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RC MODELER

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THIS MONTH'S COVER
features Texas beauty, Beki May showing off Chuck Cunningham's Lazy Ace. The Skymaster kit is powered by a Webra 91 and utilizes an EK radio. The setting is Benbrook Lake, Fort Worth, Texas. Transparency by Fred Bartzen.

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From the Shop

RCM STAFF

We regret to advise of the passing of Nathan R. Smith in early August, 1983 at age 80.

Nathan will be remembered by modelers who were active in the late 1930's as the manufacturer of the Smith Ignition Coil for model airplane engines. His company manufactured more model spark coils than the combined output of his competitors throughout the world.

We are saddened by the loss of one of model aviation's pioneers.

★

Among the many pleasant aspects of R/C modeling is the occasional opportunity to be involved with an activity that is not only enjoyable but at the same time is very beneficial to someone outside of our sport/hobby. Such a situation is described in the following note from Niels Dahl, editor of the Mount Rainier Radio Control Society, Puyallup, Washington.

R/C Club Attacks Air Defense Battalion

Nothing makes the adrenalin flow like an air attack --- even if the planes are models and the gunfire is limited to blanks and simulators. At least many soldiers would agree after an exercise conducted at Fort Lewis, Washington, recently.

The 1st Battalion (HAWK) (BIAD), 4th Air Defense Artillery, stationed at Fort Lewis, invited the Mount Rainier Radio Control Society to help add realism to their field exercises, and the R/C fliers responded with enthusiasm. Rising at 4 a.m. in order to be in position in the maneuver area by daylight, Bob Pfeiffer, Jerry McCluney, Dave Baxter, Roy Blatt and Roger Pierce operated an improvised airstrip near the route of the battalion. As the unsuspecting battalion convoy approached, Bob took off his Kaos and Jerry lifted his scratch-built high-wing monoplane, and the two of them worked the convoy over from front to rear and back again. A machine gun firing blanks simulated the straffing run of the planes, and the convoy deployed to return the fire. Umpires utilized smoke grenades and simulators to add to the realism. The troops, also firing blanks, blasted away at the models roaring overhead. It was an exciting time for everyone, especially for the pilots, whose planes suddenly disappeared in the smoke. Keeping their cool, the two pilots managed to recover control of their aircraft and land them safely. There were no casualties on either side. The exercise was conducted three times, on April 18, 20, and 24. As Lt. Col. Rogers, Commanding Officer of the battalion, said in a letter of appreciation to the club, "... The realism and excitement provided by your models could never have been duplicated by any other available training resource. The air attacks your members conducted on this unit's convoys created a great sense of excitement among the soldiers of this battalion ..." Needless to say, both parties are looking forward to another joint maneuver.

Bill Griebeler, Port Townsend, Washington, is happy with his RCM Funster (RCM plan #871). Bill covered his K & B .40 powered machine with light blue and cream MonoKote.

Dr. John Mountjoy says that his Turbulent Druine from Chuck Cunningham's plans (RCM #872) is a ball to fly and very realistic. O.S. .40 four stroke for power, Coverite with dope finish.

Thanks Niels for the info, sounds like a real blast. How did those guys retain their composure under that kind of excitement?

★

The poor maple tree that gave up its life so that we fly should not be in vain after we have broken a prop or two or three. Mack Patterson wrote the following tid-bit in the San Jose Wavemasters' newsletter "Crosstalk."

101 Uses For A Broken Prop

1. *If you have trouble with neighbor kids running through your yard, try sharpening the ends of your broken props and using them as punji sticks.*
2. *If your wife's favorite African Violet is a bit droopy --- use one as a flower stake!*
3. *If you're a doctor, you can use one for a tongue depressor. Just remember to wipe it on your pants first, not everyone likes the taste of vintage methanol.*
4. *If your wife entertains often, try splintering them up and using them for Hor' d'oeuvres --- the fuel will add that extra touch of spice.*
5. *In the winter when it's cold, use them as kindling and reflect of the warm flying days of summer.*
6. *If your wife complains about the wobbly kitchen table, a broken prop makes an excellent shim.*
7. *Try building a 1/3 scale Eiffel Tower out of 1/4 scale props.*
8. *For Contest Directors, think of how everyone will be awed by a trophy clock with a broken blade for each hand!*
9. *Use them as bookmarks.*
10. *Carry them with you on vacation to Transylvania. Never know when you will need a wooden stake!*
11. *Use them as chips at poker parties!*

With that beginning of 11 uses, we suppose that the modeler will have to dream up the remaining 90. It's going to be a long winter. □

Cunningham On RC

CHUCK CUNNINGHAM

Have you ever stopped to think just how many times that you can get at least two or more opinions on just about anything? Lots of people get started in the hobby/sport of R/C building and flying. A lot get lost along the way, and I'm beginning to wonder just how many are lost because the help and opinions that they get do vary widely from one source to another. The medical fraternity encourages a patient to get a second opinion when facing a serious problem. Okay, so one Doc says "operate," the second says "nope." Which one do you believe?

Here in north central Texas the weather is just about as changeable as any place you can imagine. Yesterday, a Saturday in July, the weather was beautiful, 90 degrees (very cool for Texas in July), the wind was very light (almost never this light) and from the south. The forecast for Sunday — hotter, with winds springing up, and wind warnings on the lakes, which means that the winds would be at least twenty-five mph with gusts over thirty mph. Now, most prudent RC'ers with some years of experience would say that just possibly the weatherman might be a bit off, and go ahead and charge up the old aircraft anyhow. Those who listened to the first opinion and planned to spend the day mowing grass or other thrilling pastimes missed out. Today, the wind is less than one mile per hour. Temperature forecast? Well, the paper says that it will be 100 degrees, while the radio that I'm listening to right now says that it may get up to 92 degrees, and both are now saying winds will be light and variable.

So, who do you listen to when you get advice on what to do next to your airplane, or what to build next, or how to cure a problem? Darn good question. All of us in the column writing business try to smooth the way for those of you who are just getting started, or are having problems, and all of us like to think that our advice is the best to follow, and quite possibly it is.

At the field yesterday, there were a couple of men who had jointly constructed a very nice model, well-built, well-covered and in every way looking like a really fine first attempt. They had received help and aid from several hobby shops to get everything right. They had visited a number of flying fields trying to get help in learning to fly and were given the cold shoulder. Finally they ended up at Thunderbird field and got some flying help, even though not many fliers were out yesterday. They hadn't charged their radio for some time, so after just one flight they were advised to wait until another day, and return with a fully charged radio. None of this advice was given by me, I didn't even know about them until they were ready to leave. However, all the advice and help that they received was good, and I hope that they will come back to get a chance to learn to fly and to enjoy all of the fun that R/C can bring. The point of all this is that you need to seek advice, but you also have to learn to sift through the advice to determine just what is right for you. Darn hard to do, but necessary not only in modeling, but in other phases of life.

"You have an advanced case of 'RC Neck'!"

Next week is the Sixth Annual Southwestern Jumbo Fly-In, and I'm looking forward to seeing a bunch of old friends, meeting some new ones, and seeing some fantastic new models. In considering what to write about this month, I thought that perhaps some advice on getting a big meet organized and underway might be of some help to those of you who are planning on throwing a contest or fly-in next season.

First of all, if you, or your club, wants to hold an event, you need to decide well in advance just what the contest or event is going to be, and then let people know about it so that they can plan ahead. If your club is young, then for the first few times a well-run club contest is the best thing to have, both to gain experience, and to know if you really want to undertake a larger event. There are a tremendous amount of contests, fly-ins, and what have you, all competing for the modeler's attention. In some ways this is good, and in some ways it is bad. There is only just so much money available in the family budget for road trips, and only so many weekends the average guy can take off to fly in any kind of an event. If your area is overcrowded with standard contests, and you really want to stage an event, you many need to come up with something new to attract attention. Lots of fliers are burned out on standard events, but they might be attracted to something new and different. Don't write to me asking what you can stage, you figure it out and then tell us all about it.

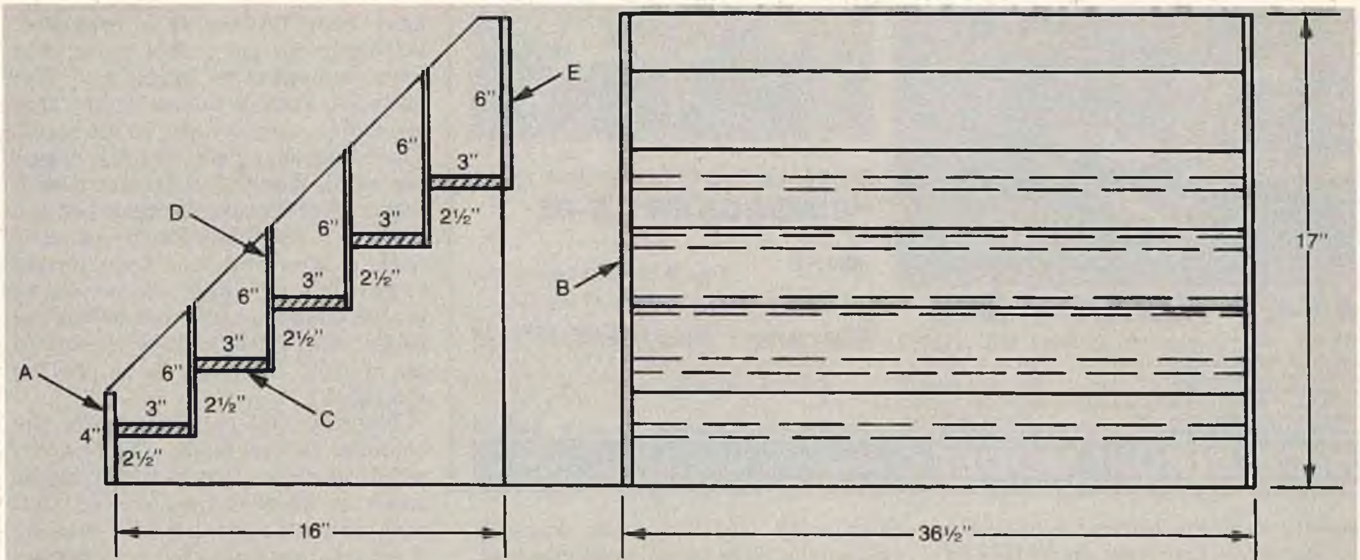
Once you have determined the type of event, several requirements must be met to guarantee success. First, you must have an enthusiastic leader --- one who can secure the aid and assistance of others in making the enterprise a success. If you're the one who wants to toss a contest or an event, then you should be the one who wants to spend the time and effort to succeed, not toss out the idea and then fade into the background. Anyone who has ever attended a club meeting knows what I'm talking about.

Now that you have a leader and have decided the type of event, you need to pick a date. In date picking you need to consult a calendar to see just what other things are happening on that day. For example, the date that you picked out at a club meeting in December just might turn out to be Easter Sunday, Mothers Day, etc., so you need to plan ahead wisely. Also, you need to decide just what the weather is likely to be in your area on that date. Heck, I know that the weatherman can't tell from one day to the next (we just talked about that a bit ago), but if the spring winds always blow in your part of the world in early April, then there's a good chance that they are going to blow on the day of your contest. Play the odds when making your date selection.

Okay, all of the easy stuff is done. Now what do you do? First, sit down in a quiet place and write down all of the things that need to be done to get the event going. What kind of judges will you need? What kind of special things need to be done to your flying field to make it contest ready? What type of trophies and/or prizes do you need to pruchase and where is the money going to come from to purchase them? Who is going to take care of this? On and on. Get it all down on paper. Decide how many jobs must be done, and then decide just how many of these jobs you are going to do, and how many that you need someone else to do. Pick out a good guy to handle the chores that you cannot do. Make sure that he's willing to do the job that you have asked him to do (if you have to talk him into it, then perhaps you need to find someone else). Keep a notebook and write down everything as you go along. Don't trust to memory. In planning anything, the two best friends that you have are your brain and a pencil.

Try to anticipate any problems before they arise. Naturally, you can't cover everything, but with a little practice, you can get a handle on this type of planning, and at least some thought may have crossed your mind as to what to do if something goes haywire. And, something will go haywire, it's Murphy's law.

Going back to trophies and prizes for a minute. You need to make a budget analysis of your event, showing estimated income and estimated expenses, and who is going to cover the deficit? If it is a club function, then you must have a prior agreement that any deficit will be underwritten by club dues. It's always best to try to plan for



TRANSMITTER IMPOUND RACK

A = 4" x 36" 1/4" PLYWOOD (1 REQ'D)

B = 16" x 17" 1/4" PLYWOOD (2 REQ'D)

C = 3/4" x 3" x 36" PINE (5 REQ'D)

D = 6" x 36" 1/8" PRESSBOARD PANELING (4 REQ'D)

E = 6" x 36" 1/4" PLYWOOD (1 REQ'D)

income to cover expenses but, if it doesn't, who is going to pick up the tab? If the tab picker-upper is you, then you need to be prepared for this and know that the event may not only cost you a lot of time, but that it may also cost you a piece of change to boot. You need to scale the entry fee for your event to cover the estimated expenses. To do this, you need to make a realistic estimate of the number of entries. Not what you hope will enter, but a realistic number. Then decide on the costs; divide the cost by the number of entries and you have the entry fee. Of course, if your costs figure out at 1000 bucks and the entries you expect come out to 10, and you come up with an entry fee of 100 bucks, well, you and I both know that you're way off base. What will the traffic bear for an entry fee? Five bucks? Ten bucks is getting pretty high for a first effort. Ten entries at five bucks a head nets you fifty bucks to spend on the contest. Twenty-five years ago we used to have a series of monthly spot landing contests with our single channel planes. The entry fee was one dollar. The pot would be divided up, 50% to the winner, 30% to second place and 20% to third place. We had lots of fun and lots of contests with this format.

One of the things that really upsets me is the arm twisting done by clubs all around the country asking for donations for the club's contest. I've belabored this point several times in the past, but it needs mentioning again. Each year all of those who advertise in either RCM, or any of the other magazines, are bombarded by requests from clubs to donate merchandise or money to be used in that club's contest. If that club isn't strong enough to stand on its own two feet when throwing a contest, then perhaps it shouldn't toss a contest. For a number of years, most businesses in this country have been plagued by less than great business. Most have had a tough time trying to survive. Not only the automobile industry, but the steel industry, the lumber industry, you name it, any industry is fighting to stay alive. The hobby industry is right there too. Why should any group think that just because they are tossing an event, it is mandatory that everyone they contact should support it. Now, if the event organizers offered to purchase items, I'm sure that most manufacturers would be happy to supply at their normal wholesale selling price. Everyone would benefit from this. It might take a bit more work raising additional money on the part of those organizing the contest, but again, why should they expect others to work hard to provide the contest something to give away? Okay, I'm jumping down from the soap box.

Last year, for the Jumbo Fly-In, I decided to make transmitter storage racks to house the impounded transmitters. Each rack can hold twenty-five transmitters. This really isn't needed for small events, but for larger events where you need to impound fifty to a hundred transmitters, it's a handy thing to have. See the drawing. It only took one hot afternoon to construct three of these racks, and the material was purchased from one of the full supply type of building material stores that have taken the place of the old lumberyard. If you need this type of storage rack, then get your saw and hammer out and give it a try.

One of the things that is bugging me this year about the Jumbo Fly-In is how to maintain a good frequency control with all of the new frequencies, with the ability of the new frequencies to hit an old frequency, and how to cope with the fact that paging companies have taken over many of the old R/C frequencies. Frankly, at this writing, I think that the entire frequency problem is a mess. Ted White tried to tell everybody a couple of years ago that they were heading into trouble, but he couldn't get the ear of those in the decision making capacity. I'm working up a pin and control system that I hope will make it safe for a number of people to fly on an open flight line, and one that may be adopted by local flying fields. I won't know if it works or not until after the Jumbo next week, but if it does work, then I'll be telling you about it on down the line.

I suppose that it is some kind of status symbol to have a pager on your belt, but I kind of look forward to being away from the telephone. In fact, the day that some expert comes up with a wrist telephone so that you can be in instant contact with anyone else in the world, will be the day that I'm going to quit paying my phone bill. I'd rather fly R/C safely than have paging companies blotting out all of the radio frequencies. I've been trying to figure out for a couple of years why some countries in Europe have been flying on up to fifty frequencies without much trouble, yet here in the U.S. we have been limited to a very few. Suddenly we get a few more, and trouble begins to break out. For example, Futaba makes radios that are sold in every country in the world. Their frequency capacity must boggle the mind. Wouldn't it be nice if each country had the same frequencies, and these were not gobbled up by someone with a thousand foot transmitter tower telling some salesman to answer the phone, or a wife telling her pager toting husband to bring home a jug of milk? Ye Gods, up on another soap box!

Time for this month's tip to the beginner in this hobby. There are a couple of places that most beginners screw up on that first aircraft that they take to the flying field --- making it almost impossible for a successful first flight. If you have an aircraft with a tricycle landing gear, then, as part of the landing gear set-up, your aircraft has a nose wheel and nose wheel strut. The turning of this nose wheel is accomplished by a pushrod going from the rudder servo to the tiller attached to the nose wheel strut. This tiller is fastened to the wire strut by means of a set screw. The wire is round and hard. It's tough for the set screw to get a good bite on the wire. Mount everything in place, lightly tighten the set screw against the wire (tight enough to mark the wire), then loosen the set screw. Remove the wire and file a flat spot on the wire. Then reinstall and clamp the set screw tight against the flat spot on the wire. This will keep the nose gear from rotating at just the wrong moment, causing the aircraft to flip over, breaking the prop. The rest of the nose gear hook-up is very important also. First, run the nose gear wire in as straight a line as possible between the tiller and the servo. Next, install a piece of plastic tubing over the wire to act as a guide. This lets the wire slip past the battery without binding. Use wire of a diameter smaller than 1/16" so that the wire can flex some to take up the shock of a hard landing. Do not turn the nose wheel too much — about 3/8" in each direction is plenty. You may have a bit harder time taxiing your aircraft but, when it is going down the runway on a take-off run, it's a lot better to have just a small amount of turn in that nose wheel.

When you're installing the nose wheel, make sure that if you give a left rudder command, the nose wheel turns left also. You can't imagine how many times a beginner has shown up at the field with the nose gear reversed --- makes for exciting take-off runs.

Time to go build the new frequency board for the Jumbo. See ya next month.

□

John Brodbeck Sr. is the Owner and President of K & B. John is showing a soon-to-be released new Marine 11cc engine that has already been timed at 96 mph.

K & B is located in Downey, California. All of the engine manufacturing, and fuel and paints are shipped from this location.

A Visit To K & B Manufacturing

This month we're going to take a visit to K & B and talk to the people responsible for making all those record breaking engines for planes, boats as well as cars. The K & B plant is located at 12152 So. Woodruff Ave., Downey, California 90241, in two large red brick buildings. They're of course, also world famous for their K & B fuel as well as model epoxy paint finishes, and many other items.

I talked first with John Brodbeck Sr., and right now I'd like to thank John, not only for giving me so much of his time, but also for the genuine enthusiasm in which he related to me all the answers to the questions I asked. And also to the time it took to pour over back issues of Model Airplane News, dating back to January 1940 (he has almost every issue printed) as well as R/C Modeler and Model Builder.

How did K & B get started, and what does K & B stand for? Well, back during World War II, John was manager of California Machining Co., in Los Angeles, who were prime contractors with aircraft companies such as North American, Lockheed, Douglas, and Convair.

John was also a model airplane enthusiast, and had built his first free flight airplane in 1936, powered with a Brown Jr. During the war he kept thinking he could build a better model airplane engine than was being produced, so while at California Machining Co. he designed, and prototyped a .29 ignition engine with the thought in mind that after the war California Machining could go into the engine business.

However, upon the surrender of Germany, many contracts were cancelled by the aircraft companies, and the owner of the company decided to sell off his equipment and go out of business.

So John, who was now out of a job, talked Lud Kading, who was a super machinist, and who also worked at California Machining, into going into business, and together they started their own machine shop in Lynwood, California, and called it K & B Manufacturing Co. (K for Kading, B for Brodbeck).

The shop was located in Lud's two car garage (John had only a one car garage) and consisted of a couple of lathes, drill presses, and a tool

Plant Manager Pat O'Brien, is showing us the incredible machined finish that their two new Mori Seiki CNC lathes will be doing on all their new engines. The finish looks so smooth it almost looks like it's chromed.

When it comes to motors, you start with Bill Wisniewski. Bill is holding the first-ever Schnuerle ported model airplane engine, which he built and flew. Bill does all the engine design work for K & B.

Bobby Tom manages the Customer Service Department. Anyone with a K & B motor problem, or anyone who just needs motor parts will get excellent service from Bobby.

If you know anything about boats, you know Jack Garcia. Even though Jack has won many boating titles, he still has the time to help other boating enthusiasts.

grinder. They picked up some of the old customers from California Machining, and one item for what was called the Manhattan Project, which they later found out was a part of the "A" bomb, and thus they survived until the end of World War II.

The moment raw materials were released from the war-time priorities, they went to work on producing their first engine, the Torpedo .29, and shipped the first production in June, 1946. The engine was an instant success and the first .29 engine to break the 100 mph barrier in Class B U-Control planes, which was accomplished by the late Tony Nacarrato Sr.

A few months later another company came out with a "Torpedo Special" engine in an attempt to gain sales on K & B's Torpedo engine name. John sued them and won the case in court, but before K & B could collect damages the other company went out of business.

It seems there's always a lot of people who are good at copying, but not much good at coming up with original ideas of their own. It was true in 1946, and it's still true today. The success of the K & B Torpedo .29 was followed by the K & B Torpedo .32 and K & B Torpedo .24 in 1947. By this time the shop had moved to larger quarters in Bell Gardens, California.

In 1948 K & B developed the Infant .020 engine which was the world's smallest production made glow plug engine, at the time. Because neither John or Lud knew if the Infant would catch on, and sell, they gambled on a first production quantity of 10,000 engines. Only 3000 engines were assembled when they made the announcement to their distributors, and in the first week they had orders for 280,000 engines. It took them a year to catch up on orders. The Infant orginally sold for $7.95 and when production quantities increased, the price was dropped to $4.95. Don't look in old magazine, you won't believe the prices.

Shortly after the start of the Korean War, K & B merged with the screw machine company that was producing the hundreds of thousands of parts required for their Infant .020, Torp Jr. .035 and Torp .049 engines. The company was owned by three partners, one of who was good at manipulating paperwork to benefit his personal financial gain, and when Lud and John found out, Lud sold his interest in the company, and John merged with Allyn Sales Co., to buy back the engine business. Allyn Sales Co. made beautiful custom static display models for aircraft companies, such as Douglas, Boeing, plus the Fury and Sea Fury line of model engines.

About 1950, Gil Henry of Veco Products decided to go into the model engine business and asked John to make the engines for him. John said okay if Veco would design their own case, so they could use Torpedo insides. This they did and the Veco .29 and .31 was born. RCM's own Clarence Lee later went to work for Veco and designed the famous Veco .19, .45 and .61 engines. (In 1967 K & B purchased the Veco line of engines, as Veco was going out of the model airplane kit, and engine business.)

In 1959 K & B received a contract from Aurora Plastics Co., to produce 250,000 .049 and .061 engines for a line of plastic ready to fly models that Aurora was going to produce.

In 1961 Aurora decided they wanted to buy K & B. They did, and though John thought of retirement Aurora signed him to a 5 year contract as President of K & B. In 1972 the famous Nabisco Company bought Aurora, and K & B.

About 1977 Nabisco sold off Aurora but kept the profitable K & B division, only to sell it to Leisure Dynamics, Inc., in July 1979. (L.D.I. also owned Cox Hobbies.)

On April 22, 1983, John bought K & B back from Leisure Dynamics and is now the owner, and President of K & B. If you kept up with all of that, you're a better man than I am!

Upon entering John's office anyone will be overwhelmed by the vast array of plaques and trophies that literally cover the walls. Over the years, John has been a recipient of every significant award that the Hobby Industry Association, Academy of Model Aviation, North American Model Boating Association, and International Model Power Boating Association has to offer. Among these

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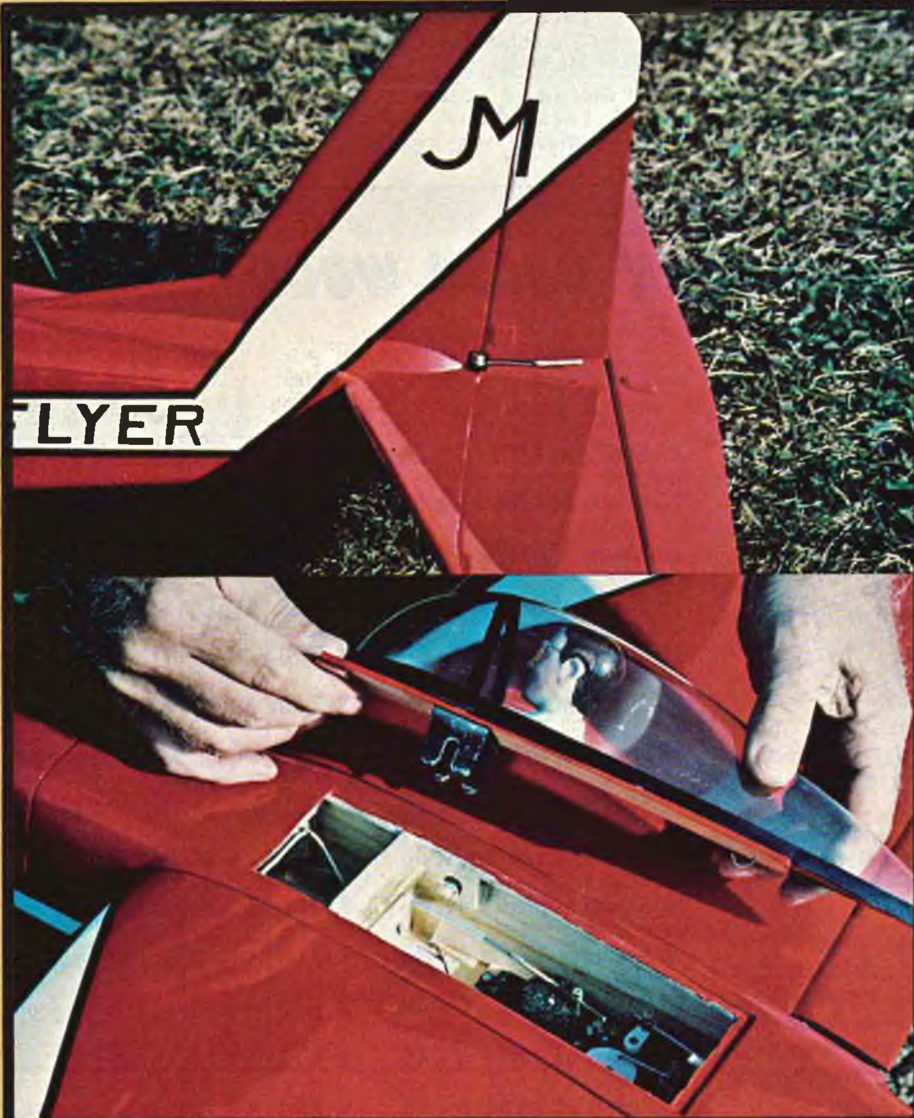


FUN

If your R/C club is like most of the other clubs in America today, the most popular events of the flying year are the Fun-Flys or Fly-Ins or whatever you call them. Because of their popularity, these events bring out a great crowd of participants and a vast variety of airplanes of varying sizes, shapes, and capabilities. The order of the day is to meet friends, admire airplanes, drink a lot of soda pop, eat hot dogs, and have a lot of fun in the competitive events.

The competitive tasks are usually simple enough that everyone can get into the act. Because of this, they are easy to complete but hard to win. Having the right airplane for the task helps but the tasks are seldom announced before you arrive and who brings four or five airplanes anyway? For example, it's hard to win a timed event with a Quaker (as great an airplane as it is) or to risk your best scale or super pattern ship doing a limbo event.

Maybe what is needed is an airplane that is reasonably fast and maneuverable for the timed events. One that can get back to the finish line in a hurry after finishing the prescribed maneuvers but then slow way down for a spot landing for extra points. While on the subject of

By J.M. Mergen

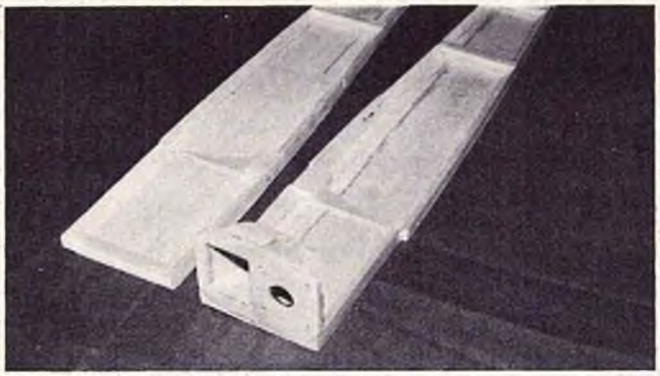
Designed for fun-fly events or just Sunday sport flying, this 40 powered "Fun Flyer" lives up to its name in just about every way.

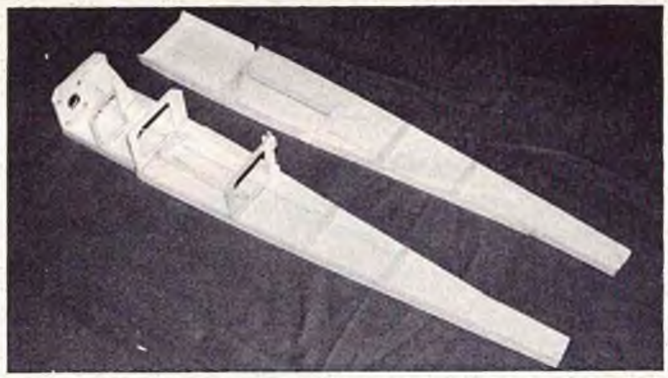
FLYER

landings, how about one that can make a landing before it wants to without leaving parts scattered around? It would be nice, too, to be able to keep the engine running after such a landing to avoid the necessity of walking a few hundred yards in front of the crowd to retrieve an airplane with a dead engine. The ability to do quick loops and rolls is an absolute necessity and predictability in every maneuver is essential. Inverted flight must be second nature to the design. In short, what we need is a fast but slow machine that is very quick but docile, flies inverted almost as casually as right side up, is always predictable, is rugged and one that we can be proud of during the "admire the airplanes" time of the Fun-Fly!

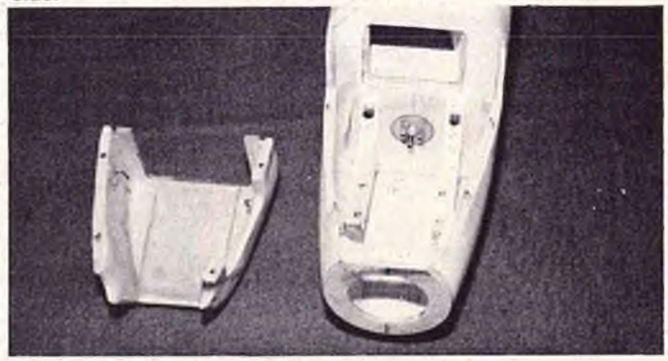
With these and a few other thoughts in mind, Fun Flyer was designed as follows:

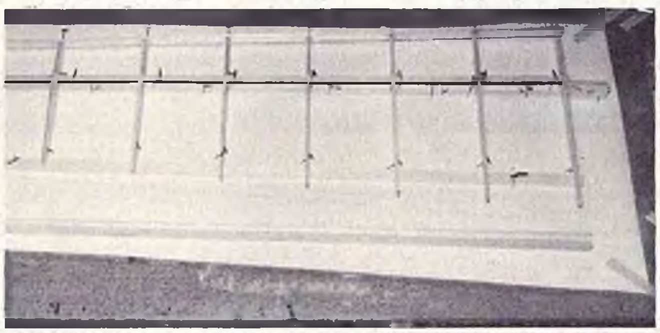
* A 60" wingspan model powered with a .40 size engine was picked as about the right size for a sport airplane.
* The fuselage was held to 40" for transportability without sacrificing pitching or directional stability.
* The wings were made in two panels for easy transport.
* Ample control surface area was

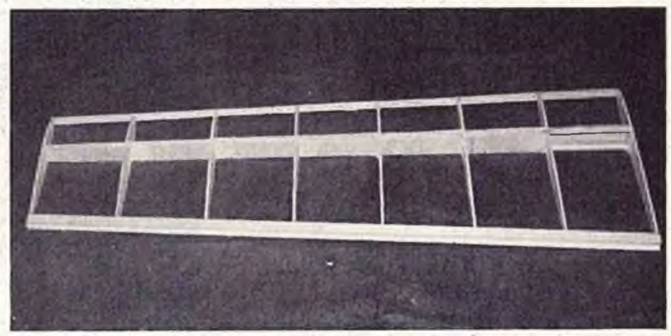

Start fuselage by assembling longerons, struts, FS1, FS2, and air exit assembly.

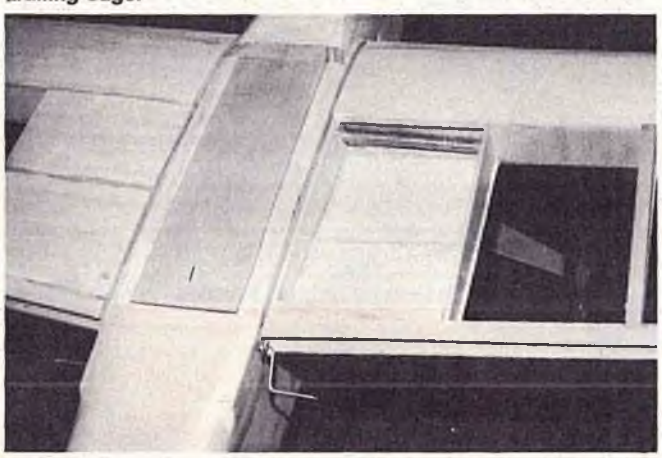

Add F3, F4, F5, servo rails and throttle cable before attaching left side.


Fuselage planked and rough sanded back to leading edge.


Detail of engine compartment and cowling.


Start of left wing panel showing ribs shimmed up for alignment of trailing edge.

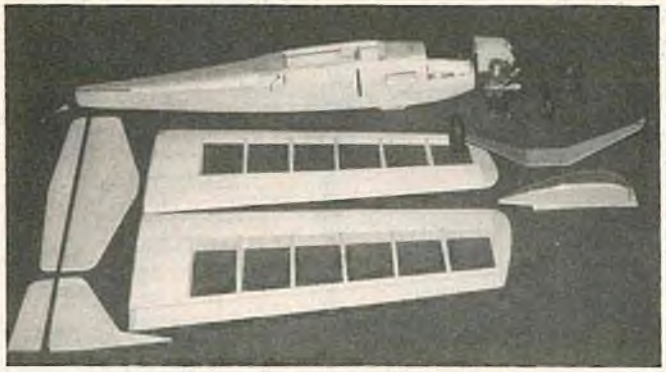

Wing panel removed from board for finishing — note first bay webbing left out.


View showing wing carry over tube epoxied in first bay.


Final nose shape is shown.

provided for maneuverability about all three axes.

* A wide stance, strong landing gear was used to provide for rough handling and rough fields.
* The basic design's upright engine was selected for easy starting and no nonsense operation.
* The engine was closely cowled to help streamline the plane for speed and for a better appearance. The close cowling and side air outlet also keeps most of the oil and exhaust concentrated. The result is that even the canopy stays clean and dry.
* The wings were tapered for appearance but the taper probably adds some structural and aerodynamic efficiency.
* The wings are quickly and easily



All parts ready for covering and assembly.

Finished airplane except for covering and trimming.

assembled or disassembled and locked in place by the canopy forks without tools. Ailerons are automatically plugged in when the wings were attached without disturbing any wiring.

* Access to the engine is provided by the snap on and off cowling attaching system.
* All structure is good for at least 15G's and has demonstrated its strength in numerous all-out aerobatic flights.
* A relatively low wing loading was picked for good low speed operation but the aerodynamically clean lines and good power loading give the design high speed and maneuverability.

All the above good intentions have resulted in an airplane weighing in at five and a half pounds with eight ounces of fuel. This gives a wing loading of twenty one ounces per square foot and a power loading of about six pounds per horsepower --- just about right for the job.

Once you arrive at the field the airplane can be assembled and ready to fly in less than one minute and disassembled just as fast. With wings off it will fit across the back seat or in the trunk of the smallest car.

Flight testing has shown the airplane to be very fast at full throttle but that it will slow down to the speed and easy handling of a trainer at reduced power. It has shown it can do just about any maneuver in the book and do them with agility. Inverted flight is outstanding with the machine trimming out with just a touch of forward trim. It is very close to being perfectly balanced in normal or inverted flight with the C.G. as shown on the plans.

Thus Fun Flyer comes pretty close to the writer's dream as to what a Fun Fly airplane is all about.

The author has tried to keep the construction of Fun Flyer as simple as possible with only a few frills such as the enclosed engine cowling (you can select two simpler options as shown on the plans) and the wing attachment and locking device. These, I think, pay off in ease of transporting the plane and assembly at the field.

Since most of the construction is conventional and the builder will have no need of step by step details, the discussion will cover the sequence of operations with an occasional explanation of a convenient way to accomplish a particular phase.

CONSTRUCTION

Fuselage:

Start the fuselage by building two identical sides. Mark the water-line and the location of the frames and struts with a soft pencil. Locating from the water-line, carefully bore the holes at F4 and F5 through both sides at once. Next cut out F1, F2, F3, F4, FS1 and FS2.

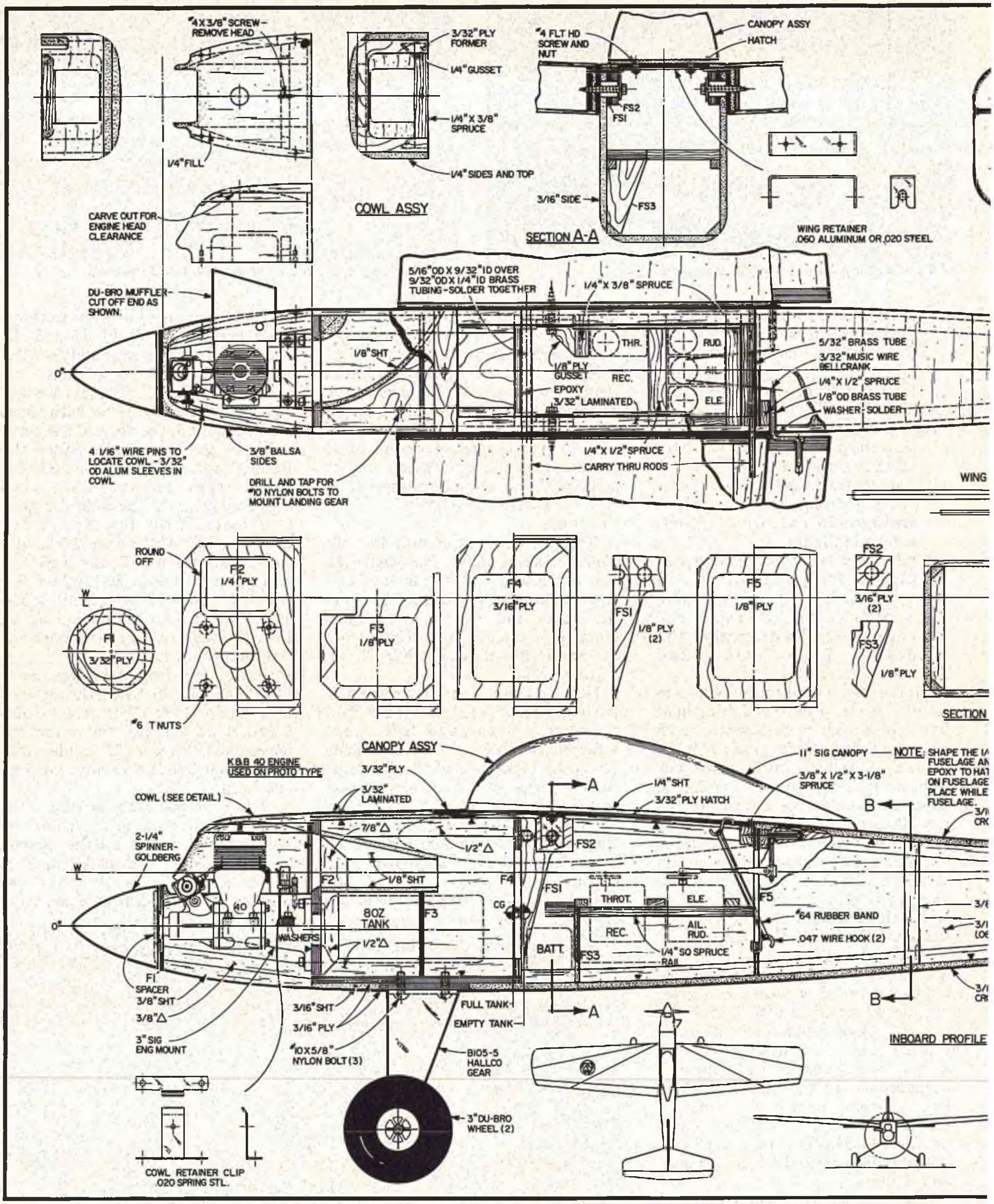
Install the 1/2" triangular longerons on both sides, being careful to make a right and left. Next assemble the F2 hardware and attach F2 to the right side of the fuselage. Build up the 1/8" sheet air exhaust and install the 7/8" triangular piece and the vertical 1/2" triangular piece. Cut and fair the exit hole and fair the 7/8" triangular piece as shown. This exhaust system is used only with the closed cowl. If you use either of the options for the nose of your airplane, the rectangular hole in F2 and the whole exhaust system is omitted. The notch in F3 can also be left out.

Next, install FS1, FS2, and the 3/8" square stiffener struts on both sides. Now install F3, F4, F5, and the servo rails on the right side. Since the fuselage does not taper from F2 to F5, these frames are installed perpendicular to the side for good alignment of the fuselage. When installing FS1, FS2, F4 and F5 be sure that the edge of F5 and FS1 are tangent to the hole in the fuselage side and make sure F5 is tangent to the other hole. Install the servo rails on the left side. This is a good time to add the throttle cable tube.

Now the left side can be cemented to F2, F3, F4, and F5. Using the top view as a guide, draw the fuselage sides together at the tail, trimming the longerons to leave a 1/2" inside width to accommodate the elevator pushrod and horn.

