FREE 2004 R/C Modeler Magazine Index

FEBRUARY 2005

RCM r/c modeler magazine

THE WORLD'S LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST

SPORT-SCALE WWII BOMBER

B-29 CONSTRUCTION

5 REVIEWS EINDECKER E1 KIT

MW-54 MK3 TURBOJET KIT • CESSNA SKYLANE 182 ARF

BANCHEE G-3D GLOW & E-3D ELECTRIC ARFs • FL-70 ENGINE REVIEW

THE WAY I BUILD THEM

One man's way to scratch-building

EVENT CLOCK CLUB PROJECT

The HITEC Annual PARKING LOT RACE

5 FWIW TIPS

$4.99 U.S. Canada $6.99

www.rcmmagazine.com

RCM r/c modeler magazine

USPS 509-190 ISSN 0033-6866

FEBRUARY 2005

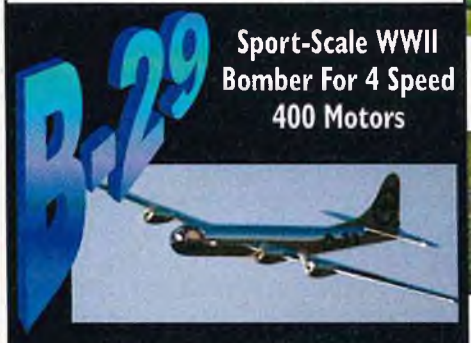
VOLUME 42 NUMBER 2

www.rcmmagazine.com

This Month's Cover — features the SR Batteries Eindecker E-1, the newest addition to their line of quality R/C products. This beautiful giant scale WW1 airplane has a wingspan of 100" and is powered by a Zenoah G-23. RCM's FWIW columnist, Jerry Smith, built this model for the product review that begins on page 116 of this issue. Jerry also took the cover photo using his digital Nikon D-70 camera with a 28-300mm lens, while his good friend and fellow club member, Gary Spears, handled the controls. The photo was taken at the Bartow County Model Aviation Club field in Emerson, Georgia.

FEATURES

CONSTRUCTION



COLUMNS

REVIEWS

DEPARTMENTS

John E. Brodbeck, Sr.

September 14, 1913 — November 2, 2004

Born in Arizona, John Brodbeck had great interest in flight from an early age. As a kid he would fly rubber band models and soon his friends at school gave him the nickname "Lindy," referring of course to one of his heroes, legendary aviator, Charles Lindbergh. This early passion for flight would eventually drive John into becoming a legend in his own right in the model engine industry.

John Brodbeck (left) and Al Prather (right), with help from a little friend, getting a boat ready for another run (Circa 1982).

John started flying free flight models in 1936. Not being satisfied with the out of the box engines that he used in his airplanes, he began modifying and fine tuning engines on his own. After seeing what he was able to do, he had dreams of starting his own model engine company. He had confidence that he could make better quality and better performing engines.

By the time WWII broke out, John was working in Los Angeles at a machine shop. There were very few raw materials available and all plans of creating his own company were put on hold. As America entered the war, John immediately saw an opportunity to help his country and follow his passion for flight. He was going to enter the Army Air Corps and become a pilot. The owner of the machine shop put an abrupt end to that. John had become General Manager of a business that was producing parts vital to the war effort. John's skills were so valuable to the company that his boss told him that he would use every one of his Department of Defense connections to see to it that if John enlisted, he would be digging fox holes on the front line!

Toward the end of the war in 1944, John teamed up with an old flying buddy, Lud Kading, who had been employed at a woodworking shop. Together they formed K&B Manufacturing with a couple of old drill presses and lathes. They took on as many machining jobs as they could. Using their combined skills and knowledge they produced high precision parts for Lockheed, some of their work helping the Manhattan Project.

In 1946, the war effort was over and K&B could begin doing what they dreamed of — building model engines. Their first venture was the .020 Torpedo. Their first run of engines hit the shelves and the next week they had more orders than they could fill in a year. The business hit the ground running and continued strong under John's strong leadership (Lud left the business in 1953). K&B developed a full line of airplane and marine engines during John's tenure and became the industry standard. He always kept his operation on the cutting edge of technology, delivering quality high performance engines.

His son, John Brodbeck, Jr., later took over the company after his Dad's retirement. The company was later sold and continues to produce high quality model engines today. In fact it is the longest continuous model engine manufacturer in the United States.

John was a very dear friend to many of us at RCM. He followed his childhood dream and left an incredible legacy in our hobby. We will always remember him for his kind heart, generosity and devotion.

John Brodbeck, Sr. is a member of the Hall of Fame for both the Academy of Model Aeronautics (AMA) and the North American Model Boat Association (NAMBA).

He is survived by his daughter and son-in-law Ginny & Bob. Our prayers are with them.

John, and first place winner, Joe Martin at one of the very first Formula I Pylon Races, circa 1964. K&B sponsored the event held in Turlock, CA.

Pat Crews enjoying time with long time friend to RCM John Brodbeck.

RCM
r/c modeler magazine

FEBRUARY 2005

VOLUME 42 NUMBER 2

www.rcmmagazine.com

R/C MODELER (ISSN 0033-6866) USPS 509-190, is published monthly by R/C Modeler Corp. Editorial and Advertising offices at 144 W. Sierra Madre Blvd., Sierra Madre, California 91024. Telephone (626) 355-1476; (800) 523-1736; FAX 626-355-6415; E-mail: info@rcmmagazine.com. Periodicals postage paid at Sierra Madre, CA and additional mailing offices.Postmaster: send address changes to R/C Modeler, P.O. Box 487, Sierra Madre, CA 91025.

EDITORIAL CONTRIBUTIONS are welcomed by R/C Modeler, but cannot be considered unless guaranteed exclusive. Manuscript must be accompanied by return postage and any material accepted for publication is subject to such editorial revision as is necessary, in our discretion, to meet the requirements of this magazine. Material is selected on the basis of general interest to the radio control enthusiast and the publisher assumes no responsibility for accuracy of content. The opinions stated in published material are those of the individual author and do not necessarily reflect those of the publisher. R/C Modeler Corp. assumes no responsibility for loss or damage of editorial contributions. Upon acceptance, payment will be made after publication at our existing current rate, which covers all authors rights, title to, and interest in, the material mailed including, but not limited to, photos, drawings, and art work which shall be considered as text. These rights include the use by R/C Modeler Corp. to reprint the material in books, pamphlets, electronic publishing, and any other means. Submission of the manuscript to R/C Modeler expresses a warranty by the author that the material is in no way an infringement upon the rights of others. Note: The review or discussion of any product by RCM does not constitute an endorsement of that product nor any assurance as to its safety or performance by RCM.

SUBSCRIPTION RATES: The United States $28.00 per year, $55.00 two years. Foreign subscription including Canada and Mexico $38.00 for one year (no two year foreign). For further information, see subscription ad. Change of address notices, undelivered copies, and orders for subscriptions are to be sent to: P.O. Box 487, Sierra Madre, California 91025. Allow 6 weeks for new subscriptions and changes of address. Back issues available: $5.95 U.S., $7.50 Foreign.

ADVERTISING: For complete instructions regarding display advertising: scheduling, prices, and specifications — Kathleen Acton, Advertising Department; e-mail: KathleenActon@rcmmagazine.com; mail: R/C Modeler, P.O. Box 487, Sierra Madre, California 91025-0487 USA. Telephone in the USA: (800) 523-1736 or (626) 355-1476. Fax (626) 355-6415. The publisher reserves the right to refuse any advertising copy.

Printed By American Press, L.L.C., Gordonsville, VA U.S.A.

From The Shop

By Jim Pearson

In Fond Memory Of John E. Brodbeck & Alvin L. Prather

The radio control community recently lost two pioneers who both left their enduring mark on a hobby and industry which they loved. On page 2 and 4 of this issue you will find tributes to two great friends to RCM. Each will be sorely missed. Our thoughts and prayers are with their families and friends.

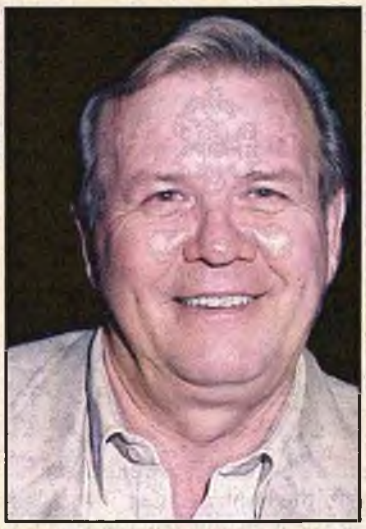
As this is being written, it's mid October and it's been a very eventful month so far. First off, the month of October kicks off the hobby/trade shows. This year began with the Hobby Visions Show in Las Vegas, NV, which was followed a week later with the RCHTA show in Chicago, IL. Both of these trade shows require a tremendous amount of time and effort for a manufacturer or distributor to participate in and the fact that they were scheduled so close together meant that many of the manufacturers/distributors could not participate in one show or the other. Hopefully, they will get the show scheduling worked out so that they will not conflict in the future. The next show will be the IMS/AMA Convention now held at the Ontario Convention Center, Ontario, CA, on January 7, 8, & 9, 2005. After that, the WRAM'S show will be held on February 25, 26, & 27, 2005 at the Westchester County Center, in White Plains, NY. Then, on April 1, 2, & 3, the Toledo R/C Expo will take place at the Seagate Center in Toledo, OH. That's all the trade show information I have at this time, but if we receive additional information, we will let you know as soon as we receive it. For the latest update on the show schedules, you can also check on our web site at:

www.rcmmagazine.com

Assistant Editor, Jim Feldmann has added a set of floats to the new Cermark "Graduate" and now has a very nice float plane. This model will be the subject of a product review in the near future.

A really great day was had at the Castaic Lake Float Fly.

ABOVE: There was a very good turnout at the Lake Casitas Float Fly, with perfect weather and lots of flying! (Photo By Jim Upton.) LEFT: There's always a wide variety of models that show up at this event, from the "Stick's and Oldtimer's to scale twins. (Photo By Jim Upton.)



Alvin L. Prather

October 19, 1926 — October 25, 2004

Al Prather was born in the small town of Gumbo, Missouri. He grew up in the town of Flat River, Missouri, where his father was a welder in the lead mines. Al served in the Army Harborcraft during WWII and was stationed on a small boat in the Philippines. After the war Al went back home and followed his father's direction, taking a job in the lead mines. He took the very hazardous position of a blaster for the mining company. Al would go down into the mines, drill holes, fill them with dynamite, then set off the charges. One year Al drilled and blasted more than anyone else in his division and was awarded an extra $1,000 life insurance policy. This was a wake-up call for Al, and after spending seven years in the lead mines, he told his beloved wife Dorothy that there had to be something better (and safer) out there for them, so they packed up everything and headed out West for a new start on life.

Al became quite an entrepreneur after arriving in Southern California in 1953. Among his many endeavors, he rebuilt batteries, ran a hearing aid store, owned and operated a service station, then formed a successful trash collection business. But it would be his son Terry's love of radio control airplanes that would spur Al into a business that truly became a passion for him and his whole family.

Al began Prather Products in 1973. They carried a line of radio control airplane kits and model supplies for radio control hobbies of all types. Terry was becoming an expert radio control pilot and Al was using his creativity and business wisdom to run a company that became a leader in the industry. Over time Prather Products began to specialize in high quality competition radio control racing boats, and they are still thriving today and still family owned. Terry has been heading the company the past few years with the helpful advice and mentorship of his father.

Al made a career out of a hobby that he loved and that he could enjoy with his family. Al, Dorothy and Terry were regulars at model boat races around the country, where they all competed at the local and national level and did quite well. During this time Al won several NAMBA National Championships. Al's Southern accent and charm were just two of the gifts that he brought to the radio control industry. He had an incredible enthusiasm for the hobby and it showed at work and at play. It was hard not to get excited when Al was talking about one of his projects.

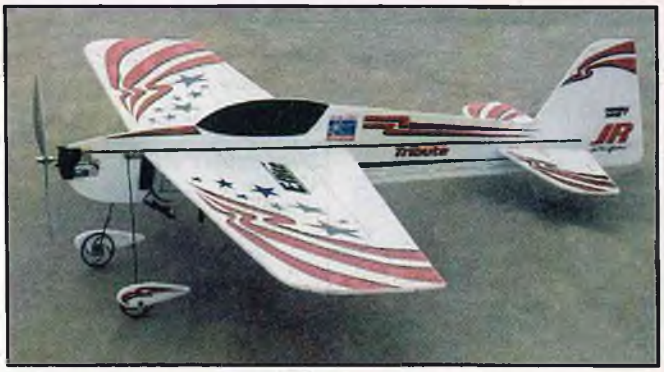
In his later years Al was content spending his time at his home in Southern California with Dorothy and his cherished cats. Al was always one to take advantage and explore the latest in technology, the Internet was no exception. He spent hours surfing the web to keep up with current events and scientific advancements. Al also became quite adept at investing online.

Al was one of those lucky people who could make a successful career out of their hobby. He will always be known as a loving and caring husband, father, employer, neighbor, friend and contributor to the radio control hobby.

Al is survived by his wife of sixty years, Dorothy and his son Terry. Our prayers are with them. (For more information on both John & Al, please go to our web site at **www.rcmmagazine.com**)

The Prathers and their Winning trophies from the 1981 NAMBA Nationals held in Amarillo, Texas. Left to Right - Diana Semler, Terry, Al and Dorothy.

Al and Terry in the mid-1970's with the Prather Little Toni Formula I pylon racer.



The Ultimate and Tribute from "E-Flite/Horizon Hobby" are really fun to fly, and have proven to be very durable!

Back in September, the Skymasters R/C Club got the fall float fly season off to a start with the Mid West Regional Float Fly, up in Michigan. This is always a great event and is attended by modelers from all over the U.S. and Canada. Hopefully we will be receiving some photos and a short write-up in the near future.

Here in Southern California, we have been having at least two float flys a month since September and it looks like there will be plenty of action on the water for those of us in this portion of the U.S. for most of the winter. So far we have attended three events and are looking forward to more in the near future.

I also just received an e-mail from my good friend Tony Stinson in Australia, and of course since our winter is their summer, they're also getting into the float flying season. In fact, Tony was on the way to another float fly and asked if we would like to see a few photos. Of course I said yes, so maybe we'll have another float flying article from our modeling brothers "Down Under" in the near future. Now, for those of you who haven't tried flying off of water, you really should give it a try... It's really great fun, and in most cases, it's as easy, or easier than flying off of a regular hard surface runway! If you're new to this part of the hobby and need some help in getting a model set up properly (and yes, that is important), check out the great articles on our web site by Chuck Cunningham. Chuck knew how to have fun with this hobby/sport, and all of his great how-to articles will live on for generations to come. More recently, Joe Hass (one of the Skymasters club members and a regular here in *RCM*) has also contributed several articles on converting the new 3D/Fun Fly models, and some slow flyers to floats. There are many very informative and useful articles on our web site, so check them out. If you are not a subscriber (and of course you should be), you can contact our office for a free one month access code that will allow you to "surf our site"!

As most of our regular readers will know, I like to fly all types of R/C models, and several weeks ago I had the opportunity to try several of the new generation of 3D park fliers, and what a blast!

They were both "Foamies" and weighed in at about 12-14 ounces each. Of course, they had to be flown in really calm air, and with that in mind, we went to a local park in the morning, before any wind came up. After first making sure we weren't in anyone's way, we decided to give it a go. Well, these things were off the ground in about five feet or less and certainly had no lack of power for their weight! We started off with getting the trims set and in short order we were trying all the basic aerobatic maneuvers and then got into some of the basic 3D stuff like hovering and torque rolls. Well, after about 5-6 minutes we had several of the local senior citizens, who use the park for recreation and exercise, stop and watch the action. And what do you think their first comments were? "Why, that's so quiet, you can't even hear the engine"! After landing, we showed them that these models were basically made from foam and that the power plant was just a small electric motor and they were simply amazed. After a few minutes of watching us have fun, they went on their way and we put in a few more flights. The point here is that we were able to fly R/C in a local park and no one complained! And do you know what ... I'm going to purchase several of these so that I can get in some extra flying at a local park or school. The bottom line here is that if you haven't tried it yet, do yourself a favor and give it a try, I think you're going to be very pleasantly surprised, I know I was! Man, I sure wish that we had all this good stuff when we were just kids; heck, I could have ...

*

Well, I'm afraid that's all the space I have for this month, so I'll have to stop for now. Just remember to keep building and flying, because that's what keeps us young, no matter how old we are!

✈

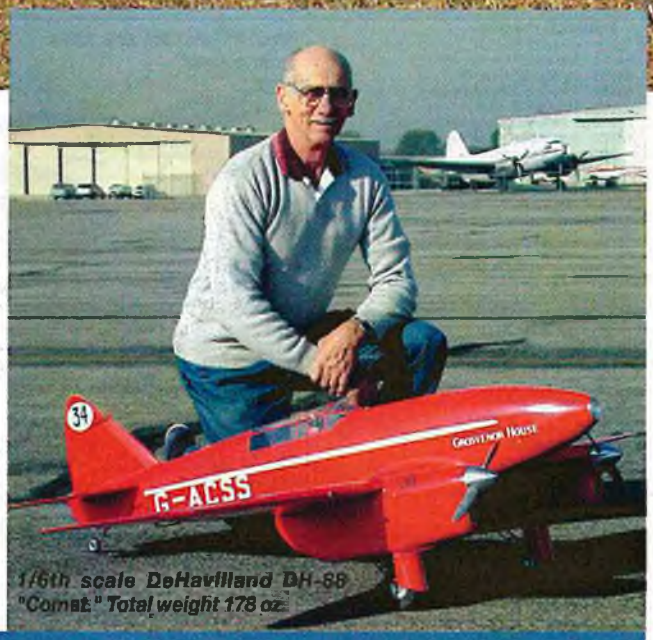
The Way I Build Them

One Man's Way of Scratch-Building

1/7th scale Grumman Widgeon.

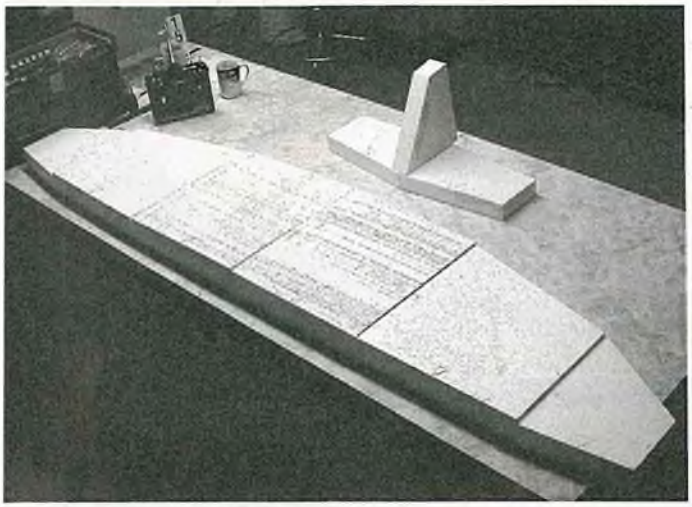
By Henry Arance

Chatting with Jim Pearson about my Tempest electric he asked the typical builder's question, "How did you build it?" When I told him, he said "You should write something about it." I was reluctant, some of my building methods are weird and who will care about them anyway, in this time of ARF's. "You'd be surprised," said Jim. "There are a good number of modelers like you and me out there, for whom building is an important part of the hobby. They would like to see how you build your models." He twisted my arm.

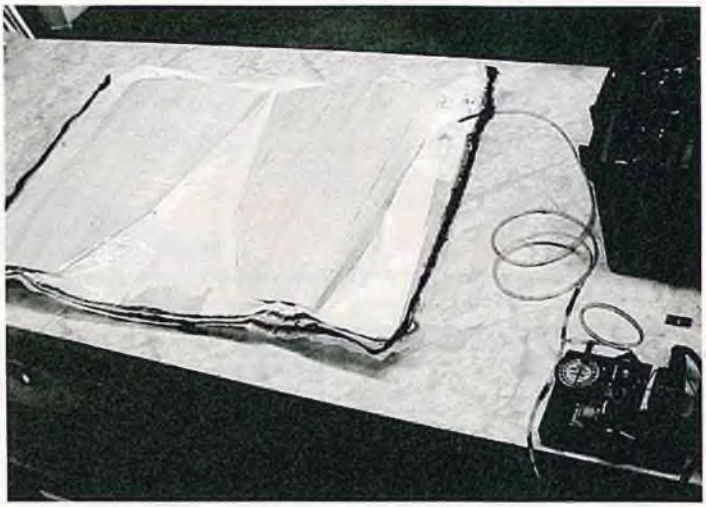


1/6th scale DeHavilland DH-88 "Comet." Total weight 178 oz.

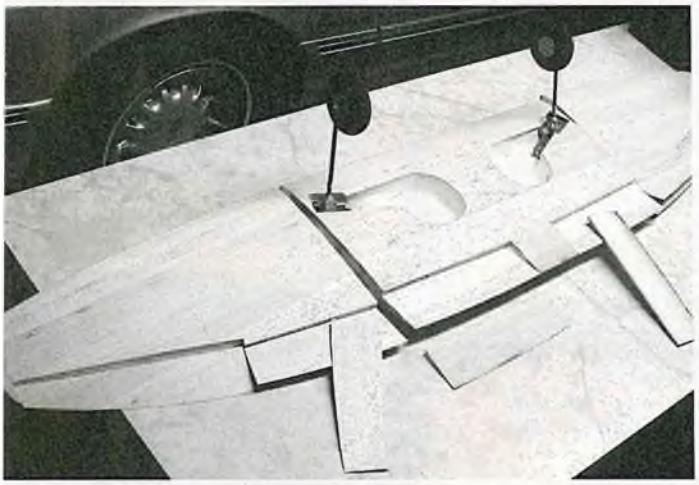
1/7th scale Hawker Tempest. Total weight 213 oz., the power pack weighs 64 oz.



The foam blocks for the Tempest.

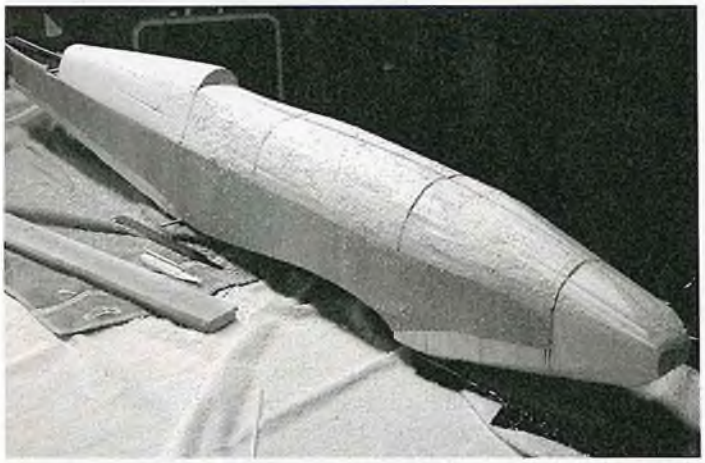


Tempest wingtips in the vacuum-bag.



Tempest wing almost done.

The Comet fuselage balsa cage.



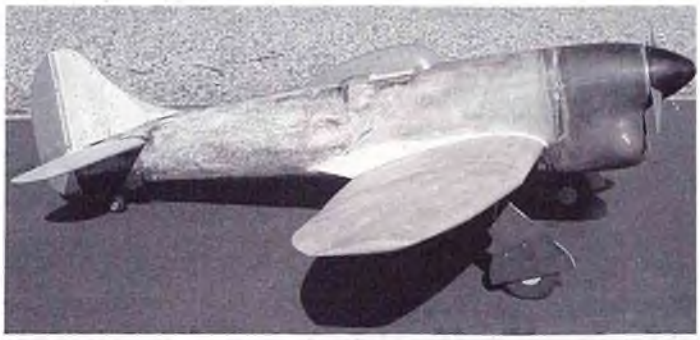
Rough-sanding the Comet's fuselage.

Comet's wing-fuselage fairing.

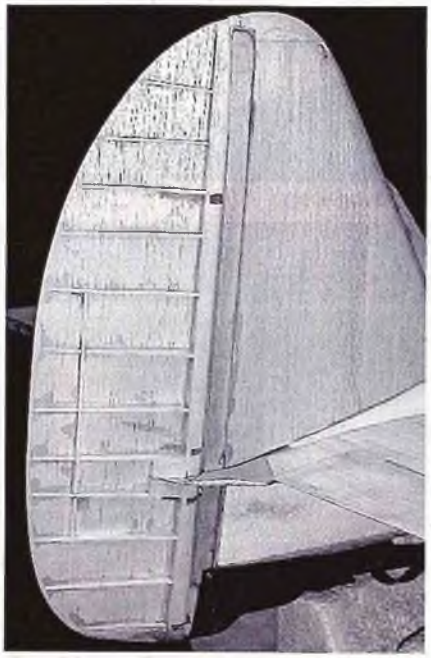
So, here we are. There was a time when most of us didn't worry too much about weight. The engine always carried the model with power to spare and we had to be sure that the model would survive our intrepid flying style, rough landings and the shakings of that powerful engine. I started paying better attention to weight when, many years ago, I tried to fly a radio controlled model powered by a Cox Tee Dee .010. Other projects, like high performance gliders and a camera carrying ship, made the matter of wing loading stand up and be noticed. Since then I've been like a priest advocating the "light flies better" mantra, often getting in arguments with those who believed that "you have to have some weight for smoothness." Nowadays the lightness truth is triumphant, the only guys who want weight are the slope soarers when the wind really blows.

By the time I got sick and tired of the messy, noisy glow engines (love the four cyclers but they are still noisy and messy) the electrics started to get noticed. Keith Shaw was rather unique, doing beautiful things that were making me salivate, but when I started to look at it closely, electrics were not easy. The penalty of the power pack weight was too severe, the motors were strange entities that behaved so differently from the power plants we were used to, and they were expensive, and on, and on, and on. However ... in just a few years there were big advances on all fronts and finally the dream of having a scale twin engined Grumman Widgeon

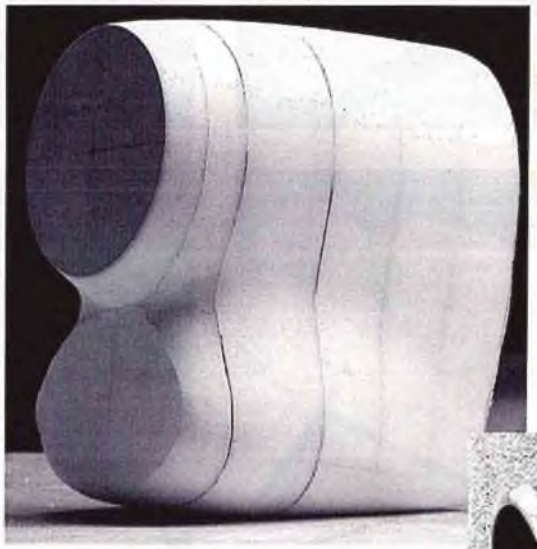
The balsa fuselage cage of the Tempest is ready to be attached to the nose molding.



The Tempest on maiden flight day.



Detail of the Tempest's rudder.



The hard foam shape of the plug that will be used to make the mold for the Tempest's nose.

The plug has been fiberglassed, primed and painted.

The Tempest nose out of the mold, weighing 6.1 oz.

without the nightmare of a dead engine on take-off was possible. Oh, boy!

I read all the articles by Keith Shaw and the other pioneers, I asked around and finally took the plunge. The first disappointment was that if I wanted brushless motors they needed separate packs and two controllers. Way too much money and the motors would be running independently. So I went with brushed cobalt motors connected in series with one controller and one pack of 14 NiCds. Plus five servos, receiver and receiver pack. Ouch! Lots of weight. The airframe had to be *real* light.

An airframe is the wing (or wings), the fuselage and the tail feathers. Let's start talking about wings. Weight-wise you can't beat a classic open frame with ribs, covered with silk, silkspan, or one of the plastic iron-on films. However, when the scale appearance requires full sheet covering, the Styrofoam core reinforced with carbon and/or fiberglass begins to get very competitive. We are talking about composite structures, where some very light stuff keeps the strong stuff in position so it can do its job. The very light stuff I use is the one pound per cubic foot white styrofoam. The list of the strong stuff starts with good old beautiful balsa, the lighter the better. Then comes fiberglass, carbon (also called graphite), Kevlar (also called Aramid) and epoxy. Here is where my experience building high performance gliders by the "vacuum bag" method comes into play. I have the means to cut the foam cores with a hot wire and the equipment to set up a vacuum bag. If you have never done this type of construction it can be scary, because it is so different. If you are experienced with it you can build a wing that is strong, as light or lighter than a longerons-and-ribs one and in less time, but most important, it will be very accurate in shape. I cut my first foam cores somewhere around 1964 and it was a disaster. A few years later, by the time we were racing the first Quarter Midgets, we could build a set of wings in an afternoon and they were good wings that could go fast and turn left pulling a ton of Gs. What I'm trying to explain is that the technology is different, it requires some special equipment, and there is a learning curve. Your first wings may disappoint you, but with a modicum of attention you will be able to create excellent parts. This is not a treatise to describe vacuum-bag construction; some of the providers of composite materials have excellent instruction manuals to go with the equipment you may need. Nowadays it is a lot easier for the beginner, you can order foam cores cut to your specifications, and you can buy all the equipment and materials needed in a single place. The two suppliers I know are true experts in composites and very helpful with their advice:

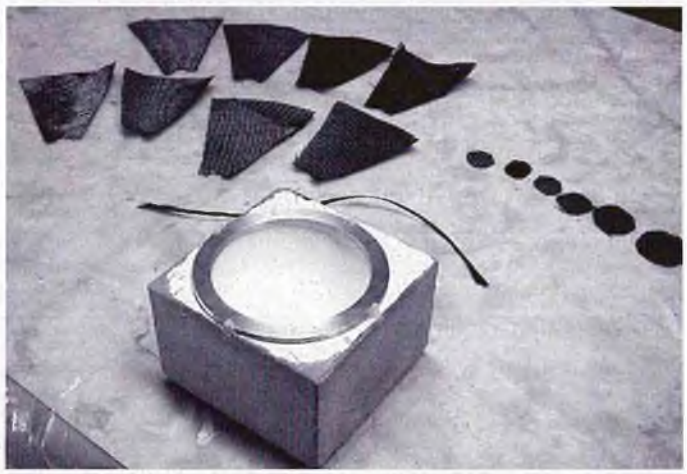
www.acp-composites.com
www.cstsales.com

If I haven't scared you out of this technique and you are curious enough to try it, the best advice I can give you is to find a guy who does it and ask him if you can watch. You'll learn in one

session what would have cost you a considerable amount of time, materials and frustration.

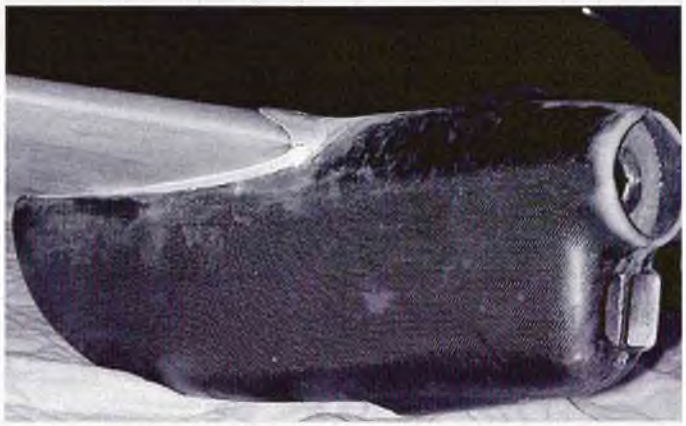
The most serious part of composite wings is "how much of what, and where." There are many ways to give strength to a wing. You could have a spar or two to carry the loads and use light skins that contribute only to torsional stresses. Or all the loads are taken by the skins, without any spar. Or a combination of both. Instead of attempting to write a treatise on composite structures -- I'm not qualified for such a task -- I'm going to describe what I've done in some of my models. None of them failed in their intended use, which means that what I did was right, perhaps with some excess material. The Widgeon (73" wingspan, 162 oz.) has one layer of 5.6 oz./sq. yd. woven carbon, top and bottom, between (and including) the nacelles, over the Styrofoam. On top of that went 1/16" contest balsa, plus one last layer of 3/4 oz. glass. From the nacelles to the tip there is no skin material other than 1/16" balsa and 3/4 oz. glass. The balsa was planked to form the total skins, sanded lightly and given two coats of nitrate dope with light sanding in-between, the idea being to avoid the balsa soaking a lot of epoxy and getting heavy. Pieces of .014" thick mylar were cut with the form of the top and bottom of the wing, waxed and hinged with masking tape

ABOVE LEFT: Four pounds of NiMH batteries on the nose of the Tempest. ABOVE RIGHT: The mold for the Tempest's spinner.

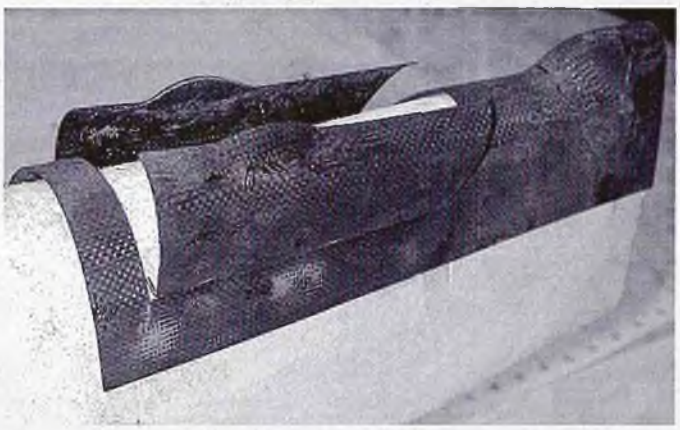


The carbon fabric pieces that will form the spinner.

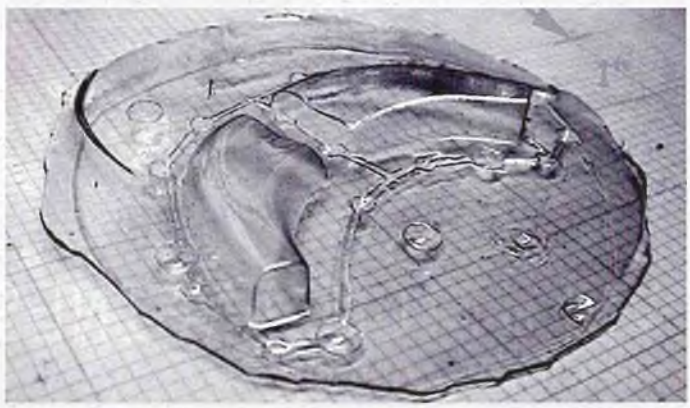
The mold for the Widgeon nacelles.



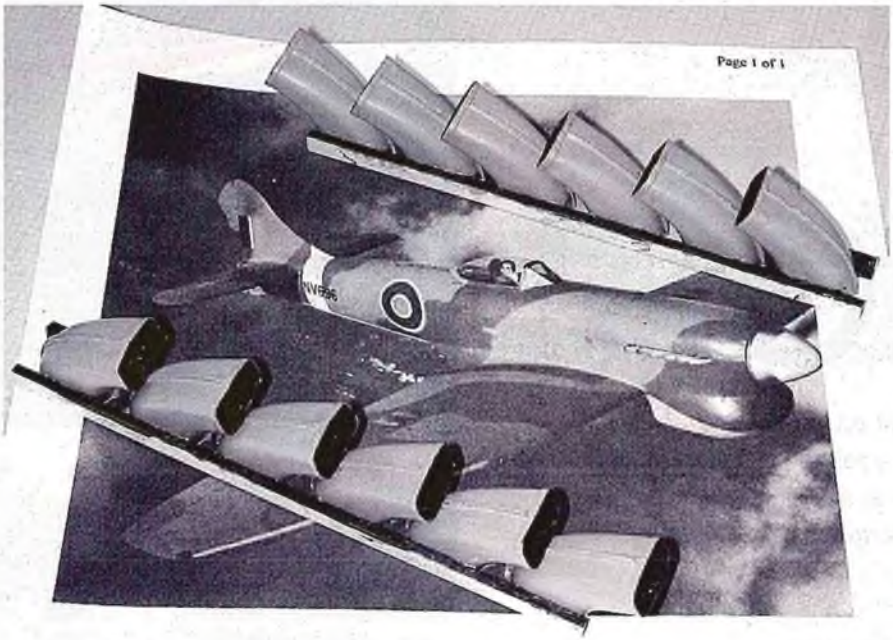
One of the Comet nacelles, 20 in. long, 2.8 oz. out of the mold.



The doors for the Tempest's retracting tail wheel.



One piece of vacu-formed acetate. The two trimmed pieces are glued to form one of the twelve exhaust stacks of the Tempest.



