R/C Soaring DIGEST

May, 1996
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A Publication for the R/C Sailplane Enthusiast!

R/C SOARING DIGEST

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Dale King, the Head Elf of Wylie, Texas, is launching Raven 3m, while Gordon Jones looks on. What a great way to have a relaxing day! Jerry Slates photo.

A RELAXING DAY NEAR WYLIE, TEXAS

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The Soaring Site

European Chronicles

Yes, our French correspondent, Marc Dufresne, is back! His column, "European Chronicles", began in May, 1993; most of you will recall that Marc had just been transferred from New Hampshire to Paris, France. In sharing his impressions of flying in Paris, he said, "Looks like I'm also going to have to re-learn how to fly."

Well, a lot has happened since then... Marc has a sailplane business he calls Hobby Direct; his French accent is more noticeable, and he obviously has an understanding of the European sailplane scene under control. Of course, he'll have to tell us if he has "re-learned" how to fly! Thanks, Marc. Glad you're back!

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Yes, we have an e-mail address! We are on-line now for those of you that have requested that we get one, to facilitate making it easier to send us information or articles. Our thanks to Fred Mallett for running the first test on an article download from a PC, and a graphic file; Fred has been extremely helpful getting us started. Our thanks to Bill & Bunny Kuhlman for their suggestions and running the first test on article downloads from a Macintosh™, Bin-Hex 4 translations, and other things most of you don't want to hear about. Our thanks also to those of you we are already corresponding with who have welcomed us on-line.

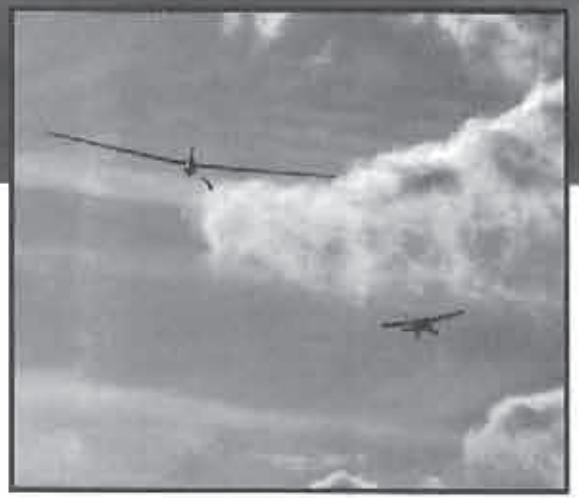
For most of you on-line, a simple e-mail message will suffice. Just include the information you want to send in the e-mail message and not as an attached file. For those that need to attach files, we can work out the details. Additional translation files are also now in place.

MSSC

The 24 page Program for the Mid-Soaring Championships is now available, and entertainment abounds! ("Not to mention the usual flying events," as Bob says...) If you are thinking about attending, and have not yet received a copy, please be sure to contact Max Hurst or Bob Sowder. Please see the event schedule or the ad included in this issue for additional information.

Happy Flying!
Jerry & Judy Slates

A 1/3 scale Flybaby (Sig.) with a 1/3 scale ASK 18 making a low pass for the camera.



1/3 scale Libelle on tow. The Telemaster can tow up 1/3 scale and larger sailplanes. It is also a great trainer (with much less power), and is easy to fly and very forgiving!

So you want to learn to fly gliders?

I have had several interesting calls recently from people inquiring about scale sailplanes. They were all set to purchase a nifty scale flying machine until I asked them what they were flying now, and the answer was, "I don't know how to fly yet."

I was a little surprised that someone was willing to purchase a scale sailplane when they didn't know how to fly at all. I advised them to go learn to fly a powered airplane and then give me a call once they had accomplished that task.

All of these people were interested in flying sailplanes, but I encouraged them to get together with a local powered R/C club and learn to fly with a motor first. I suggested that they might want to get themselves set up with a Senior Telemaster which, at a later date, could be repowered and used as a towplane.

Why a powered trainer? Quite simply, because it will take them much less time to learn to fly power. I'm assuming they can find a competent teacher at a local R/C club to help them. It will take a lot longer to learn to fly a sailplane for the many reasons.

First, lessons are not quite so dependent on Mother Nature. With a sailplane, we are always asking questions such as, "Is the wind in the right direction? If so, do we have too much wind? Do we have too little wind? Do we have thermals?" With no wind we can't winch or high-start all that high. If you're lucky enough to

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Last month, Asher Carmichael talked about how to get a 20 pound package to 2000 feet. The sailplanes discussed in the article included a 1/3 scale DG 600 (Rosenthal), and an SB 10 (Roke). Scale sailplanes such as these are easy to fly if you know how, but too expensive to learn on.

catch a thermal, are you flying low enough for the student to be able to SEE? How long a flight can you get for each training session? You get the idea!

The real advantage of learning to fly with power is that our student can fly low enough to be able to see the trainer for 20 minutes or more at a time without worrying about how to keep the thing up in the air. Mistakes which lose altitude are no problem - just climb on power and start again!

Once our student knows how to fly, then they can learn to land and take-off. In a 20 minute flight they can do 15 or 20 "touch-and-go's" and so, in a relatively short time, our student can go solo. With two or three training flights a day, our student can easily attempt a hundred or more landings in a single day! You get the point.

In short, with a talented student, it's perfectly feasible to do three or four flights a day and perhaps a hundred or more take-offs and landings in a single lesson. That's a very difficult thing to do with a sailplane, given what's necessary to keep them in the air.

The student's airtime per lesson is maximized if he flies a motor plane.

One other advantage is that many powered R/C clubs have a student program already in place with enthusiastic, willing and able instructors ready to teach.

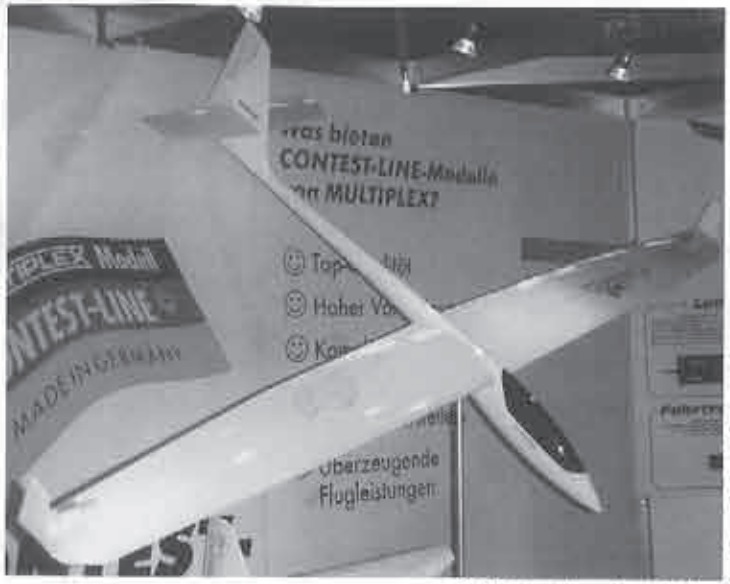
Once our fledgling pilot has gotten their (motor plane) wings, then they are ready to get with the sailplane group and learn how to high-start, airtow, or slope soar, and search for thermals with the glider of choice. One added benefit is, if the lessons are learned well, the student will also be able to become a towpilot and team up with fellow sailplane enthusiasts! Although I have heard of one person who is a talented sailplane pilot, who learned to fly and airtow in a matter of a day or so on their own, this level of God-given ability is quite rare. For some people who learn on gliders, the transition to motor planes is extremely difficult and time-consuming. It seems that many glider pilots never use their left hands much, and so in the transition to power, they find it very difficult to taxi along the ground (with a rudder) and use the throttle in a proficient manner. Indeed, it seems some glider pilots have become so right handed that it takes many hours of drudge work to make the transition to powered flight.

If they had learned from the start to use both hands equally, the transition wouldn't be so difficult.

On the other hand, the transition from power to gliders is much easier. On many occasions I have let powered enthusiasts fly some of my sailplanes, and after a few minutes they are doing what they need to do to control the sailplane and, if necessary, even land.

So, if some of you out there don't yet know how to fly anything at all, and want to learn, I strongly suggest that you contact your local model shop and find out what powered R/C clubs there are in the area and get together with them. If you're in a hurry to get your wings, you should do so in the shortest possible time with the help of these folks.

Good luck and welcome to this wonderful hobby of ours! ■



Multiplex Flamingo 2001

European Chronicles

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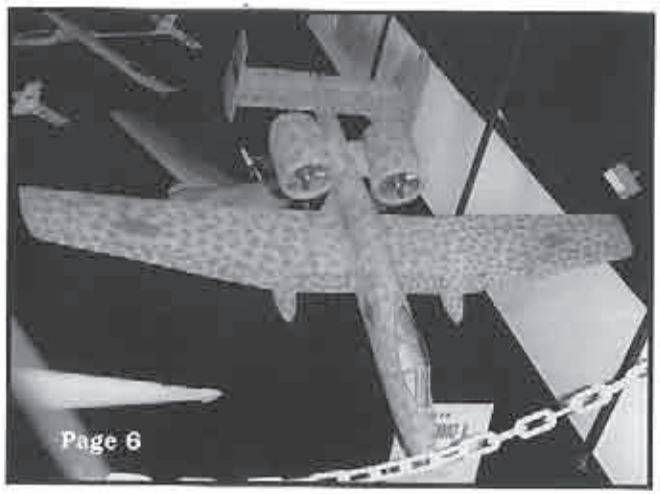
Nuremberg 1996.

Yes, it's been a long time since the last contribution. What with professional disruptions (read lay-off) and subsequent scrambling to recover and define a new career path, lots of things got put on hold, not the least being efforts to continue flying and keeping in touch with things related to soaring in general.

Anyway, things are now more or less under control and, hopefully, this column can now resume on a more or less regular basis. A checkpoint of what are the major trends in the soaring technology here in Europe appears in order. The Nuremberg fair is a good place to check what the major manufacturers, such as Graupner, Multiplex, Robbe, Simprop and Aeronaut have in stock for the future. The first things one notes is that, if you want a glider or an electric, the best and most advanced technology comes from Germany.

Three things stand out in the German offering: 2000mm class (8-10 cell) electrics, scale gliders ranging in size up 4500mm, and all foam electric powered scale models. This year sees the generalization, started last year, of ready to fly kits. This trend is market driven by two things: Space (or lack thereof) to build, and money (i.e., the technology now exists to mass produce high quality, ready to fly kits that are affordable and perform very well in flight). Kits in this class feature gelcoated fiberglass fuselages, film covered obechi sheeted foam wings, prewired servo bays and/or preinstalled bowden cables.



Graupner leads the pack in breath and depth. The attention getters at the show were the ME 323 GIGANT (span: 1666mm), powered by 6 SPEED 280s, and the V-Experience (span: 3370/3680mm) that

Aeronaut A10 for powered

SIMPROP - Inline all metal gear box for 400, 600, 700 class electric motors.

TURBO-FAN 1000 develops up to 17,5N (about 800W) of thrust when powered with an 18 cell motor. An A-10 "Wharthog" (Span: 1310mm) is especially designed to be powered by a pair of these units.

Multiplex added to its "Contest Line" of high-tech, high-performance gliders, the FLAMINGO 2001, a 3300mm, ready to fly glider that comes fitted with scissor airbrakes and optional winglets. Its sister ship, the KRANICH, is a 14-16 cell motorglider. Both sport the same HQ 3,2-11 airfoils. New, also,

Aeronaut Heinkel Hezig Electric

features a slip-on nose section that permits a switch between glider and electric. Also present were enhancements to the 10 cell class such as the Thermik Sport, a 2500mm ready-to-fly electric, featuring a built up wing with a SPICA airfoil.

Aeronaut, with Rudi Freundentaler as its technical adviser, leads the way in electric propulsion systems (fiberglass and carbon fiber propellers, yokes, shaft adapters, and electric turbo fans). It also offers a complete line of high performance motorgliders ranging in span from 2000 to 3000mm, and pylon racers such as the FOX and JET. Its is the LS7, an evolution of the legendary LS4, which is the star of the Contest Line. Its HQ 3,5-12 airfoil and 3300mm span gives it superb handling capabilities on the slope and in thermals. The kit is not as complete as the Flamingo; it's not available pre-covered, and the airbrakes are an extra option, which is a bit of shame for such a nice glider.

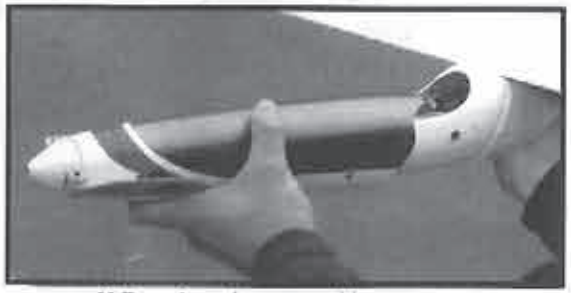
This year sees the general availability of the MC4000, 12 channel computer radio announced last year. This 12 channel radio is probably the most advanced on the market. It comes with an integrated frequency spectrum scanner that ensures that your frequency is free. If not, then the transmitter does turn the RF deck. There can be

Multiplex LS7

Multiplex Filius Electric RTF

up to 100 models stored in memory, and up to 5 different set-ups per model. It comes with 11 pre-programmed aircraft type (6 for fixed wing, 5 for Helicopter). This feature is intended for a "plug and play" set-up; just install the radio, select the model type and go flying. I hope to cover all the features available in a later column.

One other thing I discovered, although it's been available for awhile, and is the answer to prayers for a servo that will fit in the (thin) wing of those 1500mm gliders, is the MS40 super flat (4mm thick!!) servo. The only bad thing that can be said of this servo is that it comes with Multiplex connectors only.



V-Experience has removable power cone.

ME 323 GIGANT

The high-tech medal goes to Robbe with its Carbonic Profi, BAE 146 and AVEOX motors. The Carbonic Profi is a ready to fly glider that features a gelcoated fiberglass/epoxy, Kelvar reinforced fuselage, a 2830mm carbon fiber, covered wing with elliptic planform and a NH456-458 airfoil. It is for the serious F3B or F3F flyer. The BAE 146 is powered by four electric fans. It's an all foam scale jet with a 1900mm span that weighs in at about 3000g. A tad heavy for my taste. Finally, Robbe adds to its product line the AVEOX brushless motors. and their F5B ROVOX version with integrated gearbox and controllers. It is very

Robbe Rovox-Serie Brushes, with built in gear box & controller

powerful and very expensive. These motors are for those who want all out performance, pumping 60 to 80 amps out the battery pack. The ROVOX 10 cell is designed to turn a 15x13 prop at 10000 RPM.

Other products include the JOY, a V-tail, ready-to-fly, hand launch glider that is also available as an electric motorglider. Its three piece built-up wing makes it very easy to carry around, and the SANYO-Limit, a 7-10 cell derived by Urs Leodolter, is a model used in the Sanyo Limit Class.

These and all the other products, complete with video action clips, were provided on an Interactive CD-ROM, a first in the industry. This disk will be distributed through the Robbe retail network. The only snag is that it is available in German and run on Macintosh.

Since the Nuremberg fair is open to professionals only (e.g., dealers and distributors), most of the products announced will be available in stores in only six to nine months, as the manufacturers are first taking orders and then will manufacture based on demand. There is the odd product that may never become available due to poor initial demand. This is a very European way of doing business. ■

The New Spectrum 2M

from Slegers International

...by Jim Thomas
Woodinville, Washington

Every so often a new sailplane comes along that "gets it all together". I just discovered one: the new Spectrum 2M. This is one of the smoothest flying, user friendly ships I have flown in recent years. And all of this in a 2-meter competition ship!

The original Spectrum 2M started life as a smaller companion ship to the 104" Spectrum. The 104" Spectrum offered the choice of an S3021 or RG-15 airfoil, with the Spectrum 2M only offered with the S3021. Each of these ships used the popular triple taper leading edge, and carried a smart looking T-tail. These were very efficient ships, but required a bit of attention to fly up to their full potential.

The new Spectrum 2M uses an updated wing with a double taper leading edge and the contest proven SD-7037. This design provides superior lifting capability with a significantly reduced tip stall tendency compared to the original. It launches high and straight, is easy to fly effectively, can range far away with minimal loss of energy, and lands very predictably with controllable nose pitch. All in all, a very nice package for serious contest flying, or just enjoying a day at the flying field.

I had a chance to visit Ed Slegers in January, just a day before the great Blizzard of '96, and saw the results of some of the development work that he and Brian Agnew have done. There were literally dozens of wings in the rafters of his shop, built to test airfoils, planforms, flying surface areas, etc. It is clear that the wing on the Spectrum 2M was not just a lucky guess, but the result of lots of hard work and testing. I recently talked with Ed after completing and flying the Spectrum 2M, curious as to why this ship performs so well. As he put it, "We can't improve much on this wing." I for one believe it.

Ed also mentioned that due to its success, the same wing is available on three of the current Slegers International designs, which offers a choice of fuse type/tail form for the buyer. The Spectrum 2M is a T-tailed ship with a slip-on nose cone. The Barracuda 2M has the characteristic pod/boom fuselage like its larger brother with a conventional full-flying stabilator tail group. The Laser 2M is a hybrid of the two, with a Spectrum like fuselage with slip-on nose cone and conventional full flying stabilator tail group. The key is that they all use the same wing, so the buyer can get superb performance with a choice of looks in the rest of the ship. Sort of the modern modular concept.

If you are looking for a 2-meter ship that is long on performance and will help bring out your soaring potential, consider one of Slegers International ships carrying this marvelous wing: the Spectrum 2M, Barracuda 2M or Laser 2M. ■

A Look At the JR 783

...by Don McColgan
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My soaring buddy and fellow Soarhead, Paul Ikona, proprietor of California Soaring Products, made me an offer I could not refuse. He handed me a box with a brand new JR XP 783 in it and said, "If you write a review on it, I'll let you use it." He knew I was in the final stages of finishing a Mark Levoe 2M Super V and needed a radio for it. I jumped at the chance asking ,"Why me?" Paul allowed that I was the only one on our field that had been using one for any length of time and figured I might be able to program it. Well, I think I have one of the first 347's sold, but I couldn't bear to tell Paul that I threw my attempts at programming away and copied someone else's out of a magazine article. Worked for me! I just kept copying the same program over for every new plane.