Install the brass tube at F4 and the brass tube and block at F5. Install the blocks at F5. Make up the aileron cranks as shown and install through 1/8" holes in the sides. Cement to the blocks as shown. Next, add the servo

Here is where the Fun Flyer happened.



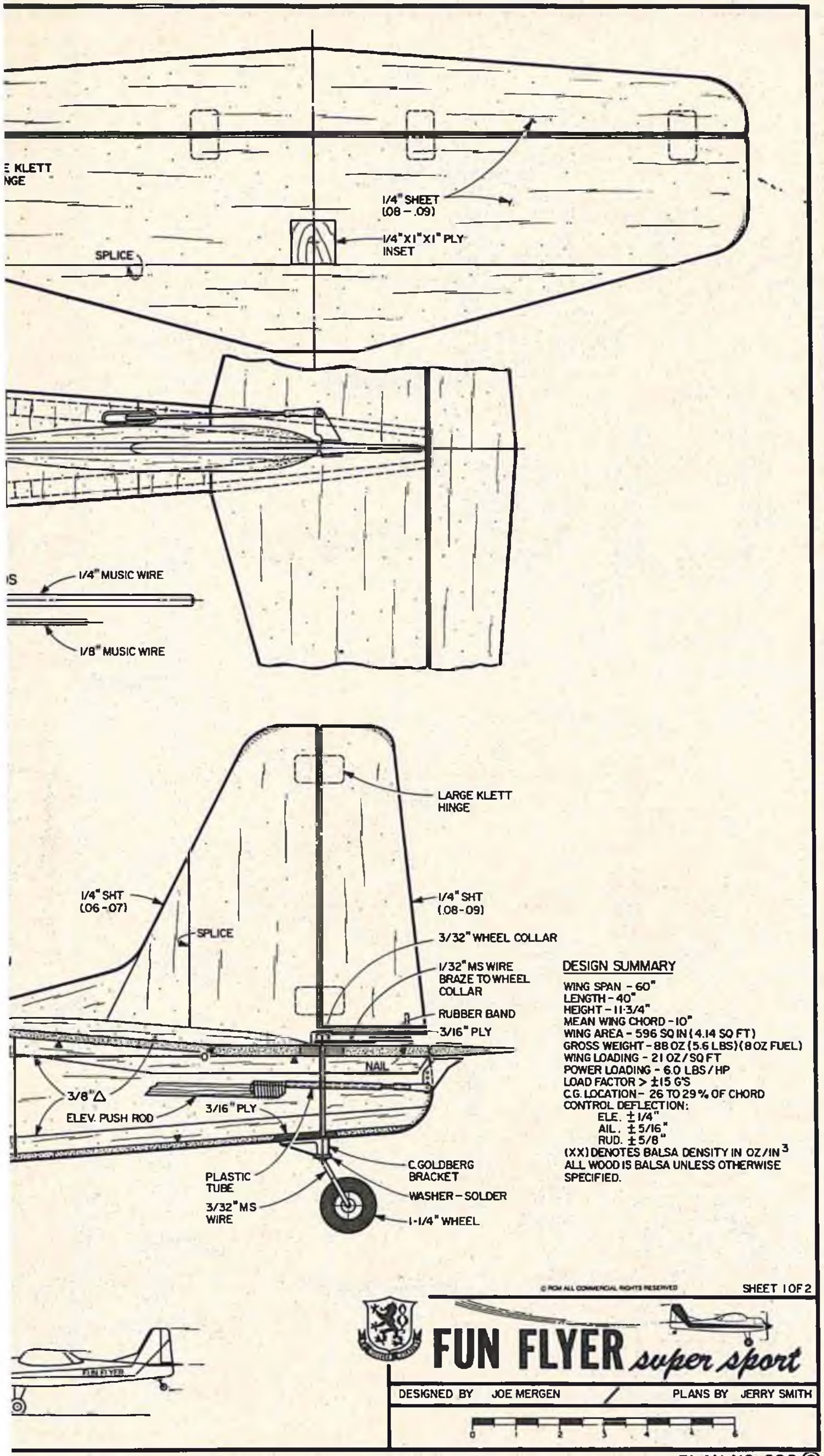
cross rails and FS3 and the 1/8" plywood gusset.

The fuselage can now be planked with balsa and plywood as shown.

To build the standard cowling which encloses the engine, the following procedure was used:

Mount the engine on its mounts to act as a reference for the cowl centerline. Secure F1 in place using the propeller shaft and thrust nut with the shaft going through a scrap piece of plywood tack cemented to F1. Fit the side and bottom sheets between F1 and F2. Then add the 3/8" triangular pieces and a block across F1 at the top. Install four metal dowel pins as shown. Sharpen the upper ends before installing. Remove the nut and the piece of scrap plywood and the engine. Rough shaping is desirable before

FULL SIZE PLANS AVAILABLE — SEE PAGE 180



FUN FLYER
Designed By:
J.M. Mergen
TYPE AIRCRAFT
Aerobatic Sport
WINGSPAN
60 Inches
WING CHORD
10 In. (Avg.)
TOTAL WING AREA
596 Sq. In.
WING LOCATION
Shoulder Wing
AIRFOIL
Symmetrical (NACA 0012)
WING PLANFORM
Double Taper
DIHEDRAL EACH TIP
1½ Inches
O.A. FUSELAGE LENGTH
40 Inches
RADIO COMPARTMENT SIZE
(L) 7½" X (W) 2¾" X (H) 3"
STABILIZER SPAN
20 Inches
STABILIZER CHORD (inc. elev.)
5¾ Inches (Avg.)
STABILIZER AREA
115 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7¼ Inches
VERTICAL FIN WIDTH (inc. rud.)
5⅜ Inches
REC. ENGINE SIZE
.40 Cu. In.
FUEL TANK SIZE
8 Ounce
LANDING GEAR
Conventional
REC. NO. CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED

Fuselage	Balsa, Ply, Spruce
Wing	Balsa, Ply, Spruce
Empennage	Balsa & Ply
Wt. Ready To Fly	**88 Oz.**
Wing Loading	**21 Oz./Sq. Ft.**

building the top cowl.

To build the top cowl, first cut out F2A. Roughly cut out the sides and the wedge shaped pieces at the front. Cement the wedge shaped pieces to the sides and then build up on the lower cowl with F2A in place and using the pins to support the sides. Add the top planking and rough sand in place. Remove the upper cowl, open the dowel holes and install aluminum tubes to fit the dowels. The interior shape can be formed at this time and the muffler slot can be added. With the engine mounts (which have been drilled and tapped) in place, the cowl retaining clip can be added. After installing the spruce cross piece to the upper cowl, put the cowl back on and mark the spot for the cut-off screw which holds the cowl in place. If you miss the location, the washers shown can be used as shims. With the cowl in place, finish sanding back to the wing leading edge.

The fuel tank and all controls are easily added through the hatch. Drill a 7/16" hole in each side for the wing retaining screws.

The hatch and canopy are one assembly. Start by building the hatch and fitting to the fuselage holding it down with the hook and rubber band as shown. Then, with the hatch in place, fit a sheet of 1/4" balsa to the contour of the hatch. Shape the balsa to fit a Sig 11" canopy. Install the steel fork and cement the balsa sheet to the hatch with the hatch in place on the fuselage. Protect the rest of the structure from the cement with waxpaper. Now cement the canopy in place. You may want to cover or paint the balsa or add a pilot and instrument panel before cementing the canopy.

Alternate #1 and #2 nose sections are built in the same manner as the standard one by using the engine to line up the front ring F1 and proceeding from there to fit the sides and top or bottom.

Wing:

As shown, the wing for Fun Flyer is built in two panels to facilitate transporting. They are joined at the fuselage by a 1/4" diameter carry through rod which is the only structural member. The 1/8" rod near the trailing edge simply maintains the wing incidence.

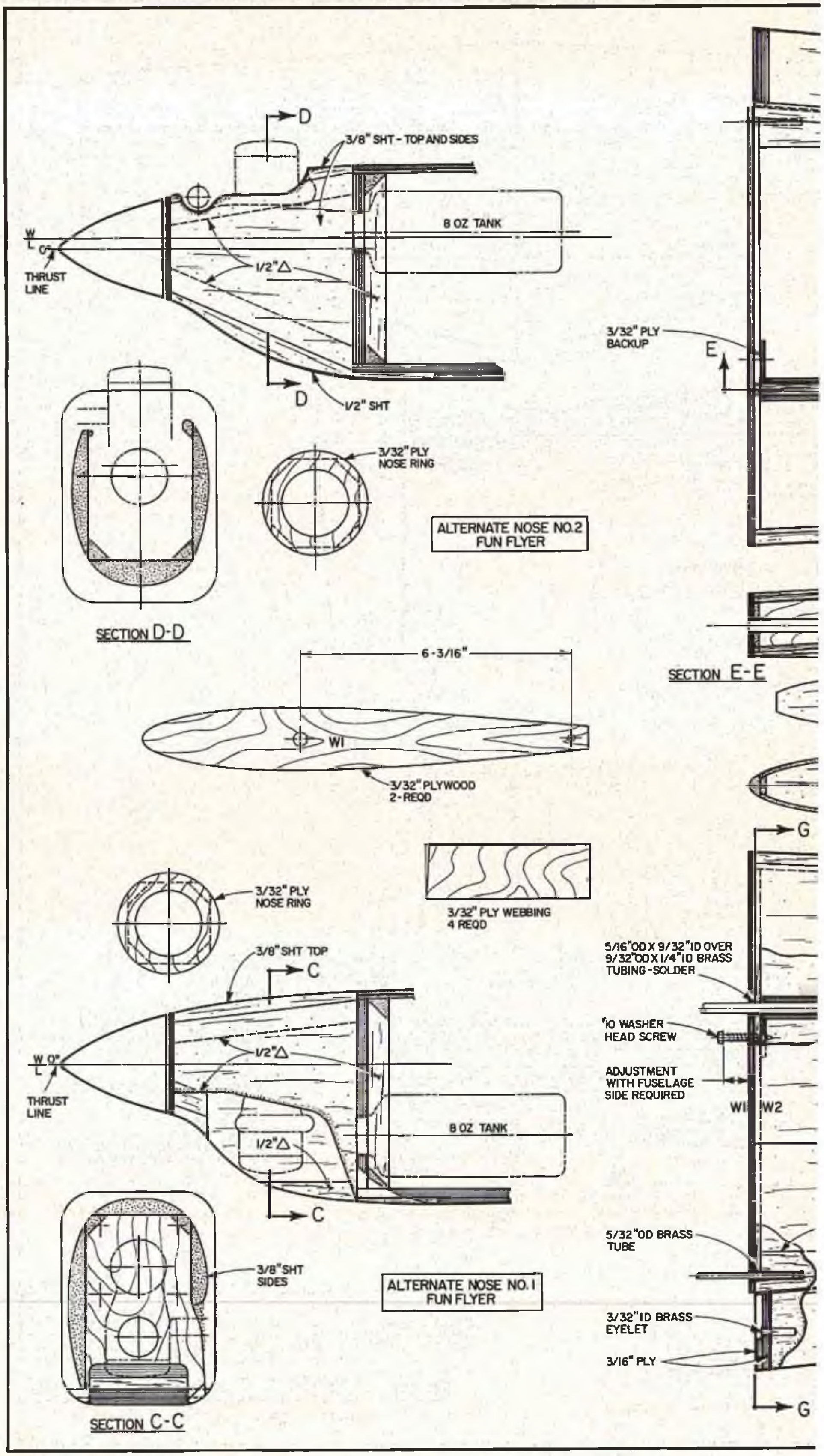
Start the wing by cutting out all the ribs. If you are building on a flat surface, pin down the spar cap and cement the ribs to it. Add the top spar cap and the inner leading edge and trailing edge while pinned down. The 3/32" balsa webbing, as well as the forward plywood webbing in the first bay, can also be installed. Also install the 5/8" x 5/8" incidence block. Upon removal from the work surface, the panel can be planked and the rib caps, outer leading edge and tip added. This is a good time to fit the aileron. Do not attach the aileron pemanently at this time. Construct the other panel in an identical manner. On both panels omit planking on the top inboard bay.

You will note that 5/16" O.D. brass tubing is called out as a bushing for the carry through rod in both the fuselage and wing. Since 5/16" O.D. x 1/4" I.D. tubing is hard to get, two thin walled tubes, one inside the other, and sweat soldered together at one end can be substituted as shown on the fuselage sheet. These can be procured at any hobby shop.

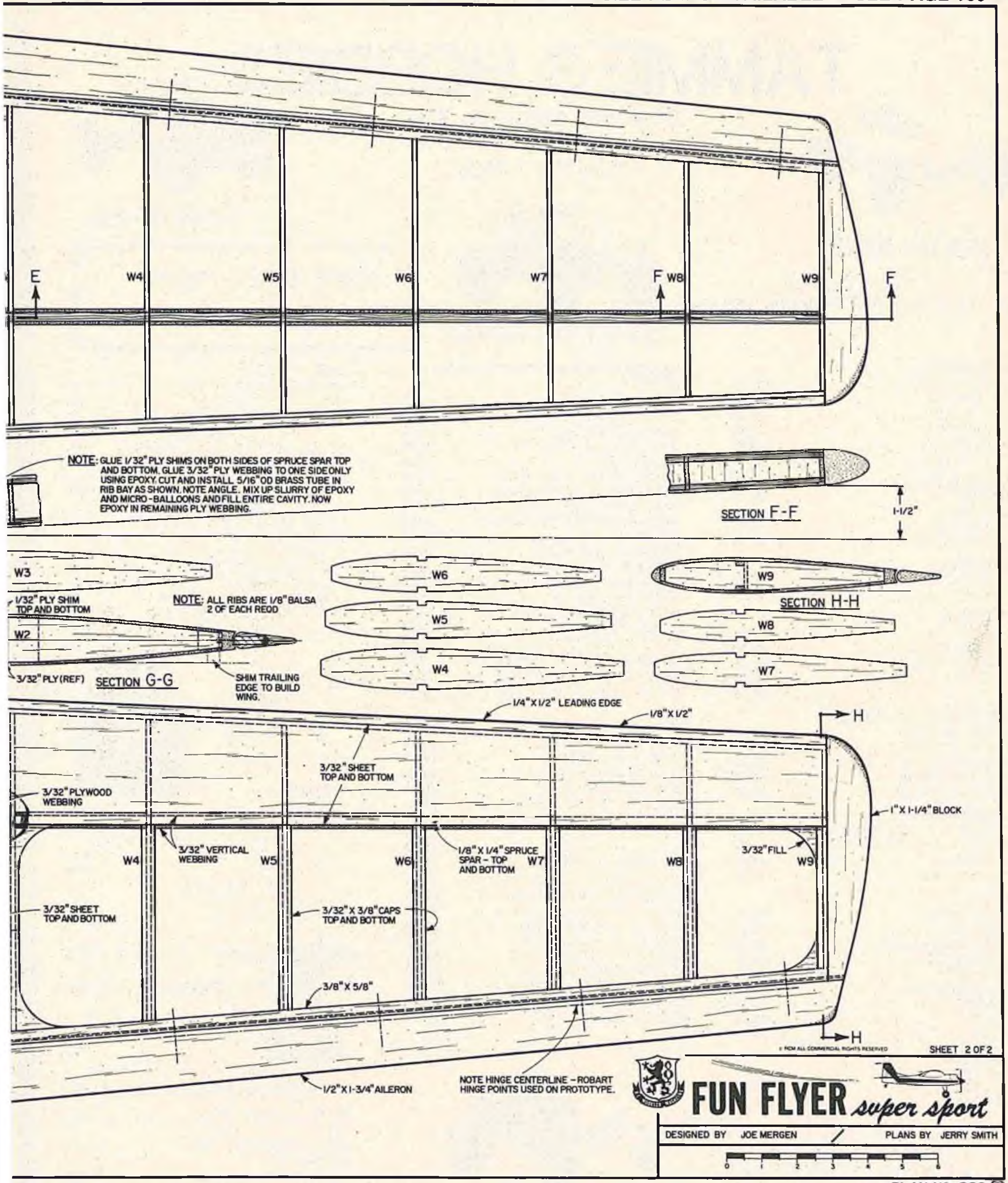
Assemble the wings to the fuselage by setting up the panels on the forward carry through rod and brass tube bushings, supporting the wing panels on suitable blocks. When satisfied that the fit along the fuselage and the dihedral are okay, tack cement the tubes to the plywood spar web. Remove the panels and finish by filling the cavities between the spar caps with a slurry of micro-balloons and epoxy; epoxy the remaining plywood web in place. Add W1 and check for fit with the fuselage. With one panel in place make sure of the incidence and drill a 1/8" hole as shown using the rear tube in the fuselage as a drill guide. Do the same for the other panel. Open the holes to 5/32" and epoxy in the rear tubes. After adding the 3/32" plywood back up, mark W1 through the hole in the fuselage and put in the #10 wing retaining screw. Finish planking. This completes the wing except for covering and permanently attaching the ailerons.

Empennage:

The fin and rudder assembly are conventional 1/4" sheet sanded to shape. In the interest of weight and balance, light balsa is used for the fin



FULL SIZE PLANS AVAILABLE — SEE PAGE 180



PLAN NO. 899 (2)

and a little heavier and stronger grade for the rudder. The same procedure is used in the case of the stabilizer and elevators. Note the fairings at the bottom of the fin. These should be added after the complete empennage is covered and in place. To install, cover the fairings leaving about 1/16" flap along the edges. Cement in place and, with the tip of the iron, seal the edges in place.

The stabilizer and elevators need little explanation except to make sure that there is adequate clearance for the horn and clevis. Note the plastic tubing on the elevator pushrod to avoid metal to metal rubbing.

Assembly and Finishing:

If an iron-on covering is used, cover the fuselage, wing panels, fin, rudder, stabilizer, and elevator separately.

Cut away covering for wood to wood joints between fuselage and stab and fuselage, stab and fin.

With the wings in place make sure the canopy fits easily and locks the wing. The #64 rubber band is doubled to get the right tension.

Drill and tap three #10 holes and attach the landing gear. Build up the tail wheel assembly and insert through the tail wheel bracket. Solder a formed 1/32" music wire tiller to a 3/32" wheel collar. Put the wheel collar on the tail wheel shaft and tighten. A small rubber band between the tiller and the nail in the rudder gives good shock absorption and protects the rudder servo.

All control and radio components are conventional. With the radio components as shown, balance is very good and no ballast was needed in the prototype.

Flying:

With the elevator, rudder and aileron deflections shown, Fun Flyer is a good sport flier with rather good aerobatic characteristics. A little more elevator and aileron throw and it becomes pretty snappy. Take-offs are smooth and comfortable. As mentioned before, inverted flight is outstanding and almost any stunt can be done. There is no worry about strength. The airplane seems to be able to take more than anyone can give it. Since it is very clean it glides very well, but, when slowed down, makes a very docile landing.

Why not build one and take it to the next fun-fly? □

Bill of Materials

(4) 3/16" x 3" x 36" balsa — fuselage sides, top & bottom.
(4) 1/4" x 3" x 36" balsa — stabilizer, elevator, fin, rudder, upper engine cowl, canopy base & outer leading edge.
(1) 3/8" x 3" x 16" balsa — lower engine cowl, fuselage struts, upper cowl doubler.
(3) 1/8" x 3" x 36" balsa — wing ribs, inner leading edge & air outlet.
(6) 3/32" x 3" x 36" balsa — wing planking, rib caps, forward fuselage top & spar webs.
(2) 1/2" x 5/8" x 36" balsa — trailing edge.
(2) 1/2" x 1¾" x 36" balsa — ailerons.
(1) 1" x 1¼" x 15" balsa — wing tips.
(1) 1/2" triangular x 36" balsa — forward longerons.
(3) 3/8" triangular x 36" balsa — longerons, fin fillets, & cowl longerons.
(1) 5/8" x 5/8" x 8" balsa — wing carry through blocks.
(1) 1/4" x 1/4" x 21" spruce — servo rails.
(1) 1/4" x 1/2" x 4" spruce — servo rail.
(4) 1/8" x 1/4" x 36" spruce — spar caps.
(1) 3/8" x 1/2" x 7" spruce — blocks at F5 as shown.
(1) 1/4" x 4" x 6" ply — F2, & tail wheel support.
(1) 3/16" x 6" x 10" ply — F4, landing gear supports, aileron roots, rudder root & tail wheel support.
(1) 1/8" x 6" x 12" ply — F5, W1, servo rail supports, fuselage doubler at F4.
(1) 3/32" x 6" x 12" ply — F1, F2A, F3, hatch & spar webs.
(1) 1/4" dia. x 10⅝" M.W. — wing carry through rod.
(1) 1/8" dia. x 5¾" M.W. — wing carry through rod.
(1) 3/32" dia. x 6" M.W. — tail wheel strut & cowl dowels.
(1) 1/32" dia. x 2" M.W. — tail wheel tiller.
(2) 3/32" dia. x 5" threaded aileron cranks.
(2) 3/32" I.D. x 1/4" brass — grommet for aileron crank.
(10) 2" Robart hinge points — aileron hinges.

(1) 5/16" O.D. x 1/4" I.D. x 12"
or
(1) 5/16" O.D. x 9/32" I.D. x 12" Brass tubing — wing carry through.
(1) 9/32" O.D. x 1/4" I.D. x 12" Brass tubing — wing carry through.

(1) 5/32" O.D. x 1/8" I.D. x 6" brass tubing — wing carry through.
(1) 1/8" O.D. x 3/32" I.D. x 4" brass tubing — aileron crank bushing & cowl pin bushings.
(1) 1/8" x 1" dia. nylon or equivalent — propeller spacer.
(1) Hallco B 105-5 landing gear.
(2) 3" dia. standard wheels.
(1) 1¼" dia. tail wheel.
(1) Goldberg tail wheel bracket.
(1) 3/32" I.D. wheel collar.
(1) Sig 11" canopy.
(1) Sullivan 8 oz R.S.T. fuel tank.
(1) K & B 40 or equivalent engine.
(1) 2¼" dia. Goldberg spinner.
(2) 3" Sig engine mounts.
(3) #10 x 5/8" long nylon bolts — landing gear.
(1) .020" x 2" x 7" spring steel — cowl clip & wing fork.
(2) #8 x 1" long washer head screws — wing lock.
(6) #4 x 5/8" long bolts — engine mount & cowl clip.
(6) #4 lock washers.
(4) #6 x 5/8" long bolts — engine mount.
(4) #6 lock washers.
(2) #2 x 1/4" long bolts & nuts — wing fork.
(1) 4 channel radio.
(1.5) rolls MonoKote or equivalent.
* Servo hardware, pushrods, clevises, ball ends, control horns, etc., as shown on the plans.
* Epoxy, cyanoacrylate, aliphatic cements, solder, foam wrap & fuel tubing as required.

A TRIBUTE TO WOODY

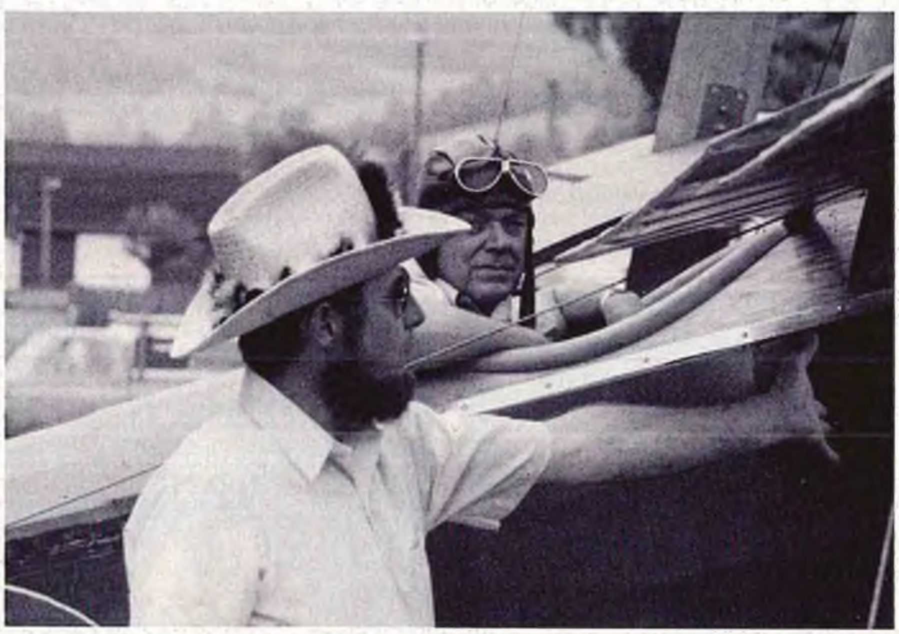
The FAA said it was caused by a leaking gas tank "sight gauge." In any event, Dr. George "Woody" Clapp, Secretary of the STARS Club of Olean, New York, was killed instantly when his airborne Sopwith Triplane replica exploded and burned in mid-air on Friday, the 22nd of July, 1983. In a split-second, we lost one of R/C's premier scale modelers.

Last year, Dick Tichenor, RCM's Assistant Editor, wrote of Woody's fabulous barn/museum. He wrote of Woody's engine and airplane collection --- real ones that Woody restored. He talked about Woody's replica Sopwith and Fokker DVII and Nieuport 28. And, of Woody's Quarter Scale models with welded steel-tube fuselages and Quadra engines. Dick also noted that Woody was restoring a beast of a Grumman Avenger. But Dick didn't know that in the year to come, Woody would get the Grumman running, build five custom banjos, start a miniature steam railroad to connect his barn and the STARS R/C airstrip --- or to design and begin welding the framework for a 40% scale Boeing B-17G, to be powered by four drone engines and carry a pilot (Woody!).

By Col John A. deVries

Woody Clapp pushes his Sopwith Triplane replica out of the hangar while Don Steeb of Rochester, New York, looks on. Note the full-sized radials hanging on the hangar wall --- Woody had a large collection of engines including examples from World War I to today's jets.

I "met" Woody about nine years ago through the mail. He had a new Curtiss OX5 engine that he wanted to use in a replica Alexander Eaglerock and I was to provide a full-scale data for its construction. At the time, Woody had completed a magnificent Quarter Scale version of the Sopwith --- sort of like a practical building exercise for the full sized bird he was to build, later. Bob Dunn and other STARS Club pilots flew the model --- Woody never became particularly proficient at flying R/C. The model was lost in a mid-air but, by that time, Woody was well into the full sized Sopwith.



Woody Clapp in the foreground describing the control system of the Sopwith to the author in the cockpit. Jacobs-powered Tripehound hadn't been flown when this picture was taken in July of 1981.

Where Woody found time to do all of the things he did is truly unfathomable! In his "spare time," this past year, he also restored an AT-6 from three hulks he had around his barn. I was to have provided him with a T-6 checklist when it came time to fly the Texan.

I met Woody Clapp only twice, face-to-face; at the STARS Scale Rallies of 1981 and 1983. But the same intensity that marked his letters to me was apparent as we talked over dinner or chatted at the R/C flying field. This year, at the Rally, he spent two long days on the P.A. system as commentator. His vast fund of aeronautic knowledge allowed him to describe the prototypes of all of the scale models being flown, even down to the production figures for the "real airplanes." And --- he commuted between his house and the Olean Municipal Airport each day in his restored Cessna 195! He probably used his restored fire truck to get from the house to the airstrip!

There never was, nor ever will be, another quite like Dr. Woody Clapp. I shall miss his monthly letters and the wonderful things he did with R/C scale models and replicas of the real thing! □

RCM PRODUCT REVIEW

Tower Hobbies
BLIZZARD

Tower Hobbies, P.O. Box 778, Champaign, Illinois 61820, has gotten together with Kyosho of Japan to bring us an interesting and rather novel R/C vehicle, the Blizzard. Blizzard is a 1/12th scale model and, in a nice way, sort of reminds us of a streamlined tank or an enclosed snowmobile.

It's a good looking rascal, for sure, but let's take a closer look and see if its beauty is only skin deep ... or do we really have something here?

Before getting started on the insides, let's take a look at the carton. This is a big box, measuring 6½" high, 15" wide, and 18" long, and is covered on the top and all four sides with great color photos of Blizzard in action, along with full specs written in Japanese. For those who are a little rusty when it comes to that interesting language, there is comparable English printing as well. At any rate, we are informed that this thing operates with dual elective motors, and runs on snow, sandy soil, grassland, and muddy roads (not to mention living room rugs, hardwood floors, or just about any other surface you can find).

Opening up the box we found that the Kyosho people had done an outstanding job of packaging. Components were grouped and sealed in clear plastic according to function. Road wheels were in one bag, the drive sprockets, tires and electric motors in another, the unassembled tracks in yet another, and the final bag contained all the necessary miscellaneous hardware. A beautiful pre-assembled gear box, the chassis and body, and a set of decals completed the inventory and we were eager to get to work . . . if you can call this sort of thing "work."

SPECIFICATIONS

Name	THE BLIZZARD
R/C Type	Catapillar Tractor 1/12th Scale
Manufactured By	Kyosho of Japan for Tower Hobbies P.O. Box 778 Champaign, Illinois 61820
Mfg. Suggested Retail Price	$149.95 — Tower price $99.98
Available From	Direct from Tower
Length	14" (18½" with blade)
Width	12 Inches
Height	8 Inches
Power	Mabuchi RS-380X 2 pcs.
Power Source	6N 1200 7.2 volt battery
Gear Ratio	12:1 or 32:1 (see text)
Recommended No. of Channels	2 or 3 (see text)
Rec. Control Functions	Steering, Throttle, Blade
Basic Materials Used In Construction:	
Body	Clear Polycarbonate
Chassis	Injection Molded
Wheels & Tires	Injection Molded/Rubber
Tracks	Molded Plastic
Instruction Manual	Yes (16 Pages)

RCM PROTOTYPE

Motor Used	As supplied in kit
Radio Used	Tower Hobbies System 500, Gold Series 6 channel
Charger Used	Tower Hobbies 5/6 cell 1200 mah Fast Charger

SUMMARY

WE LIKED THE:
Good instruction manual, fine quality materials, ease of assembly, and great off-road fun.

WE DIDN'T LIKE THE:
Found no problems.

Assembly:

The cover of the instruction manual gave us a photo of Blizzard in action, and promised great things inside. As it turned out, we weren't disappointed. In 16 pages there are fifty line drawings that show every (and we mean **every**) individual part and piece of Blizzard, and clearly illustrate exactly where they are meant to go. The assembly sequence was covered nicely by the written portion of the booklet, and we must say that this manual ranks along with the best we've come across to date.

Installation of suspension springs to the chassis started us off, and right here the combination of good drawings and written instructions paid off. The suspension springs all look alike, but we found (via the manual) that there were three different sizes of these things to be used with the 10 road wheels. From suspension springs and road wheels we moved on to the tracks. As the tracks come out of the package we found that they were in sub-assemblies, and it was a simple matter to screw the proper joints together and end up with two complete sets of tracks.

Installation of the tires onto the road wheels came next, followed by the trailing arms. This completed the basic suspension portion of the job, and our attention was next directed to such exotic things as the gear box, rear axle

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Sunday Flier

KEN WILLARD

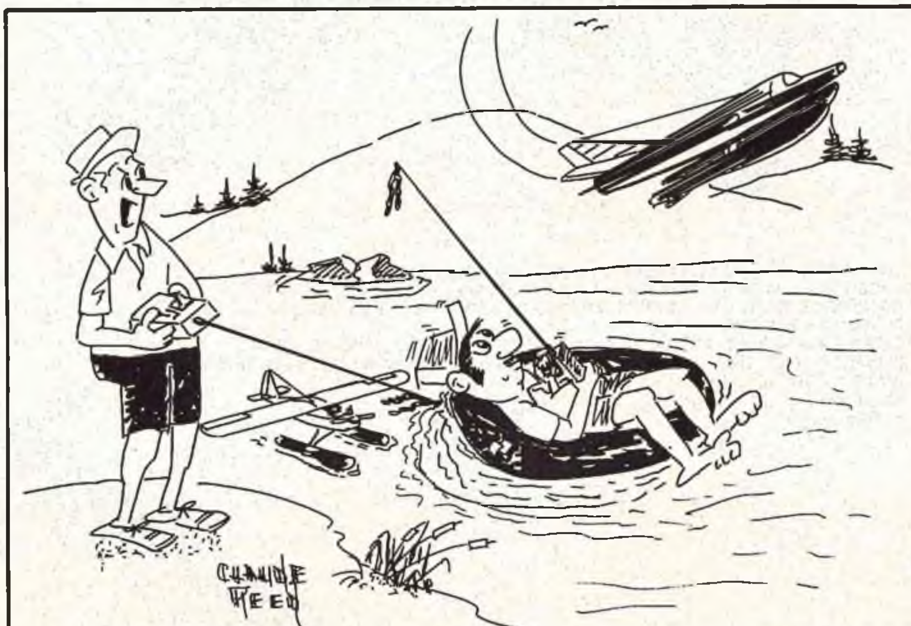
The phone rang.

It was my good friend Scott Christensen, and he had an intriguing question --- one which has been asked by others, as you will read later on.

"Why does the Contender model turn **left** and nose down when you give it **right** rudder, and turn **right** and nose down when you give it **left** rudder?"

"I didn't know it did," I replied. "let me look into it."

Since I don't have a Contender, I had to borrow one. It wasn't hard to do. Frank Milo, the marketing whiz of Pacer Products, had built one, and I had flown it, but never noticed the "reverse" action of the rudder, since most of the time I used ailerons. So, he brought it out to the field, we fired it up, took off, got some altitude, and I tried some rudder turns. Yep. Give it right rudder, it went left, and vice versa. And I do mean really vice.



"I do wish you would start taking this hobby more seriously Norton."

Why? Do any other models do the same thing? They sure do. The Kaos, the Curare, and a couple of others, when built with no dihedral in the wing, have the same characteristic. Hm-m-m. What about a stall turn? I tried one with all of them and the stall turns were normal --- right gave right and left gave left.

Aha! Just what I wanted --- another aerodynamic "mystery" for all you experts. After I demonstrated the "phenomena" to a couple of our local fliers, they had some theories --- span-wise flow into one wing hit the fuselage and slipped off the tip on the other, causing the reverse turn, was one theory which had some apparent logic to it. Another was that the rudder actually acted as a trim tab for the vertical fin and made the fin action reverse the turn.

A possible cure for the span-wise flow theory could be a large, graduated fillet at the wing root, and a possible cure for the fin theory would be to enlarge the rudder.

Understand, first of all, that this characteristic shows up only in low wing models with no dihedral or sweepback. Add either of these features to the model and the reverse action disappears.

Grist for the old Chief Sunday Flier's mill and another challenge for you. Send in your theories, or, another way to put it, write my column for me and let me be the editor. Just like some of you are doing this issue.

One of my most prolific contributors has again taken up some of my previous challenges. Brad Powers of San Diego, California, writes:

Dear Ken,

Having responded before to your seductive "send me your answers" bit, I now find myself in the position of having my friends say, "Old Powers is showing off again" when I do respond, and "old Powers didn't know the answer to that one, I guess" when I don't. Nevertheless, I get this strange compulsion to bark whenever you say "speak" --- so with mixed emotions --- sort of like watching my Mother-in-Law drive over a cliff in my new Ferrari --- here goes:

Re: (June) More discussions on 0-0 settings: Lift is the result of deflecting a mass of air downward, thus accelerating it. F = L = Ma. The Lift equals the mass of air deflected times the acceleration. In order to deflect the air, the wing must be held or "trimmed" to a positive angle of attack . . . normally by the horizontal tail. If there is no horizontal tail as on a tail-less airplane, then the trimming moment is provided by the elevon. If there is no elevon, as on a hang glider, then the pilot shifts his weight. Some means must be provided to trim and hold the wing to a positive angle. The "Force Arrangement" indicated by Mr. Miles must necessarily produce positive angle of attack in the tail as well as the wing which places an "up" load on the tail, which makes it impossible to trim the wing. If the C.G. is so far aft that an "up" load on the tail is needed, then the airplane is in an unstable condition and trim is still impossible. So, the statement that an airplane having symmetrical airfoils on both wing and tail and 0-0 incidence will not fly without some up elevator is indeed a fair one.

Re: (July) Crabby Seamaster: With that nosewheel way up front on that long nose, you almost have a forward rudder, which is directionally destabilizing --- apparently marginally so until you lengthened it.

Re: Variation in pitch along propeller blade: This is a natural *geometric consequence of the fact that near the hub, the pitch must be high to advance helically the same distance that the tip does in each revolution. Thus, the pitch decreases outwardly towards the tip.*

I am not well-versed on the subject of helicopters, but the line of flight is essentially in the plane of the rotor disc (except when climbing or descending) so that V/ND, or advance ratio applicable to an airplane propeller, does not apply and a constant pitch along the blade apparently causes no problems.

This forum for discussion that you provide in your column is thought provoking and entertaining.

Sincerely,
Brad Powers
San Diego, California

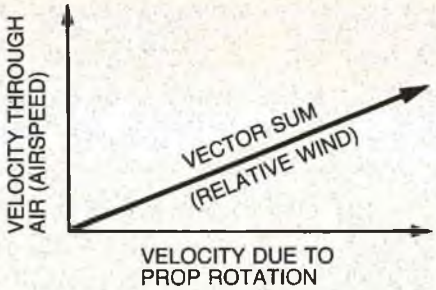
Gotcha, Brad! Bark for the readers again! Of course, if you don't know the answer, you'll just have to whimper like me!

The latest item in my "aerodynamic quiz series" drew a lively response. I refer to the bit about helical pitch on helicopter blades, so let's hear from a few theorists. Cal Malinka of Rialto, California, has this to say about helicopter blades:

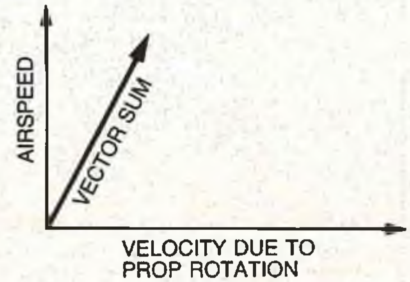
Dear Ken,

I believe I have the correct answer to your question in the July RCM, concerning why helicopter blades are not "helically" twisted to give less angle of attack at the tip as compared to the hub. It is basically because helicopters are mostly hovering and not moving through the air at high speed, as are airplane propellers during flight. The portion of the "relative wind" due to forward motion is zero during hover, as is an airplane prop blade while the plane is stationary on the ground.

To explain further, the relative wind a point on the blade "sees," is the vector sum of the forward speed perpendicular to the rotational plane, and the velocity of any point on the blade caused by its rotation. Obviously the velocity **caused by rotation** *of a point near the tip is greater than that of a point near the hub. This means that a point near the tip sees a high velocity due to rotation, and perpendicular to it, a velocity due to the plane's movement through the air (airspeed). A point near the hub sees a low velocity due to prop rotation and the same airspeed velocity perpendicular to it due to the plane's movement through the air (see sketch).*



NEAR TIP



NEAR HUB

A quick look at the sketches shows that the direction of the relative wind the prop sees while moving through the air is different near the tip than near the hub; less (or different) twist is required at the tip than at the hub. For highest efficiency, the angle of attack as measured in relation to the relative wind (and it should always be so measured), should be the same over the length of the blade. This can only be true at one airspeed, and at zero airspeed only the rotational velocity remains; which means that no helical twist is necessary or desirable at zero airspeed (only a constant blade pitch).

The only time a helicopter has airspeed perpendicular to the rotational plane of the blades is when it is rising (or falling) at a high rate of speed. This is seldom more than a few miles an hour. Also, if the helicopter blades were twisted for maximum efficiency while it is rising, although only affording a slight improvement, **they would be less efficient at hover or while falling.** *In extreme cases, this may mean the contraption couldn't get off the ground!*

Incidentally, the way we modelers measure prop twist, using inches of forward motion per revolution, does provide a constant angle of attack (approximate only) at some airspeed (assuming the prop is manufactured accurately). An airspeed can easily be calculated for a given rpm and can be thought of as the zero angle of attack, or "no-slip" speed. You once questioned why a prop still provides thrust at this "no-slip" speed; the answer was, of course, that the non-symmetrical airfoil shape of the prop provides lift (thrust) at zero angle of attack.

Hope this long-winded note is of some interest — feel free to use it any way you wish. I still want to know why a Contender tends to roll away from the turn (towards the outside) when given rudder, while most planes roll into the turn; and when this tendency is corrected by adding dihedral, the Contender pitches down.

Sincerely,
Cal Malinka
Rialto, California

Okay, Cal, since you said to use it any way I wished, I thought I'd just put it in the column --- then let you fend off the flak because I don't think too many readers will agree with you, even though your arguments do have an authentic ring. And, as you'll note, I've begun this column in search of the answer to the Contender rudder reversal.

Here's a rather cryptic note from Don Hummel of Morgan City, Louisiana:

Dear Ken,

I was reading your column in the July '83 issue of RCM, and thought I'd send in my thoughts on your question of the lack of a helical curve in helicopter blades.

I cannot quote any aerodynamic theories, but I feel the reason is the fact that a propeller is strictly a "thrust" generating device, while a helicopter rotor is a "lift" generating rotory wing.

Your question is one I've never heard and am interested in the responses that you receive. I am looking forward to reading them in your column.

Keep up the good work in the magazine.

Sincerely,
Donald D. Hummel
Morgan City, Louisiana

Don, here are some of the responses, but it's only fair to tell you that a helicopter blade is a thrust generating device, just as a propeller is, only it generates thrust vertically rather than horizontally when hovering. Then, when tilted, a part of the thrust is vertical and part is horizontal, giving lateral or forward movement.

Louis P. Crane of Sierra Vista, Arizona, had a few words:

Dear Ken;

I'm a CL flier with more than a passing interest in aerodynamics. CL models, after all, cannot crab, drift, or compensate for wind as FF or R/C does.

Your downwind turn, cross wind, and symmetrical section lift controversies are interesting, but reflect a wide lack of awareness among today's fliers!

(1) Symmetrical airfoils, at 0° angle of attack, **do not lift!** *The high wing drag couple that Larry Miles suggests, correctly points out that the airfoil is "dragged" to a small AOA when above the C.G. "One-g" lift can be produced by a symmetrical section at a quite small AOA unless the model is terribly heavy for its wing area.*

(2) The "downwind turn" business is easily cleared by stating whether the turn is referenced to the air in which the plane is flying, or to a fixed point on

the ground. The confusion may be due to the fixed, ground location of the R/C flier. In a stiff wind, a two-minute constant rate turn will drift with the wind the same distance as any air molecule in the same wind. The model will fly as if in still air. If, however, the flier at the Xmtr on the ground wants to orbit his location in the same wind, it is different.