The exhaust stacks ready for installation. The final paint was done on the model.

along their trailing edges like the covers of a book. These mylar sheets, laying flat over the table, receive the layer of 3/4 oz. glass that gets impregnated with the minimum amount of epoxy, using a squeegee with gusto. On top of it goes the balsa skins and then the pieces of carbon fabric, which get their quota of epoxy, also squeegeed to death. The balsa skin gets the lightest layer of epoxy. The next step is to place the foam core over its proper place, swing the other mylar over it, securing it with a few strips of masking tape, and the lot goes inside the bag, where the vacuum is produced, taking care that everything stays in place. The bag with the wing is placed on top of the bed from where the core was cut, the other bed goes on top and I usually put a plank over it with some weights, to be sure that the wing sets with the correct alignment. Reading all the above procedure you see that it involves a lot of preparations that can be done at leisure and at different times, but once you start pouring epoxy, everything has to be done rather fast in order to get the wing into the vacuum bag before the epoxy starts setting and gets too thick to flow. *The most common mistake of the beginner is to use too much epoxy.* Once the glass or graphite gets impregnated, there is no way you can take away any of the epoxy wetting the fibers with the squeegee. When the layers get pressed in the vacuum bag, there will be some epoxy that oozes out at the edges. Ideally, fiberglass cloth will take about 33% of its weight in epoxy. In hand-made lay-ups like these, we can't be that good and usually end up with about 50% glass, 50% epoxy. The wings of the deHavilland Comet were very similar. There are many details that would take forever to explain and there is really no need to. You need to understand that there are special attachments to receive the floats in the Widgeon, supports for the retracts in the Comet, flaps, ailerons, passages for the wiring to the motors, etc., etc. The Tempest wing had the challenge of big holes in the bottom skin to receive the retracted wheels. That moved me to add a couple of webs — 3/32" balsa, vertical grain, wrapped in 3 oz. glass and with enough epoxy as to be certain that the upper skin got very well glued to the bottom one — one in front, the other behind the wheel well. The thin layer of 3/4 oz. glass over the balsa makes an excellent finish base at a very low cost in weight and labor.

The tail feathers of the three models were made with foam cores and 1/32" contest balsa skin, again with the outer layer of 3/4 oz. glass. There are inserts of soft balsa where the hinge line goes, with a thin ribbon of carbon laminate top and bottom to form a longeron. The Tempest rudder was done in a more conventional way to maintain the scale appearance.

Of the three models shown, the fuselage of the Comet was the lightest. I loved to put this fuselage -- with tail feathers, two servos and tail wheel -- in the receiving hands of some curious modeler and watch his arms go up because he was expecting at least twice the weight. The photos show the basic

balsa cage reinforced with carbon tow. The nose was the only part of the fuselage that had compound curves, which means that all the rest could have been balsa planked very easily, but I prefer gluing blocks of white Styrofoam between the balsa forms and sand it to shape using the forms as guides. 60 or 80 grit works fast until I'm about 1/8" from final form, then switch to 180 and work with a very light touch, finishing with 220. Light spackle fills the defects nicely. The whole fuselage got a layer of 3 oz. glass, doubled on the nose. The inside of the nose had a very strong shelf made with several layers of heavy glass to support the 3 lb. power pack. I've used this type of construction of Styrofoam over a light frame covered with a thin skin of fiberglass for many years with outstanding success. In models with internal combustion engines (the electric group calls them "wet") this composite structure absorbs the vibrations remarkably well. In case of a crash the damage seems to stay at the place of impact, there is no propagation to the rest. In one of the crashes of the Comet -- that poor thing had a rough life -- it fell nose down on pavement; the nose became popcorn and there was damage to one nacelle and a wingtip, but there were no cracks or damage anywhere else.

The Tempest's fuselage is built the same way, except the whole nose is a carbon lay-up made in a mold.

So now we talk about molds. I confess, it's rather silly to make molds if you are going to build only one model. My flimsy excuse is that I'm still dreaming of making a model good enough to enter in Scale contests, and then I'll need one model with all the goodies that will be flown only on contest day and another, a workhorse, aerodynamically identical, to be flown three days a week until I can do it right. Honest. But seriously, the nacelles of the Widgeon and the Comet are beautiful in shape, strong enough for big electric motors and very light. Each of the Comet's nacelles is 20" long, and weighed just 2.8 oz. out of the mold. I suppose that I could have made them the same way I do the fuselages and end up with good looking low weight parts, but ... I made the molds and they came in handy when I had to repair crashed nacelles. There are many ways to make molds. The method I use requires a special hydrophobic epoxy, which doesn't mean it has rabies, it means it bonds and cures in the presence of water. This epoxy is very thick and is used just to make a heavy skin around the plug. Before the second coat sets, the box is filled with a special, very strong plaster batter. As soon as the plaster sets, which takes about two or three hours, the plug can be removed and the mold is ready to make parts. It is a lot faster and a somewhat cheaper way to make a mold. The only problem is that if you want to mold something big, like a 60" fuselage, the chunk of plaster will be so heavy you'll need a forklift to handle it.

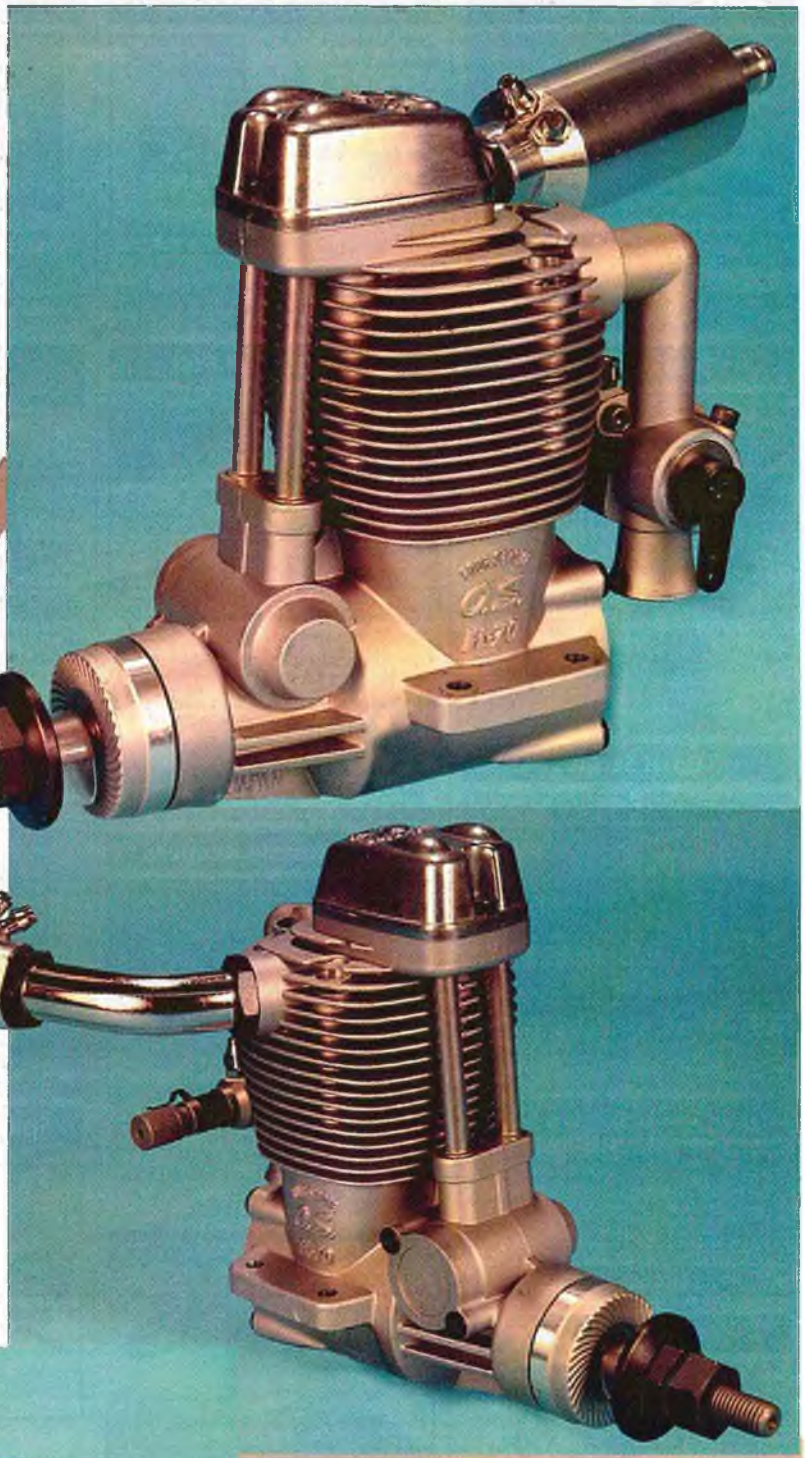
So, we've built a beautiful model, now we have to paint it. Important stuff. You see in the photos that I test fly the models before finishing them because, being scratch-built, there may be a few changes. The Widgeon was crashed twice before I solved an incidence problem, and then it was painted. The Comet flew *sooo* beautifully that I went overboard, spent a lot of money and time to get it looking like a shining jewel. It crashed in the next flight because it had a nasty scale wing section that didn't tolerate a heavy wing loading. It took a week to scrape all the hard gorgeous red acrylic paint off the broken parts. When I rebuilt it and painted it with dope it looked almost as good as before, but weighed 14 oz. less. That's almost a pound, Henry! A hard lesson learned. The Tempest has been finished with Brodak's dope. Wonderful stuff. One excellent technique suggested by Brodak is to use one coat of Silver (bright aluminum) over the primer. In the first place, it will show all the defects you missed. Secondly, it makes a very even colored base and when you apply the next color it will take fewer coats to get an even tone, white, yellow and orange are particularly translucent and will require five, six or more coats if you are shooting over uneven colored substrate. Over Silver, one tack pass and two medium heavy coats will probably be enough. Silver has such a tremendous opacity that it takes a very light coat to do the job.

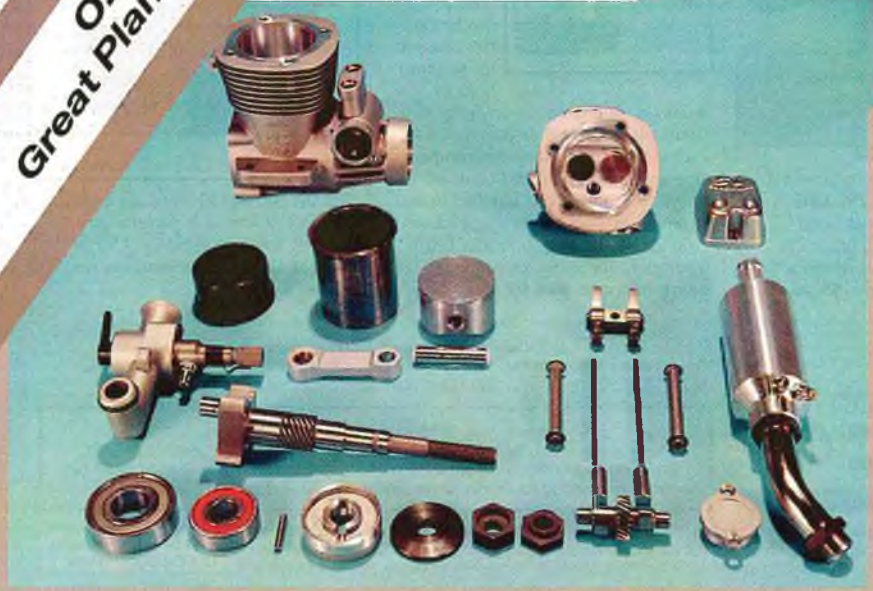
To finish this chat about building light, let me quote what we used to say in my old country: "The Kilo is made with a lot of little grams." You have to save weight everywhere, no matter how small the saving may seem, because there are so many details in a model that a small fraction on each one of them will add up to a considerable weight saving at the end of the project. And light flies better, kiddo. ✈

FL-70

O.S. Engine Mfg. Co.
Great Planes Model Dist. Co.

By Clarence Lee



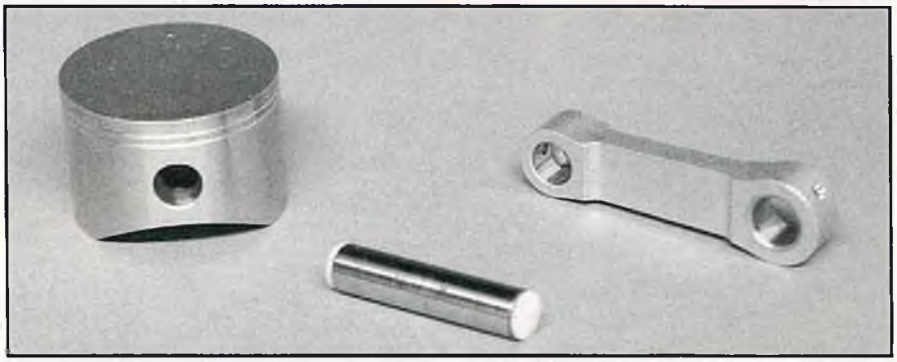


SPECIFICATIONS

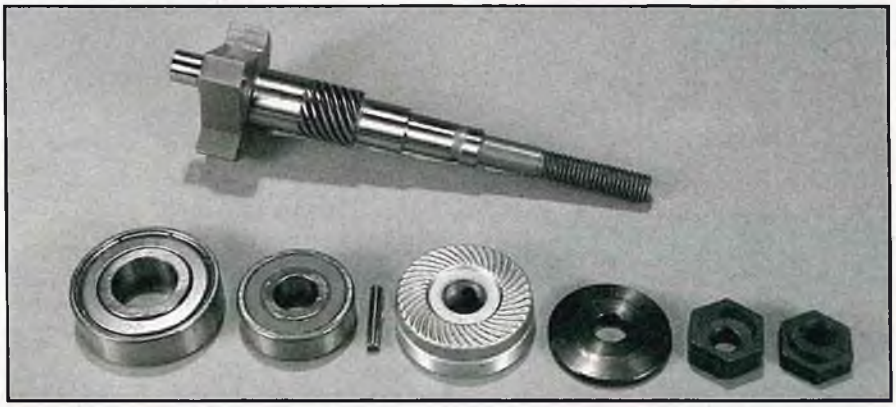
Type: Single cylinder, 4-stroke cycle, ABC type (ABN), air cooled, glow ignition
Bore: 27.7mm (1.090")
Stroke: 19.0mm (.748")
Displacement: 11.45cc (.698 cu. in.)
Compression ratio: 8.63:1
Horsepower: 1.1@11,000 rpm
Rpm range: 2,300-12,000
Weight: 16.48 oz. — w/muffler 18.28 oz.
Manufacturer: O.S. Engines Mfg. Co., Osaka, Japan
U.S. Distributor: Great Planes Model Dist. Co., Champaign, IL
www.greatplanes.com
Street price: $189.99

I don't believe there is another model engine manufacturer in the world that introduces more new models or updates their existing engine line more often than O.S. A month seldom goes by in which we do not receive notification of a new engine release. In the past year alone O.S. introduced three new R/C car engines, the Max 21 VZ-R Ver. II for race cars, the Max 21 VZ-B V-Spec for dune buggies, both of which were 2-strokes, and the FS 26S-C Ver. II 4-stroke race car engine. On top of this they added the Max 37SZ-H and Max 50SX-H helicopter engines to their engine line-up, and most recently, the FL-70 4-stroke — our review engine for this month. Our most astute readers may note that O.S.'s new 4-stroke carries the designation FL rather than FS, the first time O.S. has changed the designation on their single cylinder 4-stroke engines since the introduction of their FS-60 back in 1976, which was the world's first mass produced 4-stroke glow ignition engine. The FS designation signified Four-Stroke, but, now only the F stands for four-stroke and the L for light, i.e., the new FL-70 is a lightweight 4-stroke. Actually, the FL-70 weighs only a half ounce less than the O.S. FS-70 Ultimate that we reviewed in the April '04 issue, but the FS-70 Ultimate was already a light weight to begin with, with every effort having been taken to reduce its weight even to drilling six lightening holes in the prop drive washer which the FL-70 does not have. In comparison to the original FS-70 Surpass II the new FL-70 weighs almost 3-1/2 oz. or 20% less.

It was only last year that O.S. introduced their FS-70 "Ultimate" which replaced the FS-70 Surpass II and is now their top of the line performance .70 cubic inch 4-stroke engine. The new FL-70 is aimed at a different market — those who have not yet experienced the fun of flying with a 4-stroke engine or those who are new to the sport of flying R/C aircraft which was more or less the original intention of Shigeo Ogawa, who founded O.S., when he introduced his FS-60. The FL-70 is to the O.S. 4-stroke line as their LA series is to their 2-stroke line:



Piston, wristpin, and rod assembly. Ringless ABC type piston utilized. A first for O.S. 4-stroke engines.

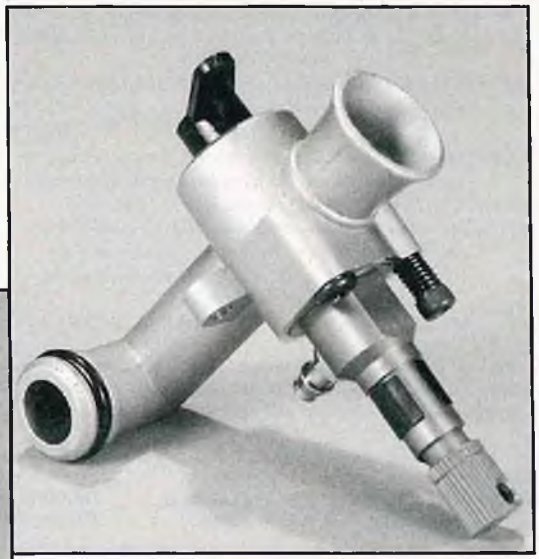


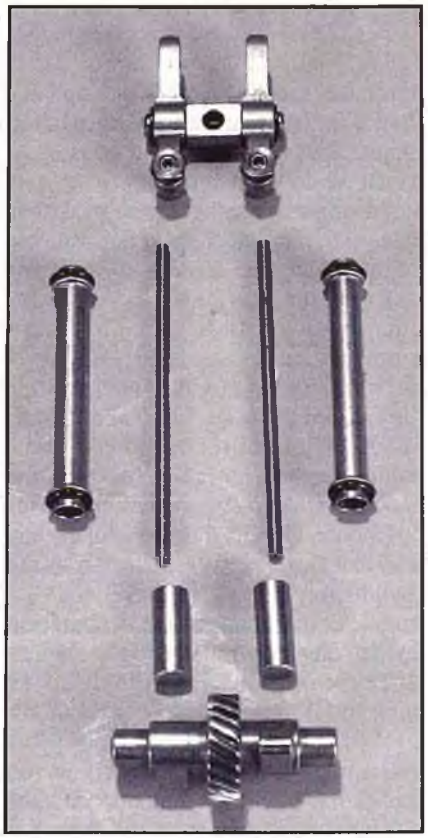
Crankshaft, bearings, and prop drive assembly. Short rod pictured between front bearing and prop driver fits hole in crankshaft and slot in back of prop driver. Can easily be lost so should be secured with Loctite. See text.

Combustion chamber side of head. Note glow plug offset towards exhaust valve to retain heat for better idle. Head retained by only four cap screws.

Injection molded plastic backcover has no screw "ears" and is secured by edge of screw heads.

RIGHT:
Air-bleed design carburetor utilized. Although basic in design, the carburetor performed very well after modification to tank plumbing. See text.
BELOW:
Muffler contains two pressure fittings. One for pressurizing fuel tank and other connects to engine crankcase vent. See text.





Valve train assembly. Camshaft supported by bronze bushings rather than ball bearings to help weight and cost reduction.

a basic engine selling for an economical price of less than $200.00, in turn, making a 4-stroke engine in this size range available to many who did not want to go the extra bucks to give a 4-stroke engine a try.

However, whereas the LA series 2-stroke utilizes sleeve bearings for crankshaft support, the FL-70 utilizes a 28mm o.d. x 12mm i.d. double shielded ball bearing at the rear and a 17mm o.d. x 8mm i.d. double sealed ball bearing at the front. So, even with expensive double ball bearings supporting the crankshaft, how was O.S. able to hold the cost down to under $200.00. Let's take a look and see.

The new FL-70 is the same physical size as the FS-70 Ultimate but utilizes completely new pressure die-cast aluminum crankcase and head castings. The mounting bolt pattern also remains the same as the FS-70. However, rather than using miniature ball bearings to support the camshaft, bronze sleeve bearings are utilized. Although ball bearings might be considered desirable, it must be taken into consideration that the camshaft rotates at only half the speed of the crankshaft, making bronze bushings perfectly adequate for this application.

The engine uses an injection molded, plastic backcover, but, what is unusual,

is the elimination of "ears" on the backcover for the retaining screws. Instead, the backcover fits into the crankcase and the edges of four large diameter, flat head screws secure the backcover. A crankcase vent nipple has been cast as part of the backcover.

Whereas all O.S. 4-strokes in the past utilized steel sleeves with a single ringed piston, the FL-70 now utilizes ABN piston/sleeve metallurgy, i.e., a high silicon content aluminum piston running in a brass sleeve given O.S.'s special 2-stage, hard nickel plating, thus eliminating the need (and cost) of a piston ring. Another cost-saving factor is the elimination of a bronze bushing at the connecting rod's wristpin end. Although the cost savings in material is very small, it is the labor and machine time involved in making and installing the bushing that is the cost-saving factor. We still like to see connecting rods bronze bushed at both the crankpin and wristpin ends, but can understand why O.S. eliminated the bushing.

O.S. has chosen to use a basic air-bleed carburetor rather than the more commonly used 2-needle design. Again, the air-bleed type being less costly to produce. O.S. also feels that the air-bleed type is easier and less complicated to adjust for the less experienced fliers than the 2-needle type. In operation we found the carburetor to work fine and the air-bleed adjustment screw to be set "right on" from the factory.

The intake valve timing was within the normal range of what we usually find in the 4-stroke engines, opening 40° before TDC (top dead center) and closing 40° after BDC (bottom dead center) for an intake duration of 260°. The exhaust valve timing, however, opened late at 60° before BDC and closed early at 10° after TDC for an exhaust duration of 150° and a short over-lap period when both valves are off their seats for 50°. This accomplished two things: by delaying the opening there is a longer period for the combustion gases to expand before exiting the exhaust, theoretically helping the engine's low end torque. By closing early, the over-lap period is shorter, allowing less air/fuel mixture to escape out the still open exhaust. Again, this benefits low end operation and helps the fuel economy. This proved out when in comparison with the FS-70 Ultimate, the FS-70 Ultimate would turn the smaller prop sizes 300-400 rpm stronger. However, when loaded down with the 13 x 8 and 14 x 8 props, the FL-70 turned 200-300 stronger showing that its maximum torque and horsepower are occurring at lower rpm. It also did this more economically, burning an ounce of fuel per minute, whereas the FS-70 Ultimate burned approximately one and a quarter ounces per minute.

A check of the engine's full stroke compression ratio showed it to be on the low side at 8.63:1. The FS-70 Ultimate, as a comparison, had a compression ratio of 9.12:1. This was most likely done intentionally to tame any kickback on starting tendency or prop throwing in the air if run too lean, as the 4-strokes have been known to do. We always measure the compression ratio of a 4-stroke engine full stroke as the compression stroke starts with the closing of the intake valve which is usually between 30° and 40° of crankshaft rotation which, in turn, amounts to a minimum of vertical piston travel as the crankshaft passes through bottom center. With a 2-stroke the compression ratio is measured with the closing of the exhaust port which is usually in the 70° to 80° range, resulting in considerably more vertical piston travel before the actual compression of the air/fuel mixture begins.

The FL-70 uses a somewhat different type of muffler fuel tank pressurizing system which O.S. refers to as the "Aeropressure" system. The benefit of this system being more consistent fuel delivery regardless of the aircraft's attitude. Rather than a single pressure fitting as is normally used, the F-430 silencer has two fittings, one with a small i.d. opening and the other with a larger i.d. opening. The smaller i.d. fitting connects directly to the backcover crankcase vent fitting. The larger i.d. fitting connects to the fuel tank. However, O.S. diagrams this two ways in the instruction manual. The line can either go directly to the fuel tank vent ala standard practice, or connect to a "T" fitting that, in turn, connects to two tank vents — one at the top and the other at the bottom of the fuel tank. The latter system being the Aeropressure system. This evidently creates a more even pressure within the fuel tank during upright and inverted flight maneuvers. What is a bit puzzling is connecting the crankcase vent to the muffler via the second fitting. Muffler pressure is evidently slightly less than the crankcase pressure, allowing the excess oil residue that collects in the crankcase to vent into the muffler. During our testing we used a single tank pressure line. In operation we found the high speed needle valve mixture setting to be somewhat sensitive going from rich to lean in only three of four clicks. Disconnecting the vent line from the crankcase and plugging the second muffler fitting so that we were using conventional muffler pressure broadened the mixture adjustment range considerably to what we would normally expect.

The engine was given our standard 30-minute break-in period consisting of six 5-minute runs with cool down time in-between. O.S. recommends that a fuel containing 5-15% nitromethane and at least 18% lubrication be used — either castor, synthetic or combination of both. Our standard test fuel — 10% Omega — met these requirements and was used for the testing with two additional ounces of castor oil added during the break-in. All propellers were Zingers. The temperature of the day was 72°F, the relative humidity 48%, and the barometric pressure 29.92" of mercury.

11 x 8 — 10,400
11 x 10 — 9,200
12 x 6 — 10,200
12 x 8 — 9,100
13 x 6 — 9,700
13 x 8 — 8,000
14 x 6 — 8,400
14 x 8 — 7,200

O.S. recommends that an electric starter be used for starting, not so much for safety reasons, but due to the engine not having a choking device. Because of this it is necessary for the engine to spin a few seconds to pressurize the fuel tank and supply fuel to the carburetor. However, we had no problems starting the engine by hand in the conventional manner, i.e., choking with our finger at full throttle until fuel could be seen in the fuel line at the carburetor, reducing the throttle to a high idle, connecting the starting battery, and flipping the prop in the normal starting direction. Oftentimes, the 4-stokes will fire up easier using the "backward flip" starting method, however, we did not find this necessary.

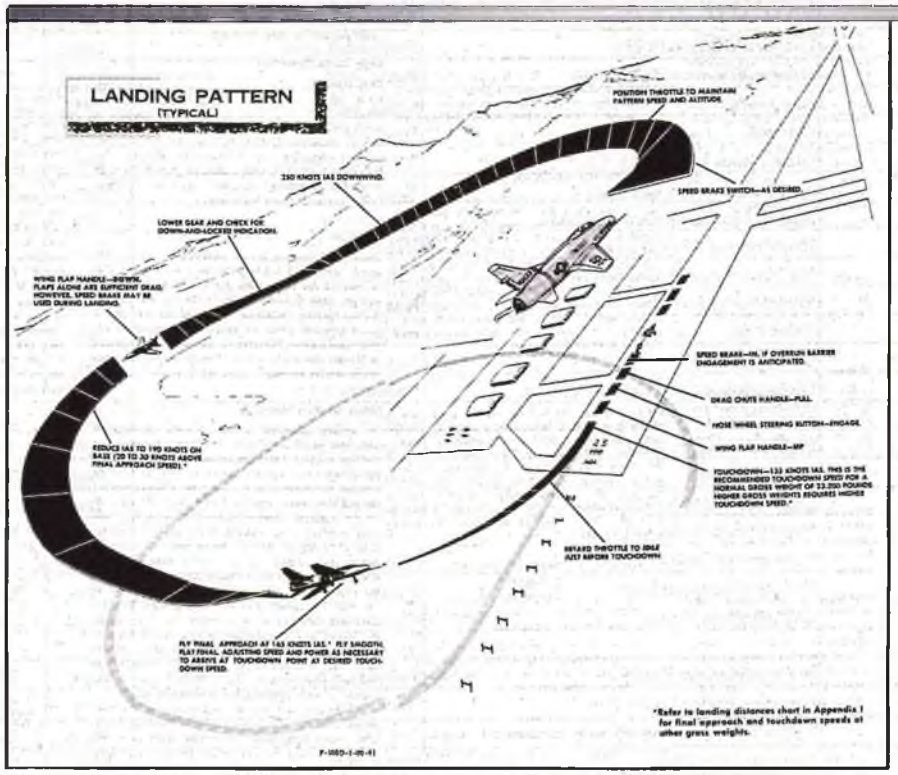
Although we had the engine idling as low as 2,250 rpm, 2,450 was more reliable with good acceleration and deceleration qualities. Being of ABN design, there was a tendency of the tight piston to "stick" if idled slower, particularly with the smaller prop sizes. With a little more running time and loosening of the piston we would expect the engine to have a lower idle speed. Heavier propellers such as the APC's would also be beneficial.

If we were to fault any area of cost reduction it would be the method of prop drive washer retention. Those familiar with running model engines will know that there are three basic ways of retention — a split collet, flats milled on the crankshaft, and a Woodruff key. The FL-70 has a hole drilled through the crankshaft, through which a short length of 2.5mm (.098") o.d. hardened steel rod is slipped, in turn, matching a slot cast in the backside of the prop drive washer. Actually a clever arrangement but one that lets the short rod fall out if the prop drive washer moves forward when removing the propeller. After having this happen on two occasions we solved the problem with a couple of drops of Bob Smith's IC-2000 instant glue. A more permanent fix would be a couple of drops of red Loctite #42 Thread Locker, but we didn't want to wait overnight for the Loctite to set.

Overall, we were quite impressed with the engine's friendly operating characteristics and performance. If you have wanted to give 4-stroke power a try, but were held back due to the price being more than the hobby budget would allow, the O.S. FL-70 could well be the answer. Although O.S. has cut a few corners to market the engine at a very reasonable price, the quality is still typical O.S., second to none. ✈

SCALE VIEWS

Art Johnson



This is a typical 360 overhead traffic pattern as flown by jet fighters. This view from the F-100 pilot's manual shows the aircraft entering at pattern altitude and making a level turn through downwind rather than the climbing turn of WWII prop fighters. There are no 90 degree turns in the pattern.

ME-108 scale model from a Hobby Lobby ARF kit. Not exactly a competition scale model, but fine for a fast building scale practice model.

FW-190 on display under the wing of the Enola Gay B-29 at the National Air and Space Museum's Udvar-Hazy Center at Washington Dulles International Airport. The huge new building contains a number of aircraft that were formerly on display at the downtown Air and Space Museum, plus other aircraft that were too large for inside display at any other location.

Landing Patterns

Most major scale contests have finally recognized that the traffic pattern for a model should be typical for the original aircraft and not limited to a canned standard pattern. I think the problem began many years ago when someone introduced into the AMA rule book, a standard rectangular square cornered landing pattern which all contestants were required to follow if they were to receive credit for a landing pattern. The problem was that very few real aircraft ever used this type of pattern. It was confined to training fields, some general aviation airports, and to heavy bombers and transports in the military. Practically no military fighters or medium bombers ever flew this type of landing pattern and do not to this day.

In WWII the standard tactical aircraft pattern was called a 360 overhead. It was started with the aircraft or formation entering traffic on an initial approach straight down the runway. When the first aircraft reached a spot above where he intended to touch down, the pilot pitched out in a climbing turn, pulled the throttle back, and continued the climb until the aircraft speed was reduced to below the limit for dropping the landing gear. With the gear down, the aircraft continued the turn, descending as the speed dropped. Somewhere on the base leg the flaps were deployed and the turn continued to final and touch down. The hot-shot fighter ideal was to pull the throttle back to idle on pitch out and not touch it again until after touch down. This made for a nice fast landing pattern, but with no room for error if the speed dropped too low. A too tight final turn at low speed was not good for longevity.

With formation landings only the first aircraft would make the fast 360 approach. Each of the other aircraft would extend the pitch-out point down the runway and roll level for a more extended downwind to provide runway spacing between aircraft. All other features of the landing would be the same. The approach altitudes for tactical aircraft were supposed to be standardized for each airfield, but in practice this might vary widely. I recall five hundred feet as being the designated approach altitude on several fields in WWII, but pilots at that time, being what they were, often ignored the rules. I have movies of my B-26 Group

landing on return from a combat mission and the approach could not have been more than a hundred feet before pitching out in the climbing turn.

When the AAF became the USAF in 1947 and jet fighters were being introduced, we soon found that some changes were needed in the fighter landing pattern. Jets, and particularly the swept wing jet fighters, did not take kindly to high "G" slow final turns. I can remember in the F-84F, that when below 600 pounds of fuel, you could not bank more than thirty degrees without flaming out. Not good for the hot-shot fast 360 approach. It was decided that with dive brakes, there was no longer a need to make a climbing turn to reduce speed before gear drop. Throttle back and dive brakes could do the trick in level flight. The upshot was that the official fighter traffic pattern was changed to a level approach and turn through downwind and the decent started when turning base leg. Traffic patterns were changed to an approach altitude of around 1500 feet. The downwind part of the turn was out farther, allowing for a more gentle lower "G" turn to final. This is the traffic pattern shown in the illustration from the F-100 dash one tech order (pilot's manual). I believe that this is the USAF jet fighter pattern still in use today.

The 360 overhead landing pattern, either original or modified, is fairly easy to fly with our models. It has the added advantage of keeping the model closer to the pilot and makes it easier for the judges to see. It is not the pattern for Cub fliers, but it is appropriate for almost all military aircraft with less than four engines (well maybe not the C-47).

There are other approach patterns typical of some aircraft that would not be too useful for our models. Instrument landing patterns come to mind. The tear drop jet fighter approach from high altitude is an example. Most of the action here would occur too far from the runway for either the pilot or judges to observe. The same goes for trying to simulate an IRS or GCA landing. Best we stick to those used for visual flight rules. After all, we are supposed to be able to see what is going on.

Air Museum at Dulles

In-between dodging Florida hurricanes I managed to visit the new Air Museum at Dulles Airport near Washington DC. This is one huge building, making it possible to put

some very large aircraft on inside display. This was the first time I had seen the Mach 2 Comet up close and it turned out to be much larger than I had expected. The museum looks a bit crowded with planes hanging at various heights from ground level to the ceiling. Many overlap some of the larger aircraft, but there are three different levels for observation, so visibility is good.

I also managed a repeat visit to the Air and Space Museum in DC. A number of the exhibits had been rearranged since my last visit. One of the most interesting was the Wright Flyer now down at ground level where you can get a very close-up look at the details of construction. Interesting to see just how the wiring was set up to control wing warping. It took a good look to figure out exactly how it worked.

As it turned out, I didn't actually dodge all the Florida hurricanes. Two of them made direct hits very close to where I live. No major damage to my place, but it is hard to do any model building, or article writing for that matter, when the electrical power is off for many days. As for model flying, I hope I don't forget how before the winds are out of here. I did plan to attend the Rally of Eagles up in the Florida Panhandle in October, but Hurricane Ivan did that one in. They say that it will take a year to rebuild the Headquarters Hotel used for the Rally.

Scale ARF for Practice

Having designed and built my own scale models for many years, it is hard to admit that I have actually built an ARF. I do most of my Sunday flying and practice with sport models which reduces the wear and tear on competition scale models. I ran fresh out of Sunday fliers a while back when I tried a roll with my Sig Cobra a bit too close to the ground. A Hobby Lobby ad for a scale ARF of the ME 108 drew my attention. The size was right, the price was right, and the model had retracts and flaps. I ordered from the Website, with delivery four days later. A week later and the model was in the air. I used the same engine that had been in the Sig Cobra (O.S. .91 4-stroke).

The ME 108 was used as a trainer by the Luftwaffe and it was such a nice flying airplane that it was put back in production after the War. The ARF version is very easy to fly and looks good in its Swiss Air Force finish. Problems with the kit, made by Graupner, were minor. The gas tank cap split on the first flight, the plastic spinner was a bit flimsy, and the mechanical retract struts bend a little too easily. I understand that this latter problem is common to many scale ARFs.

Dave Platt's Vol. 4 Video

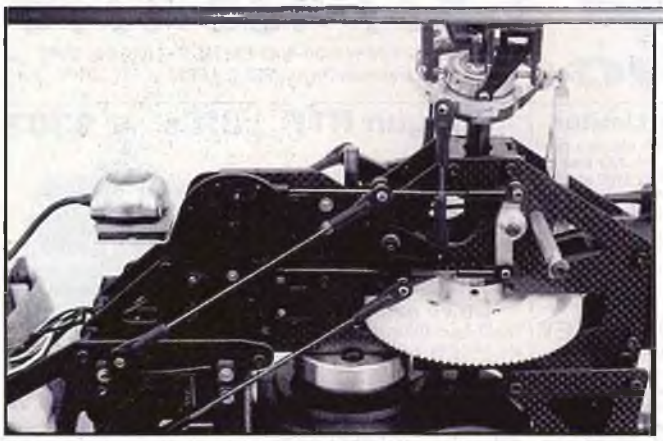
Titled "Advanced Building Techniques," Dave's latest in his Black Art series of videos covers how he built the myriad parts for the incredibly detailed cockpits in his model of the Navy Kingfisher. The video also covers the completed model's competition debut at the 2004 Toledo Show. I reviewed the DVD version of the video and found it most interesting all the way through. The video is available in both VHS and DVD formats from Dave Platt Models, Inc., 1306 Havre NW, Palm Bay, Florida 32907. Phone (321) 724-2144. Website is:

www.daveplattmodels.com

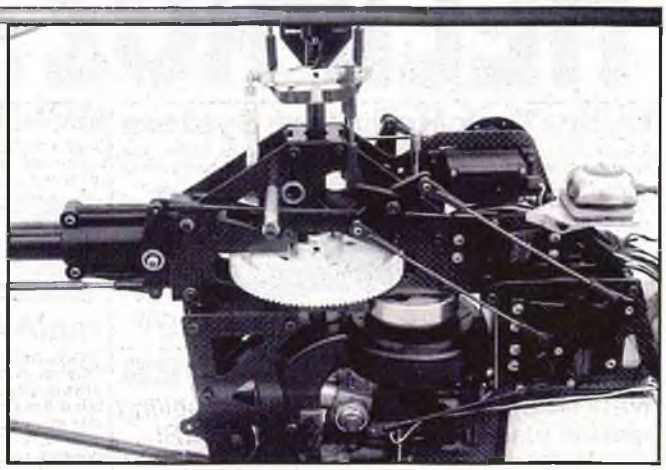
Dave Platt's latest video in his "Black Art" series covers the final techniques on how he made the fantastic cockpit details for his model of the Kingfisher float plane. The video also shows the completed model's debut at the 2004 Toledo Show.

HOVER

John Benario



The push-pull elevator assembly with my drilled Futaba servo wheel.



The new front mounted tail servo arrangement.

