# LIGHTER THAN AIR R/C BLIMP

**By TONY AVAK. . .His radio controlled blimps have been seen by visitors every year at the International Modelers Show; now the author takes us step-by-step through the construction of one of these aircraft.**

For the past nine years I've had the opportunity to demonstrate my series of R/C blimps at the International Modelers Show (IMS) in Pasadena. From the first shaky beginnings to my most current design, these models have continued to fascinate the crowds and stir up interest in the possibilities of radio-controlled lighter-than-air (LTA). Floating gently overhead like an animated cloud, turning around, and even backing up in flight, they have never failed to put a smile on the faces of the spectators. During these demonstrations many people have asked me if I offered plans for my models, to which I had to say no. That is, until now.

R/C blimps are incredibly easy to fly. Quite often at the IMS I've given the transmitter to an interested bystander, and they would happily fly the model around for a few minutes. A few years ago I gave the controls of an earlier model to the 10-year-old daughter of a friend, and she was doing precision spot landings within five minutes. Loops and rolls, however, are out of the question. I should make it clear that this model is for *indoor use only* and any attempt to fly it outdoors (except in deathly still wind conditions) will most probably result in having your model taken away by the first wayward breeze. My favorite flying sites are school gymnasiums and auditoriums, convention centers, and large airplane hangars. Even here the wind from ventilation systems has presented problems from time to time, but you quickly learn how to avoid these areas. Because the motor in front pivots together with the flight control surfaces, the model is very maneuverable. In fact, my smallest airships can fly quite easily in my living room, which is only a little over three times the length of the ship itself!

This model, this sixth in my series, was designed specifically for those people who told me they had always wanted to build a LTA craft but didn't know where to start. This model should be especially fun for those modelers familiar with traditional stick and tissue construction. My model is finished in yellow Japanese tissue which gives it a light, colorful look. Using even the lightest available plastic covering on this model would be unnecessarily heavy and expensive, although it could be done. If you've never used dope and tissue before, you have a real treat coming. Dolores Kester had an excellent article in the April '87 issue of *Model Aviation* entitled "Building Stick-and-Tissue Kits" which should answer any questions for modelers unfamiliar with this classic method of construction. I have made the model as straightforward as possible so that even a novice modeler can successfully build and fly their own Silver Cloud. Also, the design is flexible enough that, with a minimum of modifications, any standard-sized radio may be used in place of the Cannon Super-Micro system that I use. Feel free to move around parts of the model to accommodate your own radio.

My airships have evolved slowly from their first designs, gradually gaining improvements in controllability, reliability, and ground handling characteristics. This model is intended as a basic design for an R/C model LTA craft, and the builder may go either larger or smaller when designing a ship of their own. This blimp, at 8.75 feet long and 17.5 ounces without ballast, bag, or helium, is the largest and heaviest of my collection. By using smaller and lighter batteries, electric motors, and overall design, you can scale down this model for a more "elegant" version. My smallest model is a three-channel blimp powered by a large Mitshubi servo motor (taken, I'm told, from an old tape recorder) wired to the electronic guts of the throttle servo, thus using one battery pack for both radio and motor. The model is just over six feet in length and weighs 8.5 ounces all up (without helium). Models smaller than this can be built, but performance begins to drop off rapidly as smaller and less powerful motors and batteries must be selected. The Silver Cloud is actually a little slower to turn and accelerate than my smaller models, only because it has more weight to move around. This heaviness was done deliberately, though, so that the modeler can build a successful model using common, off-the-shelf hardware without worrying about finding the lightest materials available.

With the exception of the aluminized mylar plastic bag, all construction materials are available from your local hobby shop and Radio Shack. Overall cost is comparable to that of a small glider. Helium is available from welding or party supply shops. Rental prices will vary, but usually fall between $20 to $35, plus a deposit, depending on the size of the tank and how long you keep it. You may also have to pay an extra deposit for a balloon filler valve. If you want, both helium tanks and balloon valves can be purchased for $200 to $300 total, and then the only expense is the cost of refilling the tank ($40 for a 160-cubic foot tank). Of course, if you have a friend who does heli-arc welding, the price should be even more reasonable.