TRANSMITTER

Now that the cat's out of the bag, I am committed to make a serious effort to understand the 783. It looks and feels just like my old 347, light and comfortable. Same basic switches in the same locations, same display, most of the functions are identical. The display is not real fancy like the high priced brands, but it is sufficient to do the job. The transmitter supplied was the aircraft version, but it can be used for gliders or helicopters, too. Some metal foil stickers were supplied to apply to the transmitter, so the labels match the glider terminology.

783 VS 347

The 783 does have some significant improvements over the 347, including eight memories for those who can manage to have that many planes flying at once. It is handy to copy your program into another memory, make a few changes, then switch back and forth to test them. There are two more mixing channels available too, for a total of six. Trim offset memory allows you to electronically set your trims into memory, then put the mechanical trims back to zero. This allows for all models programmed to use trims at center. It is also possible to select the point at which you want mixing to begin on any channel mix except aileron to rudder. The trainer function is programmable. You can select which functions the trainee will have control of. It is also possible to program high rate aileron and rudder mixing with the launch preset.

MANUAL

The manual is set up with three software sections: aircraft, gliders, and helicopters. You could use the same transmitter for either type, and the programs can be identified as to type in the software memory. Since I fly only gliders, I skipped the other sections. After a thorough description of the hardware, the software section opens with a nice, simple flow chart showing the order that the functions come up and the applicable page number. In each case, the manual explains the function, then provides a step by step procedure to program it. At the end of the glider section is a chapter called "Practical Applications". I found this really helpful in that there are explanations of servo installation requirements, and a "lead you by the hand" procedure for setting up a full house glider. There is also a sample data sheet for reference.

PROGRAMMING

Is it easy to program? Are any of them? I will say the manual is a big improvement over the one I got with my 347. I can't compare to brands A or F, as I am not familiar with them. I think a novice could successfully program his glider by following these guidelines:

1) Start at the front and read through the manual one page at a time. Some of the steps depend on previous settings.

2) Set up the servos and linkages as suggested. (Be careful with the aileron channels; the manual is contradictory here. The left aileron must go to channel 5, the right one to channel 2, or the ailerons will go down with crow instead of up.) The manual should also mention that the output shafts of the wing servos should be on the aft side of the servos as well as the shafts pointing toward the wing tips.

3) After setting up the servos so they all go the right direction, and setting the V tail and dual flap options, I would recommend programming the SP mixes, the set of instructions that provide launch flaps/elevator control and crow for landing. These mixes can be affected by any mixing programmed in the discrete channel mixes.

4) Try to find a set up that one of the experts has used and use it as a guide. There are a number of them around and there is no sense in trying to reinvent the wheel . Look in back issues or *RCSD* and other magazines, and check the Internet. If all else fails drop me a line and I will be glad so share the articles I have.

5) Carefully fill in the programming data sheet and keep it up to date.

6) Take your DSC (Direct Servo Connection) cable with you when you go to the field. It only operates the servos if you have the PCM receiver, but you can program the transmitter without radiating and tying up the frequency or bugging your wife if she is watching channel 2.

Which brand is the best buy?

I won't answer that question. There are a lot of considerations, such as compatibility with the servos and receivers you already own, the availability of local service or other means to get quick repairs, and local expertise to help you if you get stumped. All of the brand names seem to be equally reliable and offer the same mix of servos and receivers. The 783 does everything I want it to and more! There are more features available in some of the other brands, but you have to pay for them. If all those bells and whistles are important to you, then go ahead and spend your money. If you just want an honest value for the buck that will give you every feature you need to control full house sailplanes, I recommend trying the JR. ■

Jer's Workbench

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Faceless Hinge Line

I have received several letters or telephone calls asking for more information about the faceless hinge line on some foam wings that I built. About a year or so ago, I wrote on this subject but, for the new subscribers that didn't see the article, we'll revisit the subject this month.

Figure 1 shows where a section of the foam core was removed, and a soft, balsa strip was inserted. This was done before the wing was sheeted with obechi skins.

How was it done? Starting with a full-size drawing, the hinge line is identified and then drawn on the foam core. Using a 5/8" wide, soft, balsa insert, two more lines were drawn 5/16" wide on each side of the hinge line. This is where the foam core should be cut.

There are several ways to cut the foam core. A bandsaw can be used, but extra care should be taken to work slowly and carefully. If you slip a bit, the mistake probably won't show when the wing is sheeted. A hot wire foam cutter will make a very clean cut, and it's faster. The third choice would be to use a straight edge and a razor blade.

I use the softest balsa that is available. Since most wings are longer than 48", two sheets of 1/2" balsa are glued together, end to end. A 5/8" wide strip is cut off; the finished strip is the length of the balsa

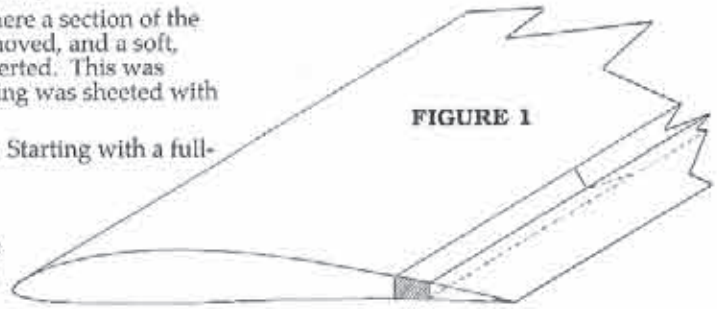
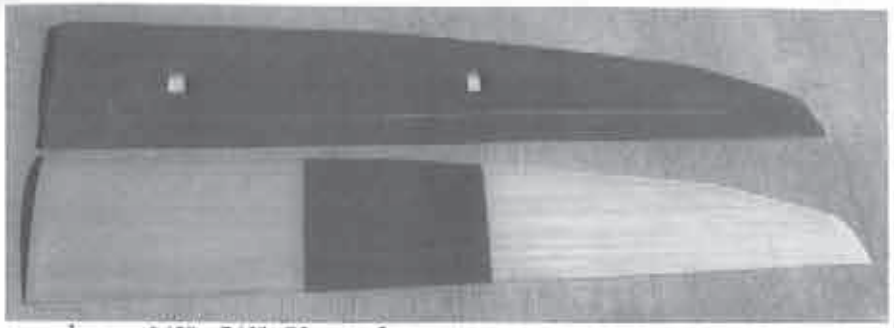


FIGURE 1



sheets x 1/2" x 5/8". **Please, be sure to keep everything straight!**

Using masking tape, the 5/8" by 1/2" soft, balsa insert is taped into the foam core. The foam core is then turned over and the bottom is taped. (Working with the front half or the back half makes no difference, as both halves have to be done.) The taping is easy but, once again, be sure to keep everything straight.

Now, turn everything over and, from the top, open the foam core and the soft, balsa insert like a book. Using 5 minute epoxy, spot glue about every 2 inches, taking care not to use too much glue. After the glue has cured, repeat the process for the other half of the foam core.

On the top side of the foam core, a bit of sanding on the soft balsa insert is required in order to match the airfoil. First, a strip of masking tape is placed onto the foam core on each side of the soft, balsa insert. Use a sanding block; the sanding must be very carefully done. If I sand into the masking tape, it is replaced with another strip. When complete, the masking tape is removed. If there are any dents or voids, these are filled using a light, model filler. Then, the foam cores are turned over and checked to see if any sanding or filling is required.

The cores are now ready to be sheeted. There is a 5/8" flat spot on the bottom of the wing. I don't feel that this will distort the airfoil, and it is not going to show when the obechi is laid over the top of it. After the hinge line is cut, there will only be a 3/16" flat spot; after a little sanding, it won't show.

I use a Sears' 10" bandsaw to cut the hinge line. Sears carries a saw blade that is only .017" thick, which makes for a very nice cut on the hinge line without removing too much wood. Another way

Flap & aileron hinge line is cut; tape hinges are installed. Look close!

to cut the hinge line is to use an exacto razor saw (.012" thick) and a straight edge.

If you would like to chat about this construction technique or other techniques used in my personal sailplanes, come to the Mid-South Soaring Championships June 20 - 23, as I will have them on display.

Last month, I talked about vacuum bagging a set of 67" wing panels, using Spyder foam and 80/20 4.7 oz. carbon/S-glass and 1.4 oz. fiberglass. The panels are complete; weight is 21 oz. per wing, and they are very strong. We'll cover this project at a later date.

■

SOARING - SOARING

Soaring, soaring, never boring,
Noble Daedalus be proud,
What a feeling, no pollution,
Soar above that fluffy cloud.

What sensations, no vibrations,
Oil and gas not needed here,
Catch that eagle, he's too agile,
Where to land we have no fear.

Here's that uplift, here's our thermal,
Watch the alti-meter climb,
Hope our crew is watching for us,
We've been gone a long, long time.

Can you hear that swishing sound?
Check the clock, it must be wrong,
Pull the spoilers, start descending,
Round her out, we're on the ground.

Hope the working week is short.
Hope the flying weekends' long.
Shine the perspex, check the O2,
Take her up and sing this song.

Soaring, Soaring, over our restless world...

Nelson Montgomery - 3/96
Glades Soaring Group, Florida

Cockpit Resource Management, or

Buddy, Can You Spare A Dime?

...by Jim Gell
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Several years ago, when my "fixation" was for motorcycle road racing, I came across a concept in Keith Code's "A Twist of the Wrist" that I have found applicable to a variety of situations. I have found that this concept can be very useful for piloting RC aircraft.

The idea is that at any one time you have $10 worth of attention. You can spend your $10 just about any way you wish; you can even be overdrawn. How you spend your $10 however, is what makes the difference. The great thing about this concept is that it applies no matter your skill level.

Remember, when you first learned to drive a car (especially one with a manual transmission)? You spent a great deal of your attention on performing the physical actions that were required: maintaining speed and direction, using signals, slipping the clutch, moderating the brakes, obeying the rules of the road, and checking your mirrors! At first, driving required a great deal of active concentration. After a while though, these activities became routine. You could now perform several of these actions simultaneously with very little effort or thought. They became automatic. Our habits become our reflexes. (Ask anyone who, after driving a manual transmission for a while, gets behind the wheel of a car with an automatic transmission, and slams on the brakes while trying to "shift" from first to second!)

Let's say that you're trying this radio control flying stuff for the first time. Chances are you will spend a lot of your time overdrawn. From the time you let go of that plane your attention is spent on every aspect of getting that plane to do what you want and get it back on the ground in one piece. If you start over-controlling and/or become disoriented, your $10 of attention have been spent several times over, your over-saturated brain has disconnected, and you're working completely on reflexes. Since you've never flown before, you have no reflexes for flying an RC glider and so enter into a complete core meltdown. (The best description of this phenomenon I've heard was by a fighter pilot who was an instructor at the TOP GUN School. After months of intense flight training and classroom work on how to fly fighter aircraft and the theory of air combat maneuvering (ACM), he began his in-the-air ACM training. He describes his first dogfight: "My brains turned to water and ran out my ears... I was flying totally on instinct!")

That's why there are instructors. The instructor's job is to focus the investment of your $10 and to help bail you out when you are seriously overdrawn and the creditors are knocking at the door. (Such as, when a gentle left turn transitions into a spiral dive at 100 ft.)

The Plane

That's also why entry-level planes are designed to be slow and stable and typically have 2-channel control. By being relatively slow flyers, they allow you time to refill the kitty between required actions. Being relatively stable, they reduce the rate at which withdrawals have to be made. By having only two channels, there is only so much you can do, and generally that's limited to one control stick on your radio.

As your skills improve, you become more comfortable launching, executing turns, and landing. You're spending only a fraction of your $10 on the basics of maneuvering your plane across the sky. You've got attention left over that you can spend on finding and using thermals to gain altitude. (Sorry slopers, my experience is limited to thermal flying, but I'm sure you can think of an appropriate slope scenario.) You don't have to stop and consciously decide, "If the plane is coming toward me and I want to turn to my right, I need to move the stick to the left." It becomes automatic. An activity that you spent $8 of attention on during your first flights, you now spend a

dime on. Gradually, the mechanics of flying the plane become "second nature", and you've got plenty of attention in reserve.

OK, you've proven with hundreds of successful flights that you can pilot your polyhedral 2-channel around the sky for hours at a time, while engaged in an intense debate with your fellow pilots about the meaning of life and the latest Selig data. You can bring your plane to a stop within 1 foot of the landing circle center without scuffing the monocote or losing a beat during your intense diatribe on the relative benefits of that little blip in 7012 polars and its importance in achieving total personal fulfillment. Even when you are working the hardest at your flying, you're only spending a fraction of your $10. You can do all this and chew gum at the same time! Now, you figure it's time to step up to a higher performance plane and a computer radio.

Whether the next step is as simple as a new wing with an airfoil that allows you fly a little faster, or a high performance F3B model, it will take some time getting familiar with the new set up.

Your new plane will not fly like the old one. (Since that's the reason you got it, that's a good thing.) The signals of lift, sink, and speed that you've grown comfortable with will be different with your new plane. That means some of your $10 is going towards learning the plane's characteristics. The plane is going to fly and react faster than you have been accustomed to. While this is good in most respects, you have to make more frequent adjustments, which means you are spending more of your 10 bucks keeping the wings level. Reactions of the plane to control inputs will probably also increase; adjusting and compensating for a new input/action loop will be tapping into your limited resources. This is one reason that many experienced pilots give the advise that if you really want to improve, stick to one plane (or one design).

In addition, you'll probably have more things to do. (Or you'll want to do, because you've read about how great they are!) Now instead of having two control surfaces (rudder and elevator), you have spoilers or flaps to contend with. You may also have ailerons, with a separate control for the rudder. All of this is designed to give you better control of your plane. However, this also means that your work load has just gone up. And when your work load goes up, you start spending those rare attention dollars faster. Just remember, you don't have to use all of the new features at once. Let your abilities be the measure for adding new things to do. For example, get comfortable making and holding smooth thermal turns with the ailerons and rudder on your new plane (as opposed to just rudder control on your polyhedral ship), before you start worrying about adjusting full trailing edge camber.

The Radio

Here's where it gets really fun! Up until now your 4-channel entry level radio has worked great. But you know that to take advantage of all the control surfaces on your new plane, you'll probably need a computer radio.

The intent of the computer radio is to provide greater ease, flexibility, and functionality for controlling your sailplane. And in many ways it does just that. Ask anyone with a computer radio whether they prefer trimming the control surfaces by adjusting the threaded linkages or by pressing a few keys on their radio!

Computer radios also allow you to link inputs between control surfaces such as having a proportional rudder input when the ailerons are deflected, or elevator compensation when flaps or spoilers are deployed. This functionality reduces your work load; you don't have to constantly re-trim your elevator every time you move the flaps. These capabilities help you to save some of your 10 bucks for more important stuff.

On the other hand... you now have an extra three or four or five knobs and switches to operate. Some are two position, some are three position, and some may be spring loaded. As you program your radio, you assign a certain functionality to each switch position. Now you have to remember what each one does, and what position does it! This can place a major tax on your attention budget. For example, if you have to spend $8 remembering which switch activates the aileron/rudder coupling and whether it's on or not, you've only $2 left to fly the plane and find lift.

This doesn't even include the potential errors that can occur from having multiple plane set-ups saved in memory. Plenty of folks have found out the hard way that the reason their plane went out of control was that they were flying their 2M contest plane using their 3M polyhedral configuration.

Again, as with learning to fly a new plane, don't try and do everything at once. Use those radio functions which make flying easier, such as coupled rudder and ailerons. Turn them on and leave them on. As you get accustomed to the new equipment begin to experiment and expand your capabilities one step at a time.

If you have multiple model configurations saved into the memory of your radio, use the same switch configuration for each model. Don't put the dual rate toggle for the 2M on the left switch and the dual rate toggle for the 3M on the right switch.

With experience, of course, you'll be spending less and less of your attention budget on flying the plane and working the radio. This is the first step in the learning process. As with most activities, the first step is to get the body to master the physical side of the activity. Time and experience are what transform deliberate actions into reflex.

The real fun comes from the far more dynamic part of the equation — your brain! As you spend less of your attention budget on the physical side of flying, you'll have change left over to develop your skills for finding lift and using it. You can also devote a greater portion of your attention to using strategy during a contest and maximizing your landing scores.

The Rainy Day Fund

Now that we've looked at how you spend your hard earned attention dollars, how can you bank some of them for that rainy day? Yes, it's called planning. For example, if you have thought through the process of how you will react if you pop-off on the launch (push over or loop under, safe landing areas, other winches and retrievers in operation, location of cars and spectators, obstacles, etc.), you don't have to figure it out when it happens. Before you hook on the launch equipment, do you know exactly what direction you're going to fly? At what time during the flight are you going to start down for your landing? Have you figured out which landing circle (or what part of the field) you're going to land in? Do you know how you plan to fly your approach? These don't need to be hard and fast decisions. However, if you've thought them through ahead of time it makes it much easier to concentrate on flying smoothly, staying mentally ahead of your plane, and make any necessary adjustments to the plan.

It's Your Money...