His control sequence will need to slow the model by the windspeed when due downwind, accelerate to desired airspeed while crabbing upwind on the "wind from inside" half, then accelerate to airspeed plus windspeed when due upwind. Through the upwind half, again, upwind crabbing is needed. Airspeed must be above apparent (from the ground) speed until the wind is directly across the flight path, then reduced **below** *apparent speed until it is where this paragraph started.*

A dynamically similar situation occurs if driving a dune buggy in a circular path on a loose, sandy hillside. Gravity and traction would be similar to the cross wind. A constant rate (degrees per second) turn would also find the vehicle considerably "downhill" from a true circular endpoint.

(3) Roger Chapman's computer ain't wrong. If aircraft heading is maintained, airspeed is unaffected, but the ground path drifts with the wind. Crabbing into the wind to maintain ground track causes a loss of groundspeed, which can be found from fairly simple trig. (Example: Windspeed half of airspeed gives us the good old 30°-60°-90° triangle, and shows groundspeed to be .866 . . . times airspeed. Sketch it out!)

Again, the confusion is whether the path is referenced to the air or to a fixed point on the ground.

(4) Roger is way off in regard to Ground Effect, though. This became important in WWII when crippled planes staggered home over long reaches of ocean by skimming the surface. The studies which followed agree that the effect is limited to about half the wingspan above the surface. Even CL stunters are out of Ground Effect, as they compete from a 5 foot base altitude. No one yet has built a serious, 10 foot span stunter! Whether Ground Effect produces lift on a 0° AOA symmetrical airfoil is of little relevance, as R/C models spend only a few hundred feet, take-off and landing, in Ground Effect.

The other miscellaneous comments about models flying with apparently contradictory trim could probably be cleared up by very careful rigging measurements. We are, after all, amateur aircraft constructors, and not usually as precise as pattern-maker

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NEED A TRANSPORTING STAND?

For Low Wing Models With Tricycle Gear

By Dick Tichenor

So often we encounter a situation that requires a solution and usually resolve it without giving it a second thought.

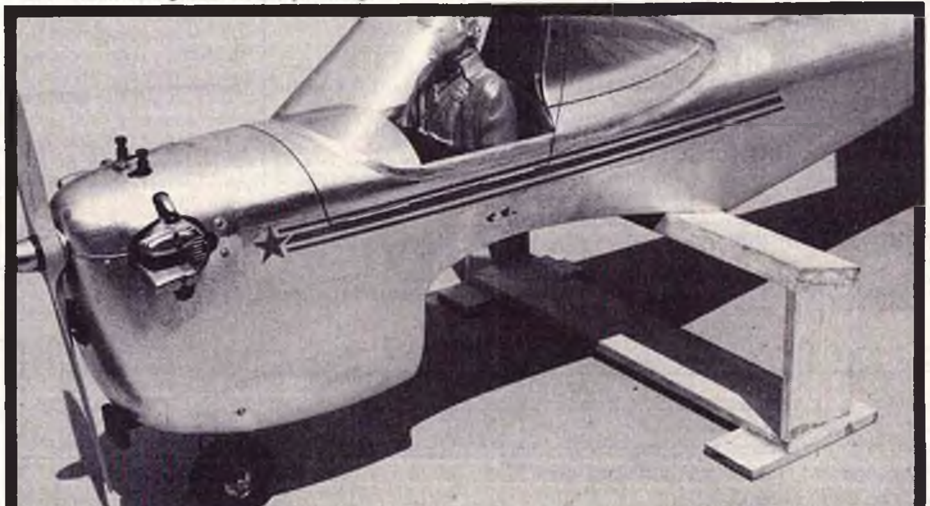
Such has been the case in transporting low wing aircraft with tricycle landing gear. An old standby has been the corrugated paper box trimmed down with appropriate U-shaped notches cut in each end. Wanting something a bit more sturdy lead us to making stands of wood.

This seemed like no big thing until we were taken to task by good friend Carl Goldberg on one of his visits to our offices. Carl enjoys seeing what sort of weird projects we have underway in the back room. During a recent visit, he noticed several fuselages setting on a variety of stands and proceeded to explain that we were remiss in not sharing this idea with our readers.

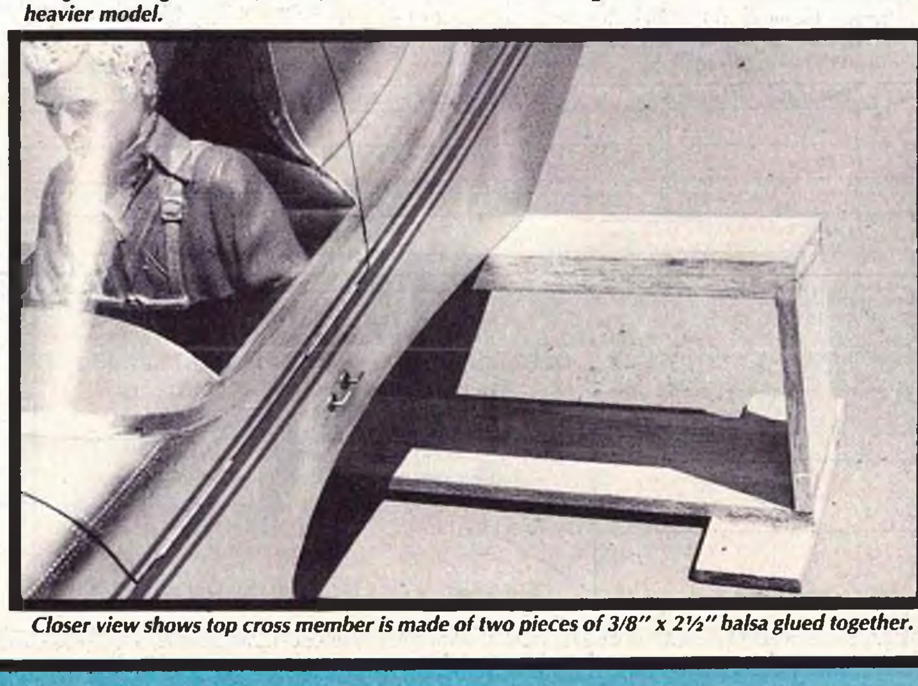
In acquiescence to pressure from Mr. Model Aviation, here are a couple of those stands. These were made of 3/8" thick balsa that wasn't suitable for model use; however, any kind of wood can be used. Yes Carl, they were glued together with Super Jet.

'Tain't no big thing and I hope that some of our readers can find the stands as useful as we have. Incidentally, we use the foam Robart Super Stand extensively on the workbench and it really cuts down on the hangar rash. Take a look at one some time, you can probably use one also. □

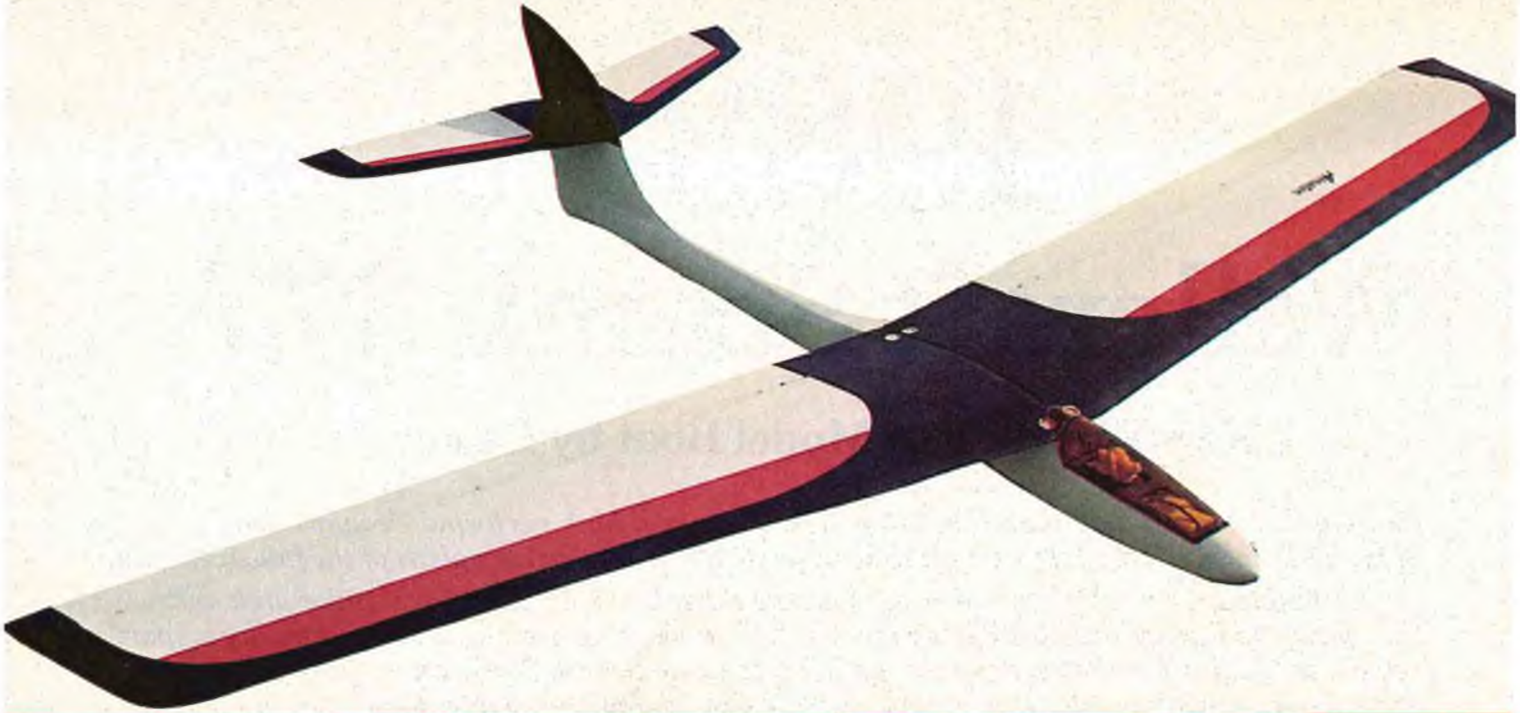
This stand can also be used to allow access to radio from bottom of fuselage. Common poly foam 3/4" thick was glued on for padding.



Wing mounting screws (1/4-20) secure this stand to fuselage. Wide tread adds stability for heavier model.



Closer view shows top cross member is made of two pieces of 3/8" x 2½" balsa glued together.



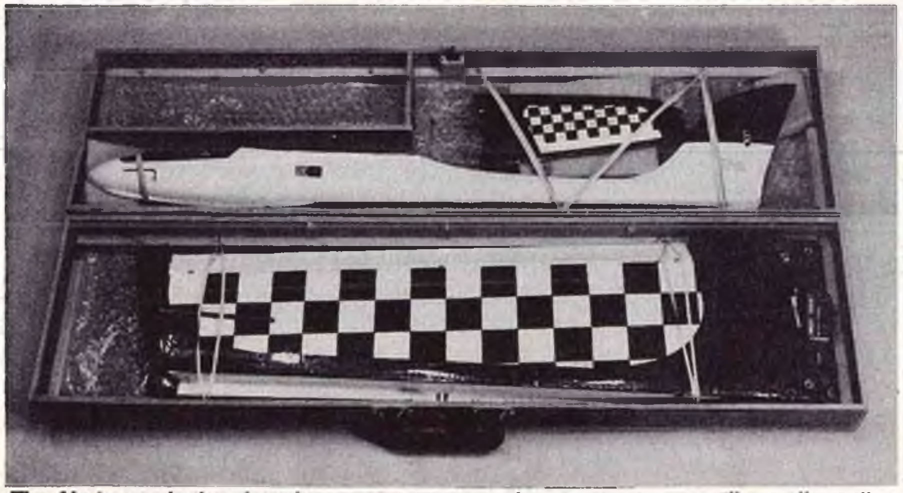
AIRSTER

Introduction

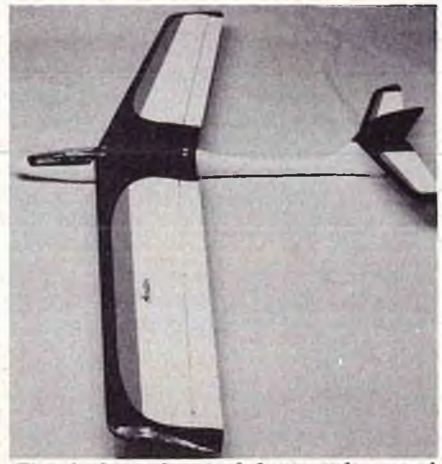
Maybe it's never happened to you, but it seems to happen to me on a regular basis. You'll be driving along on the coast, or maybe up in the hills, when suddenly you stumble across a perfectly soarable hill. The wind is perfect, the birds are having a great time, and there you stand watching and wishing. Wishing that you'd brought along your slope glider.

It's for moments like these that the Airster was designed. Although there are a lot of well-designed, fully aerobatic slope gliders commercially available, none of them can fit into a 34" x 9" x 4½" carrying case. (Because the Airster's so easily portable, you tend to take it with you more often than not.) They also can't match the Airster's broad speed range. At the lower end of its performance range, the Airster can stay up on the same lift as a Ridge Rat or a Katy II. However, at the upper end of its performance range, assuming the same wing loading, it can easily chase an SR-7 around the sky. How's that for a wild claim? The secret is in the 8% thick speed airfoil, rather than the conventional thick, semi-symmetrical, aerobatic airfoil. This airfoil, designed by Jack Caldwell, has a sharp entry which allows for excellent penetration. It tip-stalls at a slower speed than the Ridge Rat and does not have the nasty tip stall/spin combination of the Katy II. When you stall it going into the wind, there is no tendency for one wing to drop before the other. All in all, the Airster behaves itself while being very aerobatic. While there is no such thing as a perfect slope glider, the Airster might make a good choice if your plans call for a vacation on the coast or in the mountains. I took mine to Hawaii and had a ball flying it in those warm tradewinds. The Airster has the FAI legal nose radius for sportsman class slope racing. At 15 ounces per square foot, it's much faster than an F3B Mini-Merlin similarly loaded.

The foam wing and fiberglassed balsa wood fuselage are straightforward, easy to build items, and the overall cost of this project is

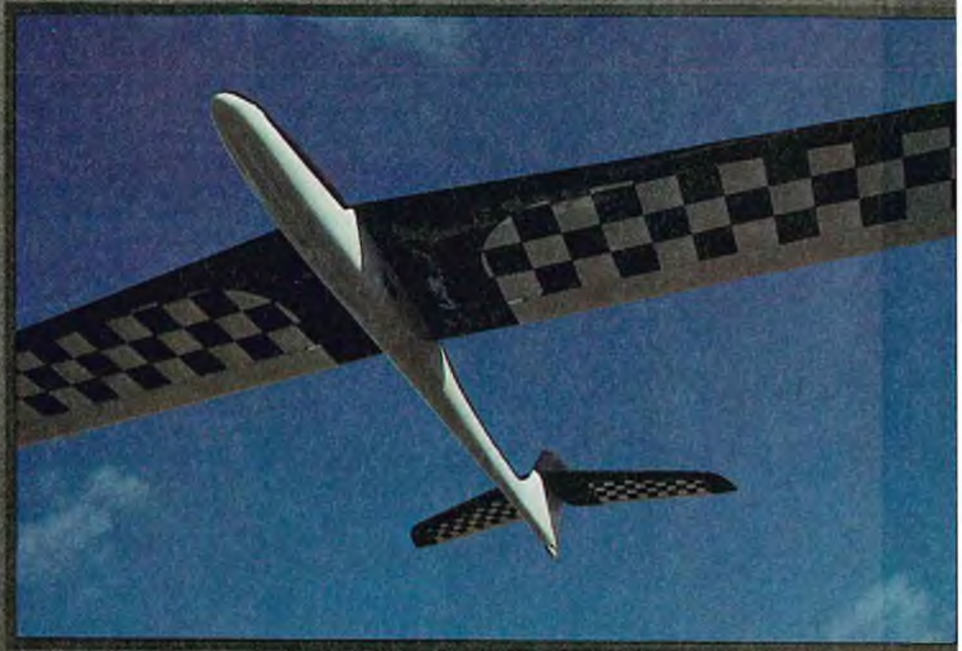


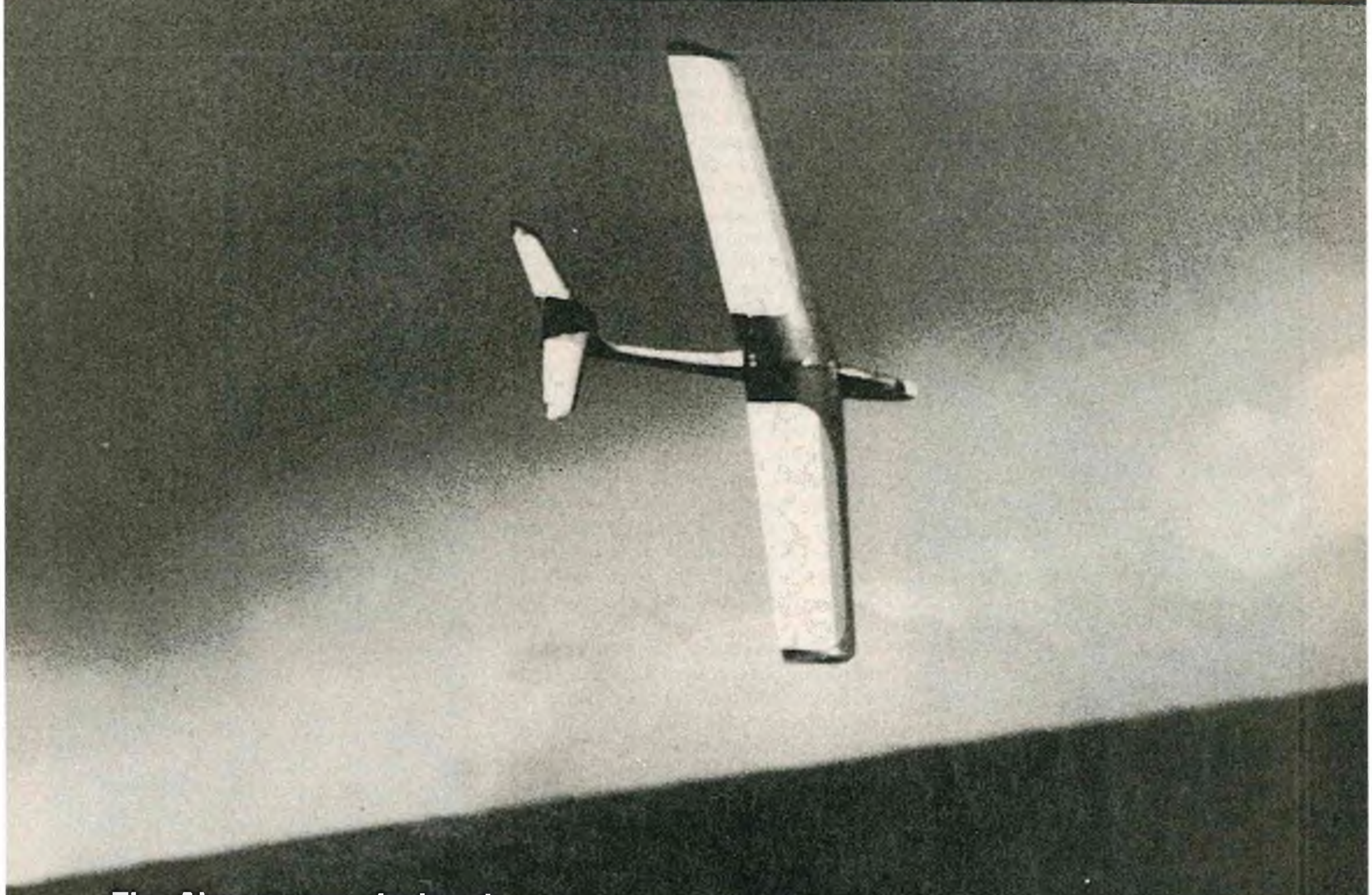
The Airster packed and ready to travel. The carrying case measures 9" x 4½" x 34".



The balsa sheeted foam wing and fiberglass over balsa fuselage are strong enough to withstand the rigors of slope soaring.

By Steve Calderon





The Airster was designed by Steve Calderon for a "take anywhere" slope soarer. Its fantastic performance along with being able to fit into a small box makes it a great addition to your stable of models.

AIRSTER
Designed By.
Steve Calderon
TYPE AIRCRAFT
Slope Soaring Glider
WINGSPAN
57 Inches
WING CHORD
Root 8"
Tip 6"
TOTAL WING AREA
400 Sq. In.
WING LOCATION
Shoulder Wing
AIRFOIL
JC8-4220-2.5
WING PLANFORM
Tapered L.E.
Swept Back
DIHEDRAL
Wing Inverted
1/2" At Center
O.A. FUSELAGE LENGTH
32½"
RADIO COMPARTMENT SIZE
(L) 5⅝" X (W) 1⅝" X (H) 1¾"
STABALATOR SPAN
17¾ Inches
STABALATOR CHORD
Root 4"
Tip 2"
STABALATOR AREA
53 Sq. In.
STAB. AIRFOIL SECTION
Symmertical
STABALATOR LOCATION
Midway on Fin
VERTICAL FIN HEIGHT
6½ Inches
VERTICAL FIN WIDTH
3¾" (Avg.)
REC. ENGINE SIZE
NA
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Aileron & Elevator
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage .... Fiberglass over Balsa
Wing .... Foam w/Balsa & Fiberglass
Empennage .... Balsa
Wt. Ready To Fly .... 30 Oz.
Wing Loading .... 11 Oz./Sq. Ft.

quite reasonable. An easy to follow fiberglassing method is described.

So what are you waiting for? You say you're halfway done with your "Whistler 900"? Oh, well, don't let me disturb you. I just had to tell you about the Airster.

CONSTRUCTION

Wing Sub-Assembly:

Let's start by preparing your foam cores for the balsa sheeting. Sand away any irregularities on the core and make sure you have a flat building board to clamp the foam cores on. If you desire a one piece wing, leave out the joiner system and the 1/16" plywood root ribs.

Add the sub-leading edge (sub-LE) and sub-trailing edge (sub-TE) with 30-minute epoxy. While you're waiting for the epoxy to set, you can start cutting out the fuselage parts.

Trim the excess length of the sub-LE and sub-TE. Match them to the top and bottom contours of the foam core using a block plane and sanding block. Be careful not to damage the cores. Then add the 3/32" balsa tip and root ribs with 5-minute epoxy. Match the ribs to the core contours.

Next, add the fiberglass cloth disc on the top of the cores directly above where the tips of the wing joiner pins will extend. Use 5-minute epoxy and carefully sand smooth.

Edge glue your 1/16" balsa sheeting and cut out the wing skins with about 3/8" overlap all around.

Cut out the two 1/16" plywood root ribs.

Sheet the top of the foam cores first using Hi Johnson "Supertape," or your favorite wing sheeting adhesive. The foam core must be resting on its foam bed that it was cut from. My foam cores were cut with the tops of the cores facing each other. This allows you to sheet the top of each core separately, and then clamp or weight the entire stack as a unit. As a general rule, I've found that it's best to let the stresses in the sheeted cores relax for about 24 hours before sheeting the bottom. I also use about 30 to 40 pounds of evenly distributed clamping force.

Trim the excess top sheeting from the perimeter of the cores.

Flip the cores over and carve out the 3/8" wide slot for the wing joiner system. Be careful not to cut through the top sheeting or fiberglass disc.

Cut out the spruce spars, balsa shear webs (with grain aligned vertically), 3/16" diameter x 6" long joiner wire and two 3" long brass tubes.

Prior to installing the joiner system, shim the center section up 1/2" for the proper dihedral angle. Clamp the leading and trailing edges of each wing-half together to maintain the proper relative incidence. The dihedral really improves the handling and barely affects the inverted flight performance. Since most of your flying is upright, I consider the dihedral important.

Before you mix the 30-minute epoxy, I would fit the shear webs, top spar and joiner pin/tube in place to check that fit. You will need to make some tapered filler wedges from hard balsa to go between the brass tubes and the spars.

Roughen the outside of the brass tubes with coarse sandpaper, and epoxy the joiner system in place in two stages.

The first stage will include the top spar, balsa filler wedge, balsa shear webs, brass tubes and joiner pin to provide alignment.

The second stage will consist of balsa filler wedge and bottom spar.

With the joiner system now installed, separate the wing halves and sand the lower spar or shear webs flush with the foam core if required.

Glass in the fiberglass disc as you did on the top, and sand smooth.

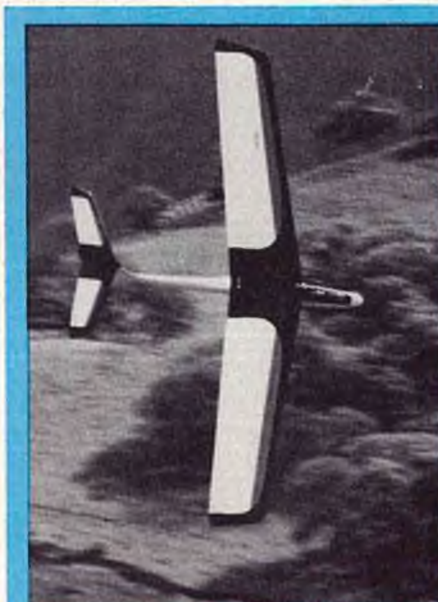
Now you can sheet the bottom of the foam cores. Clamp the entire foam core stack for 24 hours.

Trim excess sheeting and sand the perimeter flush.

Add the 3/16" x 3/8" spruce leading edge with 30-minute epoxy. Shape it after the epoxy cures to a sharp edge.

The forward wing hold-down blocks can be cut from 3/4" thick pine. Saw a 3/4" x 7/8" notch in each wing half as shown on the plans. Using 5-minute epoxy, add the forward wing hold-down blocks. Blend them to the airfoil contour. You will notice that there is a flat area where the wings come together directly over F-2.

Now, let's work on the back of the



Materials List

1 — 3/16" x 4" x 36" balsa
1 — 1/4" x 3" x 36" balsa
1 —3/8" x 3" x 36" balsa
6 — 1/16" x 4" x 36" balsa
1 — 3/32" x 3" x 36" balsa
1 — 1/2" x 1⅓" x 12" balsa
2 — 1¼" x 36" balsa trailing edge stock
4 — 1/4" sq. x 36" balsa
2 — 1/4" x 36" balsa triangle stock
1 — 3/8" x 36" balsa triangle stock
1 — 1/16" x 6" x 12" plywood
1 — 3/32" x 6" x 12" plywood
1 — 1/16" dia x 36" music wire
1 — 3/32" dia. x 36" music wire
1 — 3/16" dia x 36" music wire
1 — 1/16" I.D. x 12" brass tubing
1 — 3/32" I.D. x 12" brass tubing
1 — 3/16" I.D. x 12" brass tubing

CONTEST ANNOUNCEMENTS

CRESCENT CITY R/C CLUB
22ND ANNUAL FALL CARNIVAL
Oct. 8 & 9, 1983. CCRCC Flying Field, New Orleans, Louisiana.
For further info, contact: M. Hartman, 117 J St., Belle Chasse, Louisiana 70037. (504) 393-9133

FAYETTEVILLE AEROMODELING SOCIETY
1ST ANNUAL FALL SOAR-IN
Oct. 29, 30, 1983. Fayetteville, North Carolina
For further info, contact: Rich Madden, R.R. #1, Box 193E, Hope Mills, North Carolina 28348.

NAMBA INTERNATIONAL
4TH ANNUAL DISTRICT 9-19 CHALLENGE REGATTA
Oct. 22, 23, 1983.
For further info, contact: Cathie Galbraith, 1815 Halley, San Diego, California 92154.

If your club is planning a show or contest, fill out this form and we will publicize the event, space permitting. We must receive this information at least 3 months prior to your event, due to our magazine deadline.

Name of Club: ______________________________

Type of Event: ______________________________

Date of Event: ________________ **AMA Sanction #:** ____________

Location: ______________________________

For further information, contact: (name, address, phone no.): ______________________________

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wing. Using 1¼" wide aileron stock and 3/32" x 1/4" spruce, edge glue the two together. Make two assemblies. This will give you a 1½" wide reinforced aileron. From these assemblies, cut out the center section trailing edge (CSTE). Make sure you're making a left-hand and right-hand piece.

Make the aileron torque links from 3/32" music wire. They are 4½" long and have a 1/2" dogleg bent at 90°. Grind or file a flat on the end where the #4-40 threaded rod comes through the shaft collar and bears on the torque link.

Cut two pieces of 3/32" I.D. brass tubing 4" long and two pieces 1/2" long. Roughen their outer surfaces with coarse sandpaper.

Next, carve a groove down the center of the sub-TE and CSTE for the brass tubing to run through.

Notch the sub-TE and CSTE in the area where the shaft collar and #4-40 threaded rod will rotate back and forth. The shaft collar will have to rotate freely!

Cut out the 1/16" plywood wing reinforcing plates. Carve away the sheeting, 3/32" balsa root rib, sub-TE and CSTE to accept the inlaid 1/16" plywood wing reinforcing plates.

Let's leave this sub-assembly for now and start framing the fuselage.

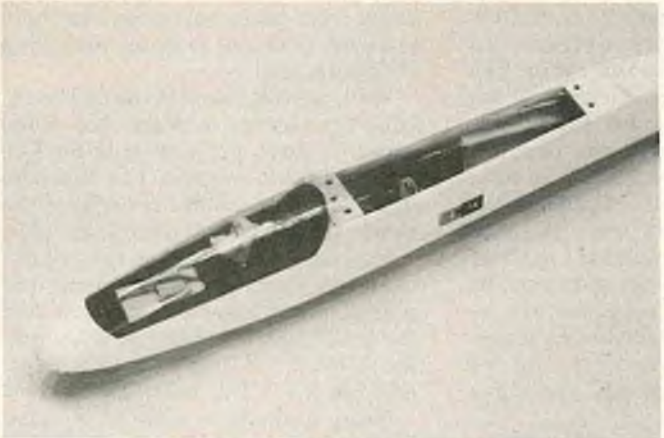
Fuselage Sub-Assembly:

Cut the fuselage and noseblock templates from the plans. Using rubber cement, glue the fuselage template to a piece of 3/32" x 4" x 36" light, but strong, balsa. In order to efficiently make the most of your balsa, one fuselage side should be laid out with the nose near the left side of the balsa stock, and the wing saddle near the top edge of the balsa stock. The other fuselage piece should be positioned with the nose pointing in the other direction and the wing saddle near the center of the balsa stock. By doing this, if the balsa stock is bowed, your fuselage sides can be assembled bowed inward an equal amount.

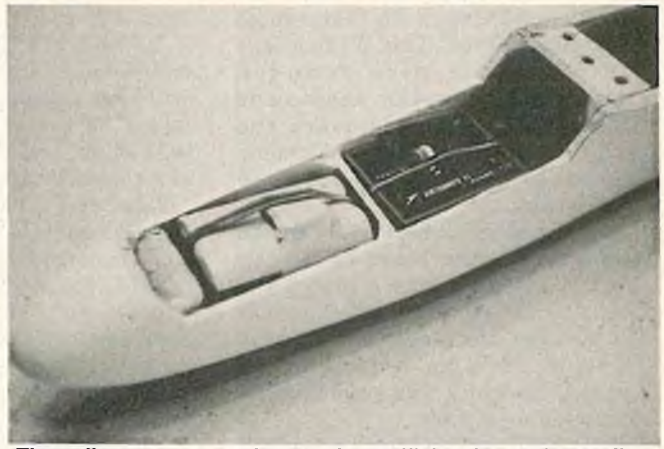
I've inadvertently built some cock-eyed fuselages by **not** doing this. After you cut out the sides, clamp them together and sand their edges as a matched pair. Before you remove the paper template, mark across the edges where the noseblock and formers will go.

After you have removed the paper template, use a gum rubber block to remove the excess rubber cement. Finish marking the inner faces of the fuselage sides to show where the noseblock and formers will go.

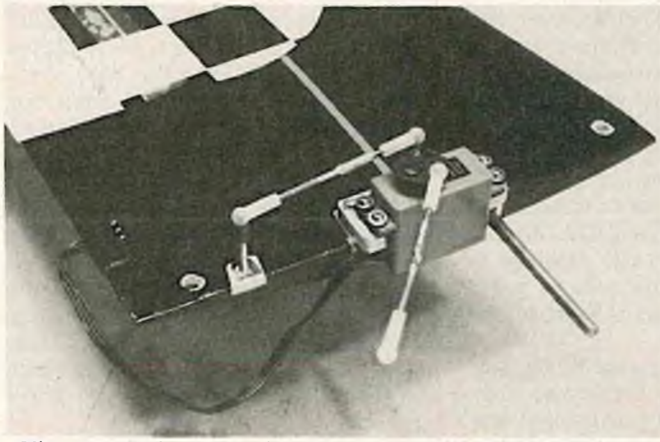
Before you cut out your formers, determine whether your stabilator drive servo and receiver can lay flat in the space shown. My Airster was built



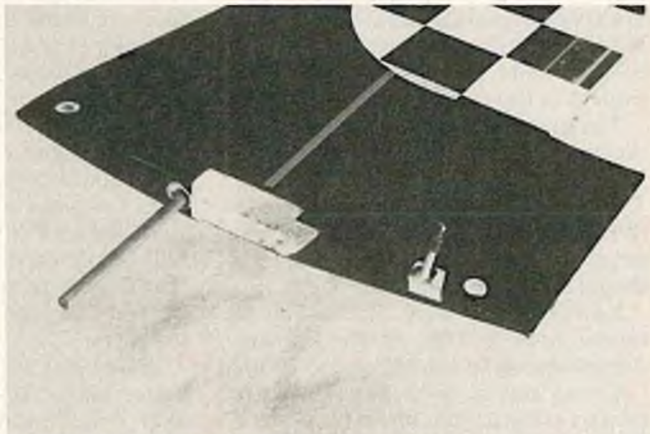
With Goofy as the pilot, the aerobatics will be a delight to watch.



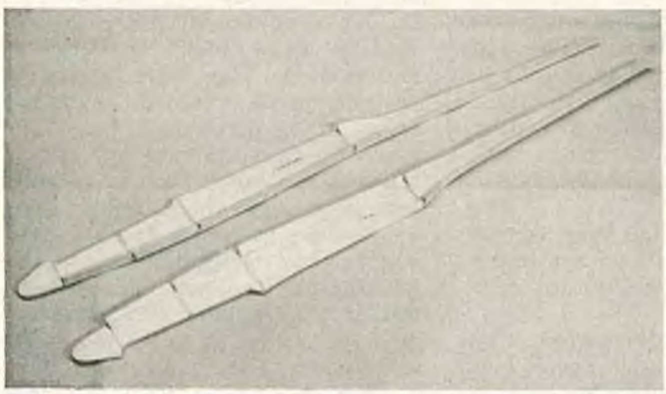
The radio compartment is snug, but sufficient for modern radios. Interior of fuselage is fiberglassed.



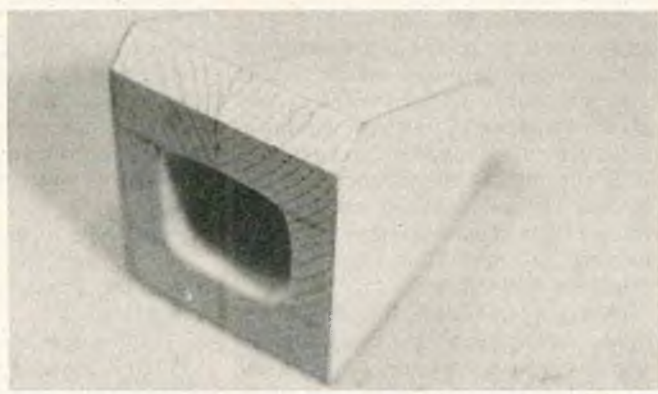
Aileron servo is mounted to right-hand wing. One ball link must be unsnapped to separate wing halves.



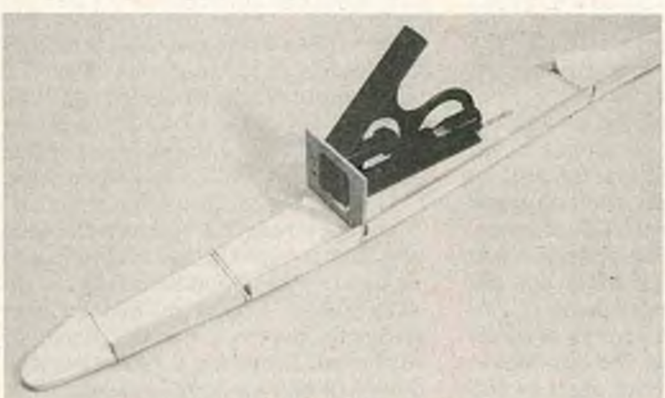
Left-hand wing is cut out to clear servo.



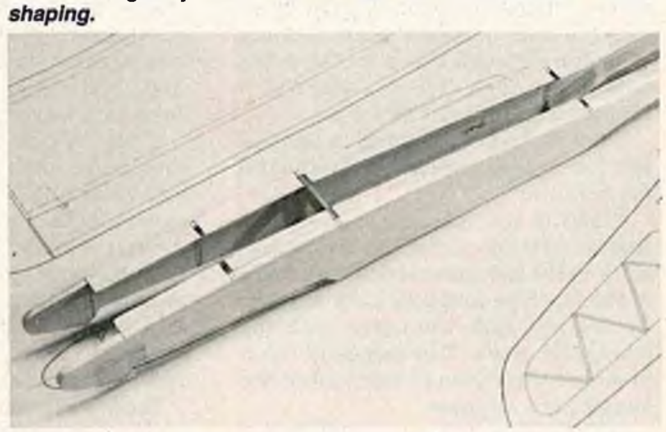
Fuselage sides are made from 3/16" balsa with triangular stock.



Nose block is made from 3/4" thick pine laminated together. The lamination glue joint serves as the vertical centerline when shaping.



Former 2 being installed.



Fuselage sides joined together using parallel reference lines to keep F-2 perpendicular.

around an Airtronics XL Series radio with mini-servos. The 2" fuselage width gives a nice rounded appearance when the shaping is finished. Remember to mark the vertical centerlines on the formers. They will help you line up the fuselage over the plans.

The noseblock is best made in the following manner: Start by sawing about 2" off the end of a pine 1 x 4. Then saw the piece in half. You will now have two pieces each 3/4" thick by 2" long and about 1¾" wide. Laminate these together with the two good edges even with each other.

You now have a 1½" thick x 1¾" tall x 2" long pine block with one good edge, three sawn surfaces and the grain running along the 2" dimension. With the good, non-sawn edge as the bottom, sand the back square with respect to the sides and bottom.

The glue joint is now your vertical centerline and all dimensions will be in reference to this centerline.

Now, using rubber cement, paste the noseblock pattern to the blank noseblock and saw the outline as shown on the fuselage side view.

Now for the top view. The noseblock tapers from 1-3/16" at the battery compartment, to 1-1/16" at the front.

Carve out a 5/8" deep ballast compartment as shown on the fuselage side view. Leave a 1/4" thick wall on both sides of the ballast compartment.

There! Wasn't that easy? The noseblock is probably the most difficult part to make on the whole airplane, but if it's done right, it will produce a graceful fuselage when the sides are pulled together and glued to it. It sure makes the job easier if you have a Dremel disc/belt sander like mine. I have never regretted spending money on tools that remove the drudgery of handwork.

Now, cut out the tail fin parts using light, but strong, balsa. You probably don't need to cut out and glue the tail fin outer skin pattern. You can probably just transfer the four corners of the skin to balsa by laying the plans over the 3/32" balsa sheet and pushing a tee-pin through the plans to mark the corners. Then, using a straightedge, cut out the skins.

The tail fin post is going to be used as a fuselage spacer for the slot the tail fin fits into.

Framing the fuselage is next. It's best to start by gluing the triangular stock to the fuselage sides. Since some of the fuselage contours have shallow curves, just span the curve with the triangular stock. You can sand them to match the fuselage sides after the formers are in place.

In the tail boom area, you will notice that the triangular stock switches from 3/8" to 1/4" about 2" back from F-3. The 1/4" stock extends an additional 7" into the tail boom. You will have to taper the thickness of the last 3" of the triangular stock. This will allow you to pull the fuselage sides together against the tail fin core.

Now, we are ready to start framing. Before I go on, I must warn you that squareness is very important in these next few stages. Your formers must be square and the fuselage must be positioned accurately over the plans. Any built-in errors now will be magnified later on, so take your time and do it right!

Glue F-2 to one of the fuselage sides. Use a square or drafting triangle to get it perpendicular. Then, place the fuselage sides upside-down over the top view of the plans. There are some parallel reference lines alongside the wing saddle area that you can align the fuselage sides with. Glue F-2 to the other side and clamp in place. Now, you should have two parallel sides with F-2 perpendicular to them.

Tack glue F-3 in place. This former will be removed after the fuselage is framed-up to enable you to pour expandable polyurethane foam in the tailboom.

Before you add the nose block, you better make sure to clamp the area near F-3. Be careful not to dent the balsa sides with your clamps. Add the nose block with 5-minute epoxy and clamp in place.

Add the 3/8" cross-grain balsa sheeting starting with the piece that straddles F-2. Next, pull the tail boom sides together using the 3/16" thick tail fin post as a horizontal spacer. You'd better cover the spacer with plastic wrap to keep from gluing it in place.

Fit the 3/8" balsa tail boom bottom by sanding it to fit the curve under F-3. The grain, you will notice, runs lengthwise.

For some strange reason, I've noticed several popular model kits that have the tail boom bottom sheeted cross-grain. It seems like every time you land one of them hard (i.e., crash) they always break the fuselage bottom in the area under the wing trailing edge. The cross-grain balsa is always the culprit.

If you stop to think for a moment, the loads imposed on a tail boom bottom during a hard landing will be tensile loads. Balsa is much stronger when it is loaded parallel to its grain. To my way of thinking, wouldn't you want the grain parallel to the applied load, rather than perpendicular? I've banged my Airster in a couple of times and I've never broken the tail boom.

There are some areas, such as the radio compartment and wing saddle area, where you can get away with using cross-grain balsa because there is plenty of access room for installing stiffeners, etc.

Well, anyway, back to the tail boom. Glue the bottom in place, but make sure you don't get any glue on F-3. Now, you can remove the fuselage from the plans. Sand the edges of the sheeting flush with the fuselage sides.