Helium is the only gas you should use to inflate your bag. The extra lift you would get from hydrogen (about eight percent more) is not enough to offset the potential hazards of handling it. When mixed with even small amounts of air, hydrogen is explosive and can be set off by an electrical spark or cigarette flame. The image of the burning Hindenburg airship is the one thing that most people think of when you talk about LTA. This is unfortunate, since the Hindenburg was originally designed to use helium and would never have burned had the American Congress allowed the gas to be sold to the Germans. (Remember, this was right before WWII, and we had the monopoly on world helium production.) Helium is so inert that large valves were installed in some U.S. Navy blimps that could flood a compartment with the gas and so displace enough oxygen to put out a fire. Helium is completely nontoxic, so can be inhaled without harm. The change in your voice occurs because sound travels almost twice as fast in the less dense helium as it does in normal room air, and the acoustics of the vocal tract change in a way that resonates with and amplifies higher frequency tones. The only danger you have from breathing in helium is the fact that doing so displaces oxygen, and if you're not careful you can pass out from lack of it and bang your head on the floor.

The bag is made from half-mil (half a thousandth of an inch) aluminized mylar plastic. Half-mil polyethylene plastic (available as dropcloth material at any hardware store) may also be used. It is less expensive and more easily available, but does not hold the helium in nearly as well. Non-aluminized (clear) mylar works better than polyethylene, but still not as well as the aluminized. Although sometimes difficult to find, it is worth the extra effort. One mil mylar, both clear and aluminized, and one mil polyethylene are easy to find but are twice as heavy as the half-mil. Unless you need to fly your model three or more days in a row and are unable to get helium to top off the bag before each day's flight, the heavier plastics are just unnecessary weight. If you can't find any at a plastics distributor near you, half-mil aluminized mylar can be ordered from Model Research Laboratories (MRL) at 25108 Marguerite Parkway, B-160, Mission Viejo, California 92692. They are currently selling a 20-foot roll for $25, postpaid. They also offer quarter-mil aluminized mylar for sale, but it is too thin to heat seal together successfully using my method of bag construction.

The construction of this model is straightforward and, except for the instructions for making the bag which follow, needs no explanation. I would recommend completion of the rest of the model before building the bag. Although I deliberately did *not* select the lightest materials available, the weight of your finished product may be greater than mine, and you may need to make a bag slightly larger in volume. The bag of this model has a volume of 24 cubic feet, able to lift a maximum of 24 ounces of weight, including the bag itself. (A simple ratio of one cubic foot = one ounce lift.) The weight breaks down roughly as follows: keel and tail assembly, with radio, 500 mAh Rx battery and two Ni-Cd "C" cells, 17.5 ounces; bag, 3.0 ounces; removable ballast, 3.5 ounces. The weight of ballast may be substituted for heavier radio components (receiver, servos), but be sure to leave at least two ounces of ballast available. As you fly around, helium will naturally leak out of the bag, and you will need some convenient way or removing excess weight. If you leave the model overnight, not only will helium leak out, but room air will leak in and displace potential helium refills the next day. In that case you will probably have to remove most of your ballast to get it flying a second day. This varies quite a bit from bag to bag, of course. I've had bags in which a little extra helium the next day was all that was needed, and I've seen a one-mil thick mylar party balloon that held most of its helium for a couple of weeks.

There are two basic methods of making a bag: taping and heat sealing. Taping gives the cleanest, best-looking bag. Heat sealing, while producing a somewhat more wrinkled product, is by far the fastest, lightest, and easiest technique. Lou Bruhn detailed the tape method of construction in the March 1981 issue of *Model Aviation*. Briefly, it consists of cutting out four or more gores for the bag and then carefully taping the seams together. He required about a week of work and produced a good, clean bag. My method of heat sealing took only an hour and a half to make a bag, including preparation and clean up time.

Sealing is done using a Sears Craftsman 230-watt soldering gun with the plastic cutting tip. This narrow knife-edge attachment reduces the amount of plastic actually melted and is much easier to work with. Soldering irons might work, but I like the control that you get with a trigger and handle.