Next time you're flying, think about how you're spending your attention dollars. Watch how the sum changes as you progress through your flight from launch to landing. Recognize when you are approaching your $10 limit and find ways to reduce your workload. Use times when the kitty is full to try new things and build new skills. As your piloting skills improve and you move up to faster and more complex equipment, remember that the transition will not necessarily be smooth. It can be made easier by moderating the workload. By training yourself progressively you can do more things in the same amount of time without effectively increasing your workload. That's how to get the most out of yourself and your equipment. ■

"SHORT CUTS"

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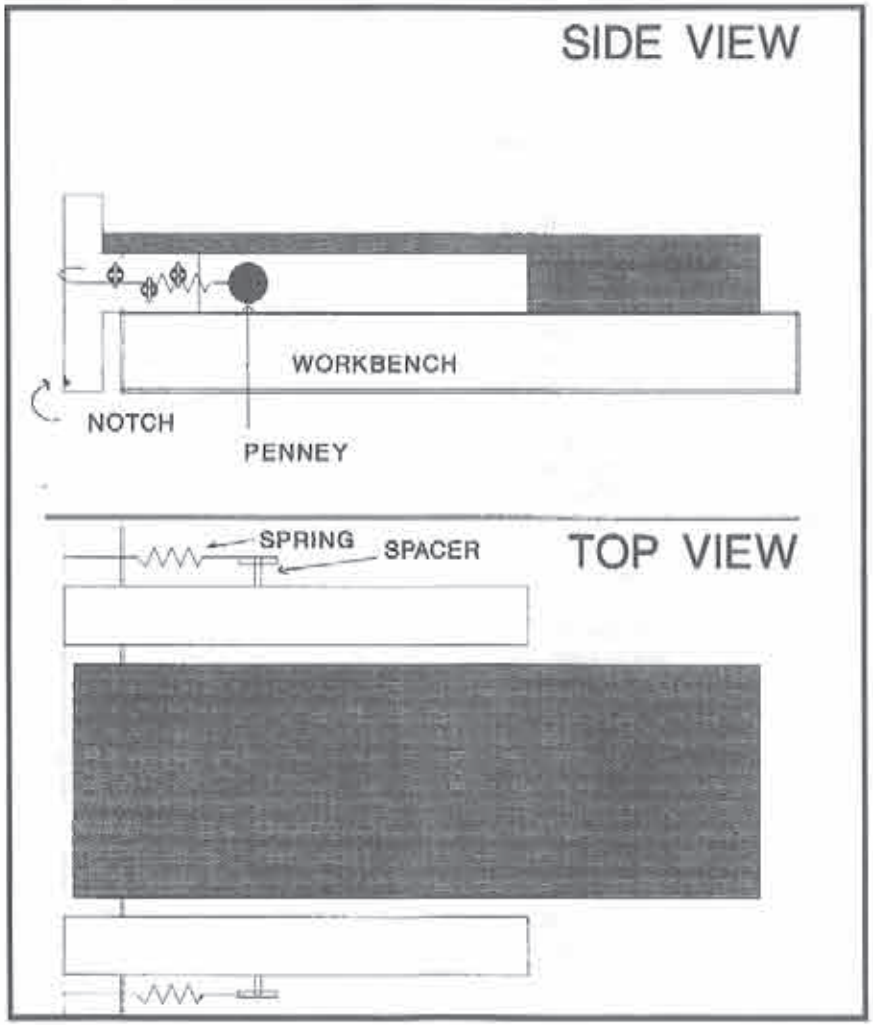
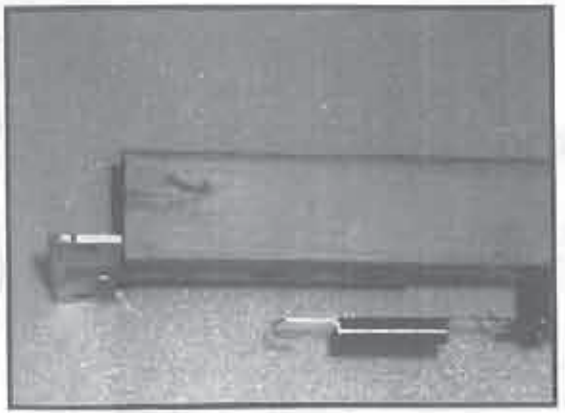
Hands Off Cutting (Planforms)

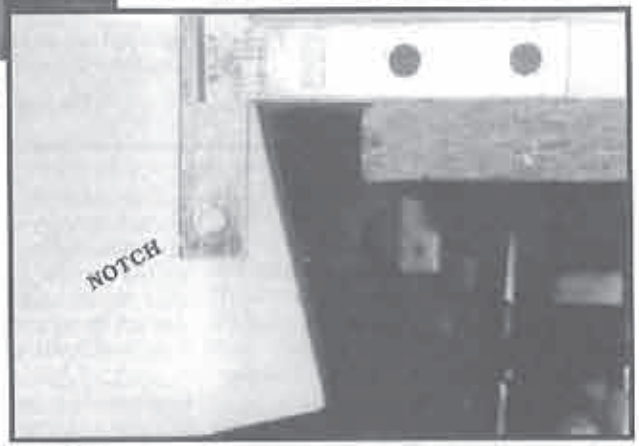
A few months ago, I got myself in a dilemma when OFB, Walter Mudget, was out of town and I had to cut a set of cores. "Not a problem," I said to myself. "I'll just call over my neighbor who has helped me out in the past." He was out of town, also. This forced me to build a hands off foam core cutting machine. It took two days and three trips to the hardware store to build, and only one redesign was required. So now I was set. Right? Wrong! Planforms must be cut before cores are cut.

My 52" bow works well with two persons to guide it, but it's too awkward to cut planforms by yourself. I already had a nice set of planform cutting guides that consist of 4" T strapping mounted to a length of 1 1/2" pine that's clamped to the work bench. The vertical edge of the strapping was first filed smooth and then rounded off and polished with



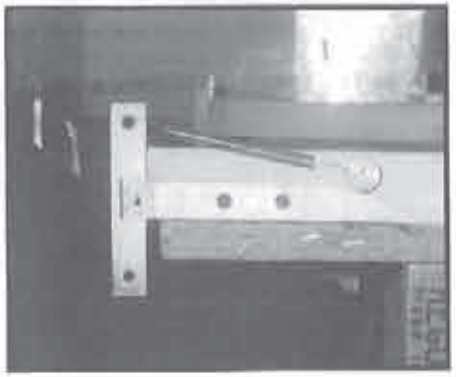


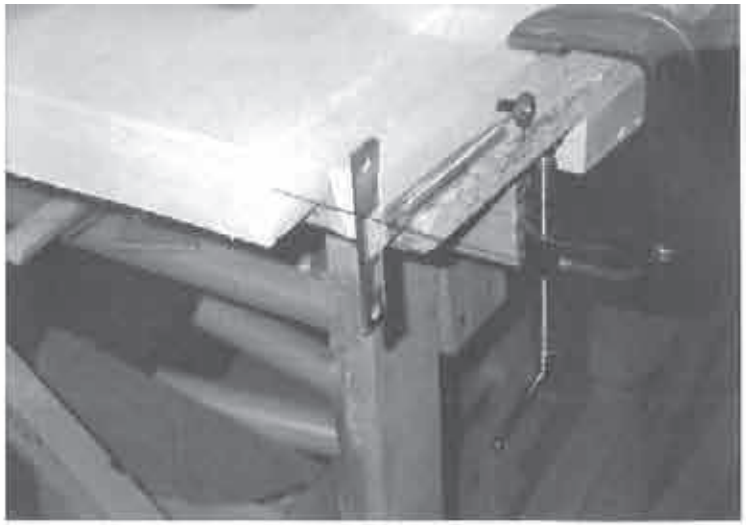
Here's how it works. Just position the guides to overhang the workbench with the foam between them. Then, clamp the guides to the table and position the foam between the guides, using the cutting wire of the bow against the guides as a cutting mark. Weigh down the foam and attach the springs to the bow wire; allow the bow to hang down below the foam. With the bow centered



400 grit emery. They work great when a person on each end of the bow guides the cutting wire against the smooth metal edge. The problem I now had was how 1 person could uniformly guide the wire against the guides and cut the foam without jumping off the guides.

The first thing I did was to file a toothed slot on the bottom of each guide to catch the wire after it exits the foam. The next modification was to attach light weight springs to the pine supports. The attachment point had to be designed so as not to cause the springs to bind, so I used two pennies (They drill easy and are readily available.) that were drilled to accept the springs and a pivot screw. The pennies were spaced off the pine 3/8" with 1/4" hollow carbon rods left over from another project. (Nothing goes to waste in my workshop, not even the dirt!)





SPRING HOLD BOW WIRE AGAINST GUIDES

BOW

around the foam, turn on the power supply; gravity, spring tension and electrical resistance will do the rest.

Most of the time both ends of the wire exit the bottom of the foam at the same time. If one leads the other, it will drop down into the toothed groove where it's captured; the slower end of the bow will then exit and be captured on its own. This system has worked flawlessly for at least 30 cuts, so far. The great thing is that once the power is turned on it's completely hands off. A sketch and several pictures are included to illustrate the set up.

Happy Cutting! ■

New Book

"Personal Aircraft Drag Reduction"

...Written by Bruce H. Carmichael
Capistrano Beach, California

This 207 page book with 195 illustrations and 239 references contains information on aircraft drag reduction beyond streamlining. Composite materials and other advances now make it possible to obtain large drag reductions due to laminar flow. The book is written with a minimum of formulas to appeal to dedicated aircraft designers, builders and fliers who may not have an engineering education and contains a storehouse of data in written and graphical form.

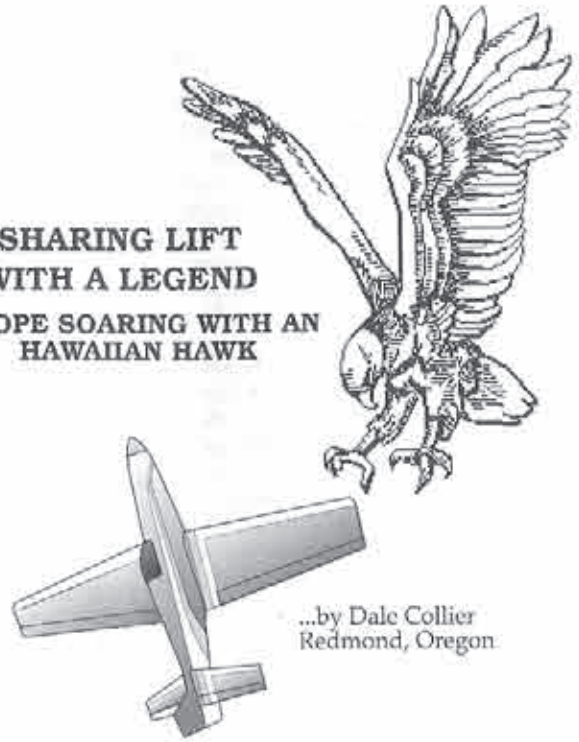
The first section, giving the history of laminar developments from the beginning to the present time, is followed by engineering data on 13 outstanding existing aircraft. The wing data section includes: minimum drag, maximum lift, maximum lift/drag ratio, and minimum power factor values for everything from model aircraft to high speed business aircraft. High lift flaps are also covered. Unique to this book is a summary of research data on laminar bodies. Low drag tail surface design, component interference drag and cooling drag are treated.

Simplified discussion of drag and performance concepts are followed by a laminar wing optimization study with and without flaps and a laminar body optimization study. Suggestions on refinement through flight test and an honest appraisal of laminar aircraft practical problems and available solutions are followed by a conceptual laminar aircraft design study. Some discussion and data for suction stabilized laminar wings and bodies are also included.

The book may be obtained post paid in the U.S.A. by sending $25 to Bruce Carmichael at 34795 Camino Capistrano, Capistrano Beach, CA 92624. The cost is $28 in Canada, $33 in Western Europe, and $35 elsewhere. ■

SHARING LIFT WITH A LEGEND

SLOPE SOARING WITH AN HAWAIIAN HAWK



...by Dale Collier
Redmond, Oregon

Circling alone above the West Maui Mountains, the female hawk flew unchallenged. Though others sometimes shared her heavens, there was no question she was queen, a queen with no natural predators. But that day the queen sensed something was different. Her kingdom was growing darker as the sun ascended in the cloudless sky, and her feathers prickled as she sensed her skills would soon be tested.

IN ANOTHER AGE, great volcanoes emerged from the ocean, devoid of plant and animal life. Lying nearly 2,400 miles from the nearest continental land mass, the cooling lava waited for the ancestors of Hawaii's native flora and fauna to cross the wide ocean barrier from all directions. As life came, clung to the rocks, and reproduced itself, it found a great diversity of habitats; and with the predators and diseases of the homeland left behind, life embarked along new evolutionary pathways. One of these ancestors (long before the first man was to spy the peaks of Mauna Loa and Mauna Kea from his canoe) was a female hawk.

She was to build a nest of twigs, sticks and leaves in the branches of a tree whose seeds had come to the Big Island only centuries before. In this nest, she would lay 2 small, light blue eggs, which she would defend from the predators she expected would come boldly in the day, or silently at night. But none ever came.

Weeks would pass and the eggs would both hatch. Always hungry, the hatchlings would scream for food "eee-ooo" and she would feed them insects and small birds which were plentiful. The young hawks grew strong on the Big Island and learned to soar high above the open grasslands and play in the lift along the windward cliffs.

Countless generations later, men arrived in their long, ocean-going canoes. With them they brought a variety of animals and plants including jungle fowl, pigs, dogs, and rats; but the hawk was already there soaring high in the mid-day sky. They marveled at this bird who could fiercely drive a lesser bird from her space or hang in the air effortlessly. It is not surprising then that the ancient Hawaiians made this bird a symbol of their beloved and feared royalty. They called her " 'IO " because of her scream.

THE WIND also must cross the ocean before it reaches these islands. Coming

from the northeast so consistently that shipping fortunes were built on it in the days before steam and diesel, the "trade-winds" buffet Hawaii's sheer island cliffs creating unequaled lift. Where the wind and the land meet on the island of Maui, white-tailed tropic birds pop in and out of their rocky nests; the great frigate birds or 'Iwas, soar gracefully down the coastline, while humpback whales frolic and breed in the warm coastal waters. Known as Kahakaloa because of its proximity to that small isolated village on Maui's north shore, this 800 foot, shear rock face supports the best soaring in the world.

Learning to slope soar here, and coming frequently to this remote spot to sharpen our skills, we have shared many wild times and special moments at this location. It was at Kahakaloa that my son, Matthew, and I set soaring records in duration, distance and altitude in 1988 and 1989. Since then, we have just been having fun flying. One of our favorite games has been "man-on-man vertical racing" (cloud base to horizon, pulling up sharply only after a winner has been declared). We have lost quite a few planes to the ocean this way when tails or other important structural items weren't as strong as our egos or desire to win.

We have also had fun with "free-flights" at Kahakaloa. Usually, a favorite glider whose time is past will be chosen to be "set-free", instead of dying a slow dusty death hanging on the wall or boxed forever. Fully ballasted with control surfaces trimmed and taped, several radio-less gliders have been thrown from these cliffs for their final flights, the gods either taking them into the heavens or the ocean below. We once even "flew" one of our gliders into the briny deep, radio and all, just to see how small the plane would appear when it hit the water. My son's scratch-built, 3/4 scale Coyote had seen better days when he direct-wired an unreliable receiver to some equally questionable servos and a 9 volt battery for its final flight. Captured on videotape, we have enjoyed over and over, watching his plane do a few final rolls and loops before heading out and down for the last time to splash in the ocean.

We have had dog-fights with a variety of slopers, including *Cheetahs*, *Ace All-Star Biplanes*, and our favorites WWII *Slope Scales*. One creative and energetic friend, Dennis Britain, has even experimented with using his gliders as platforms to fire rockets, drop parachutes, and take dramatic still and moving pictures.

We've had a lot of fun, but the events that were about to occur on an otherwise uneventful Saturday afternoon would soon top these adventures and give us a new appreciation of the beauty of our sport.

THE WINDS THAT SATURDAY were light even for winter, when the trades are sometimes fickle. Most of our friends had packed up their lighter planes and had gone thermalling on the other side of the island. Matthew and I, unwilling to give up on the wind picking up, had met a friend, Tom Schick; and the three of us made the long drive out to Kahakaloa. When we arrived we found conditions were much too light for our "fast stuff", but Matthew had brought a newly constructed *Impulse*, which did nicely in the marginal lift; so Tom and I contented ourselves to conversation and watched Matthew fly.

As the day grew on, we remarked that we had heard there was to be a partial solar eclipse in the early afternoon, but we didn't give it much thought. Perhaps because Hawaii's last solar eclipse, a total eclipse the previous summer had drawn so much attention; and today's eclipse was only supposed to be 60% over Maui; we weren't that excited. It was with only passing interest that we watched the moon slowly pass in front of the sun, through a small hole punched in an AMA card projected on Tom's white field box.

As the sky darkened, the air around us "came alive". The wind picked up a notch and white caps started to form.

As the eclipse progressed, we abandoned our viewing as it seemed we might be able to fly our faster ships after all.

Tom launched his Zero and I launched my Mustang to test the lift. To our delight there was plenty now to support even our craziest aerobatics. As we chased, rolled and dodged each other in mock combat, testing each other's skill and daring, Matthew watched and cheered us on. But he was not the only one watching our antics, for high above and behind, circling gracefully above the West Maui Mountains, was the hawk.

Like her ancestor mother before, she had at some time in the past been blown off course. Torn from skies above the Big Island (the only island in the Hawaiian chain reportedly inhabited by the 'IO) by hurricane or winter storm, she survived only to find herself alone on a strange island. Her solitary kingdom now was West Maui, and she spent her days ruling the sky above it. But today her domain was not the same. She too had sensed the darkening sky and the change in the wind, and now she spied two strange "creatures" who had invaded her space.

She had seen these strange creatures before flying off her cliffs, but she had never considered them to be much of a threat. They came infrequently and didn't stay long, and never hunted her food. But today was very different. Maybe it was the half light of the eclipse, or maybe it was their violent antics, but today she knew she could tolerate them no longer. The 'IO tucked her wings to her sides and from 2000 feet above took aim on her enemies.

WE SAW HER before we heard her. She streaked between our planes shrieking her battle cry, "eee-ooo". Instinctively, we dodged to avoid her attack. For the next ten minutes the 'IO chased and taunted us relentlessly. She could stay on our tails through the sharpest turns. She could accelerate to incredible speeds or stop in an instant. Anticipating our next moves, she rolled and looped easily. Her ability to snap roll two and three times in the blink of an eye was awesome. Our only advantage was that there were two of us. One could occupy her while the other gained altitude to dive and attack again.

Communicating continuously, we sparred with her this way. When she would hear the diving plane she would break off from the plane she was chasing, scream, and attack the intruder. After ten minutes of the most intense flying we had ever done she was the one that pulled up. She gained altitude and just watched us. Our knees were shaking. Who knows what she was thinking. Maybe she was amazed at our stupidity for not fleeing for our lives in the face of superior power and skill. Or maybe she was a little tired, but whatever her reason she just watched us from above for several minutes.

Then, resolved to destroy us, she attacked again. We scrambled as she singled out my Mustang. Rapidly closing the gap between us with talons poised, I did the only thing I knew to do to gain speed. I put the Mustang in a screaming dive straight down for the ocean. The hawk was with me all the way, belly to belly, talons reaching for the kill. This was "man-to-hawk vertical racing" for real, and we were dead even. Our little game of "chicken" was quickly reaching the point of no return, and she wasn't blinking. I pulled up as sharply as I could... So did the hawk.

Pulling up out of the depths, I was quickly losing my momentum, and the hawk was just waiting for my rolling to stop to finish me off. At that moment, Tom's Zero shot in from above startling us both. The 'IO broke for the Zero. I turned into the lift to gain precious altitude. Now from above, I pushed out and down for the Zero and hawk, which were headed straight out to sea. Closing on them steadily, the hawk never saw me until I was right under her. I pulled up and her claws struck my plane, but the Mustang kept

flying. And then just as quickly as it had all began, it was over.