Now it's time to start on the tail fin. Cover the plans with plastic wrap and pin the tail fin outer skin in place. Add the 3/16" x 3/8" spruce tail post. Add the 3/16" x 1/2" balsa leading edge. Add the 3/8" x 1/2" balsa top block.

Next, make the stabilator drive fitting from a Du-Bro or Goldberg solder-type clevis. This is done by placing a 3/32" thick spacer between the clevis plates and drilling a 1/16" diameter hole through both plates. The hole is 1/2" from the base of the clevis (the end with the soldering socket). Then, grind the overall length down to 5/8" in length.

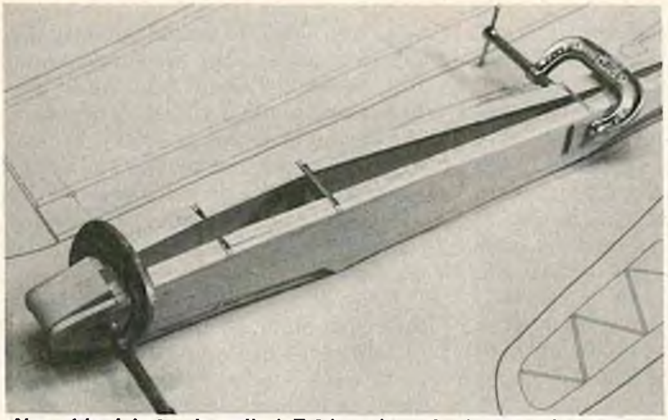
If this is beyond your means (i.e., no drill press) then use a piece of 1/8" brass tubing 5/8" long with the last 1/4" smashed flat. I feel the clevis supports the 1/16" stabilator drive pin better than the brass tube type fitting. It has two support points rather than one. The drive system is designed for ± 5/16" travel, so don't use drive fittings that are too long.

Cut the 1/16" cable and its sleeve to approximate length. Add the 3/16" x 1/2" balsa block that positions the upper end of the drive cable sleeve. Add the other locating blocks as shown on the plan. Then, using the compass mark provided, scribe the notch for the drive cable sleeve and carve the excess balsa away.

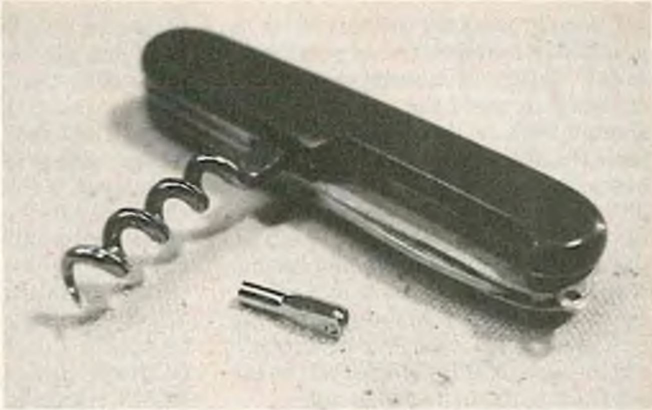
Carve the notch for the antenna tube also. Epoxy the stabilator drive cable tube in place. It should be centered in the thickness of the locating blocks. Epoxy the antenna tube in place making sure the curve near the tail fin top block is a fairly small radius. If you use a large radius, it might jam up the stabilator drive fitting at the top of its travel.

At this point, you better make sure your drive cable fitting assembly works freely. Once you seal up the tail fin, there's no turning back. With the drive cable fitting installed, add the left tail fin outer skin. Don't worry about the holes for the stabilator drive and pivot pins. We'll get to them later.

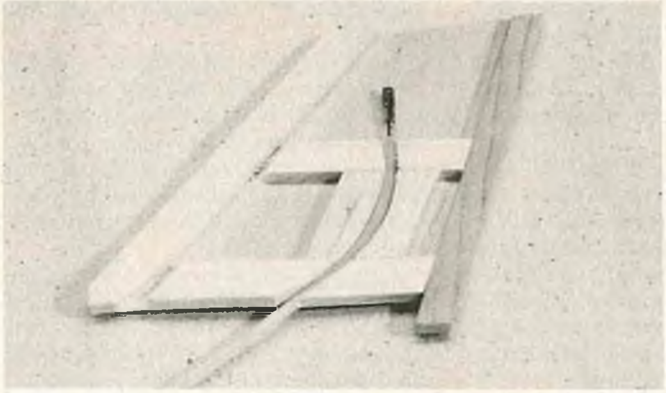
Cut out the tail boom top from 1/4" light, but strong, balsa. The 3/16" wide slot that accepts the tail fin is going to be the only thing that keeps the tail fin straight. I would make the slot accurate, but you can make the width of the tail boom top a little oversize. This will allow you to swing the front of the tail boom top left and right a little bit when you're lining up the fin.



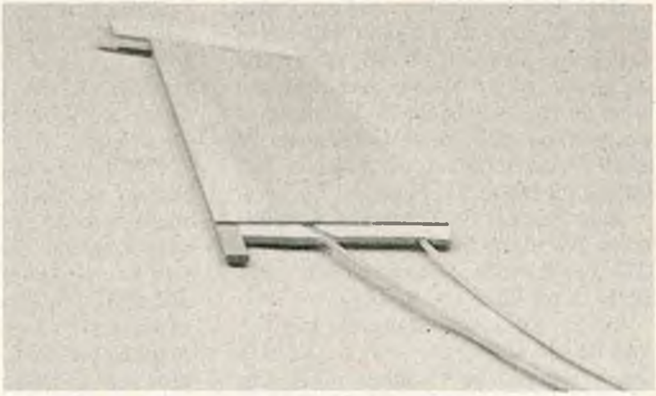
Nose block being installed. F-3 is only tack-glued in place. It will be installed permanently after tail boom has been back filled with expandable polyurethane foam.



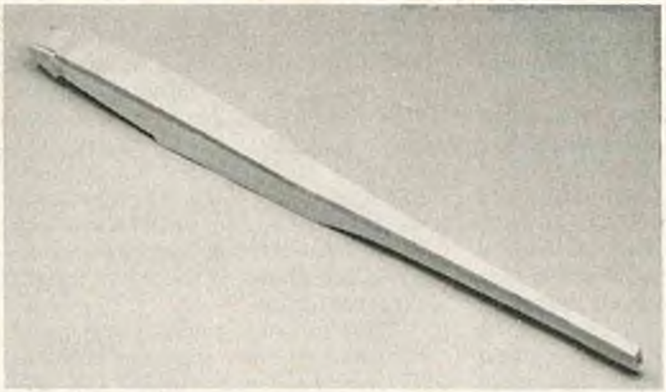
Stabilator drive fitting made from solder-type clevis.



Tail fin assembly shows stabilator drive cable/sleeve positioned in its own slot. The antenna tube slot can also be seen.

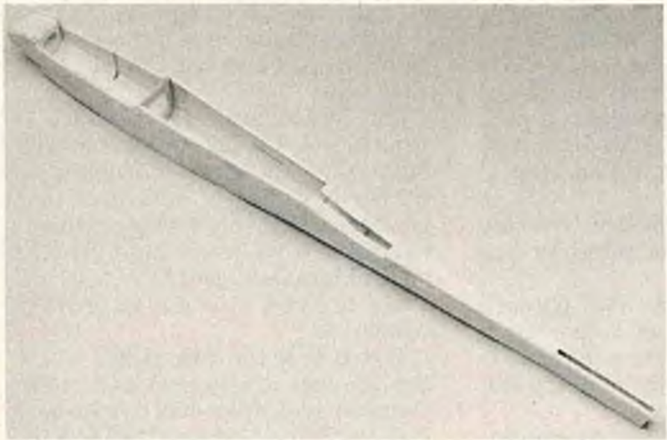


Fully sheeted tail fin with antenna and stabilator drive tubes in place; ready to be installed on tail boom.

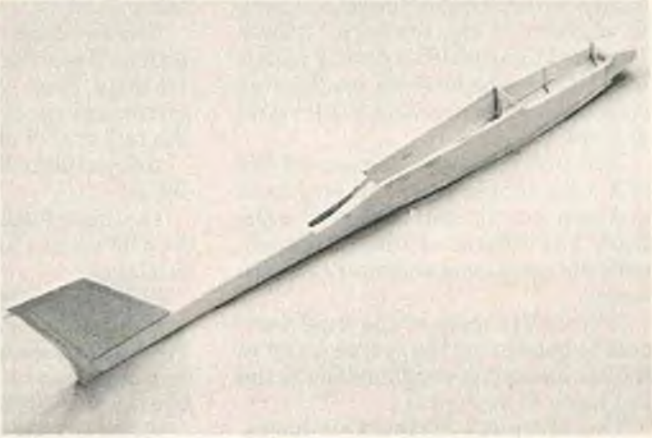


Bottom of fuselage fully sheeted and sanded flush.

Tail boom top is cut out from 1/4" balsa. The 3/16" wide slot for tail fin has been cut.



Tail boom top installed and pre-shaped. Be sure to use tail fin to insure correct alignment of slot.



Tail fin with outer framing members installed.

I usually shim up the tail boom to get the horizontal reference centerline level. This is a handy method of checking to see if the tail fin post is slanted back to its 20° angle. If you scale the plans, you will notice the tail boom bottom thickness tapers from 3/8" under F-3 and 1/4" under the tail fin post. Add the tail boom top using the tail fin in its slot for alignment. Use Titebond or a slow acting cyanoacrylate glue. Make sure the fin isn't glued in place yet. When dry, pull out the tail fin and sand the tail boom top flush with the fuselage sides.

Now is a good time to pre-shape the tail boom, or at least in the area where the fin is going to go.

Reinstall the tail fin; this time with epoxy. Before you add the 3/8" balsa tail boom piece aft of F-3, epoxy the stabilator drive sleeve and antenna tube to the tail boom in a couple of places. The tubes must be free to move in the wing saddle area. Add the 3/8" balsa tail boom top piece.

Add the tail fin fillet and trailing edge. Blend the fuselage sides into fin TE. You'll probably have to add some little balsa blocks to do this.

In the radio compartment, add F-1 and finish adding the 1/4" triangular stock where the formers meet the fuselage sides. Add the 1/64" plywood capstrips on the wing saddle.

It's balsa dust time! Shape the fuselage and fin. Although you can round the tail boom and fuselage bottom nicely, I've found that the areas under the wing and canopy can look slab-sided if you don't sand them. Even if it's a very shallow radius, the curvature helps break up the reflections on the finished surface to give it a pleasing, rounded appearance.

In the area where the wing, canopy, F-2 and fuselage side come together, you will want to blend in a bit of the corner.

After the fuselage is shaped, add the tail skid and nose skid. You may have to kerf the backside of the skid to get it to conform to the fuselage contour. Remove F-3 by whittling away a little bit of the triangle stock on the port side. Then you can swing F-3 forward and out.

Mix two 3/8 ounce portions of Sig 25X expandable polyurethane foam and pour into the tail boom. After the foam has expanded and hardened, trim the excess and reinstall F-3 with epoxy.

Most of the mass of the fluid foam goes to gas during the reaction and so the net amount of weight added to the tail boom is negligible.

The strength of the tail boom, however, increases dramatically! I haven't done any load testing, but I would imagine the strength is increased by a factor of five.

If I may digress for a moment, let me state that the increase in strength comes from the fact that the foam-filled tail boom can't buckle under severe bending loads. This allows you to load the tail boom up to the tensile limit of the balsa. A non-foamed tail boom buckles near the glue joints, usually before the tensile limit of the balsa is reached. This construction trick is probably the best idea I've borrowed from Jack Caldwell, designer of the AR-1 (see RCM October '82).

Stabilator:

The stabilator is a staightforward assembly that shouldn't give you any trouble. Start by cutting out the 3/32" I.D. by 1¼" long brass tubing for the pivot pin, and 1/16" I.D. by 1" long tubing for the drive pin. Roughen their outer surfaces with coarse sandpaper.

File away a portion of the 3/32" I.D. tubing to allow the shaft collar set screw to bear against the 3/32" music wire pivot pin. The shaft collar keeps the tail feathers snugly in place during flight. As a reminder, after the stabilators are finished and MonoKoted, glue the pivot and drive pins into the starboard half.

Select light, strong, and flat balsa for your stabilators. Cut out one stabilator and use it as a pattern for the second one. Match their outlines and lightening contour to insure equal weight.

Cut the notches for the brass tubes and shaft collar. The tube centerlines are 1⅝" apart. Shim the tubes up so that they are centered in the balsa and epoxy in place. Use the pivot and drive pins to insure alignment. Be careful not to get epoxy in the set screw hole when epoxying the shaft collar in place.

I would try to keep the epoxy to a minimum to save weight. Use scrap balsa as filler pieces. Add the 3/32" balsa diagonal ribs and then shape the stabilators.

Shape them to a symmetrical airfoil. Use a sharp entry and a sharp trailing edge. A handy means of reinforcing the trailing edge is to soak the last 1/4" of chord with Hot Stuff.

Assembling Wing & Fuselage

Wing:

The next logical construction step would be to fit the wing to the fuselage.

Begin by adding the 1/16" plywood wing reinforcing plates to the wing. Place plastic wrap on the wing saddle. You are going to use the fuselage as a form to position the plates.

With the wing halves assembled, check to see that the reinforcing plates fit properly, then epoxy them in place. I assume you've already notched the wing and CSTE to accept not only the plywood plates, but also the torque link assembly? Good! Add the torque link assembly and CSTE. Make sure the torque links rotate freely.

Add the hard balsa wing tip blocks and match to the airfoil. Separate the wing halves and add the 1/16" plywood root ribs. Drill out the hole for the wing pin.

Make your ailerons next. Cut them to length with about 1/16" working clearance at either end. Be sure to make a left hand and right hand one. I recommend hinging the ailerons with Robart Steel Hinge Points, catalog number 308, 1/8" diameter, three places in each wing. These hinges contribute to a flutter-free aileron system.

Drill the 1/8" holes in the sub-TE and aileron. Carve out the notch for the 3/32" I.D. brass aileron drive tube. Hang the aileron on its hinges but don't glue in place yet. Blend the thickness of the aileron leading edge to the wing. Epoxy the brass aileron drive tube in place.

Remove the ailerons and finish shaping them. Their leading edge must be rounded to allow for approximately ± 30° movement. Sharpen the trailing edge.

Now you can glass the wing center section. Refer to the Fiberglassing Section.

After the wing center section has been fiberglassed, fit the aileron servo to the wing. Cut out the wing to accept your aileron servo. Make the C-shaped servo mounting plate. Mount the servo in the starboard wing. Then, solder the drive links. As you can see on the plans, a differential throw can be achieved by mounting the ball links about 30° ahead of the servo output shaft centerline.

This set-up gives very good handling in the turns and reduces adverse yaw. You don't want to overdo the aileron differential, however, because eventually it will affect the straight-line rolling ability.

Let's put the wing aside for the time being and work on the fuselage.

Fuselage:

The stabilator drive servo is mounted on its side to a removable 3/32" plywood plate. The plywood plate, in turn, is mounted to a permanent 3/32" plywood plate that is equipped with #4-40 tee-nuts and glassed into the floor of the fuselage. This makes the servo easily removable.

Match-drill the two plates where the tee-nuts are located with 1/16" diameter drill. Then drill out the base plate to fit the tee-nuts. Drill out the removable plate with a 1/8" diameter drill for the #4-40 screws.

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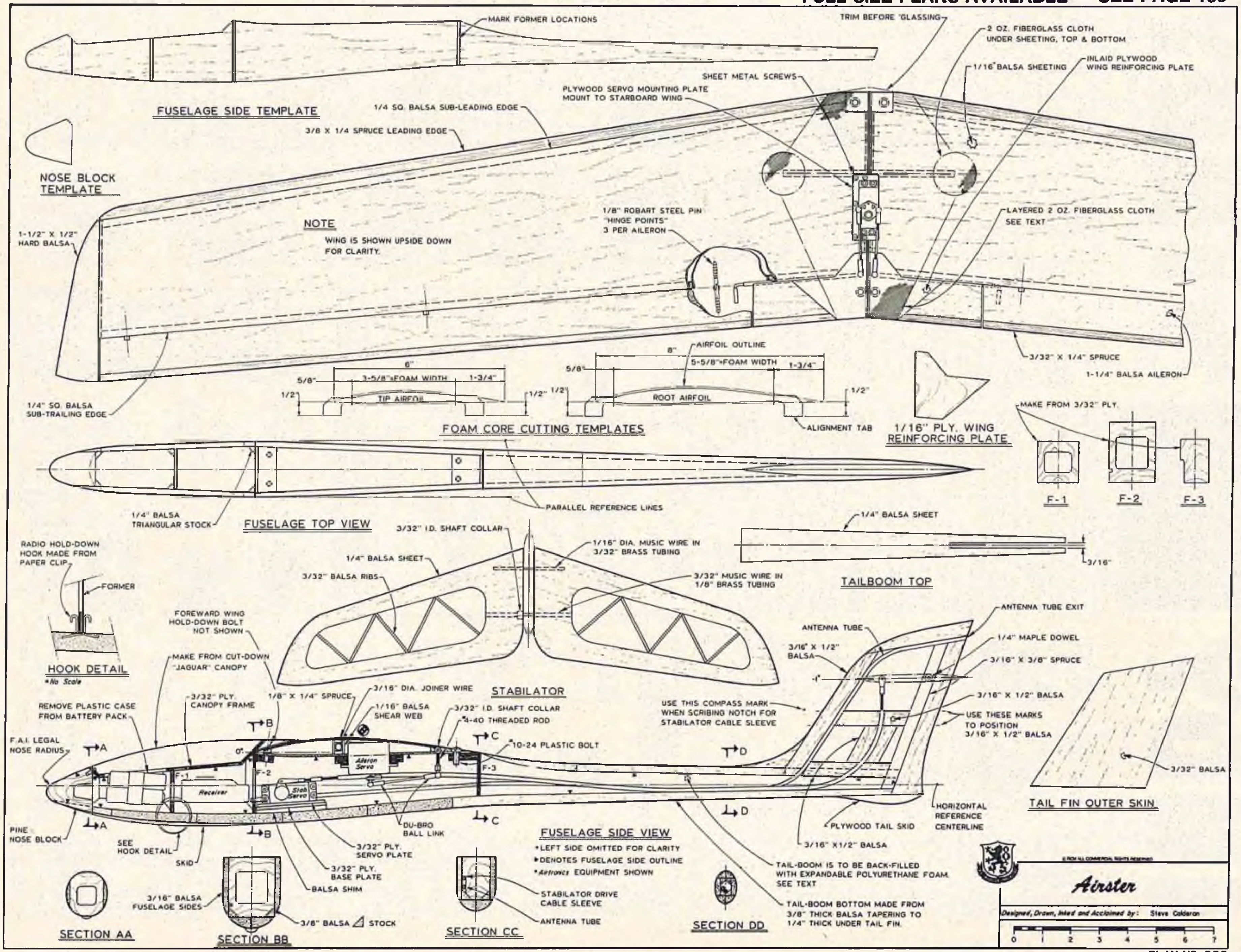
FULL SIZE PLANS AVAILABLE — SEE PAGE 180



PLAN NO. 900

A 1/8" thick balsa spacer will be needed to shim the servo plate up high enough to clear the triangular stock. Bevel its sides enough to fit in with the triangular stock. The final product should be a mounting system that allows the servo to rotate freely.

Epoxy the shim and base plate with its tee-nuts in place. What you want to do next is finish hooking up the stabilator drive system. However, you don't know the position of the stabilator drive fitting in the tail fin. You'll have to push a tee-pin through the correct location, and line up the drive fitting with the hole.

This should be good enough to tell you where to trim the excess cable. Solder a threaded coupling to the cable and mark the side of the fuselage where the sleeve will go. The mark will allow you to glass the sleeve to the fuselage wall at the proper height.

Make your wing hold-down blocks from 1/4" plywood and epoxy in place.

At this point, it's a good idea to assemble your Airster, complete with radio to see how close you are coming to the balance point. If it's 1/2" nose heavy, don't worry. You can always use a smaller battery pack. But if it's tail heavy, start sanding.

Now, you are ready to glass the inside of the fuselage. Refer to the Fiberglassing Section.

After glassing the inside, align the wing by measuring from each wing tip to the fin, and then match drill four places for the wing bolts using a No. 25 drill. Thread the holes with a #10-24 tap. Counterbore the forward holes until the plastic bolt heads fit flush. Counterbore the rear bolt holes down to the 1/16" plywood wing reinforcing plates.

Fiberglassing

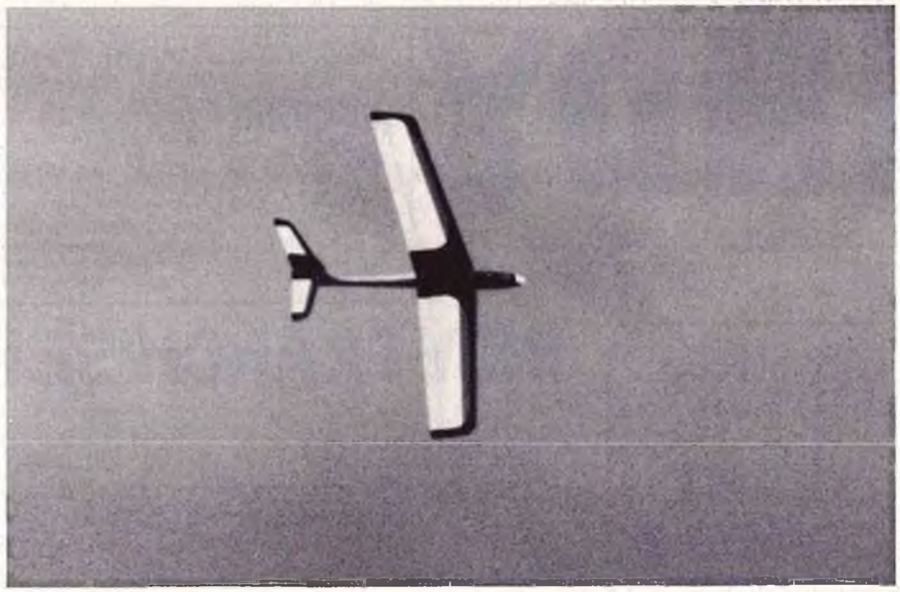
Wing Center Section:

The wing center section is glassed with a tapered layer of two ounce cloth (see plans) followed by a 1½" wide strip of two ounce cloth down the middle. You end up with a sort of fiberglass leaf spring. I'd use thinned polyester resin because it sands more nicely than the epoxy resins. Pre-cut your cloth and make sure you have 65°F to 80°F temperature. It it's too cold, the resin won't harden, and if it's too hot, you won't have any working time.

It's very easy to use too much resin in a fiberglassing job, so be careful to use only enough thinned-down resin to fill the glass cloth. The excess resin only contributes excess weight.

Inside of Fuselage:

The main reason for glassing the inside of the fuselage is to distribute stresses from areas like the wing hold-down blocks to adjacent structural members (i.e., formers, fuselage floor, etc.) without splitting open the glue joints. You will notice the lack of plywood doublers.



Neat flying. Photo by Chuck Fitzer.

The fiberglass that replaces the plywood doublers is probably lighter, yet it increases the strength and durability dramatically. The Airster is a tough little airplane that can really withstand its share of knocks.

Pre-cut your four ounce cloth. You will need some fairly narrow pieces that go along the undersides of the wing hold-down blocks and down the fuselage sides. These pieces keep the blocks from ripping out under shock loads.

The stabilator drive cable sleeve will be glassed in place alongside the wall (using the mark you placed when you were fitting the stabilator servo) along with the servo base plate. Use thinned resin and be careful not to plug up the drive sleeve, antenna tube or tee-nuts.

Outside of Fuselage:

Mix some polyester resin and paint on a thin coat directly over the balsa. This will seal the wood and keep it from soaking up too much resin. Pre-cut your 0.6 ounce cloth. You will need separate pieces for the tail fin.

The entire fuselage will get two layers. A third layer will extend from the nose to about 2" behind the trailing edge of the wing. A fourth layer will extend from the nose to about 2" behind the leading edge.

After the fiberglass has hardened, sand it down nice and smooth. Then paint on a final thinned down layer of resin. A little bit of finish sanding and you're ready for painting. Now would be a good time to drill out the tail post for the 1/4" diameter dowel. Drill the 3/32" diameter hole for the pivot pin using a drill press if possible. Cut the opening for the stabilator drive pin.

Painting and Covering

A nifty way to mount the fuselage for painting is to drive a tee-pin into the nose and tail. This arrangement can be mounted in a pair of wishbones and rotated, rotisserie style, as you're spraying.

Use MonoKote for the ailerons, wing and tail feathers. Then install the ailerons on their hinges with epoxy.

As a simple solution to sealing the aileron hinge gaps, I use drafting Mylar cut into 3/4" wide strips held in place with double stick tape. The gap cover needs only to extend about 1/4" aft of the sub-TE. As a finishing touch, a piece of clear magic mending tape is laid down to blend the front edge of the gap cover smoothly. Use gap covers top and bottom.

Make the canopy frame from 3/32" plywood. A cut-out in the battery area is needed for clearance. The plastic canopy I used was from a Larry Hargrave Jaguar. It was about the only thing left of my Jaguar after what had to have been the most spectacular crash of my flying career. The canopy is available from: Bob Martin R/C Models, 11178 Penrose Street, Unit 4, Sun Valley, California 91352.

The canopy frame is positioned by a 1/8" diameter dowel at the front and held down by a rubber band at the back. Carefully trim the plastic canopy and epoxy it to the frame.

Radio Installation:

Install some radio hold-down hooks as shown on the plans. These will keep the radio in place during violent inverted maneuvers.

Reinstall the servos. The switch is mounted aft of the stabilator servo on the port wall.

Remove the plastic case from your battery pack and fit it to the fuselage. A small amount of cutting and notching of the triangular stock may be necessary. When fitting the receiver, it may be necessary to route the excess wiring back into the wing saddle area. Slip the antenna into its tube.

Trimming:

Before you balance the airplane it's a good idea to measure the actual amount of sweep-back in the wing trailing edge. It should be around 2". If it's more than 1/4" off, move the balance point accordingly. For example, if the sweep-back measures 2⅜", then move the balance back 3/16" from the mark on the plans. A balancer made of 1/4" dowels mounted on a board gives you a more accurate location than just holding it by your fingertips.

The stabilator incidence should be adjusted for −1°. The stabilator throw should be ±1/2" when measured at the trailing edge. The ailerons should be adjusted to give 1/2" up and 3/8" down travel.

Flying:

Test fly your Airster on a day with decent lift. It's very difficult for a beginner to fly a heavily loaded airplane in light lift! Keep your turns shallow (30° bank maximum). A good strong toss on launch and a brisk cruise speed should keep you out of trouble. The speed airfoil likes to whiz along, but it can fly slowly. Just be conservative on your first few flights.

If your flying experience has only been with slower airplanes with thick, blunt entry airfoils, you'll be in for a pleasant surprise. The faster the Airster goes, the more lift the wing generates. Although you pay for the extra lift with extra drag, it's not a sizable increase in drag. As a result, you'll find it easier to gain altitude by flying faster than the minimum sinking speed.

This may seem like blasphemy to the believers of established, computer generated airfoils, but it has worked for me and for Jack Caldwell. Between the two of us, we've built close to ten airplanes with sharp entry airfoils and definitely prefer them to thick, blunt entry airfoils.

Before you get carried away with aerobatics on your first flight, I would practice stall recovery and slow flight. One of the most common errors in flying an Airster is flying it too slow. It may pitch its nose up slightly or even climb a little bit, but you'll discover that you're using up all your elevator control, and then, whoops, it stalls.

The stalls are easy to recover from and there is no tendency to drop a wing and spin.

Tip stalls in turns are good maneuvers to practice and, here also, you won't have any trouble during recovery. I expect you'll have a ball with your Airster.

See you on the slopes. □

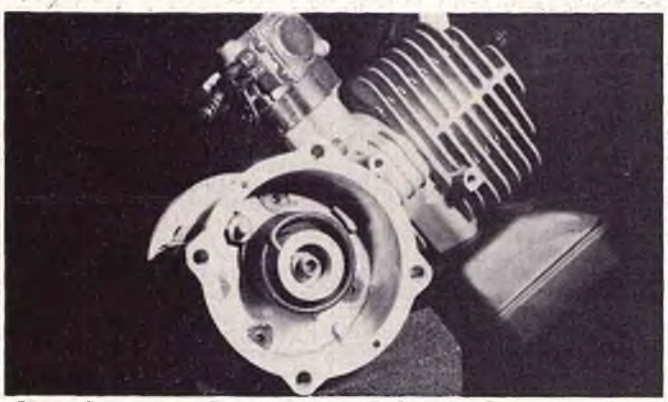
BIG is Beautiful

BY DICK PHILLIPS

H & K Super Starter, just out of the package. Simplicity itself and a snap to install on your engine.

I mentioned a new item a while back as soon as I heard of it. At the time, I had not had the chance to see and use the H & K Super Starter. Since that column, I have received one and have mounted it on one of my 35cc Quadra engines and must tell you that it comes about as close to its advertising as anything I have seen. The manufacturer says, "Probably the single most useful 1/4 Scale Accessory ever offered." I was a little overwhelmed by the statement as it seems a bit overstated. Well, what they say is so close to the truth, no one could quarrel with it. I mounted mine on the 35cc engine in a mount for which the Super Starter is not intended and it works just fine.

Mounting is simplicity itself requiring the drilling and tapping of one hole (in the right place, patterns for placing the hole supplied), and the unit slips onto the rear shaft of the engine. What it does is also quite simple, you wind the prop backwards one turn, remove your fingers (this is important!) and the spring in the starter flips the prop three to four turns. If **that** doesn't start the engine, you've done something wrong. Shades of Cox and Thimbledrone, who both



Super Starter installed on Quadra 50 engine. Bolt which traps end of torsion spring is visible above and to left of end of spring entering housing of starter.

Don Harris' On Board Charging System. Generator and wiring in front and, from left to right, the packages contain: Ammeter, Regulator, mounting hardware and drive pulleys and belt.

pioneered the concept on a smaller scale years ago. My first reaction was, "Why didn't I think of that?" as is so often the case with great ideas.

The starter consists of a sleeve, a Torrington clutch and a torsion spring. The components look like real quality and it certainly does what is claimed for it. If there is a drawback, it is that it takes a fair amount of force to turn the prop backward and the model, especially if light or with the wings off, tends to want to unwind the spring. You need to hold the airplane from "unwinding" when you use it. I'm not suggesting that it takes a lot of strength to back the prop up, but the airplane will want to follow it around and it takes two hands, one to wind the prop and one to hold the airplane. It's highly recommended that you keep your wits about you when doing this as you could have your hand in the wrong place at the wrong time if you're not concentrating on what you are doing. Other than that rather minor criticism, it's a good accessory and will certainly make starting the 50cc Quadra a lot easier.

Available from P.K. Products, P.O. Box 6226, Hayward, California 94540, at $39.95 plus $1.50 postage and handling. The introductory offer is $29.95 plus postage and handling and, at that price, it's a steal and should be mounted on all the engines it will fit. At the time of the announcement it was available for both Quadras (specify which when ordering) and will soon be available for the Kioritz, Magnum II and Roper 3.7. It can be used on most engines with a projecting rear shaft and I will be greatly surprised if it isn't marketed to fit any such engine that comes along in the future. Good accessory, great price. I ordered one for my 50cc Quadra that same night I tried it on the 35cc engine!

There are a couple of kinks to mounting the starter on the Q50 engine. It's necessary to remove the motor mount from the engine to drill for, and position, the screw which holds the end of the torsion spring. The mount and engine are attached with Allen screws and, as the mount is recessed, you'll have to use a pair of vice grips or something like them to get the Allen screws out. They have been sealed in place with one of the many thread locking liquids. You may find that you cannot move the screws with normal pressure without damaging your Allen wrench. The answer is, of course, to apply some heat with a propane torch to the heads of the screws which will then make the screw removal job much easier. Highly recommended that you apply some thread adhesive (Zap makes one called Zap Lock) to the screws when they are reinserted. No chance of them shaking loose in the air and causing you a problem.

Some of the early coil springs required a little forming to get them to fit properly, but this is not unusual in a new product and it isn't all that hard to do. I gripped the torsion spring in my vice, carefully, and used a heavy duty screwdriver to spread the eye on the end of the spring a bit so that it would fit easily around the screw. It also helps to bend the end of the spring out away from the main barrel of the spring in order to permit the nut to close down on the spring eye. These are no big deal and were corrected as production increased. If you got one of the early ones, these two minor adjustments will make things easier for you. At the price, it's a little accessory and at the ten bucks off introductory price, as stated above, it's a steal!

As mentioned here some time ago, Don Harris, the Smoker King has completed work on his latest addition to the accessories we find valuable. Don's latest addition is an airborne charging system for Receiver Battery Packs.

It consists of a generator which is driven by the rear shaft of your engine, a voltage regulating device, an ammeter and the associated wiring and hardware to mount the gear and to make it work. The system provides for the use of two batteries (and they can be almost any size) which produce an almost identical result to the use of a redundant battery system, with the added plus that the batteries will remain at full charge for a practically unlimited amount of flight.

What happens is much the same as happens in your automobile, as power is used from the battery, it is replaced by the generator **as required** to maintain fully charged battery condition at all times. This requires 3500 rpm from the engine which is about half throttle, obviously, operating at less than half throttle for prolonged periods of time would eventually drain the battery. This would, however, take a long time as, although the charging system may not be replacing **all** of the power from the battery, it would still be replacing some of it. In essence, what this means is that the limiting factor on flight time is now the fuel carried rather than the battery capacity.

One thing I am interested in trying is driving the generator with a small propeller, much as was done in airplanes of the 20's and 30's. This would have the advantage of working with engines which do not have a rear shaft or where a rear shaft is committed to some other use as is the case with the starter from P.K. Products mentioned earlier in this column. Judging from the "feel" of the generator Don is using, this should work, especially if mounted in the prop blast and it would likely produce adequate generator rpm at almost any engine speed, and would have the added advantage of providing charging current even if the engine should stop in flight for whatever reason. The forward motion of the model through the air may well provide high enough rpm of the generator to supply the required charging current.

However, even if the engine should fail, with two adequate batteries on board, fully charged as they would be, adequate flying time should be available from the receiver for almost any eventuality.

At $49.95 plus $3.00 postage and handling, an on board charging system is great flight insurance including as it does, battery redundancy and charging capacity. For additional information, or to order, contact Don Harris, 23668 Shadow Dr., Auburn, California 95603.

Don't forget your transmitter battery now becomes a factor. The airborne charging system won't charge your transmitter battery so its capacity will limit the flight time available. However, the drain on the TX is no more than it would be with a smaller model so you should detect no change in flight time from what you are used to from your particular transmitter. The obvious question for Don Harris is, "Okay, Mr. Genius, what's next on your agenda?" Knowing Don as I do, I doubt very much that he'll rest on his laurels and, some months down the road, will astonish us again with his ingenuity.

I mentioned the Bantam engine in a coverage of Toledo '83 but wanted to give you a bit more information (and a photo) of it. As is obvious from the picture, the engine is one with which any modeler can identify. It looks like a model engine with some really fine, although slight, changes. The carburetor is mounted inside the engine mount at the rear of the engine. Good for a couple of reasons. If you should ever manage to drive the engine into the ground, the carb is going to have excellent protection from the impact and from ingesting any debris. The positioning also moves the needles well back from the prop arc and that may preserve a few fingers over the years. The engine also incorporates a ground adjustable spark advance for peaking the engine (all you old timers around who have flown ignition engines in the past will remember that!) and I would not be surprised to see this feature eventually coupled to throttle for automatic spark advance for even better performance.

The Bantam 2.6 c.i. gas burning model engine. From the same people who gave us the Bantam .19 many years ago and designed from the ground up as a model engine. Clean beauty of this BIG Bantam is obvious. Note carb mounted inside engine mount.

Those of you who remember the Bantam .19 will appreciate the apparent quality built into this almost 14 times larger cousin. The engine is 2.6 cubic inches in displacement, Schnuerle ported with a chrome cylinder, two rings and has three ball bearings on the crankshaft. The con rod bearings are rollers, the muffler is built in and valving is a rear disc rotor. The motor mount is integral and the ignition is transistorized. All in all, quite a package and very good looking as well. Those of you who have avoided getting into larger models because you didn't want a converted industrial engine will now have to find another excuse. The Bantam is good looking and if it lives up to the Bantam legend, will be a barn burner of an engine.

While not cheap at $350.00, the uncompromising quality required by Ben and John Shereshaw should more than justify the cost. If there is one of these beauties in your future, contact Ben at Bantam Precision Products, Inc., P.O. Box 363, Ridge Road, Oakridge, New Jersey 07438. Tell 'em Dick sent you!

Dario Brisighella of US Quadra has something new available. It's a 26% Skybolt. "Another Skybolt?" you ask. Well, not actually. This one is up to the old master's usual standards which make most others look . . . well, a little less impressive. As I've said in the past, Dario does a superb plan, and the Skybolt is no exception. 26% equates to 78" span, 60" fuselage and 17 to 20 pounds. Designed for 35 to 50cc engines (surprise!) on the 50cc Quadra, it should be a very striking performer. Dario worked from Lamar Steen's original plans, so you can bet it's about as accurate as you are going to find anywhere. Formed gear is available as are cowl and pants (details on the plan) and a semi kit (all the shaped parts required) is available from Medallion Products, 6700 Comstock Rd., Richmond B.C., Canada V7C 2X6 at $99.95 U.S. funds.

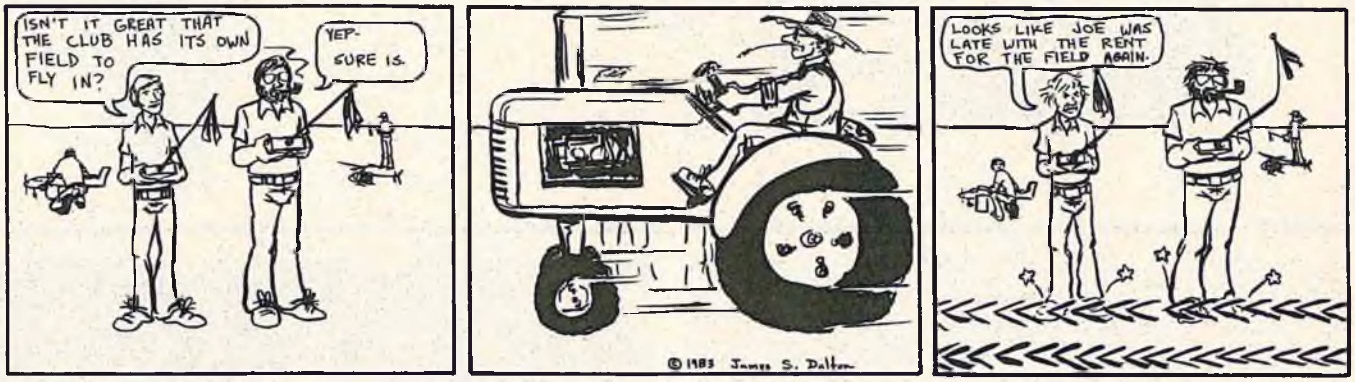
The plan is right up to date and available from Dario (US Quadra) and incorporates all updates to the original full sized plan as per Lamar Steen. Airfoil is fully symmetrical and at the weight designed with a 50cc engine on board, it should satisfy the most discriminating of fliers. Rated to do all of the FAI and AMA maneuvers, the Skybolt certainly sounds like the ultimate Sport Biplane. Plans are $30.00 from Dario.

Ron Busch and the good people at Balsa USA have not been letting any grass grow under their feet either. They introduced their new Der Jaeger kit at Toledo last April and it's a dandy. My well-known predilection for their kits caused me to bring one home (to be added to the long line of things I'm going to get to eventually). The span is 80", length 68", and it should come out about 20 pounds and will take engines of 2.2 c.i. and up (might be a great place to put one of Ben's 2.6" Bantams). The plans show full wing panels (you don't have to oil the plan sheet and reverse it). Formed ABS cowl, wheel pants and aft deck are in the kit along with tempered aluminum gear blank, decals and instrument panel material. The kit I have was not hand picked, just a production run kit and it's as good as we have come to expect from the folks at Balsa USA. The wood is great stuff, die-cutting is crisp and the instructions and photos are as good as you'll find in any kit. The price is a nice surprise, it's a lot of kit for $124.95, especially in these days of high prices and low quality. The Der Jaeger is an excellent buy. Marshall White created the original in 1969 as a WW I type fun homebuilt. Good documentation is available as demonstrated by club member Don Bazian whose smaller, scratch-built version took home a ton of hardware at our annual club static display this spring. One thing for sure, you'll never lose this one against any kind of sky, it's a bright yellow with large black Maltese crosses on it. At 1/3 scale and painted as brightly as it is, it'll stand out like a sore thumb, only it'll look a lot better!

Going to Toledo last April I found myself seated next to John and Mrs. Tatone (Taytownee, I discovered is the correct pronunciation, with the "ow"

FLYIN' FOOLS

by Jim Dalton



pronounced as know). What could have been a boring ride from Denver to Toledo turned into a very pleasant interlude in getting to know John and his good wife. He's a quiet sort of guy and makes some great stuff, much of which has been mentioned here in the past. I have several of his items in my own stock and it is quality material. Those of us who build large models owe a good deal to John and to others like him in the industry who are busily engaged in building things we need and want. John was among the first to start building mufflers and other good things for us which, in the early days of Quarter Scale, was a bit risky. There were lots around in those years who said that the big birds were a fad and would not last. There are now many thousands of us who have proven such gloom and doomsayers as dead wrong, and it's due in large part to manufacturers like John Tatone who had the vision to see where we were headed and to provide many of the good things that have made our models both safe and as popular as they are. At least we don't have to fabricate from scratch as many things as we used to! I don't know that I said "thank you" to John during that flight, but I should have; for all of us, Thanks John.

A sincere "thank you" too, to all of you who have read along over the several years we have been doing this column. Your support, your welcomed letters and complimentary comments (and a few not so complimentary when I goofed!) have been a source of pleasure to me. Knowing you are all out there reading the column makes it worth the effort. Thanks as well to those who have ordered the Booklet, **Building Big Is Beautiful** from me. Your comments have been totally complimentary and I'm pleased to have been able to help out. I still have some left at $8.95 (sorry about that $1.00 increase, postal rates are the culprit) so if you are in the market for what has been called the "most comprehensive and informative material on building large models," drop me a line and I'll get one to you by return mail, postage paid. Address: 9 Geneva Cr., St. Albert, Alberta, Canada T8N 0Z3.