The first step is to draw a full-sized pattern on a large piece of paper and then cut it out. As you can see in the photos, I just tape sheets of newspaper together until I've got enough. The pattern shown on the plans is half-scale to fit it on the paper. If your model is significantly heavier than mine, or if you would like a little extra volume for other purposes, just make the bag longer in the middle. You may need to add a little extra volume if you are flying this model in a high altitude location such as Denver, as lift is directly dependent on the density of the surrounding air. For every extra three inches in length in the middle, you get about another 1.1 cubic feet (i.e., 1.1 ounces lift). Because half mil mylar is available only in 48-inch widths, this ship represents the practical limit in bag diameter. Large diameters would have to be made from the wider rolls of one mil mylar or polyethylene. *Be sure* to include places for the inflation/deflation tubes in the paper pattern. The small soda straw filler tube is located on the bottom, the large diameter deflation tube in the tail. I used a clear payload tube from a model rocket for my deflation tube with a tight-fitting balsa plug. You can use a 35mm film canister or any other large diameter tube with a tight-fitting lid instead. A small cork or piece of modeling clay is used to plug the inflation tube.

Spread the mylar (or the plastic of your choice) on a smooth concrete surface. The floors of most garages are ideal, but if you think yours may be too rough, a layer of newspaper will serve as a protective surface. Be sure that the floor is scrupulously clean, to avoid any sand or grit from wearing into and puncturing the bag as it is being made. I always sweep and then damp mop the garage floor before construction.

If you are using aluminized mylar, be careful to have the plastic side in and the metal side out, otherwise the heat seal will not stick. If you can't tell which is which by looking at it, try scratching away metal from one side or the other. If you still can't tell, try some experimental heat seals, and stress test the seams by pulling on them.

With two layers of plastic gently stretched across the floor with tape, place the pattern on top and hold it down with small weights to keep it from shifting around as you work. The plastic must be pressed together when you seal it. To do this, take a short, straight stick and place it on the inside edge of the pattern and while holding it down gently, draw your hot iron along the edge. The stick presses the plastic together and gives you a firm, straight line, which helps hold the pattern down as you work with it. I have found that designing the bag as a series of short straight lines is not only easier to build, but also gives a better looking bag when inflated. Be sure to overlap your heat seals as you make them, and watch out for smoldering paper. Setting fire to your project will almost certainly cause a delay in the building procedure.

Work quickly and smoothly. Too fast, and you may miss some spots or apply inadequate heat. Too slow, and you concentrate too much heat at once and melt excessive plastic away. Speed varies with the type of plastic used and the heat of the iron, which should glow a dull red for best results.

Gently lift the plastic and pattern from the floor, and then separate the paper from the plastic. Be careful: you don't want to tear your new bag. If all looks well, then you may tape the soda straw filler tube and large diameter deflation tube to the bag and proceed with air inflation. Use only dry or room air. Don't inflate it with your lungs. Besides hyperventilating yourself, the moisture from your breath will condense inside, making a wet, heavy bag. An airbrush pump or hair dryer blowing cool air works well.

Look for a slow, steady deflation of the bag when under a very slight pressure. Even an apparently small (1/16 of an inch) leak in the heat seal will become obvious in a few minutes. Most of my leaks occur at the compound curves around the filler tube, so this is the first place I look. Feel for leaks by holding your mouth over the suspected area. Even small air flows will create a cool sensation on the lips. I have found through experience that using a soap solution around the seam to find a leak results in a complete mess, as the bag does not have enough internal pressure to raise a bubble. Scotch tape makes an excellent patch. It is important to the performance and pleasure of your model that you get all of the leaks now, if you can. It is very annoying to have to remove weight or reinflate your model every few minutes once you are flying. Finally, with the bag fully deflated, tape the aluminum tubes for the support sticks in place as shown, and you're done.

The fuselage is suspended from a series of lines made of heavy (button or carpet) thread, looped around both the suspension sticks on the bag and the fuselage. I also use clips (such as safety pins or paper clips) right where the lines meet at the fuselage, so it is easy to remove individual lines for movement around the aluminum tubes if necessary. Shorten or lengthen the lines using the device shown on the plans until the fuselage hangs level under the bag.