Carbon Predator

I finally got my second Predator rebuilt in the new carbon layout. It took me longer than planned because after I rebuilt the first one earlier in the summer I was simply enjoying flying it and didn't have the motivation to sit at my workbench and rebuild the second one. Couple the great flying with the fact that the Predator has been completely trouble-free and one tends to lose interest in anything but flying. Other than making sure the ball links on the tail control assembly don't wear too much, the Predator has been a "charge and fly helicopter."

The two obvious design changes between the original aluminum version and the carbon version are the push-pull elevator servo on the left side and the front mounted tail servo on the right side. These two differences also apply to the push-pull elevator and front mounted tail servo that I developed last summer. There are also many other hidden improvements that have been incorporated into the kits without any notice. It was a pleasant surprise building the carbon kits, as I discovered the improvements as I went.

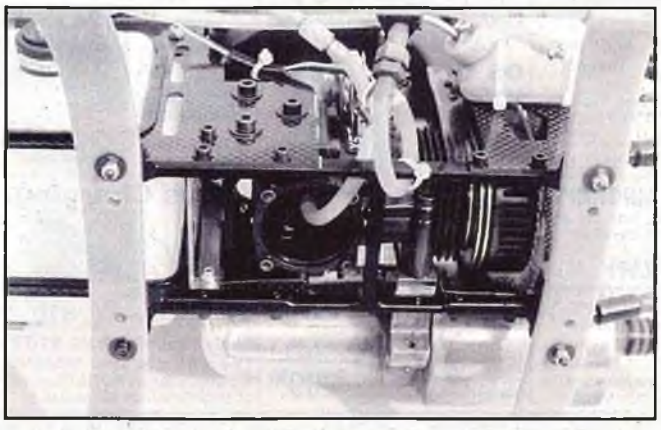
Last summer when I built my first Predator, I compiled a list of things that I thought should be improved on. This is no different from any other top of the line helicopter, there are always things that could be done better. The difference this time was that the manufacturer was listening.

One of the improvements, heavy duty ball links, was incorporated very quickly, while other improvements, such as the clipped axle, took longer. While I would like my suggestions to be acted on immediately, so that I can have a perfect helicopter without any extra effort on my part, the realities of mass production do not allow such speedy results. The Fury was improved on for many years to get to its current successful configuration and the Freya is in its second configuration. Since it was my wish list that instigated most of the changes I am very pleased with the current product.

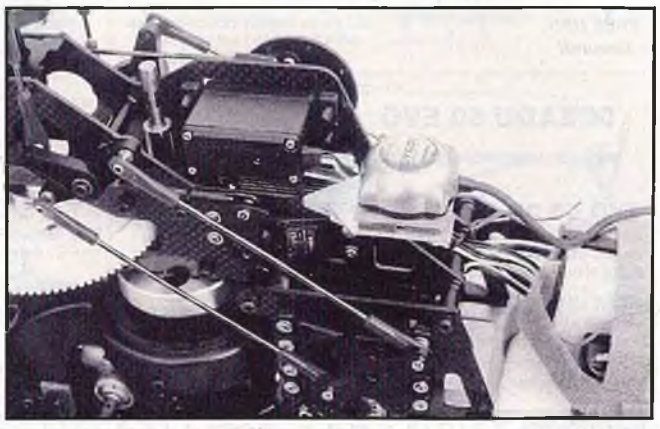
Back to the push-pull elevator and the front tail rotor servo. These were two design changes that I implemented on my kits when I built them last summer. Peter Chao did my designs one better. By moving the elevator servo to the left side he was able to mount the tail rotor servo where the elevator servo had been on the original non-push-pull set-up, which in turn produced a straighter pushrod run than I had on my version which had the tail rotor servo opposite the throttle servo.

I differed from the instructions slightly when I installed these two components. Century recommends their special aluminum servo arm for the elevator servo with holes at 20mm and 14mm which match the unusual layout of the elevator arm. I didn't have the Century arm and since I prefer plastic for servo arms, I used my Enco mill to accurately drill a large Futaba wheel at 20mm for the lower pushrod and 14mm for the upper pushrod. Note the Futaba wheels have holes at 19.3mm, not 20mm, so both holes had to be drilled. Chalk up another cost savings from the mill.

On the tail rotor pushrod set-up I used the plastic Fury bellcranks that I had used on my own front tail servo arrangement rather than the aluminum lever that the kit comes with. The Fury



The machined bottom plate. Very nicely made. Should(?) be crashproof.



My homemade gyro mount. A lot of people have asked me where I mount the gyro.

bellcranks use larger bearings which have slightly less play than the smaller bearings in Century bellcranks. If I did not already have the Fury bellcranks I would have used the stock ones without any concern.

The carbon sideframes use a very nice milled aluminum bottom plate that fits into the lower frames versus the aluminum components which had a stamped bottom plate that bolted to the bottom of the lower frames. Because of this difference it took a different building technique to get the engine aligned properly. My goal is to have the clutch bell free enough so that when the blades are pushed forward the friction in the auto hub is enough to spin the clutch bell. It is difficult to achieve this degree of freedom with the Predator/Vigor clutch bell arrangement because the large bearing that supports the clutch bell has inherent drag and the rigidity of the design exacerbates the effects of the slightest misalignment.

On my first attempt I didn't think the construction through and even though I did get everything smooth, after a day of flying the drive train had binding.

I figured I had missed something when I built the frames the first time so I took everything apart and assembled it a second time with shims everywhere. I am not really sure why I thought I needed all the shims, but at the time it seemed like a good idea. I got everything smooth, but after flying the binding came back.

I took everything apart again and decided this time to think about what was going on before I wasted another day. It turned out that the mistake I made was in the sequence of tightening the sideframe bolts. I tightened the rear lower sideframes first, then the front lower sideframes and then installed the bottom plate. Tightening the front and rear portions independently essentially guaranteed the front portion was not aligned with the rear portion. With the front and rear portions not aligned, the frame assembly was twisted when the bottom plate was installed. The ability to bolt together in a misaligned condition is a result of the tolerances in all the bolt holes. This is a disadvantage of a stacked sideframe arrangement, to go along with the advantage of being much more rigid than a narrower flat sideframe design.

The trick was to bolt the upper frames securely so that the main shaft slides freely in its bearings and the clutch bell is set to the proper mesh with the main gear, but leave all the other bolts loose until the bottom plate is installed. Once the lower frames were secured to the bottom plate the remaining bolts were tightened. Using this method ensures that the front portion of the sideframe assembly is properly aligned with the rear portion and none of the frame components is stressed when the bottom plate is installed.

Once the sideframe bolts are all tight, the engine and mount are secured so that the engine lines up with the clutch bell and start shaft. With the sideframes properly assembled the engine spacing to the mount is the remaining unknown. The Predator kits come with 0.020" (0.5mm) engine shims to space the engine. In most cases 0.020" will be too large a step and it is very helpful to have 0.010" and even 0.005" shims so that the engine can be lined up exactly with the clutch bell. Robbe makes 0.032" and 0.008" shims, or shims can be made from brass using the shim punch.

By assembling the sideframes as described here and using the finer shims it was possible to line the engine up accurately such that the clutch bell does spin when the blades are pushed forward and most importantly, remains that way.

On my first Predator I spent many days before I got it right, but on my second kit I had the engine lined up very quickly since I knew the procedure. I remember when I built my Vigors years ago I had the same issues with lining the engine up and it took me a number of attempts before I got the engine alignment down. It is amazing how difficult it is to learn from one's experiences!

O.S. Pump C-Spec

After talking to Curtis at IRCHA I am trying the O.S. pump with the 3-needle carb to compare the power to the pressure-Kline set-up. So far I have a few gallons through the pump engine. As I fly it more I will report on it.

If you're not flying you're not trying. I can be reached at:

bll230@yahoo.com

FLYING LOWE

Don Lowe

Photos by Tim Tucker

The top 7 finishers. From left to right in order of placing: Somenzini, Shulman, Paysant-Le Roux, Hyde, Leseberg, Sebastiano, and Goldsmith.

2004
DON LOWE MASTERS

Perspective:

As I write this I am sitting in our motor home at Triple Tree Model Airdrome near Woodruff, SC, awaiting the start of the Don Lowe Masters Contest. We are now feeling the aftereffects of Hurricane Jean that has followed the other hurricanes in devastating Florida and the southeastern states. We have a driving rain and 60 mile an hour winds at the moment. The surrounding areas have been warned of flash flooding. It's not likely to happen here with the drainage system Pat has created. We are hoping for clearing weather tomorrow (Tuesday) to dry things off to be ready for the event that begins on Thursday. Having been in the Adirondacks all summer we are humbled to have escaped serious harm to our property and life as experienced by so many in Florida and the coastal areas, which has been the experience of many modelers, especially in Punta Gorda and the panhandle areas, and of course, Pensacola. Ron and Betty Jo Chidgey had a tree fall on their home that destroyed most of it. Ron was the Chairman of F.3.A.Committee for many years and competed in Pattern events in this country. He was one of the several judges who could not come to the Masters since they had to clear away debris and fix up their homes.

Friends in the Orlando, FL, area experienced damage and the R/C World Club shelter was destroyed. We want to extend our most profound sympathy to those who have lost so much from the storms. We have lived in Central Florida since 1981 without ever experiencing hurricanes in that area, but this year three hurricanes came across through Orlando.

In spite of the hurricanes we are happy to have our health and have the Masters to look forward to, assuming things dry up here in South Carolina. This column will end with a report on the event which brings together many of the very best fliers from around the world to compete for significant cash prizes.

Why Competition?

Wherever I go I am appalled by a great lack of enthusiasm for modeling competition. Most modelers are content to fly their sport aircraft and test their ability to get it in the air, fly it around doing a few maneuvers and then land it safely. A very small percentage of AMA members actually engage in formal model competition, yet the AMA commits thousands of dollars annually to field world competition model teams.

Many modelers who attend Fly-In Rallies say that they do it because they don't want to compete, and yet it, too, is a form of competition since each flier is

Bob Sadler's very fancy equipment set-up.

A few of the competitors' aircraft waiting for the morning fog to dissipate.

ABOVE: Somenzini's two Yaks.

LEFT: F.3.A. World Champ Christophe Paysant-Le Roux and I chat. Christophe finished third behind QuiQue Somenzini (first) and Jason Shulman (second).

proud of that model aircraft he/she created and wants the modeling world to be aware of our building and flying skill. Why else do we travel hundreds of miles to show it off in front of a large crowd of modeling enthusiasts? Wouldn't it be easier just to go out to the local flying site and hack around a little while?

Competition is strongly evident in every sport or activity that I can think of: golfing, tennis, racing of all kinds, and it goes on and on, even in business and product manufacturing.

Competition is the impetus for product development and the ever-increasing sophistication in every aspect of our hobby. It is the spark driving the evolution of our radio control systems. The reason we now have unlimited choices in engines, control systems, batteries, even the aircraft themselves, has been the competition.

Mark Leseberg and the JR banner welcome the competitors.

A good example is in our larger and more sophisticated aerobatic model designs and the required associated equipment to fly them, all due to the Tournament of Champions that began in 1974 through the vision of Bill Bennett, then the Circus Circus Board Chairman, and Walt Schroeder, editor of *Model Airplane News*. Both of these gentlemen are now deceased.

This event was begun using the then existent Pattern competition aircraft. Their vision was to emulate Full Scale aerobatic competition aircraft. In time the TOC aircraft were scale models of those used by the Full Scale pilots. The process of this evolution was painful since we were always struggling to find engines, or develop them, for what was needed to power those increasingly larger aircraft. When the .90 size engine came along we had a big breakthrough. On its heels came the Tartan engines, modified chain saw engines, and now our choices are unlimited! Why? Because industry saw a demand to feed not only the needs of the competitors, but also the thousands of model fliers who wanted to be like their heroes.

Such development is seen in every aspect of the hobby, for instance look at what has happened to the old Du-Bro Whirly Bird helicopter, and today, .90 powered and turbine powered machines that are incredibly aerobatic. What drove this development? Competition!

Take a look at the very recent evolution of F.3.A. aerobatic aircraft that were long the province of piston engines (2- and 4-stroke) and now are invaded by electric-powered aircraft of incredible performance. Why? Because they are quieter, have less vibration, and allow very sophisticated energy control for perfect maneuvers. Take a look at the proliferation of electric model aircraft of all kinds created by the demand for less noise to keep club flying

Chip Hyde is ready. Chip finished fourth after moving to his backup model.

Here is that beautiful first place trophy!

Jason Shulman runs through the maneuvers.

QuiQue prepares for flight.

sites, and competition among fliers and/or manufacturers to satisfy the desire for something new ahead of their competitors.

Industry needs competition as a focus for their product development and, yes, they certainly should support it, for without it this hobby would stagnate and lapse into mediocrity. The model fliers need it to satisfy their need for something new or different.

I am not saying that we all must fly in model contests, but competition certainly has a place — a need to stimulate excellence in our hobby from which we all benefit. Now for a report on one competition.

The 2004 Don Lowe Masters:

This year's event represented a major restructuring of the Masters to make it even better in terms of organization, schedules flown, prizes provided, quality of the judging panel and, of course, the proficiency of the competitors attracted.

Contest Director, Mike Gregory; Contest Coordinator, Warren Thomas; Associate Chief Judge, Tom Miller; Mike LeTourneau, Scoring; Bob Sadler, Announcer; Carol McKinney, Event Secretary; the members of the Confederate Air Farce and, of course, Genial Host, Pat Hartness combined their talents and expertise to make this one truly memorable.

The contest featured $50,000 in cash prizes awarded to the top seven finalists. We had many of the very best fliers in the world and an international judging panel of high quality. The contest format was structured in a manner similar to the former T.O.C. in that Known, Unknown and Free Style patterns were flown, with the scores combined to form a total score. Twenty-one competitors flew two days of eliminations, with the top seven moving on to a new contest on day three. I was

Peter Goldsmith (seventh place) makes a pass with his big original CAP.

3D; they love it!

Bob Sadler, announcer, the "Mouth of the South," and our gracious host: Pat Hartness.

The seven finalists and their aircraft.

No, it's not on fire! It's the smoke from Silvestri's Free Style performance.

impressed with the flying from top to bottom. The finalists earned their positions. (See scores included.)

The aircraft flown were all 40% or bigger, using engines of 150cc, or larger. There was evidence of 160cc, 210cc, and a prototype D.A. 200 (4) flown by Chip Hyde. Most fliers made an effort to reduce noise for additional points. Many three-bladed props and large exhaust canisters were in evidence. A qualitative assessment of model noise in flight was made by the judges, and points awarded from zero to ten. Pat Hartness and the contest committee are pushing noise reduction to assure the longevity of this beautiful place for model flying. We had also made an effort in constructing the patterns to reduce the energy requirements for very long vertical lines. There was some discussion about requiring a particular noise set-up for the next Masters in 2006. As you may know, IMAC now requires a quieter set-up. It should not be difficult to get below their limit: 98 DB at 25 feet. I have a 37% Extra 300L that measures 92 DB at that distance, using a three-bladed prop and canisters.

We made a special effort to accurately score all maneuvers by using something a little different: a three-person jury to look at all maneuvers to assure the correct

COMBINED TOTAL POINTS				KNOWN 1			UNKNOWN 1			FREE STYLE 1			KNOWN 2			UNKNOWN 2			FREE STYLE 2		
PLACE	TOTAL NORMED	PILOT NAME	MEET TOTAL	NORMED & WEIGHTED	POINTS	PLACE	NORMED & WEIGHTED	POINTS	PLACE	NORMED & WEIGHTED	POINTS	PLACE	NORMED & WEIGHTED	POINTS	PLACE	NORMED & WEIGHTED	POINTS	PLACE	NORMED & WEIGHTED	POINTS	PLACE
1	100.00	QUIQUE SOMENZINI	100.00	40.00	32948.50	1	50.00	35734.00	1	10.00	19158.00	1	40.00	34452.50	1	49.73	37078.50	2	9.96	18360.00	2
		BEST	100.00		32948.50			35734.00			19158.00			34452.50			37283.50			18426.00	
2	98.16	JASON SHULMAN	98.16	38.76	31930.50	2	49.86	35634.50	2	9.04	17310.00	4	38.00	32733.00	2	49.56	36953.50	3	9.53	17568.00	5
		BEST	100.00		32948.50			35734.00			19158.00			34452.50			37283.50			18426.00	
3	98.04	C. PAYSANT- LEROUX	98.04	38.37	31606.50	4	49.36	35279.50	3	9.65	18480.00	2	37.72	32490.50	3	50.00	37283.50	1	9.66	17808.00	4
		BEST	100.00		32948.50			35734.00			19158.00			34452.50			37283.50			18426.00	
4	96.84	CHIP HYDE	96.84	38.53	31739.50	3	47.71	34096.50	4	8.05	15420.00	5	37.25	32080.50	4	48.80	36390.00	5	9.51	17520.00	6
		BEST	100.00		32948.50			35734.00			19158.00			34452.50			37283.50			18426.00	
5	95.21	MARK LESEBERG	95.21	36.03	29682.00	6	47.54	33975.00	5	9.40	18012.00	3	36.28	31252.00	5	48.93	36485.00	4	10.00	18426.00	1
		BEST	100.00		32948.50			35734.00			19158.00			34452.50			37283.50			18426.00	
6	93.36	SEBASTIANO SILVESTRI	93.36	36.62	30160.50	5	45.36	32418.50	6	8.99	17220.00	5	35.69	30739.00	6	46.86	34941.50	6	9.88	18210.00	3
		BEST	100.00		32948.50			35734.00			19158.00			34452.50			37283.50			18426.00	
7	84.22	PETER GOLDSMITH	84.22	35.20	28998.50	7	36.68	26211.50	7	7.27	13920.00	7	35.57	30638.50	7	39.54	29482.00	7	9.11	16788.00	7
		BEST	100.00		32948.50			35734.00			19158.00			34452.50			37283.50			18426.00	

maneuvers were flown. The judges then could concentrate on scoring the quality of what they saw without concern that the maneuver was flown in sequence. It seemed to work out well.

Some of the fliers participating were: Christophe Paysant-Le Roux, current World Aerobatic Champion; QuiQue Somenzini, Second Place finisher in World Championships and many times T.O.C. winner; Silvestri Sebastiano, Italian National Champion; Chip Hyde, current Third Place World Championships, and many times winner of the NATS, World Championships and TOC winner; Jason Shulman, U.S. Team World Championship, multi winner at the Don Lowe Masters, current AMA Pattern Championships, and many others.

It was apparent from the start that QuiQue was on mission to win since he flew beautifully, including extremely good Free Style. Jason, Christophe and Mark Leseberg and all the others responded to the challenge with extremely good flying in great weather. It was a real pleasure to sit and judge them and all the other fliers. As you know I really enjoy precision aerobatics, and this was the epitome!

As you can see from the Finals scores, QuiQue was very strong; the other placings were a dog fight.

The contest organizers have decided to make this a bi-annual event in order to not interfere with the F.3.A. World Championships, improve organization of the event, and increase the prize awards.

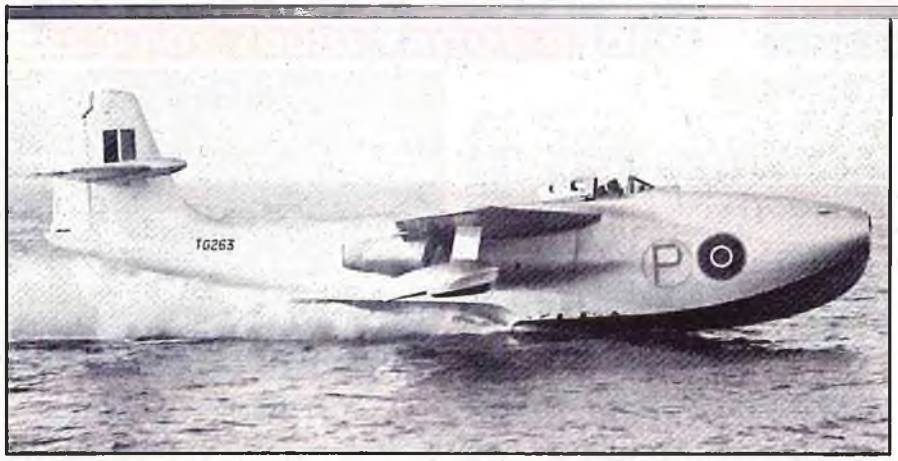
Invitations have been extended to the current top ten place fliers for the 2006 contest; the rest will be selected on the basis of their competition record.

If you want to see the best model aerobatic flying in the world conducted at the premier, most beautiful flying field in the world, then mark your calendar for 2006 to come to the Triple Tree Aerodrome, Woodruff, SC.

I want to extend my heartfelt thanks to all the guys and gals who make this event possible. My special thanks go to my good friends Pat and Mary Lou Hartness who make this all possible. Pat told me recently that model aviation in his life has led to his success in the business world; most of us in this hobby will agree. This is a GREAT hobby!

BIG IS BEAUTIFUL

Ken Runestrand



Shortly after WWII, the British firm, Saunders Roe, designed and built this experimental jet powered flying boat.

Real Pilot?

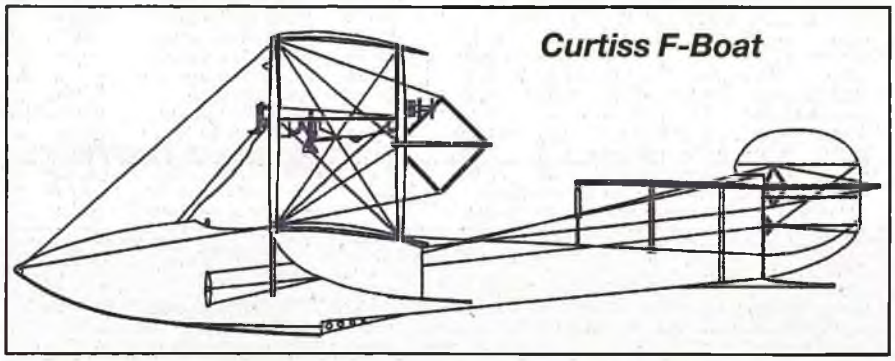
A flight simulator can be a boon for a beginning model pilot ... and your mistakes don't require re-building time or cost. I was very fortunate, because with a CFI (Certified Flight Instructor) for a brother, I not only got to play with big planes, we could set up flight plans with computer simulators that mimic actual full-scale flying. Being a "real pilot" can be exciting at first, but as a "hobby," I find that model flying is much more interesting. Long flights in big planes can actually become boring. At least on a commercial flight, you can get something to eat besides a cold "lunch" ... or go to the bathroom.

I would certainly recommend that any model pilot with access to a flight simulator to make use of it, but there is quite a bit of difference between the performance of a model and a real plane. You won't see most planes doing 3D maneuvers, and for that reason, a modeler seeking a flight simulator to improve his model flying skills should shop for a **model** flight simulator so that the performance simulation can be comparable to what we experience with model flying. Another recommendation to beginning pilots is to make use of access to model cars ... powered of course. Learning to drive one skillfully can teach that beginner how to make use of all transmitter controls except up and down. The really big help is steering. You learn "right from left," not only going but coming, and every pilot recalls the control problems with a model coming at him. A beginner, once mastering a "road racer," only has to learn the "up and down" control to handle an airborne model. Learning time could easily be as short as an afternoon of flying. I see the young guys who started with electric racers solo in one day and soon out-fly a parent who has flown for many months.

Safety "Chute"

Another aspect of the modeling hobby is the joy of flying without the fear of a sudden "power off" condition that threatens bodily harm when in a full-size plane. I don't think that I could parachute out of a plane that had any control available to me ... even if it meant more harm to my person. Dumb as it sounds, many pilots have leapt from a stricken plane without a parachute. You usually read of such tales of a war-time pilot with a plane on fire. The choice was being burned alive or a leap to certain death. But would you believe that a few pilots have survived falls from altitude without a parachute? One, Lt. Col. I.M. Chissov, a Russian, fell 23,000 ft. and survived, though badly injured. In another occurrence, a British bomber crewman, Flt. Sgt. Nicholas Alkemade, jumped from his blazing aircraft at 18,000 ft. without a parachute ... yet not only survived, he didn't get a single broken bone! How such things can happen, I don't know. It just wasn't their time, I guess. If your TV gets the Discovery Wings (DWINGS) channel, you may have caught the biggest parachute drop of all. In 1960, Capt. Joseph Kittinger of the USAF jumped from the gondola of a big helium balloon at a height of 102,200 ft. over New Mexico. He free fell for 4 minutes 38 seconds and reached a speed of mach .93, 620 mph! His automatic chute opened safely, but as I recall, he wasn't ready to go dancing.

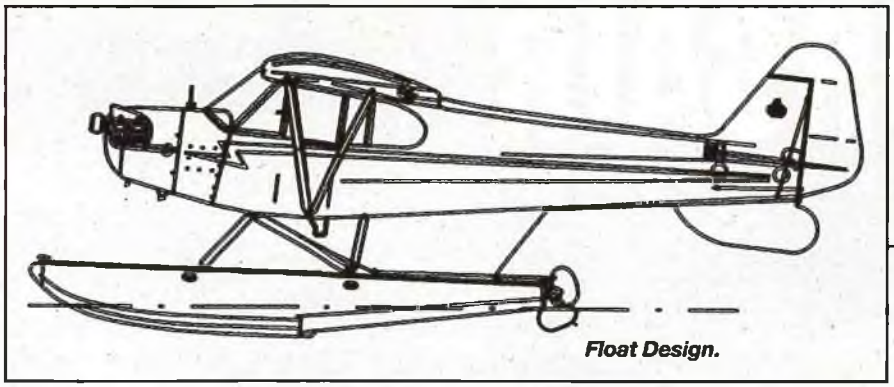
Chute! I got to thinking about this stuff for a simple reason. I think a model manufacturer has missed the boat. Why not a trainer with an extra channel transmitter that has a spring-loaded parachute that could recover a model in trouble. There are a number of larger aircraft that have such a parachute available. A chute of sufficient size is "fired" out to deploy and safely land a plane with minimal damage. Such a design for models would probably need to be spring-launched, but I can see instances that such a system needs to be more sophisticated than just that. If a plane is under full power when the chute is deployed, it might not be effective or other damage may result. It could happen when you have a radio/battery problem. With that kind of problem, you're probably going to lose the plane anyway. A chute activation system that would cut engine power, apply some timely up elevator to force a stall, and then eject the parachute could be very useful in some instances. When a wing folds or there is a mechanical malfunction with the model, it sure would be nice to recover that "supreme effort" from a test flight, right?



A big float with wings! The Glenn Curtiss F-Boat was designed for Navy use. More in text.

Flying "Floats"

Another DWINGS episode referred to the plane shown in the photo. A jet powered flying boat that was meant to be a fighter, the SR/Ai was built by the



Float Design.

FLOAT DESIGN
Expressed as a percentage of fuselage length (rear of the prop to rudder hinge line)

Float Length (L) = 75% of fuselage length
Float Depth (D) = 10% x L
Float Width (W) = 11% x L
Step Location = 50% x L
Step Height = 1/2" to 3/4"
Model's C.G. at float step

Correction: *The line art drawing shown to the left was featured in my November column on Float Parameters; however, the specs under the drawing were omitted.*

Saunders-Roe Company shortly after WWII, but being about 100 mph slower than landplane fighters, the experiment was abandoned. I was impressed with the looks of this design while researching my "library" for flying boats, seaplanes, and float plane information. My files also had information on the plane shown in the drawing. It is the Curtiss F-Boat, a design intended to get the military interested in flying, and the Navy bought many of them. Note how similar the design is to my mention of just enlarging a float and adding wings and tail surfaces. You might also note that flying boats tend to have the engines directly over or close to the Center of Gravity.

Curtiss's early efforts had a problem getting off the water when it was "glassy" and calm. There is a tendency for float surfaces to almost bond with a smooth water surface. Experiments by Curtiss resulted in the design of the "step" on floats/hulls that greatly enhanced their performance. Another interesting feature that Curtiss came up with on the F-Boat was what were called "anti-sway" surfaces. The drawing here shows one between wing struts and hiding most of the engine. Some were mounted atop the upper wing and they looked like "short fences." I have yet to understand their use or effectiveness except to add "side area" to the design.

That "diamond" between and at the trailing edge of the wings, is a cable-operated control horn to the interplane control surface that Curtiss also came up with. They are what are known as ailerons today. The Wright Brothers viewed the controls as an infringement on their patents and ensuing legal battles lasted for years. I could never understand how a separate/movable surface could be compared to wing warping control. While the Wrights continued to anguish over the legal battles, Curtiss went on to bigger and better things that firmly established him in the aviation industry. It was a Curtiss built flying boat, the NC-4, that became the first plane to cross the Atlantic Ocean. Curtiss built four NC's for the Navy to make the trans-Atlantic flight, but mishaps resulted in only the NC-4 completing the journey. I'm "journeyed" out for now, so see you right here next time.

PRODUCT REVIEW

Hangar 9/Horizon Hobby

CESSNA SKYLANE 182 ARF

By Bob Wallace

The Cessna 182 is an evolutionary design that was first introduced back in the mid 1950s, essentially as a tricycle gear version of the Cessna 180. Eventually named the "Skylane"; Cessna's 182 went on to become one of America's most popular and successful civil aviation designs. Production of the 182 ceased in 1985, but was resumed by Cessna in the mid 1990s, with the introduction of the model 182S. Almost 22,000 Cessna Skylane 182S have been built, and they continue to be a familiar sight at just about every airport in the country.

Hangar 9's Almost Ready to Fly (ARF) Cessna 182 Skylane design is modeled after the most recent "S" model and is slightly less than 1/4 scale, yet it is still large enough to qualify for use at International Miniature Aircraft Association (IMAA) events. It is designed for use with 1.08 to 1.48 (2-stroke), 1.20 to 1.80 (4-stroke), and 23 to 38cc gasoline fueled engines, has a wingspan of 94-3/4", with 1246 sq. in. of wing area, and its overall fuselage length is 76-3/4". Surprisingly, for a giant scale aircraft of this size, it is packaged in a relatively small carton that measures 18-1/4" (W) x 13" (H) x 56-1/2" (L). This carton is adorned with full color labeling that shows the finished model and lists its basic dimensions and specifications, along with the basic kit contents.

Almost all present day ARFs involve little more than assembling completed sub assemblies and installing the engine, fuel tank, radio equipment, and control linkages. Hangar 9's giant scale Cessna 182 Skylane certainly falls into that category and both the degree of prefabrication and quality of craftsmanship are very high. This is an all wood structure type aircraft that utilizes conventional construction techniques. As the component parts are finished and covered, it is difficult to completely

SPECIFICATIONS

CESSNA SKYLANE 182 (ARF)

Aircraft Type
1/4 Scale - Sport Scale
Mfg. By
Hangar 9
Dist. By
Horizon Hobby
4105 Fieldstone Rd.
Champaign, Illinois 61822
(217) 355-9511
Mfg. Sug. Retail Price
$569.99
Available From
Both Dist. & Retail
Wingspan
94-3/4 Inches
Wing Chord
16-7/32 Inches (Avg.)
Total Wing Area
1246 Sq. In.
Fuselage Length
76-3/4 Inches
Stabilizer Span
31.5 Inches
Total Stab Area
262 Sq. In.
Mfg. Rec. Engine
1.08-1.48 2-stroke; 1.20-1.80 4-stroke
23-38cc gas
Rec. Fuel Tank Size
16.9 (supplied by mfg.)
Rec. No. of Channels
5 (glow), 6 (gas)
Rec. Control Functions
Rud., Elev., Throt., Ail., Flaps
For Gas – "Kill" Ignition Switch
Basic Materials Used In Construction
Fuselage
Balsa, Ply & Hardwood
Wing
Balsa, Ply & Hardwood
Tail Surfaces
Balsa
Building Instructions on Plan Sheets
NA
Instruction Manual
Yes (51 pages)
Const. Photos/Illustrations
Yes

RCM PROTOTYPE

Radio Used
Airtronics RD Super 6, 9 Servos
Engine Used
U.S. Engine 35cc
Fuel Tank Used
16.9 Oz. (supplied by mfg.)
Weight, Ready to Fly
294 Oz. (18 Lbs. 6 Oz.)
Wing Loading
33.97 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Quality of construction, overall appearance, and flight performance.
WE DIDN'T LIKE THE:
Elevator coupling horn, weak nose gear unit, and assembly manual errors

assess the quality of craftsmanship put forth in building them. However, the areas where the internal structure is visible, and the manner in which the parts fit together, suggests that the quality of workmanship in this ARF is excellent. Each balsa sheeted wing panel is attached to the fuselage using a rugged tubular aluminum main center spar, with two smaller tubular aluminum anti-rotation and positioning pins, and a 1/4-20 nylon bolt that is installed from within the fuselage cockpit area to hold the wing in place. The use of individual wing panels, rather than a one piece wing, makes transporting this aircraft to and from the flying field a much easier task.

The Hangar 9 Cessna 182 is attractively finished with white UltraCote film type covering material and pressure sensitive trim colors and detailing. The ailerons, flaps, rudder, and elevator surfaces are pre-finished with corrugated sheet plastic surfaces that result in a scale-like appearance. There were a few wrinkles in the UltraCote covering on both wing panels and the fuselage of our test review model, but these were easily removed with a heat gun. The engine cowl, tail cone, and wheel pants are of molded fiberglass construction with a painted finish that perfectly matches the white UltraCote covering. This is a big plus, compared to the cheaper and more damage prone molded ABS plastic parts that are used on some R/C aircraft.

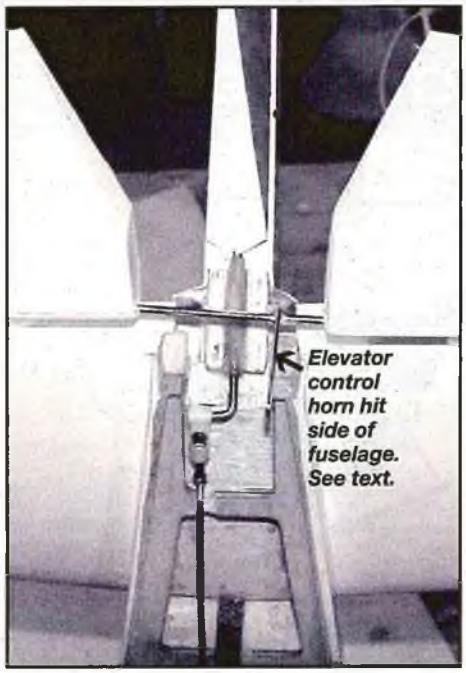
All component subassemblies are enclosed in vinyl bags, as are all of the related parts and hardware; and all are carefully packaged in sectioned off portions of the carton. A highly detailed 8-1/2" x 11", 52-page assembly manual is included that contains a basic parts inventory, lists of additional items and materials required for assembly of the aircraft, and step-by-step assembly instructions that are augmented with numerous assembly photographs. This manual is very well done, but not perfect, as it contains several errors and contradictions. The hardware and accessory packs are very extensive and include almost everything needed to complete this model. Rather than listing everything that is included, it is easier to mention the necessary items that are not. Other than adhesives, engine, and radio equipment; these items include: fuel tubing, filter and filler, a propeller, an ignition "kill" switch if a gasoline engine is to be used, and a 3-1/4" spinner.

Assembly:

Assembly of the wing panels consists of installing the aileron and flap hinges, servos and related linkages, and wiring extensions. The very first page of the assembly manual (Section 1: Hinging the ailerons) contains a contradiction. Eight CA type hinges (four for each aileron) are specified, yet each wing panel and the ailerons are slotted for only three hinges. As the Cessna's ailerons are rather large (2-3/8" x 23-1/2"), I wondered whether three CA type hinges were adequate, and the thought of using heavier duty pin type hinges or adding additional CA type hinges did enter my mind. I decided against this, as any deviation from the manufacturer's assembly instructions, or any structural modification made, no matter how small, would compromise the objectivity of a product review test. The wing flaps are attached using heavier duty pinned type hinge points. Each aileron and flap requires an individual servo, and 24" extension leads are required for the aileron servos.

One aspect that I did not like is that the flaps require that a reversed servo, a reversing "Y" harness or JR "Match Box" be used, unless an 8 or more channel computer radio is utilized that allows the flaps to be set up using a programmable mix. As the flaps are supplied with the control horns installed, it is not possible to simply reposition one of the flap servos to allow the linkages to be set up mechanically to operate correctly with a standard "Y" harness, unless structural modifications are made. A Cermark (Gold Series) servo reverser was employed on our test aircraft to produce the correct flap servo movements.

Several pages, or sections, of the assembly manual are redundant, as the assembly step being detailed and explained has already been done by the manufacturer. The painted, airfoil-shaped aluminum wing struts are supplied with pre-finished ends. The mounting holes in the undersides of the wing panels and on the fuselage are already drilled, with 4-40 blind nuts installed, so that once the wing panels are installed, the wing struts need only to be drilled to fit. Molded ABS plastic strut fairings are supplied and the assembly instructions detail that these are to be epoxied to the wing panels and fuselage. This was done, although the urge to attach these fairings to the painted struts rather than the glossy UltraCote finished wing and fuselage surfaces was great.



Installing the pre-finished horizontal stabilizer and vertical fin is an easy process of properly aligning them and gluing them in place with epoxy. The elevator and rudder servos are mounted on an installed plywood servo mounting plate located in the aft end of the fuselage, which has easy, open access, thanks to a pre-finished access hatch. The installation of the rudder and elevators revealed what was, in my opinion, the most serious assembly flaws or shortcomings associated with this aircraft. The rudder control horn is a pre-bent music wire torque rod type that is installed into a predrilled hole in the rudder. As supplied, this torque rod is rather short to the point where the internal plywood fuselage structure had to be cut and channeled to allow sufficient clearance for the rudder control rod to operate with sufficient clearance (see photo).

