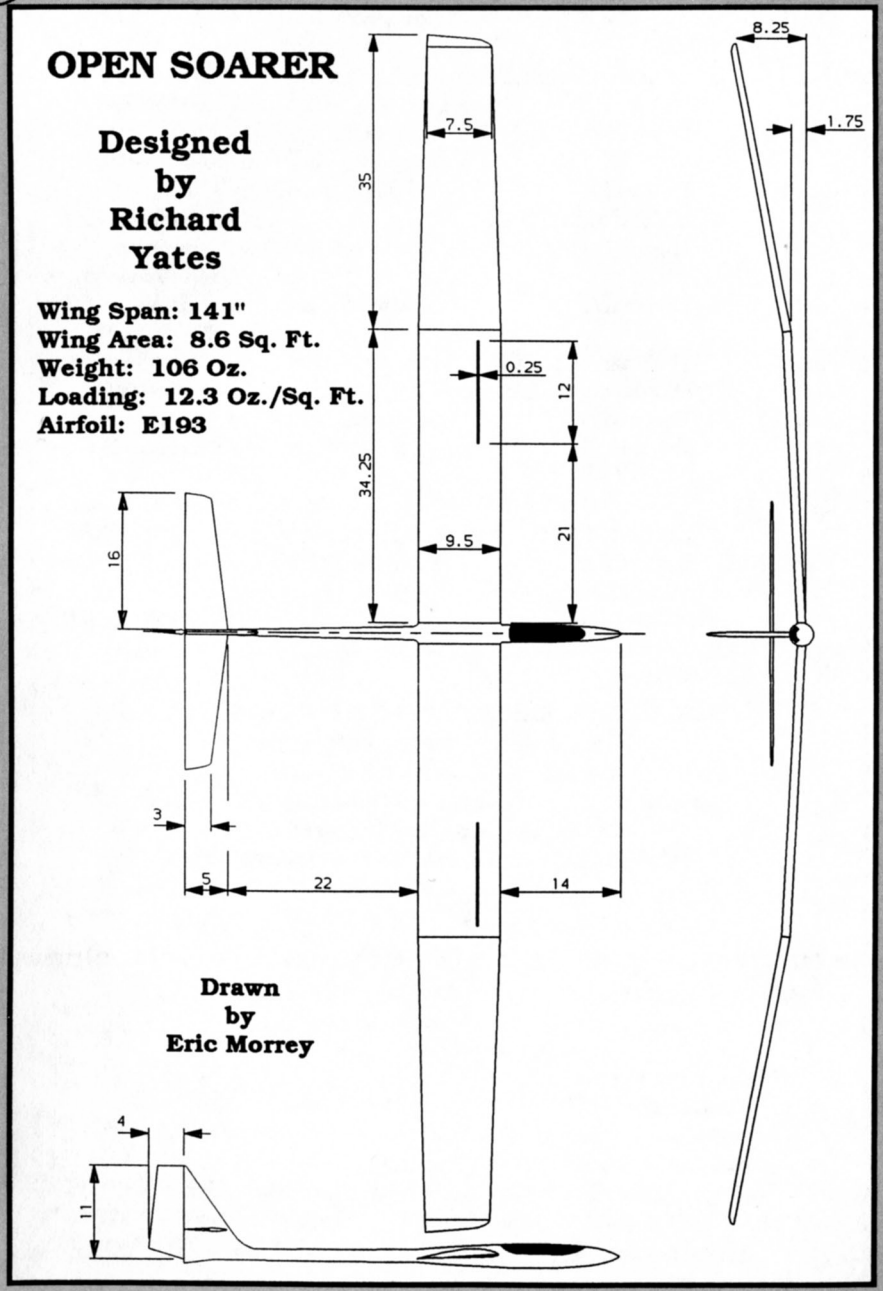
R/C Soaring DIGEST

October, 1990
Vol. 7, No. 10

OPEN SOARER

Designed by Richard Yates

Wing Span: 141"
Wing Area: 8.6 Sq. Ft.
Weight: 106 Oz.
Loading: 12.3 Oz./Sq. Ft.
Airfoil: E193