To prepare your model for flight, put together the entire keel assembly, minus any ballast, and loop the suspension lines around the places shown on the plans. Connect the suspension lines to the suspension sticks, which have already been slid into place on the bag lying flat next to the keel. With the deflation tube tightly capped, start inflating the bag with helium through the filler tube. At first the bag will be cumbersome and unwieldy as it is inflated because all the gas will run off to one end, but when it gets about half full it will begin to level out. Continue to inflate until the model starts to float, then alternately add gas and BB ballast until the bag is comfortably full and the model hangs motionless in the air. Don't overinflate. By "comfortably full" I mean that the bag is inflated to the point that tipping it forwards or backwards makes no static trim change. This can happen when one end is pitched up, and the helium in an under-inflated bag flows towards that end, causing it to raise up even more due to the increased lift of the gas, resulting in a very awkward permanent pitch attitude. (This principle is illustrated in the Time-Life book *The Giant Airships* where an overly long experimental blimp crashed in 1908 because all the internal gas rushed towards one end and burst the bag.) With the model floating free, slide the suspension lines/sticks forwards or backwards along the fuselage or bag as necessary until the model is floating level and parallel to the floor. Rotate the fuselage until it is hanging vertical (as viewed from the front), turn on the radio, and you are ready to fly your model.

It is best to fly with a neutral or slightly heavy ship. The heavier the ship, the faster you have to fly it to make use of dynamic lift. If you fly your ship with a slight positive buoyancy, it is entirely possible to sent it to the ceiling and not get it back until sufficient helium has leaked out.

If you plan on making flights over ten minutes at a time without landing, you may want to have some way of releasing ballast in flight. I've indicated on the plans the location of an optional droppable ballast device which can be set up to drop one BB at a time given extreme (with trim) up and then down control.

The instructions for making the bag were first published in my previous article, "Have You Tried LTA?" in the October 1981 issue of *MB*. That article, along with others, has been included in a short model aviation bibliography of LTA and LTA-related articles of which I am aware. The interested modeler should be able to get a lot of good ideas for new or different LTA projects out of these. If you know of any other articles that should be added to this list, please write to me (preferably with a copy of the article) and let me know about it. Anyone sending me an article or reference will automatically receive a completed list when I've got it all together. My address appears at the end of this article. If, after you've built this model, you would like to design your own LTA craft, you may want to consider some of the features that I've incorporated in the Silver Cloud. I would encourage variations on my design (like a pusher version or a semi-rigid design), but there are several details to keep in mind for your own model. These design details were developed over a long period of trial and error, and you may save yourself some trouble by learning from my earlier problems.

The use of a pivoting motor to provide vectored thrust gives great controllability even at zero airspeed. At the first IMS contest nine years ago, I had a blimp with a motor that turned only left and right. Bob Peck, of Peck-Polymers, had his own airship with a motor that pivoted only up and down. I could literally fly circles around Bob's airship, but it took me about forever to maneuver up and down. Bob's ship could move up and down great, but had a lot of trouble turning. The very next day Bob had designed and built a pivoting motor system that allowed the motor to move in all directions easily, and it is this system which I have used in each of my models since then. By putting the motor way out in front, you get the fullest effect of the motor to pull the ship around left and right. The weight of the motor in front also helps balance out the weight of the tail in back, allowing the rudders to be placed well rearward where they are most effective. I've seen model airships with the motor on the rudder for some really radical turns, but this requires a major reshuffling of components within the model which I find inconvenient.

In addition to vectored thrust, up/down control is provided by two pairs of "diving planes." Elevators, in their conventional sense, do not work well on model airships of this size. Because of their slow speed and the relationship between "static'tching force on the tail, with the greater of the two forces ultimately forcing the ship down. (See figure 2.) A better design would put the horizontal stab up in front where the lifting force of the stab could combine with the dynamic lift of the bag. My design puts a horizontal stab at both ends of the fuselage, allowing a level climb and dive attitude. You can experiment by taking off the rear, then the forward, then both pairs of stabs to see how this effects controllability.

In addition to vectored thrust, up/down control is provided by two pairs of "diving planes." Elevators, in their conventional sense, do not work well on model airships of this size. Because of their slow speed and the relationship between "static" and "dynamic" lift in flying, you may find the elevators work exactly opposite the way you think they should. It works like this: In a conventional fixed-wing aircraft, as the trailing edge of the horizontal stab lifts up, the downward aerodynamic force pushes the tail down and (as a result) the nose pitches up, increasing the dynamic lift of the wing. (See figure 1.) However, due to the pitch stability in most airship models, the dynamic lift from the bag is often equal to or less than the downward pitching force on the tail, with the greater of the two forces ultimately forcing the ship down. (See figure 2.) A better design would put the horizontal stab up in front where the lifting force of the stab could combine with the dynamic lift of the bag. My design puts a horizontal stab at both ends of the fuselage, allowing a level climb and dive attitude. You can experiment by taking off the rear, then the forward, then both pairs of stabs to see how this effects controllability.

