few eyebrows raised in the near future, because for some time to come, it isn't going to be the fastest airplane that wins! Until we all become proficient at this new event, the secret is going to be in the design itself — making it fly well without being excessively touchy. And if you don't believe it, wait until you fly around those pylons at 70 or 80 miles per hour, and have three more planes crowding you and jockeying for position. You're going to be so busy flying — as well as avoiding traffic — that you can't afford to have an airplane that is overly sensitive to control. You have to have a design that enables you to take your eyes off of it for a few seconds, maybe to check a far pylon, or to watch what the character with the yellow job is going to do, or keep one corner of your eye on the red ship who looks like he's going to drop way down in front of you at the next pylon. You definitely **don't** want an airplane that is going to stick its nose toward the ground and go roaring for it the moment you take your eyes off of it. The design has to be one that will track in the groove, doing **what** you want it to do, **when** you tell it to do it.

In other words, the Goodyear event has every indication of being the answer to the long-desired event designed for **everybody.** I sincerely feel that it will be around for quite a while, increasing in popularity as experience is gained. In addition, N.M.P.R.A. officials are already contemplating future additions such as possibly a Bendix and Thompson trophy event. In my own opinion, this event has a greater future than the stunt category, since it encompasses scale and semi-scale, ease of construction, and a chance for every RC'er to enter and compete.

Whether you build the Aeolus, or some other of the Goodyear designs, get out and practice and don't be afraid of entering competition. This is a national fun event designed for **YOU.**

And you'll not only have a chance — you'll enjoy it!

From
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