Drawn by Eric Morrey

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Schedule of Special Events

Date	Event	Location	Contact
Oct. 14	Regional Slope Race	Lompoc, CA	Rudy Mullen (805) 736-5777
Oct. 14	2 Meter/Unlimited Thermal	San Diego, CA	B. Anderson (619) 286-8366
Oct. 14	Thermal/Unlimited	Denver, CO	J. Sasson (303) 447-0813
Oct. 20	Thermal 2M & Unlimited	San Antonio, TX	B. Como (512) 650-9835
Nov. 4	Thermal/Unlimited	Modesto, CA	A. Stoner (209) 878-3403
Nov. 10	Thermal/2M	Lakeland, FL	L. Postage (813) 644-1942
Nov. 11	Thermal/H.L./2M Standard & Unlimited	Denver, CO	J. Bann (303) 355-3833
Nov. 17	Thermal 2M & Unlimited	San Antonio, TX	G. Dickerson (512) 656-1796
1991			
Jan. 19-20	Thermal/Open Unlimited — Southwest Regionals	Casa Grande, AZ	Vern Poehls (602) 945-1957
May 24-26	Slope Race Mid Columbia Cup	Richland, WA	(509) 627-5224 Wil (509) 627-2603 John (509) 525-7066 Roy

News Flash!!!

Mid-America Sailplane Symposium

October 27, 1990, 8:30 A.M.
Guest Speaker: Jim Thomas
Location: EAA Museum — Oshkosh, Wisconsin
$10.00 at Door for Registration
Contact: Bob Johnson (414) 676-0206
Tom Gressman (414) 367-0205

• •

Southwest Regionals Model Sailplane Championships

Hosted by: Central Arizona Soaring League
Casa Grande, Arizona
January 19 & 20, 1991
R/C Soaring Events for Open Class -- 1990/91 AMA Rules Apply
Trophies to Five Places Each Day Plus a Sweepstakes Award
January 19th: Triathlon (T6 Modified) with L4 Landing Option
January 20th: 7 Minute Precision Duration (T3) with L4 Landing Option
Gold Stickered Transmitters Required -- Entry Deadline: December 1, 1990
C.D.: Vern Poehls (602) 945-1957 & A.C.D.: Chuck Wehofer (602) 821-0874
C.A.S.L., P.O. Box 2472, Chandler, AZ 85244-2472

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Judy Slates — Publisher • Subscriptions & Address Changes • Submission of Materials Via Disk (MacIntosh or IBM) or Modem

J. Morgan Graphics — Printing (415) 674-9952

Feature Columnists & Technical Editors — Martin Simons, Bill & Bunny Kuhlman (B^2), Gordon Jones

The Soaring Site

We receive many phone calls and letters requesting information. Most of the requests can be easily answered. Some of the types of requests we receive are as follows:

1. I'm moving out-of-state. Can you direct me to other clubs or fliers in the area?
2. Can you direct me to someone who manufactures or supplies high performance sailplanes, composite materials, etc.?
3. Can you send me a list of anyone in California who does custom vacuum bagging or complete foam wing construction?

Questions 1 & 2 are easily answered, but can anyone answer question #3? If so, please drop us a line or give us a call so we can let others know who does this sort of work.

Another frequently asked question is about back issues. Yes, we have back issues available for all of 1990 and most of 1989. The cost is $2.00 each by first class mail. If you are a new subscriber this year, you may request that your subscription begin with the January issue. We effected this roll-back because of the many great reviews we received in other magazines where it was suggested that a new subscriber request that the subscription start with the January issue.

We hope you like the expanded version of the *Digest* effective with this issue.