The exact location of the center of gravity on the fuselage is not as critical on my blimp as it is on conventional aircraft. The cg shown is simply a suggestion that will make ground handling easier. When the cg of the fuselage is hanging directly under the center of volume of the bag, the model will float properly. Most of the removable weight of my blimp (the batteries and ballast) have been located near the CG to minimize any static pitch changes that may occur when adding or removing ballast, or when changing battery types. Once inflated, simply slide the suspension lines along the fuselage or move the suspension sticks on the side of the bag forwards or backwards until the whole thing is floating level. You don't have to add weight to the nose or tail to balance things out.

The characteristic triple tail (reminiscent of the Lockheed "Connie") was developed as a result of a problem discovered on my second blimp. This model had a single huge rudder to steer it around. Whenever this rudder was deflected left or right for a turn, the lateral CG of the fuselage shifted so much that the whole assembly leaned precariously off in that direction. Holding the tail up by a string taped between it and the bag didn't help much, and it looked worse. The solution was the triple tail. For the same amount of vertical tail area, the lateral cg now moves only a fraction of what it did before. In addition, the triple tail structure is a more sturdy and more warp free design.

Another convenient design feature is the ability to take the blimp apart and pack it in a small box for travel. All of my last three airships have had this capability so that I could pack the models in my suitcase and fly cross country to demonstrate them at the IMS. The Silver Cloud was actually transported in two boxes (one of which I mailed to myself in California), but the last two of my smaller ships could be broken down and packed into a shoe box, bag and all. The Cloud can be built as a single unit, without the disassembly option, but I would suggest you try it with first. The photos show how the tail unit is hinged (with tissue at the joint) to fold flat for transport. The thread used for bracing the structure is glued only in strategic points to allow easy assembly/disassembly. In addition, the motor, landing gear, horizontal stabs, and stab cross pieces are all removable for travel.

Ease of transport was what drove me to nonrigid airships (blimps) in the first place, even though my real interest is in the big rigid frame ships like the Hindenburg and Graf Zeppelin. The key word here is "big," as even a modest R/C rigid airship must exceed ten feet in length in order to hold enough helium to lift its own weight. And how do you move and store a model of such heroic proportions and delicate construction? The answer is: with great difficulty. Just ask my parents, who have patiently stored a 14-foot long cardboard box containing my 13-1/2-foot long scale model of the Shenandoah in their garage for years. They've asked me what I plan to do with it, but I can't honestly tell them. I've got to get rid of it in the next year or so, and would be happy to give it away to anyone in the Southern California area that can give it a good home. Drop me a line if you're interested.

Andy Horn is a modeler in Basel, Switzerland, who has overcome the problem of transporting scale models of rigid airships. He has built and flown a nonrigid 1/30th scale model of the Hindenburg. It is 26.8 feet long, 4.5 feet in diameter, with a volume of 280 cubic feet. It weighs 308 ounces without helium, and is powered by four Mabuchi 540 Race 6V/15A motors for a top speed of 15.5 mph. He can get 20 to 40 minutes flying time, depending on the weather. He sold the ship to a hotel in Gstaad, Switzerland, which is 2780 feet higher in elevation than Basel. He found that he lost about 13 percent of his lift due to the altitude change and had to remove two of the motors, but this did not significantly effect the top speed of the model.

The throttle used on my model is a set of three roller lever microswitches available from Radio Shack (Cat. No. 375-017), activated by a sliding panel with small wooden steps glued on. As you can see from the wiring diagram, when operated in sequence the motor uses either one or both batteries to get full throttle, half throttle, neutral, or half speed reverse. Exact dimensions of the wood steps will depend on your switch sensitivity and servo throw. Just make sure the switches are activated in the order shown on the plans. These switches have some hysteresis that make the throttle feel sloppy, but it is no real problem.

By lucky coincidence, the motor batteries are used in such a way that it is easy to tell when you are getting low on power before you get in real trouble. Remember, blimps need just as much power and control to go down as up, and you may find yourself floating near the ceiling unable to get back if you run the batteries out too fast. I get a lot of enjoyment just watching them hang in midair for minutes at a time, drifting with the room ventilation. Blimps have got a heck of a glide ratio! The motor can run flat out for 15 to 20 minutes on two "C" cells, depending on the type, but can easily go more than an hour if you run it at half speed or just let it "coast." The battery compartment is made for easy removal and replacement of batteries, so fresh ones can be inserted in just a few seconds.