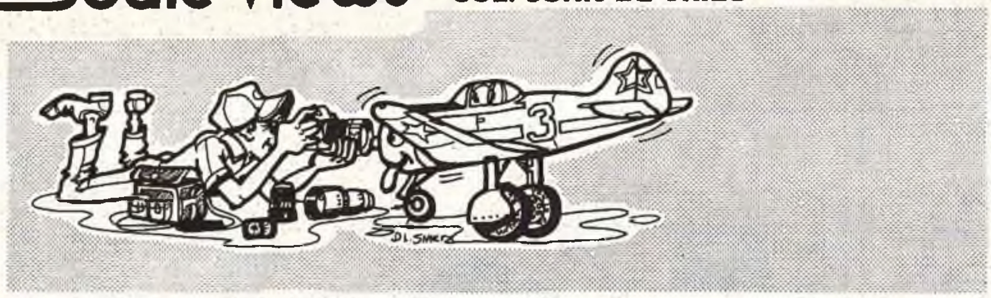
RCM recently announced that coverage of all trade shows and all meets and contests is just not possible for any magazine. The same thing applies to covering all the **big** rallies in the country as well (heck, in North America, for that matter!). In my own case, even announcing what is going to happen is not that easy. There are so many "fun" flies, and non-competitive events happening that our columns would be filled with them and little else. Not to mention the fact that in most cases, those responsible for getting announcements out do not appreciate the long lead time necessary for us to get such material in the column at the right time. Often material arrives here at home a couple of months in advance of the event and, if used at that time, would appear a couple of months after the event was over. We'll still make sure you hear about the really Big Shews (as Ed Sullivan used to say) but we just don't have the space to announce every rally or fun fly in the country. However, please don't stop letting me know about them, I do travel a bit and can often make small changes in itinerary that might permit me to attend yours. I'm no different than all the rest of us, I love a good fly-in and have been known to go a long way out of the way to attend. Keep me posted!

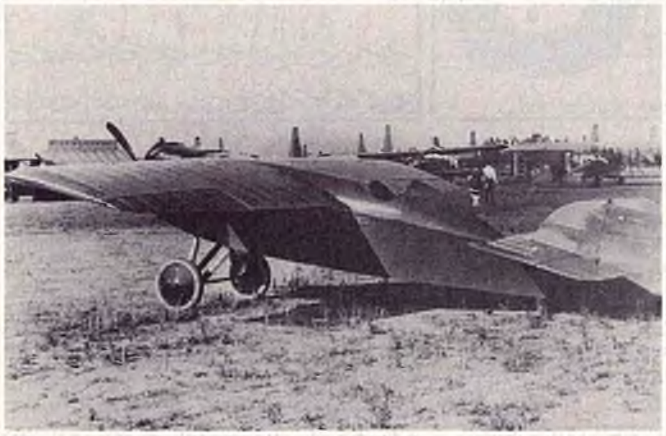
See you next month.

□

Scale Views

COL. JOHN DE VRIES





Columnist's next scale project --- the 1920 Pacific C-1 0X5-powered racer, designed by Otto W. Timm. Model will be Quarter Scale from original Timm drawings — with an Enya 4-cycle .90. Photo courtesy Major Truman "Pappy" Weaver.

Two-tone blue and white Sig Smith Miniplane, built by Dave Miller of Colorado Springs. Dave is a professional R/C radio repairman during the week; flies 'choppers and beautiful models like this one on weekends.

Big Un's

Did you know that there is a direct correlation between the way the "real airplane" flew and the way your scale model of that airplane will fly? If, for example, the real bird was a ground looping doozy, chances are that your model will inherit that unfortunate tendency. Or --- if the big bird dropped its right wing when it stalled, your model probably will as well. If a bit too much back pressure at the top of a loop would cause the prototype to snap, be careful when you loop your scale model. Of course, scale models will inherit the **good** characteristics of the real airplane as well. So, when we choose a subject for Standoff, it's important to **know** how the prototype handled and flew. We can, thus, anticipate how the model will react.

How do we go about finding out the flight characteristics of an airplane we wish to duplicate in model form? Yep --- that's right --- **research**! Most modelers aren't full-scale pilots. And, even if they were, with thousands of aircraft designs, it would be literally impossible to have flown the bird to be modeled. The answer, of course, lies in the library, at the historical society or on the airport flight line. Many of the books we see when we're documenting our models also include comments by

skillful pilots about how the real airplane flew. If our subject is the Sopwith "Pup" and the book says that most pilots considered it, "a delight to fly," chances are that our Balsa USA "Pup" will be, too. If we're building a Sopwith Camel and the word is that, "it had a vicious tendency to snap (roll) on takeoff," we'll have to watch out for this characteristic in our model even if it doesn't have a rotary engine.

How most of the U.S. aircraft of WW II handled is discussed at length in Higham's "Flying Combat Aircraft of the USAAF-USAF." So, if you've chosen to model a P-40 or P-47, that's a good source of "handling" information. H. A. Taylor has done the same thing for scale modelers interested in British aircraft of WW II --- in his book "Test Pilot At War." The point is this --- a lot of good information on the flight characteristics and handling ability is available in most good libraries. And, it isn't too difficult to locate. If you don't live right across the street from a good library, it's worth the trip to locate one!

The Amer. Aviation Historical Soc. (AAHS) Quarterlies are another fertile source of "how the real ones flew." Particularly for aircraft of the so-called "Golden Age," the AAHS Quarterly frequently includes contemporary comments by pilots who flew the birds. Same goes for the publications of the Antique Airplane Association (AAA) and the Experimental Aircraft Association (EAA) in the latter's magazine "Sport Aviation." And --- people who fly the Warbirds and other Antiques can give you direct testimony on the characteristics of their craft. Finally, the aviation magazines (both full-scale and for models) of the period during which a specific airplane was flown are good sources of information that will be of direct use to the scale modeler.

How can we use the handling information? Let's take a specific instance. Currently, I've got the "hots" to do a model of the Seversky P-35 --- a low wing, all metal, aircraft of 1937. The bird had retracts but part of the wheels extended into the airstream when they were "up." That'll "save" the model in case the retracts hang up from lack of air pressure. According to Capt. Don Lykins, who provided a report in Ed Maloney's book "Sever The Sky, Evolution of Seversky Aircraft," the P-35 handled well on the ground and had very positive directional control on takeoff --- both desirable characteristics for a scale R/C model. In level flight, the Seversky was stable and easily trimmed. We can expect the model to be the same. In stalls, the P-35 would fall off on either side, depending on which wing tip stalled first --- gotta watch that on the first test flight of the model. Rolls required a lot of physical effort (because of long, broad ailerons) so, even though we won't be pushing the stick inside the model, we'll have to use some sturdy torque rods. Landings of the real bird showed three things: full flaps and low power --- the aircraft sank at an extremely high rate; rudder control was exceptionally good throughout the landing approach and touch-down (great!); and the airplane could be slipped on the approach with full controllability (no rudder blanking!). All of these characteristics bode good for an R/C model of the P-35! Let's see --- there are a couple of nose gear retracts out in the garage, and the Lee-Veco .61 isn't in anything right now! Hmm!

What happens if, after you've done your research, you find out that the bird you want to build a scale model of was a D-A-W-G when it comes to handling characteristics? All is **not** lost! We scale modelers have a whole bag of tricks that the full-scale designer couldn't use or didn't consider when the real bird was being

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Sam Pisciotta's Top Flite P-40. It looks great making low passes with the gear retracted.

Rich Pabilonia's Royal B-17. Model's been a-building for about three years. Rich guarantees it'll fly (on its four O.S. .25 Schnuerle engines) sometime in 1984. "As soon as it's finished!"

built and flown. We can choose an entirely different airfoil for our model --- one that is more stable --- and not affect the exterior appearance substantially. We can add a bunch of wash-out (in) to our model's wing to eliminate tip stalling --- and overcome rolling when the model quits flying. We can make subtle changes in the model's fuselage moments --- extend the nose a bit, move the tail surfaces aft an inch or so --- changes that aren't visible from 15 feet but make the model fly better. We RC'ers can adopt the old bit used by free-flighters --- increase the area of the horizontal tail surfaces for a more stable model while eliminating the "nastiness" of the prototype. Ground loopers can be "tamed" by widening the gear's tread a smidgen and "snake-y" taxiing can be minimized with a bit of "toe-in" of our model's landing wheels. We can move the landing gear fore (or aft) a tad --- to improve ground handling and takeoff rolls --- without goofing its scale appearance. For airborne stability, we can add (or substract) a degree or two of incidence from the model's wing or tail surfaces from the scale settings --- and turn a "tornado" into a gentle "zephyr."

Even if you find out, too late, that your model has inherited the bad habits of its prototype (after the model's built) there are still some things that can be done without too much rebuilding or repainting. Moving the C.G. a bit more forward to correct "antsy" flight is a technique that most of us use. Lengthening or shortening the landing gear struts (or using wheels of a larger or smaller diameter) doesn't take too much effort and may help keep the model on a straight takeoff course --- without goofing scale appearance too severely. Unstable biplanes are amenable to the addition of some clear plastic sheet, glued to the inboard side of the interplane struts --- it adds directional stability to scale models built with scale dihedral, particularly three channel ships. And, it's relatively "invisible." Thrust adjustments (down thrust, side thrust) are also "invisible" fixes that'll "cure" ballooning tendencies or torque tugs in scale models when power is changed. It may mean that the nose of the model has to be re-sanded or filled to cover up the fact that you've jiggled the thrust line --- but the improved flight characteristics are well-worth the effort.

What we're suggesting is that, when you choose an airplane to model, whether you're going the kit route or building from scratch --- find out how the real airplane flew and handled. If you do, you can anticipate any problems that may show up in flying your model.

Scale Detail

Seeking perfection in duplicating the external details of R/C scale models, there are a number of finishing touches that escape the attention of most of us. For example --- most of the USAAF fighters of WW II had a hole in the lower rear fuselage. Actually, it was a piece of reinforced tubing that ran from side to side, usually below and slightly forward of the horizontal stabilizer. It was used to lift the rear of the aircraft or to tow the bird around the airfield because the tow bars of that time were, literally, bars. Running a piece of brass tubing of the proper diameter through the rear of your model is a simple task and will duplicate the "tow hole." Our fighter squadron used the tow hole for an entirely unique function. Charley Lind designed a steel tubing yoke that went through the hole. He welded the mechanism for a P-51 bomb release to the aft end of the yoke and ran an electrical control wire up the side of the Mustang and into the cockpit through the Very pistol vent on the left side. We used the

The question is, "Where's Charlie Smith gonna fly this Vought SOC seaplane." Water flying sites are few and far between on the plains of Colorado. Charlie designed and built the bird --- super scale!

Charlie Smith designed and built this Grumman Guardian. A 60 powered bird, Charlie has plans for it. He recently moved back to Colorado after an extended sojurn in Arizona.

tow hole yoke to tow banner targets for aerial gunnery. The tow cable could be released after a firing mission by hitting a switch and the bomb release opened --- over the Squadron's runway. Incidentally, target towing might be an easy way to get two mechanical options for scale flight (target towing and target release) with WW II fighter scale models.

AT-6 "Texans" used for instrument flying instruction, were usually equipped with radio D/F (Directional Finding) loop antennae. Early birds in the T-6 series had an uncovered loop installed on the lower wing center section centerline, just aft of the wheel wells. On the AT-6D's we used later in the war, the D/F loop was enclosed in a streamlined tear-drop mounted on the upper fuselage, aft of the rear cockpit. Either type of loop would add eye appeal to a Texan model. If you opt to add the loop, make sure you paint your model's fin and rudder red and add a red chevron to the wing --- to indicate you're flying an instrument trainer! While we're talking about the North American trainer, several of them used at the USAAF Instrument Instructors' School were modified to carry a 75-gallon **drop tank.** The extra fuel container was mounted below the wing's center section on a couple of post-mounts and steadied with side sway braces. You could fly half-way across the U.S. with a "drop tank equipped" AT-6!

While we're talking about small, finishing details --- when was the last time you saw a model with static discharge "feelers?" From WW II onward, most U.S. military aircraft had thin wires mounted on the landing gear or tail wheel struts that rubbed across the ground. The purpose of the "feelers" (that look just like curb feelers on a car!) was to discharge static electricity as the aircraft taxied. A similar function, albeit while the airplane was airborne, was performed by "wicks." Particularly on transport aircraft like the C-47 (DC-3) and the C-54 (DC-4), these wicks were attached to the trailing edge of the ailerons to serve as a discharge point for static electricity. Simple in construction --- a flattened aluminum tube holding a rubber tube holding a cloth "wick" --- a quartet of 'em glued to the ailerons of your model Gooney Bird would be a nice scale touch. On the full scale bird, the wicks really did their job! You haven't lived if you haven't flown through a winter thunderstorm in a Gooney and have not seen St. Elmo's Fire dancing all over the wing --- and watched it crackle and splutter as it poured off the wick-tips!

And --- don't forget the windshield wipers! WW II-era bombers and transports used 'em and they were heavy duty devices --- with dual arms!

And then there were "nose flatteners" --- gun sights in fighter aircraft. Even though your model may be built to Sport Scale standards, with no consideration being given to interior cockpit detail, the location of the gunsight, smack-dab in the windshield, should be modeled. It's visible from the outside of the bird, usually very prominently. We called 'em "nose flatteners" because that's what they did if your "pursuit" stopped suddenly and your shoulder straps weren't cinched-up tight!

Brake lines are an easily added detail that most of us forgot about. Even on today's aircraft, the lines usually snake down to the wheels along the landing gear struts. They're held in place with brackets or clips around the landing gear leg. They're visible --- if you look carefully. And black insulated wire is the material with which to duplicate them.

And --- one final, kinda sneaky way of adding detail to your scale R/C bird. Military aircraft, since the dawn of time, have been encrusted with stenciled instructions --- all over their airframes. Civilian airplane builders are a bit more restrained about these painted-on instructions --- but, they're not immune. These how-to instructions are usually duplicated in three ways. The decal sheet that came with your scale **kit** may include some of the stencils; or, you can use press-on letters; or, you can go blind, trying to print all of those tiny legends with pen and ink (dope). In any event, you're going to have to cover the bits with something that's fuelproof or the first crank of the engine's going to blow 'em away or the fuell will dissolve 'em. But --- nobody without binoculars will be able to read, "Tire Pressure --- 80 lbs." on the landing gear fairing of your model! Particularly, if he's 15 feet away. So --- why write it out? A simple

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Give It A Whirl

JOHN GORHAM

Sorry, this will be a short column this month — we are still on the road since I decided to drive from Los Angeles to Springfield, Massachusetts, to attend the 1983 AMA Nationals. So this column will be mailed (somewhat late!) to Dick Kidd from Philadelphia (on our way back). If he is kind and squeezes me in, this will provide you with an early brief summary of the most extraordinary R/C helicopter Nats we have had in the USA to date.

You won't believe this! At last the R/C Helicopter Nationals has become more than just a small group of about 20 inveterate heli fliers who socialize each year and take turns in winning. The 1983 R/C Helicopter Nats, held at Springfield, Massachusetts, had an entry list of 84! More important, though, there were many, many new faces and machines. So many entries that we had to run three concurrent flight lines.

This year the AMA introduced an unofficial event conducted under the F.A.I. rules. The F.A.I. rules are those established by the model section of the Federal Aeronautique International, the recognized governing body for world championship and record flying. The top few winners in the Nats competition are often considered to represent the USA in the world championship competition.

Among the new faces was Yoshiaka Nagatuska, a top helicopter flier from Japan. Yoshiaka entered both the Expert class and F.A.I. class events in which he demonstrated his superb flying talent and captured first place in F.A.I.

Following closely on Yoshiaka's heels was 17 year old Tom Dalusia who, as a Senior (16 to 21 years old), topped this event **and** the AMA Expert (Senior) class. Robert Gorham placed third and became the USA's top candidate for our world team, if sent. Cliff Hiatt of Florida and Bob Belluomini of Kentucky placed fourth and fifth and Tom's father, Ralph Dalusio, placed sixth. (See how it is, Ralph?) A newcomer to the Nats, Bob Hamilton of California, placed seventh.

Scale was another surprise event. Usually I turn up with

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Robert Gorham of Calabasas, California, won Open Expert, and third place in FAI. He is new National champ.

Yoshiaki Nagatsuka and Robert Gorham. Yoshiaki of Japan was second in Open Expert, and first in FAI.

Sam Newhouse of Jersey City, New Jersey, was first in Novice and is shown receiving his plaque from Horace Hagen.

Thomas J. Dalusio of Woodbridge, Connecticut, shown with his awards which include 1st Expert Senior, 4th Expert Open, 1st FAI Senior, and 2nd FAI Open.

Portrait of winners (Back row L-R): Dave Davis, Ralph Geese, Jim Morrow, Bill Curtis, and Charlie Sjobeck, Jr. (Next row L-R): Sam Newhouse, Bob Belluomini, Dave Bickert, Bill Cane, Cliff Hiatt, Jr., and Tom Dalusio. (Bottom row L-R): John Gorham, Robert Gorham and Walter Saber.

Line-up of some of the helis.

a reasonably well-built machine and fly well enough to win, or at least place high. This year I was confronted with a line-up of 10 beautifully built scale machines and some excellent fliers, too. Had to struggle to place third! Results are as follows:

	NAME	AREA	MACHINE
1st	Paul Terceiro	Tiverton, RI	Hughes 500
2nd	William Cane	Wilmington, MA	Kavan "Jet Ranger"
3rd	John Gorham	Calabasas, CA	Hirobo "Lama"
4th	Franz Fletcher	Kingston, Jamaica	Hirobo "Jet Ranger"
5th	Sam Newhouse	Jersey City, NJ	Kavan "Alouette"
6th	Sam Tartaglia	Norwalk, CT	Hirobo "Bell 47G"
7th	Walt Schoonard	Orlando, FL	Schluter "A Star"
8th	Richard Walter	Buckingham, PA	Kavan "Jet Ranger"
9th	Bruce Buchanan	Winona, MN	Kavan "Jet Ranger"

Now to the prime AMA events. Expert class had 17 actual fliers — all good. Yoshiaka gave the American a terrific fight but everyone put in super extra efforts and Robert Gorham of Calabasas, California, is now our new National Champion. Yoshiaka placed second. Young Tom Dalusio entered this event also and became our top Senior flier. Results are as follows:

	NAME	AREA	MACHINE
1st	Robert Gorham	Calabasas, CA	Competitor
2nd	Yoshiaka Nagatsuka	Gotemba, Japan	Baron
3rd	Robert Belluomini	Crestview Hills, KY	Superior
4th	Thomas Dalusio	Woodbridge, CT	Competitor
5th	Bill Curtis	Greenville, PA	Competitor
6th	Robert Hamilton	Harbor City, CA	Competitor

Nats had a good turnout.

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In the Intermediate Class 23 entrants battled it out. Ralph Geese of Farrel, Pennsylvania, had a well-deserved win so he is our 1983 Nats champion of this class. Results were:

	NAME	AREA	MACHINE
1st	Ralph Geese	Farrell, PA	Competitor
2nd	Charles Sjobeck, Jr.	Randolph Center, VA	Superior
3rd	Donald Morrow	Hubbard, OH	Competitor
4th	David Davis	Hubbard, OH	Competitor
5th	Franz Fletcher	Kingston, Jamaica	Superior
6th	Jeff Sands	Denver, CO	Superior

Now, the most encouraging note of all. Twenty-one fliers were entered in the Novice class! The winner was Sam Newhouse of Jersey City, New Jersey, flying a **scale** machine. How about that! Anyway, the 1983 Nats was a great event and the size of the entries shows clearly that lots of fliers are now mastering helicopter flying. Placing of the Novice event was as follows:

Some of the beauties in scale.

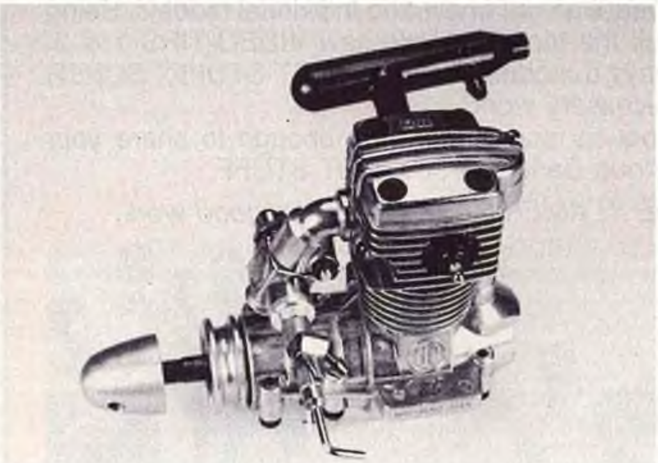
	NAME	AREA	MACHINE
1st	Sam Newhouse	Jersey City, NJ	Alouette
2nd	Walter Saber	Tewksbury, MA	Competitor
3rd	David Bickert	Chichester, NH	Superior
4th	Michael Robins	Woodbridge, VA	Competitor
5th	Michael Songer	New Haven, CT	Competitor
6th	Carlos Vargas	Woburn, MA	Competitor

So, that's it for this month. I'll have lots of news next month of all the fliers I have met on the way to and from the Nats. Will also try and provide a summary of where "we are at" with R/C helicopter flying in the USA in 1983. □

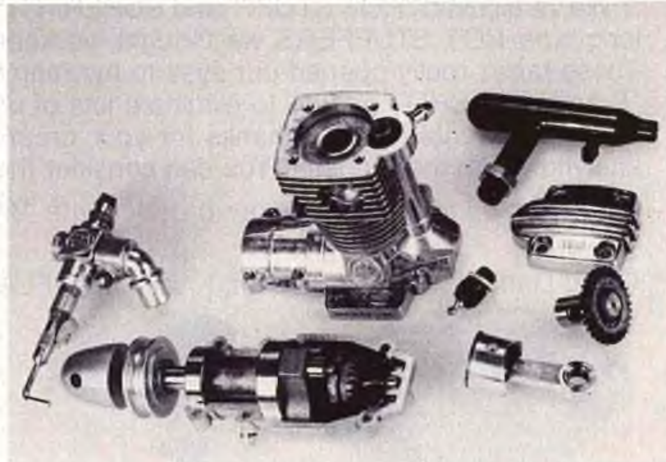
a time to give thanks

Happy Thanksgiving From The Editors and Staff of R/C Modeler Magazine

Engine Clinic CLARENCE LEE



The HP .21 four stroke engine features a rotary valve design approach. The engine is available from Tower Hobbies.



A major assembly breakdown of the HP .21 four stroker.

Fifteen years ago, in 1968, Hirtenberger Patronenfabrik of Austria introduced the first commercially produced Schnuerle ported two stroke model engine to the hobby market. Although several individual modelers here in the U.S. and in Europe had been working with Schnuerle ported engines in U-control speed, (Bill Wisniewski, head of K & B's engine design department and his "Wart" .15 being the most notable). Hirtenberger was the first manufacturer to mass produce a Schnuerle ported R/C engine. This was the start of the trend that now finds all high performance two stroke model engines using various modifications of the Schnuerle porting. Hirtenberger's first engine was of .61 cu. in. displacement and featured a rather unusual large diameter drum rear intake. The carburetor being mounted on a downward angle from the bottom of the intake casting did present mounting and fuel tank location problems in an R/C aircraft. The engine was a real powerhouse, however. This engine was shortly followed with a more conventional front rotor intake design that became a very popular selling engine here in the U.S. Over the years, Hirtenberger has expanded their line of engines to include engines from .20 cu. in. through a 1.20 cu. in. inline twin cylinder engine as well as engines for marine and R/C car use.

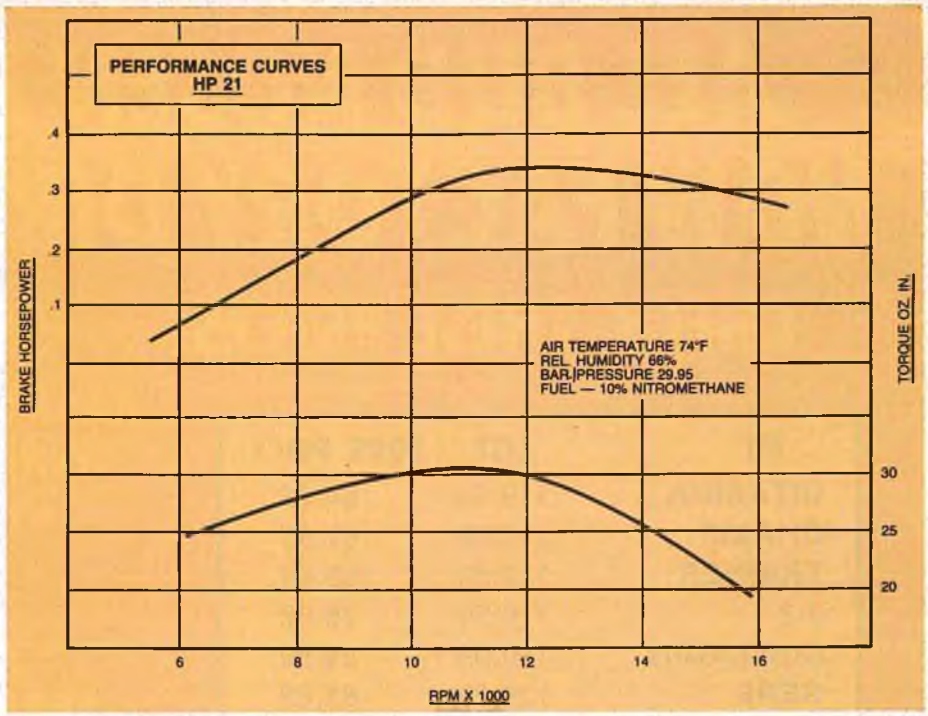
This past month I received Hirtenberger's latest development — a .21 cu. in. displacement four stroke engine. As with Hirtenberger's original Schnuerle ported engine, they have chosen to depart from the normal design trend and come up with an entirely different method of four stroke induction. Rather than the use of an intake and exhaust valve and the related actuating mechanism, the new HP 21 uses a rotating drum or valve mounted vertically in the head with appropriate openings to time the intake and exhaust. The drum valve is driven by a shaft mounted spur gear that is, in turn, driven by a pair of bevel gears mounted in the rear of the crankcase. The master gear in the crankcase is driven by an extension of the crankshaft crankpin. The assembly being completely enclosed eliminates the possibility of dirt causing wear to the moving parts and greatly lessens the possibility of damage due to a crash.

Hirtenberger is not the first to market a four stroke engine using a rotary valve type of induction rather than poppet valves but their drum valve does differ from the types used by other manufacturers. Webra first introduced a rotary valve type four stroke two years ago with their .87 cu. in. Webra T-4. This engine used a variation of the Aspin conical rotary valve used in full size engines. The cone shaped valve is mounted vertically with the inside of the cone being the head of the combustion chamber. A belt driven shaft and bevel gearing, in turn, driving the valve. The English Condor 91 also uses a horizontally mounted cylindrical rotary valve driven directly by a belt on the back of the engine. Both the Webra T-4 and Condor 91 having their driving mechanism exposed to the elements.

Hirtenberger's new HP 21 is the smallest four stroke engine on the model market. It is a known fact that most four stroke model engines develop about two thirds the power of an equivalent displacement two stroke engine but do have the capability of turning larger propellers in the lower rpm ranges. Four strokes are also limited in rpm capability by the valve mechanism which has a tendency to "float" at rpm levels much over 10,000. Valve float is simply the point where the valves can no longer open and close rapidly enough and begin to stay partially open. Increasing the valve spring pressure helps, but, in turn, increases wear to the cam lobes and valve train in general. By going to a rotary valve intake system the engine, in turn, has higher rpm capability. Something that would be necessary with a smaller displacement four stroke engine. This is the case with the HP 21. One might think that a .21 cu. in. four stroke engine might not have enough useful power to be practical. This is far from the truth with the HP 21. The Hirtenberger people claim .34 horsepower for the engine at 12,500 rpm. Although not an outstanding figure for a Schnuerle ported two stroke engine, it is the equal to many of the cross flow ported .19's of just a few years ago. With the rated horsepower at 12,500, it is obvious that, although of four stroke design, the engine was not to be limited to big props and low rpm operation although the engine still has excellent low speed lugging power characteristic of four stroke engines.

Over the years, after having run many thousands of engines, I do not really find it one of my favorite fun things to do. The little HP 21 was the first engine to come along in a long time that I was actually looking forward to checking out.

I received the engine direct from Hirtenberger in Austria with no accompanying correspondence. Just the instruction booklet printed in four languages. The engine had been run and I imagine it was one of the first production line samples. The serial number of #85 would substantiate this. Although the engine had been run, it seemed to be far from broken-in so I gave it an additional thirty minutes of rich break-in running using a 9/6 Top Flite Super M propeller and Cool Power 10% nitro fuel. Although four stroke engines work better after break-in with lower oil content fuel, I still like 20%-22% oil content for the initial break-in while the parts are polishing together and seating. I have also found that while nitromethane does not give the power increases in a four stroke engine that it does in a two stroke, it is a big aid in the idle and acceleration. I also suspected that as the HP 21 developed its horsepower in the 12,500 rpm range, it might benefit by the use of nitromethane.



After the initial rich break-in, rpm/power checks were begun. Cool Power 10% was used for all checks initially. Actual rpm figures obtained were as follows: 7/6 Top Flite, 14,700; 8/6 Top Flite, 12,700; 9/5 Top Flite, 10,800; 9/6 Top Flite, 10,200; 10/6 Top Flite, 8,200; 11/6 Top Flite, 6,500; 12/6 Top Flite, 5,600.

Needles to say the 11/6 and 12/6 were getting a bit large for the engine but I was curious as to how well the engine would lug the really big props. The 7/6, on the other hand, was a bit small but, since the manufacturer lists the rpm range of the engine as 2,500-15,000 rpm, I wanted to check the high rpm capability. When plotting a power graph it is also necessary to run an engine above and below its maximum rpm/torque limits to determine its horsepower/torque curve. As can be seen in the accompanying power graph, the engine had a very flat horsepower peak developing over one third horsepower between 11,000 and 13,000 rpm with a peak of .35 hp at 12,000-12,500. Maximum torque of 31 oz. in. was obtained at 11,000. Transposed to actual propeller sizes, a 9/6 would appear to be the best prop for the engine. Allowing for unloading in the air, the engine would turn a little under its maximum horsepower peak and slightly above it maximum torque peak. A lot of fellows mistakenly believe that an engine should be propped for its maximum horsepower peak, but this would only be true for all out speed engines. In the case of a sport engine, it is better to run the engine below the horsepower peak and closer to the torque peak. It is torque that turns the prop and allows the use of larger propeller sizes. The aircraft naturally plays a part in proper propeller selection, so possibly a 9/5 or even 10/4 for an antique scale type model would be more practical. The engine can handle up to an 11/6 without overheating if the application should require this size propeller — more on the operating temperature later in the article.

It is quite interesting to note that Hirtenberger was not overestimating the power of the engine and state a horsepower figure actually achieved. I have checked many engines over the years that claimed horsepower figures considerably higher than those actually obtainable. Of course, many "manufacturers resort to "guestimation" rather than by actual dyno testing.

The engine was very easy starting and, like most four strokes, liked to start "wet." Unlike most four strokes that seem to start best by flipping backwards — the engine kicks and takes off running in the proper direction — the HP 21 started easiest

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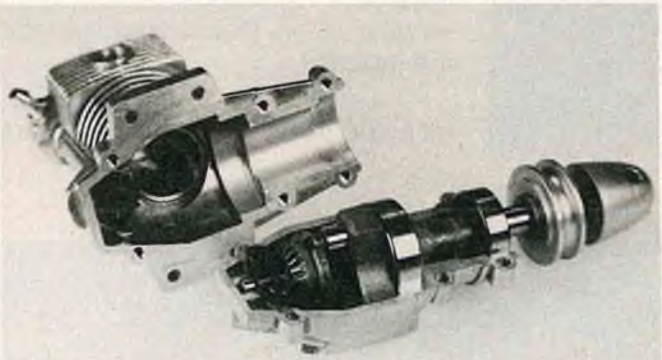
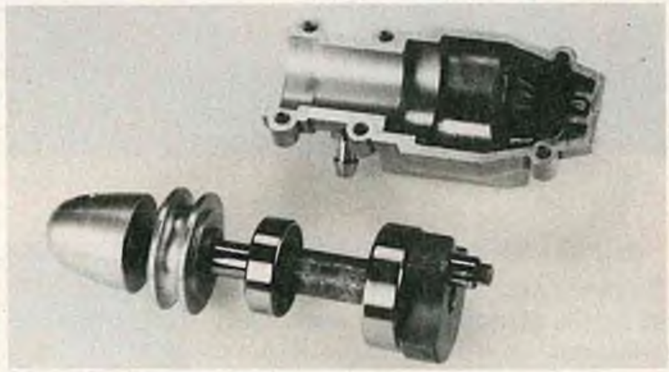
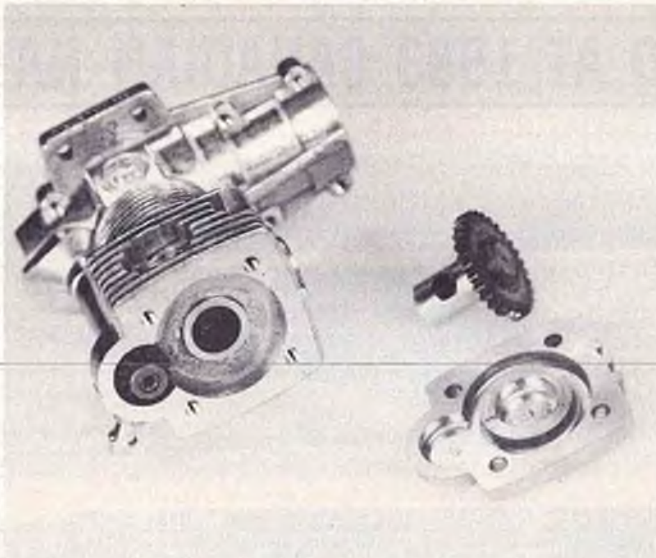


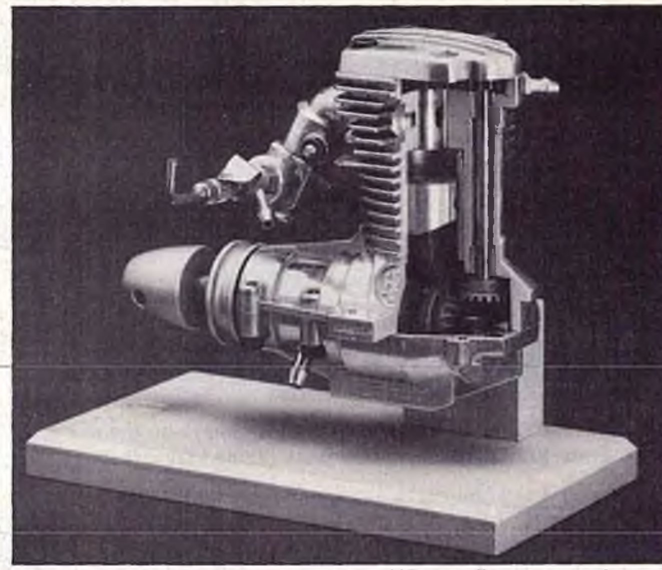
The first stage bevel timing gear is driven by an extension on the crank pin.



Crankshaft and ball bearings removed from crank case pan.



Rotary valve is driven by smaller spur gear in cylinder head.



This cutaway photo shows how the HP .21 all goes together.

by flipping in the direction of rotation the same as a two stroke engine. In fact, I could seldom get it to start using the backwards flip start method. Flipping in the direction of rotation following a wet prime in the exhaust would have the engine running in two or three flips. Due to the extensive amount of starting and stopping of the engine, I did resort to the electric starter after the first five or six starts to speed up the testing. A finger over the intake while hitting with the starter and quickly removing the finger had the engine running in one or two seconds every time. I should point out that placement of the carburetor does not make for easy choking of the engine. In fact, there is not enough room between the carburetor intake and top of the front housing for your finger. However, the carburetor can be rotated in the intake elbow and the elbow, in turn, swung to either side, then making it an easy matter to choke the engine. The finger manipulation necessary does leave the thumb sticking towards the prop and you do have to be careful not to get bit as I did a couple of times.

Throughout the entire testing the engine ran very smoothly and cleanly. There was no trace of detonation or tendency for the engine to kick and throw the prop. If the mixture were leaned excessively, the engine would just stop running.

The only blemish on the whole engine performance was the idle. I could not get the engine to idle reliably below 3,500 with 4,000 being a safer figure. This was using the 9/6 prop. Of course, being a four stroke engine with a firing impulse every other stroke, you are getting a 2,000 rpm sound which makes the engine seem to be running much slower than it actually is. This was also rather deceiving at the high end with the engine turning 14,700 rpm, it was hard to believe it was turning this rpm with the 7,350 rpm sound.

Up until this time I had been using the Cool Power 10% fuel. Being unable to get the engine to idle below the 3,500 rpm figure, I now diluted the Cool Power with 50% methanol alcohol giving an oil content of 11% and nitro content of 5%. Although the idle did improve very slightly with the drop in oil content, it was nothing significant. Power checks were also made with the 9/6 and 8/6 props. Rpm was down about 400 indicating the engine did like more nitro. So some fuel was mixed using 10% oil (Klotz), 10% nitromethane, 2% Propylene oxide (an igniter), and the balance alcohol. Rpm was back up to the same as with the Cool Power and idle now improved to the point where it would reliably hold 3,500 rpm. With the starting battery connected, it would idle reliably at 2,700. A variety of glow plugs were tried including the glow plug that came in the engine, a K & B, Fox, Fireball hot, Glow Bee, and O.S. four stroke plug. Plugs did not seem to make that much difference. The O.S. plug seemed to work the best of all but not that much better over the plug that came in the engine. The Fireball hot did improve the idle but had a tendency for the engine to misfire at the top end.

I attribute the engine's non critical plug tendency to the rotary valve drum intake. The glow plug is only exposed to the combustion chamber when the port in the drum valve lines up with an opening that leads to the glow plug; acutally, just about one revolution of the engine. The glow plug being shut off from the combustion chamber during the next revolution.

Although 3,500 might be a little higher than some fellows might like, it is low enough for most applications. If a lower idle is required it might be necessary to use an on-board power supply for the glow plug. Possibly with more running time a lower idle could be achieved. I did accumulate about a total of two hours running on the engine but it still had a tendency to lose 200-300 rpm after warm-up. That is, starting up from cold, the engine would hit a 200-300 rpm higher figure than after warm-up. Since compression was exceptional and nothing seemed to be tight I would assume that the engine was still not fully broken-in.

Although the noise level is very low with an open exhaust, the engine does come with a small muffler that looks like a small CO_2 bottle. As small as the muffler is, it did lower the exhaust level considerably — enough so that you could hear the propeller singing. Surprisingly, the muffler did not cause any loss of power with prop sizes over 8/6. With the 7/6 there was about a 200 rpm drop. All testing was done with the muffler installed in order to utilize the muffler pressure for pressurizing the fuel tank. Incidentally, while checking the idle, both muffler pressure and no pressure was tried.

Something I did think was a little strange is the manufacturer's recommendation for the method of using muffler pressure. You will note in the accompanying pictures of the engine that a pressure fitting is installed in the head of the engine. A piece of tubing is connected between this fitting and the muffler pressure fitting. A line is then run from the crankcase vent fitting on the bottom of the crankcase (between the front and

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Power Boating

HOWARD POWER

A couple of new items have crossed my palms this month. Steve Muck (6003 Daven Oaks Dr., Dallas, Texas 75248) is manufacturing a couple of tuned pipes that will be of interest to boaters. These pipes are meant to be used on 7.5cc and 10cc racing engines. Their design is patterned after the more or less out of production International Products' pipes. These pipes have 1" flat cylindrical surface between the diverging and converging cones. This feature gives these pipes exceptional low rpm torque while still giving good top end rpm. The samples provided had good workmanship and our tests have shown that these pipes are some of the best we have used. The 7.5cc pipe is particularly useful on hydros. Its low end torque characteristics lets you use a bigger propeller or lets you shorten the pipe when you use the

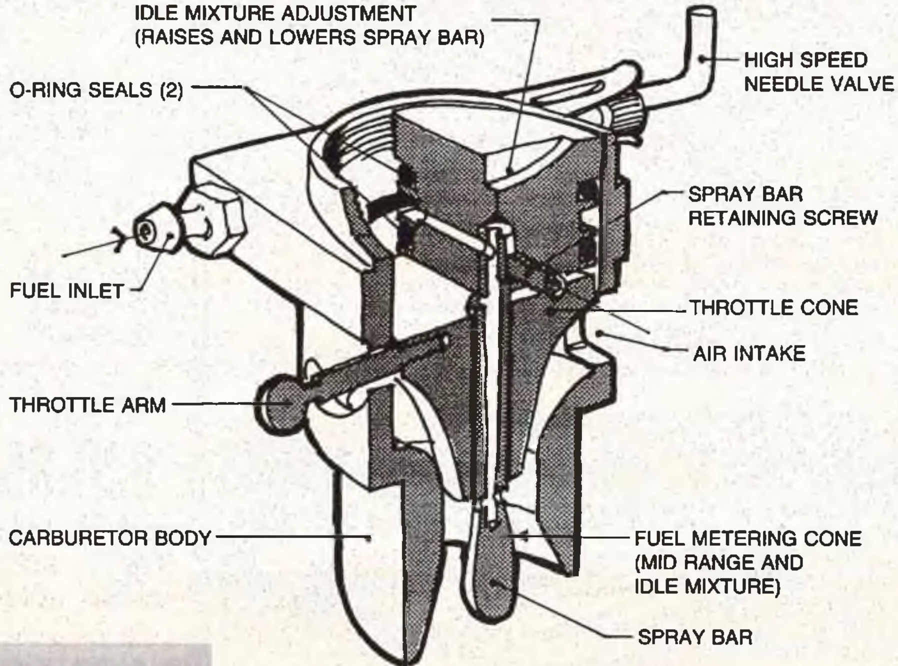
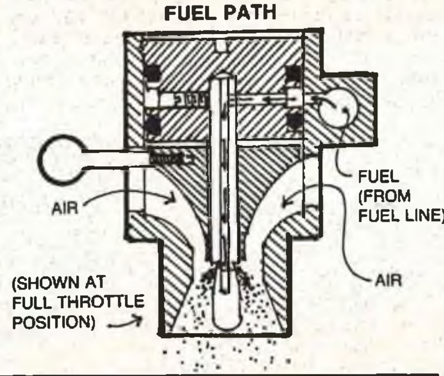


FIGURE 1

CROSS SECTION VIEW

FUEL PATH



same propeller. We use the 10cc pipe on our scale hydro with good results. It has a large volume and the maximum diameter is small enough to fit into the cramped quarters of a scale boat.