A more serious problem was the pre-bent music wire type elevator control horn that simply did not fit as supplied! The steel control horn arm is welded, or brazed to the "U" shaped wire coupler in an off center position to allow for the control rod linkage to be installed alongside the rudder torque rod within the fuselage. Both of the pre-finished elevators were pre-drilled by the manufacturer to accept the coupler/control horn. But when installed, the control horn arm lined up against the side of the fuselage rather than within the open area, as shown in the assembly manual photographs (see photo). This problem was further compounded by the fact that the supplied elevator coupler control horn was an item that was made specifically for use on this particular aircraft, and not a readily available hobby shop accessory item!

My solution to this problem was to drill another control horn coupler hole further in on one elevator, to allow the control horn arm to be positioned in the proper location within the fuselage. Using a Dremel cut off wheel, I then cut the right angle bend off of the opposite side of the control horn coupler just beyond the bend. A new right angle bend was made out of scrap music wire of the same diameter, to extend the point of the angle bend on that side of the coupler to fit the existing hole in the opposite elevator. After grinding random flat spots and irregularities on both the existing coupler wire, inward from the point where the original angle bend had been cut off, and on the mating end of the new right angle piece of music wire, a piece of brass tubing was slid over both of these pieces then silver soldered together. Not a perfect corrective fix, but my reasoning was that even if the silver soldered joint should ever fail, reduced elevator control would still be maintained via the unmodified portion of the supplied elevator control horn coupler. I do not know if this problem was simply the case of an incorrectly fabricated elevator control horn coupler, or perhaps one that was fabricated to fit another type aircraft, being accidentally included in the hardware package of our test review aircraft, or if this is a widespread problem. If it is a common problem, it is a serious one.

The rudder and elevators, and the vertical fin and horizontal stabilizer are supplied with neatly cut slots to accept CA type hinges. Speaking of CA, our Hangar 9 Cessna 182 Skylane was assembled using Zap CA adhesives, Z-Poxy epoxies, and their related accessory products, exclusively. These fine adhesive products performed very well.

The main landing gear legs are rugged pre-formed and painted aluminum, which are bolted in place from within the fuselage. The painted and detail-trimmed fiberglass wheel pants are finished and drilled, ready for installation. This is another area where an entire page of the assembly manual (Section 13, page 32) is devoted to an assembly step that has already been completed by the manufacturer. The supplied wheels are installed using the hardware pack axle bolts that are provided with lock nuts. Unfortunately, the threaded portion of these axle bolts is a bit short and this prevents the entire locking portion of the lock nuts from gripping onto the threads. Zap Z-42 thread locker was used on these nuts as well as on all of the other landing gear mounting bolts. The wheels are held in place within the wheel pants, using set screw type wheel collars. In searching through the hardware pack supplied with our Skylane, it was discovered that none of the wheel collar set screws were included.

The nose gear assembly is a conventional music wire type that is equipped with a shock absorbing coil spring. The nose gear mounting bracket and steering arm are high quality, rugged, aluminum units. The steerable nose gear assembly is bolted to the engine compartment bulkhead, via pre-drilled holes that have been equipped with blind nuts by the manufacturer. The engine is mounted to a square box that extends forward from the engine compartment bulkhead. This box also houses the fuel tank and throttle servo. A set of adjustable, aluminum engine mounts are included with the Skylane for use with glow engines, and these mounts will accept a variety of 2 and 4-stroke engine types. If a gasoline engine is to be installed, it is bolted directly to the face of the box. The assembly manual shows a Zenoah G-26 engine installation. The molded and painted fiberglass engine cowl is supplied with pre-drilled holes that match perfectly with the blind nut equipped mounting blocks within the engine compartment. The only work required on the engine cowl is to cut the necessary engine clearance, cooling, and access openings to accommodate the engine that is to be utilized. The supplied fuel tank has a 500cc capacity (16.9 oz.), and is compatible with both glow fuel and gasoline.

One of the Skylane's nicest features is that the cockpit area is pre-finished with a nice sprayed-on fleck-type finish, and cockpit detailing components such as seats and a finished instrument panel housing are included. All radio system component parts positioned in the cockpit area are hidden from view beneath a pre-finished, removable, floor plate. A molded and tinted windshield is included, along with a molded rear window, and side windows, all of which are tinted. Despite their curves, the molded windshield and rear window need only to be trimmed to produce an excellent fit. Zap Formula 560 canopy glue was used to install all of the window pieces on our test aircraft, and this specialized type of

adhesive was ideally suited for such work, as it produced a neat, strong, and resilient bond.

Engine:

A 35cc US Engines gasoline fueled engine was selected to power our Skylane. The segment of the assembly manual pertaining to the engine installation provides well-detailed information and photographs for the installation of a Zenoah 26cc engine. There is even a throttle servo mounting cutout provided in the engine box mounting extension that is designed for use with the Zenoah 26 engine. Installing the US Engines 35cc engine required that the throttle servo be relocated, as the throttle linkage on this engine is opposite from the Zenoah engine. As the painted fiberglass cowl has already been fitted and the mounting holes drilled for its installation by the manufacturer, a shortened aluminum prop hub had to be used on the US Engine 35cc engine to obtain the proper cowl nose ring/spinner clearance. While the full scale Cessna 182S Skylane was equipped with a three-bladed propeller, I elected to use a Master Airscrew 20 x 6 propeller, along with a Dave Brown 3-1/4" aluminum spinner on our review aircraft.

Radio:

An Airtronics RD 6000 Super 6 radio system was used in our review aircraft, and all six channels were utilized along with nine servos. Eight servos are required, and I opted to also install another servo to operate an engine ignition "kill" switch. A nice feature provided by the manufacturer is a servo mounting position just for this purpose, should a gasoline engine be used. Each aileron and wing flap requires an individual servo, as does the steerable nose wheel that is coupled to the rudder servo via a "Y" harness. Standard size Airtronics servos were used, with #94731Z servos being used for aileron, elevator, and rudder control, and #94102Z servos being employed for the flap, throttle, nose wheel steering, and engine "kill" switch functions. An Airtronics #92065Z 6-channel dual conversion receiver was used, along with a #95005Z 1200 mAh battery pack.

Flying:

Our Cessna 182 Skylane weighed in at 18 lbs. 6 oz. ready to fly, less fuel. No dead weight, or shifting of the radio components was necessary, as the C.G. was exactly where the manufacturer recommended that it should be. (Yeah, I know, all reviewers say this, but it really was!) The various control surface travel limits were also set up according to the manufacturer's recommendations.

A cool, overcoat autumn day was the scene for our maiden flight, from a flying site that is actually a huge turf farm, with many acres of finely tailored grass. After making a radio range check, the engine was started and another radio check was performed to see if there were any signs of engine ignition induced interference. None were apparent, so I proceeded to taxi the Skylane around a bit, in order to assess its ground handling capabilities. It was quickly apparent that the Skylane was far too sensitive to steering control input. The nose wheel on our test aircraft had been set up using the outermost hole on the nose gear steering arm as the assembly manual indicated. The photos in the assembly manual also show the outermost hole on the nose gear servo arm being used. While the assembly manual provides recommended control surface travel limit amounts, there is no suggested nose wheel movement. The nose gear control rod clevis was repositioned to the innermost hole on the servo arm, and this significantly improved the Skylane's ground handling characteristics. Ground handling was still a bit on the sensitive side, but manageable. It was obvious that very little nose gear movement is required to make the Skylane respond. A few higher speed simulated take-off runs were then made, without encountering any tracking problems.

The Skylane's fuel tank was then topped off, the engine restarted, and I taxied out for take-off. A cool breeze of about 8 to 10 mph was blowing, but with the flying field being as large as it was, it allowed for the take-off run to be made directly into the wind. Throttle was gradually fed in, and the Skylane tracked nicely as it accelerated. After a run of about 200 feet, a slight amount of up elevator resulted in the Skylane becoming airborne and climbing out at a nice shallow angle. After climbing to an altitude of a few hundred feet, minute amounts of aileron and elevator trim correction were fed in, and our Skylane was flying straight and level, thumbs off, at about 2/3 throttle. Several minutes were then spent becoming familiar with the Skylane's basic flight characteristics. It is reasonably aerobatic for an aircraft of this type, being capable of loops, rolls, inverted flight, and other basic

maneuvers. However, for maximum realism, the Skylane is at its best being flown at reduced throttle in a gentle, smooth manner.

Stalls were performed next with the engine at idle, and proved to be gentle and easy, with recovery being clean with no tendency to drop a wingtip and fall off into a spin. Our Skylane had been set up with two steps of flap deflection programmed in, mixed with programmed amounts of down elevator also being applied. With the engine at about 1/3 throttle, partial flap deflection (1-1/2") resulted in nice slow flight and the application of full flaps (3") resulted in even slower flight that came very close to being a zero ground speed, stationary hover due to the brisk headwind that existed.

Several landing approaches were made to become better acquainted with the flaps. My first landing was accomplished without incident. A rather wide approach was made, while maintaining what I thought was a bit more than normal airspeed due to the wind, on the downwind leg. Partial flaps were applied, and after turning onto final, full flaps were used along with the throttle being gradually reduced to just a bit above idle. The Skylane settled in nicely on the main gear after a slight flare, with the nose gear touching down last. The landing roll-out, if it could be called that, was very short due to the brisk headwind, no more than 30 or 40 feet! After taxiing in, a quick inspection revealed that the nose gear was noticeably deflected rearward. A closer inspection revealed no damage, and the nose gear was simply bent back to its original position with hand pressure. As the maiden landing had been a good one, it was difficult to figure why the nose gear had bent rearward. After refueling, a second flight was made, with several touch & go landings being performed. At the conclusion of that flight, another inspection revealed that the nose gear had been bent rearward again. Not a lot, but enough to be easily seen, and to warrant straightening. As none of the touch & go landings had been hard ones, nor had the final landing been a rough one, my conclusion was that the nose gear leg needs to be of more robust construction; especially if the Skylane is to be flown from grass fields. The nose gear leg employs a length of music wire that has a single loop, coil type spring bent into it for shock dampening purposes. This piece of wire inserts into tubular pieces of the gear leg assembly and is retained with set screws. Unfortunately, the single loop, music wire coil spring, appears to be too soft, and does not spring back to its original position.

In cleaning the Skylane after my initial flying session, I also noticed that the pressure sensitive trim color pieces do not seem to be adhered that well, as the thin end areas on some of these trim pieces easily came loose. Perhaps a trim material that utilizes a more permanent bonding type adhesive should be considered by the manufacturer.

Summary:

While not perfect, Hangar 9's Cessna Skylane 182 is a top notch ARF aircraft. It is certainly one of the finest ARF airplanes that this reviewer has seen or reviewed. It is very well crafted, utilizing conventional building methods, and flies as well as it looks. It is reasonably aerobatic, and does not exhibit any bad in-flight characteristics. In-flight, it looks and flies best being flown in a smooth, scale-like manner. The US Engines 35cc gasoline powered engine is an ideal engine choice. Any RC'er with good intermediate level sport aerobatic aircraft piloting skills, should not have any difficulty flying this aircraft. Our review aircraft did have some flaws that need to be addressed by the manufacturer; most notably the elevator control horn that did not fit, and a weak nose gear leg. The assembly manual also needs to be corrected and edited. Even with these shortcomings, all of which can be easily eliminated by the manufacturer, Hangar 9's Cessna Skylane 182 is an excellent airplane. RC'ers with an interest in giant scale civil aviation designs would be well advised to take a close look at this fine aircraft. ✈

EVENT CLOCK

By John Valentine

Club Project How-To

Build this clock for your next club event. Use it to start or time contest events of any duration. It's completely self contained, compact, portable and best of all inexpensive to build.

Could your club use a clock for that next pylon race or other club event? This inexpensive clock project is easy to build and can be constructed for about $60 with all new components. Even less if you scrounge some electronics parts from your scrap parts cache. This clock will run all season on a set of AA batteries and is large enough to be seen all the way down the flight line. The one described here is a 30-second start clock but you can build it to any time range you want by selecting the desired motor RPM and changing the clock face. The heart of this clock is an inexpensive gear head motor designed for the advertising display market. I am sure you have seen the countertop displays with some sort of rotating or oscillating attention getter. The clock described here is 24" x 24" but you can build it any size or time range you want with no changes to the circuitry. You may even get a suitable motor by checking with a local retailer for discarded advertising displays. The motors are only about $18 new and come in a variety of RPM and voltages. They have extremely low power consumption, making battery power practical. While this is not a true clock motor, the time can be tightly controlled by using a voltage regulator circuit to power the motor. Operation is as simple as turning on a power switch and pushing a start button. The clock will cycle one time and return to the start position.

After the clock was finished and presented to the club, there was a strong desire by the pilots to have the clock activate some sort of signaling device as well. So it was back to the bench, but on the way I stopped by the local auto bone yard and acquired an inexpensive auto horn. As a result of this "design by committee," I have added this feature but left it as an option for the builder. The clock circuit and horn control circuit could easily fit on a 3" x 5" circuit board. Because the horn control circuit drives a simple relay at the output stage, it can be used to drive any type of signaling device such as lights or sirens, etc.

Construction

The clock frame is constructed of 3/4" plywood and the face plate and back are 1/8" tempered hardboard. The clock face is protected by a sheet of 1/8" acrylic sheet. All these materials are readily available at your local Home Improvement store. The clock face was designed in AutoCAD and then printed by a large format inkjet printer on photo quality paper. If you don't have access to this software or equipment, see the note at the end of this article. The printed face is attached to the 1/8" hardboard with contact cement. The dimensions on the drawing will produce a 2-foot square clock.

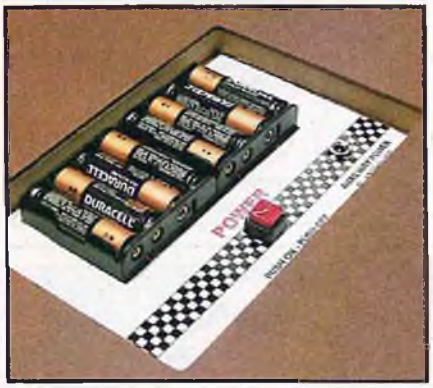
Start by cutting the four 24" by 5-1/8" pieces for the sides, top and bottom. Miter the ends and then cut the dado for the clock face. Rabbet the back and front edges to accommodate the backplate and the acrylic faceplate cover. The faceplate is retained by a 3/4" x 1/2" wood frame that is applied after everything is calibrated and working. The backplate is retained by #6 x 3/4" wood screws. Drill the holes for the start switch and the spinout stand pivot pin in the top and bottom pieces respectively.

Clock Face

I used 3-M Formula 77 contact adhesive to attach the printed clock face to the hardboard clock face panel. Drill two 3/8" holes for the motor shaft and the jumbo LED. The motor was

Event Clock Electronic Parts List

Part	Description	Source	Cat #	WEB Address
C1	1000 Mf 35V Electrolytic capacitor	Radio Shack	272-1032	http://www.radioshack.com
C2	.1 Mf 50V Ceramic capacitor	Radio Shack	272-109	http://www.radioshack.com
D1	10mm Jumbo High Intensity LED	Radio Shack	276-086	http://www.radioshack.com
K1	DPDT 5V Relay	All Electronics	UA2-4.5NW	http://www.allcorp.com/
M1	2 RPM Gear head DC Motor	Standard Drive Products	A 3Z16-0020A	http://sdp-si.com
R1	1k .75w 15 Turn Trim Potentiometer	Radio Shack	271-342	http://www.radioshack.com
R2	220 Ohm 1/4 Watt	Radio Shack	271-1313	http://www.radioshack.com
R3	1k Ohm 1/4 Watt	Radio Shack	271-1118	http://www.radioshack.com
R4	68 Ohm 1/2 Watt	Radio Shack	271-1106	http://www.radioshack.com
S-1	SPST Push Button	Radio Shack	275-1566	http://www.radioshack.com
S-2	SPDT Magnetic Switch	All Electronics	MS-7	http://www.allcorp.com/
S-3	SPST Push on/Push off	Radio Shack	275-617	http://www.radioshack.com
VR-1	LM 317	All Electronics	LM317T	http://www.allcorp.com/
Misc.	Battery Holder	Radio Shack	270-387	http://www.radioshack.com
	Small magnets	All Electronics	MAG-76	http://www.allcorp.com/
	Circuit Board	Radio Shack	276-158	http://www.radioshack.com



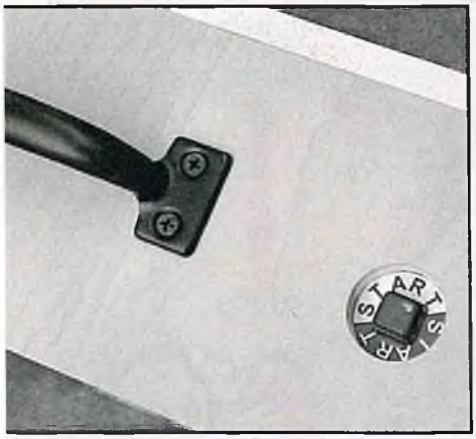
The back panel contains a recessed opening for the batteries, power switch and auxiliary power jack. The recess protects the components.

Part List for Event Clock Case

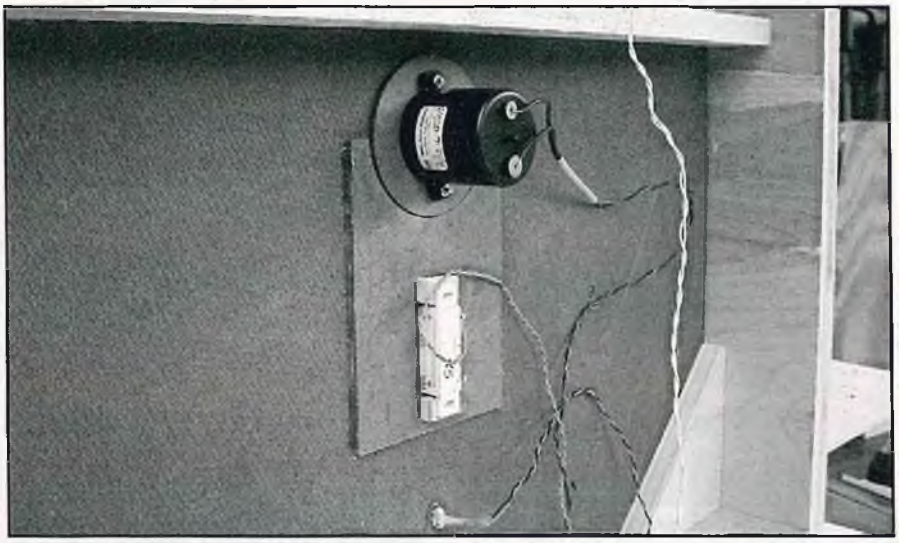
Part	Size	Quantity	Material
Back Brace	2" x 21-1/2" x 3/4"	1	Plywood
Back Cover	23-1/2" x 23-1/2" x 1/8"	1	Tempered Hard Board
Case	24" x 5-5/8" x 3/4"	4	Plywood
Face Plate	23" x 23" x 1/8"	1	Tempered Hard Board
Foot	5-5/8" x 1" x 3/4"	2	Plywood
Front Brace	2" x 22-1/2" x 3/4"	1	Plywood
Gusset	6" x 3/4"	4	Plywood
Lens	23" x 23" x 1/8"	1	Clear Acrylic
Motor Mount Plate	3" x 3" 1/8"	1	Tempered Hard Board
Recessed Battery Plate	8" 5-3/8" x 1/8"	1	Tempered Hard Board
Second Hand	2" x 16" x 1/8"	1	Lite Plywood
Spin-out Base	21-7/8" x 5-5/8" x 3/4"	1	Plywood
Stop Block	8" x 2-5/8" x 3/4"	2	Plywood
Support	21-3/4" x 6-5/8" x 3/4"	1	Plywood

mounted to a 3" diameter piece of hardboard with two #4-40 flat head bolts. This mount was then glued to the back of the clock face board with hot melt glue. This eliminated the need to have any bolts protruding through the clock face. Install the completed clock face into the rabbet and assemble the four sides with nails and glue. Install the gussets with one side against the inside of the clock face. I used carpenter's glue on the edges of the gussets and hot melt between the gusset and the back of the faceplate.

I recessed the battery holders, power switch, and auxiliary power jack to protect them from handling. If you opt to do this also, now is the time to cut the hole in the back panel and build the recessed panel. After cutting the opening in the back panel, frame the inside with some 1/2" thick trim stock and glue the 1/8" panel onto that. Glue the back panel brace in place and install the battery holders, start switch, and auxiliary power jack. Install the front panel brace as close to the motor as possible while leaving enough room to

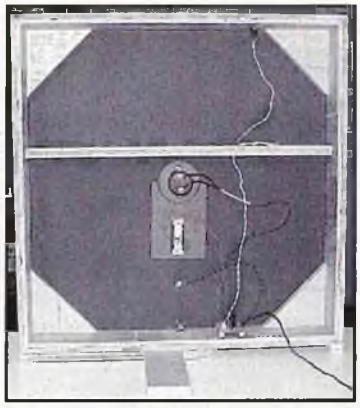


Top view showing the carrying handle and the recessed start switch.

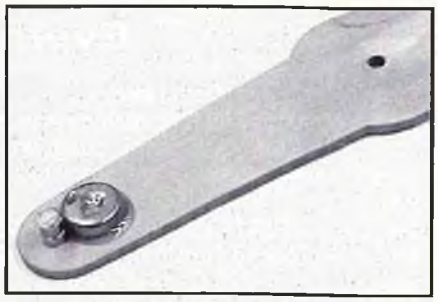


View from the open back showing the motor mount and the magnetic switch mounted to inside of the clock face. Also note the gussets and the bracing above the clock motor, directly under the magnetic switch is the high intensity LED power-on indicator.

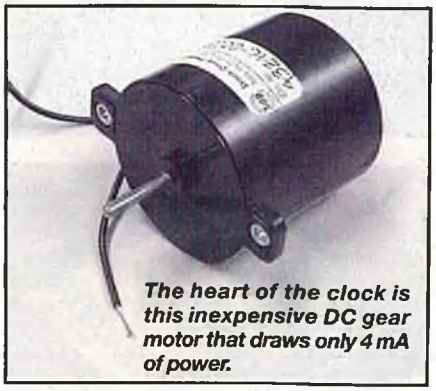
This tiny circuit board contains all the electronics. The bolt at the left is the spinout stand pivot pin. The wing nut is used as a jam nut to keep just the right amount of tension on the spinout stand. Note that the adjustable resistor is facing the back and will be accessible through a small hole in the back panel.



All wiring done, calibrated and ready to button up the back with #6 wood screws. Note the spinout stand in the extended position.



Bottom and back of the sweep second hand showing lead ballast and magnets attached. Balancing the hand eliminates any play from gear lash.



The heart of the clock is this inexpensive DC gear motor that draws only 4 mA of power.

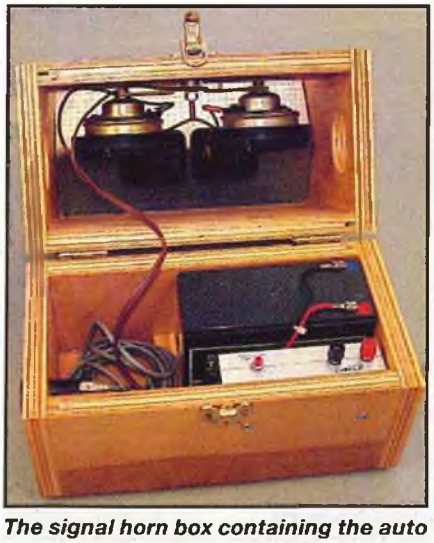
access the #4-40 nuts that retain it. After the electronics are installed and tested, the remaining parts can be assembled to complete the mechanical portion of the clock. Attach the spinout stand with a 1/4"-20 x 2" bolt and two nuts. Use the second nut as a jam nut. When drilling the finger holes in the spinout stand, don't drill them all the way through, just about 1/2" to 3/8" deep. Otherwise they can act as a finger guillotine: that's experience talking! A 3.2mm prop adapter is attached to the 1/8" motor shaft to enable mounting the sweep second hand. The sweep second hand was cut from 1/8" aircraft plywood, sanded and sealed with epoxy resin to prevent warping. The front was then painted day-glow orange.

Electronics

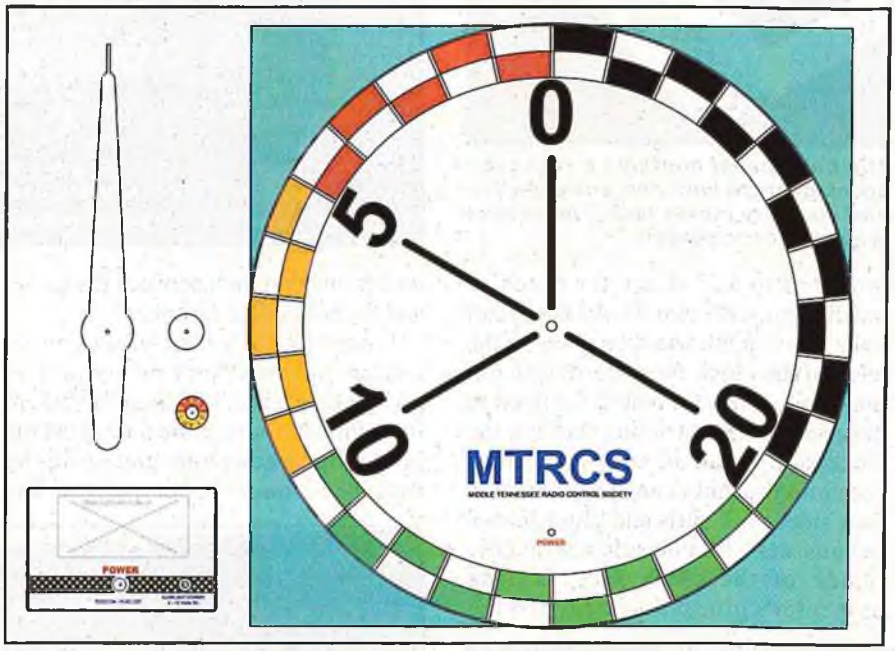
The primary components in the circuit are the LM-317 Voltage regulator and K1 DPDT relay to latch the power on until the time cycle is completed. Switch S-2 is a magnetically actuated SPDT alarm switch that is actuated by a magnet attached to the sweep second hand. The exact position of this switch is determined by trial and error but this is easy to do. K1 was selected for its very low power requirements: only 20mA.

Clock Circuit Description

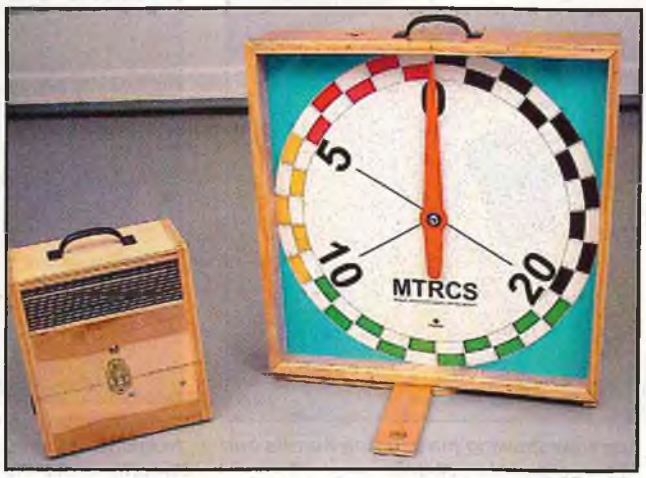
A stack of eight AA batteries or an auxiliary source between 9 and 12 volts



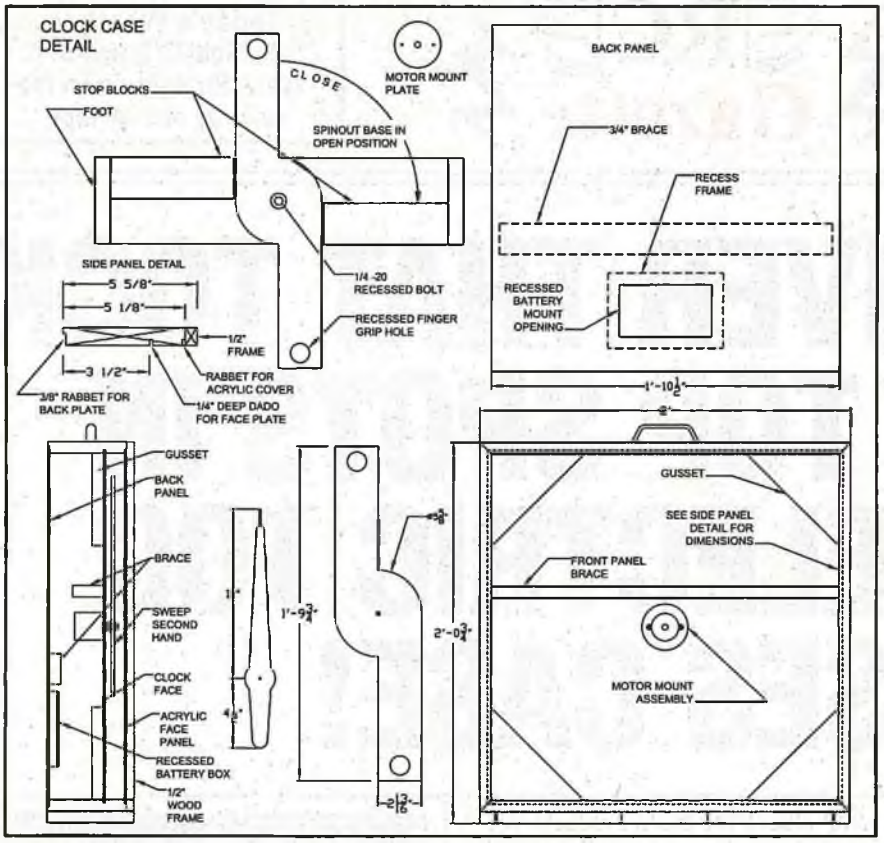
The signal horn box containing the auto horns, a 7 Ah battery, switching relay and an auxiliary jack used to power external equipment such as a PA system.

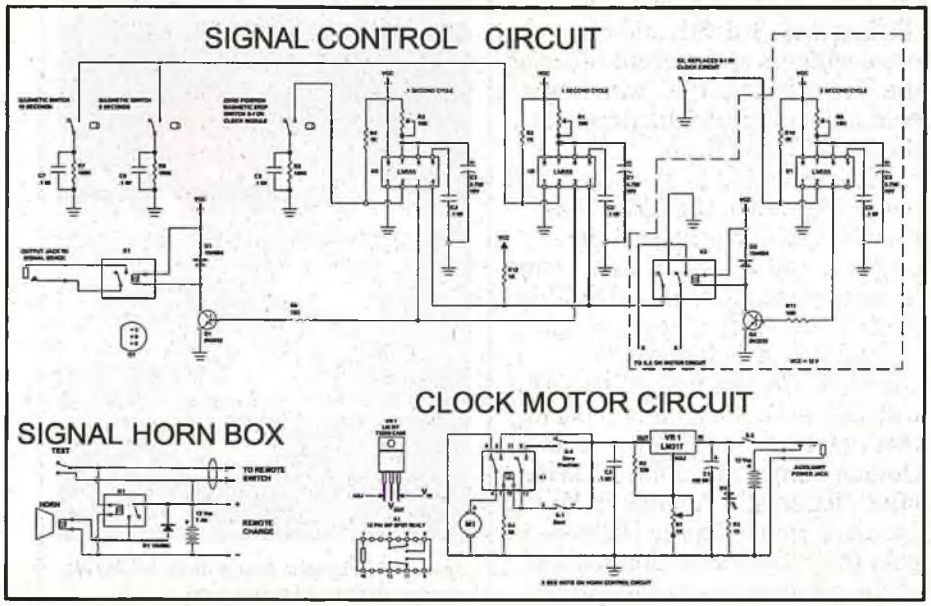


ABOVE: These full-size graphics are available with your club name for $24.95 plus shipping. They are printed on heavyweight glossy photo paper. If you would like additional changes, send your requirements for a price quote.



RIGHT: The Event Clock and signal horn ready for race day. This project was so well received by several visiting clubs, I thought it may be of interest to yours.





supplies power for the clock. Your transmitter charger will do just fine as an auxiliary power source. When the power switch (S-3) is turned on, a regulated voltage is supplied to the circuit from the output pin of VR-1. Power on is indicated by D1, a jumbo high intensity LED and current limiting resister R3. Switch S-2 is an inexpensive magnetically actuated alarm switch that is activated by a magnet attached to the back of the sweep second hand. When the sweep second hand is at the zero position, switch S-2 is held in the open position. Switch S-1 and S-2 are wired in parallel, when switch S-1 is depressed the coil of K1 is energized and power is supplied to M1, through pins 8 and 4 of K1. As the sweep second hand removes the magnet from the proximity of switch S-2, S-2 relaxes to the closed position and continues to supply power to the coil of K1. This cycle requires the start switch S-1 to be held down for about 1/2 second for the magnet to clear S-2 and maintain the relay in the latched position. Note that utilizing the start circuit shown in the Signal Device Circuit can eliminate this delay requirement. As the sweep second hand completes the cycle, the magnet is once again brought into proximity of switch S-2, which then opens and power to K1 coil is removed. The motor pins are shorted through pins 6 and 4 of K1 to provide electronic breaking and very effectively reduces the coasting effect of the motor. The circuit is now ready to be cycled again. The exact position to place S-2 will depend on the strength of the magnets used and the sensitivity of the switch. A micro switch or infrared interrupt device could be used; however, these would require an opening in the clock face or a device on the clock face itself. R-4 provides current limiting for the coil of K1, which is rated at 4.5 Volts. Calibration of the clock cycle is adjusted by trim resister R1.

Horn Function

The horn circuit described here gives a short enunciation (blast) at the ten and five second mark and a longer one at the zero or start mark. These signal points and durations can be easily modified by adding or relocating the magnetic switches on the back of the clock face and adjusting the trim pots on the 555 timer circuits. This device can clearly be heard by all pilots and corner workers over the sound of the screaming engines.

Horn Timing Circuit Description

Two simple 555-timer circuits (U2 and U3) control the length of the on time of the horn. The components indicated here will give you a suitable time range, I used about a 1/10th second signal at the five and ten second mark and a one second signal at the start mark. The third timer circuit (U1) is used to eliminate a

signal at the start of the clock cycle and may be eliminated if a start signal is desired. The three 555 timers are configured exactly the same and the duration of the time cycles are adjusted by means of R1, R3 and R9. The timers are triggered by a negative pulse at pin 2; in fact, as long as pin 2 is held negative, the output pin 3, will remain high even after the timer has timed out. Since the time cycles I wanted were shorter than the latch time of the controlling magnetic switches, I used a simple RC network to provide a short negative pulse while not holding the trigger pin low. When one of the magnetic switches closes, the voltage at pin 2 (trigger pin) goes low until the small capacitor charges. After the switch opens, the capacitor is quickly discharged by the bleed resister in the RC network and is ready for the next cycle. During the timing cycle, output pin 3 goes high and drives Q1 into saturation, activating relay K1 and closing the circuit to any signal device attached.

Horn Box

The horn and associated components are constructed in a separate box that can be located at least eight feet from the clock for two reasons. First of all, it's loud and annoying. Second, it requires several amperes of power to drive the horn. As a result of switching this load and the inherent internal workings of the horn, it generates some RFI. This RF noise can trigger the timer circuits, causing the system to loop or false trigger. Noise suppression caps and a little distance between the two devices will eliminate this problem. I used a 7 Ah Gel Cell to drive the horn and isolated the switching load from the control circuit relay by using another relay in the horn box itself. The box itself has an opening at the top to allow the sound to radiate in all directions.

Note:

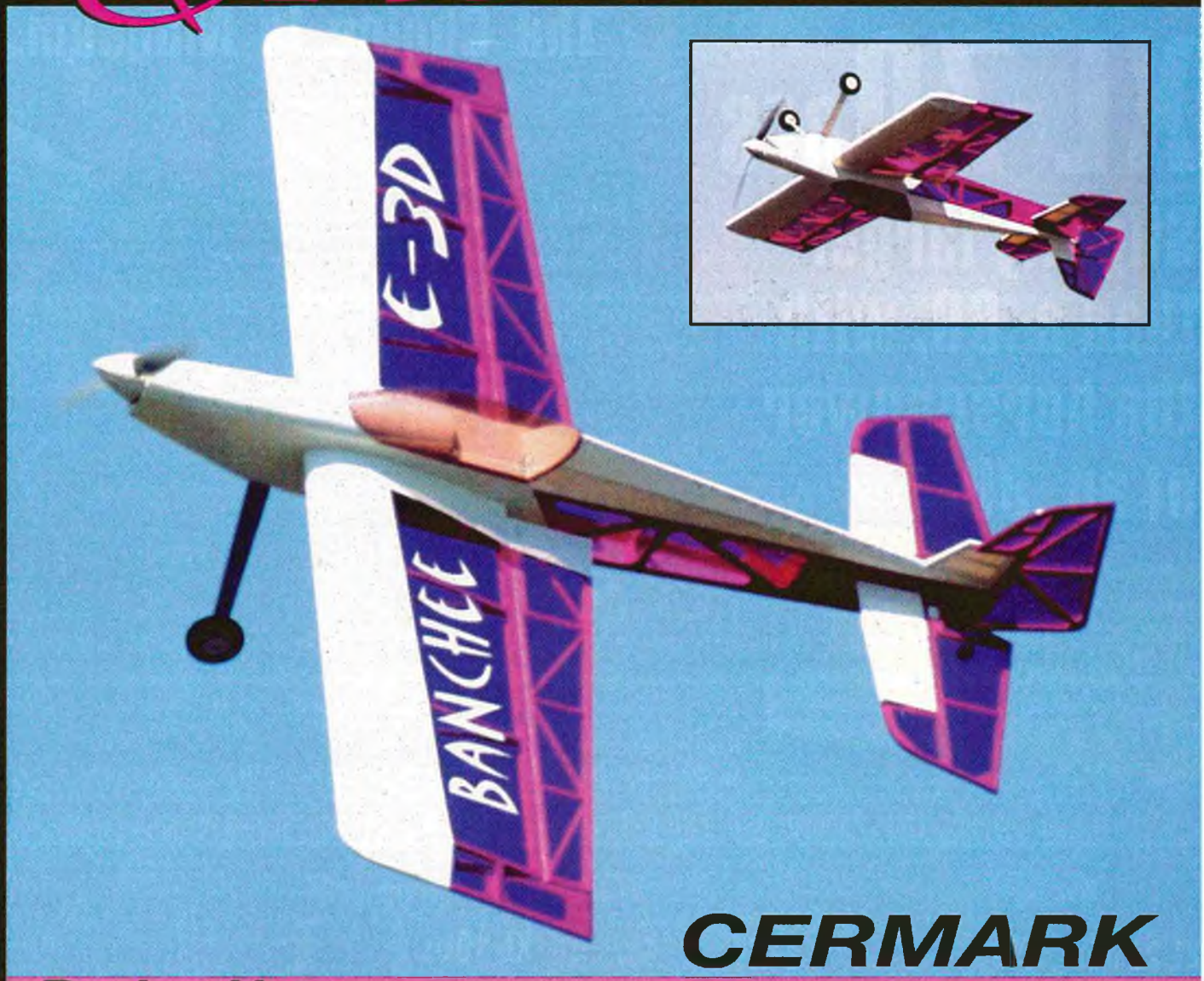
If you would like to purchase the printed clock face on double-weight glossy photo paper with your club name on it along with the back panel label, start bezel and the pointer templates, the complete set is available for $29.95 plus shipping. If you would like a custom clock face, send your requirements to me at:

tnproducts@cs.com

for pricing information. If you have any questions regarding the Event Clock, I will be happy to respond to them. You can contact me at this same address.