Having suspension sticks on either side of the bag is useful for several reasons. First, it helps distribute the weight of the fuselage more evenly along the bag, avoiding undue stress points. Next, because the stick is not attached to the bag but rather slides within aluminum tubes which are in turn taped to the bag, it is very easy to use them to fine tune the trim of the model to have it floating level. Finally, the bag does not need to be fully inflated to maintain its general shape. If the bag is a little low, the sticks simply move closer together, causing a vertical elongation of the bag compared to the round shape of a fully inflated bag. (See figure 3.)

There is another method of bag attachment that works well for semirigid airships designs such as the one shown elsewhere in this article. On a semirigid, a long keel is attached directly to the bottom of the bag. If the bag is not filled to capacity, the keel simply hangs lower, pulling the bottom of the bag down. (See figure 4.) The keel must be at least three-quarters the length of the bag, though, otherwise an under-inflated bag would fold up like a V in the middle.

The ferrite 020 motor shown on my model is not being imported by Astro Flight anymore, having been replaced by the new cobalt designs, though a few hobby shops may still stock the old motors. The new cobalts are heavier (3.5 oz. vs. 2.0 oz.) and much more expensive than the old motors. Fortunately, there are a number of other electric motors on the market which can do the same job for low cost. As long as it can carry a prop, it will probably work. Dumas Boats now sells the old Astro Flight 020 as stock motor #2021, and an 020/035 prop adapter can be purchased from Astro Flight for $5. Another to look at is the VL Products HY-70 motor system. It is small and very lightweight, but would have to be slightly modified to run in reverse properly.

With a few additions to the model, you could easily add devices to allow you to drop small gliders, parachutes, or paper helicopters from your blimp. Also, signs can be hung under the fuselage or around the bag for advertising purposes. With other modifications to the basic design, you could build a scale model of some of the airships flown by the turn of the century aeronaut Alberto Santos-Dumont.

For those of you that may be interested in something larger that can be flown outdoors, there are a couple of sources that I am aware of. Peck-Polymers has been selling an 11-foot, 80-cubic foot blimp kit for several years. Inflated, the pre-made bag can carry a total of 28 ounces of radio equipment, gas or electric motors, control surfaces, and other loads. These blimps have been used for advertising, aerial surveys (it is a stable, vibration-free platform for a camera), and has "thrown out" the first ball at the Houston Astrodome. Bags can be custom built to order if you want something special. Send $2 to Peck-Polymers at Box 2498, La Mesa, California 92041, for their full catalog. Another source is Bill Watson at California Airships, 16140 Covello, Van Nuys, California 91406. Bill is currently putting together a videotape titled "Blimp Mania" that will explain and demonstrate everything you ever wanted to know about building model airships. He also offers plans, kits, materials, and professional design consultation. I learned a lot about building blimps from Bill several years ago, and he has also demonstrated at air shows and the IMS with his model airships.

I would be glad to give additional help or advice to anyone interested in LTA. If you build the Silver Cloud, send me a photo of your completed model and let me know how it worked for you. Experiment with a few of your own designs. I'll write a short follow up article in the future and feature your photos and experiences. I think you'll find airships to be one of the most relaxing and enjoyable aspects of our hobby. . . floating through the air with the greatest of ease.

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*29. "Foreign News" by Peter Chinn.* *Model Airplane News*, September 1982. Photos and some information on a 36-foot long R/C blimp from Japan.

30. "RCM Product Review', anonymous. *Radio Controlled Modeler*, October 1982. Review of the Peck-Polymers Pony Blimp.

31. "R/C World" by Bill Northrop. *Model Builder*, April 1983. Coverage of the 1983 IMS.

32. "Seventh Annual IMS" by Bill Northrop. *Model Builder*, May 1984. One photograph of four LTA models in flight.

33. "Man-Powered Blimp" by Bill Warner. *Model Aviation*, May 1985. Excellent article about blimps (model and full-sized) by Bill Watson.

34. "Building a Radio Controlled Balloon" by George Steiner. *Model Builder*, October 1985. Plans and instructions.