The second item of interest is not a new device but one which I have only recently become aware. This carb has been manufactured by Martin Enterprises (170 Navajo, San Marcos, California 92069) for the "fly boys" for a couple of years. Figure 1 shows the design features of the Martin carb. This carb has a very efficient venturi design that uses a movable plug to regulate the throat area. Air enters the venturi through a rectangular intake located on the side of the carb. This air then passes through an annular shaped passage formed by the plug and the carb venturi. Fuel is admitted by a spray bar that is mounted on the centerline of the carb throat. In this way the spray bar obstructs very little of the throat area. These features make this carb the most efficient we have yet tested. The real surprise is that this carb has what all boat racers need — very linear part throttle operation. Most big bore carbs with multiple needles have excellent idle characteristics and superior top end performance. Sometimes, however, we have had to put up with mid-range mixture problems that could only be solved by reducing the load on the engine. This Martin carb design has solved this problem on every engine we have tried it on. In short, this carb is the greatest!

The carb is available in three sizes: Model 6000 has a throat inside diameter of 0.310", Model 6000L has a throat ID of 0.360" and Model 9000 has a throat ID of 0.430". Each carb has a mounting stub outside diameter of 0.505 and comes complete with adaptor cylinders so that you can use the carb in any motor that has a backplate hole size of approximately 0.505", 0.525", 0.545", 0.590" or 0.625". This carb fits most of the popular racing motors with no modifications. We suggest the use of the Model 6000 on 3.5cc engines, Model 6000L on 7.5cc engines, and Model 9000 should work well on 11cc engines. Our tests show that maximum performance on 7.5cc engines is reached by boring out the ID of the Model 6000L carb. I suggest an ID of 0.390" on the Picco 45 and an ID of 0.410" on the O.S. 46 motors. In all cases we have tested, the application of this carb has allowed a shortening of the pipe and a very healthy increase of top end rpm has resulted. Add to this the previously mentioned linear control of mid-range rpm and you have a superior carburetor for boat racing. If you do bore out the 6000L carb, I would suggest that you enlarge the size of the intake window. This window was sized for the 0.360" bore and if you don't enlarge the window the flow may be controlled by the intake window, not the carb throat.

The disadvantage of the carb is that its linkage must be actuated in a direction that is across the centerline of the boat when used on rear rotor engines. This requirement is easily satisfied by placing a 90° bellcrank on the engine mounting rails. Don't try to push or pull the carb plug control arm in a fore and aft direction. It won't work smoothly and you will drive yourself nuts trying to get smooth operation. We always use red Loctite to install carbs on our racing engines. I just can't keep them on the motor if I don't. The Martin carb has a very low mass because its major parts are aluminum. It should stay put much better than the steel or brass barreled carbs used on other motors. The carb body is machined from bar stock and it is therefore stronger than the die cast or sand cast carb bodies. We have had no problems with the carb after running it hard for several weeks. Be sure to use pipe pressure for best operation. The intake window should be mounted so that it doesn't face the bottom of the hull if possible. Early tests proved that this thing sucks so hard that it swallows any water drops that happen to hit the bottom of the boat. By interchanging the position of the fuel inlet and needle valve assembly you can orient the carb intake window so that water ingestion is not a problem. We highly recommend this carb and hope that others will find that it increases their boat's speed and reliability.

Recently I broke the crankpin off of one of my two year old Rossi 65's. I replaced it with one of the new design crankshafts. After reassembly, I took it to the lake to work out some new ideas. Unfortunately, during the second run my engine stopped very quickly with that sickening sound only breaking metal parts make. Upon inspection I found that the rod bushing had spun and the bottom end of the rod broke sending all kinds of stuff through my good piston and liner. What a trash job! Since this kind of destruction is definitely no like the usually trouble-free Rossi, I started looking for what I had done wrong when I reassembled the engine. To make a long story short, the new crankshaft has a much larger fillet at the base of the crankpin. This was probably done to reduce the chance of breaking the pin off. However, this feature caused the destruction of my engine because I used what must be an older style 90 rod. These older rods have a chamfer on both faces of the lower end bushing that allows the rod to position itself up against the face of the crankshaft counterbalance. This chamfer provides for a space between the crankpin fillet and the rod bushing so that oil can lubricate the lower end bushing. This geometry insures that the rod only pushes against the bushing surface and the crankpin bearing surface outside of the fillet.

The new crank had a larger fillet so the bushing came into contact with it, sealed off any oil flow, and grabbed it. The solution is to enlarge the size of the rod chamfer so that the rod can be pushed to the crank face without the pin fillet coming into contact with the rod. If you are careful you can enlarge the chamfer by using a standard countersink bit rotated by hand. Non-drying blue marking ink, available at any auto parts store, can be used to get an indication as to whether these parts are coming into contact in the critical area. Carefully polish the rod face after you have finished and you will have no more trouble with rod breakage. If you are not into rod rework, you will have to order a new style rod with a chamfer that matches the new cranks. Be sure to check any after market rods that you install in any motor to be sure that this problem doesn't exist.

Last month we started a discussion on engine intake systems. We outlined the basic operation of a venturi and developed equations to predict mass flow, pressure and velocity in the passageway. We also discussed spray bar contributions to the development of fuel suction and introduced the effective venturi throat area which may be used to compare the size of various carb designs. The previous information assumed a steady continuous flow. In fact, we have a very unsteady situation when our two stroke engines are running. This complicates the situation greatly. The following information comes mainly from Gorden Jennings' book, "Two Stroke Tuner's Handbook."

Most of our racing engines have rotary valve, or some modification of rotary valve, intake timing (drum rotor or crankshaft port). This type of intake flow control is best for many reasons. Rotary valve engines will operate very well even without intake tract resonance. Rotary valve engines have a broader power band on either side of peak power than those with other types of intake timing. By taking advantage of intake resonance these favorable effects can be retained and increases in peak power can result. If you are not careful, however, you can destroy the ability of the engine to make power by setting up destructive intake tract flow that tends to reduce the intake flow rate.

The work of moving air through the crankcase is performed by the effects of sonic wave resonance and the inertia of the fuel and air mixture caused by the engine's intake and exhaust pipes. These high amplitude pulsations make it possible to achieve very high power but they also have an adverse effect on the ability of the venturi to meter fuel. If the spray bar is placed too close to the intake window it is subjected to radical pressure fluctuations and it loses its ability to meter the fuel. The spray bar, therefore, should be located toward the end of the intake resonant tract for best performance.

If you could look at what is going on inside the venturi when the engine is running you would see that the fluid particles of air can pass the spray bar three times before they enter the crankcase. During the intake flow, air in the duct passes by the spray bar into the constant area section. It then reverses direction as a result of the pressure pulse generated when the intake port closes. It then reverses direction again and passes by the spray bar a third time as the next intake period begins. A gradual opening of the intake port tends to extend the duration of the sonic wave that is used on its return trip to supercharge the engine's crankcase. This will broaden the engine's power band. In fact, if you want to stop all resonance effects in the intake tract you should reduce the venturi throat diameter until the choke area is 35% or less of the intake port area. In this configuration the venturi acts as a wave damper. A small venturi will stop resonant wave action which results in small variations of mixture strength and a very broad power range but with less than maximum power. Now you know why most manufacturers of sport engines supply small diameter carbs on their engines.

Last month we indicated that the venturi has disadvantages because it, when used by itself, cannot throttle the engine. Its fixed choke area results in a richer mixture with increased air velocity in the throat and, therefore, as rpm increases, the mixture richens. At low rpm the throat velocity decreases and the mixture leans which makes it harder to pull big props off the beach. To cure this mixture change problem and to provide for throttling, a variable choke area intake device or carburetor should be used. The simple rotating type carb provides for throttling by decreasing the venturi choke area to a point where the intake mass flow is not sufficient to provide for the amount of fuel and air required to run at high rpm.

As the intake mass flow decreases, so does the power and rpm of the engine. However, a new problem raises its ugly head. Since the throat area of the carb decreases, this produces an increase in throat velocity and, therefore, the part throttle mixture richens. In fact, the mixture richens so much that a very low idle rpm is impossible to achieve by our glow plug engines. Acceleration from idle to part throttle is also very slow. This is why a more sophisticated carb design that provides for a mixture control needle valve at idle and another mixture needle that controls the top end rpm is necessary for racing purposes. These more complicated twin needle carbs give us the acceleration characteristics that we need, a good idle, and the right high speed mixture for max power. In my experience this type of carb allows the boater to turn larger props more reliably than if the engine had a venturi and exhaust throttle set-up.

Those of us who are interested in performance would like to take advantage of any power boost we can find. This is the main motivation for using larger than stock carbs on our

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racing engines. Carburetor sizing is more of an art than a science since the quick gulp intake flow and pulsations of the intake tract and exhaust tract complicates the analysis process so much that even today's computers find it difficult to predict the flow characteristics. For these reasons it is not advisable to change your stock carb to a larger size unless you wish to raise the peak horsepower rpm or if you suspect that the manufacturer is too conservative in his carb size selection for reasons of easy needle settings. Switching to a larger carb alters the intake tract resonant frequency radically. You will usually have to change the intake tract length to bring sonic waves back into phase with the intake timing or you will have to operate at the new frequency. If you don't readjust the intake tract, the loss of the sonic wave produced intake ram effect will more than offset any gains from a larger mass flow capability.

The tuning of intake flows is more complicated than that of the exhaust system whose resonant frequency is largely only a function of length. On the intake side the flow sees a resonating flask made up of the engine crankcase and its intake tract. For the simple case of a bottle and a tube the resonance frequency, F, in cycles per second is calculated by:

EQUATION 1:

$$F = \frac{V_{sonic}}{2} \sqrt{\frac{A}{V_{case}\,(L + 1/2\sqrt{A})}}$$

where V_{sonic} is the speed of sound (the velocity at which sonic waves travel in feet per second). A is the cross sectional area of the intake tube in square feet, L is the intake pipe length in feet, and V_{case} is the crankcase volume in cubic feet. Since the sonic speed is a constant (about 1149 fps for dry air) we see that the resonant frequency increases as the square root of the effective carb area increases. This is why increases in carb size (as measured by the effective area) results in a power peak at higher rpm. We also see from Equation 1 that the frequency is inversely proportional to the square root of the intake length. If we want to increase performance at a higher rpm we should be prepared to shorten the intake length somewhat to achieve resonance if the area is held constant. If we wish to keep the same operating rpm when we increase the carb size we must also then increase the intake tract's length to keep the resonant frequency the same. The formula is really not of much use except to predict the direction we must go to improve things. The real engine has, for example, a continuously varying crankcase volume as the piston moves up and down. It is, therefore, impossible to apply the result exactly to our case.

Yamaha's Naitoh and Nomura have developed a rule of thumb formula that helps determine the carb bore required for two stroke high output motorcycle engines.

EQUATION 2:

$$D = K\sqrt{CN} = \sqrt{\frac{4}{\pi}\,A_{eff}}$$

where D is the carb diameter which is calculated in terms of the effective throat area, K is a constant to be determined, C is the displacement of the engine, and N is the rpm at the power peak. This result predicts a larger carb is needed as peak power rpm is increased at a constant displacement. If you know the stock peak rpm and the stock carb diameter you can calculate the value of the constant K that satisfies Equation 1. With the constant K determined you can then calculate how much of a change is required to achieve peak power at any other desired peak power rpm. Unfortunately, the constant K is not a universal member that is applicable to every engine. In fact, this constant has a unique value dependent on the design features of each engine. Again, the equation only shows us tendencies, not absolute answers to our problem.

We are then left to experiment with various carbs and to evaluate their effects. In general, the use of larger effective area carbs will result in a power peak that occurs at higher than stock rpm. Readjustment of the exhaust system (shortening the pipe) will also be required to place both the intake and exhaust sytems in harmony. There is a limit to the maximum carb size that is dictated by the load placed on the engine. If you have to unload the engine by decreasing the size of the propeller too much to achieve the resonant rpm, a loss of speed can result. If we operate the engine with a carb bore that is too large the engine will run erratically at full throttle or the engine will stop abruptly. Atmospheric changes will make the needle hard to set and reliability will suffer. Each boat and propeller setup will require a slightly different carburetor for maximum performance. It will take a lot of work to find the best carb but you will be rewarded with an increase in speed if you are successful.

Next month, to help illustrate this carb discussion, I will provide you with a very efficient venturi design that we have used on 11cc engines with success. We also will present a compilation of different manufacturers' carbs and their important properties. In the mean time, the following letter goes along with our present discussion.

Dear Howard:

With the growth of the sport in our area we are seeing less and less "open water" on race day. Saturday, at our lake, my needle was right on, maybe a touch rich. The very next day, race day, and only sixty miles to the south, my needle was nearly one turn lean. How do temperature, pressure, and humidity affect one's needle setting, how much and which way, right or lean?

On a different note, Howard, I buy RCM primarily to read your column, but personally, I much prefer your in-depth "technical" articles. The literature available to the beginner is obviously necessary, but it far outweighs the information printed for the growing or advanced enthusiast. I am personally interested in 40 and 60 hydro and scale 60 hydro and would like to know how to make these boats go faster, cleaner and more reliably. I know these are some of your favorite classes so I am sure you must be bursting with information.

Richard Oelschlaeger
Sarasota, Florida

The answer to your mixture problem is not easy because the engine requires a fixed ratio of fuel to air to run properly. If you leave the needle valve alone you are fixing the fuel flow aspect of this ratio. The variable is then primarily the quantity of air flow as measured by air density. The equation of state for air allows us to calculate the density change in terms of changes of temperature and atmospheric pressure as long as the air is dry. This equation of state is:

EQUATION 3:

$$d = \frac{p}{1716T}$$

If temperature, T, remains constant the air density, D, increases with an increase of pressure, p. If air density increases, this tends to lean out the fuel mixture. So, if the pressure goes up you have to richen the mixture to get good power. If you take your boat to a higher altitude, air density will decrease because the atmospheric pressure is lower as altitude increases. In this case you will have to lean down the mixture if temperature remains constant. If the pressure remains constant, air density is inversely proportional to temperature change. If the day gets hotter (at constant pressure), air density will decrease and you will have to lean the needle valve to keep the proper fuel/air ratio. The real problem is, however, that most days change both temperature and pressure. In this case you will have to calculate the new day density and compare it to the test day density. Then you will have an idea which way to adjust your needle. Moist air has a smaller density than dry air. As a result, increased humidity will require a leaning of the fuel supply to get best power. How much of a change in needle setting depends upon your boat's setup. If you are very close to maximum performance, the changes required may be great. Only by testing and by keeping a book of results will you be able to predict what needle changes your set-up will require.

Well, that about does it for another month. Send your questions, comments, etc., to the address at the end of this column. If you desire an answer before magazine publication, enclose a stamped, self-addressed envelope so I may answer your letter by return mail. Howard Power, Hobbies Unlimited, 766 Broadway, Seaside, California 93955, (408) 394-1200. □

Soaring

AL DOIG

Three all-glass models. In front, "Heavy Solution" E214 Brian Chan, two rear, "Half-Fast Solution" E182 Don Edberg. Don Edberg photo.

And a good evening to you, too. It is my custom each year to have Don Edberg report on the Two Meter World Cup contest. I don't go because it's too darned expensive to attend a meet in which I don't compete. I don't compete because F3B-like contests are just not my bag. My reactions are so slow that I sometimes give up-elevator after I'm back sitting in my chair. Anyway — here's Don's report:

Two Meter World Cup
June 11 and 12, 1983
By Don Edberg

This year's so-called World Cup was held in Modesto, California, about an hour's drive from Sacramento, the State capitol. (I say so-called because there was only one contestant not from the U.S.A. — Canada.) It was apparently decided to have the meet later in the year to avoid the cold weather that has plagued the event in the past, but it almost wasn't so! On Saturday, it was overcast and this reporter had to wear his sweats and windbreaker until the afternoon!

Dennis Brandt and "Predator" 5th place. On ground, Larry Jolly's "Pantera." Don Edberg photo.

Casey Goeller, 3rd, and "Camita" — Camero wings on Sagitta fuselage. Don Edberg photo.

According to the result sheets, 49 pilots competed this year. Since the events were similar to those used in international competition, many of the entrants had competed in the U.S. F3B team selections near Chicago last year. This year a new twist was added: the pilots flew from five identical winches, so there was no winch that was "better" or "worse." Also, the contest organization provided official timers for all events except for the Duration event (10 minute max, flown man-on-man, with a 100 point runway landing) so there could be fewer mishaps with the reporting of the pilot's scores. The events this year were the same as all the others: the Round One was the Speed event, where one tries to fly four lengths of a 150 meter (492 ft.) course as fast as possible. Round Two was the Duration event mentioned previously, while Round Three was Distance — try to fly as many lengths of the speed course as possible within a four minute time period. These events were flown on Saturday, while on Sunday three rounds of "simulated cross country racing" were flown. The racing task

Launch for Distance task. 5 pilots fly at one time. Don Edberg photo.

Keith Finkenbiner and fiberglass original. Don Edberg photo.

Keith Finkenbiner slid across the finish line to complete the course — just barely. Don Edberg photo.

Mike Bame, 2nd, and his original. Don Edberg photo.

One of five identical winches, built by Buddy Fox. Don Edberg photo.

was to complete 10 lengths of the speed course in as short a time as possible.

Since there was only one Duration event, most of the aircraft flown were heavy, high wing loading types. Last Year's winner, Don Edberg, flew an all-fiberglass racer intended for slope racing features an Eppler 182 airfoil. Other pilots entered combinations of other craft, like Casey Goller's Camitta — Camero wings on a Sagitta fuselage. Many pilots flew models using Mike Bame's fiberglass fuselage and his airfoil designs. Others flew aileron equipped Sagitta 600's, or Mini-Merlins. By far, most of the models were originals — not kits.

After a wing failure on the first launch, the Speed event settled down to a leisurely pace. Lift on the course cycled rapidly, with one pilot

Rich Schrameck and "Whisper." Don Edberg photo.

The only foreigner, Fred China, from Vancouver, B.C. and his "Runaway." Don Edberg photo.

Angel Sanchez-Figueras' "Mugen" (Japanese for "Without Limits") launched by Casey Goeller. Don Edberg photo.

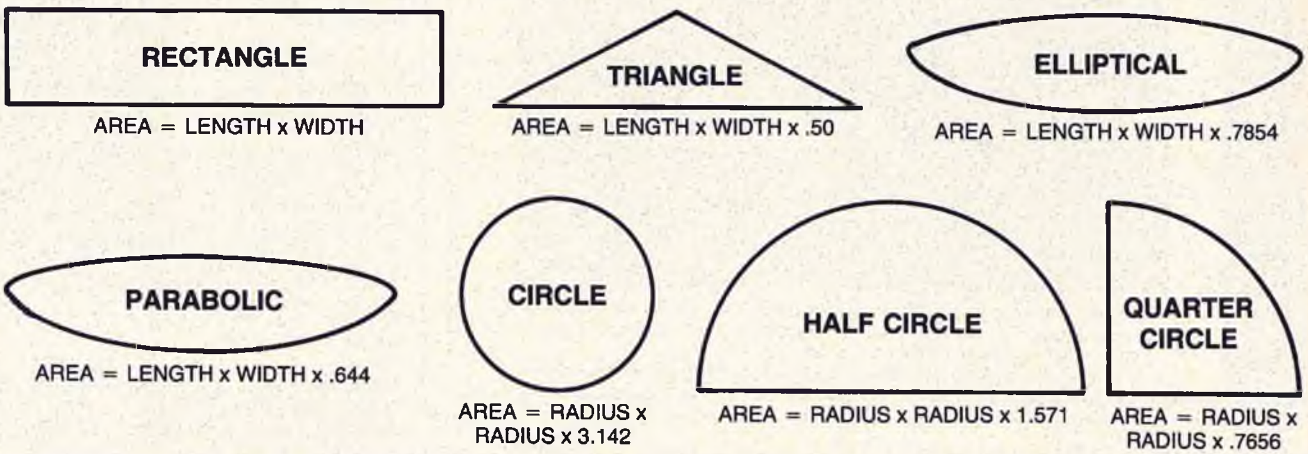
screaming through, a few minutes later another pilot struggling to finish. The fast time was set by Mike Regan, his 24.7 second run netting 1000 points. Next fastest were Robert Regalado at 27.5, Keith Kendrick with 28.4, and Dennis Brandt at 29.3. Judging by the wide variations in speed times by similar aircraft, one might think that this event was somewhat weather dependent. Perhaps the task should be two lengths of a

Larry Jolly's "Pantera." Brian Chan photo.

Don Edberg with "Half-Fast Solution." Brian Chan photo.

CONVERSIONS & FORMULAS FOR THE MODEL BUILDER

WING & STAB PLANFORMS



INCIDENCE MEASUREMENTS

WING CHORD	DEGREES	HEIGHT OF L.E. ABOVE T.E.
100mm	1°	1.7mm
100mm	2°	3.5mm
100mm	3°	5.2mm
150mm	1°	2.6mm
150mm	2°	5.2mm
150mm	3°	7.8mm
200mm	1°	3.5mm
200mm	2°	7.0mm
200mm	3°	10.5mm

COMMON BALSA THICKNESS	NEAREST AVAILABLE METRIC EQUIVALENT
1/32"	1mm
1/16"	1.5mm
3/32"	2mm
1/8"	3mm
3/16"	5mm
1/4"	6mm
5/16"	8mm
3/8"	10mm
1/2"	12mm

TO CONVERT	TO	MULTIPLY BY
Inches	mm	25.4
Feet	Meters	.3048
Yards	Meters	.9144
Miles	Km	1.6093
Ins^2	Cm^2	6.4516
Ins^3	Cm^3	16.387
Gal	Litres	4.546
Ozs	Grams	28.35
Lbs	Kg	.4536
Fl. Oz	cc	28.41
mm	Inches	.03937
Meters	Feet	3.2808
Meters	Yards	1.0936
Km	Miles	.6214
Cm^2	Ins^2	.155
Cm^3	Ins^3	.061
Litres	Gal	.22
Grams	Ozs	.0353
Kgs	Lbs	2.205
cc	Fl. Ozs	.0352

$$\text{Aspect Ratio} = \frac{\text{Span}}{\text{Av. Chord}}$$

$$\text{Aspect Ratio} = \frac{\text{Span}^2}{\text{Area}}$$

$$\text{Wing Loading (Oz per sq. ft.)} = \frac{\text{Ozs} \times 144}{\text{Wing Area (ins}^2\text{)}}$$

Wing Area = Span x Average Chord

$$\text{Av. Chord} = \frac{\text{Area}}{\text{Span}}$$

$$\text{Av. Chord (Parallel Taper)} = \frac{\text{Root chord} + \text{Tip Chord}}{2}$$

R/C MODELER MAGAZINE

longer course --- at least someone ought to try it.

Duration, Round Two, again showed the weather's influence. Mike Regan's 5:08 and no landing netted 900 points and kept him in first, while Marion Crowder's 3:13 flight gave 991 points (don't forget, this event is flown man-on-man) and second place. Mike Bame's 10:03 and 92 landing gave 992 points and third place, while Larry Jolly's 3:30 with 90 landing moved him into fourth. Quite often in this round, one pilot would "sky out" and bury all the four others who had dropped out at two or three minutes. Perhaps the organizers would consider a seven or eight minute max to reduce the luck factor a bit. If you can make seven or eight minutes, you can usually make ten anyway.

Next, the task was Distance. With the wind a steady 10 to 15 mph, most pilots added ballast to their craft. Mike Regan's 6 laps was the best in his heat, keeping him in first place. Mike Bame's 12 moved him up to second, with Don Dell, Mike Smith, and Marion Crowder in third, fourth, and fifth. Smith's 17 complete laps was the best of the day.

The winner, Mike Regan with "Tern." Brian Chan photo.

Gary Ittner 4th and "Lesser Tern." Brian Chan photo.

First ten places. (Rear row R-L) 10th through 4th. (Front row R-L) 2nd 1st and 3rd. Brian Chan photo.

On the first day, it seemed like everyone was "popping-off" the winches. Perhaps it was a combination of unfamiliar weather and untrimmed airplanes; but, at any rate, many pilots lost their chance to do well. I've never seen so many pop-offs in a single contest.

Saturday night featured several two meter long sandwiches to be eaten by the contestants, as well as beer and wine. After a brief speech by AMA prez John Grigg, and a mention of the contest sponsors and donations, all the contestants spent the evening hangar flying. Then, many visited "Graffiti Night" in Modesto, where every imaginable variety of automobile could be seen cruisin' down the main drag in Modesto. It was definitely a night to remember.

The next day (Sunday) was much warmer and began almost calm. Pilots had to decide whether to fly lighter to *be sure to complete the course (but at a lower speed), or heavier and finish faster (but risk not finishing). Many pilots flew relatively heavy as the winds increased during the day.*

My notes for these three rounds are not as complete, but in the fourth round, the top five were Bame, by 95 points; Regan, Jolly, Brandt, and Goeller. Keith Finkenbiner had about the closest finish imaginable when he slid by a nose over the finish line.

The fifth round had the fastest time of the day when Don Edberg finished the course in 111 seconds. If you include the trip back from release (the clock started on release), this works out to be an average speed of 33.2 mph — not bad for a model with no engine. Now the top five were Regan, Bame, Jolly, Goeller, and Ittner.

The sixth round was similar to the fifth, but the wind had increased and was slightly across the course. The top five battled it out in the last heat. Unfortunately, Larry Jolly's pop-off only yielded 348 points — a 900 flight would have given him first. After the dust cleared, the top ten were: Mike Regan, 5457.6; Mike Bame, 5424.5; Casey Goeller, 5398; Gary Ittner, 5193; Dennis Brandt, 5135; Jimmy Wichert, 5109; Rich Schrameck, 5004; Keith Kendrick, 4936; Larry Jolly, 4891; Don Edberg, 4786.

As is the usual, the top places had their choice of merchandise for their work. Regan and Bame took Airtronics radios home; Goeller and Ittner took Futaba and Kraft radios. Other pilots chose from kits and merchandise, including Novak servos, Sagitta 600 kits, a Sailaire kit, an Electricus kit, MonoKote, adhesives, and the like. No one left the field without some prize. All in all, everyone had a great time! Contest Director, Rich Hanson, and his crew from Modesto are to be congratulated for a great job running a fine contest.

And there you have it for another year.

★

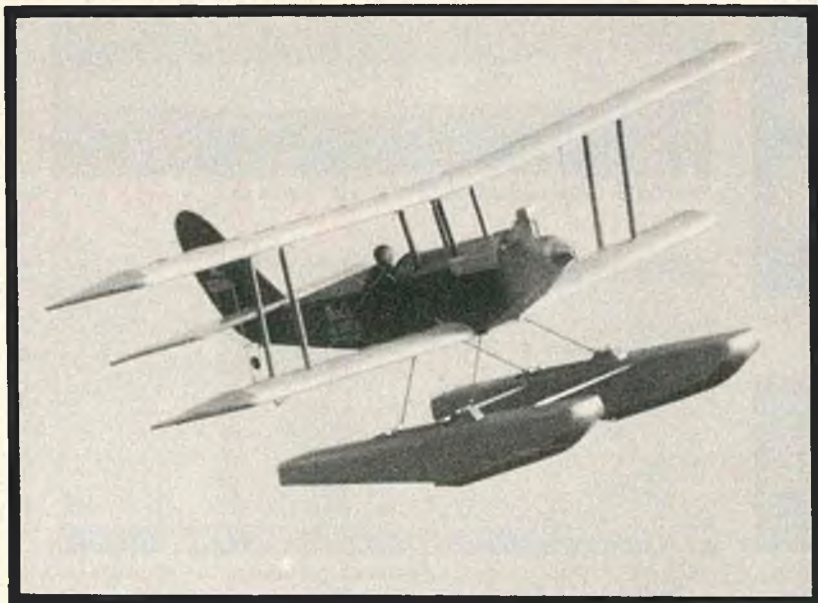
As you remember, in th August issue we ran some spectacular pictures of a sailplane crash which resulted from wing stall on tow. I observed that aileron sailplanes seemed to be more prone to instability on launch that their polyhedral counterparts and wondered why. I received a very lucid explanation from Douglas Graham, of Redlands, California, that I'd like to share with you.

In the August issue you expressed puzzlement as to why aileron sailplanes experience more crashes on high-angle launch than polyhedral jobs. Perhaps I can help. What is happening is a variation of the classic stall-spin, but under tow conditions rather than free flight. As the pilot sees the nose start to rotate, he may instinctively apply up-elevator, which, of course, makes things worse. If he doesn't give "up," he will almost certainly apply aileron opposite the turn. This is also a path to disaster. In a spin, one wing is stalled while the other is not. In a spin to the left as shown in the photos, the left wing is stalled. Application of right aileron deflects the left aileron downward. This **increases** the apparent angle of attack on the left wing, making the stall worse, and increasing the spin rate. Recovery for a spin on tow should be the same as for a normal spin. Apply **forward** stick; make no aileron inputs; apply **rudder** opposite the direction of rotation. Furthermore, stopping the tow (if a winch is being used) might be a good idea. Unfortunately, since all this is happening at low altitude, there's not much time for recovery. The best solution is not to stall on tow, as you pointed out. Polyhedral ships are probably less susceptible to an on-tow spin because of two factors: (1) they usually don't have ailerons for their pilots to misuse in a spin — rudder correction is used instead; (2) they are more resistant to spinning because their polyhedral gives them increased roll stability. The apparent angle of attack of the outer panel is less than that of the inner panel because of the polyhedral. The situation may be easier to understand if we think of the towline as a substitute for gravity. If you think of the towline direction as "down." the spin that is taking place becomes apparent. Howzat?

Yours truly,
Douglas W. Graham

Very good, Mr. Graham. All this tells me that it would be a good thing to have transmitter decoupling of rudder and aileron for launch, with a bit of dihedral for roll stability. A great many aileron ships used for thermal flying have mechanically coupled rudder and ailerons. As my mind becomes automatically decoupled from my thumb in a crisis, my action becomes strictly a reaction. Seeing an apparent yaw on tow, there's no way in the world I could do other than give opposite aileron/rudder. The way I avoid having to enter into this knee-jerk reaction is to launch my aileron ships straight out, with vigor.

Well, catch you next month, all being well. Howzat! □



GOLDEN OLDIE FLOATS

A Float Design For 5-8 Pound Aircraft

By Fred Reese

This photo is enough to inspire any rabid RC'er to build the Golden Oldie with floats.

Just like the Hitchcock movie. The Golden Oldie is being attacked by a flock of birds.

GOLDEN OLIDE FLOATS
Designed By:
Fred Reese
LENGTH
31 Inches
MAX WIDTH
4 Inches
MAX HEIGHT
3⅞ Inches
SIZE OF AIRCRAFT
80-128 Oz.
CONTROL FUNCTIONS
Water Rudder
MATERIALS USED
Balsa & Ply
Covered w/Glass Cloth
TOTAL WEIGHT
26 Ounces

Last month we featured Fred Reese's Golden Oldie vintage type sport biplane for .40-.45 four cycle engines. It flew so well, he added floats. These floats will also work well on other .40-.60 powered aircraft weighing up to eight pounds.

For three years I have been building and flying off of water with a variety of aircraft and float designs. With each new design I learn something new because some new problems occur. One by one the problems would be corrected to make the floats work. During this time I have read and studied everything I could find on float design for both full scale and models. My latest effort is the Golden Oldie, a 56" vintage type sport biplane using an O.S. FS 40 four cycle engine for power. I had decided that if the Golden Oldie flew as I expected, I would build a set of floats. The airplane flew as well as I hoped, even better. I quickly drew up a set of floats and built them. I called my friend Don Harris at Lake of the Pines and we arranged to fly that weekend.

We taxied the Golden Oldie around for a few minutes to check out the water rudder which turned out to be very effective. I decided it was time to try a take-off and at that point my real education on floats began. What followed was a very long, high speed taxi run. After about a quarter of a mile, the Golden Oldie did lift-off with a lot of elevator coaxing, and after what seemed like an eternity of fancy stick wiggling, it was flying. It was certainly not overpowered, but we both flew it, taking turns, and even managed some loops and rolls. We both liked it, but something had to be done about that take-off.

First, the model was not tracking straight on the water. This required a lot of rudder correction during the take-off. An inspection showed that the floats were not mounted straight. I had anticipated this problem and the mounting method shown on the plan allows for some adjustment. After some adjusting and taxiing, followed by more adjusting and taxiing, we got the model taxiing straight and the take-off's were much easier and a little shorter. Later that day I flipped the model over on the water and got everything wet, so we quit for the day. If you get your four cycle engine wet, be sure to run it afterward at full throttle for about ten minutes to get all of the water out of the crankcase and valve train. Otherwise, remove the backplate and any other covers and warm in an oven until dry and then oil everything.

That night, at home, I checked the float angle relative to the wings. On paper, I had designed the top of the floats to be at 0° relative to the bottom wing. I should qualify for Ken Willard's dum-dum award for following my own plans, as the floats were at least 2° positive, relative to the wing. The engine could not generate enough speed to overcome the extreme amount of rotation necessary to get the wings to flying attitude. A quick cure of the problem was to slip a 3/8" spacer between each float and the struts. With the floats now at the proper angle, the Golden Oldie would take-off in about three hundred feet.

I wasn't completely happy yet, but it was flying and taking-off consistently. Still, the model was sensitive to rudder corrections during take-off and several times while making a second take-off during a flight, the model would be unstable at lift-off. When I dumped the biplane in the water a couple of times, Don laughed at my

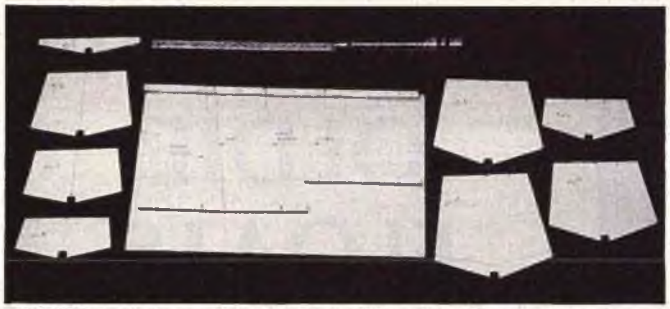


PHOTO 1: Make a miter box for bulkhead angle cuts from scrap balsa and plywood.

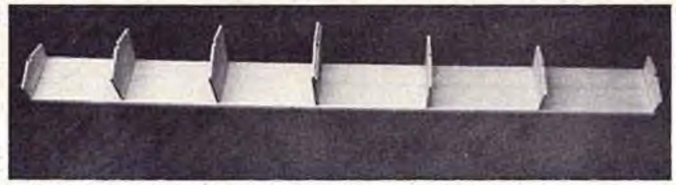


PHOTO 2: Glue bulkheads to 1/4" x 3" balsa top.

PHOTO 3: Glue on 1/8" balsa float sides and add 1/4" balsa keel.

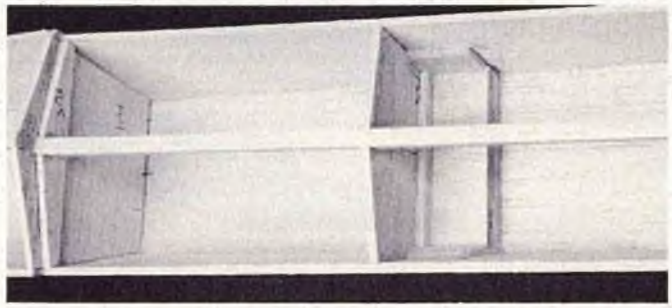


PHOTO 4: Glue in box structures for aluminum spreaders between the two floats.

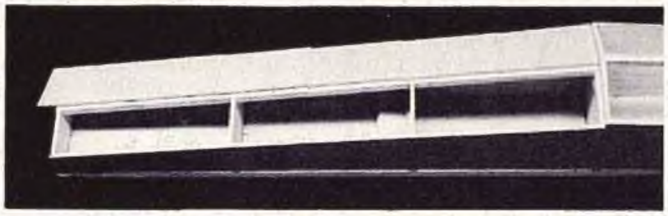


PHOTO 5: Glue on 1/8" sheet balsa bottom.

PHOTO 6: Add balsa noseblock and 1/8" plywood transom. Cover floats with 3/4 ounce glass cloth and resin. Glue on 1/4" square balsa spray rail and 1/4" plywood top mounting rail.

fumble-thumbs until it happened to him. The airplane was acting tail heavy, but that seemed improbable to me as the Golden Oldie on wheels was slightly nose heavy and very stable. I hadn't rechecked the C.G. location on floats relative to the wheeled C.G. position. It then occurred to me that the wheeled landing gear weighs thirteen ounces and is positioned several inches ahead of the C.G. The floats are only slightly heavier forward of the step and do not compensate for the heavier wheels. I screwed some weights to the nose of each float and the stability problem was cured. Before, with a full tank of fuel, the C.G. was far enough forward for the model to be stable, but later as some of the fuel burned off, the C.G. shifted rearward and the stability became marginal. With the model properly balanced it is a real pleasure to fly, but I still felt the take-off run could be improved.

During one of our flying sessions at the lake, Eut Tileston visited us. Eut has designed full scale seaplanes and his R/C floats are excellent, so I listened to his suggestions. He told me that the rudder sensitivity during take-off would be helped by moving the float step rearward a little. Now I realized that a re-design of my floats was necessary. I wanted to change the angle of the forward keel so that the float bottom just ahead of the step would also be at 0° relative to the wing. I felt that the new float bottom

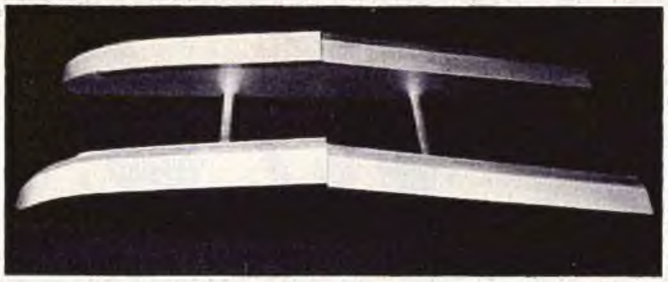


PHOTO 7: Epoxy the KS streamline aluminum tube spreaders into the floats.

PHOTO 8: Make the "kick-up" steerable rudder from .030 brass and brass tube.

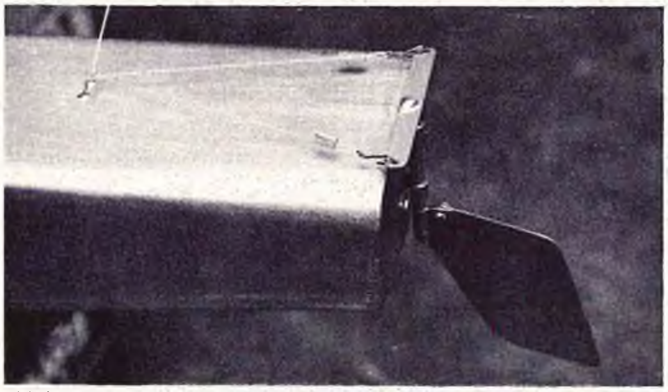


PHOTO 9: Mount steerable rudder to left float. Bent pin hooks allow easy removal of monofilament control cables. Cables run from water rudder through wire "U's" to aircraft rudder.

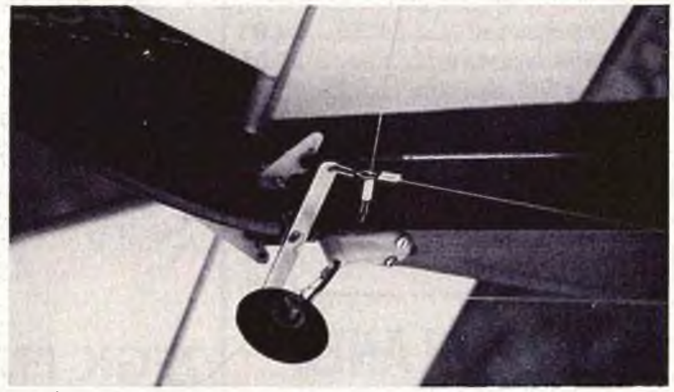


PHOTO 10: Tiller bar on aircraft rudder. Control cables are attached to bent pin hooks with crimped aluminum tube. No need to remove tail wheel.

would cause less drag on the water. Every little bit of drag is critical on a low powered float plane. Thrust must overcome drag to reach flight speed, the more drag, the longer the take-off run. Most R/C models have the extra power to quickly reach flight speed, so float design becomes less critical with increased power. The step was moved back 1¼" to reduce the steering sensitivity. I also increased the angle of the rear portion of the floats and deepened the step for easier rotation at lift-off. Three-quarter ounce weights were glued into the nose of

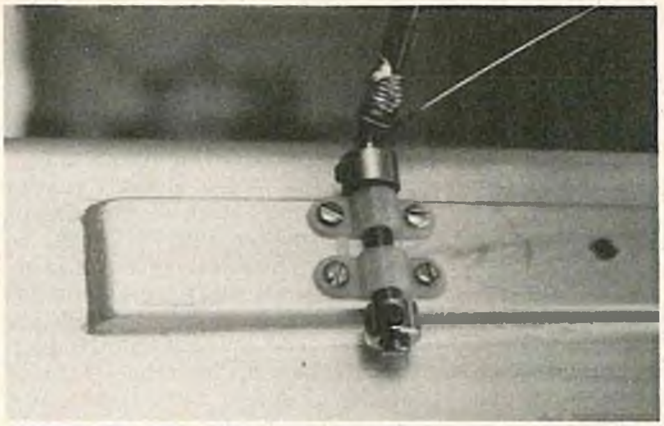


PHOTO 11: 5/32" wire struts are attached to the floats with Goldberg 5/32" nylon landing gear clamps, which are also used to attach the struts to the fuselage.

PHOTO 12: 1/16" wire cross braces are soldered to the struts after aligning the floats to the wing.

each float to adjust the C.G.

We tried several different propellers, but an 11/6 Zinger seemed to work best.

The result of the changes is that the Golden Oldie will now take-off in less than one hundred feet. This has been a very interesting learning experience for me and I am very satisfied with the results.