Happy Flying,
J^2

R/C Soaring Digest
P.O. Box 6680
Concord, CA 94524
(415) 689-0766

Jer's Workbench

How to Make a Mold to Meet Your Hardware Needs

...by Jerry Slates

In the soaring world, I'm sure you have found by now that there is often a very limited supply of miscellaneous hardware items available at your local hobby shop. So, when you really need something, you find that you must forge, fashion or fabricate your own miscellaneous hardware items.

I needed a bellcrank of a specific shape and size that I couldn't find. But, rather than make only one by carving it out of a piece of plywood or printed circuit board, I decided to make a mold and cast an epoxy carbon-filled bellcrank. I would like to share with you how I went about making this mold. Remember, once made, you can easily pull additional "hardware" items at a later date.

You say, "Make a mold? Not me!" Yes, you can. It's easy!

Plug Construction

I started by making my plug (model of bellcrank) out of a piece of plywood, dowel and a couple of scraps of wood. Then it was glued together and painted with model lacquer. The finished model is shown in figure 1.

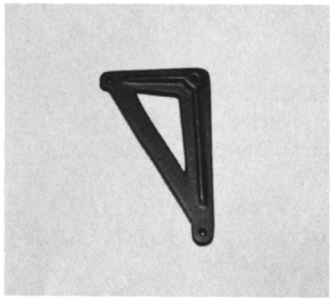


Figure 1 — Bellcrank Model

Mold Construction

The molding board (or small box), as shown in figure 2, is constructed out of plywood. You may construct your molding board out of any scraps of wood that you find around the workshop, once you have determined what hardware you need to make a mold of. Once the molding board is made, the model (plug) is glued permanently in place.

Next, knock off the dust and clean your molding board and plug, and apply three or four coats of wax. Now you're ready to apply a standard "2-part molding rubber", which can be found at most hobby shops, craft shops or at your local fiberglass dealer.

Figure 2 — Molding Board, Wax & & 2-Part Molding Rubber

Before you open the cans of molding rubber, carefully read the manufacturer's instructions. Ready? Mix the 2-part molding rubber as specified in the instructions and pour into the waxed molding board. See figure 3.

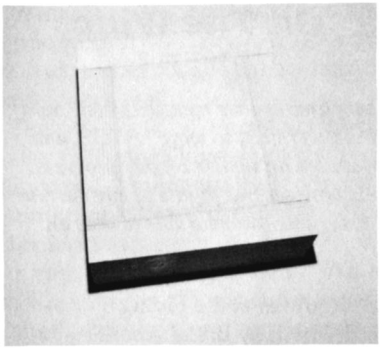


Figure 3 — Molding Board filled with Rubber

In about 24 hours, after the 2-part rubber mold has cured, you may remove the mold from the molding board. This is best accomplished by running a knife around the edge of the molding board and, then, by using a small screwdriver to finish the job. Using the screwdriver to dig into a corner of the rubber mold, carefully pull the rubber mold off of the molding board.

Now that you have completed your mold, let's make a bellcrank.

The Finished Product

First, wax the mold being careful not to have any wax build-up in the corners. The wax is only intended to make it easier to release the finished hardware item.

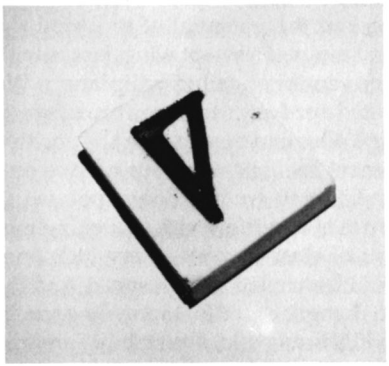


Figure 4 — Filled Mold

Cut lengths of carbon from a 50K carbon tow. Only a few inches will be required to make a bellcrank. Most small items do not require much carbon.

Ready? Fill your mold about 1/4 full of epoxy, and carefully layer in the pre-cut carbon until you get even with the top of the mold. Then, add more epoxy until the mold is full. See figure 4. Let stand until the epoxy has cured.