PRODUCT REVIEW

BANCHEE G-3D glow & E-3D electric ARFs



CERMARK

By Joe Hass

Flight photos by Joe Rubinstein

SPECIFICATIONS

BANCHEE G-3D/E-3D ARFs

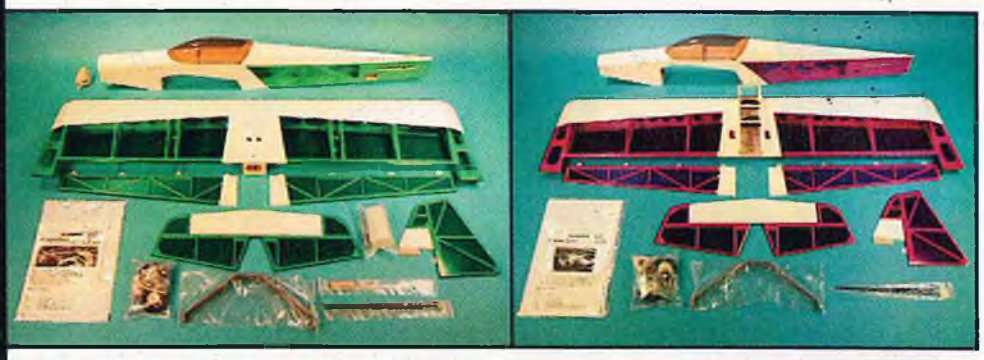
Aircraft Type
Sport 3D
Mfg. By
Cermark
9830 Bell Ranch Dr.
Sante Fe Springs. CA 90670
(800) 704-6229, Fax (562) 906-0820
www.cermark.com
Mfg. Sug. Retail Price
$159.95
Available From
Both Mfg. & Retail
Wingspan
54 Inches
Wing Chord
13.15 Inches (Avg.)
Total Wing Area
710 Sq. In.
Fuselage Length
53 Inches
Stabilizer Span
23 Inches
Total Stab Area
155 Sq. In. (Approx.)
Mfg. Rec. Engine
.40 2-stroke; .52 4-stroke
Mfg. Rec. Motor
Brushless 600/5 to 1 gear drive
Rec. Fuel Tank Size
9 Oz. (included)
Rec. Battery Size
8 to 10 cells, 2000 to 3300 mAh NiCd
Rec. No. of Channels
4 to 6
Rec. Control Functions
Rud., Elev., Throt., Ail.,
Coupled Flaps/Spoilers
Basic Materials Used In Construction
Fuselage
Balsa & Lite Ply
Wing
Balsa & Lite Ply
Tail Surfaces
Balsa
Building Instructions on Plan Sheets
No
Instruction Manual
Yes (8 pages)
Const. Photos/Illustrations
Yes

RCM PROTOTYPE

Radio Used
Futaba Super 7 Tx, Hitec Rx. Servos: 4 Hitec HS81 MG, 1 HS300. Castle Creations Phoenix 45 ESC w/BEC
Engine/Motor Used
O.S. .46 AX/Mega 22/20/2
Fuel Tank/Battery Used
9 Oz. (incl.)/LiPo 12.4V 6000 mAh
Weight, Ready to Fly
Glow: 68 Oz. (4 Lbs. 4 Oz.)
Electric: 63 Oz. (3 Lbs. 15 Oz.)
Wing Loading
Glow: 13.8 Oz./Sq. Ft.
Electric: 12.7 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Fantastic flight performance, good looks, fast build, single source for plane and electric power system.
WE DIDN'T LIKE THE:
Applying lettering, no directions for included tape, and minor hardware problems.



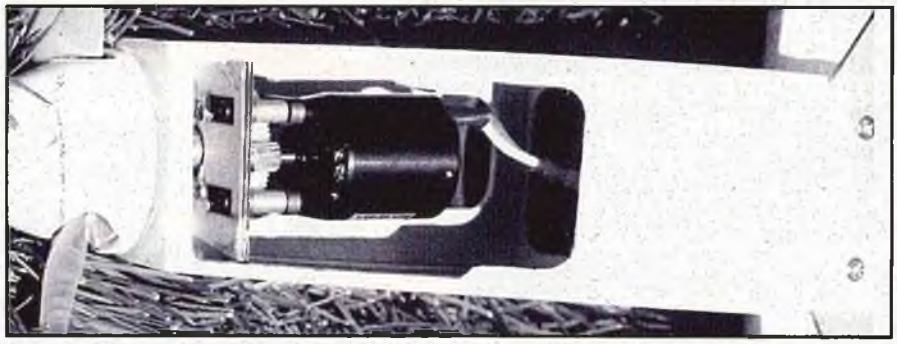
3D/Fun Fly aircraft offer remarkable flight performance. They are lightweight, high powered with huge control surfaces to allow you to turn on a dime and give you 9 cents change and they are a blast to fly!

There are numerous articles about converting a glow-powered 3D Fun Fly aircraft to electric. Cermark makes this easy with the Banchee. If you want a glow version, buy the Banchee G-3D. If you want an electric 3D aircraft, buy the Banchee E-3D. I'll tell you now that they both fly great.

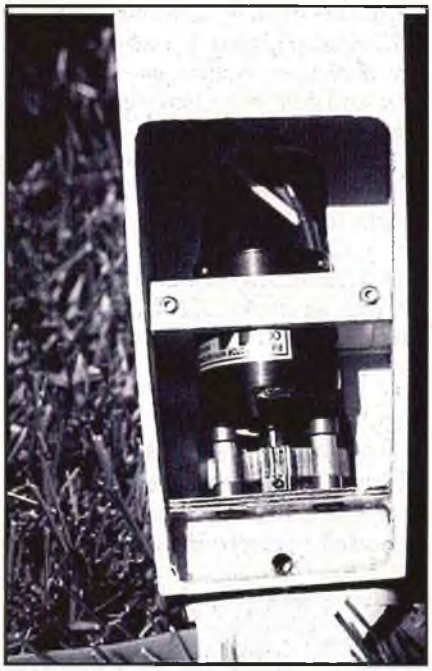
What's In The Box:

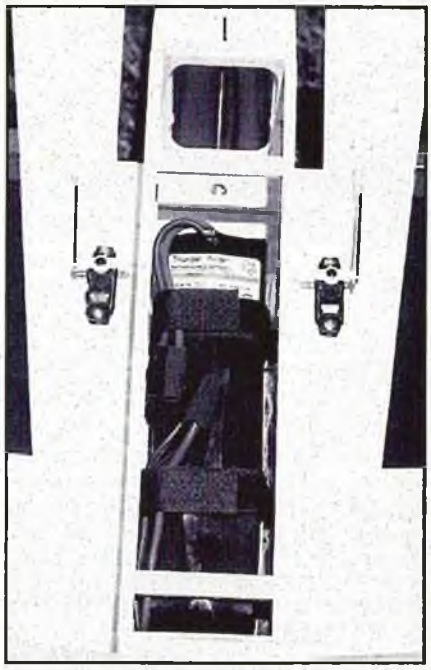
Both boxes measured 54.50" x 14.25" x 8.00". They are well packaged with the aircraft structure in plastic bags and supported by cardboard, small parts are in small bags and the landing gear is secured in a cardboard partition so there was no damage to any of the fragile components. Wheels, spinner, hinges, control horns and pushrods are included in both kits. There was very little wrinkling of the covering. With the one-piece wing and the tight fit of the various parts, the Banchee can easily be assembled dry to get a feel for the entire airplane. Both the glow and the electric versions have the same planform. They go together in a similar fashion but there are differences in some of the construction. Examples include the fuselage being wider in the glow version to accommodate the width of the engine. Aileron servos on the glow version are located mid-wing. On the electric version they are located closer to the fuselage. The openings for the servos are larger on the glow version. The joiner for the elevator halves is more robust on the glow version as well. It is really interesting to see all the differences the

An O.S. 46 AX fits snugly in the nose of the G-3D. Running the O.S. inverted gave us no real problems.



A Mega 22/20/2 brushless 600 size motor and MEC 5 to 1 Super Gearbox is the recommended power system for the E-3D.





LEFT: The mount originally supplied with the MEC gearbox broke on the second flight. The author added a reinforcing plate in front of the mount and a hardwood frame to hold the rear of the motor in place. Since the review was completed, Cermark has doubled the thickness of the mount which should solve the problem. RIGHT: The E-3D has a hatch in the bottom of the fuselage for battery access. The aileron servos are mounted close to the fuselage on the E-3D, but further out in the wings on the G-3D.

designers thought were appropriate just because of the different power systems.

The 8-page manual is packed with photos and text. Hitec HS 325 HB "Karbonite" servos and the new Electron 6 receiver were used in both aircraft, as were ZAP adhesives — all of which performed perfectly. Either version is available in your choice of purple or green.

Assembly:

Both wings need the aileron servos installed. They are mounted on the lower surface with plywood doublers for the servo mounting screws already installed under the balsa skin. Servo extensions will be necessary for the glow version as the servos are in the center of each wing panel. CA hinges hold the ailerons in place. Be careful when tightening the covering on the ailerons as it's easy to put a major twist in them during the heating process. Attaching the control horns and pushrods is straightforward. Make sure you install small pieces of fuel tubing on the clevises to ensure they don't come apart during flight.

The lettering for the wing is precut sign material. The kit did not include instructions or carrier materials to transfer the lettering to the wing. After removing the unnecessary material from the lettering sheet I used blue, 2" wide, low tack painters tape to hold the relationship between the letters and to lift the letters from the paper and position them on the wing. After rubbing the lettering down, the blue tape was easily removed. With the exception of setting up the control throws, the wings were done.

The tail feathers fit well with only minor sanding needed to get the horizontal stabilizer square with the wing. The elevators in the glow version need to be slipped in first before the horizontal stabilizer is glued in place. After squaring the horizontal stabilizer to the wing, a few drops of CA locks it in place. 30-minute epoxy can now be applied through the servo openings and the slot for the vertical stabilizer to permanently hold the horizontal stab in place. CA hinges connect the elevator to the stab.

The instructions call for the tail wheel bracket to be CA'ed to the fuselage. Based on my previous experience, I elected to epoxy it to the fuselage to provide more strength. The vertical stabilizer is retained with epoxy. CA hinges hold the rudder in place. As with the ailerons, tighten the covering on all the tail surfaces carefully as they easily twist during spot heating.

The elevator and rudder servos will require extensions. Use your favorite method to tie the extension connector to the servo leadwire so that control is not lost due to the connector coming apart. I ran the servo extensions up to the top of the fuselage to help hide them. I then used plastic wire ties to gently hold tension on the wire as it passed into the radio compartment. Installation of the control horns and pushrods was straightforward. Again, remember the fuel tubing on the clevises.

The wheels easily assembled to the landing gear aided by the fact that the threads on the axles were precisely the correct length, so I simply ran the nuts to the end of the thread for a perfect installation.

Power Systems

Glow:

The new O.S. Max 46 AX was

purchased from my local Riders Hobby Shop. It fit easily into the built-in, precut wood mounts. After positioning the engine for spinner clearance the four mounting holes were drilled. I then tried to seat the included blind nuts with the included bolts. Unfortunately, the bolts were quite soft and the heads stripped before the blind nuts were set. I switched to hardened hex head bolts and pulled in the blind nuts easily. After removing the engine, a few drops of CA locked the blind nuts in place. Cutouts are required for the muffler, muffler-mounting bolts and throttle pushrod as well as the high speed and low speed needles. After all the cutting was done the entire nose section was fuelproofed with white Sig dope. The tank was easily assembled per the instructions. The front of the tank was covered with Zap-a-Dap-a-Goo and slid into the tank compartment so that the front of the tank formed a fuelproof barrier. The tank was retained with the included balsa block. A throttle servo and linkage completed the installation. I did not use the enclosed clevis as there was not enough room in the engine compartment. I used an EZ connector on the servo and a piece of music wire with a 90-degree bend at the throttle arm. An APC 12.25 x 3.75 fun fly prop is a perfect combination with this aircraft and engine. All-up weight was 4 lbs. 4 oz.

Electric:

There are a wide variety of electric power systems available for the Banchee. The instructions picture motors with inline gearing. Clamshell mounts trap the motor and provide the mounting holes to hold the assembly to the built-in motor rails. I opted to purchase the motor system available from Cermark that consists of the MEGA 22/20/2 brushless motor mounted to the Model Electronic Corporation (MEC) 5 to 1 Super gearbox. Castle Creation (785-883-4519) supplied their Phoenix 45 brushless speed control. Make sure the "brake" function is turned off in whatever speed control you decide to use. The sudden reverse torque to the brake is very hard on the drive train and contributes to problems with the gearbox and motor mounts. This system coupled with an APC 16 x 8 electric prop and a 3S4P (3 cells in series — 4 cells in parallel) lithium polymer battery pack has resulted in outstanding performance. Voltage on the pack off a fresh charge was 12.4 volts. Measured at full throttle with an Astro Flight (310-821-6242) WHATT meter and a separate tachometer, the following was observed:

Volts: 10.6
Amps: 41
Watts: 446
Rpm: 5,600

There were a number of problems in getting the electric power system to work reliably. Cermark supplied a 1/8" plywood mount for the gearbox. There were no instructions for the location of the wood mount. I set up the motor, gearbox, wood mount, prop adapter, and spinner to determine the location of the wood mount, allowing clearance for the spinner. Once this was established, the mount was glued in place. The wood mount proved to be unable to handle the loads of swinging the large prop and the unsupported motor. The wood mount began to break after two flights, allowing the prop and motor to oscillate wildly. Since it was impossible to remove the glued-in wood mount I boxed in the front end, tying the wood mount to the nose ring and fuselage sides with a single piece of 1/8" aircraft plywood. Thin CA was flooded over the rest of the wood mount to harden it. This is especially important where the gearbox mounting screws are located. I built a removable spruce box around the rear of the motor to support it as well. That locked the motor in place. *Editor's Note: Cermark is now shipping the Plywood Motor Mount/Firewall for the recommended Super Box gearbox with a thicker material. It appears to be about twice as thick as the original.*

Another problem developed with the motor pinion gear. The hole for the setscrew was tapped very loose. It stripped as I tightened the setscrew for the first time, so I drilled and tapped a new hole 180 degrees from the first. The MEC instructions call for grinding a flat in the motor shaft and using blue Loctite to hold the pinion to the motor shaft. In talking to the folks at MEC I found that the gear relies almost entirely on the Loctite to handle the load. I don't think I cleaned the motor shaft well enough nor put on enough Loctite, so make sure you follow the directions completely. The original gear eventually broke apart. The second gear, properly installed with sufficient Loctite, has stayed on for over 30 aggressive flights.

After a number of flights, the screws that hold the front of the spinner to the spinner backplate pulled through the spinner front, necessitating replacement of the spinner. The ready-to-fly weight for the E-3D was 3 lbs., 15 oz.

Completion:

Control throws and C.G. started out per the instructions. After a lot of flying I have settled on these values for both glow and electric:

Aileron Low Rate: 2.0"
Aileron High Rate: 2.5"
Elevator Low Rate: 2.0"
Elevator High Rate: 2.5"
Rudder Low Rate: 2.25"
Rudder High Rate: 3.0"

Exponential was set to -40% for both high and low rate. The C.G. is at 5" behind the leading edge.

Flying:

The E-3D (electric) was the first in the air and the performance potential was obvious even though there was a problem with the motor mount as previously noted. After the motor was secured the airplane came alive. Knife-edge from horizon to horizon was easy. Hovering was simple. Inverted flight barely required any down elevator. Flight times, with heavy aerobatics, exceeded 20 minutes. There were no bad habits. Harriers were easier to do with a bit of spoileron programmed in (ailerons go up as elevators go up). However, I rarely use them and have never used the coupled flaperons that I also programmed in. Stated another way, a simple 4-channel dual rate system, preferably with exponential, will fly the airplane very well.

The G-3D (glow) flew equally impressively, virtually identical to the electric ship. So little power was necessary for anything but the most aggressive maneuvers, that five pilots flew the glow version on the first flight and there was still fuel in the tank. You will use the throttle and rudder a lot with the Banchee to maximize your enjoyment.

Conclusion:

Due to the low weight and high power-to-weight ratio, the Banchee flies great. My son Chris prefers the glow version. I prefer the electric. In actuality we both just enjoy flying either version of the Banchee. It is a great design that is economical. Pick your power preference and give it a try.

Post Script:

I used the Banchee E-3D, flying a freestyle routine to the theme from "Top Gun" to win first place in the Skymasters annual Top Gun competition. The trophy is proudly displayed in my office.

ENGINE CLINIC

Clarence Lee

The past few months we have received several letters from readers confused over whether it's okay to use 2-stroke outboard motor oil in their larger size 2-stroke gas burners being used for the quarter scale and larger aircraft, IMAC pattern competition type aircraft, etc. Many of these engines having evolved from weed whacker and leaf blower type utility engines. The confusion comes about due to many of the weed whacker/ leaf blower manufacturers specifically stating that 2-stroke outboard engine oil not be used in the engine. This mainly due to your 2-stroke weed whacker/ leaf blowers operating under different operating temperatures and conditions than 2-stroke outboards. Whether this would actually have that much effect on our model aircraft engines or not is hard to say.

Back in 1974 the Pennzoil/Quaker State Co. in conjunction with a company in Florida named Lockwood Aviation Supply ran some tests utilizing four new Rotax 503 twin cylinder, 2-stroke engines — probably the most popular engine available for the Ultra-light type aircraft. Pennzoil 2-cycle Air Cooled Engine Oil, Pennzoil Outboard Multipurpose 2-cycle Oil, conventional petroleum 2-cycle oil, and 2-cycle Synthetic Oil were tested. This information, along with an article by Charles Kudolis on "How 2-cycle Oil Works," was published in the Experimental Aircraft Association's (EAA) monthly newsletter "Experimenter." Although copies of the results and Mr. Kudolis' article were at one time available, they no longer are. However, this information can be had on the Internet. So, if you have wondered about the differences between outboard 2-stroke oils, leaf blower/chain saw oils, etc., the website is:

www.oil-store.com/ OilDoesMakeADifference.pdf

I believe you will find the articles interesting.

RCM would like to wish all of our readers a Happy New Year

Dear Clarence:

I have read your column since the very first one, and I don't believe I have ever missed one. I have written you a couple of times previously, and you have always been very helpful. Although I have been in the hobby 50 years, and in R/C about 35 years, I have encountered a problem that has me stumped. None of the local guys I have spoken to have been any help at all. This concerns the first 4-stroke engine I have ever run. I imagine that you have probably answered this question in your column at some time, but most of my back issues are rather hard to access.

I have a Thunder Tiger 54 in a TT 40 size Giles 202. It is mounted with the cylinder at 225 degrees, as viewed from the front. I try not to over-choke. I have used Master Airscrew glass-filled 11 x 6 and Power Prop wood 11 x 6 props. My fuel is Omega 15%. I have used O.S. F type, Fox Miracle, and K&B 4011 FS plugs. The engine was bench-run to break it in per a procedure published in MAN by Dave Gierkie, and I had no particular problems during the break-in running (mounted upright in E-Z-Just test stand). Since mounting the engine in the plane, I have had a terrible time with it backfiring(?) and loosening the prop nut. Early in the third flight, I lost everything off the shaft but the drive washer.

Since then, I have been determined not to repeat that fiasco, but it seems that nothing that I try works. It kicks back and loosens the nut while spinning with the electric starter. I have also had it happen while just slowly pulling it through by hand. I have not even attempted another flight, because this happens every time I attempt to start it. I thought maybe I just wasn't getting the nuts tight enough. I put my knee under the right-hand prop blade, held the end of a screwdriver blade on one of the steps on the spinner backplate, and tightened both nuts just as tight as I could with my 4-way wrench, but I expect the same result on my next starting attempt.

Any idea what might be causing this problem? I was talking to another modeler here who has been in the hobby as long as I have, and has been running 4-strokes since they first became available. He said he had no idea. A long time ago he had an engine that did the same thing, and he never did figure out what caused it. Any help you can give me will certainly be greatly appreciated. Except for this problem, I love the engine and the way this plane performs with it, but it is doing me very little good until I resolve this problem. An SASE is enclosed for your convenience.

Warmest regards,
Wilbert L. Washam
Sunland, CA

Wilbert, placing your engine at a 225° angle is probably letting excess fuel and oil, that would normally leak or blow by the piston into the lower crankcase, remain in the cylinder. This, in turn, results in raising the compression ratio of the engine. The oil content of Omega fuel is in the 17-18% range which should be fine, but you might want to try a fuel intended for 4-strokes which has slightly less oil. Stick with the O.S. "F" plug as it is the best available. Also get yourself a 6" box or combination wrench, i.e., box on one end and open end on the other to tighten the prop nut. You can tighten the nut a lot tighter with a box or combination wrench than with one of the 4-way prop wrenches.

If you still have trouble, pull the head and make sure the head gasket is in place. If missing, you will know the cause of the trouble. If one is installed, then ganging of tolerances have probably caused the compression ratio to be too high. Add another gasket and reset the valves. This should cure the problem. Let us know if it does.

Dear Mr. Lee,

I'm sure you have covered this many times but I can't find the correct issue.

My owner's manuals for the O.S. .25FX and .46FX both say NOT to use after-run oil (at least not through the intake) as it might damage the carb "O" ring.

I have been using a mix of half and half Marvel Mystery Oil and automatic transmission oil in my other engines. Would 3-in-1 Oil be better? What is your suggestion?

Many thanks,
L.H. (Mick) Mickelson
Fresno, CA

Gee Mick, someone who actually reads the operating instructions.

Evidently, O.S. uses silicone "O" rings either in the carburetor or as a carburetor seat seal. Any petroleum-base oil will cause silicone "O" rings and tubing to swell and turn gooey, so it would be best to use an oil that is compatible with silicone rubber. Both Marvel Mystery Oil and 3-in-1 are petroleum-based so there would be no advantage to switching to 3-in-1. Performance Specialties (Dave Shadel), P.O. Box 3146, Gardnerville, NV 89410, phone (775) 265-7523, has an after-run oil (Ultra-Oil) that is compatible with silicone rubber. If any of our readers know of another oil that is compatible with silicone rubber, let us know.

Mr. Lee,

I am ready to start covering my 1/4 scale Sig Cub. After reading your excellent article on the RCV-90 SP and the RCV-120 SP I get the distinct feeling that the 90 has enough torque to handle this aircraft. I am fortunate to live on a beautiful lake and in a picture perfect cove and after some test flights and getting used to this model, I plan on putting floats on it so I don't have to drive 35 miles to a field.

Will the RCV-90 SP handle this task or should I count on going to the 120? Either one will fit nicely up front.

I would prefer the superior power to weight of the 90, but will go with your better judgment and experience. As a bonus to using either of these engines I get to swing a scale 18 inch prop.

Thanks for your reply and keep up the good work.

Charles McSwain
Salem, SC

Although the RCV 90 would handle the ship fine, once airborne, getting a float-equipped aircraft up on plane and breaking loose from the water surface tension takes considerably more power. Especially if the water surface is smooth, i.e., no ripple. Although the 90 might handle it, you would probably do best to go with the 120 and just throttle back if it is too fast in the air.

Dear Sir,

I am using an O.S. 1.08 FSR engine and this turns a 13 x 6 at 12,000 rpm and a 14 x 6 at 10,700 rpm. Being a big engine, is it ok to run it at 12,000 ground rpm or do I have to limit the ground rpm around 10,700 or so?

Ajay G. Podar
Parel -- Mumbai 400 012
India

Ajay, 12,000 rpm is about as fast as you would want to run your O.S. 108 FSR. Any faster than this and you would be above the points where the engine develops both its maximum horsepower and torque. The engine was never intended to be a high rpm engine. As far as which prop to use — if it is speed you are after then use the 13 x 6. If after vertical performance then use the 14 x 6.

Dear Clarence,

I read your column exclusively, I have a strong interest in engines especially the high performance pieces. My question to you is, I have an O.S. RSR .65 and no one

has ever seen this engine before?

I saw the article on the Metkemeijer in the January issue and what inspired me to write you is the Metkemeijer has the exact same spinner as my O.S. My engine has a blue anodized head, rear intake with a 7-13 carb., side exhaust and is ringed. I was hoping you could give me a little information such as its rpm range, type of fuel or how much nitro it will handle? Can you recommend a prop size and pitch?

My other question is, can you squeeze this engine into the Direct Connections Tsunami, which is a .40 size 58" span pattern plane? I also have my eye on the new West Eurotech 50VI, provided I can shoe horn my .65 into the plane. Which engine would be the better performer?

Also would there still be a source of parts, I would like to use a standard spinner, but I can't find a standard drive washer.

I thank you very much for any help you can provide for me.

Sincerely,
Joseph Perry
Cincinnati, Ohio

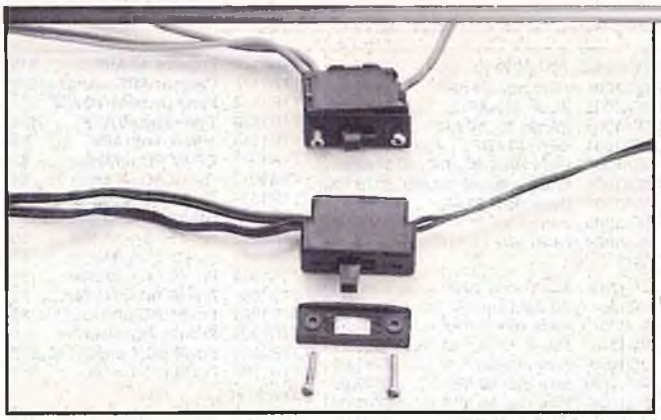
Joe, your O.S. 65 RSR was made back in 1977 and was marketed both with a straight through venturi for control-line speed/free flight use and with a carburetor and water-cooled head for marine use. None of my old O.S. catalogs show the engine marketed as an R/C engine. Either someone installed a carburetor on the aircraft version, or installed an aircraft head on the marine version. As your engine is missing the prop drive washer I'm guessing that your engine may have been sold originally as a marine engine. Either version was intended for high speed operation in the 20,000 rpm range. However, the engine should handle a prop in the 11 x 8 to 12 x 6 range okay with 15% nitro. For control-line speed and marine use guys were using up to 65% nitro, but you wouldn't want to do this when lugging the engine down with larger prop sizes.

As for parts — you might want to try Gene Steinkamp, 8773 Russett Ct., Cincinnati, OH 45251. Gene used to head the service department for World Engines who imported the Super Tigre engines and has some parts for the old Super Tigre, O.S., and Picco engines. Sorry, but I don't have a phone number for Gene.

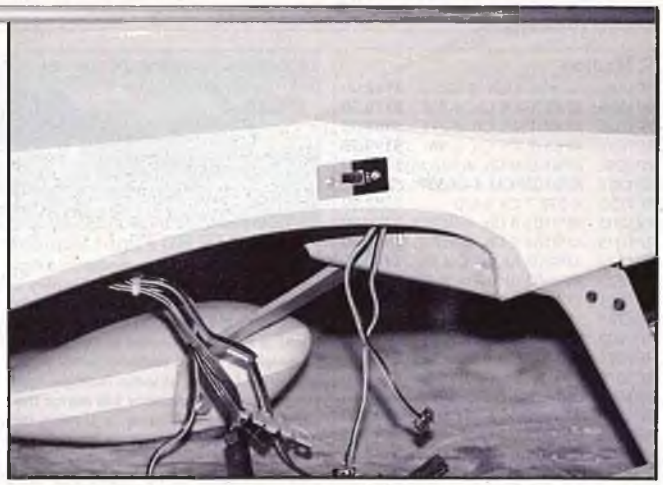
Actually, this engine would be far too much engine for a 40 size aircraft and you would be a lot better off to use a 50 size engine. I'm afraid I've never heard of the West Eurotech 50VI you mentioned.

'Til next month.

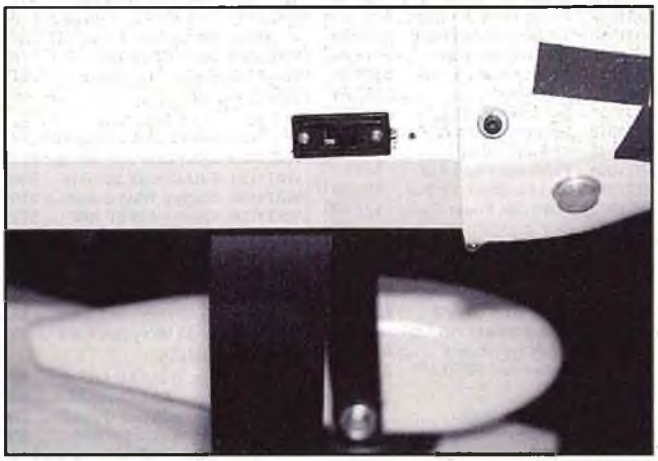
BEGINNERS' BENCH Jerry Festa



"Switch Harness" and "Switch Harness II." Two examples of switch harnesses — Airtronics in the foreground, and JR in the background. Note the three sets of wires leading from the switch. One goes to the battery, another to the receiver, and the third is a charge cord.



"On-Off Switch" on this model of Great Planes RV-4 has a metal switch plate in two colors — red for "On" and black for "Off."



"On-Off II." This switch's location was possible because the plane (Funtana 90) had its engine mounted sideways, permitting the exhaust to exit out the bottom of the cowl.

"Cub On-Off." Planes like this J3 Cub permit the switch to be located inside the fuselage, accessible through a functioning door and window.

One of the necessary rituals modelers go through is installing the "On-Off" switch harness. This applies to either ARFs (Almost Ready to Fly) or kits. The primary requirement is that the switch be placed away from the engine's exhaust. With most trainer planes the engine is mounted upright, meaning the exhaust is commonly located on the right side of the fuselage. Therefore, we would not want to locate the switch where it could be exposed to the exhaust, but rather on the opposite side to eliminate any potential problems caused by this oily residue.

One question that commonly arises deals with the switch's orientation: should the switch be pushed forward or rearward to activate the airborne radio? There are pros and cons for whichever way you decide to mount your switch, so let's discuss a couple of them. When the switch is slid forward to turn ON the radio, the modeler handling the model must be careful not to turn the radio OFF when releasing the plane. One modeler claimed the long grass at the end of the runway turned his radio off! His switch did extend outside the fuselage side a significant amount and it was true his radio was on when he was taking off. Likewise, it was true his plane did proceed to fly through some tall grass on the end of the runway as he slowly climbed out after rotating. Then nothing ... no control! The plane did a slow roll and became a top candidate for practicing how to use thick and thin CA on a multitude of parts. Was the friction of the grass strong enough to slide the switch to the "Off" position? No one knows for sure, but the modeler in question is sticking to his story.

So two cases against positioning the switch forward, but like someone at our field recently said, when the plane hits the ground (aka "Crunch"), they want the switch to slide forward, turning Off the radio! Hummm, never thought of that before. Another modeler mentioned that frequently he forgets to turn on the radio until after he starts the engine (not a good practice!), so by pushing the switch rearward he is pushing the aircraft away from him as he is positioned in front of the plane. That whole scenario gives me nightmares!

Some modelers will mount their switches so that it will move up or down to turn on or off the radio. Other than a clumsy handler, one shouldn't mess that one up — but it is possible. So "Up" is **on** or **off**, it shouldn't matter.

Many of the newer ARFs and kits are suggesting a location for the On-Off switch by including a horizontal slot on both sides of the fuselage. The iron-on covering is hiding these two openings and the modeler only has to remove the covering on the side that is to be used. It should be noted that this should be located in lite ply. Mounting a switch in a balsa-only area will cause problems over time. If the location you choose does not have plywood doublers, please add one to the inside of the fuselage. The last thing you want is to have your "On-Off" switch flopping around inside your plane.

To mount a switch, many modelers use the switch cover as a guide. The cover is

usually a piece of black plastic that has two holes and a slot that permits the actual switch to protrude through. This cover can be placed on the fuselage and used as a template. When removing the material from the slot, be careful and remove enough balsa/plywood so the switch can travel its entire length — in both directions!

The two holes that hold the switch cover to the fuselage and switch can be drilled with a 1/16" or 3/32" drill bit. The switch slot can be opened up with a #11 X-Acto blade.

The most common switches supplied with currently purchased radios have three wires leading from the switch itself. Each of these three sets of wires has a connector already secured. The "wire" is actually two or three smaller wires molded together in a bundle. One of those bundled wires will have a connector that will only connect to the battery. This connector is commonly found in the wire bundle consisting of only two wires (a positive and negative) and has a female connector. Also leading from that same end of the switch will be another set of wires which can lead to the receiver.

I personally think the black plastic switch cover is pretty flimsy and the words "On" and "Off" can barely be read. Therefore, the switches on-off status should be indicated on the fuselage so there isn't any doubt as to which direction indicates "On" at least. Some ARFs and/or kits supply a decal sheet that can be used for this purpose. If your plane lacks any indication concerning the switch, you could use a permanent marker to write the words "On" and "Off."

Maybe you have been at the field and saw a little black knob that protruded from the fuselage that was used to move the switch. A couple of manufacturers offer a clever device that secures the switch on the inside of the fuselage and only requires a short threaded rod to exit the plane. This makes the plane look a bit more streamlined and is quite small, and if placed at just the right location, it can even appear to be a door knob!

Anyway, this product can be purchased from companies like Great Planes, Du-Bro, and a few others for less than $4.00. On the inside of the plane the switch is suspended on a plastic tray and is activated by a short wire pushrod. This makes for a very nice, neat installation.

To go one step further, both of the aforementioned companies offer a combination charge jack along with the switch in this configuration. The advantage to this is that the battery status can be determined with an ESV (Expanded Scale Voltmeter) from the outside of the aircraft, thereby eliminating the need to remove the wing in order to plug into the charge cord. Many a plane has been saved from total destruction because the prudent modeler decided to check the battery status **before** a flight and found it lacking!

The "Pull-Push" type of switch gives rise to another dilemma — is it better to **push** the switch to turn the plane on or is it better to **pull**? There are advantages and disadvantages with either choice, but let's agree on one thing — use what makes sense to you! I personally like to arrange the switch to turn on when the pushrod is pushed — but maybe that doesn't make any sense to you. Yes, the switch could get pushed in (and, therefore, "on") during the trip to the field, and yes I could arrive at the field with a dead or low flight battery. But I'd rather take that chance as opposed to having someone bump the switch in (and therefore "Off") as they release my plane!

ModelSport Magazine took a survey a couple of years ago addressing modelers' opinions concerning switches and which direction the switch should move to be turned on or off. The results were evenly split — about half of those who responded said forward is better, the others indicated backward was! Likewise, half thought pushing to turn on the plane was favored over the other half that selected to pull the switch to turn the plane on!

As you progress in this hobby, some of you will decide to hide the switch. Whereas most switch cover plates are black, you can hide the switch by running a thick black stripe down the side of the fuselage, and mount the switch in the black area.

Another method is to put the switch in the cockpit. This often works with those planes with what we call "Open Cockpits." WWI planes frequently did not have a plastic bubble protecting the pilot from the environment and that opens an area in which the On/Off switch can be located.

If you happen to be making a propeller driven "Jet," the dummy jet exhaust area is frequently home to the On/Off switch, and even within a fuselage when you have an opening door on a plane like the J-3 Cub. You can also make a box within the fuselage that holds the switch and then cover this area with a hatch like a cargo door.

In conclusion, the choice of mounting the switch is yours and you should have your reason(s) to slide, tug, or pull the switch the same way on all your models. That way you can become a creature of habit and **not** start your plane with the radio off. Therefore, go forth, mount your switch to your latest and greatest airplane and maybe I'll be lucky enough to see **you** at the flying field! ✈

FOR WHAT IT'S WORTH

By Jerry Smith

A NOTE FROM JERRY

Many readers have been sending me suggestions by e-mail. They are good, usable ideas that could be published; however, I cannot use them if you do not include your address. Your e-mail address is not enough. I need your complete home address in order to get back to you when, and if, your suggestion is published. So please include it. And, while I have your attention, please submit an SASE when asking for information if you want to receive an answer ... Jerry.