The hawk pulled up again and gained altitude. She tucked her wings a few times and started to dive on us making her "eee-ooo" screech, but then would stop and resume her watching. After a minute or two, she flew off.

It didn't take Tom and I long to get our planes safely on the ground and start rehashing excitedly what had just happened. We had never experienced anything quite like this before and we were pumped.

We haven't seen her in the weeks and months that have passed since then, but we swear we can feel her watching us from just out of sight. It's hard to say how she feels about that day, but in our minds she still rules the skies above West Maui. Her fearlessness and natural flying abilities humbled us, and we will always consider ourselves lucky to have survived her attack.

* * * * *

IN A SPORT LIKE SOARING natural ability sometimes seems to overshadow practice and determination, and intuition often separates good from great flyers. If you're like me, you not only watch birds for the beauty, but to learn their secrets. Rare occasions when you get to fly with them are always special. Working the same thermal with an owl is the epitome of thermalling. Flying combat with a hawk, I know now is the ultimate in slope soaring.

On a Saturday, at a place called Kahakaloa on the Island of Maui, my friend Tom and I, with my son watching, battled an Hawaiian hawk during a solar eclipse. It was truly special. You may not believe that it actually occurred as told here. Sometimes we even wonder if it was true. But when these doubts come over us we need only look again at the one inch gash in the fuselage where the 'IO thought my brain was.

THE END

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on the Wing

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A Possible Solution to Adverse Yaw in Plank Planforms

In a previous column (August 1992), we discussed the possible effects of differential on the performance of tailless planforms. Since that column, we have been involved in effective solutions for two types of control problems, one involving a plank, which we'll discus this month, the other involving a swept wing. Both difficulties are related to aileron differential.

The first case centered on our favorite design, Dave Jones' Blackbird 2M. The Blackbird is essentially a plank type planform which can use either the CJ 3309 airfoil (3% camber at 30% chord, 9% thick) or the CJ 25^{2}09 (2.5% camber at 25% chord, 9% thick). Both of these are reflexed sections with strong positive pitching moments.

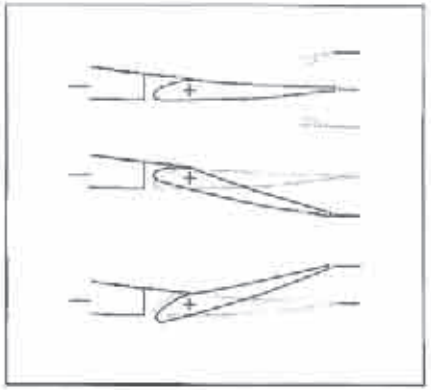


Figure 1

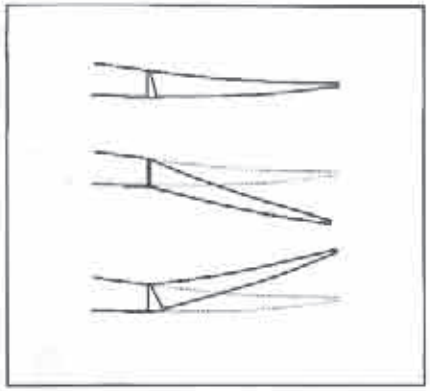


Figure 2

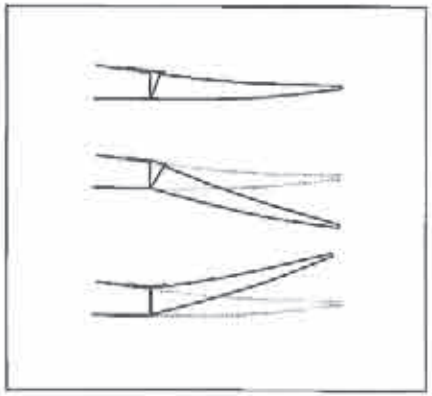


Figure 3

The original elevon design for the Blackbird 2M was of the "Frise" type. The Frise aileron utilizes a rearward hinge line such that when the aileron is deflected upward the leading edge protrudes into the airflow along the wing bottom surface. (See Figure 1.) This produces some amount of drag, and effectively counteracts adverse yaw.

After building several Blackbirds of various sizes, we noted they all shared a common fault. When flying in a straight line, alternating left and right aileron input did not produce rolling motion. Rather, the wing would simply oscillate around the yaw axis.

Our initial attempt at inhibiting this tendency was to hinge the elevon from the top surface, thus eliminating the Frise type action. (See Figure 2.) The Blackbird 2M, which we took to Australia in 1993, utilizes this hinging method. The yawing motion resulting from the alternating input described above is reduced, but not eliminated. On the other hand, up elevator is no longer accompanied by the increased drag of the control surface leading edge protruding into the airflow.

When constructing a foam core version of the Blackbird, we decided to hinge the elevons from the bottom surface. (See Figure 3.) Hinging from the bottom was no more difficult than hinging from the top, but the elevon area is actually reduced as it is deflected upward. Bottom hinging thus gives reverse differential action. Yaw response to alternating aileron input has been nearly entirely eliminated, roll control is very precise, and beautiful coordinated turns can be easily made. This is the smoothest flying Blackbird of all, including our XC version, which is significantly larger.

Next month, we'll describe an effective solution to a tip stall problem in a swept wing.

We are always appreciative of readers' suggestions for future topics. Contact us at P.O. Box 975, Olalla, WA 98359-0975, or via e-mail at <bsquared@halcyon.com>. ■

Understanding Sailplanes

...by Martin Simons

13 Loch Street, Stepney,
South Australia 5069

Yet more about wing sections

Clarification

Previous articles in this series explained how wing camber affects lift and drag. In reminding readers of these, some further clarification and emphasis seems necessary.

One of the troubles that besets practical people in model flying is that some very ancient theoretical ideas, long since disproved, tend to remain in the minds of our fellow club members, especially those as old as or older than the author of these articles. We were brought up on a diet of books like The Model Aeroplane Manual and Aeromodeller or Model Airplane News magazines dating back to the nineteen thirties and forties. Frequently the ideas purveyed in these old sources were seriously out of date or plainly wrong even at the time they were published. Young people in those days tended to accept them.

The resulting advice we may get now can be seriously misleading unless the greybeards concerned have taken the trouble to update themselves.

It is also easy to be carried away by the enthusiasm of some newer theories and follow the latest trends, not because they have been proved in flight but because we all tend to follow fashion. Computing methods have advanced greatly in recent decades and a great deal of reliance is placed on these now in wing design for full scale aeronautics. Even here, there are still some surprises when the aircraft is tested in flight.

With model aircraft and even for full scale sailplanes and ultra light aeroplanes, the basic theoretical work on wing sections is still being done. There is a lot that we do not know yet. The final test of a wing is always in actual flight.

But saying this does not mean that if the latest theory does not seem to work perfectly, the old one dating back to the previous century must be correct. Many of the old theories have been disproved. The newer ones work pretty well so far but, perhaps next week, someone will find a fault in some of them.

Nothing said in these articles should be beyond the understanding of the model flier who prefers flying to reading about it. At the same time, a little serious attention to what other practical people have discovered when flying and trimming their aircraft does help to avoid troubles on, or above, the flying field.

Revision on camber

The nature and effects of wing camber have been discovered in practical aeronautics over the past century. The camber in practice should always be described entirely in terms of the mean line or skeleton line of the wing profile. A camber of more than 5 percent (e.g., Eppler 385, Wortmann FX 63 - 137) is large, 3 to 4 percent (e.g. Clark Y, Eppler 193, Eppler 205) is moderately high, 1.5 or 2 percent (HQ 1.5/9, Eppler 375, NACA 2412) is small, a symmetrical profile has 0 percent, zero camber and so on. The position of the maximum camber point of a profile is also of some importance but less significant than the figures given above.

There is no other way to describe camber other than in terms of the mean camber line of the section.

Phrases like flat bottomed and undercamber are quite useful when considering the structure of a wing. A wing with a truly flat underside can be built easily on a flat board. It is a serious error, however, to suppose that any wing section with a flat bottom will behave like any other flat bottomed section. The camber of the sections may be quite different and this difference will affect lift, drag and trimming.

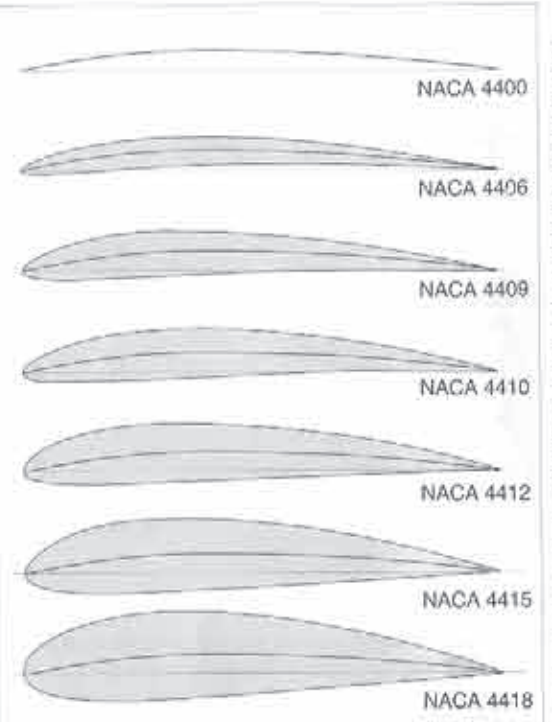


Figure 1

All the wing sections shown here were constructed around the NACA 4400 camber line. That is, all have 4 percent camber with the maximum camber point at 40 percent of the chord. This is what the first two digits in each case mean.

Although very different in thickness, all these profiles have very similar characteristics in flight, especially the same ideal angles of attack for trimming. The differences in thickness change the stalling behaviour and drag.

Covering wings with undercamber can be quite difficult, the film or fabric tending to pull away from the ribs on the underside. However, aerodynamically it is superfluous to mention these features since the shape of the mean line of the section is the decisive factor for both lift and drag. An undercambered wing will not necessarily fly more slowly or develop more drag than a flat bottomed wing or a symmetrical wing. The reverse may be true.

Some other terms, such as semi - symmetrical, Phillips entry, etc., are totally meaningless and should never be used under any circumstances. Those who persist in using such terms reveal only their ignorance. In practical flying, thinking of wing profiles in these ways leads only to disappointment and, sometimes, accidents.

A symmetrical wing profile produces zero lift at zero angle of attack, but will produce plenty of lift at positive angles. It will also produce its **lowest profile drag at zero lift.**

A cambered section, will produce lift at the geometric zero angle of attack.

To trim a cambered wing profile for zero lift (e.g., to put the model in a vertical dive or vertical climb), it must be brought to a negative angle of attack. The angle of attack at which a cambered wing section produces zero lift is called the **aerodynamic zero** of the section.

A cambered wing profile will produce a **higher maximum lift coefficient** than a symmetrical section but will **stall at a lower geometric angle of attack**, than a symmetrical section. However, measured from the aerodynamic zero, or zero lift trimming angle, the cambered wing stalls later.

A **cambered wing** will produce least drag when it is operating at some positive angle, know as the **ideal angle of attack** for the section. This is the reason cambered wings are used:

they produce **less drag at positive lifting trim**.

Aerobatic aircraft use symmetrical sections mainly because they need to have similar characteristics whether flying upside down or right way up.

Wing thickness

After camber, the thickness of a wing section is the next most important feature. **Figure 1** here (a development of Figure 4 from *RCM News* No. 8) serves not only to illustrate how thickness may vary within a family of wing profiles, but also re-emphasises the points made above. All the sections in Figure 1 have identical camber, 4%. They will all behave very much alike in terms of practical trimming for flight, and they will all operate best at the same ideal angle of attack. The fact that some would be allowably described as undercambered or (nearly) flat bottomed and others would be called (by the ignorant) semi - symmetrical, must not in practice confuse us.

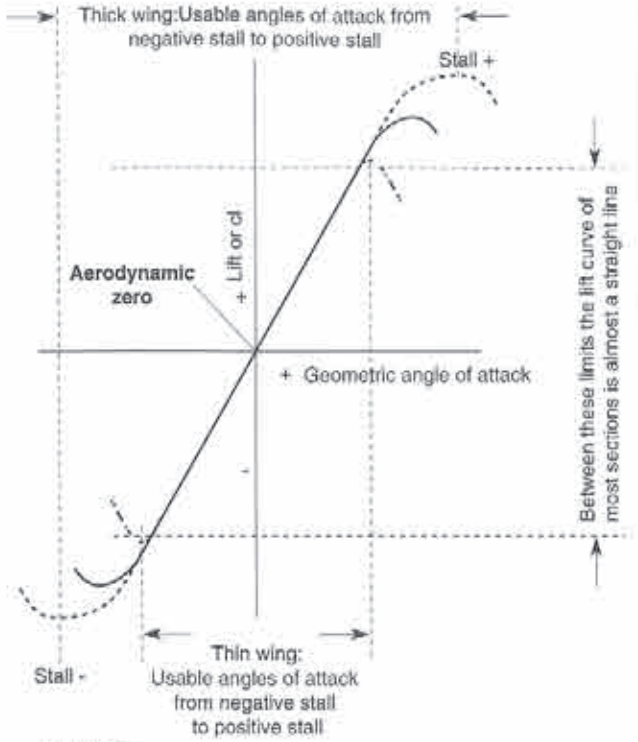


Figure 2
The lift curve of symmetrical wing sections of different thicknesses

The sections shown in this diagram are all from the NACA four digit series of profiles in which, as explained previously, the first two figures describe the camber, and the last two the thickness of the profile.

Thickness and the lift curve

Figure 2 shows in a general way how profile thickness affects the lift. As usual, in these simple charts, the lift coefficient is plotted against the angle of attack. Because the sections are symmetrical, they produce zero lift at zero angle of attack.

As the angle of attack increases, the lift also increases and, while there may be some minor wobbles in the line, the average slope remains similar for all the profiles. That is to say, starting from aerdynamic zero, increasing the angle of attack by one degree will produce about the same amount of lift for a thick section as for a thin one. Increasing the angle to two degrees, produces the same lift increment for all the profiles, and so on over a certain range of safe trimming angles.

There are, at model aeroplane sizes and flight speeds, usually some minor wobbles in the lift curve. These are caused by small scale local flow separations called separation bubbles. For the moment, they will be ignored since their effect is not usually very large with radio controlled models. (They become very much more significant with small free flight models.)

Differences in thickness make a difference when the wing approaches the stalling angle. As the diagram shows, the thin wing section tends to stall earlier than the others and the thickest profile stalls last. The thick profile may thus be described as a high lift section. This is not because it produces more lift at low angles of attack, but because it tends to stall later and reaches a higher maximum lift before stalling.

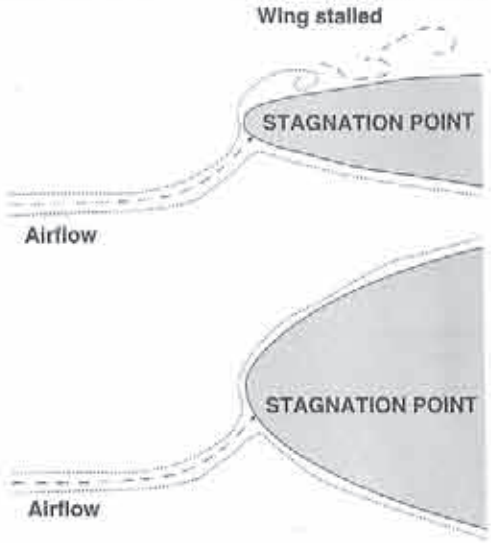


Figure 3
The flow of air round the leading edge of a wing section at a lifting angle of attack is complicated. The air approaches the lifting wing at an upwashed angle so the point where the upper and lower surface flows separate is slightly under and behind the leading edge. The air destined to pass over the top of the wing must first flow forwards. Since a thin wing has a smaller leading edge radius than a thick one, flow separation and leading edge stall is more likely. The thin section stalls early and sharply.

In contrast, the stall of a thick wing tends to be more gradual, the lift curve slope is gradually reduced and when the stall does arrive it is relatively gentle.

The reason the thin wing tends to stall sharply is that the airflow is forced to flow round a relatively sharp curve at the leading edge of the wing. As shown in **Figure 3**, at all positive angles of attack the point at which the flow divides to pass above and below the wing is always slightly under the leading edge. This point is termed the stagnation point. The air immediately above the stagnation point has to flow forwards for a short distance, against the mainstream direction, to get round the leading edge of the wing. If the curve it has to follow is gradual and

Since models take off and land at angles of attack close to the stall, the model with a thick wing will have a shorter take off run and a slower landing speed than one with a thin wing.

The model with a thin wing will be more likely to stall if it is in a steep turn because a turning model operates at a higher angle of attack than when flying straight at the same airpseed.

Also as the diagram shows, the stall of a thin wing is likely to be quite sudden. The lift curve increases steadily like the other profiles up to a point but the flow breaks away suddenly and with very little warning.

smooth, it can remain attached to the wing all the way round. If the wing is thin, however, it may be unable to follow the sharp curve and may separate, causing a very sudden leading edge stall.

One way of curing this problem is to make the leading edge of the thin wing more rounded, by, for instance, adding some filling material such as microballoons and resin, or by sanding the profile to a blunter shape. These dodges change the thickness form of the profile, and may have other undesirable results, especially on the profile drag.

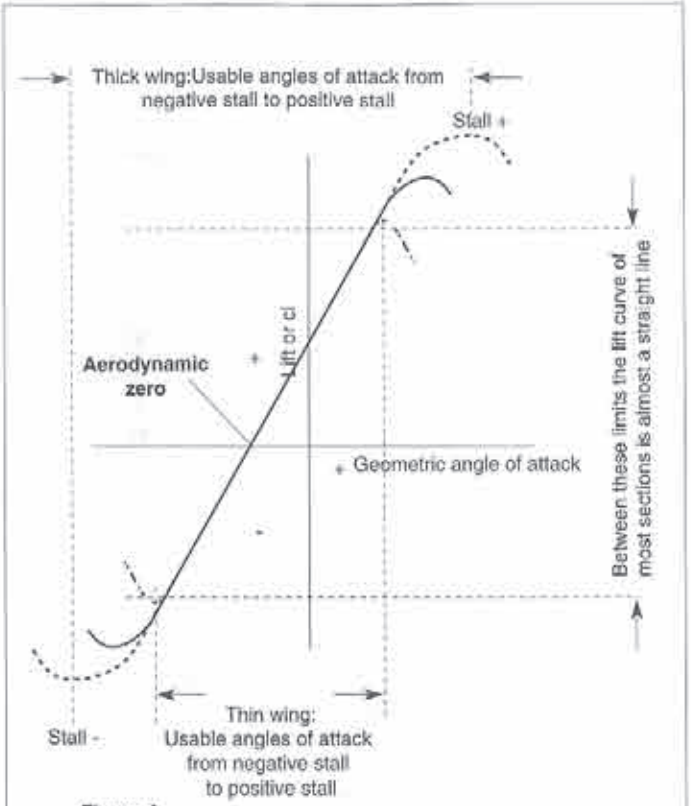


Figure 4
The lift curve of cambered wing sections of different thicknesses. Compared with the symmetrical sections of Figure 2, the lift curve moves as a whole upward and to the left. Otherwise there is very little change.