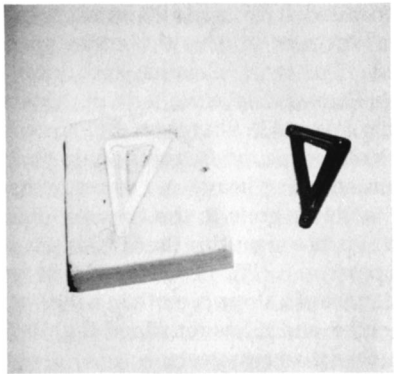


Figure 5 — Finished Product

Be careful not to get the epoxy on your fingers, or you will have a real mess on your hands. You may find it easier to use a couple of pointed sticks to stuff the carbon into the epoxy.

To remove the finished product from the mold, grab the mold on each end and give it a twist. Your product should pop out much like an ice cube will pop out from an ice tray. Using a small file, dress off the rough edges. See figure 5.

News Flash!!!: 1991 U.S.A. F3B Team Champions
Larry Jolly, Daryl Perkins, Joe Wurtz
More Information in November

Bill Kuhlman & the Flying Wing! Photo by Bruce Abell

On The Wing

...by B²

Some time ago we mentioned our own tailless project, a 'wing for F3B, and promised an update on our progress. Following several flights of our current design we are now able to give an informative report.

As is the case with many projects, our goal with Project Penumbra is not so much to come up with something entirely new and earth shaking, but more to take existing information from a variety of sources and come up with a design which (1) is within our capabilities to construct, (2) can be flown well with but a reasonable increase in flying skill, (3) will provide excellent performance in all flight regimes once sufficient skill is acquired. We are also eager to learn more about flying wing structures and aerodynamics. It is hoped that the eventual design will be a competitive F3B machine.

Conventional designs and swept flying wings are rotated in pitch by control surface movement behind the CG; the nose is raised by applying a downforce. Project Penumbra began with the idea that a swept 'wing with narrow chord and large sweep angle could have its elevator in front of the CG. This is advantageous in that the force needed to change pitch is in the direction of the desired change; thus down elevator increases lift over the center of the wing and raises the nose. Due to the extreme sweep angle needed and the fact that what is really being considered in this case is a canard (in general a poor soaring configuration), the idea was abandoned.

We knew from experience that plank designs would not be competitive in the F3B environment as they tend to be one speed airplanes. We also knew that trim drag had the potential of reducing the speed range of a swept wing, just as with a conventional tailed sailplane. We wanted our design to have a broad speed range. Our experience with the positive moment coefficients of our planks, and tailed aircraft we had flown, pointed to the use of an airfoil with a pitching moment of close to zero. Very little trim would be needed at high speed, and the trim change needed for thermaling would actually be beneficial to stability and the lift distribution.

Construction of our first swept 'wing was started. It featured a 9% symmetrical Quabeck section over the entire span, used 1° of twist, elevons, and double spar. One week later we had a pink foam 'wing covered in fiberglass. Built before we had our vacuum bagging equipment, it turned out so heavy and so crude that we've never gone to the time, trouble, and expense of putting the finishing coat of epoxy on it. We also realized that we had more of a slope racer than a thermal machine, and it has remained flightless for more than two years.

In retrospect, it should have been obvious that the symmetrical Quabeck section was not appropriate as it would not be able to provide a large amount of lift. About this time we received some information on the EH series of profiles created by John Yost. These sections are cambered, ranging from 1% to 2%, have high lift capability, and yet have a pitching moment of nearly zero. It looked like we had access to a wing section that would work well.

The 1989 MARCS Symposium featured Walter Panknin talking about his "Flying Rainbows". Walter was quite effective at committing us to our concept. Home from Madison we immediately set up our vacuum bagging system. We laid out constant chord foam cores, installed Walter's spar system, applied several layers of fiberglass and sucked it all down with our GAST vacuum pump. A few nights of work on the control surfaces and our creation was finished. Compared with the previous 'wing, this one was beautiful: accurate, light, and glassy smooth.