FAST GLOW PLUG IGNITER BATTERY CHECK

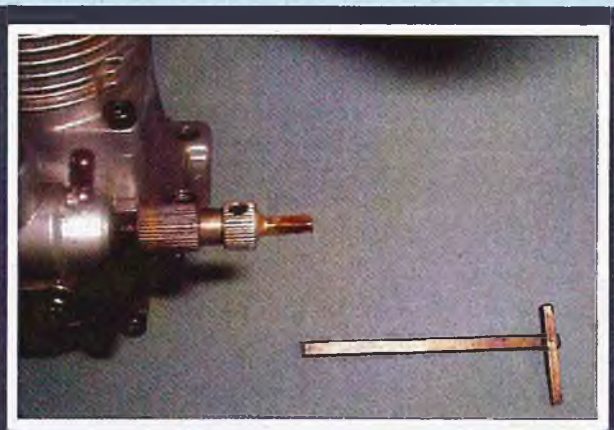
Your engine is not starting? Could be a dead glow plug igniter battery. Find out fast with this handy field box mounted glow plug. Add a magnifier cap for even greater visibility on bright days. The cap can be made from a short piece of plastic tubing and a button type magnifier from a discarded scope. The tube I.D. should be sized to force fit the magnifier glass. A small plywood plate, with a hole drilled to accommodate the glow plug, and then mounted to the field box with enough clearance for your hand and igniter to line up with the test plug. The igniter can be tested by just making contact without being clipped securely to the glow plug. Submitted by Bruce Botway, Plainview, NY.

AFTER- RUN OIL TUBE

When you have an engine mounted under a cowl it takes access holes to attend to its different functions. John Hanson, Kennewick, WA, had a rear-mounted carb on an inverted ST 4500 in a Top Flite Corsair and needed a way to inject after-run oil in the carb. By installing a small tube on the firewall he was able to run the oil directly into the carb. Yes, it took another access hole in the cowl to do this but was well worth it.

NEEDLE VALVE EXTENSION

George Kutcher, Trenton Ontario, Canada, has found a positive way to adjust the needle valve on his under cowl engine. He brazed a short piece of square tube to the needle itself. Then, using the next size larger of square tubing, which will fit over the brazed on piece, George found it a more positive way when connecting to make adjustment on the needle valve. This beats a bent wire sticking out of a hole in the cowl and doesn't require you to remove the needle valve when it becomes necessary to remove the cowl.



TO MATCH TRIM TAPE COLOR PAINT IT. MODEL MASTER PAINTS HAVE A VARIETY OF COLORS WITH WHICH TO CHOOSE FROM

CUSTOM TRIM TAPE

Trim tape is available in all sorts of colors. But suppose you want a special color, one that you have mixed yourself, and can't find tape to match? That's an easy question to answer. Why not paint it the same color. Most all of the tape can be painted. On a recent project I used Model Masters acrylic paint to paint some tape to be applied around the cockpit, providing a nice sharp line. Much easier than masking and painting. Try it on your next project and come up with the exact color needed. Submitted by John Romeo, Kennesaw, GA.

MARKING HINGE LOCATION

When it comes time to mark locations for hinge slots on a wing, stab or rudder, why mark the covering or painted surface. Simply lay down a piece of masking tape and mark the locations on the tape, then you won't have to clean off the marks -- which sometimes are not easy to remove. Another benefit, save the marked tape for the other elevator or aileron and you won't have to remark it. You will find this a handy way of marking. Submitted by Gary Spears, Cartersville, GA.

Win A DREMEL *Variable Speed MultiPro Super Kit*

in RCM's For What It's Worth Contest

Every modeler has a trick or two up his sleeve that comes in handy when solving a particular modeling problem. We would like you to share your "shop secrets" with us and our readers and, in so doing, be eligible to win a Dremel Variable Speed MultiPro Super Kit for your shop, furnished by Dremel. Each month we will draw a name at random from all "For What It's Worth" ideas submitted that month to determine the winner.

Send your ideas to:
R/C Modeler Magazine, "For What It's Worth Contest"
P.O. Box 487, Sierra Madre, CA 91025

Congratulations To Our November 2004 Winner!

The following winner won a prize from RCM and Dremel:

J. Chandler, High Point, North Carolina

Offer void where prohibited. Substitutions may be required due to availability of item.

The Dremel Variable Speed MultiPro Super Kit (Model #3956) includes Flex-Shaft for precision, hands-free operation. Cut, grind, carve, route, sharpen, drill, polish, sand, and more. Contents include: Variable Speed MultiPro Tool; Flex-Shaft Attachment; Wrench; "New" Customized Storage Case; 72 Assorted Accessories; and a 175+ Uses Book.

WANT MORE?

GET IT ALL ONLINE NOW AT NO ADDITIONAL COST!

Support Our Web Site Sponsors

Online access is now included as part of your magazine subscription. 100% of the printed editorial content, plus much more, will now be available on our new Website at:

www.rcmmagazine.com

Now you can view all the great features and construction articles each month in addition to the detailed reviews, columns, and departments ... plus tools for content searching.

On the RCM address label is a 5-8 character subscription ID. Use this as your User-ID. Your password will be this ID plus the first 3 digits of your zip code. The system will then instruct you on how to create your new password.

Become an RCM subscriber and you, too, can get it all!

Go to the Buyer's Guide at:
www.rcmmagazine.com

ELECTRIC B-29

Sport-Scale WWII Bomber For 4 Speed 400 Motors

By Jim Young

ABOUT THE AUTHOR

Jim Young has been modeling and flying R/C for 19 years. He built his first model on the desk in his college dorm room. He started with glow power and transitioned over the years to primarily electric power. Jim has designed several models and has had three plans and other articles published in various magazines. He has won five awards at the annual Toledo R/C show, including 3rd place in Non-Military Sport Scale at the 2004 show.

The reliability of electric power lends itself to multi-engine aircraft. You don't have the trouble of synchronizing multiple engines and worrying about flame-outs. So if you don't have these problems, why stop at just two motors? The four engine Boeing B-29 is a perfect subject.

The Boeing B-29 had many new features for its time, including remote controlled guns and pressurized crew areas. It was the heaviest production plane of its time due to its ambitious range and payload requirements. Boeing, Bell, and Martin built over 3500 B-29's before production ended in 1946. The former Soviet Union used three captured B-29's to jump start their long range bomber program and produced a rivet for rivet copy of the B-29, the Tupolev Tu-4.

B-29s saw action in World War II primarily in the Pacific theater. As many as 1,000 Superfortresses bombed Tokyo at one time. The most famous B-29, The Enola Gay, dropped the first atomic bomb on Hiroshima, Japan on Aug. 6, 1945. B-29's saw service beyond the war including aiding the quest to break the sound barrier.

The Model:

Construction of the Electric B-29 is greatly simplified by the use of foam core wings and fuselage, and to keep it simple, the landing gear has been omitted in favor of belly landings. For power, a relatively low cost power system using Speed 400 motors keeps this project in reach of most modeler's budgets. So, if you love the sound of four motors beating as one, let's get started.

CONSTRUCTION

Tail Feathers:

The tail feathers are built from 1/8" balsa sheet. Edge glue several pieces of sheet together and cut and sand the fin to shape using the plans as a guide. Add the 1/8" balsa doublers to form the tail gunner turret. The prototype flies fine without a rudder, but feel free to add one if you like.

Bockscar nose art.

ELECTRIC B-29
Designed by:
Jim Young
TYPE AIRCRAFT
Sport Scale Electric
WINGSPAN
80.5 Inches
WING CHORD
7 Inches (Avg.)
TOTAL WING AREA
560 Sq. In.
WING LOCATION
Mid-Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
1 Inch
OVERALL FUSELAGE LENGTH
54.5 Inches
RADIO COMPARTMENT SIZE
18" (L) x 3-1/4" (W) x 3" (H)
STABILIZER SPAN
24 Inches
STABILIZER CHORD (inc. elev.)
5-1/4 Inches (Avg.)
STABILIZER AREA
125 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
9 Inches
VERTICAL FIN WIDTH (inc. rud.)
6-1/2 Inches (Avg.)
REC. MOTOR SIZE
6V Speed 400 (4)
BATTERY SIZE
8-Cell 2000+ mAh
LANDING GEAR
None
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Elev., ESC., Ail.
C.G. (from L.E.)
3 Inches
ELEVATOR THROWS
3/8" Up – 3/8" Down
AILERON THROWS
3/8" Up – 1/4" Down
SIDETHRUST
–
DOWNTHRUST/UPTHRUST
5° Downthrust
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Foam & Balsa
Wing ..... Foam, Balsa & Ply
Empennage ..... Balsa
Wt. Ready To Fly .... 72 Oz. (4 Lbs. 8 Oz.)
Wing Loading ..... 18.5 Oz./Sq. Ft.

Flying buddy Ron McHale helps the author prepare the B-29 for flight.

Cut and glue 1/8" balsa sheet for the stabilizer. The grain on the stabilizer tips should run perpendicular to the span. Bend a 1/16" music wire joiner according to the plans. The elevators are cut next and positioned between the stabilizer tips. Mark the location of the joiner wire and carefully drill a 1/16" hole in each elevator half and bevel the leading edge as shown on the plans. For an internal control linkage, silver solder a piece of threaded rod to the middle of the joiner wire. Then thread a ball link onto the rod for a slop free connection. Cut and fit a piece of 1/8" balsa to go between the elevators, this will be attached when the stabilizer is mounted to the fuselage. Sand all the outer edges round and set the tail feathers aside.

Motor Mounts:

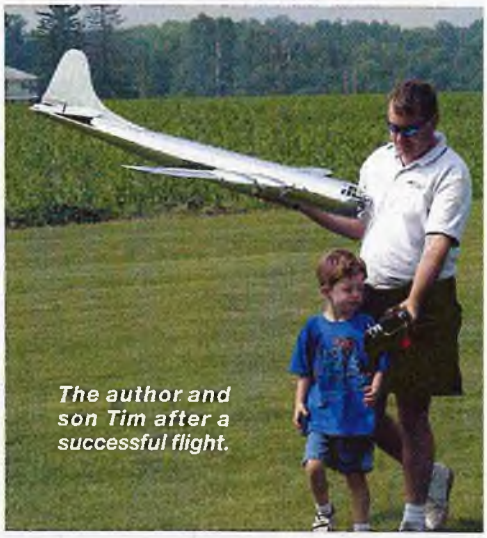
The motor mounts consist of 1/16" plywood and balsa triangle stock. Cut out eight sides and four bottoms. The bottom of the motor mount is parallel to the top edge of the sides. This gives several degrees of down thrust. Mark each side with a line that starts at the lower front corner and runs parallel to the top edge. Tack glue the bottoms and the sides together with the bottom lined up on the marks. Add the balsa triangle stock and the motor mounts are done.

Fuselage:

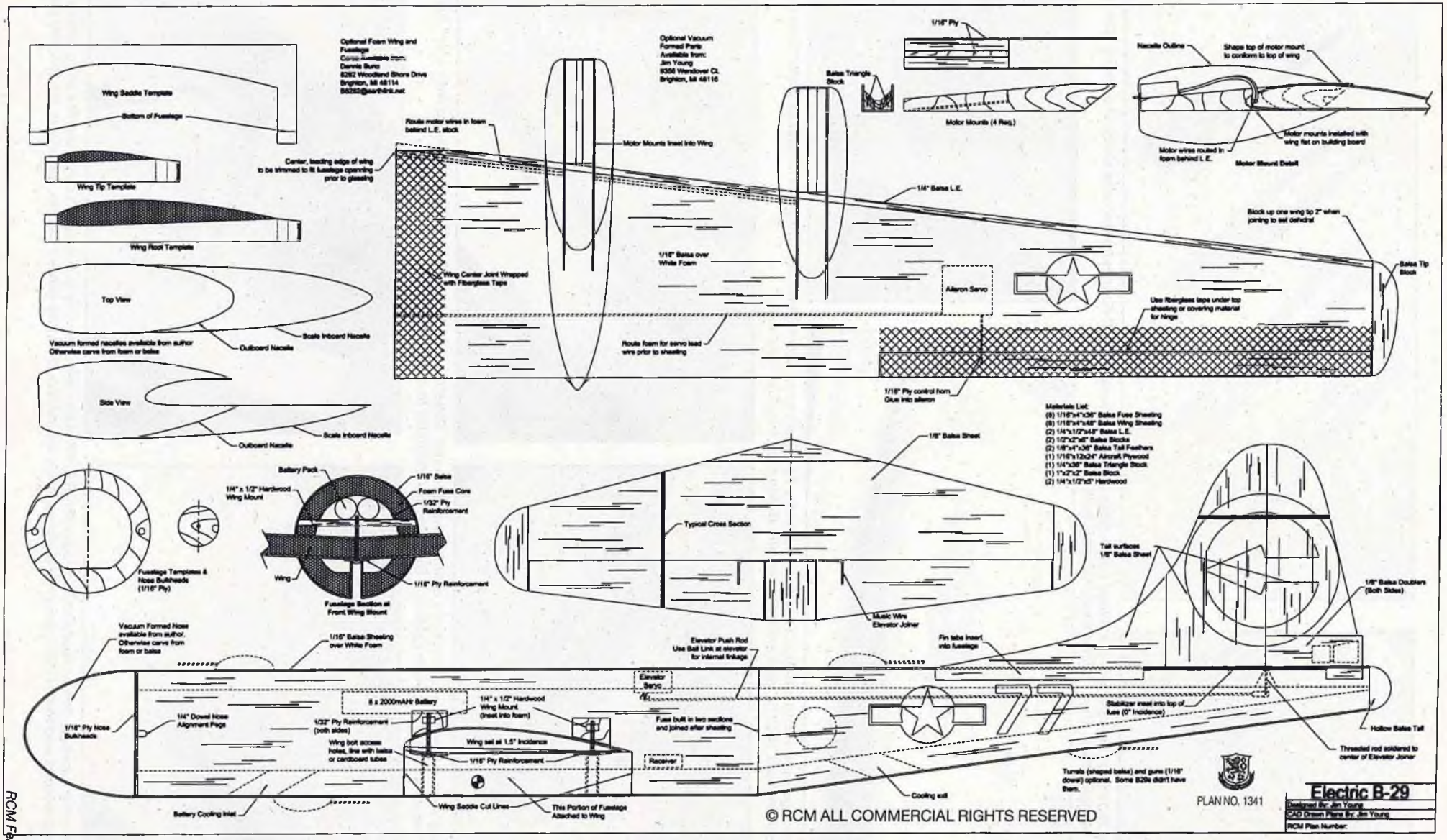
Next it's time to cut some foam. I cut the prototype with a homemade hot wire set-up, but I also have made arrangements with a friend, Dennis Buno, who has a CNC foam cutter and will cut all the foam parts at a very reasonable price. His contact information is at the end of this article.

If you choose to cut the foam yourself, the wing is a single taper and should not be a big problem. The fuselage is cut in two sections. The main section is a simple tube and the tail is a cone. I started with a 6" x 6" x 25" blank for the main section and a 6" x 6" x 24.5" blank for the tail. Finding 6" thick foam can be a problem, but I was able to find 2"x4'x8' sheets of white foam at the local home improvement store. I made the blanks by tack-gluing three pieces together with some foam-safe spray contact cement. Just mist a very light coat on the pieces and immediately press them together. This will hold them together well enough to cut and the hot wire will not get hung up on this type of glue.

Make a set of templates for the fuselage. I use Formica for my templates because the edges can hold a very smooth finish. If there are any rough edges on the templates, the hot wire can get hung up and cause problems. Pin the templates to the ends of the foam blank. Position the blank over the corner of a table so the ends of your cutting bow can hang down on each end. Position the cutting wire down the top center of the blank and turn on the power. When the wire hits the template, nudge it to one side and let gravity pull it down around the template. When the wire gets to the 3 o'clock position, turn off the power and rotate the blank 90 degrees. Start the wire cutting again and let gravity take over. Again let the wire cut 1/4 of the way around the template and then stop and rotate the blank. Repeat this procedure two more times and you'll have a nice tube. If there is some burnout or bumps, a few seconds with some sandpaper or light filler should true it up. (Save the cutoff blanks and cores. You will need them later!) Hollowing the inside of the tube is much easier. Poke a piece of music wire though the center of the tube and use this to fish the cutting wire though and reconnect it to the bow. Now, just hold the tube and rotate it as the hot wire cuts. Next, place the fuselage tube back in the blank and use the wing saddle templates to cut out the location for the wing. If you temporarily tack-glued

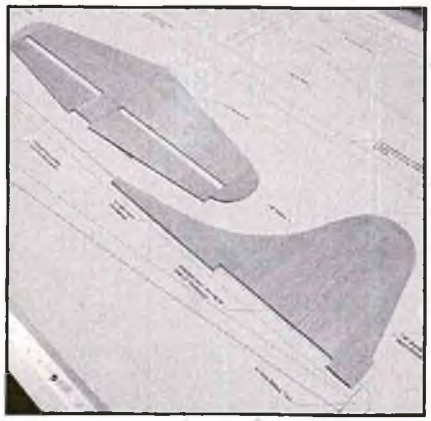


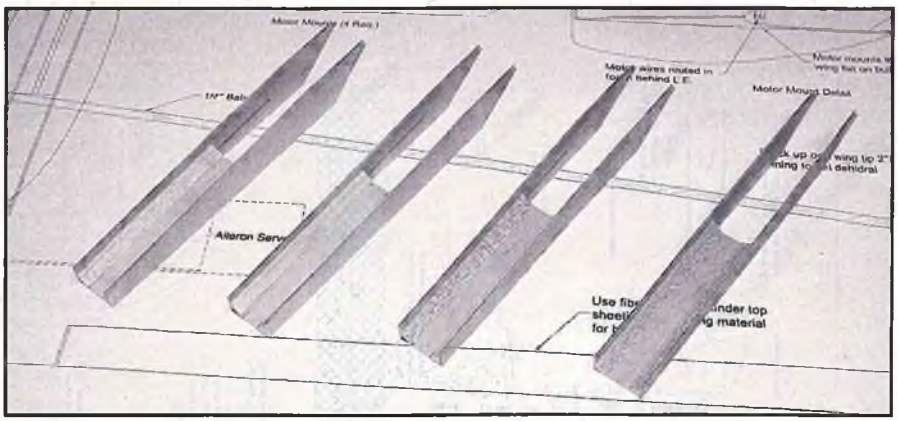
The author and son Tim after a successful flight.



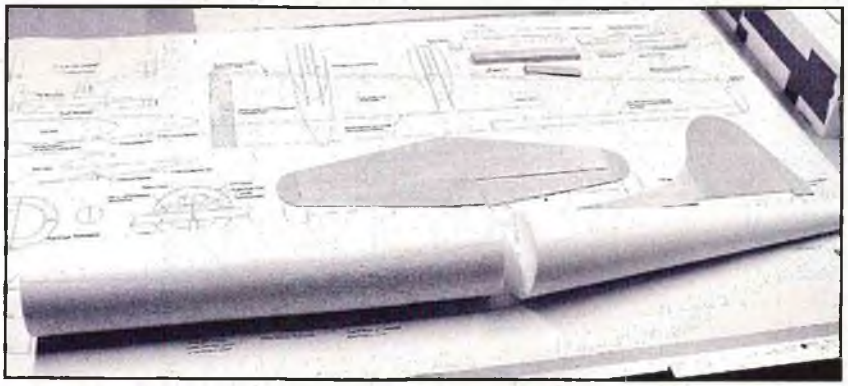
PLAN NO. 1341

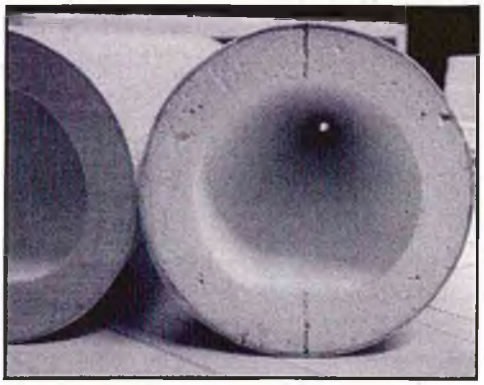
FULL SIZED PLAN AVAILABLE, SEE PAGE 149



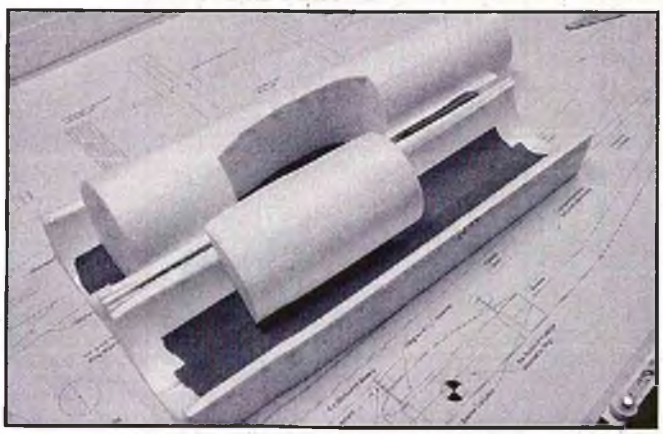


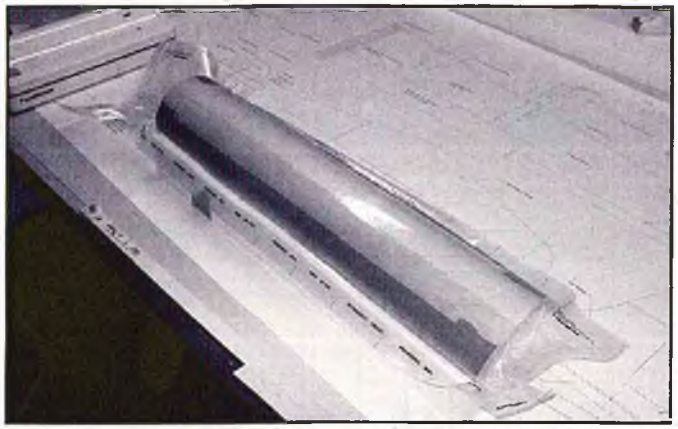
LEFT: The "tail feathers" are cut from 1/8" sheet balsa. Note grain directions. RIGHT: Four motor mounts are built up from 1/16" birch ply and balsa triangle stock. The required down-thrust is built in.



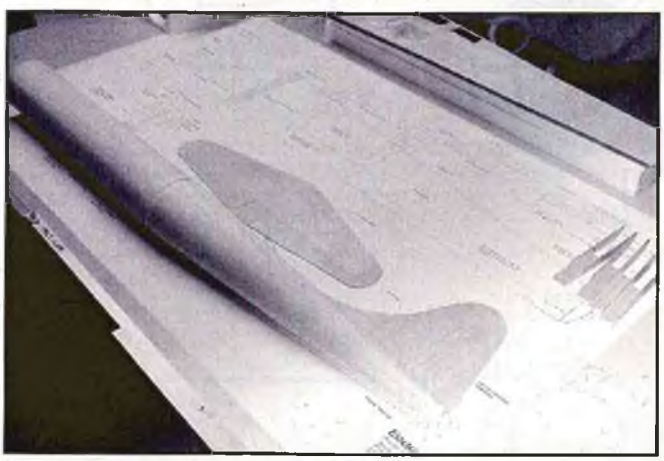


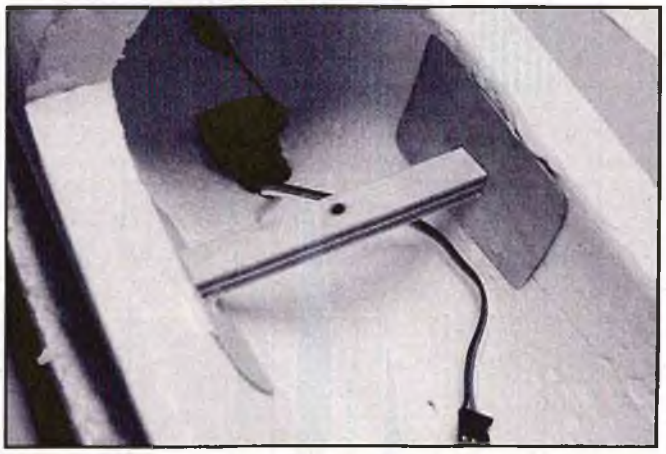
LEFT: The fuselage starts with a foam cylinder and a cone. The foam components can be cut by the builder or purchased from a supplier listed in the text. RIGHT: Both are hollowed out. (Saving the cores for later use.)



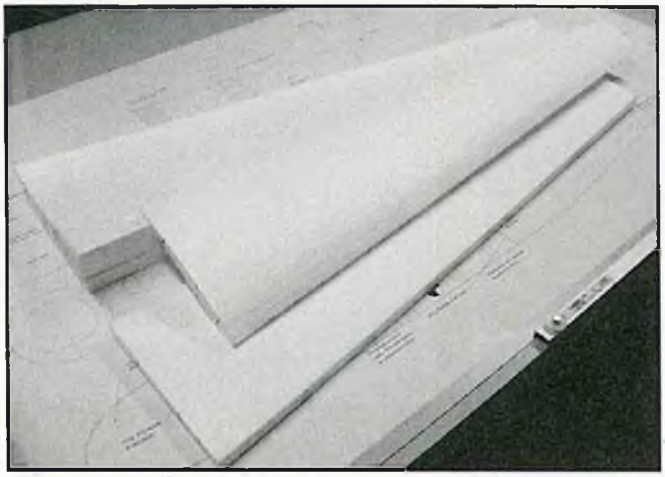


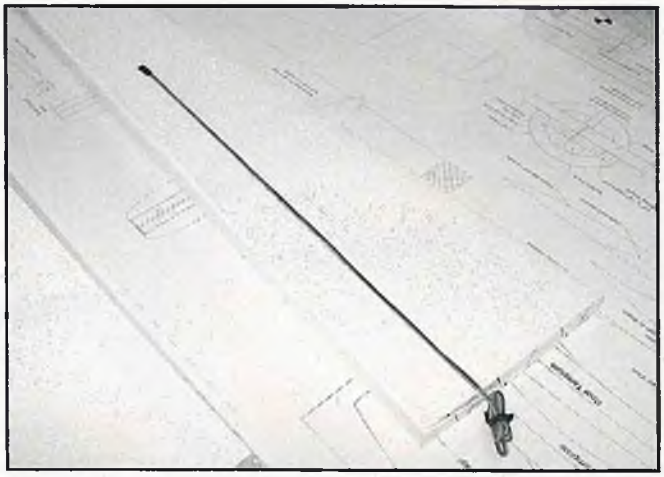
LEFT: The wing saddle/hatch is cut from the cylinder and the core. RIGHT: Here the fuselage is being sheeted with 1/16" balsa. A "Food Saver" vacuum-bagging system assures a good bond of the balsa to the foam.



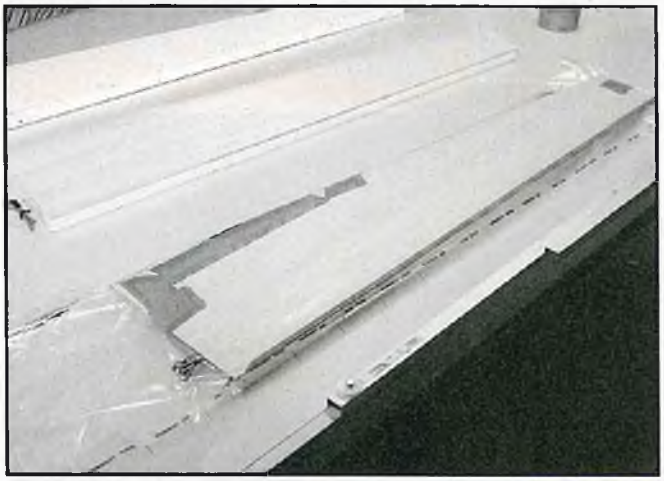


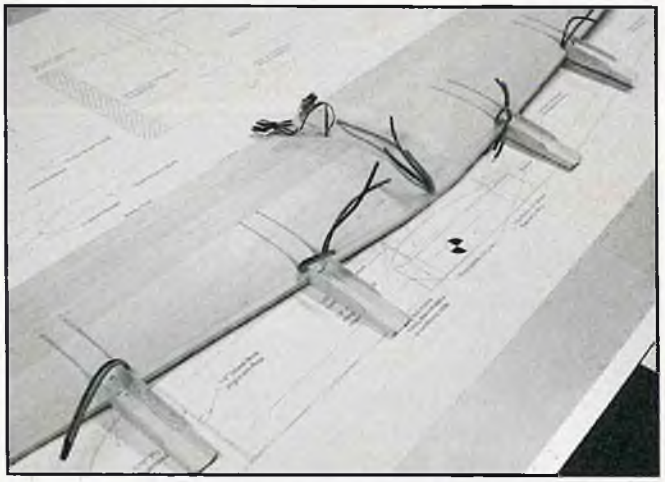
LEFT: The sheeted fuselage cores, ready to join together. RIGHT: After the sheeting is trimmed away from the wing saddle, the hardwood wing mounts and their 1/32" plywood reinforcements are added. Note the elevator servo, glued into the foam at the top of the fuselage.





LEFT: Here are the basic wing cores. The author used a home-made cutting bow to make all the required cuts. RIGHT: The aileron wire leads are imbedded in the foam before sheeting the wings.





LEFT: The wings are also sheeted with 1/16" balsa and vacuum-bagged. The traditional method of replacing the sheeted cores in the blanks and weighting them will also work. RIGHT: Heavy gauge wire is run behind the leading edges for motor power. The motors are wired in parallel.

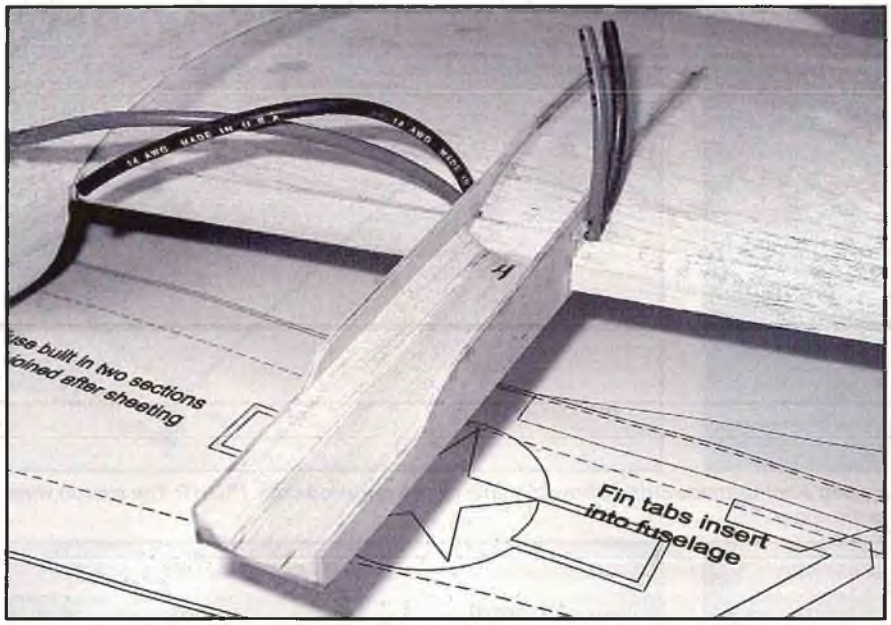
the foam for the fuselage, take time now to permanently glue them together. Add the 1/16" plywood plate to the front of the main section.

The fuselage is fully sheeted with 1/16" balsa. Start by preparing 1/16" balsa sheeting for the main fuselage by edge gluing four sheets of 4" wide sheet together. It will make it easier to sheet the tail section if the skin is made up from tapered sheets. This way the grain of the balsa will follow the taper of the tail cone. Cut four sheets of 1/16" balsa that taper from 4" to 1-1/2" and glue them together for the tail sheeting. Sand the sheeting smooth and vacuum off the dust.

Mark a centerline on each of the sheets and along the top center of each fuselage section. I used spray contact cement to laminate the sheeting to the foam. Temporarily tape the inside of the main tube and the cutout for the wing saddle back into the main fuselage section to help keep the foam tube from deforming. You only get one chance at this, so it may make sense to practice a few times before applying the glue. The foam tube will be placed on the middle of the skin and is rolled onto the skin. You will need to apply slight pressure to avoid forming a bubble between the balsa and foam. Apply contact cement to the balsa skin and foam tube, and allow for the recommended drying time. Position the balsa skins on a smooth flat surface and carefully position the top center of the tube along the center line on the skin. In a smooth motion, roll the foam tube onto the skin, first in one direction and then the other. Trim the balsa skins where they overlap on the bottom and secure the seam with odorless CA. Repeat for the tail section.

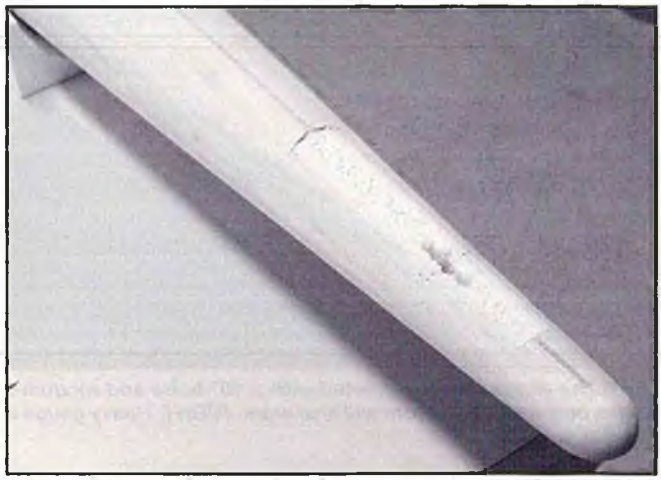
Probing with a pin from the inside of the main section, you should be able to find the edges of the wing saddle. Cut through the balsa sheeting and remove this section. Trim the balsa sheeting and true up the ends of the fuselage sections. The main and tail sections are joined upside down on a flat board. Once the fit between the two sections is satisfactory, glue them together with aliphatic glue or epoxy. Make sure there is a good bond between the balsa sheeting. The tail is finished with a block of balsa, carved and sanded to shape. Cut a battery cooling inlet and exit in the bottom of the fuselage as shown on the plans.

Mark the locations for the 1/4" x 1/2" spruce wing mounts on one side of the fuselage. Cut holes through the balsa sheeting and foam so the wing mounts can be inserted. Remove the



ABOVE: Carved balsa wingtips finish the wing.

LEFT: Motor mounts are set into slots in the wing. The flat bottom wing and the flat bottom of the mounts line up, making the proper amount of down-thrust automatic.



LEFT: The aileron servos are glued into the foam core and the balsa aileron covers are held in place by the covering. RIGHT: A slot is cut into the top of the fuselage for the vertical fin/rudder and a flat surface sanded to fit the horizontal stabilizer.

foam on the opposite side of the fuselage down to, but not through, the balsa sheeting. Cut the four wing mount reinforcements from 1/32" ply, making the holes for the wing mounts a tight fit. Cut the wing mounts to length and insert them through the side of the fuselage. Thread two wing mount reinforcements on each wing mount and glue everything in place with 5-minute epoxy. If the holes in the wing mount reinforcements are tight enough, they should hold themselves in place and conform to the inside of the fuselage. Patch the holes in the fuselage side with scrap balsa. Set aside the fuselage for now.

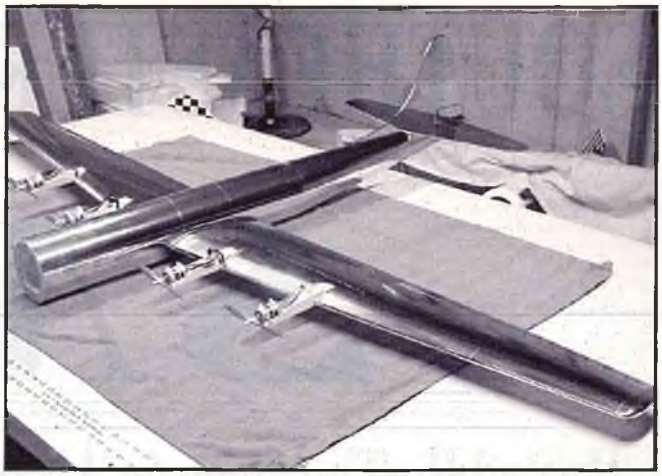
Wing:

The wing is fully sheeted with 1/16" balsa. Prepare the wing cores by marking the location of the aileron servos. Cut a shallow channel in the bottom of the core for the aileron servo lead as shown on the plans. Do NOT run the servo leads next to the motor wires. Glue the servo leads in place and fill in any gaps with light filler. Make a paper template so you can find the end of the lead after the wing is sheeted. The ailerons are hinged with a fiberglass hinge under the top wing skin. Simply cut a 2" wide strip of 0.5 oz. cloth on the 45-degree bias. Lay this on the inside of the top skin across where the aileron hinge line will be and squeegee on the laminating epoxy. I used epoxy to skin the wing and vacuum-bagged it in my wife's FoodSaver. If you don't have a vacuum bagging system, just make sure you sheet the wings in their original blanks and pile on enough weight to get a good bond.

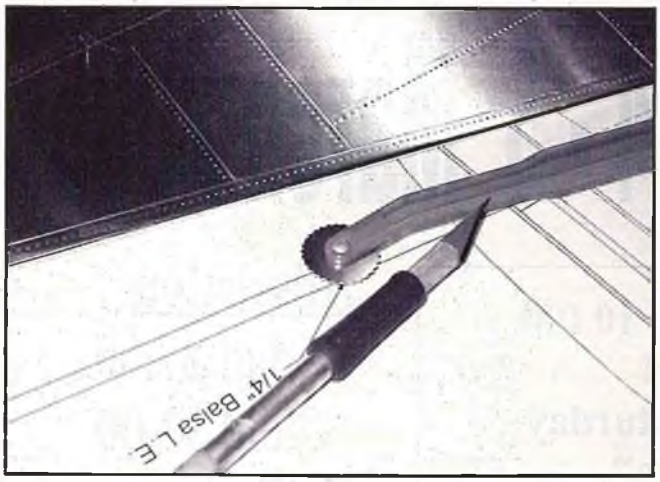
After the wings have set up overnight, trim the wing sheeting and true up the trailing edge. Sand the trailing edge down to 1/16" thick. You can toughen the T.E. with some foam-friendly, thin CA.