CONSTRUCTION

Cut out the bulkheads from light 1/8" x 3" balsa. I made a little miter box from 1/4" square balsa and a scrap piece of plywood. All of the bulkhead side angle cuts and bottom angle cuts are the same. The miter box simplifies cutting out the bulkheads and makes the parts more accurate. Lay the 1/4" x 3" balsa top over the plan and mark the centerline and the bulkhead locations. Glue the bulkheads to the top. Cut out the 1/8" balsa sides and bevel the top edge and glue to the bulkheads and top. The sides will have to be pulled in at the front and the top pulled down slightly to meet the sides at the front. My original floats are not pulled in at the front and they do not look as nice as the plan floats.

Epoxy the 3/4 ounce lead weights into the nose of each float. Glue in the 1/4" x 1/2" balsa spreader spacers and the 1/8" plywood plates and 1/4" square braces to complete the boxed slots for the aluminum float spreaders. Make the forward keel from 1/4" balsa sheet and 1/4" square and glue into place. Glue in the rear 1/4" square keel. Sand the keel and sides with a large, flat sanding block to true up the edges. The bottom front sheet bottom is glued on cross grain, one piece at a time, fitting each 3" length along the keel centerline. The rear, bottom sheet halves can be glued on in one piece with the grain running lengthwise. True up the front and rear

ends of the floats with a flat sanding block. Glue on the nose blocks and the 1/8" plywood transoms. Shape the nose blocks and round the edges of the top of the floats.

The entire floats are covered with 3/4 ounce glass cloth and resin. Cut a piece of cloth large enough to cover the top and both sides. Mix the resin and hardener and add one or two teaspoons of acetone to thin the mixture slightly. Brush the resin over the cloth and wrap the edges over the bottom. Remove all excess resin by unrolling a roll of toilet tissue over all of the cloth to act as a blotter. The tissue will absorb any excess resin. The tissue is immediately and carefully pulled off. This process leaves the cloth weave saturated with resin but removes any excess resin that would have to be sanded off later. I like to warm the wet resin with a hair dryer after blotting, to evaporate away the acetone before the resin sets. If the resin is not thinned with acetone, it may be too thick to brush without distorting the thin glass cloth. Thinning also makes it easier to blot away the excess resin. Lightly sand the rough cloth edges on the bottom and apply a layer of 3/4 ounce cloth to the rear bottom and a layer of 2 ounce or 6 ounce cloth on the front bottom. The cloth along the keel in the front gets scuffed and worn from scraping on the beach. I recommend you apply an extra strip of cloth over the forward keel to prevent possible leaks caused by wear. Lightly sand the edges and sand off any high spots. Fill any pores in the glass cloth and low spots with vinyl spackle and then sand. Glue on the 1/4" square spray strips along the inside front of each float along the bottom edge. Sand the spray strip to shape as shown on the float front view. Epoxy the 1/4" plywood mounting strips to the tops of the floats. Apply one or two coats of primer and then the final paint finish.

Cut the holes in the inside of each float for the 5/8" KS streamline aluminum tube spreaders. Fit the spreaders and then epoxy the spreaders into the slots. Bend the two 5/32" wire struts, which are the same as LG-2 on the aircraft plan. Attach the two wire struts to the floats, as shown using the Goldberg 5/32" nylon landing gear clamps. Mount the floats and struts to the fuselage also with the nylon landing gear clamps. Align the floats relative to the lower wing by using strips of masking tape criss-crossed on one side. Adjust the tape until the top of the floats are parallel to the bottom of the lower wing. Cut and bend the 1/16" wire cross braces and wrap the junctions with copper wire and solder.

The steerable, kick-up water rudder has proven to be very effective and trouble free. The rudder itself is loosely held in the brass clamp by a 2-56 bolt and locknut. If the rudder hits something, it can move up and down and is not damaged. Gravity holds it down and in place. The rudder shaft is 1/8" OD brass tube with a 3/32" piano wire core for strength. The brass clamp is soldered to the bottom of the rudder shaft and then drilled for the 2-56 bolt. The bearing is a 1½" length of 5/32" OD brass tube. Solder the .030 brass mounting clips to the bearing tube. The bearing tube should be held away from the transom 1/32" by the mounting clips so that the clamp does not rub against the transom. Slide the rudder shaft into the bearing and solder the tiller bar to the top of th rudder shaft. Mount the rudder assembly to the left float transom with four #4 SM screws. Glue the 1/16" wire "U" into the top of the float to act as a pully for the monofilament fishline steering cables. Bend the little "S" hooks from pins and attach them to the monofilament loops with crimped 3/32" aluminum tube.

Make the brass, aircraft rudder tiller bar and attach to the aircraft rudder. Another wire "U" must be installed in the bottom of the fuselage. Connect the monofilament cables from the water rudder, through the two wire "U's" to the aircraft rudder. Connect the cable from the left side of the aircraft rudder to the right side of the water rudder to make the rudders move in the same direction.

Check the C.G. location with the floats on the airplane. The balance point should be the same as the wheeled aircraft or a little forward.

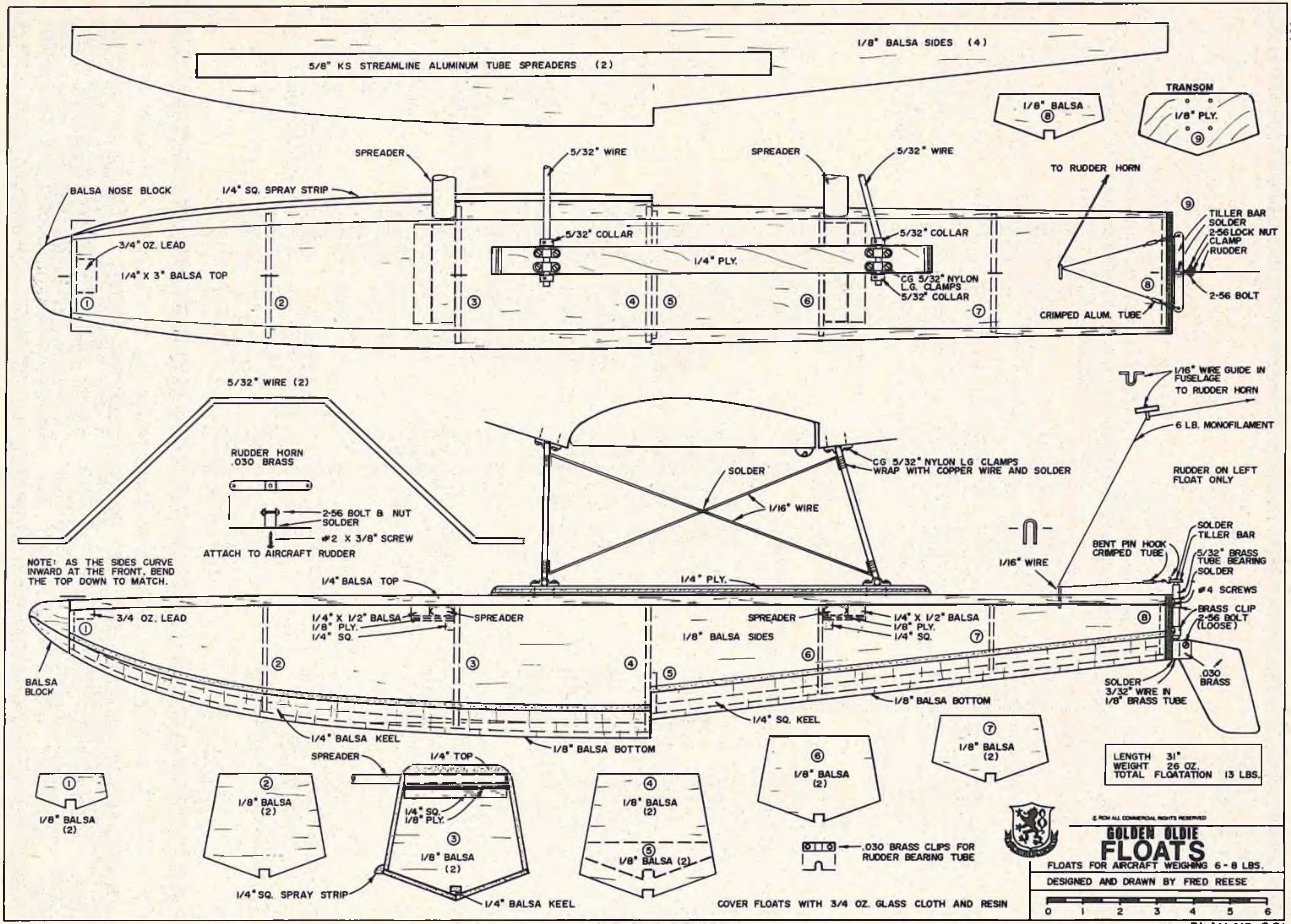
Before attempting to fly, taxi the model and adjust the alignment of the floats until the model will taxi straight.

If you have gotten this far, it is time to fly it. Turn the nose into the wind and give full power. As the model reaches full speed, give a little up elevator and the model will lift-off in a couple of seconds. Once in the air, the Golden Oldie on floats looks and flies like a vintage biplane. To land, gradually reduce power during the approach until the airplane is descending. Let the airplane come on down until just before touchdown, cut the power and flare. To me, landing on water is easier than on land. Once on the water, the model slows down very quickly and can be taxied back to shore.

Flying from water is exciting and sometimes perplexing. I hope my experiences will be helpful to you.

☐

FULL SIZE PLANS AVAILABLE — SEE PAGE 180



PLAN NO. 901

BIRDS GIVE AEROSPACE EDUCATION A LIFT

By Ben Strasser

Saturday, May 14, 9:00 a.m. Aerospace education students and their teachers from Banning High School, North Hollywood High, Crenshaw High, Markham Jr. High, and Columbus Jr. High of the L.A. Unified School District join members of the Southern California B.I.R.D. Model Airplane Club for a day of R/C flying.

This long anticipated event was the celebration of the near completion of some of the students' R/C models which they proudly brought for a check-out. About a year earlier, as an outgrowth of the efforts of Ms. Fran Blair at Banning High, members of the B.I.R.D. R/C Club designed a project intended both to support the educational goals of aerospace education and to stimulate the students' interest in flying R/C models. Under the apt leadership of John Martinez, Project Director, they enlisted the help of York Diamon at Futaba who donated eleven of their R/C systems, Lou Stanley at Great Planes Model Manufacturing who donated eleven of their GLA R/C kits, John Brodbeck at K & B Manufacturing who donated eleven of their K & B .40 engines, Dick Kidd at RCM who donated eleven of their Flight Training Course Volume I books, and nine hobby shops and Bob Martz (club past President) who donated additional kits and all of the glue, wheels, pushrods, covering, and

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Chuck McCain explaining some of the finer points to students.

John Martinez, Project Director, checks out student's GLA.

Flight instructor Bob Martz concentrates as student flies.

other accessories required to complete the models.

But getting the kits and related materials was only the beginning. It was then up to the club members to organize the kits, radios, and accessories into individual classroom R/C Care Packages. These were then formally donated to the Los Angeles Unified School District for distribution to selected aerospace education classes.

To provide help for the teachers, most of whom had never built or flown an R/C model, two volunteer club members were assigned to each class. On occasion they visited the classrooms to meet with the teachers and talk to the students about building and flying R/C models. Safe building and flying practices were emphasized. As appropriate, their comments were related to what the students were learning about the science of flight.

Flight instructor Chuck McCain takes over for some up elevator. Whew.

Teachers and students get answers to their endless stream of questions about radio installation from club members.

Finally, eight months after the classes had received their R/C Care Packages, the big day arrived. Five teachers and their students who were able to arrange their own transportation (required by L.A. City Unified School District policies) were invited out to the club flying field. Only five of the eleven participating classes were invited to this first of several such flying sessions in order to keep the group small enough so all would be assured of some stick time. (Good planning!)

As the students and their teachers

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SUPER TWINKLE
STARS Club "Rally 1983"
By Col John A. deVries

STAR's club member, Bob Dunn's original design 30% Monocoupe 110. Model has piped Quadra for power. In flight, its sound and maneuverability duplicates the prototype, exactly.

"Chicken-Charlie" Nellis' Volksplane. A member of the STAR's club, Charlie earned his nickname, cooking 4 to 800 barbequed chickens for Rally participants each year. And — man, are they good!

T'was an orgy on a mountain top! The mountain top is in southern New York State — the orgy, the Stars R/C Club's Annual Scale Rally. Blest with two days of scale R/C weather (after two years of one-day stands because of rain), the Star's Rally more than lived up to its promise as the premier scale event of the summer. Over 140 avid scale modelers from eight states showed up to display their models, fly them and socialize with others with similar interests. Under the guidance of Rally Director, Bob Brown of Braddock, Pennsylvania, assisted by Star's President (and resident curmudgeon) "Mother Superior" George Privateer (of Allegany, New York), turned the 10/11 July weeekend into an event to be remembered. And, as usual, each participant was given a "more than tasty" chicken dinner, simply for registering.

The Stars have always been in the forefront of the "rally idea." It isn't a contest (there aren't any prizes or entry fees). It isn't a competition (you don't even have to fly your scale model if you don't want to --- just show it off). It isn't a fun-fly (just do "your thing" --- your reward is in the ooo's and ahh's and the applause of an appreciative audience --- over 3,000 this year). You **do** have to pass a safety inspection before you fly and wait for the pin. But, even this latter is so smoothly controlled (with a wild frequency board that keeps the wait between flights short) that one has enough time to get ready and still see all of the other models fly. Since many of the Rally entrants drove in from Canada, the Star's organizers had the more involved problem of integrating the Canadian R/C frequencies with the newly approved U.S. "numbers." So well was this accomplished that there wasn't a single instance of reported interference at Olean's Municipal Airport all weekend. No "glitches," either. Only three crashes marred the festivities; two, the result of mechanical failure of the models involved; the other, the result of pilot disorientation. Good crowd control and flight patterns placed well away from the spectators insured the safety of everyone at the Rally.

Less than a dozen of the models registered for the Rally were of what we would call "normal sized." In other words, there were a lot of big, big birds. There were a bunch of Sig Cubs in the 1/4 scale size, most of them of the long-wing variety. Discounting the Star's fleet of Bristol Scouts, the second most numerous model type represented were Concept Fleet biplanes (and most of them magnificent in their paint jobs). Since the rally was in the east, it would be expected that there would be a bunch of Nick Ziroli's designs --- and there were. Three AT-6's, four Fokker Triplanes --- there were a bunch. But the fact that struck wanderers of the Olean flight line were the host of self-designed and scratch-built big models! Three models in particular of this category caught my eye: Ralph

Charlie Yaindl's magnificent Heath LN-4. Charlie started with EAA drawings for the real bird and designed and built this orange 1/3 scale model. Outstanding workmanship — and, to coin a cliche, it flew as good as it looks!

Canadian Colin Wilson's breathtaking pre-WW I Avro biplane. Only three channels (no ailerons!), model is flown by Rudy Mayer when there's absolutely no wind! Quadra powered, Colin used a second Quadra cylinder to provide nose weight and simulate the engine on the "real" Avro.

Scratch-built from "Model Aviation" drawings, Sam Melli's scale Maule was covered with Coverite and painted with DuPont acrylic lacquer. Quadra hauled it around the Olean airport.

Larry Potter's big Gere Sport bipe. Substantially modified (spruce and plywood) Nosen kit --- with a Kioritz. Larry's from Courtland, New York.

One of four Ziroli designed Fokker Dr. 1's at the rally, this beauty was built and flown by Bruce Kane. Something went amiss when this model was airborne and it became one of three models damaged at the STAR's Rally (repairable!).

IMAA Chapter 73's Woody Haggerty's modified Bucker Jungmeister. Smooth flier, with a Quadra.

Ron Miller's big Fokker DVII — Quadra.

Norm Orcutt's E-2 Cub --- 50% enlargement of RCM drawings, for a Quadra. E-2 was predecessor of much better known J-3.

Butler, Pennsylvania's Ralph Bruner's 1/3 Scale Howard "Ike." One-time P-51 "driver" Bruner designed and built this Golden Age air racer. Good flier, Ralph was sorting out Quadra engine problems — flew bird with and without the cowling.

Another view of Bob Dunn's Quadra Charger powered Monocoupe. STAR's club members don't usually fly at their own rally, leaving the skies to visitors' models. Dunn gave into popular clamor --- flew it beautifully!

One of Ken Koeppel's three WW I Bristol Scouts. Quadra powered, 1/4 biplane is part of the STAR's club fleet.

Norm Orcutt, STAR's member and "keeper of the flight line board." The advent of our new R/C frequencies plus many Canadian frequencies required very close control. All entrants had a numbered plaque on the board --- were called for flight when it reached the bottom of his frequency slot. Sporty board built from maple, taken from the tops of old school desks!

Jim Hand, Wellsville, New York, built this Fox 60 powered DH.2. Model is one of the few on display that couldn't be considered a "giant."

Ziroli Sopwith Triplane by Ziroli. Like other of Nick's designs, this Quarter-Scaler flew very well.

Ray Hinds, of Connecticut, drew his own plans for this 1/3 Scale French Morane Saulnier WW I "pursuit." Dead-on scale, model had prototype's "all flying" stabilizer; Quadra power. Wings warp, too!

Canadian Rudy Mayer's DH, one of the few belt driven/geared models flown at the STAR's '83 Rally. Big model had a 40 in it!

Big British S.E. 5, built by Jerry Joseph of the Rochester, New York R/C Club (RCCR) --- and representative of the spirit of the STAR's Rally. You don't have to fly your model --- and almost completed beauties like this one are welcome.

Bruner's Howard Ike; Charlie Yaindl's Heath LN-4 and Ray Hind's WW I Morane monoplane --- all were outstanding!

'Nuff of the words --- because the **pictures** really tell the story. Even five rolls of 35mm film weren't enough to capture **all** of the models on the flight line or in the display area. Watta orgy! □

Ralph Hind's Morane in flight at the Olean airport. Ralph said that all-flying stab gave him difficulties during pre-Rally test flights — until he found the proper degree of movement. Third scale bird flew steady as a rock at Olean.

Dick Allen, Endicott, New York, assembles his Ziroli designed Fokker Triplane. Allen duplicated the paint job of Cole Palen's full sized DR. 1. Fantastic flier.

Ziroli's van --- young Nick flew the be-jabbers out of the Taube in the foreground. It had a 4-cycle 60 in the nose and flew like the prototype.

Three Ziroli T-6 Texans (Nick's is in the middle). The "Harvard" on the left was built by Ralph Jackson of Endicott, New York. The 94th Pursuit Squadron "hack" on the right was built by Chris Dascano of Hancock, New York, and featured a pair of Dascano designed and built retracts that'd blow your mind. Ziroli's and Jackson's models both flew — Dascano's was so new that Chris didn't have time to bolt in an engine.

Wendell Hostetler's Bucker (from Orrville, Ohio) is a perfect model of a real airplane (two wings and a round engine!) Real class.

ANIMALS AND AIRPLANES

By Toby S. Hutcheson

My husband, Jerry, has flown R/C planes since he was about eleven. He and his father have had many planes and would fly almost every weekend, in the early 60's. I naturally assumed (incorrectly, I might add) that this had been a childhood hobby and that he had outgrown model airplanes, R/C or whatever. Never assume anything when dealing with men, especially with those who love airplanes. After approximately a 10 year sabbatical away from flying R/C's, Jerry resumed the hobby at a fever pitch.

I wasn't particularly bothered by his talking about it, nor was I very disturbed when he resurrected an old plane called "the Candy." He fussed over it night and day trying to get her into flying condition, then he just seemed to lose interest. Not a good sign. I was to discover later, this means there is a possibility of a new plane appearing, and that is exactly what happened. I came home from work, and noticed furtive activity in the direction of the bedroom closet. It was then the ambiguous questions started, "How would I feel about him flying R/C's again?" "Would I mind if he bought a new plane?" I nodded agreement, shook my head no, not really listening to anything he said. There were a few more generalities, then he disappeared, returning with a plane kit. The picture on the box was of a "Spitfire." Being totally naive, I asked him how much the kit had cost, figuring no more than $25-$30. Big smile and he told me --- I had no idea that balsa wood could cost that much. Another smile and he informed me that he had to buy the radio equipment as well. I stared at him in disbelief, immediately he started defending the plane and himself. There was no other recourse for me to take, so I accepted the plane, if rather grudgingly, as a new addition but, I added, no more planes.

Man and plane were firmly ensconced in our bedroom and had been for about a week. Jerry would arrive home, open a beer and start working on the plane. Dinners would get cold and my temper would flare; it was about this time I also met "X-Acto."

"X-Acto" is a wonderful tool if used properly. It cuts, shaves, trims, as well as putting holes where they should be and sometimes where they should not be. Jerry tends to be very careless with "X-Acto," and "X-Acto" can be very unforgiving to careless people. Jer had gotten up to answer the phone and had forgotten "X-Acto's" whereabouts, only to step full-weight and find him. A low wail-like scream was followed by a flow of unrepeatable words. Not content to stay in the bedroom and moan, I must also share in the experience by having to examine the wound. Jerry will trail blood over any surface, rug or linoleum, to show me a gaping slash on his foot. I am far from sympathetic, as I am the one who has to clean up after these mishaps. "X-Acto" tends to be quite vindictive and I spend a lot of time cleaning up while he is in use.

Along with the drawbacks of "X-Acto" are the minute slivers of balsa wood and dust that seem almost ever-present in our small apartment. I am not one of your outstanding housewifes, but the most irritating thing to me is a dirty rug. I have an absolute mania about it. During the height of model building, I vacuum alot. I tend to disregard anything that gets in my way with the vacuum and just plow ahead. Jerry panics when he sees me coming and quickly tries to gather as much as he can out of the path of the vacuum. I have had more than a few sessions with him over this, as he gets a little bothered about my attitude towards his plane. He has come up with a diabolical strategy against the vacuum, although he would never fully admit it. He manages to leave a few odd nuts and bolts around, so when I vacuum, I always find them. The most godawful noise is emitted from the vacuum engine, it sets my teeth on edge, not to mention the damage it must be doing to the engine. So far the vacuum has not broken down.

When Jerry is not working on the planes, he props them up against the bedroom wall. They list to the right, or to the left and always look on the verge of falling. Getting up in the middle of the night is a real challenge. Like a game of blindman's bluff, arms outstretched, hands waving gently, so as to feel a fuselage or wing without actually knocking it over. Jerry has sometimes changed the location of a plane and not informed me. Invariably, I knock it over only to hear screams of vengeance issuing from the bed in the dark. One night Jerry was sick and he asked me to get him a glass of water. I walked right into one of his planes and put my big toe right through an air vent. I did not mention the mishap but I knew he had discovered it the next day when he glared in the direction of the plane and then at me.

The Air Force in our bedroom now numbers four planes, two gliders, one plane under construction and two in paper bags. During the building process of all of the planes, Jerry not only has to contend with the destruction I cause, but has to deal with the animals as well. We have a rabbit, a dog and a cat, listed in the order of the most destructive.

The rabbit is by far a very efficient eating machine and his diet now includes balsa wood. He stumbled upon this discovery one night after being left out of his cage. Jerry had left

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By Dick Kidd

If you're scratching your head as to what to do for the little RC'ers, give this project some thought. It's something you can't go out and purchase at the toy store.

Built 2½ years ago as a Christmas present for his granddaughter, Sarah, now 4½, still gets a kick out of being the only "Kidd" in town with her own airplane.

This old time biplane is the perfect toy for the future RC'ers up to the approximate age of six. It works well for either a boy or girl and if you get started right away, you can have it finished long before Christmas.

This idea was originated by Dr. Clois McClure, who built a complete squadron for the day care center at the College of San Mateo.

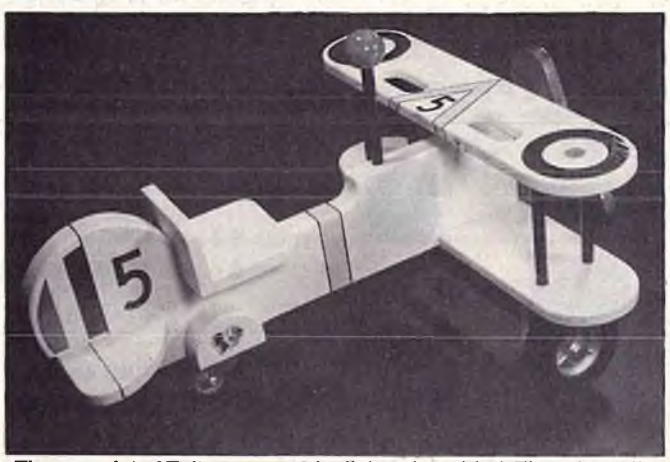
The fuselage is cut from a 2" x 10" x 36" piece, while the rest of the parts are cut from 1" x 6". We used clear redwood, however, the choice of wood can be left entirely to the builder. We spent the better part of a day penciling the parts onto the wood and then cutting them out using our bandsaw. A saber saw would work fine and, if you have a table saw, or circular saw, many of the straight cuts can be made. An electric drill is also necessary for drilling the axle, and installing the prop, control stick and wing struts.

The total cost on this project came very close to $45.00. This was starting from scratch and purchasing everything new. If you were to check around and do some scrounging here and there, you could no doubt come up with most of the materials. The wheels and caster took a good bite out of the $45.00.

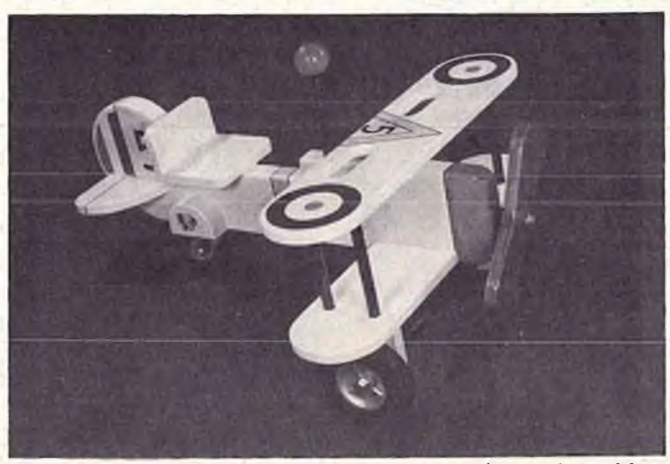
Construction:

Now that we have all the pieces cut, the edges sanded smooth with a small radius and the flat surfaces sanded to builder's satisfaction, we can proceed with the various assemblies. We'll start with the landing gear side pieces. Mark the axle location and drill a 1" hole 1/4" deep for the axle to set in. A small pilot hole should be drilled completely through the side pieces for a guide when drilling the axle out for the lag screws. Now glue the axle into the 1/4" deep holes and, at the same time, glue and nail the landing gear top in place using finishing nails. These are to be countersunk and the holes filled before priming and

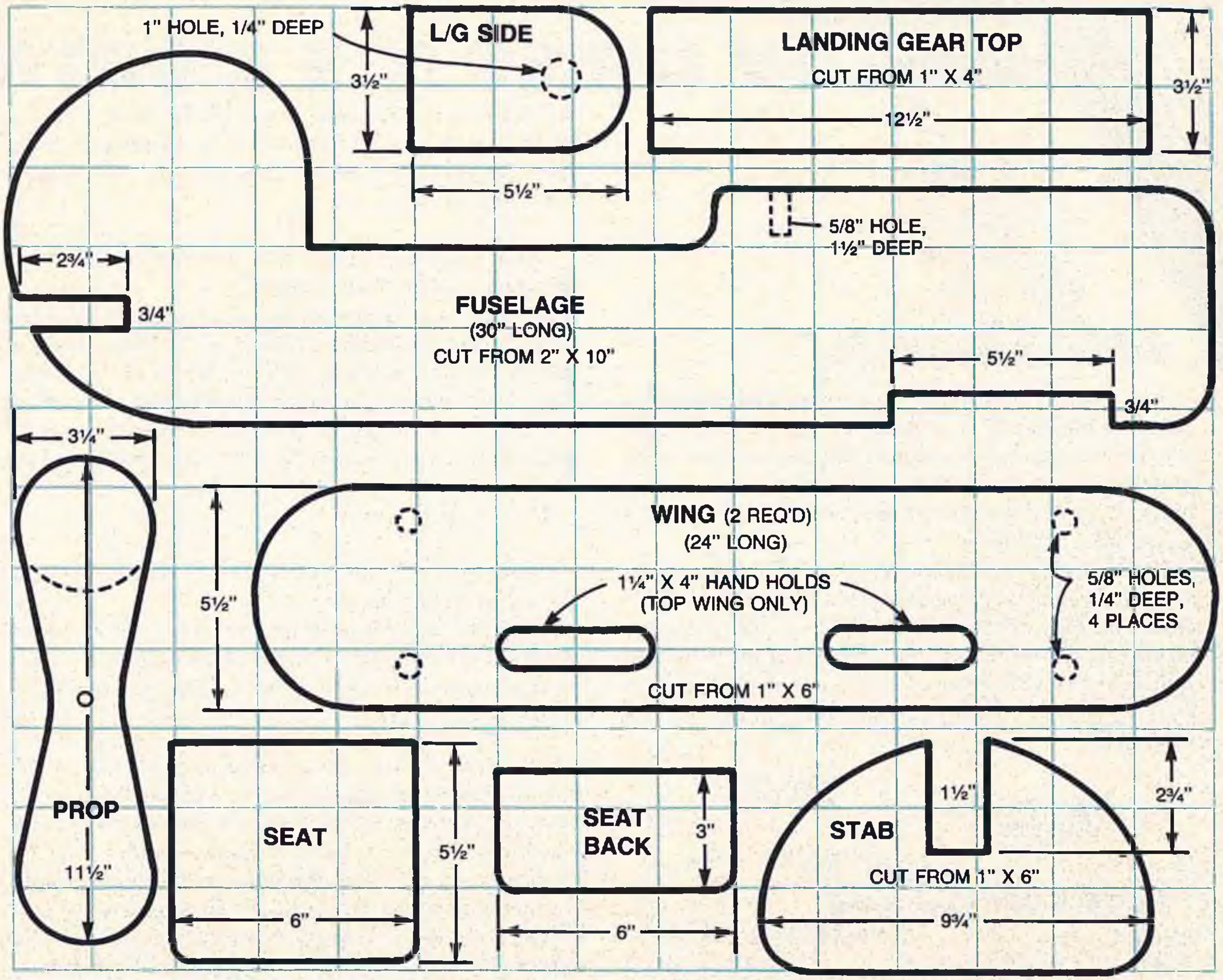
SANTA'S TAILDRAGGER BIPE



The completed Taildragger with all the trim added. There is really no place to stop.



We even thought about putting dummy engine and machine guns but ran out of time.



REPRODUCE TEMPLATES ON 2" GRIDS

painting. When the glue has set, the axle can be drilled for the lag screws. Be sure to drill deep enough for the lag screw to seat against the wheel. Do not install wheels or landing gear at this time.

The wings are next in the assembly. Start by locating the strut positions and drilling four 5/8" holes 1/4" deep. (This is a good time to go ahead and drill a 5/8" hole in the fuselage for the control stick along with the hole in the control stick knob.) Glue and nail the four 7" struts in place between the two wing panels. Again, use finishing nails and countersink the nails to be filled later.

The stab can be slid into the slot cut in the fuselage. It should fit snug and, with some glue applied, it can be nailed from the bottom side of fuselage. The back of the seat is glued and nailed to the seat bottom. The seat

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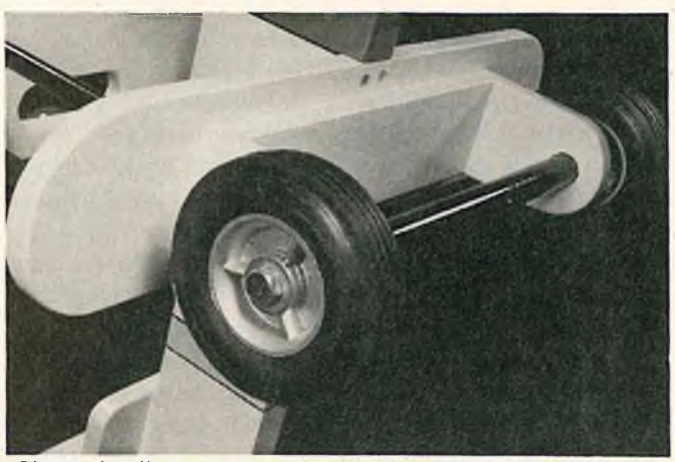
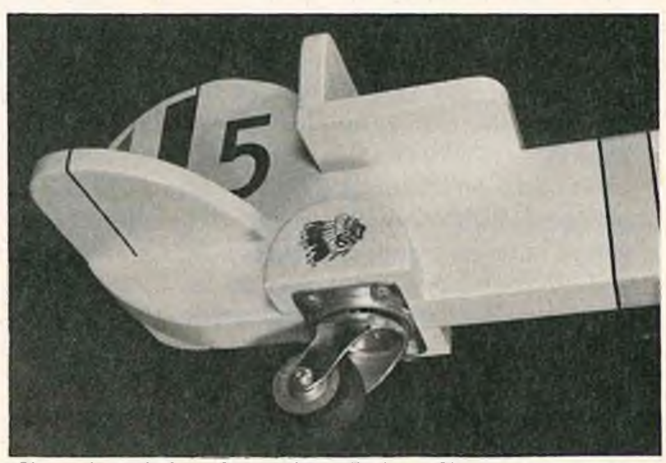


Shows landing gear and lower wing. Wings installed after painting as noted by the two screw heads showing.



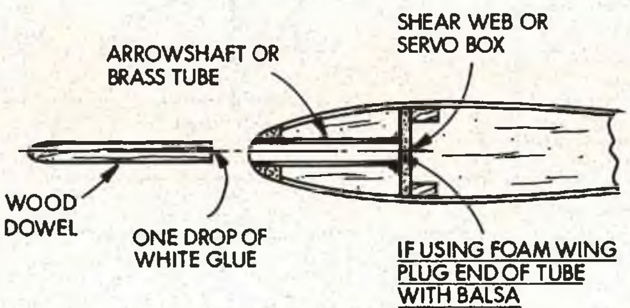
Shows installation of castering tail wheel. Shim had to be placed under mounting flange. (See text.)

FOR WHAT IT'S WORTH

Edited By Jerry Smith

Have you ever tried to replace a broken wing hold-down dowel? Trying to drill it out is all but impossible. Here is a good solution in case you are faced with this problem. Build into the wing a length of 1/4" I.D. fiberglass arrowshaft or brass tubing. If you are using foam wings, install it when gluing them together.

After the wing has been covered, cut out the hole in the arrowshaft with a #11 modeler's blade. Put one drop of glue on the end of the wing hold-down dowel and push it into the arrowshaft until bottomed. To replace it, a slight twist is sufficient to break the glue joint for removal. Many thanks to Frank Weaver of British Columbia, Canada, for this super idea.



Ray Benton, Baltimore, Maryland, tells how he solves an old problem. Having trouble with masking tape or (even) vinyl tape lifting paint off a model and spoiling the finish --- especially if either kinds of tape have been left on a model for a long while? Here's how Ray does it.

Carefully lift up about 1/32" of the tape at the end. If the tape is heavily coated with paint, then run a razor blade carefully along the line of the tape to cut loose the paint. Using a camel hair brush, dip it in Bestine Solvent and flood the adhesive side of the tape. As the adhesive is dissolved, gently pull up the tape. The adhesive is dissolved when the tape offers no resistance. Bestine Solvent is the trade name for ruber cement thinner which can be purchased in any art supply store. It will not affect doped or enamel surfaces and can clean metals. The goo that is left on the model after removing the tape can be cleaned with the solvent. Wash model with a detergent afterward for a spotless surface.

Stan Leonard, Flint, Michigan, had this idea that makes life at the flying field a bit easier.

A hatch cover that has come off in flight is easier to spot if one end of an old frequency flag or similar piece of cloth is glued to the underside of the hatch. The streamer will make the hatch easier to track as it descends, and also make it easier to find.

Ronald Hemphill, Butler, Pennsylvania, submitted the following solution to an old problem.

So many times when we install plastic canopies on a new plane, we get them glued in place only to find sawdust or dust or lint on the inside. The solution is in your wife's dryer. Use one of the anti-static sheets such as "Bounce" or "No Cling." When the canopy is ready to mount, wipe it with one of these sheets and it takes the static out of the plastic as it cleans it. Now the canopy can be mounted without picking up dust.

Shawn Miller, South Beloit, Illinois, sent in this idea that has been very helpful.

He applies a coat of bright red paint to any removable cap on tubes or bottles so that he can easily find it among the tools, wood, etc., on his workbench. Usually those things are the hardest to find when they are right under your nose.

Perry Rose, Moosup, Connecticut, suggests that if you want fast starts on cold engines in cold weather try the following: Open the throttle wide, prime with 10 to 20 drops of fuel depending on engine size. Remove the glow plug and spin the engine with an electric starter. Excess fuel should exit through the glow plug hole. If nothing comes out, hold a finger over the carb venturi and spin again for a couple of seconds. Remove finger and spin again until a fine mist starts to exit the plug hole. Replace glow plug, close throttle, attach battery and flip with finger or stick. Perry has an Enya .19, a Max .25, a Fox .45 and a Como .51. They all start on the first or second flip using this method.

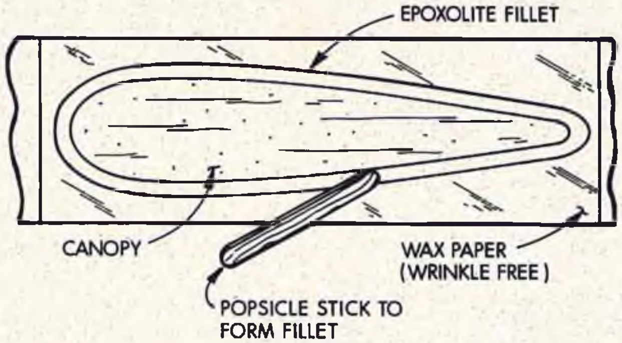
Troy Osborne, Danville, Virginia, suggests that to avoid ragged edges when cutting fiberglass cloth put two layers of newspaper under it and cut the paper along with the glass cloth. It works well and leaves a good edge.

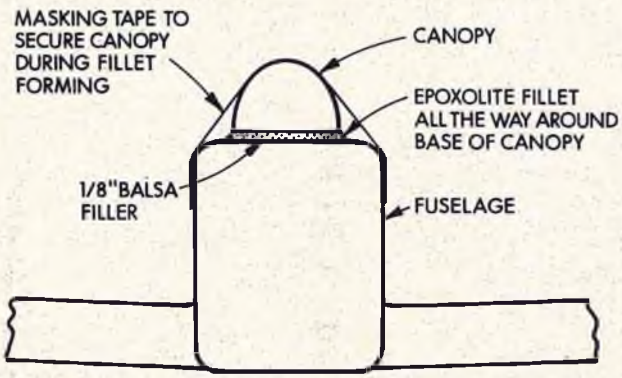
Terry Gaillard of Auburn, Alabama, has found that the following procedure for mounting a canopy is easy and makes a real neat installation. He starts by cutting a piece of 1/8" balsa to the shape of the canopy so that the balsa fits snugly inside and flush with the bottom of the canopy. Paint the balsa insert the desired color. Glue the painted balsa insert flush with the bottom of the canopy using Super Jet or equivalent. Tape waxpaper to the fuselage where the canopy is to be mounted. (Use masking tape and make sure the paper is wrinkle free.)

Using black plastic tape, tape the canopy, using the top of the balsa insert as a guideline. Position canopy and secure in place with masking tape as shown in sketch. Using Sig Epoxolite, make a fillet around the canopy and shape it with a popsicle stick. After shaping, use your little finger (wet) and smooth the Epoxolite.

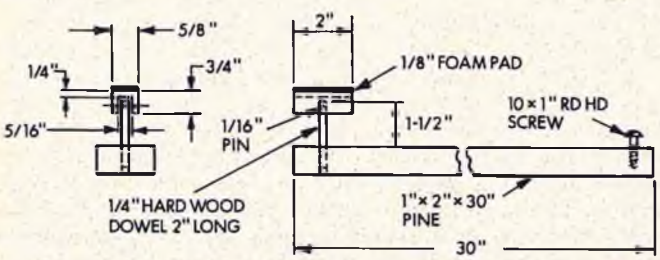
After the Epoxolite has cured overnight, remove from the fuselage and sand the outer edges using 400 wet or dry paper. Paint the fillet your desired color. After the paint has dried, remove the black plastic trim tape. Attach the canopy to the fuselage with Super Jet or Hot Stuff Super T.

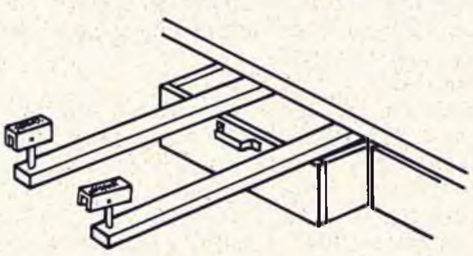
The fillet allows the canopy to flow into the fuselage making it look molded in place rather than just glued on. And, it makes an easy canopy installation. See sketch.





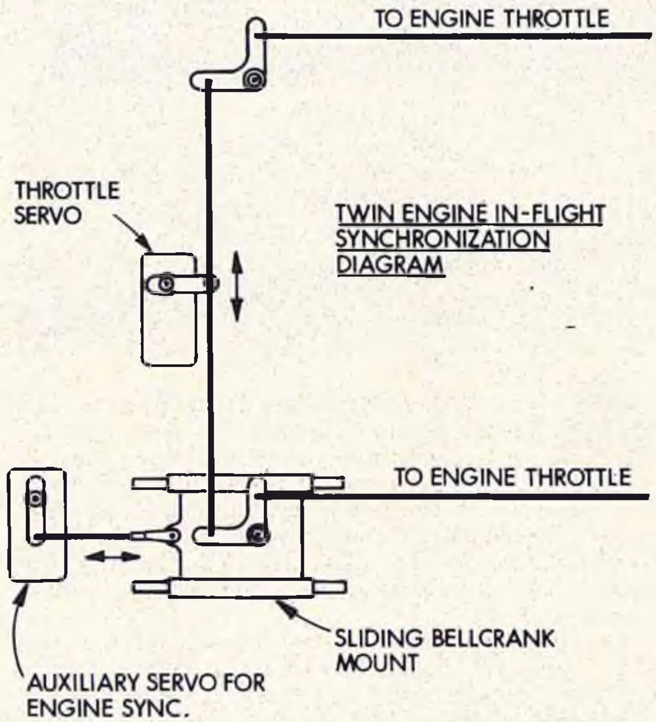
Ed Fisher of Cold Spring, Minnesota, has a real neat way of balancing his airplane. He calls it an adjustable balancer for model airplanes. See the self-explanatory sketch for building details.