First flights of Penumbra.1 were hand launches over wet grass on a cold morning. Several hand tosses indicated that much weight could be safely removed from the nose, but running across the field as fast as possible and throwing the 'wing as hard as possible still resulted in its diving to gain speed. The ship was finally roughly trimmed out with the elevons in neutral, and we elected to winch it up.

Not only was it cold but the fog which had saturated the grass still lingered overhead. Earlier flights that morning with our Blackbird 2m had resulted in "out of sight" performances, so we were careful to limit the launch height of our new 'wing, particularly since the only paint on her was grey primer. We pulsed the winch line tight and threw her hard. She went up on the line with no veering and came off the line with no problems. Turns were made in both directions. There was absolute silence during an overhead pass. Two 360° turns brought her into a long shallow approach. Water sprayed into the air from the entire leading edge of the wing, but she was on the ground in one piece. We decided to pack up and go home with Penumbra.1 still in one piece and wait for a more conducive flying day.

Two days later, while cleaning Penumbra.1, it was discovered that during that single flight the upper surface of both wings had failed in compression! This probably occurred during launch. It suddenly dawned on us that fiberglass is not so good in compression as balsa, and that Walter's spar system was for a balsa sheeted wing. We were pleased, however, that Penumbra.1 had not only continued to fly but had flown so well, even with major structural failure.

Constructed of pink foam and fiberglass, Penumbra.2 is aerodynamically identical to Penumbra.1; structurally, two 3/32" plywood vertical web spars in each wing reach well past the previous point of failure. Penumbra.2 has now been completed and winch launched several times.

Results of these first flights have been quite satisfying. Although air speed is very high, Penumbra.2 gives obvious indications when in lift, and has been thermalled. Although a bit pitch sensitive, aileron control is quite positive, and the flaps, when deflected 80°, bring her to a nearly complete stop. The airframe is extremely strong, as evidenced by several hard "landings".

On the negative side, we still haven't entirely eliminated all of the structural problems, as on one launch (the highest) both wings appeared to flutter. This most likely came from the control surfaces. Also, launch height is not nearly so high as it could be. Improved height off tow will come with proper CG and towhook locations, along with eliminating the flutter and achieving higher speeds.

We are still at the "proof of concept" stage, yet all of the goals we set for Project Penumbra are being met. Although our construction techniques have been challenged, the project falls well within our capabilities. *...continued on page 6*

Open Soarer
...by Richard Yates

My 140 odd inch open class soarer was built initially with transportation in mind, the 4 piece wings being an easy to manage size. (Have you tried getting 6' wings in the back of a Nova? It can be done, but with care.)

The inboard panels have 6' of HT 15F apiece joined in strategic places with alloy plates, with the ribs being 1" apart. Careful selection of wood enabled above average amounts of shear webbing to be put in, which added tremendously to their strength. The tip panels are quite light enhancing the turning ability of the model.

When I came to work out the wing loading (including 12 oz. of joiners) I was quite amazed, as the model flies at its best in the most gentle breeze. However, it will cope quite well with strong winds. The 7/16" silver steel joiner has never bent (apart from the pre-bend which is done via an oxy torch and allowed to cool naturally) on the tow and, if you ask my regular towmen what the model goes up the line like, you might be surprised. I get the feeling that some of the other models using this joining system are dragged rather than flown up the line. (Towhook tweeking is as important as CG location for effective launching.)

My next Open Soarer is being built on similar lines to the present model. However, I have opted for a faster section S3021 and foam inner panels (to speed up building). With a bit of luck, the loading should be about the same. (Even if it's heavier, I'm not really bothered.) As on those days when you decided to fly 100S and then get outspanned by a big ship, it should do quite nicely.

The information on the Open Soarer was provided by Derek Lucas. Derek is the editor of *Verbals*, the club newsletter of the Soar Valley Soarers. Derek says, "Soar Valley Soarers are a small but very active club, flying silent flight only, and mostly to BARCS rules."