The ailerons are cut free as follows. Mark the outline of the aileron on the top and bottom of the wing. Cut the inboard end of the aileron free from the top and bottom sheeting. Cut a 1/16" wide channel in the bottom sheeting along the leading edge of the aileron. Remove the bottom sheeting and dig out the foam core down to the fiberglass hinge. Using the back edge of a hobby knife, crease the top sheeting along the leading edge of the aileron. You should now be able to flex the hinge. This hinging method is very strong, permanent, and provides a hidden sealed hinge line.

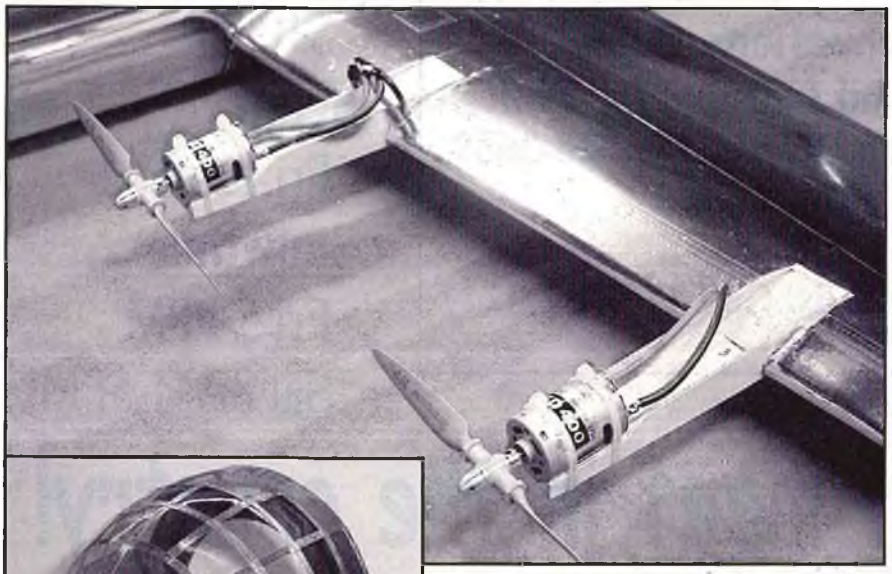
Along the leading edge of each wing panel, route out the foam for the motor wires. There will be approximately 20A going into each wing, so I would recommend using good 14AWG or 16AWG wire. Using the plans, mark the locations of the motor mounts. Put a new blade in your hobby knife and carefully cut slots through the top and



LEFT: Here's the basic structure ready for covering. RIGHT: And covered with chrome UltraCote.



LEFT: Panel lines and rivet detail was added with a dress maker's wheel and the back of a #11 blade. RIGHT: The nose and nacelles can be carved from balsa or purchased in molded plastic from the author (see text).



Motors mounted and wired. Note Graupner 6.5 x 4 two-blade flying props.

Aluminum tape intended for sealing sheet-metal ductwork was used to cover the nose and nacelles.

bottom sheeting for the motor mounts. Work slowly and keep the slots as tight to the motor mount sides as possible. The tops of the motor mount sides will need to be trimmed to blend into the tops of the wings. Number each motor mount and mount location to keep them organized. Run the motor wires through the leading edge of each wing panel. The motors will be wired in parallel. In each wing panel run two wires from the wing root to the first motor mount, and two wires from the first motor mount to the second motor mount. Make small cutouts for the wire in the top sheeting next to each of the motor mounts. Leave enough extra wire hanging out for the motor hookup.

Remove the motor mounts and cut and glue into place the 1/4" balsa leading edge. Rough sand the leading edge to shape and cut slots in it for the motor mounts. Reinstall the motor mounts. Both the wing panel and the bottom of the motor mounts should be flat on the building board. Use the plans to line up the motor mounts, as it is easy to twist them left or right. Once they are lined up, use odorless, thin CA to glue them in place. Add the balsa block wingtip and carve and sand it to shape.

With one wingtip blocked up 2" to set the dihedral, sand the joint between the two wings to get a tight fit. Cut exit holes for the aileron servo leads and the motor wires. When satisfied, glue the two wing panels together with epoxy. When the center joint has cured, test fit it to the

Dave Grife launching the B-29 on its maiden flight.

fuselage. The center portion of the leading edge will need to be sanded down to fit properly. Once the wing will fit into the wing saddle, wrap the center joint with 2 oz. fiberglass cloth and secure with a good quality finishing epoxy. You will get a stronger joint if the cloth is applied on the 45-degree bias. This way all of the fibers cross the joint, not just half of them. After the epoxy has cured, cut two 1/16" plywood plates to reinforce the wing mount bolt areas of the wing.

Align the wing to the fuselage, center it left and right, and square it to the fuselage. Mark the locations for the wing mount bolts and drill two 3/32" holes through the wing and into the wing mounts. Tap the holes in the wing mounts for a 6-32 thread and open up the holes in the wings to 5/32". Harden the threads with thin CA and then re-tap.

Locate the aileron servo locations with your template and cut the bottom sheeting away. Be careful not to cut through the servo leads, it is very difficult to solder them back together and not melt the foam cores (don't ask me how I know about this). Cut out the foam core to fit your servos and glue them in place. Make 1/16" balsa covers to size and cut holes for the control arms. Make aileron control horns from 1/16" ply. Cut a tight fitting slot in the aileron and use odorless thin CA to glue the control horn in place. The servo covers are held in place with the iron-on covering.

Final Assembly:

With the wing mounted to the fuselage, cut and fit the wing saddle cutout to the bottom of the wing. Before permanently attaching it to the wing, cut two 5/8" holes to access the wing mount bolts. Glue the fuselage section to the bottom of the wing. Line the bolt access holes with 1/32" balsa to help guide your screwdriver to the bolts.

Mark the location of the fin slots and the stabilizer position on the fuselage. Cut the slots for the fin through the balsa sheeting and all the way through the foam. Slowly cut away the sheeting from the area where the stabilizer mounts. The top of the stabilizer should sit even with the top of the fuselage sheeting. Bolt the wing to the fuselage, and use it to line up the stabilizer. Assemble a control rod for the elevator and install the elevator servo. The servo is just glued into the foam in the top of the fuselage. Cover the tail feathers before permanently attaching them to the fuselage.

Vacuum-formed canopies and nacelles are available from me; my contact information is at the end of the article. If you choose to make the nose and nacelles yourself, there are outlines on the plans. The nosepiece could easily be made from foam turned in a drill press and glassed. The nacelles could be made from foam or balsa and glassed as well. The vacuum-formed nose only needs to be trimmed to fit, and then install the 1/16" ply former and 1/4" alignment dowels. It is held in place with a rubber band mounted inside the fuselage. Trim the nacelles and tape together the two halves. Use the plans as a guide to cut and fit the nacelles to the wing profile. When satisfied with the fit, scuff up the inside of the joint, and use fiberglass tape and epoxy to join them. On the front of each nacelle, cut holes for the motor shaft, cooling holes, and mounting holes. The nacelles are held in place by two screws through the front into the motors.

Finishing:

Most B-29's saw service in polished aluminum. I found some aluminum "duct" tape (not the cloth variety) at the local home improvement store that worked great for finishing the nose and nacelles. Some brands have printing on the tape, but it is easily removed with alcohol. Cut the tape to size and use a wooden stick to burnish it down. Working from the center of the tape outwards and not trying to cover too much with one piece helps to avoid wrinkles. The fuselage and wing are covered in chrome UltraCote. Panel lines are added with a straightedge and the back of a hobby knife. To really knock their socks off, add rivet detail. This may sound hard, but it's not. Pick up a "dress maker's wheel" at the sewing store for a few dollars. This is a small, serrated wheel for tracing dress patterns. Tape a straightedge in position, and run the wheel along the edge for a perfect row of rivets. Start with the tail feathers to get some experience, and always use a straightedge. You will be amazed at how fast you can detail a model this way. The turrets and markings shown on the plans are optional. The "Bockscar" that I modeled didn't have turrets.

Install your radio gear, battery, and ESC. The control throws should be elevators +-3/8", ailerons +3/8" -1/4" for the first flight. Your ESC should be able to handle at least 40 Amps and I would recommend an 8-cell CP2400 battery pack. Graupner 6.5 x 4 scale props running on direct drive 6V Speed 400 motors are a good combination. Four-bladed props would be nice, but you'd be landing on their tips. The motors are

simply taped to the fronts of the motor mounts using fiber-reinforced packing tape. Add three noise suppression capacitors (1uF ceramic) to each motor. A capacitor should run from each motor terminal to the motor case, and a third between the two terminals. Connect the motor wires. Reference the plans for the balance point and move the battery pack around for the proper balance. The pack is held in place with Velcro strips. The finished weight of the B-29 should be around 4.5 lbs.

Flying:

Before flying, take some time to do a thorough range check with the motors on and off. There is a lot of current flowing through this model and it can affect the radio reception. I have not had any problems with Chrome UltraCote affecting radio reception, but I cannot vouch for other brands. The first few flights were done with the antenna taped to the tip of the stabilizer. Since then, it runs down the bottom of the fuselage and I have had no problems. The B-29 needs a basic hand launch. You don't need to heave it, but just give a solid, level toss. Allow it to build some speed and gain some altitude, then throttle back. Remember, this is not a sport model, so try to resist the urge to play airshow pilot. The first time I took mine out, everyone stopped flying and just enjoyed watching it cruise around the field at half throttle. For landings, set up low and keep some power on until you're over the field, then cut the power and flair before touch down to keep the nose out of the dirt.

My "Bockscar" B-29 flew several times at the 2004 Mid-America Electric Fun Fly, and won the CD's choice and "Most Beautiful" awards. I hope you enjoy flying your piece of history as much as I do.

*

For custom cut foam cores, please contact: Dennis Buno at 8282 Woodland Shore Drive, Brighton, MI 48114, or at:

B8282@earthlink.net

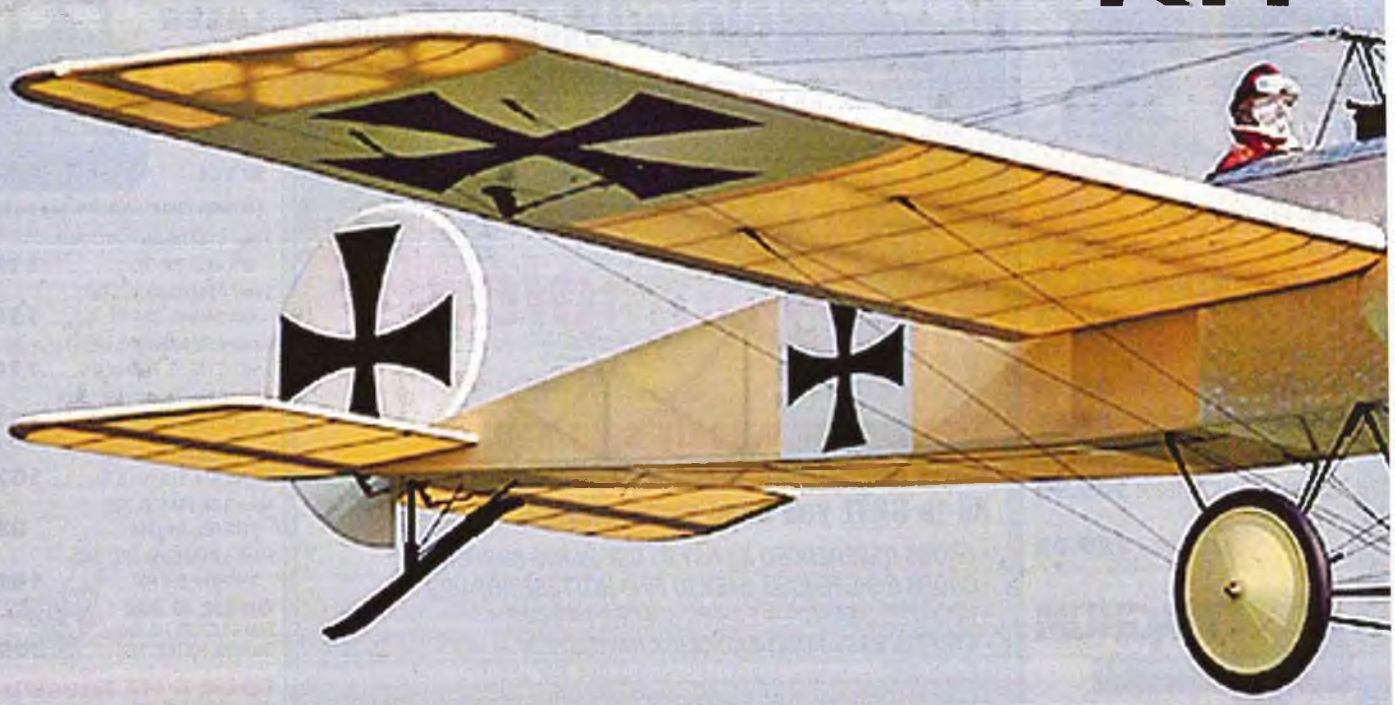
For vacuum-formed canopies and nacelles, please contact me at: Jim Young, 9356 Wendover Ct., Brighton, MI 48116, or at:

tnjyoung@spcglobal.net

SEE PAGE 149 FOR PLANS LISTING.

PRODUCT REVIEW

Eindecker E1 KIT



SR Batteries

Text and Photos by Jerry Smith

Anthony Herman Gerard Fokker, the son of a Dutch tea planter, was responsible for the first monoplane fighter in WWI, the Eindecker. The Eindecker was also the first to be able to fire a machine gun through the prop without the bullets hitting it. This synchronized firing mechanism was a major step forward in aerial combat; it avoided damaging the propeller and allowed the pilot to fire the gun at the opponent simply by pointing his aircraft at it. For a few months in early 1915 the Eindecker destroyed the allies' superiority in the air. The monoplane was used to control the air over Verdun during their offensive of Feb. 1916. By the summer of 1916 the allies had regained air superiority with other aircraft. Fokker went on to design other well-known German airplanes such as the Fokker D-VII, DR-1 Tri-plane and others used so successfully during WWI; having produced over 60 airplane designs during that period. After the war he moved to America where he died in 1939 at the age of 49.

I talked to Larry Sribnick, President of SR Batteries, asking about his design philosophy and goals intended for the Eindecker. Here is what he said: "My intention was to design an aircraft that

SPECIFICATIONS

EINDECKER E1

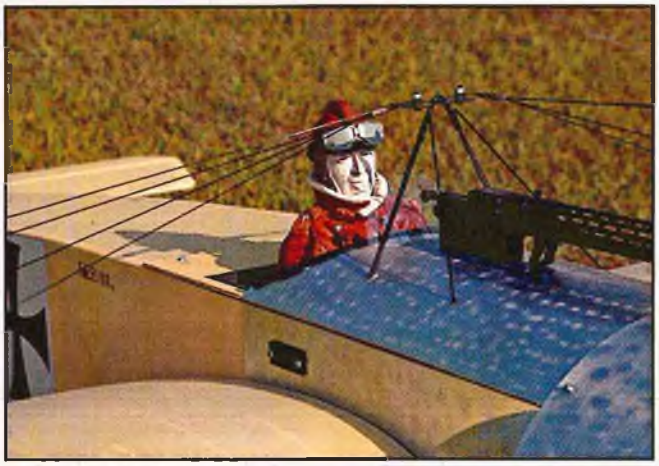
Aircraft Type
Sport/Scale
Mfg. By
SR Batteries, Inc.
Box 287, Bellport, NY 11713
(631) 286-0079
www.srbatteries.com
Expected Street Price
$349.95
Available From
Direct from Mfg.
Box Size
(L) 45" x (W) 12-1/2" x (H) 7"
Wingspan
100 Inches
Total Wing Area
1700 Sq. In.
Airfoil Type
Flat Bottom
Overall Length
67 Inches
Stabilizer Span
32 Inches
Total Stab Area
315 Sq. In.
Mfg. Rec. Engine Range
1.20+ 2-stroke; 1.50+ 4-stroke; G-26 Gas
Mfg. Rec. Motor Range
AXI-4130-20 Electric
Fuel Tank Size
24 Oz. (both Glow & Gas)
Mfg. Rec. Motor Battery
24 Cells
Rec. No. of Channels/Servos
4/6
Rec. Control Functions
Rud., Elev., Throt., Ail.
Basic Materials Used In Construction
Fuselage
Hardwood & Lite Ply
Wing
Balsa, Lite Ply & Composite Tubes
Tail Surfaces
Balsa & Lite Ply
Cowl
Aluminum
Instruction Manual
Photos & Text (110 pgs.)

RCM REVIEW MODEL

Radio Used
TX: Futaba 9CA, RX: FMA Quantum 8,
Batt: SR 1500 mAh,
Servos: Hitec HS-635HB
Engine Used
Zenoah G-23, 1.40 cu. in.
Propeller
Zinger 18 x 6
Weight, Ready to Fly
280 Oz. (17 lbs., 8 Oz.)
Wing Loading
23.7 Oz./Sq. Ft.
Runway Surface
Grass
Field Altitude
740 Ft.

SUMMARY

WE LIKED THE:
Excellent kit, great instruction manual, quality materials, very well done.
WE DIDN'T LIKE THE:
See text.



Look at all those great scale details. The pilot is from PerfectPilots.com, and is available from SR as part of their optional accessory packages for the Eindecker.

The author poses with his Eindecker. He likes it.

you'd want to fly every weekend rather than just at special events. I also wanted to design an aircraft that would be a great first giant scale project.

"Naturally, I decided to use ailerons rather than wing warping and went to elevators instead of an all-flying horizontal stabilizer. I also changed the airfoil to the one I developed for the X250 and Cutie kits. It has been great in those applications and I expected it to be even better with a 17.5" wing chord. Even the locations of the ribs are to scale. The outlines and aspect ratios of the wing, stabilizer, and fuselage are all dead on the money; however, I did change the size of the horizontal and vertical stabilizers to make the Eindecker fly better. I wanted it to fly slowly like a Cub or trainer and it does.

"The landing gear looks scale, but we've changed the shock absorbing method to one that Sal Calvagna, who helped with the Eindecker design, came up with and it works great. It looks complicated, but I think you'll be surprised at how easy it is to make if you just follow the steps in the instruction manual. The Eindecker represents 9 months and hundreds of hours of work. I know you are going to like it."

The SR Eindecker arrived in a plain cardboard box. No fancy colorful photos hyping the features you normally see when shopping for a kit. I popped the lid and was surprised at the amount of content in the box. It didn't seem like enough to build it. The kit included two stacks of laser-cut balsa packaged in plastic to keep the parts from falling out. One package of laser-cut lite-ply parts, one package containing the wing spars and wood sticks for the fuselage, one hardware package, one package containing the preformed wire parts, a beautiful aluminum cowl and a plan set of five sheets. A 110 page assembly manual with 350 exceptionally clear photos is included to lead you through the building process. Of course you will have to put up with some of Larry's dry wit throughout the manual.

Construction:

Construction starts out with building the wings. The kit includes a RH and LH wing panel plan so that you won't build two left or right hand wing panels. That can easily happen with this airplane. The laser-cut ribs are slid onto two 1/2" composite tubes and accurately spaced with a supplied template called a "comb." The tubes are supported on 1" blocks on both ends. A special gauge aligns the root rib with the spars. This is a very important step. The leading edge is also a 1/2" composite tube and easily snaps into place with precision. This reminds me of building a wing with the old RCM Wing Jig (Aug. 1967 issue). Only in this case the tubes stay in and become the wing spars. Pretty clever SR! The wingtips are made up of laser-cut parts, with balsa laminated over a lite-ply core, tied in with the leading and trailing edge. The ailerons are built separately from the wing. I particularly liked the wing's composite tube leading edge. It requires very little sanding, is dingproof and adds immensely to the stiffness of the wing, which, by the way, has built-in wash-out. The wings assemble quite fast and very accurately with this building method.

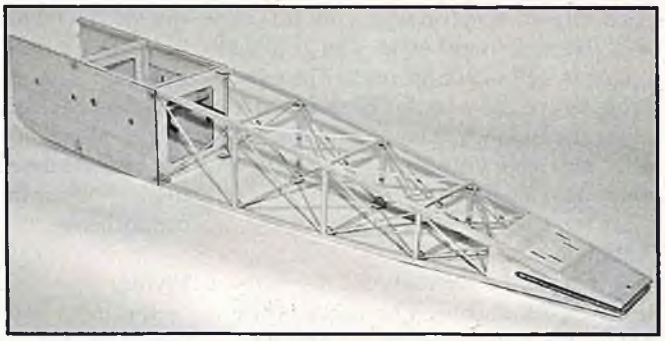
The tail plane has smaller composite tubes incorporated in the stab LE and elevator TE. The trailing edge of the stab is laminated from balsa laser-cut strips with the center lamination slightly shorter on each end. This allows a tab in the laminated tip to interlock with the trailing edge, making a strong overlapping joint. The forward end of the tip has a tab that inserts into the LE tube. Stiffness in the stab is achieved through use of the composite tube LE and the laminated TE without the use of tail struts. The full-scale Eindecker didn't have them either. The full-flying rudder is constructed with a lite-ply core and balsa laminated on either side. It moves on a composite tube and builds up very fast. Be prepared to do lots of laminating, there is plenty of it in this kit.

The fuselage is built entirely of hardwood. The sides are built first with a lite-ply laser-cut piece from the cockpit forward. 3/8" sq. longerons are then glued to the sides with 1/4" sq. uprights and crosspieces holding the longerons to shape the fuselage. Between each of the uprights and crosspieces, 1/8" sq. "x" bracing is applied. Lite-ply gussets reinforce the uprights and crosspieces to complete a strong box-like fuselage. The firewall is made up of three laminations of lite-ply. Here you have your choice of going gas, glow, or electric. One lamination is laser-cut to accept a gas G-26 engine mounting. Another lamination is set up for mounting an electric motor. Before laminating them together you must decide which you intend to use. On the front if you intend to use a glow engine you will have to put the third plain lamination piece, on the front, then locate and lay out your own engine mounting holes. I opted for the gas version.

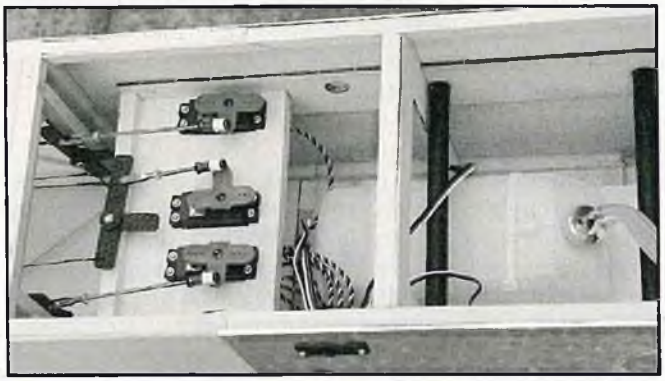
Assembling:

The landing gear takes a skill which some of you may have to work on:

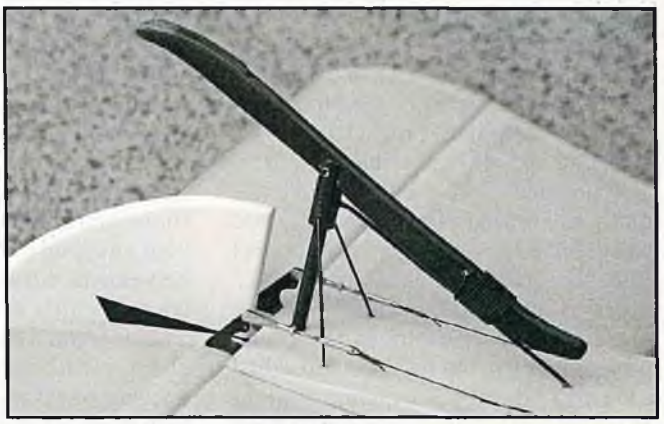
The wing structure is light, well engineered and strong.



The basic fuselage is a built-up truss structure. Looks like the tail end has been built 90 degrees off from the front, doesn't it?



Lots of room for the radio in the cavernous fuselage. Note the fuel tank mounted on the C.G. The pump carb on the G-23/26 allows the tank to be mounted this far away from the engine without fuel draw problems.



The bottom of the tail shows the shock-absorbing tailskid and the lower half of the pull-pull elevator cables.

soldering. When you first look at it you are somewhat overwhelmed. Take it step by step as is shown in the manual and you will get through it just fine. Generally speaking, the wire parts are bent quite accurately but may take some tweaking here and there. Wire wrapping and soldering will keep you busy for a while. Just plain lead solder will do the job fine. Be sure to keep it neat. The landing gear is certainly a work of art with working shocks for the wheels. When completed I cleaned and then painted mine with Black Satin Rust-oleum.

The wings are held in place with composite dowels, locating them in the fuselage, and with 80 lb. test landing and flying wires. Rigging the func-tional landing and flying wires is very straightforward following the instruc-tions in the manual. There is no adjustment on these wires unless you decide to use turnbuckles. I installed them by pulling the wires taunt when rigging, and then pushing the wire through the crimping tube, then over and back through it again, along with flattening and crimping. Crimping the wire properly becomes a very important procedure because if the wires break loose, there goes a wing! Once rigged there are only four connecting points to retain the wires, making field assembly easy and fast. Good thinking here SR!

There are a number of optional accessories for the Eindecker that can be purchased from SR, and will complement your kit and make your Eindecker look very special. When building the review model I chose the Deluxe Hardware Kit, Vinyl Graphic Package, Pilot (unpainted), Covering Material, and the Pull-Pull System for Rudder and Elevator. If you purchase the Deluxe Hardware Package, SR will include the Squadron/Signal Eindecker scale documentation book free! There are other options including a complete Deluxe Electric Power System, and Deluxe Gas Power System. Many items in most optional packages can be purchased separately not requiring the purchase of the complete package. For more information about these optional items and what they consist of, go to:

www.srbatteries.com

On the review Eindecker I chose to do the front end with the optional .004" metal aluminum tape. I had never used it before, but looking at the simple instructions that came with it really enticed me. First I cut off a piece long enough to do the top of the hatch. Now why did I pick the hatch rather than the obscure fuselage bottom for trial? Confidence! So I took off the paper backing of the tape. It immediately rolled up on itself and turned into an absolutely unusable sticky mess. Less confidence now. I tried another piece and screwed that up too. My confidence is now completely gone and frustration has set in! The third try I got it on but had a few wrinkles here and there. I left it at that because I was running out of material. By the time I got through applying all the tape I was getting really good at it, but alas, no more tape to install. Isn't that always the way? Here are some things I learned that might help if you decide to go with the metal option: (1) Make sure you have a well-sanded and impeccably clean surface before applying. (2) When removing the paper backing, lay the piece face down. Then it won't roll up on you after the paper is removed. (3) When applying the tape, work from the center and work outward and **do not let it touch anywhere except where you are smoothing it down. It is very sticky.** (4) Use a credit card, or similar object, to work the material down. These are some of the things that helped me succeed. A slow turning motor tool with a Dremel brush installed and steel wool rubber banded to the brush is all you need to apply the swirls that give it the finish. I found the result well worth the trouble and time.

Covering:

I covered the review Eindecker with SR-Tex Antique fabric material, sold by SR, which comes in a 30 foot length when you purchase that option. I found the material easy to apply; it has good shrinking characteristics, and does not require painting. Before applying the graphics, I painted the white background squares on the wings, rudder and fuselage with white Satin

Rust-Oleum. Krylon will work just as well. Be sure to get satin. The graphic option is well worth the price. The vinyl crosses are easy to apply and really make the Eindecker stand out. Best of all it will save you time. Okay, if you must, paint them on.

Engine:

I installed a Zenoah G-23 simply because I had one. The G-26 is the recommended engine; however, both engines are interchangeable in mounting. The G-23, swinging an 18 x 6 Pro Zinger prop will fly the Eindecker with no problems. If you decide to go electric using the Axi 4130/20 motor, you might consider a 18 x 8 Pro Zinger Prop. Motor, mount, prop adapter, ESC and batteries are all available from SR.

I mounted a 24 oz. Sullivan fuel tank on the C.G. where the plans indicated and plumbed it with Tygon medium fuel line. A couple plastic tie straps with a piece of foam rubber under the tank made it right at home in the place provided for it in the fuselage. I installed a Du-Bro Fill It Fuel System, #840, in the carb line to make fueling and defueling easier from outside the cowl.

Radio:

My radio to test the Eindecker is a mixture of several products. The transmitter was a Futaba 9CA, while the receiver was an FMA Quantum 8 dual conversion and the five servos were Hitec HS-635HB high torque. For the throttle it was a Futaba S148. All of this equipment performed extremely well and gave me no problem. The Hitec servos are really great with 22 ga. wire on the lead, a universal connector and the new, tougher Karbonite gears putting out about 70 oz./in. with a 4.8v battery. With a 6v battery they will put out over 80 oz./in. of torque! I used an SR 1500 mAh 4.8v NiCd battery (flat pack), and a heavy-duty switch harness. The radio compartment is quite large with the servos located near the top of the fuselage for easy access. I installed the Pull-Pull System option from SR with a servo on each elevator and one on the rudder. SR has this worked out very nicely and laser-cut the exit slots in the rear of the fuselage, which lined up perfectly with the control horns.

Flying:

It is most important when testing an airplane for the first time that everything be double-checked. After spending all that time building you don't want to lose it on the first flight. So, I went over the Eindecker thoroughly. Checking the C.G. location on the plans I found it to be 31.4% of the wing chord, which told me it was well aft, but in the ballpark. Control throws were set as stated in the manual as well as checked for movement in the proper direction. I also checked the decalage, the angle between the tail and wing, and found the wing at a little over 3 degrees positive. This told me to expect elevator trim changes with power changes. There is no way to change the wing or stab relationship because it is built in. Your only option here is downthrust in the engine; I ended up with 3 degrees downthrust, which worked out perfect for my type of flying, and that is — I don't like trimming the elevator every time I change the throttle setting. Remember the Eindecker is no speed demon and there is no need to fly it wide-open throttle. It needs to be slowed down to look realistic.

The Eindecker is billed as slow flying, somewhat akin to a Cub. I found this to be true. When you first taxi out to take off, you will discover that ground handling is much different than the normal taildragger. You guessed it, no steerable tail wheel. So, instead of holding up elevator you hold a bit of down, kick the rudder and burp the throttle. This lightens the tail and enables rudder effect. After you get used to it you will be able to turn on a dime. I fly from a grass field — I imagine on a hard surface that taxing would be a little trickier.

On the first flight, with the G-23 churning away and after trimming it out, I found the Eindecker to be very stable and predictable in everything it did. Stalls were very gentle and it didn't take long to get completely comfortable with the airplane. It had great visibility in the sky with the big white patches and black crosses standing out against the blue. I did several landings, both wheel and three pointers. Once in ground effect, add a little throttle to keep it floating and, when the wheels touch, cut the throttle. You'll love flying the Eindecker. At the time of this writing I have a couple hours of flying time on it and have become thoroughly acquainted with its flying characteristics and performance. Don't look for a lot of aerobatics. It will loop, roll, split S, chandelle, and Immelmann like the full size Eindecker would have done. But, don't overlook the low and slow fly-by. It does them in grand style. They are absolutely a joy to watch!

Conclusion:

Building the SR Eindecker is an experience that will satisfy both the intermediate and experienced builder/flier. Because of its simplicity and fast building techniques it presents a great way for the newcomer to get started in giant scale. The Eindecker is not simply a conversion to electric. It was designed from the ground up for Gas, Glow, or Electric, giving more options to the builder. This is the first giant scale kit that I know of with these options. SR also provides many more options in the way of hardware and materials to make your Eindecker stand out on the flight line. My only criticism of the kit is that it fell short in part identification and relied heavily on pictures and text to determine what the actual part looked like and where it was to be placed; forcing you to read the manual to be sure, and check the plans, which were also shy on part identification. This is not all bad because the information was there, you just had to stare at it more and look harder to make the determination. Maybe this had a built in purpose, like **read the manual**! As a builder you can be proud to know that the SR Eindecker E1 has great flight performance with built-in simplicity and responsible engineering to make it a superb airplane to build and own. Thanks to Larry and Sal, I have a keeper here and can hardly wait to head for the flying field again. Why don't you build one and join me! Note: My sincere thanks to Gary Spears for flying the Eindecker while I took the flight shots.

Manufacturer Links:

SR Batteries, Inc., (631) 286-0079, www.srbatteries.com
Sullivan Products, (410) 732-3500, www.sullivanproducts.com
Du-Bro Products, (800) 848-9411, www.dubro.com
Hitec, (858) 748-6948, www.hitecrcd.com
Futaba, www.futaba-rc.com
FMA Direct, (800) 343-2934, www.fmadirect.com

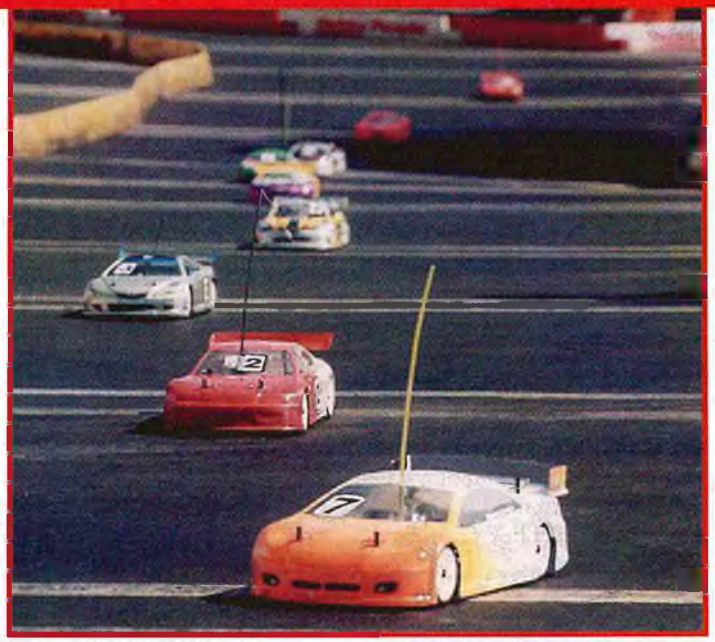
THE HITEC ANNUAL PARKING LOT RACE

Event Report

By Mike Lee

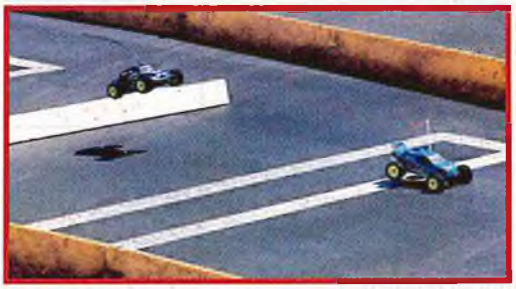
It's not often that a radio manufacturer gets so enthusiastic about R/C car racing that it sponsors a race to celebrate racing. But that's the idea behind the Hitec Parking Lot race, held in late July of 2004. This annual major event attracts over 200 drivers in a wide variety of classes for a solid day of racing action.

As a partner in the sponsorship and actually performing the race direction, Hobby People stepped up to the plate and together with Hitec, they pulled off a first class event that catered to the drivers. The venue was the main parking lot of the Hitec facility in Poway, CA. Here, Hitec has their main warehouse, service and administrative facilities. But even this large area was insufficient to handle the number of drivers and their equipment. In response to this, several large shade tents were erected in the parking lot and the adjacent street area, making the event an almost carnival affair. Hobby People have been known in the Southern California area for their exciting summer series of parking lot races, using a portable track barrier system, and had the Hitec race set-up in a hurry. An electronic transponder system from AMB facilitated the lap counting as well as race timing. With a recipe that had tents, tables, chairs, a track and racing system, all you needed to do is add drivers! And add they did. By pre-entry registration alone, this race was completely filled well before the date of the race, ensuring a full schedule of racing for the day.



A line of cars comes into Turn One of the course during race action.

A track marshal scrambles to correct a car that has nosed into the barriers. Not an easy task for the marshals when dealing with a road course.

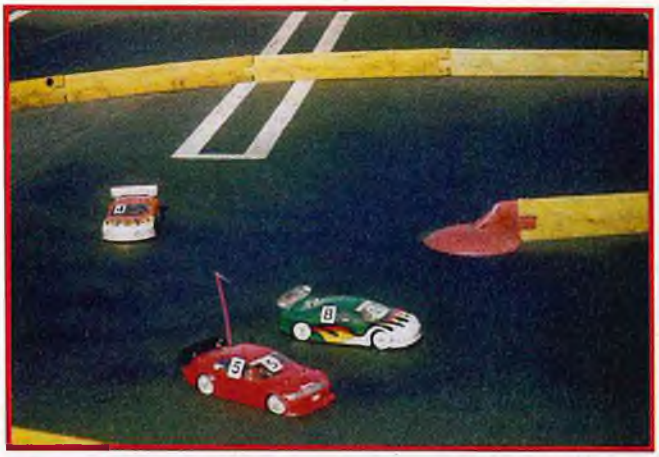


Losi Mini-T cars take to the jumps of the paved road course as a part of the Hitec Race. These small off-roaders can take a lot of abuse, even on pavement.