It is probabaly not necessary to say that to use a sharp pointed leading edge on a model wing will produce highly undesirable stalling behaviour. (The idea that a sharp leading edge enables the wing to cut through the air more easily, is quite false. The air flows, it does not have to be cut like a tough T bone steak.)

Figure 2 is concerned with symmetrical profiles. **Figure 4** shows the effects of adding camber. It was noted previously that, other things being equal if a section is cambered, the chief effect on the lift curve is to move it on the chart to the left and slightly upwards. That is, the zero lift trimming angle of attack is now geometrically negative, and the maximum lift coefficient is somewhat greater. Conversely, the negative stall (inverted flight) is sooner.

Thickness and drag

Once again, beginning with a series of symmetrical wing sections, the general effect on drag is shown in **Figure 5**. Here, as usual, the drag coefficient is plotted against the lift coefficient.

In **Figure 6**, the effect of camber is shown. As expected, the point of minimum drag moves up on the chart, so that a cambered wing has an ideal trim at some lifting angle of attack. This is why wings are usually cambered: to reduce drag at a usable lifting angle of attack.

As shown, the thinnest sections produce the lowest minimum drag and the thickest sections the highest. This seems to indicate that for any model

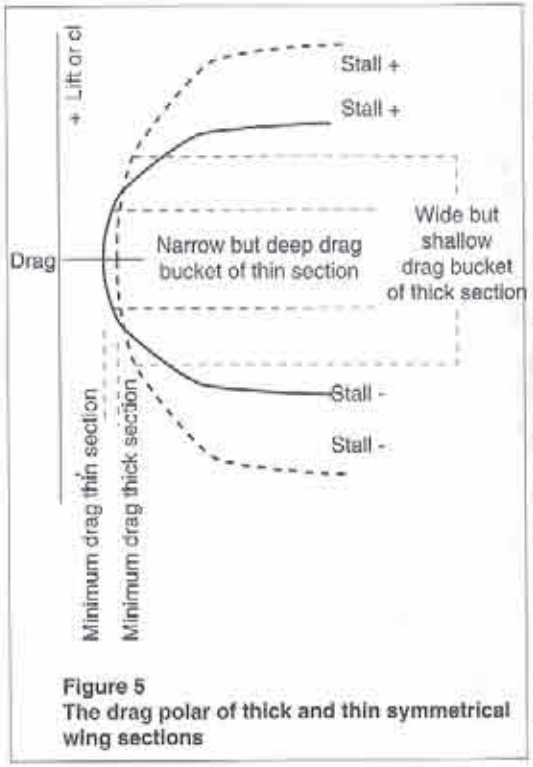


Figure 5
The drag polar of thick and thin symmetrical wing sections

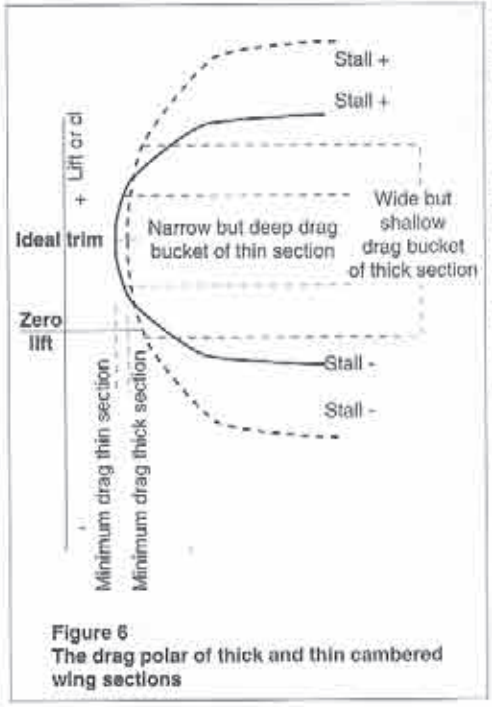


Figure 6
The drag polar of thick and thin cambered wing sections

which is intended to fly fast, the thinnest possible wing sections should be used.

However, the diagrams also show that while the thin section produces low minimum drag at an ideal trim, if the angle of attack is increased or decreased the drag rises quite sharply. On the other hand, while the thick section produces more drag at the ideal trim, there is a wider range of usable angles.

The slang expression for these effects is to say that the thin wing has a narrow and deep drag bucket, the thick wing has a wider but shallower drag bucket.

Figure 7 shows how two otherwise similar models may be compared, one with a thick wing and one with a thin section.

The one with a thin wing may be able to fly faster straight and level so long as it is accurately trimmed at the minimum drag attitude. It will slow down markedly if the trim is altered, as, for instance, when it is made to perform a steep turn in a pylon race.

The thick winged model will be slower in the straights but in pylon turns the drag rise will be much less severe. The result may be a faster time for the race as a whole.

Structural considerations

Quite apart from aerodynamic effects, it is well known that a thick wing can be more easily made strong and stiff than a thin one. For this reason alone, the thinnest of wing sections are impractical. The stresses tending to break wings multiply rapidly towards the inner end or root of the wing. It is here that some depth of wing section is most valuable from the structural engineer's viewpoint. Outboard

Thin wing: faster in the straights
Low angle of attack, ideal trim, narrow drag bucket

Thin wing: slower in the turns
High angle of attack, far from ideal trim, high drag.

Thick wing: slower in the straights
Low angle of attack, ideal trim, wide drag bucket

Thick wing: faster in the turns
High angle of attack, wide drag bucket, low drag

Figure 7. A comparison of two racing models with thick and thin wings. The final choice of section must be a compromise between the demands of straight flight and turns

the loads become rapidly much less, so thinner profiles are acceptable. It is very common for these reasons alone to taper wings in both chord and thickness, quite apart from aerodynamic considerations.

Compromise

For the present it may be accepted that there is no single answer to the question of which thickness of wing section to use for a particular model aircraft. Compromise between the narrow deep drag bucket and sharp stall, and the wider shallow drag bucket and milder stall, has to be struck. Not only the type of flying to be done but also the particular style of the pilot, has to be taken into account. ■

This concludes the last of the series of articles in the column "Understanding Sailplanes":

"Flight Without Figuring". We are delighted and honored that Martin found the time to share his technical expertise through the pages of *RCSD*; he began writing this column, "Understanding Sailplanes", in January, 1990. Thank-you, Martin! ■

SOARING HAPPENS!

ZIKA

The ZAGI Combat Wing

...from Trick R/C
...Jerry Teisan

About 10 years ago, combat became popular. At first, it was fun and exciting, but the planes evolved to these hybrid composite screamers that required excessive building time and expense.

We think the new generation of foamy combat ships are a lot more fun. Into the mix of foamys and semi-foamys Trick R/C of Venice, California introduces the ZAGI Combat Wing, based on the design premise that the lowest target profile is the most efficient for combat. The ZAGI has only one glue joint. Then, just cut out the foam and squeak the radio gear in. Precision-cut, two pound, white foam cores, with 2.4 mil poly tape provides a rugged ship with tough skin. Two standard servos and a 500 mAh battery works best. The ZAGI Combat Wing flies with a mixer radio or a separate electronic mixer. The ZAGI also flies using a DU-BRO mechanical mixer for non-mixing radios. Flying weight is only 16 ounces providing a loading of only 5.56 ounces per square foot. What is really surprising about this one pound wing is that it flies in winds from 7 to 40 mph. The ZAGI is fully aerobatic and agile, with a good speed range, for a one pound wing.

On the slope, the familiar sounds are: frequency call "47", shouts of "Coming out... Landing... On the course", followed by the high speed whistle of an expensive composite airplane. Take these same guys and put a ZAGI in their hands and all the rules of contact avoidance are reversed. It's more than fun. Emotions run high when you nail your buddy in the turn. Shouts and laughter follow each contact. Airplanes that flip and fall a few feet recover and keep flying. The best part of the ZAGI Combat Wing is the price and a three hour building time. Glue it, tape it, squeak your radio in and fly it.

Priced at $30 + $5 S&H USA. DU-BRO Mixer, add $6. CA residents add sales tax. Special club prices are available. Visa and MasterCard. TRICK R/C, 938 Victoria Ave, Venice, CA 90291; Voice/Fax: 310-301-1614. ■

NEW PRODUCTS

New Products

The information in this column has been derived from manufacturers press releases or other material submitted by a manufacturer about their product. The appearance of any product in this column does not constitute an endorsement of the product by the R/C Soaring Digest.

Specifications:

Wing Span	48"
Wing Area	2.83 Sq. Ft.
Airfoil	Zagi 12/5
Loading	5.65 Oz./Sq. Ft.
Weight	16 Oz.
Radio	2 channel or mixer

Kit Contains:

Precision cut 2# white foam
Pre-cut balsa elevons
Complete hardware package
2.4 mil poly tape
1.5 ounce lead nose weight
Complete instructions

Frisch Wilga

Müller 1/3 Discus

Scale Stuff!!

...from Sailplanes Unlimited Ltd.

Frisch Wilga

Sailplanes Unlimited Ltd. is now importing the PZL 104 Frisch Wilga 35, one of the best, easy to fly, scale towplanes available. It is popular in Europe, and hard at work wherever airtowing is flown.

1/3 ASK 18 - Paul Melnyk posing on a rare thermal day at Long Island.

The Wilga is 1/4 scale, with a 109" wing span (2.78 meters); it is 79" long and weighs 20 - 23 lbs. The fuselage and cowl are epoxy glass; the wings, flaps, ailerons, rudder, and elevator are obechi covered styrofoam. The wings have aileron and flap cut outs for servos. Kit includes scale landing gear, decals, wheels and a hardware package. Suitable motors, not included, are Zenoah, G62, 3W60, etc.

Large Scale Sailplanes

A small selection of 1/3 sized sailplanes have been ordered, and some are now available. They come with high gloss, epoxy glass fuselages, foam/obechi covered wings and flying surfaces. The wings have cut-outs for all flying surfaces; spoilers are installed, and the wing joiner rods are in place.

- Müller 1/3 Discus with flaps and ailerons, 5 meter span, HQ 2/12 airfoil, approximately 20 lbs.
- Müller 1/3 Discus with ailerons, 5 meter span, E209-207-205 airfoil, approximately 20 lbs.

EMS DG 800

The scale DG 800 sailplane from EMS in Germany is completely finished and ready to fly. It is extremely light for its size (4+ meters), has an HQ 2.5/14 wing profile, and weighs in around 6 lbs. It flies in the lightest of lift. Requiring zero building time, could be your best entry level scale experience.

It comes with styro/obechi wings covered in Supercoat or something similar, ailerons and flaps are (tape) hinged, spoilers are installed and ready to go, stab and rudder are finished, wings have plug-in winglets (for added performance and 2 wing spans to choose from).

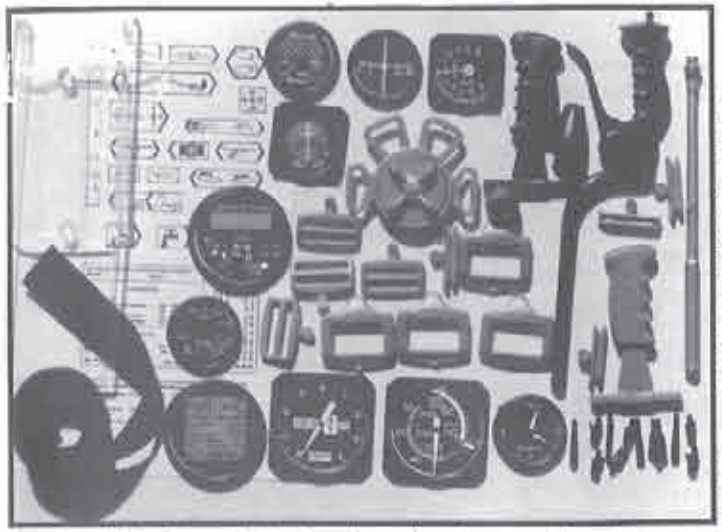
Coming Soon...

A new company with great prices is making fabulous, completely finished, all ready to cover, sailplane kits. The fuselages have the wing joiner tube installed, with a nifty snap-on system for the wing. Push fit the wing onto the fuselage and it will snap tight; when done flying, simply pull the wing off - it will "snap" off! A fixed or retractable wheel with a nifty shock absorbing mechanism is built into the fuselage. All flying surfaces are obechi/foam covered, and beautifully sanded with the ailerons and spoilers capped, ready for covering. All 1/3 and larger scale sailplanes, included are: Ka6E (5m), ASK 13 (5.3m), ASK 18 (5.3m), ASW 19 (5.4m), ASW 24 (5m), ASW 27 (5m), and Fox (4.66m). Available on special order.

The Fox is a two seater version of the Swift, which is the hottest, new, full-sized, aerobatic championship glider. Kits only require covering and installation of radio gear.

1/3 Scale Fox, ASW 24, ASH 26

Another new company is manufacturing superb, and very light (20+ lbs.) versions of the Fox, ASW24 and ASH 26: all glass replicas of the real thing. With the exception of cutting the canopy to fit the canopy frame, these models require absolutely no building whatsoever and even come with peel-off decals. The Fox comes with a scale color scheme and color molded into the molded, epoxy glass finish. Install radio and go fly. Initial availability will be (1) Fox and (1) ASH 26.



Cockpit Instrument Sets

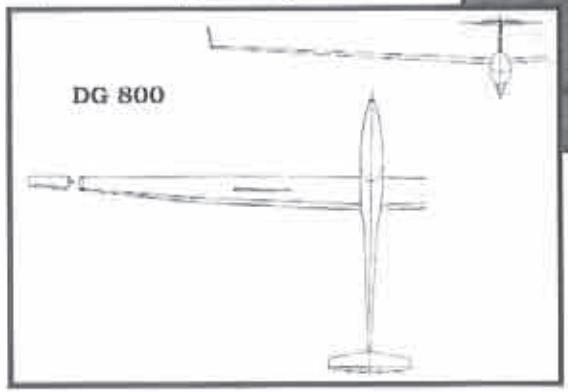
Cockpit Instrument Sets

Imported cockpit instrument sets, selling for around $35 each, include sliding cockpit window, instruments and instrument housing, controls and rudder sticks, nifty seat buckles and harness for a scale pilot, and a sheet of instrument markings for some of the more modern ships.

Favorable Exchange Rates

The recent shipment of Roedel ASK 21, Roebers ASW 24, Roebers Discus, and Büchele Nimbus 4, in stock at present, came in below projected costs, due to a more favorable exchange rate. Let's hope that the trend continues.

Marie Rolf is holding a 1/3 scale Ka6E.



Sailplanes Unlimited, Ltd., 63 East 82nd St., NYC, NY 10028; (212) 879-1634, fax: (212) 535-5295. ■