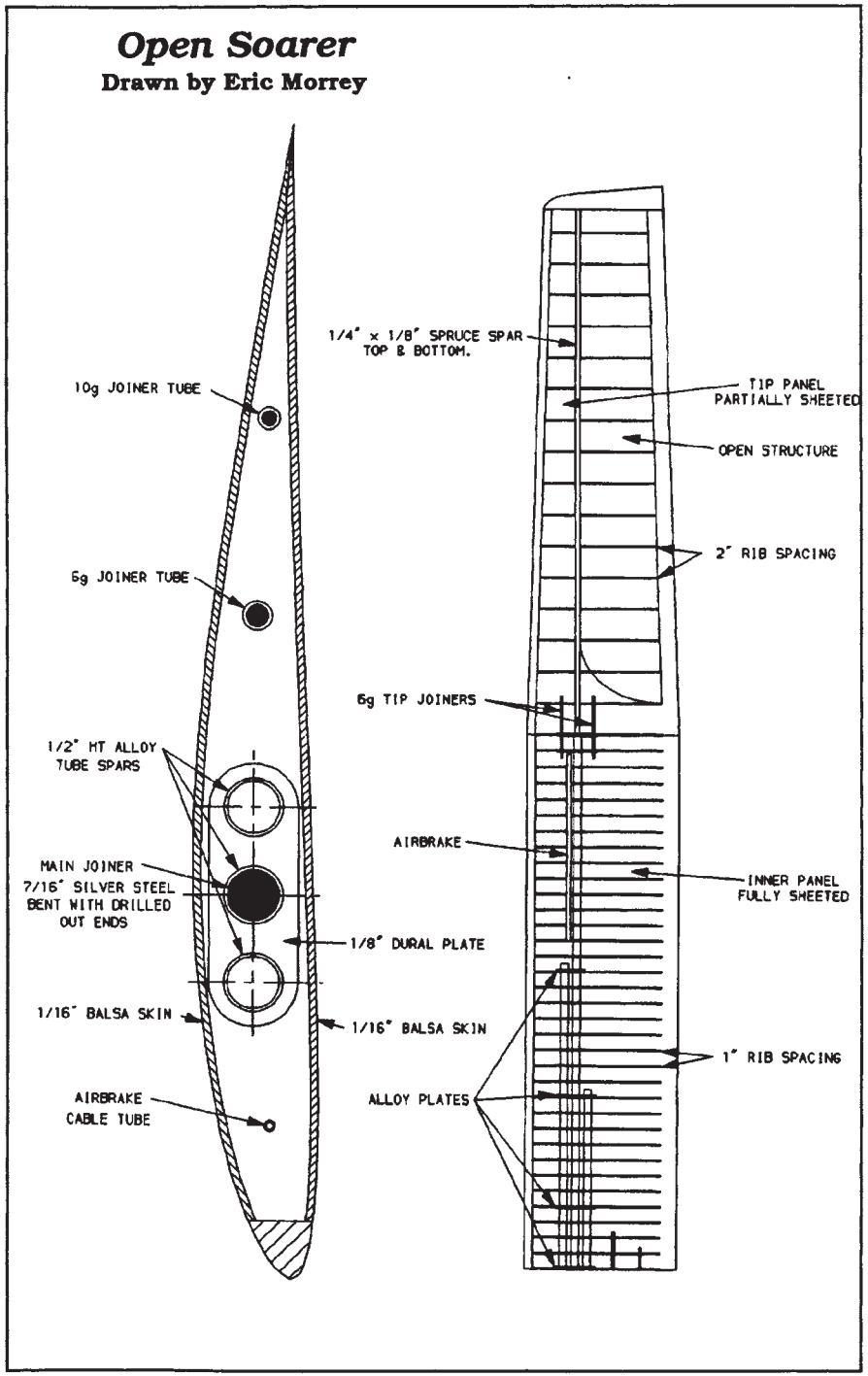
Verbals: Derek Lucas, Editor
50 Hazelwood Road
Wigston, Leicester
England

On The Wing...continued

Penumbra.1 proved easier to fly than expected, and it was immediately obvious that the design had great potential. Penumbra.2 has confirmed that notion. Our goal of learning more about structures and aerodynamics is being fulfilled beyond our expectations, and evaluation and further evolution of the design will continue.