On the menu for the drivers were racing classes for stock and modified electric sedan, spec. class sedan, the mini-class cars, the Mini-Losi-T class, and gas powered sedans. As is the current rage, sedans rule the road courses with mostly 4-wheel drive layouts. These cars are considered by most drivers to be "point-and-shoot" type cars, where you can simply slide into a turn and when the front end is pointed the right direction, just punch the throttle! This is quite a change from the previous generation of 2-wheel drive cars that require a lot more finesse to negotiate the tight turns of a road course. The mini-class cars are incredibly cool 1/18th scale cars that feature all the sophistication of their bigger cousins, but at half the size. Some of these palm-sized cars were powered with brushless motors and lithium batteries, making them into micro-sized road rockets. And the Mini-Losi-T cars are the latest rage in micro-sized off-road vehicles. Full 4-wheel suspensions and oil filled shocks allowed the Mini-T cars to take jumps on the course in stride. Bringing up the back of the schedule was several heats of thundering gas-powered sedans, with a bit longer race times and pit stops.

Now, you might think that this was just another typical parking lot race. Not so, as the Hitec people made it well worth your while to be a driver in this race. Between Hitec and Hobby People, there were dozens of great prizes given

Part of the Hitec crew (from left): Bren Lugo, Marty Salgado, and Sean Popov get a moment away from the racing action for a quick joke.



ABOVE AND BELOW: Racing action on the track.

The race lap counting was handled by an AMB scoring system using a laptop computer. The Hobby People "Blue Crew" handled the conduct of the race.

One of the pit tents erected by Hitec to accommodate the large number of drivers in attendance. Nice way to make you feel welcome.

The Hitec Race was definitely a family event, as the mix of kids and adults was common on the driving stand.

Intense driving is seen from the drivers' stand during a heat.

Hitec honcho, Glen Merritt and his son, Max, duel it out on the track during their main event. Max beat dad!

away to the attendees, ranging from tools and accessories to complete car outfits from top-line manufacturers. You might not win your race, but you could surely come out a winner with some valuable prizes just the same. It's no wonder that drivers were excited to make this race!

To make the drivers feel at home, Hitec did everything to accommodate the drivers. Two very large tents were erected to cover the pit areas, allowing virtually everyone to have a table space with electricity to charge the batteries. Add to that some hot lunch and soft drinks, plus tech support from the Hitec crew if you needed some assistance with your radio equipment. Each driver was entitled to a race T-shirt and if you ever wanted to see what goes on inside the Hitec facility, you could take a tour, courtesy of the Hitec crew.

The track itself is constructed from portable plastic barriers placed on the pavement of the Hitec parking lot. An eleven-turn road course featured an 80-foot long back straight going into a wide, right hand sweeper towards the infield. The barriers themselves were pretty friendly to the cars, as they did not inflict damage to the cars if they were hit. The plastic construction had some "give" to the surface, yet kept the cars within the lanes to protect other cars from being interfered with in the other lanes. The AMB timing system allowed the "Blue-Crew" Members from Hobby People to keep accurate track of the racers while each race progressed. Some 23 heats of racing were produced in two qualifying rounds and then the main events.

The drivers who were in attendance were not your heavy hitting factory drivers, as the Hitec Race is for the sportsmen drivers. It was great to see youngsters and women on the drivers stand dicing it out with the guys in a totally family oriented event. We observed more than a few father and son teams having a great time on the track, as well as a couple of the ladies showing their mastery of the lanes.

It was a full day of fun, competitive racing and it certainly shows just one of the many ways that the industry members pay homage to their patrons by sponsoring such a great event. Of course, Hitec is the manufacturer of radio control systems, servos and receivers used by many drivers, and is an active supporter of race activities worldwide. You have to admit, when these guys throw a party, they know how to do it right! ✈

SOARING

Mike Lee

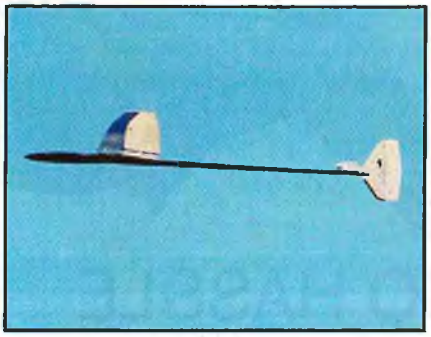
I recently purchased a new HLG model, the Polecat Aero XP-4, which is the successor to the XP-3 I had owned about two years ago. I have to say that the main reason I made the purchase was because of the International Hand Launch Glider competition in June of last year. There were a lot of these models on hand, and all of them flew outstanding. Most notable of these models was that they launched really high and had excellent wind penetration. I was duly impressed and made the purchase.

This is the completed Polecat Aero XP-4 HLG, and it's a real winner! Total weight here is 10.7 ounces.

Upon receiving the new XP-4, I noticed that the fuselage is already attached to the boom and the control pushrods to the tail were installed. That's a good start, and as I went a bit further, I found some really gorgeous wings and similar tail sections. What is so different on the XP-4 versus the XP-3? Well, the fuselage is more generous in space, allowing easier equipment installation. The wing is mounted on a larger and taller pylon, giving it better strength and resistance to torque during the launch. The horizontal stabilizer has a bit different shape to it with a larger elevator, and the vertical stabilizer is a lot different shape with a larger rudder. The end result is that it takes advantage of some cleaner aerodynamics found in the lab and it does work in practical application.

I equipped my XP-4 with Hitec HS-50 servos for all flight control surfaces, and those were mated to an FMA M-5 dual conversion micro receiver. A 4-cell pack of 370 mAh batteries was stuffed up front with ease, and I needed an additional ounce of weight to make the balance correct. The whole project took me three evenings to complete and make ready to fly. Final weight came in at 10.5 ounces.

At the field, I did a couple of gentle tosses to trim the model out, and then I started to let her have the full strength launch. Guys, I don't mean to brag, but this model is **awesome!** It launches high and, with a bit of camber, it floats. Dead air times are consistently around 80 seconds. But what I am really impressed with is the thermalling ability of this model. The XP-4 transmits thermal signals readily to the pilot, making an engagement quick and reliable. The handling is very fast, so if you don't like a sensitive roll and pitch response, then you better relegate yourself to plenty of exponential control dialed into the transmitter. You will fly the controls a lot on this bird to get the most from her, but the effort is well worth it. After getting stabilized from the launch, you should toss in a bit of camber for best hang time. If you need to motivate the plane, simply clean up the trailing edge and off you go. For landing and precision approach, the flaps are superb. This plane rocks!



The XP-4's in-the-air handling is awesome, with terrific launch height, excellent penetration, and good thermal ability.

Cody Remington won the Junior Class at Visalia with this Extreme aircraft. He had consistent times and landings that earned him the victory.

I am certainly pleased with the XP-4, and if you are a competition pilot, this is a seriously potent weapon. The list price as of the time of this writing was $369.00 from Polecat Aero, and you can order Online at:

www.polecataero.com

Now, I'm going to have some serious fun!

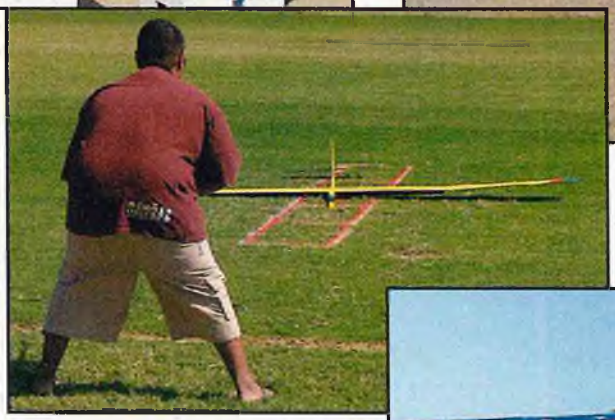
Visalia 2004

Speaking of serious fun, the 2004 edition of the Visalia Fall Soaring Festival was held on October 2nd and 3rd, with 300 entries on the books. This contest is traditionally the largest model sailplane event in the country, with entries in the Open class that easily outstrip the AMA Nationals. This year was no exception, and we had a blast. What I wanted to comment on this year was two trends that seem to be growing. The first, and most important trend, is the number of youth pilots. It appears there were about 8 or more youths in the field flying very competently, and the group included a female pilot as well. Two of the Junior class pilots were a part of the Junior F3J World Championship Team that I had the honor of managing, and they both got all of their flight times in the seven rounds of competition. Winning the Junior class was Cody Remington, with Casey Adamczyk in second, and Manny Gomez in third. JR Radio was gracious enough to award a new JR 9303 radio system to the top placing Junior pilot, and that gave Cody Remington a real reward for his flying. It's great to see the younger pilots participate in this sport, and we at RCM encourage the education of our youth in model aviation in every respect. Our thanks to JR for also seeing the value in promoting the Junior pilots.

The other good trend I observed at

Cody Remington holds his trophy and a new JR 9303 radio system — his prizes for his victory in the Junior class at Visalia 2004. 2nd place is Casey Adamczyk, and third is Manuel Gomez. Notice the bare feet?

Bobby McGowan holds Robin McGowan's Danny RES model at Visalia before a launch. Robin is a Junior class pilot and certainly has command of R/C flight. She led the entire first day scores in Junior!



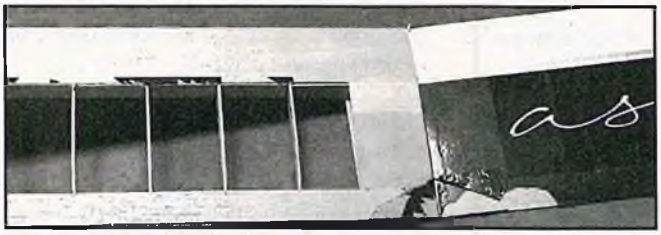
Junior pilot Manuel Gomez places his Artemis XT into the landing zone at Visalia. Manuel was also the alternate pilot for the Junior F3J World Championship team.

Karl Hawley begins to launch Chris Adamczyk's RES model at the 2004 Visalia Fall Soaring Festival. RES is back!

Visalia is the continued popularity of the RES class. I believe the introduction of the high-tech models like the Ava, Topaz, Danny, Ukranian Buzzard, and similar models have done a tremendous service to the RES class by bringing modern technology to it. These are extremely light, very high performance models that are strong enough to withstand winch abuse all day long! And I am talking about abuse! I watched several pilots simply stand on the winch pedal without relenting, and the models will take it. They might not penetrate like a glass slipper model, but they certainly will thermal with the lightest of lift that a glass slipper can't even feel. In my opinion, there is nothing that matches the feeling you get when you can loft a plane into the sky and literally sit back to watch it fly. Not that a big 3-meter bird can't loaf around up there, but an RES bird just says, "I'm flying, guys!"

Okay, I know I got off the subject of building up the Leading Edge Models' P-51 Mustang for slope, and I promise I'll get back to that next month. For now, I'll leave you with a real quick little project tip that you should try next time the opportunity arises. At a local contest event, one of the extra-curricular events was a swap meet in the parking lot. It was there that I spied a Hangar 9 Aspire 2-Meter ARF ... well, it was the fuselage and tail feathers, anyway. After inquiring with the owner about the model, we agreed to a price of $20.00, including a sight-unseen wing. Hey, $20.00 for a brand new fuselage and tail section is not a bad deal at all! So, let's see the wing.

In a couple of hours, I was presented with the missing wing and, not surprisingly, the wing needed some help. There was a good reason for the new fuselage and tail, as apparently, the wing was the sole survivor of some type of meeting with a hard object ... or two. Nonetheless, it was still worth the $20.00 deal. At home in the workshop, I had determined that stripping off the film covering was required to perform a complete inspection of the wing structure, as I suspected some underlying damage was present. My hunch paid off, although the damage was not as bad as I thought. It took me only about an hour of work to make the structure the way I felt was strong and in the same contour as



This is the wing from a Hangar 9 Aspire ARF I purchased at a swap meet. It needed a little help under the covering, and so here it is, half-stripped away. We found some damage to the structure.

The repaired and recovered Aspire wing now looks new and flies terrific. Well worth the effort.

originally built. Add two rolls of MonoKote film to re-cover the wing, and that evening, I virtually had a new model! After installing a simple 2-channel radio, this model proved to be a very good flying plane and is now a weekend training model for our club. The bottom line moral of this story is that you should always take the opportunity to repair what others might consider a write-off. Most of the time, the model is quite salvageable with just a little TLC. Don't be put-off by thinking you can't repair a damaged model just because it's an ARF. Somebody assembled it in the first place and as long as you have most of the parts, the plane can be rebuilt again. Take your time and you'll be surprised at just how easily a repair job can be accomplished. As for my $20.00 Aspire? Best $20.00 model I ever purchased!

I mentioned earlier about the high-tech RES models now becoming very popular, and now I have information on the evolution of one of those models. The Topaz model is now available as a full house TD bird, with the addition of ailerons and flaps. Along with this change comes less dihedral in the wing planform to allow for better roll characteristics and neutral stability. The empty weight of this model is predicted to be around 32 ounces, and with another 10 ounces of radio equipment, the flying weight will be between 42 to 46 ounces. This is outstanding for a model with a 3-meter size wing. The airfoil is the AG35 transitioning to an AG37 and the stabilizer uses an NACA008 airfoil as a full flying stabilizer. This model is available from Hobby Club and you can get more details on their Website at:

www.hobbyclub.com

This bird is intended for all-out Thermal Duration and is said to be able to handle an F3J two-man tow.

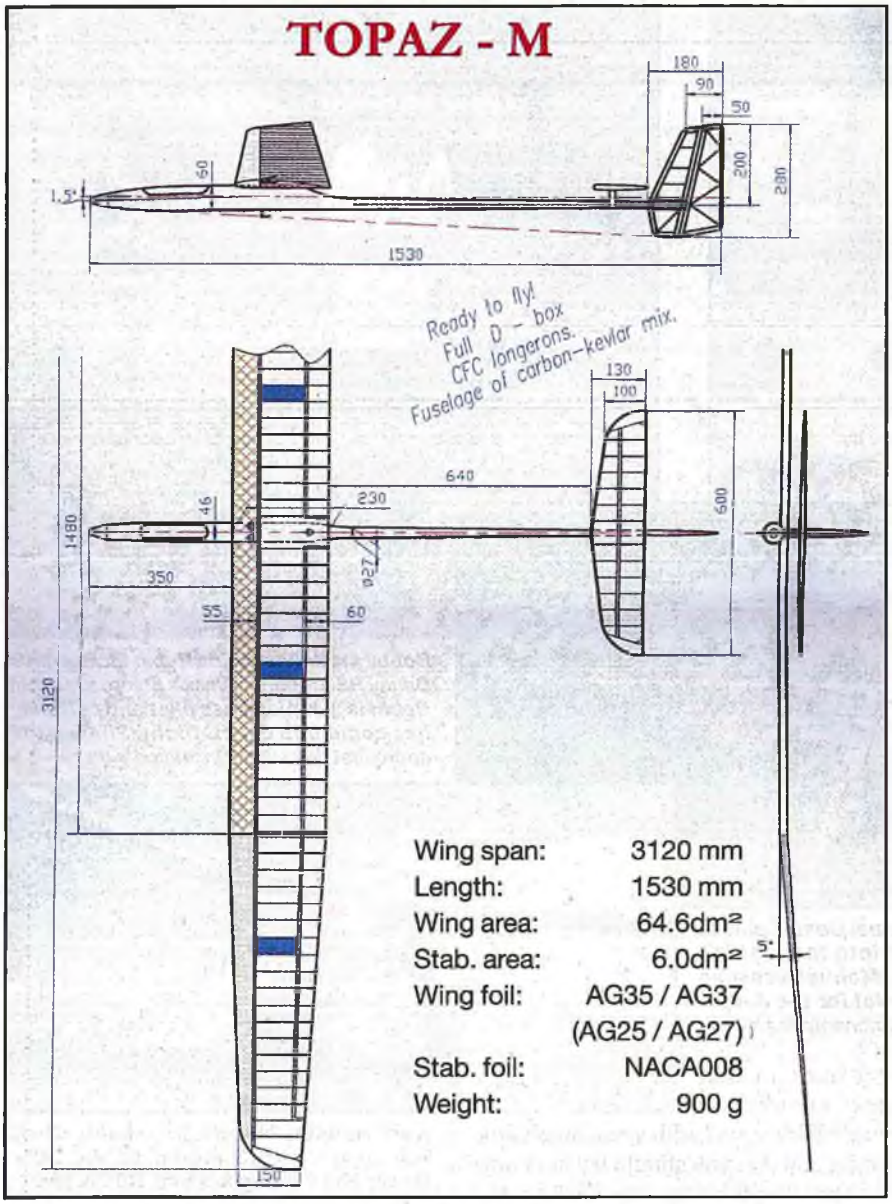
Next month, we continue with the LEM Mustang for slope, as well as other good stuff. By the way, Radio Carbon Art has an awesome model soaring calendar for 2005, entitled the Soaring Experience. Great shots of slope action and scale models as well as TD birds. A portion of the proceeds from sales of the calendar go to future U.S. Soaring competition teams, so you will be making an investment. See their Website at:

www.radiocarbonart.com

and check that out. If you have any questions or want to share some tips with us, drop me an e-mail at:

mlee8249@aol.com

and let's make something happen. Seeing that is now the winter building season, hit those swap meets and do some building. Even if it's a repair job, you'll be pushing yourself to make that model better! Dare to do better. Only those who dare truly live. ✈



PRODUCT REVIEW

MW-54 MK3 TURBOJET

Wren Turbines, Ltd. KIT

Photo #2: All parts contained in the box.

By Giancarlo and Alessandro Genta

The Wren MW-54 Mk3 turbojet is a medium-sized model turbojet sold in kit form by Wren Turbines from England. It is an improved version of the Wren MW-54 Mk2.

The assembly and handling of the Wren MW-54 Mk2 was summarized in our construction article of the Eagle V (*RCM* Dec. 2004 and Jan. 2005).

Photo #1: At last the kit arrived: a plain cardboard box

Wren Turbines turbojet kits are sold directly by the manufacturer through their website

www.wren-turbines.com

and through their U.S. distributor, Jet Hangar Hobbies,

www.jethangar.com

This formula not only makes available a turbojet unit at a cost which is substantially lower than that of a complete unit, but also gives the assembler some good information on how the engine works and how to maintain it. A marginal advantage is that the manufacturer is compelled to keep the highest standards in all details, since nearly all potential flaws are evident.

Moreover, assembling the engine is a very enjoyable project for the mechanically inclined.

Although the external dimensions are identical and the look is similar, the Mk3 is quite different from the Mk2. A first improvement is in performance: the nominal static thrust is 62-67 N (13.5-15 lbs.) instead of 55-60 N (12-13 lbs.). This improvement results primarily from a new compressor wheel and intake diffuser. These items are also sold as a retrofit and the mounting dimensions are identical to the older version. We installed the new, updated

SPECIFICATIONS

MW-54 MK3 TURBOJET

Engine Type
Single-spool turbojet in kit form
Mfg.
Wren Turbines Ltd., 5 Stoneham Street, Coggleshall, Colchester, Essex, CO6 1TT, England
www.wrenturbines.com
Dist. in U.S.
Jet Hangar Hobbies, Inc.
P.O. Box 1607
Hawaiian Gardens, California 90716
www.jethangar.com
Expected Street Price
1,250 £ (approximately $2,100 U.S.) including front cover and on board starter.
Available From
Mfg. or U.S. Dist.
Size
89mm dia. X 179mm (plus starter motor) length
Weight
1 lb, 11-1/2 oz (780 g) (without ECU, fuel pumps, starter motor and batteries)
Thrust
13.5-15 lbs. (62-67 N)
Fuel Consumption
3.35 oz./min. (210 ml/min)
Instruction Manual
Yes, 31 pages, with step-by-step instructions. Pictures of each step.

SUMMARY

WE LIKED THE:
Overall quality, documentation, performance, ease of assembly, post-sales assistance.
WE DIDN'T LIKE THE:
No bearing assembly tool included -- including one would be very helpful.

parts in our Mk2 with very good results.

The other changes are mostly linked to further engineering and a simplification of the whole design, which results in fewer parts and a simplified assembling process. The main differences are: A single piece outer casing, without the need of sealing the joints and installing the backplate; securing the combustion chamber with only three screws, making the alignment of the outer case and the installation of the plug much simpler; simplifying the lubrication system without the need of gluing the metal screen; use of a single glow-plug instead of two. This is a consequence of the improved attachment of the combustion chamber (the plugs also

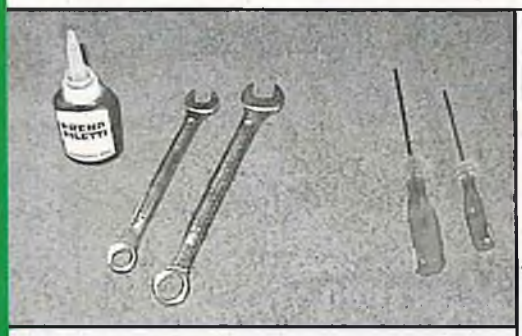


Photo #3: Tools needed for assembling the turbojet.

acted as attachment bolts for the chamber in the Mk2). We liked having a spare plug, so that you can start the engine right away after blowing a plug — but I honestly must say that a burnt plug is a rare occurrence if you do not make a mistake with the connection and send 12 volts to the plug.

The rotor components come pre-balanced. This is important, since the balancing procedure can be a delicate one, and is definitely a very important one.

What's In The Box:

The kit ordered was a complete kit, with front fairing and on-board starter (they come as options, and you must request them explicitly). I suggest including them since they are very useful. The whole package was bought for 1,250 £ ($2,271 at the exchange rate on the day of writing), including shipping to Italy. Check on the web for current prices and shipping rates. To my knowledge it is the best price for a turbojet and, considering the quality of the product, the quality/price ratio is amazing.

When we ordered the kit it was back-ordered — this is the only fault we found on this engine. An e-mail assured us that this was due to the delay caused by some supplier, and will be corrected in the future. At any rate we were warned of this at the time of ordering.

A look at the box told us that this is a no-frills product: just a plain cardboard box, with no fancy pictures or labeling (Photo #1). When you open the box you will see that all parts are well protected by the foam interior and that they are packaged separately in plastic bags (of the type you can close again after opening: a handy choice for the bags containing small parts).

Apart from all hardware, the box includes a glow plug and two Allen wrenches for M2.5 and M3 Allen screws (Photo #2).

The tools needed for the assembly work are minimal: apart from the two wrenches included, you need only a

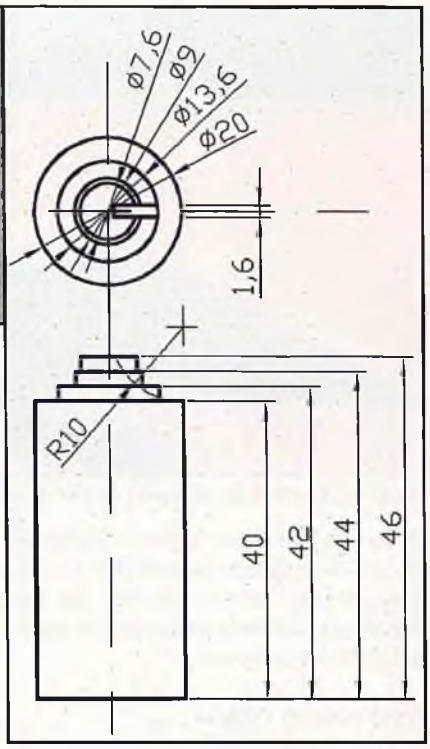


Photo #4: Our homemade tool for putting the balls of an accidentally dismantled bearing back into place. Tolerances are not critical, and almost any length will work. It was turned from a piece of aluminium stock, with the slot for introducing the balls cut with a Dremel wheel (dimensions in mm).

Photo #5: The rotor assembled on the shaft tunnel and the nozzle guide vane.

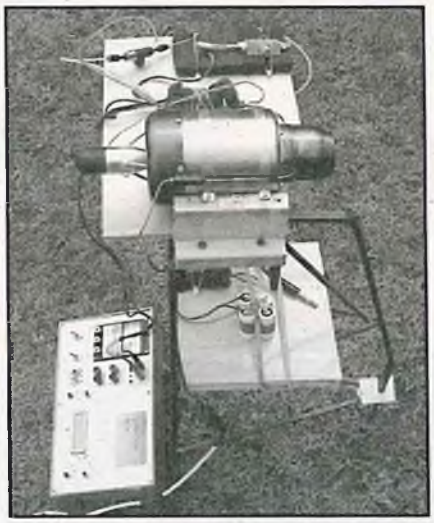


Photo #6: The MW-54 Mk3 on the test stand, ready for its first run.

Photo #7: The Rafale powered by the Wren MW-54 Mk3.

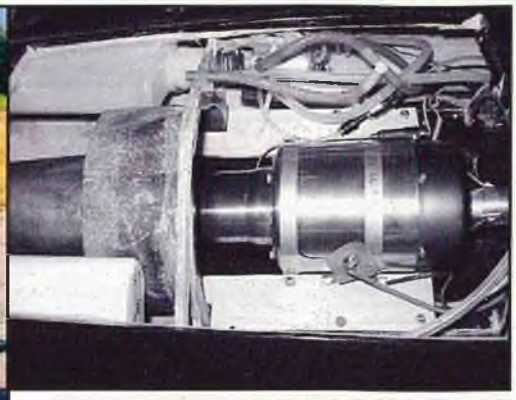


Photo #8: Turbojet installation onboard the Christen Diffusion Rafale. Note the two tanks on the sides of the stainless steel tube and the fuel pump. The small header tank (to avoid air bubbles) is not visible.

10mm and a 12mm spanner and some thread-locking compound (Photo #3). A soldering iron is needed for the electric connections to the starter motor and the electric pump.

Pre-Assembly Notes:

The 30-page, full-color, instruction manual is very detailed, and contains pictures of all the 66 steps into which the building is subdivided. It also contains safety specification, installation, running, troubleshooting and maintenance instructions.

Here a few words of warning are needed. We often follow the saying: when everything else fails, refer to the manual. This is a no-no in this case: no matter how experienced a modeler you are, read the manual first and then stick strictly to the instructions. Even if you have experience with full-size turbojets as I do, you must remember that all engines are different and only the designers know the relevant details. No complex machine can be better than its manuals, and full-size aircraft have been lost, with loss of

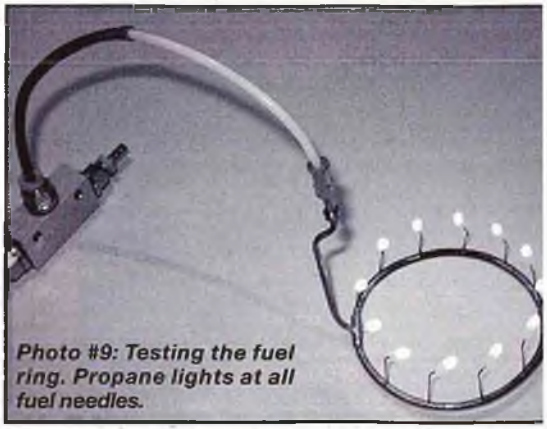


Photo #9: Testing the fuel ring. Propane lights at all fuel needles.

lives and material damages, due to errors in following the instructions in the manuals, mistakes in manuals, or even delivery of the wrong version of the manual from the manufacturer. Follow the manual step by step, and you will end up with a good engine that you have assembled with your own hands!

You do not need an aerospace factory clean room, but nevertheless cleanliness is very important. A clean workspace, possibly covered with a white cloth, is a must. A suggestion: since there are many small parts which must be handled with care, put a cardboard tray under the cloth, so that if a part falls down, it does not roll away. It is easy to pop a bearing open, and you will not enjoy looking for the tiny ceramic balls on the floor (see below).

Assembling The MW-54:

Start with step 2 (step 1 is just "check all parts in the box"), inserting the lubrication pipe.

Step 4 is the first critical step: installing the front bearing. The bearings are of the high speed, angular contact, ceramic ball, precision type. Since it has no cage, a wrong maneuver will cause the two races to come apart and the 14 balls to get loose. Remember this from the instant you open the bag containing the bearing to the moment in which the engine is closed. However, if you accidentally dismantle a bearing (it has happened to us twice, building both the Mk2 and the Mk3), do not panic. Just be careful not to lose any balls, and put the bearing together again. This may be a tough job, but it is possible. The first time it happened to us, we tried to put the balls back for more than an hour without much success, so we turned a small tool (Photo #4) on the lathe and then in less than two minutes the balls were in their place. The second time it was a no-problem job: just take the small tool and fit the balls back. So, if you have access to a lathe or you have a friend who owns

Turbine Wheel Quality Certificate

WREN Turbines Ltd.

This Turbine Wheel has been manufactured to the exacting standards of the aerospace industry, and meets the requirements of the Academy Of Model Aeronautics when sold in the USA.
Certified to conform to:
AMS-STD-2175 Grade 'B'

Serial No. 15960 x 2 Type. MW54 Max. RPM. 160,000

Signed. R B Parnell
On behalf of ~~Wren Turbines Ltd~~

Warning: Inappropriate use of this turbine wheel or engines to which it has been fitted can result in serious injury. Always follow a code of safe practice, such as that drawn up by the Gas Turbine Builders' Association. Copies available from: http://www.gtba.co.uk

Wren Turbines Ltd, Unit 13, Century Business Centre, Manvers Way, Rotherham, S63 5DA, UK. ++44 (0)1709 300290

Photo #10: The turbine wheel quality certificate (An AMA requirement).

one, it may be a good idea to turn the tool beforehand, just in case. A piece of wood dowel (a broomstick?) with the end properly shaped will also do. A suggestion to the manufacturer: why not include this tool in the kit? It is cheaper than one of the Allen wrenches, and if you pop a bearing open, much, much more useful.

To reassemble the bearing, you must put the outer race on a flat surface, put the balls inside it and slide the inner race in its place; the small tool just keeps the outer race in position when you put the balls back and then allows you to pull up the outer race, keeping the whole thing aligned.

Steps 11 and 12 (installing the rear bearing) are again critical from this viewpoint. Care must be taken to insert the bearings in the correct direction.

The turbine wheel is already assembled on the shaft, together with the rear bearing, and similarly the shaft tunnel is already assembled with the preloading spring and the O-rings. A correct bearing preloading is vital for the proper operation of a fast rotor and the fact that these units are pre-assembled is a great help.

Step 17, aligning the front case, must be performed with care. It is not difficult, just do not overlook it. The rest of the steps are straightforward, and you will soon complete the assembly process.

Test Running The MW-54:

Now it is time to hear the roar of your jet. If you have a jet trainer ready, with the engine exposed or at least a model with the jet directly exhausting outside, you could even install the MW-54 directly on the plane and do all testing in place. However, particularly if you plan to install the jet engine in an internal position, it is advisable to secure the engine on a test stand to make the first tests and to practice the starting procedure. A malfunction or an error can easily result in a flameout, and you do not want to start a fire in a closed model. Also, it is easy to equip the test stand with a mechanical balance to measure the thrust, so that you can know how much your engine is pulling. However, this is not strictly needed, since the starting panel (included) has a display showing the rpm: if your engine at full throttle reaches 160,000 rpm (as it will, if it is properly assembled) the thrust will be there.

First you have to brew your own fuel, mixing jet fuel with some turbine oil. The bearings are lubricated by the oil in the fuel, as in 2-stroke engines, so this is essential. All instructions are clear in the manual, so that here, also, you just follow them.

We initially departed slightly from the instructions: instead of adding 2.5% of oil to the jet fuel, we used 5% in the Mk2 engine and 4% in the Mk3. We did it after suggestions from a local turbojet builder. We now think it is not necessary, and we suggest sticking to the manual; however, a bit more oil does no harm in the short run and allows having just a little more lubricant in case some malfunction

arises. For all our testing and flying we get jet fuel and oil at the local airfield. The mix is prepared, carefully filtered and kept in 5 liter cans, from which it is directly transferred to the tank. Note that the fuel for turbines is much less expensive than glow fuel, particularly the high nitro fuel used in ducted fans. Even if the fuel consumption is much higher, the overall saving on fuel if compared with ducted fans is substantial.

The Mk3 comes with a two-part mounting bracket which is easily assembled. For the Mk2 a pair of large hose clamps was used, which is a suitable alternative, but the supplied bracket is much nicer. The Mk3 mounted on the test stand, ready for the first run, is shown in Photo #6.

We strongly suggest you build a starting box, like the one described in the Eagle V construction article and shown in Photo #6. The starting box allows you to start your engine without wires and switches hanging around and minimizes the possibilities of errors.

The Mk3 was flight tested in the Eagle V, just to have it in a model we know well, in case anything went wrong. This precaution proved unnecessary since no trouble was encountered. After a number of flights, the Eagle V got its Mk2 back and the Mk3 was installed in a Rafale from a Christen Diffusion kit (Photos #7 and #8), a ten year old model with dozens of flights using a Ramtec fan-Rossi 90 combination which was easily converted to turbine (it was also repainted black, and needed some maintenance after all those flights!). The turbine is in a mid-fuselage location, and the jet engine exhausts through a stainless steel tube. The turbine runs as cool as in an open installation, and the loss of thrust due to the ducting is minimal.

The plane has roughly the same weight as with the ducted fan, but the increase in thrust is impressive. The Rafale is known for being a good flier with the fan, but with the Wren 54 performance is much better, particularly at take-off and where the top speed and practically unlimited vertical performance are concerned. Also the greater reliability, particularly at idle, is important.

Maintenance And Assistance:

Turbojets are intrinsically simple machines, at least for the mechanical parts. The control is another story, but happily modern ECUs (electronic control units) handle all the control functions. This should allow you to have many trouble-free running hours without problems.

We found two maintenance points which should be checked regularly. The first is the Bendix joint of the starter motor. Care must be used in ensuring that the starter motor is well aligned — if it is not, the starting process becomes noisy and you should realize something is not right. The friction surface on the shaft spinner is the inner surface of an O-ring. It should last for a long time, but if this is your first turbojet it is likely you will make a lot of starts and you can wear it out. Check for wear: if the rubber ring is worn, replace it immediately. If you are at the field and realize the O-ring needs to be replaced,

just reverse it and it will allow you to make many more starts.

Another point is fuel cleanliness. The Wren MW-54 has many small fuel injection tubes; this is nice, because it gives you a well distributed flame, but it also means that each tube is very thin and easily clogged. After more than one year of running, our Mk2 started to have trouble. It seemed to be a fuel problem. We tried the new ECU of the Mk3 (the ECU controls the fuel pump): no improvement. We tried the new fuel pump: same results. Also complete checking of the tank system and plumbing gave no results. After an exchange of e-mails with Wren Turbines their suggestion was that a few fuel injection needles were clogged. The fuel ring was put on the bench (yes, you need to dismantle everything, but since you assembled the engine, you know how to do it), and the propane bottle used for starting was attached to the fuel ring. By lighting the needles it was clear that a number of them were clogged. We cleaned the fuel ring using an ultrasonic cleaner and, after cleaning, all fuel needles lit up with a nice flame (Photo #9). The fuel ring was reinstalled, and the engine runs like new.

One of the best things about Wren Turbines is the helpfulness of the people there. If you have a problem, just send an e-mail and you will receive a very quick, and above all, helpful answer. They say that in the unlikely case of trouble, they will service your engine for you.

Safety:

There is little to add about safety to what is written in the manual. Read it very carefully and above all follow the few, but important, safety rules.

Be particularly careful not to leave anything loose in the fuselage and to secure all wires and pipes well; jet engines are like enormously powerful vacuum cleaners and will ingest anything loose in front of them. Particularly, stay away from the intake with your fingers. There is nothing that you will need to touch close to the engine (no needle valve!) so stay clear.

The turbine rotor is a very carefully engineered piece of machinery, and the engine comes with a certificate regarding the turbine wheel quality. In the USA this certificate is required by the AMA. Be sure to keep the certificate as it regards the turbine wheel as it comes from the factory. Any small damage to the wheel jeopardizes its safety. If you think you may have damaged the turbine wheel or the compressor wheel, contact Wren Turbines and they will tell you what to do. And if still in doubt, replace it.

Conclusions:

The Wren MW-54 is a nicely-sized turbojet, with a thrust just under that of the larger engines, but is much lighter and uses much less fuel. At take-off, the plane can then easily be 2 kg (4.4 lbs.) lighter, yielding a thrust/weight ratio in the same range. This, together with its smaller size, allows you to fit it into smaller models. We think it is an ideal choice for converting models designed for Byrojet or Ramtec fan units to turbine (we plan to prepare a future article on a number of different conversions of this kind). The plane

comes out roughly as heavy as with the fan unit (or even lighter), but the thrust is much greater. It is also an ideal choice for small and medium-sized sport jets and jet trainers and allows you to build twin turbine planes of reasonable size.

The new Mk3 version is even more powerful than the original MW-54, without any increase in weight and size and little increase of fuel consumption.

The first unit we assembled took two evenings; later, having assembled some units for friends, the time required from opening the box to installing the engine on the test stand was less than three hours. All units we tested were running at the nominal performances on the first attempt, and our older Mk2 unit has been running for a year and a half, with the only trouble, now solved, related to the clogged fuel needles described above.

The idea of selling the engine in kit form is a very nice one, since it allows the modeler to save some money and to gain a good, first-hand knowledge on the engine's operation and maintenance. The engineering and the construction is first class, and the design of the Mk3 has been improved from several viewpoints, making the task of the builder easier and more straightforward. We were much impressed by design, the manufacture and the performance.

Editor's Note:

For those readers living in the U.S. and who are interested in additional information, or in purchasing any of the WREN products, you can contact the following distributor:

Jet Hangar Hobbies, Inc., is the Western Hemisphere distributor for Wren Turbines Ltd. Wren manufactures 7 lb., 12 lb., 14 lb., and 18 lb. thrust turbine engines for use in a wide variety of jet models. All Wren engines come complete with electronics and Hand Data Terminal (HDT). TBO on bearings is up to 200 run hours. The advantage of owning a Wren kit engine is that the consumer can perform most maintenance. Replacement bearings and other parts are available from Jet Hangar Hobbies, P.O. Box 1607, Hawaiian Gardens, CA 90716, phone: (562) 467-0260, fax: (562) 467-0261, e-mail and website:

LarryW@jethangar.com
www.jethangar.com