Schedule of Special Events

Date	Event	Location	Contact
May 11	2M Thermal Soaring	Tullahoma, TN	Brian Smith, (615) 393-4876
May 11	Desert Dash	Rosemond, CA	Merrill Farmer, (310) 923-2414
May 11-12	Wasatch Scale/PSS Fun Fly	Salt Lake City, UT	Bob Harman, (801) 571-6406
May 17-19	Slope Scale Soar-In	Los Banos, CA	Lynsel Miller, (408) 275-6403
May 17-19	SIG/LASS Midwest Slope Challenge	Lucas, KS	Paul Wright, (402) 796-2175
May 18-19	Spring Fling	Davis, CA	Jim Ludwigson, (415) 387-6260
May 18-19	CSS STD & UNL (Sanct.)	Cincinnati, OH	Chuck Lohre, (513) 731-3429
May 24-27	2m, Unl., Fun, XC	Morriston, FL	Ken Goodwin, (904) 528-3744
May 25	SASS HL #1	Redmond, WA	Jim Thomas, (206) 488-2524
May 25-26	Cash Slope Race	Davenport, CA	Gavin Botha, (408) 338-0662
May 25-26	Spring Thermal Soaring	Tullahoma, TN	Chuck Anderson, (615) 455-6430
June 1-2	4th Annual High Country Soaring Festival	Montpelier, ID	Arlie Stoner, (208) 847-3925
June 1-2	1st Annual Northeast Aerotowing Fly-In	Elmira, NY	John Derstine, (717) 596-2392
June 1-2	LSF V Task Weekend	Tri-Cities, WA	Don Pesznecker, (503) 659-9624
June 7-9	Second Annual Aerotowing & Scale Fun Fly in the South	Fayetteville, NC	Wayne Parrish, (919) 362-7150 Bernie Coleman, (704) 536-5260 b1rdbernie@aol.com John E. McCullough, (919)851-3538 jem1@nando.net
June 8 - 9	SWSA 2M Soarfest '96	Covina, CA	Pete Olsen, (909) 597-2095
June 8-9	HLG (8th)/2M (9th)	Baltimore, MD	Jack Cash, (301) 898-3297 or BadIdeas@aol.com
June 15	Desert Dash	Rosemond, CA	Merrill Farmer, (310) 923-2414
June 15-16	Int'l HLG Festival	Poway, CA	Ron Scharck, (619) 454-4900
June 15-16	Large Glider Fun Fly	Hiltenfingen, Germany	Local Hobby Shop or Flying Club at Schwabmünchen
June 20 - 23	Mid-South Championships	Memphis, TN	Bob Sowder, (901) 751-7252
June 29-30	Ontario Grand Prix Soaring	Cookstown, Ontario	Jack Nunn, (705) 728-4467
June 29-30	I.G.G. Aerotow Fly-In	Belpmoos (Bern), Switzerland	Jack Kagi, 011-41-01-926-2187
June 29-30	2m, Unl.	W. Palm Beach, FL	Jim McCudden, (407) 967-8909
July 8-9	Soaring Contest w/ Airtow	Near Kiel, Germany	Hans Büchele, 011-49-741-21826
July 8-9	Large Sailplane Fly-in w/ Airtow	Lahr, Germany	Hans Büchele, 011-49-741-21826
July 11-14	Flying Circus Model Flying Festival	Fiss, Austria	Flying Circus, + 07161 929385
July 13-14	SOAR 96 (Unl., 2M)	Redmond, WA	Jim Thomas, (206) 488-2524
July 13-14	Flatland Open	Hillsdale, KS	Richard Kohout, (913) 897-3104
July 16-21	Canadian R/C Soaring Nationals - Write: SOAR NATS 96, 18C Arnold Dr., Nepean, Ontario, Canada K1A 0K2	Ottawa, Ontario	
July 20-21	Large Airplanes w/ Airtow (Gliders & Motor) - Airfield Erbach	Ulm, Germany	Dieter Bulling, 011-49-7305 21359 fax: 011-49-7305-24162
July 20-21	XC & Pig Roast	Omaha, NE	Christopher Knowles, (402) 330-5335
July 27	Wasatch Thermal Contest	Salt Lake City, UT	Bob Harman, (801) 571-6406
Aug. 3-4	2m, Unl.	W. Palm Beach, FL	Jim McCudden, (407) 967-8909
Aug. 6-13	Viking Race	Hvolsvöllur, Iceland	Jón V. Gíslason, + 354 587 6789
Aug. 10-11	Thermal Grabber (Unl., 2M)	Redmond, WA	Jim Thomas, (206) 488-2524
Aug. 24-25	I.G.G. Annual Scale Slope Soaring Festival-Swiss Alps	Adelboder, Switzerland	Jack Kagi, 011-41-01-926-2187
Aug. 30-Sept. 2	2m, Unl., Fun, XC	Williston, FL	Ken Goodwin, (904) 528-3744
Aug. 31	SASS HL #2	Redmond, WA	Jim Thomas, (206) 488-2524
Sept. 13-15	Scale Airtow Meeting	Röttingen, Germany	Local Model Club or Hobby Shop
Sept. 14-15	Airtow Fly-in - Plettenberg, Germany		Local Model Club or Hobby Shop
Sept. 14-15	20th Annual NW Championship Soaring Tournament	Tri-Cities, WA	Tom Culmsee, (509) 375-1587
Sept. 21-22	Scale Fun Fly	St. Catharines Ontario, Canada	Gerry Knight, (905) 934-7451 Don Smith, (905) 934-3815
Sept. 21-22	2m, Unl.	Orlando, FL	Hank McDaniel, (407) 831-3688
Sept. 21-22	Fall Thermal Soaring	Tullahoma, TN	Chuck Anderson, (615) 455-6430
Oct. 4-6	Aerotow Fly-In	Pensacola, FL	Asher Carmichael, (334)626-9141 Rusty Rood, (904) 432-3743
Oct. 6	Fall "Intergalactic" RCHLG Championship	Cincinnati, OH	Paul Siegel, (513) 561-6872
Oct. 12-13	CSS STD & UNL (Sanct.)	Cincinnati, OH	Chuck Lohre, (513) 731-3429
Oct. 19-20	2m, Unl.	Williston, FL	Bob Wargo, (813) 938-6582
Nov. 29-1	Tangerine	Orlando, FL	Ed White, (407) 321-1863
Various*	1.5m Hi Start Contests	Washington, MI	Ray Hayes, (810) 781-7018

*May 11, 18, 25 & June 1, 8, 15, 29 & July 6, 20 & Aug. 10, 24, 31

A Bit About Martin Simons

Martin Simons was born in 1930 in a small village in Derbyshire, England. He cannot remember any time when he was not fascinated by flying. He struggled with early model aircraft, but had no help and some positive discouragement from parents.

His first sight of full scale sailplanes was during a visit to the British National Gliding Competitions in 1939, a fortnight before the outbreak of World War II. This was the beginning of a lifelong devotion to soaring, but all civilian flying was forbidden in Britain for the next six years. Model making and model glider flying were allowed, but materials were very scarce. Martin managed to design, build, and fly several models, with varying success. Parental disapproval strengthened.

As soon as possible after leaving school in 1946, to work in a Sheffield steel-works laboratory, he joined the gliding club at Camphill a few miles from home and began learning to fly on solo primary gliders. An accident in 1947 involving serious injuries ensued. Parents said, "We told you so!"

Martin did not get into the air again until he was in Germany in 1948 - 1950, drafted as an AC 1 into the occupation forces. RAF gliding clubs used captured German equipment and he managed to get himself posted to a tiny radio unit at Scharfoldendorf, known as Der Ith, a famous pre-war German soaring site. Model flying continued in a small way, and a little progress was made with full scale soaring.

After release from the RAF, Martin trained as a teacher and taught from 1953 in north London schools, married Jean and started a family while continuing to study in the evenings for a London University Honours Science degree. This was completed in 1959. His first daughter, Patricia, was born in 1957 and Margaret in 1960. There was little time or money for flying of any kind, but some free flight models were built and a few full sized glider flights done.

After 1959, he was appointed as lecturer at a teacher training college in Newcastle upon Tyne in northern England; a further degree was completed and then, in 1963, it was back to lecturing in London University, training graduates for teaching. He wrote some small school textbooks and several academic papers, while gaining some editorial experience with an

academic journal during this period. He also served for a couple of years on the British Gliding Association Magazine Committee, which produced the BGA journal, *Sailplane and Gliding*.

Both full scale and model glider flying occupied more time now. The first efforts with radio controlled models were with 'rudder only' controls in 1961, then with more sophisticated radios as these became available. Most flights were done over the slopes at Ivinghoe Beacon in Bedfordshire.

Progress with full scale soaring produced a Silver C badge in 1965, and the distance leg (317 km) of the Gold C in 1967, this last flown in a Ka 6E. A badly wrecked Skylark 2 was bought for £50, rebuilt over a two year period 1965 - 1967 with significant modifications, and flown successfully. (This plane is still operating in England.)

In 1968, Martin and family decided to emigrate. He took a lecturing post at the University of Adelaide in South Australia, where he was engaged again chiefly in training graduate teachers and supervising higher degree students. His own third degree was completed in 1974, in philosophy. More school textbooks and research articles were published.

Full scale soaring tended to eclipse modelling for a few years with the Gold badge completed and two diamonds added, flying now in glass/plastic sailplanes and entering State and National Championships, with some good results, and some not so good.

When model flying, designing and building began again seriously, Martin discovered the almost complete lack of modern books about model aerodynamics and set to work in 1974 to rectify this. The result was his book, *Model Aircraft Aerodynamics*, published by the well known English firm, Argus, in 1978. (After 18 years, this is now in its 3rd edition and is still the only book of its kind in the English language.) Ever since he has been publishing articles in modelling magazines in several countries, and continues to do so.

In 1986, after serious delays, the book *The World's Vintage Sailplanes 1908 - 1945* was published in Australia, and in England, the small book, *Model Flight*, followed in 1988, with more books since, and more still to come.

He continues to fly both model and full scale sailplanes and, since taking an early retirement package in 1993, has less spare time than ever. Martin and Jean remain together. Patricia returned to England, works as a librarian, is married, with two daughters of her own in London. Margaret is a successful journalist and novelist, living in the Blue Mountains of New South Wales.

The World's Vintage Sailplanes 1908 - 1945
Kookaburra Technical Publications Pty Ltd
P.O. Box 648 Dandenong 3175
Victoria, Australia

The World's Vintage Sailplanes 1908 - 1945
Raul Blacksten
P.O. Box 307
Maywood, CA 90270
($60 postpaid, add $5 for foreign)

Model Flight
Model Aircraft Aerodynamics
Zenith Books
(800) 826-6600
Historic Aviation
(800) 225-5575

Gliding with Radio Control
A beginner's guide to building and flying model sailplanes.
B² Streamlines
P.O. Box 976
Olalla, WA 98359
(US$18, airmail extra on foreign)

■

Sailplane Homebuilders Association (SHA)

A Division of the Soaring Society of America

The purpose of the Sailplane Homebuilders Association is to stimulate interest in full-size sailplane design and construction by homebuilders. To establish classes, standards, categories, where applicable. To desiminate information relating to construction techniques, materials, theory and related topics. To give recognition for noteworthy designs and accomplishments.

SHA publishes the monthly ***Sailplane Builder*** newsletter. Membership cost: $15 U.S. Student (3rd Class Mail), $21 U.S. Regular Membership (3rd Class Mail), $30 U.S. Regular Membership (1st Class Mail), $29 for All Other Countries (Surface Mail).

Sailplane Homebuilders Association
Dan Armstrong, Sec./Treas.
21100 Angel Street
Tehachapi, CA 93561 U.S.A.

The Vintage Sailplane Association

Soaring from the past and into the future! The **VSA** is dedicated to the preservation and flying of vintage and classic sailplanes. Members include modelers, historians, collectors, soaring veterans, and enthusiasts from around the world. Vintage sailplane meets are held each year. VSA publishes the quarterly **BUNGEE CORD** newsletter. Sample issue: $1.00. Membership is $15.00 per year. For more information, write to the:

Vintage Sailplane Association
Route 1, Box 239
Lovettsville, VA 22080

THERMAL TALK
F3J

A NEWSLETTER FOR F3J ENTHUSIASTS WITH EUROPEAN F3J LEAGUE NEWS

Thermal Talk is an unofficial publication designed to act as a forum to discuss, educate, and exchange information concerning FAI Class F3J. Subscription Rates: £5.00 UK, £8.00 Continental Europe, $11.00 North America, £8.00 Rest of World.

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T.W.I.T.T.

(The Wing Is The Thing)

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines. Full information package including one back issue of newsletter is $2.50 US ($3.00 foreign). Subscription rates are $18.00 (US) or $22.00 (Foreign) per year for twelve issues.

T.W.I.T.T., P.O. Box 20430
El Cajon, CA 92021

Reference Material

"Summary of Low-Speed Airfoil Data - Volume 1", Michael Selig wind tunnel testing results. $25 USA (includes postage), $29 surface outside USA, $31 air Western Hemisphere, $38 air Europe, $42 air all other countries. Computer disk, ascii text files (no narrative or illustrations), is $15 in USA; $16 outside USA. Source for all "SoarTech" publications, also. Contact Herk Stokely, 1504 N. Horseshoe Cir., Virginia Beach, VA 23451. Phone (804) 428-8064, email: herkstok@aol.com.

LSF

The League of Silent Flight (LSF) is an international fraternity of RC Soaring pilots who have earned the right to become members by achieving specific goals in soaring flight. There are no dues. Once you qualify for membership you are in for life.

The LSF program consists of five "Achievement Levels". These levels contain specific soaring tasks to be completed prior to advancement to the next level.

League of Silent Flight
10173 St. Joe Rd.
Ft. Wayne, IN 46835

R/C Soaring Resources

These contacts have volunteered to answer questions on soaring sites or contests in their area.

Contacts & Soaring Groups - U.S.A.

Alabama - North Alabama Silent Flyers, Ron Swinehart, 8733 Edgehill Dr. SE, Huntsville, AL 35802; (205) 883-7831.

Alabama - Central Alabama Soaring Society, Ron Richardson (Tres.), 381 Stonebridge Rd., Birmingham, AL35210; (205)956-4744, e-mail: lamerat@ix.netcom.com.

Alabama - Southern Alabama & NW Florida Aerotow, Asher Carmichael, (334) 626-9141, or Rusty Rood, (904) 432-3743.

Arizona - Central Arizona Soaring League, Iain Glithero, (602) 839-1733.

Arizona - Southern Arizona Glider Enthusiasts, Bill Melcher (contact), 14260 N. Silwind Way, Tucson, AZ 85737; (602) 325-2729. SAGE welcomes all level of flyers!

Arkansas - Northwest Arkansas Soaring Society, Tom Tapp (President), RT 2 Box 306, Huntsville, AR 72740; (501) 665-2201, eve.

California - California Slope Racers, John Dvorak, 1063 Glen Echo Ave., San Jose, CA 95125; (408) 259-4205.

California - Desert Union of Sailplane Thermalists, Buzz Waltz, 3390 Paseo Barbara RD, Palm Springs, CA 92262; (619) 327-1775.

California - Northern California Soaring League, Mike Clancy, 2018 El Dorado Ct, Novato, CA 94947; (415) 897-2917.

California - South Bay Soaring Society, Mike Gervais, P.O. Box 2012, Sunnyvale, CA 94087; (408) 683-4140 after 5:00 pm.

California - Southern Calif. Electric Flyers, John Raley (President), 1375 Logan Ave., Costa Mesa, CA 92626; (714) 641-1776 (D), (714) 962-4961 (E), e-mail: E-Flyer@ix.netcom.com.

California - Torrey Pines Gulls, Ron Scharck, 7319 Olivetas Ave., La Jolla, CA 92037; (619) 454-4900.

Colorado - Rocky Mountain Soaring Assn., Phil Weigle, 1290 Salem St., Aurora, CO 80011; (303) 341-9256 eve.

Eastern Soaring League (VA, MD, DE, PA, NJ, NY, CT, RI, MA), Jack Cash (President), (301) 898-3297, e-mail BadIdeas@aol.com; Bill Miller (Sec./Tres.), (609) 989-7991, e-mail JerseyBill@aol.com; Michael Lachowski (Editor), 448 County Rt 579, Milford, NJ 08848, e-mail mikel@airage.com.

Florida - Florida Soaring Society, Ray Alonzo (President), 3903 Blue Maidencane Pl., Valrico, FL 33594; (813) 654-3075 H, (813) 681-1122 W.

Georgia - North Atlanta Soaring Association, Tim Foster, (404) 978-9498 or Tom Long, (404) 449-1968 (anytime).

Hawaii - Maui Island Slope Soaring Operation, MISO, Hank Vendiola, 10-C Al St., Makawao Maui, HI 96768; (808) 572-5283.

Illinois (Chicago Area) - Silent Order of Aeromodeling by Radio (S.O.A.R.), Jim McIntyre (contact), 23546 W. Fern St., Plainfield, IL 60544-2324; (815) 436-2744. Bill Christian (contact), 1604 N. Chestnut Ave., Arlington Heights, IL 60004; (708) 259-4617.

Illinois (Northwest) - Valley Hawks R/C Soaring Club, Jeff Kennedy (President), 414 Webster St., Algonquin, IL 60102, (708) 658-0755, eve. or msg.

Iowa - Eastern Iowa Soaring Society (Iowa, Illinois, Wisconsin, Minnesota), Bob Baker (Editor), 1408 62nd St., Des Moines, IA 50311; (515) 277-5258.

Indiana - Bob Steele, 10173 ST Joe Rd., Fort Wayne, IN 46835; (219) 485-1145.

Kansas - Wichita Area Soaring Association, Pat McCleave (Contact), 11621 Nantucket, Wichita, KS 67212; (316) 721-5647.

Kentucky - Bluegrass Soaring Society, Frank Foster (President), 4939 Hartland Pkwy., Lexington, KY 40515; (606) 273-1817.

Maine - DownEast Soaring Club (New England area), Steve Savoie (Contact), RR#3 Box 569, Gorham, ME 04038; (207) 929-6639. InterNet e-mail <Jim.Armstrong@acornbbs.com>.

Maryland - Baltimore Area Soaring Society, Russell Bennett (President), 30 Maple Ave., Baltimore, MD 21228; (410)744-2093.

Maryland & Northern Virginia - Capital Area Soaring Association (MD, DC, & Northern VA), Steven Lorentz (Coordinator), 12504 Circle Drive, Rockville, MD 20850; (301) 845-4386.

Michigan - Great Lakes 1.5m R/C Soaring League & "Wings" Flight Achievement Program & Instruction. Ray Hayes, 58030 Cyrenus Lane, Washington, MI 48094; (810) 781-7018.

Minnesota - Minnesota R/C Soaring Society, Tom Rent (Contact), 17540 Kodiak Ave., Lakeville, MN 55044; (612) 435-2792.

Missouri - Independence Soaring Club (Kansas City area, Western Missouri), Edwin Ley (Contact), 12904 E 36 Terrace, Independence, MO 64055; (813) 833-1553, eve.

Missouri - Mississippi Valley Soaring Assoc. (St. Louis area), Ken Trudeau, 3033 Plum Creek Dr., St. Charles, MO 63303; (314) 926-8556.

Nebraska - B.F.P.L. Slopers, Steve Loudon (contact), RR2 Box 149 E1, Lexington, NE 68850; (308) 324-3451/5139.

Nebraska - S.W.I.F.T., Christopher Knowles (Contact), 12821 Jackson St., Omaha, NE 68154-2934; (402) 330-5335.

Nevada - Las Vegas Soaring Club, Jim Allen (President), 7117 Caprock Cir., Las Vegas, NV 89129; ph (702) 658-2363, fax (702) 658-1998.

New Jersey - Vintage Sailplane R/C Association, Richard G. Tanis (President/Founder), 391 Central Ave., Hawthorne, NJ 07506; (201) 427-4773.

New York, aerotowing Long Island Area, Robin Lehman, (212) 744-0405.

New York, aerotowing Rochester area, Jim Blum and Robin Lehman, (716) 367-2911.

New York - (Buffalo/Niagara Falls area) - Clarence Sailplane Society, Lyn Perry (President), (716)655-0775; e-mail perryl@sstaff.sunyerie.edu; Jim Roller (Competition Coordinator), (716) 937-6427.

New York - Long Island Silent Flyers, Stillwell Nature Preserve, Syosset, NY, Joe Coppola (President), (516)798-1479, or Taylor Fiederlein (VP), (516) 922-1336.

North Carolina - Aerotowing, Wayne Parrish, (919) 362-7150.

Northwest Soaring Society (Oregon, Washington, Idaho, Montana, Alaska, British Columbia, Alberta), Roger Breedlove (Editor), 6680 S.W. Wisteria Pl, Beaverton, OR 97005; (503) 646-1695 (H) (503) 297-7691 (O).

Ohio - Cincinnati Soaring Society, Chuck Lohre, 3015 Beaver Ave., Cincinnati, OH 45213; (513) 731-3429, lohre@iac.net, http://www.iac.net/~lohre.

Ohio - Dayton Area Thermal Soarers (D.A.R.T.S.), Walt Schmoll, 3513 Pobst Dr., Kettering, OH 45420, (513) 299-1758.

Ohio - Mid Ohio Soaring Society (MOSS), Hugh Rogers, 888 Kennet Ct., Columbus, OH 43220; (614) 451-5189, e-mail tomnagel@freenet.columbus.oh.us.

Oklahoma - Central Oklahoma Soaring, George Voss, (405) 692-1122.