OPEN DRAWER AND ADJUST BALANCER TO FIT MODEL

This drawing is for a system whereby you can easily synchronize the engines in a twin engine aircraft. It has the advantage that you may tune each engine individually for its maximum performance, and then simply adjust its carb position via R/C until the engines are in perfect sync. It also works like a whiz on the ground for taxiing. For a twin taildragger, a system such as this is almost mandatory --- on the ground (for a left turn) pull the auxiliary servo back and advance the throttle stick. For normal operation the auxiliary servo is located at its center position and use the throttle normally. Minor repositioning of the auxiliary servo will bring the engines into close synchronization. One final note: Since this system will occasionally pull the throttle of the engines far lower than normal, an override spring on the low side will be necessary and the throttle stop adjustment must be used to determine full-low idle. Low idle trim cannot be used for engine shutoff. If you do use this system on a big bird, be sure to provide for some method of positively shutting down the engine, **this is mandatory!** Thanks to Prince Georges Radio Control Club Newsletter.



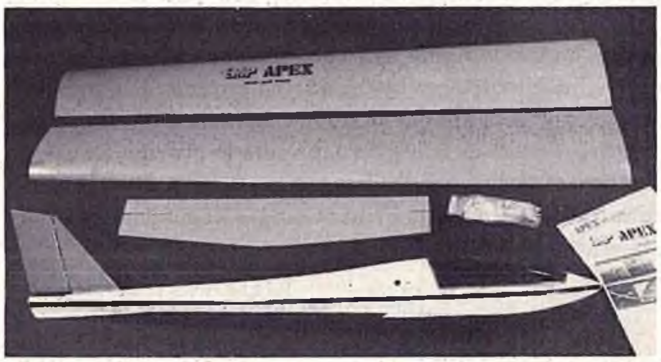
If you've ever painted your model and left the masking tape on too long and found that the tape has stuck or left a tape glue residue, you know how hard it is to remove without damaging the newly painted surface.

George Harlan of Irvine, California, has found that by using WD-40 and a soft cloth, the sticky tape residue comes off with little effort and no damage to the painted surface. But, remember, when trying something new, try a test area for your particular circumstance.

Send your hints & kinks to R/C Modeler, P.O. Box 487, Sierra Madre, Ca. 91024 — win a free book from RCM's Anthology Library series if your idea is used.

RCM PRODUCT REVIEW

Edmunds Model Products
APEX 98



SPECIFICATIONS

Name	APEX 98
Aircraft Type	Sailplane
Manufactured By	Edmunds Model Products, England
Imported By	Hobby Lobby International, Inc. 1 Franklin Pike Circle Brentwood, Tennessee 37027
Mfg. Suggested Retail Price	$175.00, Hobby Lobby price $139.00
Available From	Direct from Importer
Wingspan	98 Inches
Wing Chord	7" (Avg.)
Total Wing Area	672 Sq. In.
Fuselage Length	42 Inches
Stabilizer Span	24 Inches
Total Stab Area	96 Sq. In.
Recommended Engine Range	NA
Recommend Fuel Tank Size	NA
Recommended No. of Channels	2
Rec. Control Functions	Rudder & Elevator
Basic Materials Used In Construction:	
Fuselage	Plastic
Wing	Foam w/Balsa Sheeting
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (4 pages)
Construction Photos	No (Drawings)

RCM PROTOTYPE

Radio Used	Airtronics
Engine Make & Displacement	NA
Tank Size Used	NA
Weight, Ready to Fly	40 Oz.
Wing Loading	8.22 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
"Prefabability" of the kit. Good fit of parts and covered well — good flier.

WE DIDN'T LIKE THE:
Slight problem on stab hold-down. Tow hook needed to be moved 1" aft.

Apex. Websters Dictionary defines Apex as, "the highest point of anything; tip; peak; vertex." This is high praise, indeed, in today's sailplane market, and we recently had the opportunity to find out first hand just how close this aircraft comes to living up to its name. The Apex is manufactured by Edmunds Model Products, in England, and is available in this country from Hobby Lobby International, Inc., P.O. Box 285, Brentwood, Tennessee 37027.

Upon opening the carton, one word immediately comes to mind, **"quality,"**. Contained within the 50" L x 9" W x 6" H box was the finished fuselage complete with vertical fin and rudder attached. The canopy, too, was in place. We have no idea what kind of plastic was used in the fuselage, but it is an exceptionally good one for this purpose. Very lightweight, quite strong with just enough flexibility to get you through hard landings without any fracturing and, at the same time, rigid enough to serve well in its intended role. The finish was excellent. The care and attention that had gone into the construction of the wings fairly leaped out at us. The horizontal stab, a four page instruction manual, and a plastic bag of miscellaneous parts completed the inventory. At this stage of the game you may correctly assume that we were very impressed with Apex, but, as they say, the best is yet to come.

One doesn't really construct or build Apex. It's a matter, for the most part, of assembly. The plastic bag contained the following: screws, rubber bands, wing rods, screw eye hooks with plastic plugs for the wing hold-down, servo tape, Kwik Links for pushrod ends, and control horns.

The manual, in the form of four 8½" x 11" sheets, covers just about everything you want or need to know about getting this sailplane airborne. Complete instructions, plus very good isometric drawings, show the way the wing is held in place, how to bolt the stab to the fuselage, radio installation, and pushrod dimensions. There is a section on how to achieve the correct Center of Gravity and, you guessed it, a fine outline on test flying the bird. Included under the flying instructions is a rather detailed examination of ballasting and slope flying. Closing off the manual is a general hints section that covers everything from safety checks to repair methods, parts replacement, etc. As far as we could tell, nothing had been left out and, indeed, quite a bit more had been included than we would normally have expected.

Construction:

Almost immediately we encountered our first and, as it turned out, our only hitch. The screws that bolt the stab to the fuselage do not seat far enough down and, as a result, restrict the free swing of the rudder. A slight bit of countersink cured the "problem" in quick time. In conjunction with this, we noticed that the plywood plate that the stab screws go into did not appear to be too well-glued in place. A touch of 5-Minute epoxy was added for insurance.

It is necessary to make up a simple tool out of 1/16" music wire that will hook onto the rubber bands that hold the wings securely against the fuselage. The wings really have to be seen to be fully appreciated. They use the Eppler 193 airfoil which is very popular in the European circuit and, as a matter of fact, was used on the Austrian designed Passel that captured the World Championship in 1979. Each panel weighed exactly 8.11 ounces, and was constructed of foam, plywood, balsa and covered with English made Superkote film. We retightened the covering with a heat gun and, to date, it has remained sag free. Installation of pushrods was straightforward with no problems along the way.

Radio:

The radio system used was an Airtronics' four channel with only the rudder, elevator functions used. We found more than enough room for installation, and followed the instruction manual's directions to the letter. The servos were held in place with the double stick foam tape (provided), and all in all a very clean, "easy to do" set-up was attained.

Flying:

On the slope, Apex provided lots of fun, and was easy to control. It flew well with zero ballast in 2 to 10 mph winds. Above 10 mph, ballast can be added as needed with the maximum (according to the manual) at 12 ounces. Because of two control configuration, Apex could not be called an aerobatic glider, with stall turns, loops, very, very slow rolls, and tail slides completing its bag of tricks. Inverted flight can be achieved but, because of the wing design, can't be sustained for any great length of time. We left the elevator at the recommended throw, and set the rudder at maximum for our stint of slope fun.

Because Apex flew as well as any kit-built glider we had flown in a long, long time, we decided to push it structurally to see just how well the spar-less foam wing would hold up. For example, at an altitude of six to seven hundred feet (verified by nearby instrumented hang gliders). We dove Apex vertically for about 150 feet with a mild pull out to around a 60° angle and held for approximately 200 feet. The stick was then let go, and Apex continued to dive at the same angle. This was good. If the C.G. had been too far forward (tail heavy), it would have pulled out of the dive, and if the C.G. had been too far aft (nose heavy), she would have tucked and dove at a steeper angle. These tests were conducted at the recommended C.G. location. During the dive the wings went completely flat and then the tips loaded slightly more as speed and angle changed. With ballast added, the speed increased and results were easier to see. While the design size is completely adequate, we would recommend larger diameter wing rods if any violent maneuvers with a ballasted ship is contemplated. For all normal flying, Apex does just fine the way she was born.

While thermal flying in still air, the dive tests were again conducted, and the results were pretty much the same. One minor fault did surface here, however. When diving in still air, without the benefit of slope lift, the stab is in a slightly washed-out configuration. This will result in a delayed response during pull out. Depending on the altitude at the start of the dive, painful consequences would be your reward. We stick by the tag "minor" when describing this fault --- the test we put Apex through was not your run of the mill maneuver.

We found that the tow hook was too far forward to allow a satisfactory altitude gain during launch. Moving it 1" rearward increased our launch height at least 50%.

Conclusion:

Apex is a great sailplane, and can take its place alongside the best --- and in front of many. Workmanship, quality of materials, appearance, and wonderful flight characteristics mark

to page 182

from page 164

the wing of one of his planes on the floor, the rabbit hopped on in and had been peacefully munching away until he was discovered and thrown back into his cage. Since that first introduction to balsa wood, it has been love at first bite. The rabbit has learned the art of discretion when he makes these commando-type raids. He waits until Jerry is either out of the room or is sleeping soundly, then he attacks! I have heard the rabbit chewing the wood and I do attempt to stop him, if rather halfheartedly. Jerry, on the other hand, becomes a demon possessed, brandishing an X-Acto and heading for the rabbit. I have to intervene at this point, asking for mercy and emphasizing the fact that rabbits are not known for their intelligence. Eyes glowing and muttering something about seeking revenge, Jerry retreats back into the bedroom and peace reigns, if only for a short while.

It really is not the dog's fault that he sometimes puts holes in the wings, it's just that our bedroom is so small. It is hard enough to navigate in the bedroom with only two legs, but it presents an even bigger problem with four. Jerry is anything but organized, and is very haphazard about where he leaves his planes sometimes. He usually leaves them scattered all over the floor; to get to the bed is a real feat. You must learn to balance on one foot and try to leap at the same time to reach the bed. I can manage this all right but the poor dog has to really tax what little brain he has in order to figure what is really his best approach. He has the running method, this is where he just runs full tilt and hopes for the best, or the jumping method, which is the least successful and is the last resort. He just leaps in the direction he wants to go and, hopefully, he makes it. When he does not succeed there are paw-sized reminders that he failed. The dog has shown a decided preference for eating screws, nuts and servos. I look at this problem very rationally; if the dog eats them, my vacuum doesn't. Jerry, on the other hand, is not as understanding since servos are very necessary and expensive. There is no sadder a sight than that of Jerry staring at the plugless ends of servos.

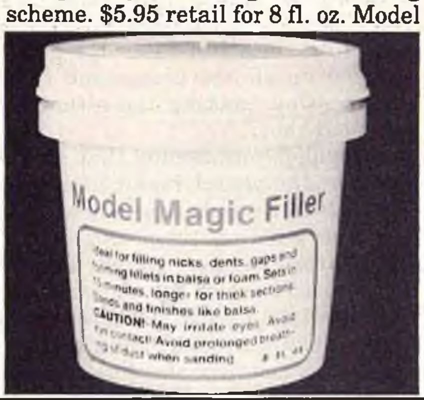
The cat is by far the most fortunate, she is Jerry's favorite. I fit in somewhere between the dog and the rabbit. There have been five planes built in our bedroom. When Jerry has finished with the building plans, he rolls them up and puts them on the floor of our closet. For a while the cat chose the closet as a place to sleep. Jerry used to marvel at her individuality, and even went so far one day as to open the closet door and admire her while she slept. Occasionally the sound of paper being rustled would come from the direction of the closet. Jerry would get this idiotic expression on his face and tell me how wonderful the cat was. Why it never occurred to him that the shredding sound might be his plans, I'll never know. He did discover what happened to them. He had to re-do a portion on the "Spitfire" and he needed the plans in order to do so. He was looking in the closet and asked me why there were all these tiny pieces of paper all over the closet floor. I realized what they were but did not want to say anything to Jerry until I had hidden the cat. It wasn't long before Jerry figured it out himself. By piecing some of the larger bits together he could just make out that this was all that remained of his plans. No words, just a slow flush that started under his collar and spread upwards into his face. He slowly picked up all the pieces and threw them away, making the alterations without them.

Wouldn't you assume that all this misfortune would make him think twice before purchasing a new model or stop building them entirely. No way! Jerry has just bought his sixth kit to construct in the bedroom with all our animals still under the same roof. A few of my girlfriends were over last week and were skeptically eyeing the bedroom mess. One of them asked me how I could stand all the fuss and the mess. I just smiled and told her, "I wouldn't have it any other way!" □

SHOWCASE '83

from page 146/144

set, and ready to sand in 15 min. for small jobs; deep build-ups take longer. When set, it is to be treated as balsa and sands **exactly** like balsa and will accept any covering or finishing scheme. $5.95 retail for 8 fl. oz. Model Magic Products, P.O. Box 7784, St. Paul, Minnesota 55119 (715) 425-1397.



APEX 98

from page 177/176

it as one to be very seriously considered if you are in the market for a 98" wingspan sweetheart. It can be assembled and successfully flown by the novice, provided he takes the time to read the very excellent manual that accompanies it. And for the very same reasons --- that is, workmanship, quality of materials, appearance, and flight characteristics, the experiened flier will be greatly pleased.

It was a real pleasure to assemble and fly Apex, and her designer Dick Edmunds certainly is to be congratulated in making available such a wonderful sailplane. □

BIRDS GIVE AEROSPACE EDUCATION A LIFT

from page 155/151

arrived, they were greeted and invited to walk around the pit area to look at the planes and talk with their pilots. Club members Merle Ruppert and Phil Wolf flew some demonstration flights with a 1/4 Scale Pitts and .40 size Smith Mini Plane respectively. Then, the more formal activities began with a pre-flight meeting in which Chuck McCain reviewed the operation of the transmitter. "Pulling back on the right control stick makes the elevator go up. Pushing forward ... (doesn't anyone out there still fly Mode I?)" Then it was out to the flight line. One at a time the well-mannered and eager students would step up, take the buddy box transmitter and wait anxiously for that moment when their instructor said, "You've got it." Then we heard familiar comments like, "Easy on the controls. Give it time to respond so you don't over-control."

After the teachers and their students had some stick time, they lined up to watch Rich Verano put his pattern ship through some awe-inspiring maneuvers to demonstrate what an R/C pattern plane can do in the hands of a talented and experienced pilot. Following a round of applause for Rich and more time for informal discussions, their exciting day at the field closed with a drawing of some kits and engines that were donated by the club. The club also extended an open invitation to the students to bring their models out to the field when they are ready for that critical first flight.

As a follow-up to the day at the field, aerospace education students at Markham Junior High went on a tour of the well-known Craft Air R/C model manufacturing Company. Led by production manager Rich Verano, the students saw R/C kit production first-hand and also learned about career opportunities in the industry. Their visit concluded with the donation of several Craft Air R/C kits to the class — much to their surprise.

While we've only touched on some of the highlights of this year-long aerospace education project I think it's clear that when the B.I.R.D. R/C Club says they support aerospace education, they mean it. Coordinating the acquisition and organization of the kits, radios, engines, and miscellaneous parts, meeting with the teachers and students, and giving up a precious Saturday of flying time took a great commitment to the project. Having watched it from the sidelines, I can attest to that.

On behalf of all of us in the hobby and the teachers and students who participated, I want to express our sincere appreciation to John Martinez, Project Director, Bob Martz, Melody Hanes, and all of the members of the B.I.R.D. Club for making this unique community sponsored learning opportunity possible. And we can't forget also to say thanks to the contributing manufacturers and numerous hobby shops for their support. As one of the students comments, "This is really great. I'm going to remember what we did in this class for a long time. And I'm building my own R/C glider, thanks to what we learned from the people in this club." □

SANTA'S TAILDRAGGER BIPE

from page 173/172

is then attached to the fuselage using glue and three screws — two into the seat and one in the seat back. These screws should also be countersunk.

At this time, the landing gear assembly is glued and either nailed, or screwed to the lower wing. Don't forget, the hand holds are on the top wing.

The heavy duty caster we purchased for this project had a wide mounting plate. This made it necessary to add two half round pieces cut from the 2" x 10" on each side of the fuselage. These pieces were glued and had two long screws in each side. Although not shown in the photo, the tail wheel caster needs to have a wedge shaped piece cut to make the caster level when the bipe is sitting on its three wheels. The front of the mounting plate needs to be raised about 3/8". This will avoid the tendency of the bipe to want to tip over when turning.

Now it's time to fill all nail and screw holes and apply some sealer and primer. The amount of primer and sanding you do will give you whatever finish you desire. When satisfied, either spray or brush the final paint. Ours was sprayed with white lacquer and the wing struts, control stick, and axle were painted black. The cowling and control stick knob were painted red.

The wing assembly can now be attached to the recess area in the fuselage via glue and four screws. Wheels are screwed into the axle using two of the lag screws with a washer on each side of the wheel. Our wheels required 1/2" diameter axles so be sure to check this when getting together the materials for this project.

The prop was stained with a light oak and had several coats of clear varathane brushed on. The prop is installed using a 3/8" lag screw with washers on both sides. We took a 3/4" length of 1" dowel and drilled a 3/8" hole through the middle. This was painted black and put between the prop and the fuselage. It looks neat!

The additional insignias, numbers, and wide stripes were cut from MonoKote trim sheets. Black striping tape was used to outline the rudder and elevator.

This conception is only one of many designs that could be built. Just minor outline changes could make most any WW I model or most any model you want. Do your thing and watch the surprised look on the face of the little RC'er on Christmas morning. It makes the whole effort worthwhile. □

TAILDRAGGER BIPE MATERIAL LIST

2" x 10" x 36" — fuselage.
1" x 6" x 72" — wings, tail, seat and back.
1" x 4" x 36" — propeller and main landing gear.
1" dowel, 13" long for axle (comes in 3' lengths).
5/8" dowel, 36" long — five 7" pieces for wing struts and control stick.
1½" round wooden drawer pull for control stick knob.
Two 5" wheels and one 3" caster.
Three 3/8" x 4" lag screws with two washers each for mounting wheels and prop. Check axle size on wheels. You may need 1/2" lag screws.
Bottle of Wilhold aliphatic resin glue.
Misc. screws and finishing nails.

ENGINE CLINIC

from page 106/100

rear bearings) to the tank. Muffler pressure enters the gear box area — passes through the hollow shaft that drives the rotary drum valve — through the crankcase and on to the tank. Evidentally, this is done to keep the spur gears in the head lubricated. However, metal particles from normal wear, gunk in the crankcase, and a lot of combustion residue from the engine and muffler, are all forced back through the engine and into the fuel tank. With this set-up, a fine screen filter between the fuel tank and carburetor would certainly be a must. Having some real reservations as to the practicality of this set-up, I chose to take the muffler pressure directly off the muffler fitting as is standard practice. A shot of oil in the head fitting every half dozen flights should take care of lubrication of the rotary valve spur gears. In fact, I imagine normal fuel leakage past the rotary valve might provide sufficient lubrication.

One of the reasons we can get away with lower oil content fuel in a four stroke engine is due to the lower operating temperature. Firing every other stroke, the incoming fuel charge helps to cool the piston between firing impulses. Most two stroke glow engines operate with the cylinder head temperature running between 360°-380°. With a lean run, the temperature can go well into the 400° range. While really lugging the HP 21 down with the 12/6 prop, a cylinder head temperature check was made. The engine was running surprisingly cool indicating only 210° at the glow plug washer and 220° at the exhaust stub. This was with a fully lean, maximum power mixture. Richening the mixture lowered the temperatures by 30°. Herein is one of the big advantages of a four stroke engine — lugging larger props without overheating.

The manufacturer lists the bore of the engine as 16.6 mm (.654") and the stroke as 16 mm (.630) for a displacement of .21 cu. in. Our particular engine had a bore of .654 but a slightly longer stroke of .638. However, this slight increase in the stroke does not significantly increase the displacement (.212 versus .214 cu. in.).

The aluminum diecast crankcase/cylinder is a bit unusual in that, rather than being of one piece design with a removable back plate or back plate and front housing, it splits into two pieces along the crankshaft centerline. The crankcase half and cylinder head is a one piece unit. This was evidently done to provide rigidity and maintain proper alignment of the rotary valve drive gearing mechanism. Other manufacturers have used split crankcase halves in previous years. One example is the late Bill Atwood's Triumph .49 and .51 designs of the late 1940's. The Atwood Triumph engines also had a removable front and back plate. Bill Atwood later incorporated this type of crankcase in his Cox Concept .15 and .40 designs that were never put into production by Cox.

With the split crankcase and integral head, I figured the engine would have a chromed cylinder bore without a separate liner or sleeve. However, this is not the case with the H.P. Close inspection indicates that the engine has what appears to be a chrome plated brass sleeve either cast into the casting or pressed in. I could not determine any conventional way of removing the sleeve and did not want to try forcing things with possible resultant damage. If it were cast in, then there would be no way for its removal. There are two holes, approximately 1/8", drilled 180° apart in the lower end of the sleeve which may have been index holes to locate the sleeve while the crankcase was being cast or, possibly, have to do with the installation / withdrawal of the sleeve. As the parts sheet that accompanied the engine does not list a separate sleeve, only the complete cylinder casting, I assume that the sleeve is not removable.

The two crankcase halves do not use a gasket and are assembled with Loctite. This type of split crankcase certainly makes bearing installation a snap as you have only to lay the crankshaft/bearing assembly into place and join the two halves together.

The integral cylinder head is perfectly flat bottomed in design and the bottom end of the rotary valve fits flush with the inside of the head surface. The piston at top center only clears the bottom of the head by .010" on this engine forcing the air/fuel mixture into the hollow drilled rotary valve. This small opening is .215" in diameter and approximately .195" deep. So, in effect, the inside of the head surface is an extremely wide squish surface forcing the fuel mixture into the small .215" x .195" tubular chamber. The top side wall of the chamber has a .185" square opening that lines up with the exhaust port, intake port, and glow plug port as the rotary valve rotates.

Past experience with combustion chamber shapes whould lead me to believe that modification to this small tubular combustion chamber shape would result in a power increase. In fact, one of my first projects, after RCM's chief photographer Dick

Tichenor gets through taking the photographs to accompany this article, will be to try a modification to the rotary valve combustion chamber shape. An extended "Trumphet" shape. Maybe it will result in a power loss but you do not know without trying.

The full stroke compression ratio of the engine figures to be approximately 9.77-1. With the small tubular combustion chamber shape and the glow plug on the side of the head, trying to fill the combustion chamber with oil to get a volume measurement posed some problems in eliminating possible air bubbles.

With a two stroke engine, compression ratio is usually figured from the time the exhaust port closes. That is, if an engine has a stroke of .800" and the exhaust port height was .200", then .600" would be used to compute the compression ratio. In the case of a four stroke engine, the compression stroke starts as the intake port closes which can be anywhere from close to bottom center to 45° after bottom center. In the case of the HP 21, the intake closes 35° after bottom center. Actual timing of the HP 21 intake opens at 35° before top center and closes 35° after bottom center. The exhaust opens 35° before bottom center and closes 35° after top center with an overlap period where both the exhaust and intake are partially open of 70°. The intake port closes 35° after bottom center results in a vertical piston travel of only .040", hence the reason for the full stroke being used to calculate compression ratio.

The piston appears to be a high silicon aluminum, permanent mold casting and uses a Dykes ring. With the chrome plated brass sleeve, aluminum piston, and Dykes ring, you might consider the engine of ABCD design — a term first coined by World Engines for some of the Super Tigre line, if I recall correctly. The piston is not a lapped or tight fit in the cylinder as with a true ABC design having a running clearance of .001" and relying on the Dykes ring for sealing. This does make fitting of the piston/sleeve a somewhat easier task production wise. This particular engine had an exceptional compression seal and, until disassembling the engine, I thought it would have a lapped type piston/sleeve fit. I was quite surprised to find the engine used a Dykes ring. Due to the rotary valve allowing no compression leakage as do regular poppet valves, the engine feels much the same as a two stroke engine with the exception of coming on compression every other stroke.

The connecting rod is machined from bar stock aluminum and is of quite massive proportions. Only the big end is bronze bushed with the wrist pin end running in the aluminum rod. The steel wrist pin is full floating and used Nylon pads at the ends rather than what has become pretty universal now — Teflon. Why HP chose to use Nylon is a bit puzzling but they evidently felt that, due to the lower operating temperature, Teflon would not be required.

The crankshaft is made of steel, hardened, and finish ground on the bearing surfaces. The crankpin is a separate pressed-in piece and presses into a very massive crank disc that is .195" wide. The crank disc is, in turn, milled on each side of the crankpin to provide counter balance. A small extension on the end of the crankpin drives a bevel gear that meshes with the mating bevel gear that, in turn, drives a shaft and the spur gear rotary valve in the head. The crankshaft is supported by two ball bearings of Japanese manufacture. The rear bearing is 24 mm (.945") O.D. x 9 mm (.354") I.D. and the front bearing is 19 mm O.D. (.748") x 7 mm (.275") I.D. The front bearing is of the double sealed type to keep foreign matter from entering and, in turn, sealing the crankcase.

The carburetor is of the rotating barrel type that moves in and out as it rotates. An idle mixture adjustment is provided on one side and the high speed mixture adjustment on the opposite side. The carburetor venturi diameter appears quite small at .160" (after working with two stroke carburetors for so many years), but one must remember that four stroke engines have much longer intake and exhaust periods so that large intake and exhaust openings, as used on two stroke engines, are not required.

As can be seen from the accompanying photographs, the HP 21 is of rugged construction and, in my opinion, has a very nice overall appearance. The down sloping intake tube with the inverted carburetor does account for a rather different look. The intake manifold can be removed and the carburetor mounted directly to the head if a particular application that would require this type of mounting should arise.

Four stroke engines certainly seem to be the coming thing judging by all the manufacturers that are now producing them. In the quest for more power, I believe more manufacturers will be turning to rotary valve type designs to overcome the rpm limitations of poppet valves. As with their original HP .61 Schnuerle engine that started the present trend to high performance two stroke engines, the HP 21 four stroke and its big brother the HP 49 not yet released at the time of this writing, has lead the way with the first of what might be considered "high speed" four stroke engines.

The engine is being imported into the U.S. by Tower Hobbies and will sell for a very low $79.98. This is the lowest price four stroke on the market. □

SCALE VIEWS

from page 92/84

black fuelproof dope **squiggle** at the appropriate position(s) on your model will serve as the stenciled "instructions." Don't slop dope over everything, mind you --- just some even looking marks. I hope that I haven't offended any of the scale purists amongst the readership. But, there **are** times when a practical solution to a scale building problem makes life a tad easier!

This won't be the last time we'll talk about external details for scale R/C models. There are a lot of things we can do in this area --- and most of 'em **don't** add a bunch of weight --- the bane of scale models!

★

This latest release from Hobbypoxy is the continuation of its presentation of scale color formulas with three new Royal Air Force colors, which cover the change in camouflage schemes effective in 1942 and carried through the remainder of WW II.

Day fighters based at home had their upper surfaces painted in Dark Green and Ocean Gray (Ocean Gray replacing the Dark Earth of the earlier camouflage scheme), with under surfaces in Medium Sea Gray.

Day fighters based abroad were finished in Dark Green/Ocean Gray upper surfaces, with Sky Type "S" under surfaces. Day fighters used in the North African campaigns were painted in Dark Earth and Middle Stone on the upper surfaces, with Sky type "S" on the under surfaces. Formulas for Dark Green, Dark Earth, and Sky Type "S" were given in an earlier release. The new formulas are:

Medium Sea Gray — Three parts H70 Gray; one part H10 White.

Ocean Gray — Seven parts H70 Gray; two parts H81 Black; one part H33 Stinson Green.

Middle Stone — Three parts H49 Cub Yellow; four parts H70 Gray; one part H65 Bright Red; one part H10 White. And don't forget to use Flat Hardener for a proper matte finish. □

When writing to an advertiser, be sure to let them know that you saw their ad in RCM.

SUNDAY FLIER

from page 49/46

machinists.

I go back a long time and seem to remember a few of your designs which were not R/C. I still find satisfaction in CL because it raises design challenges for which there is little valid reference material, and because it provides a physical immediacy of contact impossible in R/C. Good R/C fliers develop a ***projected*** *feel for the model in flight, but CL is direct, physical, and real connection through the model to the air it flies in.*

Keep up the interesting column! I'd love to see an updated flying boat from either you or Don McG . . . CO2? Electric? Indoor?

Regards,
Lou Crane
Sierra Vista, Arizona

I have to chide you mildly, Lou. Roger Chapman's letter did not say the cross wind affects airspeed (and you're right, it doesn't). What the letter said was (p. 197, June RCM) "a direct cross wind will not affect his **ground**speed enroute," and that's the error Roger refers to. Simple vector analysis will prove it affects groundspeed. As for the updated flying boat, I'm working on one for a later issue.

Todd M. Stock of Lafayette, Louisiana, has some very pertinent comments on helicopter blades. Read on:

Dear Mr. Willard;

In response to the question concerning helicopter blades in your column last month, I did a bit of review and found that almost all full scale helicopters utilize some degree of twist in their rotor systems. A partial list follows.

Bell Model 412 — This aircraft features a soft, in-plane rigid rotor system, with slightly over 11 degrees negative twist. The blade tapers in chord as well as thickness. Construction is of fiberglass and titanium composite lay-up.

Bell Model 212 — 5 degrees negative pitch, and an extended trailing edge on the outer two-thirds of the blade.

Other aircraft that have negative twist and outboard modifications to the airfoil include the Bell 206 series, the Boeing Chinook (Model 234) series, and just about any production helicopter I have time in.

The least expensive type of rotor blade to produce would be a 0 degree twist, symmetrical, constant chord blade. However, this blade is also the least effective. With composite technology, a computer optimized blade design can be built to match the desired flight envelope for a price that is reasonable.

With regard to Mr. King's comments concerning prototype inverted maneuvers, I know of no helicopter capable of sustained inverted flight. The Westland WG-30 and the BO-105 both have provisions to produce negative angles of attack in the rotor system to aid in ground operations, however, to the best of my ***knowledge,*** *no prototype helicopter will take more than 1 negative "g" before encountering control malfunction or conversion into a case for the NTSB.*

I would suggest as reference material both the Bell helicopter and Sikorsky Aircraft manuals on aerodynamics. The standard manual

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SUNDAY FLIER

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for Army and Air Force helicopter instruction is FM 1-51, Rotary Wing Flight, available from the U.S. Government Printing Office.

I have enjoyed your column, and hope that you contine to question "sacred cows," and provide your readers with aeronautical conundrums to solve. For your information, I am currently employed as a pilot with Commercial Helicopters Incorporated of Baton Rouge, Louisiana, and hold a helicopter CFI and Airline Transport Pilot certificate issued by the FAA. After hours, I convert scale models into spinner-shaped impressions in the mud.

Again, thank you for your column and your time.

Sincerely,
Todd M. Stock
Lafayette, Louisiana

Todd knows whereof he speaks. In checking on some full scale designs, it turns out that the majority of them do have **some** built in twist from the hub out to the tip.

I've run out of space for this month, so I'll have to postpone further discussion for a future issue. Except for this last jab by my good friend Dave Kalb of Santa Clara, California. First, before running it, it is only fair to say that Dave and I did reach agreement on his question pertaining to fixed wings. However, his Great Uncle's exploits deserve to be known by all of you experimenters in aerodynamics.

Dear Ken,

I would like to take this opportunity to reply to your latest column in the July issue of RCM, which asks the question, "Why don't helicopter rotor blades have a helical twist similar to a prop to increase the lift efficiency?"

Really Ken, I think the noise of too many unmuffled .049 engines has finally taken their toll. Without going into a lot of Aerodynamic formulae which will just bore you, I will ask the question, "Why don't fixed wing aircraft have a helical airfoil to increase their lift efficiency?"

However, I would like to point out some experiments conducted on helical lifting devices in the early 1920's. These tests were conducted by my Great Uncle Thickwhistle O'Mildew, an Irish immigrant and self-taught engineer. O'Mildew was an auger designer for the defunct Buffalo Brace and Belt Company. He reasoned that a properly designed auger (Helix) could screw itself into the air.

Detailed eyewitness accounts describe his machine as having an auger about eight feet in diameter with a height of approximately four feet. This was mounted on a four wheeled frame and powered with an engine removed from an Apperson "Jackrabbit." On the day of the test, all went well until, with the engine running at full throttle, the drive clutch was engaged causing the engine to backfire and start running in reverse. Before the horrified spectators could rush to his aid, Uncle Thickwhistle had screwed himself through the roof of an abandoned coal mine and plunged to his death.

Although these experiments have received little mention by aviation historians, I though I would bring them to light in an effort to prevent some other fool from making the same mistake.

Sincerely,
Dave Kalb
Santa Clara, California

So be alert, lest your engine should backfire and make your plane fly backwards.

Would that be a base canard? □

BLIZZARD

from page 43

.... shafts, and drive sprockets. As we mentioned earlier, the gear box was already assembled and needs only the emplacement of the two Mabuchi R-S 380 motors. At this stage you are given a choice of gear ratios through a simple but effective method. If you wish to run the high gear (32:1), you tighten set screws on a particular pair of rear axle gears. If you'd rather go for the lower range (12:1), then two other set screws are tightened on another pair of rear axle gears. Naturally, when one set of gears are being used, the other pair are left to free wheel. As great as this thing is, it just won't run in two different gear ratios at the same time.

Blizzard's tracks were installed, and the spring loaded trailing arm kept the desired tension against the forward road wheel, thus ensuring that the flexible tracks would turn freely and resist being peeled or thrown during off-road operations.

At this point we installed the Blizzard three piece option parts set (Tower Hobbies order no. TE 702, at $16.98), which consisted of a power shovel, a patrol light, and a muffler. This set is accompanied by a single instruction sheet that has been divided into six steps, each well-illustrated by a black and white photo. The power shovel is raised and lowered by a servo which, naturally, now makes Blizzard a three servo machine. So be informed . . . if you have a two channel system, the power shovel would **not** be a functional item. If, however, you use a three (or more) channel outfit, we recommend you consider this option. It not only adds realism to the rig, but, as we found out, added to our fun during operations. The patrol light has its built-in flasher, uses its own switch and 9 volt battery, and looks great installed on the roof of the cab. The muffler is, of course, non-functional, but does look good in place.

Incidentally, we should point out that we painted the clear polycarbonate body a bright red, using Pactra Formula "U" paint on the inside surface, prior to the installation of the patrol light and muffler. The furnished decals were applied, and Blizzard looked ready to go. Well, almost.

Radio And Electronics:

We decided to use the Tower Hobbies System 500, Gold Series, 6 channel radio with Blizzard, even though we'd need just three of the channels to do the job (remember, you only need two channels if you don't use the option set). For those of you who haven't yet had the opportunity to get up close to one of these radios, we'll give you a brief description. Appearance-wise this is just a beautiful piece of electronic gear. The case is gold anodized, brushed aluminum, and this is set off by the flat black side plates. The unit we used was the Mode II conventional stick arrangement with the throttle function on the left stick positionable by a fine grid ratcheting for precise setting. The adjustable sticks are the open gimbal type, with dust covers. In addition to the aforementioned four channel Mode II set up, our 6 channel rig had a toggle switch that could be used for retracts, bomb dropping, or any other "on-off" non-proportional application. The sixth channel is a proportional lever and can, of course, be assigned any appropriate task you choose. In addition to all this, there is a trainer switch that will allow the rig to be used in a trainer system. Also present are dual rate switches to reduce servo throw in relation to stick movement, and servo reversing switches that reverse the usual direction of servo travel. In addition to all these goodies, Tower includes a 12 month warranty with this radio. At $159.95, this system merits serious consideration by anyone in the market for new gear.

Back to Blizzard and the radio installation. The provisions made for component locations were found to be very good, indeed. The receiver went onto a special mount, and the receiver battery was held in place by a metal clip. The three servos were bolted onto a metal servo mount, and the controller rheostat positioned just aft of that location. The 6N-1200 mah 7.2 volt battery (Tower no. TG696 $22.98) was located lengthwise on the floor of the chassis. Wiring the switches, the patrol light, and bolting on the power shovel completed the job, and Blizzard looked ready for anything. At this stage, the battery was charged with Tower's fast charger (Tower no. TG695 $19.98) and ready we were.

Performance:

Controlling Blizzard was certainly different .... but offered no real problems, and after a very few minutes we found we could shave by objects (like table legs, chair legs, and even a human leg or two) very precisely. Our initial run was indoors, and after having gone around or over everything we could find, we decided we were ready for the great outdoors. We proceeded to tour the back forty, and this is where Blizzard proved to be a real fun machine. Soft dirt was graded and piled using the power blade, and all sorts of small objects were climbed. Terrain varied from lawn, hard earth, soft dirt, and sandy soil to layers of fallen leaves, small twigs . . . and Blizzard proved to be right at home with all of it ... and all the while looking like a full scale vehicle in action.

Conclusion:

If you were like us as a youngster, you probably, at one time or another, had a couple or so small non-powered model cars that you pushed by hand through the dirt and over "bridges." If you'd like to re-live some of that fun, and do it in a way that's easier on the hands and knees, you ought to give Blizzard some serious consideration. Here's a chance to play in the dirt — and not get dirty! And when you get tired of building roads and dams, you can always bring it back inside the house and chase the dog or cat around with it. We don't live in snow country, but for those who do, Blizzard should really prove to be a great year round fun machine.

As a parting word, Tower Hobbies has informed us that they stock a complete line of spare parts for the Blizzard. ☐

PIT STOP

from page 16/14

awards are elections to the Model Aviation Hall of Fame, and to the Model Boating Hall of Fame. John E. Brodbeck is indeed admired and respected by his peers.

John's son, Johnny Brodbeck, is the Vice President and oversees virtually every operation at K & B and makes John's job much easier. (Johnny is often referred to as Jr., but he really isn't a Jr. His middle initial is W, while John's is E.) Johnny was away on vacation when I visited K & B, so I didn't get an in-depth interview with him, but he certainly is the spark plug of the company. He makes everything go.

The Plant Manager is Pat O'Brien. Pat is totally dedicated to improving every engine K & B makes. John left this job up to Pat, and Pat went full steam ahead. He personally contacted many plane, boat, and car people to ask them how their engines could be improved. Rich Lee and myself spent hours with Pat showing him things that we thought should be improved on the 3.5 engine to be able to keep up with their competition in the R/C car engine market. Pat listened, asked questions, took notes, and each batch of K & B 3.5 engines has improved greatly. As a new way is found to improve the quality of a particular part on an engine, that same method can be used to improve that part on the whole line of engines. So, not only are the 3.5 engines being improved, but all the engines are constantly being improved.

One of the things that John and Pat are proud of, is the two new Mori Seiki CNC lathes. The parts coming out of these computer numerically controlled machines are absolutely beautiful. Some of the machining is done with diamond tooling, that gives the aluminum parts a finish that looks like polished chrome! Tolerances that they could only dream of are now easily held and easily duplicated. Some operation that had to be done out of plant on special machines, can now be done in plant with a much higher level of quality and consistency. There's something else they can do now, that they couldn't do before. Before, when doing the nose-piece, the large bearing bore and crankshaft hole would be machined, then the part would have to be turned over and put in another machine and the small bearing bore machined. Tolerances add up and both bearings may not always be perfectly aligned. On these new lathes, both bearing bores and the crankshaft hole are all done in the same operation, so all three are perfectly aligned, making for a much more freely turning crankshaft. This is only one example of new things coming. It will also allow making the crankcase nose all in one piece now, making for greater rigidity. Now that John again has full control of K & B, things are definitely getting better.

Next I got to talk to Bill Wisniewski. Bill has taken over where John left off, and for the last 25 years has been doing the engine design work for K & B. Bill started flying control line planes when he was 7 years old and he was National Champion in 1960, 1964, and 1966!

In 1963 Bill developed the first Schnuerle 15 engine. These prototype engines were nicknamed the Wart, because of the funny looking bumps on the sides of the crankcases, which were actually the Schnuerle ports. Well, the Warts were fast, to say the least, as the U.S. Team used them to take 1st, 2nd, and 3rd places in 1964, and in 1966 they were the first to use tuned pipes.

In 1972 K & B came out with the first K & B-15 Schnuerle ported engine which was an immediate success. The 6.5cc or 40 cu. in. size was next and it immediately dominated pylon racing. The 3.5 or 21 followed and it immediately took over the R/C boat and car markets and records. An outboard .21 size was so popular a new boat class was made just for it. Then a 7.5cc or .45 inboard and outboard followed. Soon to be released is a brand new 11cc, or .67 inboard that National Champion Steve O'Donnell has already been electronically timed at 96 mph with. And there's more coming that are still in the prototype stages, that will be setting new records. When you think of engines you certainly have to think of K & B and Bill Wisniewski first. At least other engine manufacturers around the world do.

If you know anything about boats, you have to know and like Jack Garcia. Jack has been a modeler since day one. He designed and raced slot cars for Dynamic Models, and together with Hi Johnson, developed the first 1/8 scale fully independent suspension gas car. He still had time to race boats with Dick Norsikian, and later they produced their own Nor/Kar 1/8 scale gas car. Jack then went to work for Associated and helped them to develop their first 1/8 gas car. Associated moved from Paramount to Santa Ana, and Jack opted not to make the move and then joined K & B heading up the Marine Specialties department. If you need help at a boating event, I'm sure Jack will help you. He's that kind of person.

One of the things K & B is famous for, is their Customer Service Department, headed by Bobby Tom and ably staffed with three knowledgeable ladies. Bobby has been with K & B for 26 years and certainly knows engines. But equally important, he knows how to help you, the customer, with a motor problem. K & B's motors are warranted for any defects in manufacturing, which are few and far between. What keeps this department busy is rebuilding or replacing used motors with a Maximum Repair Service that can't be beat. Also, most distributors do not carry spare engine parts, so dealers can order engine parts directly from K & B. Engines, fuel and paint, are obtained through distributors only.

If you have an engine problem with a K & B engine call the Customer Service Department, Bobby or one of the girls will help you. They can tell you over the phone, if your engine is covered by warranty. Or, if you want your engine repaired, they can tell you how much it will cost, or if you qualify for their Maximum Repair Service. You'll find that they're more than fair and will treat you as you like to be treated. They really care.

For that matter, everyone at K & B cares about their customers. □