Oregon - Southern Oregon Soaring Society, Jerry Miller, 3431 S. Pacific Hwy. TRLR 64, Medford, OR 97501, e-mail jmill@cdsnet.net, ph/fax (541) 535-4410.

Tennessee - Memphis Area Soaring Society, Bob Sowder, 1610 Saddle Glen Cove, Cordova, TN 38018, (901) 751-7252, FAX (901) 758-1842

Tennessee - South Central Area, Brian Smith, 317 Crestwood Dr., Tullahoma, TN 37388, (615) 393-4876, anytime.

Texas - Texas Soaring Conference (Texas, Oklahoma, New Mexico, Louisiana, Arkansas), Gordon Jones, 214 Sunflower Drive, Garland, Tx 75041; (214) 271-5334.

Utah - Intermountain Silent Flyers, Bob Harman, (801) 571-6406. "Come Fly With Us!"

Virginia - Appalachian Soaring Association, Virginia's Southwest (Bristol area), Greg Finney, 266 Plumb Alley West, Abingdon, VA 24210; (540) 628-4992 (H), (540) 676-3788 (W), (540) 676-3094 (fax).

Virginia - Tidewater Model Soaring Society, Herk Stokely, (804) 428-8064, email: herkstok@aol.com.

Washington - Seattle Area Soaring Society, Waid Reynolds (Editor), 12448 83rd Avenue South, Seattle, WA 98178; (206) 772-0291.

Outside U.S.A.

Australia - Southern Soaring League, Inc. (SSL), Mike O'Reilly, Model Flight, 42 Maple Ave., Keswick SA 5035, Australia. Phones: ISD+(08) 293-3674, ISD+(08) 297-7349, ISD+(018) 082-156 (Mobile). FAX: ISD+(08) 371-0659.

Canada - Greater Niagara Area Thermal Soarers (GNATS), Flat Field Soaring & Aerotowing, Gerry Knight, (905) 934-7451 or Don Smith, (905)934-3815.

Canada - MAAC Men Gliding Club, Jim Holland, 168 Verona Dr., Winnipeg, Manitoba, Canada R2P 2R8; (204) 697-1297.

Canada - Southern Ontario Glider Group, "Wings" Programme, dedicated instructors, Fred Freeman, (905) 627-9090, or Bill Woodward, (516) 653-4251.

England (Thermal Talk & Europe), Jack Sile (Editor), 21 Bures Close, Stowmarket, Suffolk, IP14 2PL, England; Tele. # 0449-675190.

Hong Kong - Robert Yan, 90 Robinson Road, 4th Floor, Hong Kong; (852) 25228083, FAX (852) 28450497.

Japan - Dr. Paul "Sky Pilot" Clark, 2-35 Suikoen Cho, Hirakata Shi 573, Osaka Fu, Japan; IAC+(81) 720-41-2934, fax: IAC+(81) 6-954-4144, e-mail: 76055.3546@compuserve.com, http://ourworld.compuserve.com/homepages/skypilot.

Scotland - Ron Russell, 25 Napier Place, South Parks, Glenrothes, Fife, Scotland KY6 1DX; Tele. # 01592 753689.

Reference Material

Still a few copies available of some issues of the printed transcripts of talks given on RC Soaring at the Previous Annual National Sailplane Symposium. Prices reduced to clear out stock. Talks were on thermal meteorology, flying techniques, hand launch, cross country, plane design, airfoil selection, vacuum bagging, plastic coverings, flying wings, etc., etc. Send SASE or call for flyer giving details. Many copies of most recent (1992) transcript left. Clubs have found them good for raffle prizes, gifts, etc. Al Scidmore, 5013 Dorsett Drive, Madison, WI 53711; (608) 271-5500.

BBS/Internet

Internet - Email list/resource of RC soaring related folks, including US and international club contacts, vendors, kit manufacturers/distributors, software, equipment and supplies. Also a resource for aeromodelling related WEB sites on the Internet. Contact Manny Tau at taucom@kaiwan.com, or on CompuServe: 73617,1731.

Internet soaring mailing listserve linking hundreds of soaring pilots worldwide. Send a msg. containing just the word "subscribe" to soaring-request@airage.com. The "digestified" version that combines all the msgs. each day into one msg. is recommended for dial-up users on the Internet, AOL, CIS, etc. Subscribe using soaring-digest-request@airage.com. Post msgs. to soaring@airage.com. For more info., contact Michael Lachowski at mike@airage.com.

The Frequent Flier's Info. Hot Line, San Francisco Bay Area - Box 1 (lost & found airplanes, helpful tips, upcoming events), Box 2 (questions). Larry Levstik, (415) 924-4490.

Seminars & Workshops

Free instruction for beginners on construction & flight techniques, Friday & week-ends (Excl. contest days). Bob Pairman, 3274 Kathleen St., San Jose, CA 95124; (408) 377-2115.

THE GREATER NIAGARA AREA THERMAL SOARERS (GNATS)
Will Host a
SCALE FUN FLY for SAILPLANES & MOTORGLIDERS
SEPTEMBER 21 & 22, 1996
Approx. 30 Miles West of Buffalo/Ft. Erie
Niagara Peninsula, Canada

Emphasis will be on aerotowing, although winches will be available for those wishing to launch smaller size sailplanes. Bring your 3M (118") or larger sailplane with releasable nose hook and ailerons. Enjoy the thrill of being launched behind a skilled tug pilot; join the growing aerotow movement. 1996 MAAC and/or AMA membership required. $6 pilot registration fee.

We are expecting Robin Lehman, Sailplanes Unlimited, Ltd., and Jim Blum to be on hand, with their 1/3 and 1/2 scale gliders & tugs, to demonstrate and instruct in the art of aerotowing.

For additional information contact:
Gerry Knight, 360 Bunting Rd., St. Catherines, Ontario, Canada L2M 7L6
(905) 934-7451

Don Smith, 996 Lakeshore Rd., Niagara-on-the-Lake, Ontario, Canada L0S 1J0
(905) 934-3815

FIRST ANNUAL NORTHEAST AEROTOWING FLY-IN

June 1-2 1996

TO BE HELD IN ELMIRA NY
SOARING CAPITAL OF THE U.S.
HOSTED BY:
HARRIS HILL L/D R/C

COME FLY WITH US AND SOAR TO NEW HEIGHTS!

Three meter & larger w/ailerons & nose release
Fun & training- join the growing aerotow movement. Experienced tow pilots & tugs willbe provided. Large flat site. $5.00 reg.
Contact: John Derstine 717-596-2392

SECOND ANNUAL AEROTOWING & SCALE FUN FLY IN THE SOUTH

June 7 - 8 - 9, 1996

To be Held at the
PIEDMONT AEROMODELERS
R-C Club Field
Fayetteville, North Carolina

Mark your calendar! See you there!

For further information, contact:
John E. McCullough, (919) 851-3538
or e-mail jem1@nando.net
Bernie Coleman, (704) 536-5260
or e-mail b1bernie@aol.com
Wayne Parrish, (919) 362-7150 After 9 pm

This event is open to anyone with a $5 landing fee, a valid AMA license, and a real interest in scale sailplanes. It is being held to bring scale enthusiasts together for a fun time and to meet others who love flying beautiful sirplanes. Scale soaring is growing by leaps and bounds. Five years ago, scale sailplanes were scarce and aerotowing was a dream. Today, scale sailplanes are admired wherever they are flown, and aerotowing is catching on fast. Our first effort in May, 1995 brought 14 pilots, 12 sailplanes and 4 towplanes together for some great flying. The weather was great, and the 1/2 mile square hay field is ideal. It was the first time aerotowing for most, but all wanted to know when we were doing it again. Now they know! If you want to learn how to aerotow your sailplane, to learn how to be a towplane pilot, to share your plane with others, or just have fun, come fly with us! The field is easy to find. It is in the heart of North Carolina's Costal Plains off I-95. Take I-95 exit 58 east on U.S. 13 for 2.2 miles, turn right on Hayfield Rd. for 1.5 miles to stop sign, straight at stop sign for 1/4 mile, and field is on left. There are motels close by and some of the best Southern Fried Chicken you have ever tasted!

Classified Note

Please note that the cut-off date for classified ads has been changed to the 1st of the month.

The cut-off date for display ads is also the 1st of the month, and the ad must be camera ready.

Davenport Cash Trophy Slope Race

...by Gavin Botha
Boulder Creek, California

Based on the huge success of last year's cash trophy race, it was inevitable that a second and even better event should follow.

Davenport

Davenport will remain the host for the second annual cash trophy race on May 25-26, 1996. Located on the California coast, about 15 miles north of Santa Cruz, Davenport is one of the most scenic settings for high-performance slope racing. With winds averaging over 25 mph, and fantastic lift conditions, this site has become a favorite for unlimited racing.

Cash

Using cash prizes to lure all of the top pilots provides an opportunity for racers of all levels to compete with the world's best. This contest is a fun event, designed to bring all slope racers together for a weekend of action packed craziness. For those of you who are new to the sport of slope racing, this is your chance for some intense training! All entry fees are applied directly to the cash trophy awards (with the exception of race expenses). Pilots who finish in the top 15-20% will split the money. Raffle proceeds will also be applied to the cash awards. $1000.00 is the goal for first place prize.

The Race

This is American slope racing at its ultimate. That's right! Three or four man heats with pilots competing against each other, not a clock. After all gliders have launched, a 60 second countdown starts the race; four gliders scream across the start line at speeds exceeding 100 mph, heading toward the far turn. Colored turn lights flash, callers scream "Roll-Turn", wings flex, adrenaline flows, and four speeding gliders are headed back towards the near turn. Rolling the wings knife edge, and carving the edge of the cliff, the pilots guide their racers through the close turn and back towards the far turn. Eight laps later the winner crosses the finish line, victory rolls, and attempts to land while still loaded with adrenaline. Ahhhh, what a feeling!

First Cash Trophy Race

Last year's event provided some of the closest and most exciting racing I have seen. The wind and lift conditions were both perfect for record-breaking racing. The races were close, fast and exciting, with only 3 gliders lost to mid-airs. Locating the pilots and callers at the near turn has significantly reduced mid-airs, by giving the pilot full view of the course at all times. With George Paige as the CD, and dedicated crews of course workers, conflicts were eliminated and officiating was superb. Sportsmanship was excellent and the contest ran like clockwork, with 7 rounds of racing and fly-offs completed by 3 o'clock Sunday afternoon. Thomas Pils and Gavin Botha flew-off in an exciting race for top cash honors. Thomas won the race and went home a richer man. Gavin Botha, Rich Tiltman, and Daryl Perkins, all finished as cash winners.

Pre-Registration

To enter this event you must pre-register. This allows the organizers to be prepared on race day, getting you in the air faster. We welcome pilots of all skill levels, and will provide assistance if necessary. Unlimited slope racing is fast, exciting, and a fantastic spectator sport. If you are interested in getting really close to the action, then sign up to be a course worker. Course workers are entered into a workers-only raffle, with prizes that include a molded RnR Genesis and a Spectrum. To receive additional information, or a registration package, call or write to: Gavin Botha, 121 Paone Dr., Boulder Creek, CA 96006; (408) 338-0662. ■

ZIKA

Classified Advertising Policy

Classified ads are free of charge to subscribers provided the ad is personal in nature and does not refer to a business enterprise. Classified ads that refer to a business enterprise are charged $5.00 per month and are limited to a maximum of 40 words. The deadline for receiving advertising material is the 1st day of the month. (Example: If you wish to place an ad in the March issue, it must be received by February 1.) *RCSD* has neither the facilities or the staff to investigate advertising claims. However, please notify *RCSD* if any misrepresentation occurs.

Personal ads are run for one month and are then deleted automatically. However, if you have items that might be hard to sell, you may run the ad for two months consecutively.

For Sale - Business

GLIDER RETRACTS - high quality, 1/5, 1/4, 1/3 scale made in U.S.A. 1/4 are standard or heavy duty. Contact Bill Liscomb, 7034 Fern Place, Carlsbad, CA 92009; (619) 931-1438.

PC-Soar Version 3.5 Sailplane Performance Evaluation Program Optional Sailplane Library now expanded to 54 models including: Alcyone, Anthem, Genesis, Mako, Probe, Thermal Eagle, and Synergy-91. Free Library Upgrades. PC-Soar Upgrade to Ver. 3.5 $10, PC-Soar New Purchase $40. New Libraries of Sailplanes and Airfoil Polars $30. Please include $3 P&H for all purchases & upgrades. Also available: *RCSD* Database and Laser cut airfoil templates. LJM Associates, 1300 Bay Ridge Rd., Appleton, WI 54915; ph: (414) 731-4848 after 5:30 pm weekdays or on weekends.

PRECISION AMAP WING CUTTER, replacement parts, and service. AMAP Model Products, 2943 Broadway, Oakland, CA 94611. Butch Hollidge, (510) 451-6129, or FAX (510) 834-0349.

A.M.P. Aerial Model Products, sport, slope, race prototypes - all airfoils. 60" Del Valle Snake, 94" H&K Cobra, AMAP Flair, Kevin Cutler's full house Davenport Monitor. All race tested. Butch Hollidge, (510) 680-0589, eve, California.

FORD LONG SHAFT MOTORS, $75. Classic glider kits, cool bands. HITEC, FUTABA, AIRTRONICS radios. #2 meter zip starts: $24.95. Call us for your glider needs. 1-800-359-0233. Ask for Scott. 10AM - 4PM MTN time.

ELECTRICS ARE NOW: Specializing in ASTRO FLIGHT & LEISURE equipment. Illustrated catalog with special ELECTRIC FLIGHT information packet available. Phone 508-947-2805, $7.00 USA, $8.50 Canada, $10.00 overseas. Visa, Master & Discover Card. C S FLIGHT SYSTEMS, 31 Perry Street, Middleboro, MA 02346; ph/fax 508-947-2805.

For Sale - Business

Vinyl letters and graphics precisely cut to your specifications and pre-spaced for easy, professional results. Send SASE, call or e-mail for full details. Comp-U-Cut, 976 W. Foothill Blvd. Suite 328, Claremont, CA 91711; (909) 624-2906, email: ddmc@cyberg8t.com.

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PARACHUTES: $10. Dale King, 1111 Highridge Drive, Wylie, TX 75098; (214) 475-8093.

"SURE Transmitter GRIPS": $5.00 + S&H. Get a real grip on your transmitter. Instantly install or remove w/o modifications. Personalize and easily identify your transmitter. Basic Aircraft Tech., 10424 Golden Willow Dr., Sandy, UT 84070; (801) 571-6406.

For Sale - Personal

RnR Synergy III SE, NIB, white tops w/black bottoms, center wing section has special layup for slope racing... $565.00; Rotor glass fuse w/molded fin and stab... $100.00; Rotor wing cores, actuators, etc. Call for info: Rob, (619) 930-0616, Calif.

1/3 scale Nimbus 2, 6.7m, flaps/ailerons/spoilers, wings completely finished except for servos and covering, gel coat fuse... $1750.00 FOB; Roebers Discus, 4m, NIB... $575.00. Dan Troxell, (714) 831-8013, Calif.

Infinity 600 radio, very good condition, w/receiver, battery pack & servos... asking $300.00 + shipping (negotiable). Romeo Uriate, (510) 658-4750, Calif.

Thermal Eagle built by Texas Tom Williams, white/red with 4 x 4141 & 2 80's, skinny battery pack... $400.00. Tom, (405) 741-8016.

DUCK, 100" 7037 triple taper w/all Airtronics servos, newly finished, winner/tough contest ship... $425.00; DUCK, 118" 7080 triple taper, new, uncovered/bare but will cover, winner/tough contest ship... $395.00/$450.00. D.O. Darnell, doz@inworks.net, (918) 481-5855, fax: (918) 481-6373, OK.

Airtronics Module Upgrade 3.0, 600ma Tx pack. All functions of a Vision 3.0 w/built-in timer, four Air. 94394 servos, 800ma pack Rx, RCD 8 ch Rx, Air. switch (Tx & Rx ch 44). Best reasonable offer. All electronic components are in mint condition. Hans Wiederkehr, (516) 696-3361, after 6pm, EST, NY.

118" Shadow, newly completed, RTF, never flown, includes 6 servos (2 Airtronics 141's, 2 - 102's, 2 - H580's)... $575.00 with servos, $375.00 without servos + shipping. Stan Koch, (615) 352-9264, 7 - 9 pm, CDT, Tennessee.

German tow plane, Roebers Sky Wing, 99" span, suitable for 1/4 size or larger gliders, NIB... $475.00; 1/4 Roedelmodell Robin Remorquer (scale towplane), 2.18m span (86"), Clark Y wing profile, approx. 15 lbs., suitable motors are OS BGX-1, Brison 3.2 or similar, NIB... $350.00; 1/4 Roedel Piper Super Cub (scale towplane), 2.687m span (105"), Clark Y wing profile, approx. 15 lbs., suitable motors are OS 160 T, 300 T, OS BGX-1, Brison 3.2 or similar, NIB... $385.00; Roebers B-4, 3.75m span (147"), Ritz III wing profile, 8 lbs., NIB... $495.00; 1/4 Rosenthal Ralley Morane, 2.78m span (109"), approx. 18 lbs., NIB... $495.00. Robin Lehman, (212) 879-1634, New York.

Wanted

The S.W.I.F.T. Club needs a retriever, badly! The design should have a positive history and be complete or kit or plans. We need a retriever this season. Christopher Knowles, (402) 330-5335, Nebraska.

TIDBITS & BITS

Desert Dash
LSF Cross Country & Fun Fly

The following was sent in by Merrill Brady, Southern California.

"Somewhere there is a need to do things that are unknown to most; to a glider pilot we know what it is to say, "I was flying in the biggest lift. My glider was just a dot in the sky." Well, if you think that's not possible, it is! There is a place if you have the time. On the second Saturday of May, and the third Saturday of June, we are getting together in the desert for a fun fly day with good air and to have a good time. There will be enough room to fly as far as the eye can see.

"For LSF, we start with level 1.2.3.4.5. If you only need a time flight, you can do that, too.

"The runway is 700 ft., and landing is great, as well. There is a bathroom available, and a shaded patio for lunch, which can be a do it yourself BBQ or Subway.

"The location is a 1 hour drive from downtown L.A. in Rosemond. Take either the 405, 5 or 210 freeway to highway 14, going north to Lancaster. Continue north past Palmdale and Lancaster to Ave. A. Turn left on Ave. A; go about 3 miles to Ave. 60th. Turn right and go 1 mile to Gaskell; turn left. Continue less than 1 mile to 6720. There should be a sign on the left side of the road.

"Set-up time is around 9:30 am - 10:00 am. Flying is all day, and the wrap up is around 4:00 pm. The sponsors for this event are Connie & Harry, M M Glider Tech, and California Soaring Products. For more information, call Merrill Brady at (310) 923-2414." ■

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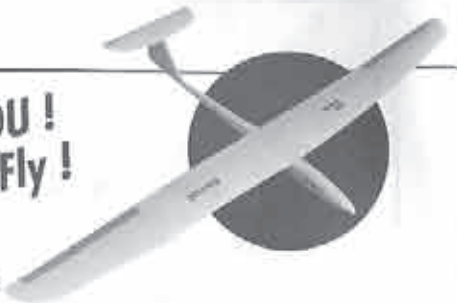

FLIC FLAC $ 380*
FLIC FLAC ELEKTRO $ 410 *Two metre class elegance !*

- Gelcoated fiberglass/epoxy carbon reinforced fuselage.
- Balsa sheeted foam wings with carbon fiber spar covered with Oracover.
- Cased aileron servo bays with pre-wired leads.
- Complete accessory pack.

Wingspan : 2 100 mm
Airfoil : RG15
Fuselage length : 1 050 mm (glider); 950 mm (Elektro)
Wing area : 34,5 dm2
Airframe weight : 720 g (Glider); 740 g (Elektro)
Functions : ailerons, elevator
Power : 10-12 cells (Elektro version)*

REFLEX EXPERT $ 525
REFLEX EXPERT ELEKTRO $ 535
An excellent all around performer.

- Gelcoated fiberglass/epoxy kevlar reinforced fuselage
- Obechi/fiberglass/expoxy sandwich sheeted foam wings covered with Oracover.
- Carbon fiber reinforced main spar.
- Pre-installed MULTIPLEX scissor airbrakes.
- Cased aileron and airbrake servo bays.
- Pre-wired aileron and airbrake servo leads.
- Pre-installed rudder and elevator Bowden cables.
- Gelcoated moulded full flying stab and rudder (Glider).
- Complete accessory pack.

Wingspan : 2 800 mm
Airfoil : RG12
Length : 1 230 mm
Wing area : 54 dm2
Airframe weight : 1 300 g (Glider); 1 250 g (Elektro)
Functions : ailerons, rudder, elevator, airbrakes
Power : 10-12 cells (Elektro version)

CARAT EXPERT SPECIAL $ 720
CARAT EXPERT SPECIAL ELEKTRO $ 735
Voll GFK/CFK...Master of the slope and thermal

- Gelcoated fiberglass/epoxy kevlar reinforced fuselage.
- Fiberglass/carbon fiber/epoxy sandwich moulded wings.
- Pre-installed MULTIPLEX scissor airbrakes.
- Pre-cut aileron and airbrake servo bays.
- Pre-wired aileron and airbrake servo leads.
- Pre-hinged ailerons and flaps.
- Pre-installed rudder and elevator Bowden cables.
- Gelcoated moulded full flying stab and rudder.
- Complete accessory pack.

Wingspan : 3 600 mm
Airfoil : RG8
Length : 1 400 mm
Wing area : 69 dm2
Airframe weight : 1 800 g (Glidar & Elektro)
Functions : ailerons, rudder, elevator, airbrakes
Power : 14-16 cells (Elektro version)

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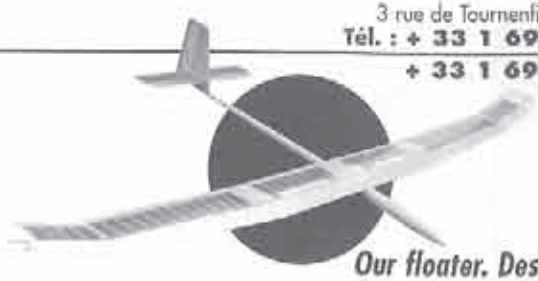


SUNWIND $ 490
SUNWIND ELEKTRO $ 490
Our floater. Designed for F3J thermal soaring class.

- Gelcoated fiberglass/epoxy kevlar reinforced fuselage.
- 3 piece built-up wing covered with transparent Oracover.
- Carbon fiber reinforced main spar.
- Pre-installed rudder and elevator Bowden cables.
- Pre-installed flip-up airbrakes.
- Built-up full full flying stab covered with transparent Oracover.
- Complete accessory pack.

Wingspan : 3 100 mm
Airfoil : SD 3021
Length : 1 420 mm
Wing area : 63 dm2
Airframe weight : 1 050 g (Glider & Elektro)
Functions : rudder, elevator, airbrakes
Power : 7-10 cells (Elektro version)

SPIRO SPECIAL $ 525
For pure fun and versatility, the SPIRO is hard to beat.

- Gelcoated fiberglass/Aramid/epoxy carbon fiber reinforced fuselage.
- Fiberglass/carbon fiber/epoxy sandwich moulded wing.
- Carbon fiber main spar.
- Aileron servo bays pre-cut and pre-wired.
- Carbon fiber wing key.
- Fiberglass/epoxy moulded T stab.
- Pre-hinged ailerons and elevator.
- Rainbow airbrush design on wing and stab.
- Complete accessory pack.

Wingspan : 1 800 mm
Airfoil : RG15 8,5%
Length : 980 mm
Wing area : 33,5 dm2
Airframe weight : 610 g
Functions : ailerons, elevator
Power : 7-16 cells

SOLITAIRE $ 450
The Hotliner for the serious F5B competitor

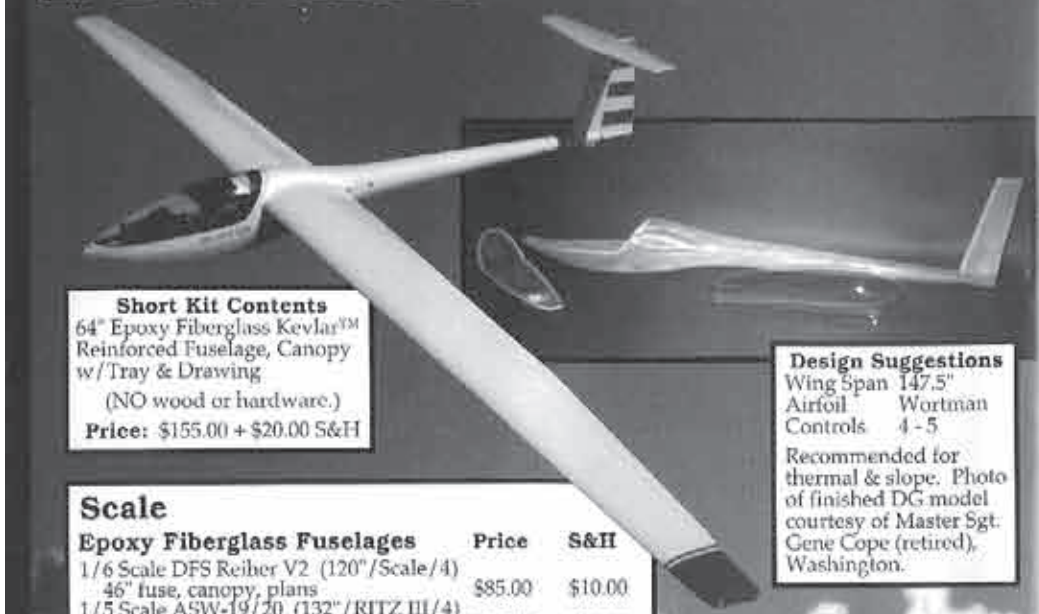
- Gelcoated glassfiber/Aramid/epoxy sandwich fuselage.
- One-piece fiberglass/Aramid/carbon fiber sandwich moulded wings.
- Carbon fiber main spar.
- Servo bays pre-cut.
- Pre-wired aileron servo leads.
- Fiberglass/epoxy moulded T stab.
- Pre-hinged ailerons and elevator.
- Complete accessory pack.

Wingspan : 1 690 mm
Airfoil : RG15 8,5% mod
Length : 985 mm
Wing area : 31,3 dm2
Airframe weight : 595 g
Functions : ailerons, elevator
Power : 27 cells

Also available : complete line of AERO-NAUT accessories such as CF propellers, yokes & shaft adapters.

CUSTOM DESIGNED, FIBERGLASS FUSELAGES FOR THE SCRATCH BUILDER

1/4 Scale DG - 100/200



Short Kit Contents
64" Epoxy Fiberglass Kevlar™ Reinforced Fuselage, Canopy w/Tray & Drawing
(NO wood or hardware.)
Price: $155.00 + $20.00 S&H

Design Suggestions
Wing Span 147.5"
Airfoil Wortman
Controls 4 - 5
Recommended for thermal & slope. Photo of finished DG model courtesy of Master Sgt. Gene Cope (retired), Washington.

Scale

Epoxy Fiberglass Fuselages	Price	S&H
1/6 Scale DFS Reiher V2 (120"/Scale/4) 46" fuse, canopy, plans	$85.00	$10.00
1/5 Scale ASW-19/20 (132"/RITZ III/4) 54" fuse, canopy, plans	$85.00	$10.00
1/5 Scale Nimbus (159"/Wortman/4 - 5) 54" fuse, canopy, plans	$85.00	$10.00
1/5 Scale Rhoenbussard (112.5"/Scale/4) 40" fuse, plans	$80.00	$10.00
1/5 Scale ASW-17 (135"/Mod. Eppler/4-5) 49" fuse, canopy, tray, dwg.	$90.00	$10.00
1/5 Scale Orlice (135"/E392/3-4) 49" fuse, canopy, tray, dwg.	$80.00	$10.00
1/5 Scale Ornith (142"/E392/3-4) 49" fuse, canopy, tray, dwg.	$90.00	$10.00
1/5 Scale Salto (90"/E387/3) 42" fuse, canopy, plan	$80.00	$10.00
1/4 Scale DG-100/200 (147.5"/Wortman/4 - 5) 64" fuse, canopy, tray	$155.00	$20.00
1/4 Scale Libelle (154"/RITZ I/ 3-4) 58.5" fuse, canopy, frame	$155.00	$20.00
1/4 Scale Jantar (187" or 202"/Wortman/4) 67" fuse, canopy, plans	$155.00	$20.00
1/4 Scale HP-18 (147"/RITZ III/4) 69" fuse, canopy, plans	$145.00	$20.00
1/4 + 10% Scale Salto (142.5"/RITZ I/ 3-4) 61" fuse, canopy, frame, plan	$155.00	$20.00
1/4 Scale SZD - 30 Pirat (147"/Clark Y/4) 62" fuse, canopy, plans	$155.00	$20.00
1/4 Scale Kestrel (167" or 187"/RITZ/4-5) 63" fuse, canopy, frame	$155.00	$20.00
1/3 Scale ASW-19/20 (16.5'/Wortman/4-5) 89" fuse, canopy	$250.00	Call
Semi-Scale ASK-14 (90" or 110"/flat bottom/4) (motor glider .15 cube in. or electric) 40" fuse, canopy, plans	$80.00	$10.00
1/4 Scale Super Cub (108"/12-20 lbs./4/Zenoah G-38 or equiv.) fuse, fiberglass cowl & wing tips, white foam cores, plans (NO wood or hardware.) 2 Boxes	$250.00	$25.00

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These epoxy fiberglass fuselages include suggested specifications (Wing Span/Airfoil/Radio Channels). We do not carry a large inventory, but rather custom make each fuselage as the orders are received. Normal delivery time for most partial/short kits and canopies is 10 days. Large orders take longer. Please call.

Short Kit Contents
41" Epoxy Fiberglass Kevlar™ Reinforced Fuselage, Hatch, Plans
Price: $75.00 + $10.00 S&H

Servo Cover Set w/Instructions
Covers 1 1/2" x 1 1/2" Servo Well
Trimming Req. $4.95 per set

Need Custom Mold Making?
Please call.

Design Suggestions
Wing Span 83"
Airfoil E193
Channels 3
Recommended for thermal & F3B.

Canopies & Accessories
An in-house vacuum form machine allows us to produce our own canopies, which are made using PETG .040. If you are looking for a canopy or other vacuum formed accessories (including sailplane, power, etc.), please let us know. We have a large inventory of canopies and do short production runs. Manufacturer inquiries are welcome.
Glider type from 11" - 24"
Standard type from 4" - 18"
Detailed type from 6" - 13"
Others - Various Sizes

Price Range:

Glider Type	$5.00 - $18.00
Standard Type	$4.00 - $12.00
Detailed Type	$4.00 - $12.00

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Selected foam cores are available thru:

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Foam cores or Ben Matsumoto, custom, glass bagged wings, stabs, rudders and other building services for all Viking Models, U.S.A. fuselages are available thru California Soaring Products.

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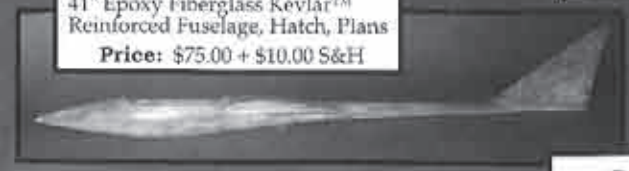
Inquiries: (818) 966-7215
FAX: (818) 966-7915



Thermal or Slope

Epoxy Fiberglass Fuselages	Price	S&H
Aeolus III (60"/NACA 63A010/3) 43" fuse, plans	$65.00	$10.00
Condor 3m (bolt-on wing mount/up to 10" chord) 52 1/4" fuse, nose cone	$80.00	$10.00
Contestant (148"/E205/3-4/10.5" chord) 60" fuse, canopy, tray	$80.00	$10.00
Elf 2m (bolt-on wing mount/up to 10" chord) 44 3/8" fuse, nose cone	$70.00	$10.00
Facctor (83"/E193/3) 41" fuse, hatch, plans	$75.00	$10.00
Oden (100-130"/S3021/As Req./10.25" chord) 51" fuse, canopy	$75.00	$10.00
Raven 3m (119"/Mod. E193/As Req./10.75" chord) 51" fuse, plans	$80.00	$10.00
Smoothie (100"+/None/Var.) 49" fuse, hatch	$70.00	$10.00
Special Edition (100-130"/Any/As Req./9.625" chord/bolt-on wing) 54" fuse, nose cone	$80.00	$10.00
Stiletto I (100-136"/Any/As Req./10" max. chord/plug-in wing) 49" fuse	$75.00	$10.00
Stiletto II (100-136"/Any/As Req./10" max. chord/bolt-on wing) 49" fuse, hatch	$75.00	$10.00
Stiletto RG-15 (100-136"/RG-15/As Req./plug-in wing) 49" fuse	$75.00	$10.00
Stiletto HQ 2.5/9 (100 - 114"/HQ2.5/9/As Req./10" root cord/plug-in wing) 49" fuse	$75.00	$10.00
Zen (100"+/None/Var.) 51" fuse, hatch	$75.00	$10.00

All fuselages are Kevlar™ reinforced.

S&H via U.P.S. - Continental U.S.A.
(Texas residents add 7.25% state sales tax.)
Check or money order only, U.S. funds, please. C.O.D. $4.75 additional. Prices subject to change without notice.

THE CONDOR

SPECS:	
WING SPAN	112.5"
WING AREA	918 SQ. IN.
AIRFOIL	SD7037
WEIGHT	62-66 OZ.
WING LOADING	9.7 - 10.3 OZ./SQ. FT.

★ VISA ★ MASTERCARD ★ AMERICAN EXPRESS ★ DISCOVER ★

CONDOR

Tomorrow's Sailplane, Technology Today

The Condor is designed by Mark Allen, who is considered one of the best model sailplane designers in the United States, if not the world. Mark has taken all of his previous experience in competition thermal duration flying, plus all the knowledge he has gained from his earlier contest and sport designs, to design the Condor. Mark Allen's previous planes, to name only a few, are: Falcon 880 and 800, Falcon 600, Swift, Thermal Eagle, Vulcan, Night Hawk, Sky Hawk, Electric Hawk, Falcon 550E, Rocket, Pocket Rocket and, of course, the molded, world championship F3B Eagle. By taking the best of these designs and the new construction techniques available today, Mark has come up with, what we feel, is the absolute best open-class sailplane available.

The wings are made in America by Ron Vann, owner of Spectrum Enterprises. Ron is also an avid competition flier, and is considered to be one of the best wing manufacturers in the industry. Taking his years of experience in manufacturing wings, Ron has produced wings and stabs for the Condor that we feel are world class. Starting with the spar that Mark Allen designed, Ron uses only the best and most accurately cut foam cores available. He then uses hand-picked obechi from Kennedy Composites, which is applied with West Systems epoxy. This is after he has first reinforced the wing with carbon fiber and fiberglass. The servo wells are routed out, as are the flaps and ailerons. What this means for the sailplane enthusiast is a minimum amount of work before getting the sailplane into the air. The wing is light but strong enough to take "pedal to the metal" launches. Also available as an option is Ron's unique internal capped hingeline. This means even less work for the modeler.

The fuselage is made by Steve Hug, owner of the Fuse Works. Steve is another master at what he does. Fuse Works makes what we consider to be the best fuselage in the business. Steve uses only the best fiberglass and Kevlar™ available. All fuselages are manufactured using the West Systems epoxy. Steve's fuselages have the least amount of pinholes, if any, that we have seen. In fact, the fuselage is so pretty that many people do not paint it. The fuselage is extremely light, and yet strong enough for very aggressive flying and landing. For those with very little building time, and those who don't like to paint, there is an optional pre-painted, in the mold, fuselage which includes a unique carbon fiber canopy.

All kitting is done at Slegers International's new and larger manufacturing facilities. We have spared no time or expense with supplying the modeler with the best materials available. The kit contains pre-sheeted wings and stabs by Ron Vann, fiberglass and Kevlar™ reinforced fuselage by Steve Hug, 3/8" diameter titanium wing rod from Kennedy Composites, optional 3/8" diameter steel wing rod by Squires Model Products, control horns and tow hook by Ziegelmeyer Enterprises, pushrods by Sullivan, or optional one piece steel rods. All wood is custom cut. Specially cut basswood of 60" is supplied to eliminate splices in leading edge, flaps and aileron capping. All balsa is hand picked, light to medium, to ensure light weight wing tips, stab tips, and rudder. Aircraft ply is used for the pre-fit servo tray and towhook block. A comprehensive instruction manual is included.

The Condor, designed by Mark Allen, wings by Ron Vann, fuselage by Steve Hug, and kitted by Slegers International, we feel, is the best open-class, thermal duration sailplane available, at an affordable price of $395.00 plus S&H.

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