We've drawn some sketches of the structure of Penumbra.1 and Penumbra.2. While these drawings are probably not sufficient for construction of a competition machine, they do include information on materials used in both versions and show the points of failure on Penumbra.1. We'd be happy to share them with anyone sending us $1.00 in postage. Full sized plans for Penumbra will eventually be available from our plan service, B^2 Streamlines; watch for an announcement in *RCSD*.

Bill & Bunny
Kuhlman
P.O. Box 975
Olalla, WA
98359-0975



Workbench Wisdom
Darn Good Pushrods
...by Don Anthony

Somebody once dropped a peal of wisdom on me that I took to heart. It was stated that: "....If you want to find a good way to do something, find a smart, lazy man and give him the job to do. Then, watch how he does it and learn!"

One of my young adulthood heros, that Grand Guru of sailplanes, Dave Thornburg, designed and built something called the "Bird of Time". Early on I bought a set of plans and built one. I recognized genius at work because, after I built that Bird of Time fuselage, every balsa fuselage I have ever built since then has used the same construction techniques pioneered by Dave. I simply have never found a quicker, easier, more effective way to do that job.

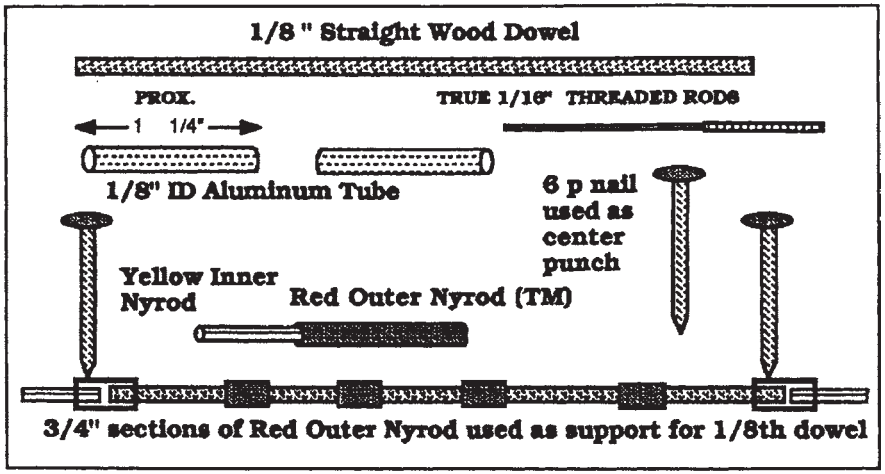
One problem I had during this time period was trim change due to the expansion of the plastic pushrods I so often used during these early building days. So, one day, I dreamed up the following system that has worked very well for me and which I would like to share.

I have used these pushrods on the smallest and largest planes including F3B. They have been completely trouble free and very stable under all temperature conditions and I have had to make little if any trim changes, even on the hottest days.

♣ ♣ ♣

Cut 1/8" dowel to proximate length. Cut three or four 3/4" pieces of red nyrod support sleeves and slide them onto the dowel. Cut two pieces of 1/8" ID aluminum tubing. Clean inside with pipe cleaner and alcohol. Sand end of dowel if necessary to make a light, push fit into aluminum tube. Make a guide mark on the 1/8" dowel about 3/4" from the end so that you will know how far you have slid it into the aluminum tube coupler. Put a little flex zap or medium zap on dowel end and slide it into the aluminum tube coupler to your mark. Take a short piece of yellow inner nyrod (about four inches long if you are exiting the fuselage with it, or about one inch long if it is just going to be a coupler. Put a little zap on it and slide it into the aluminum tube coupler until bottoms on the wood dowel.

Cut away end view of aluminum tube showing center punch dimples into nyrod or dowel.



Then, using a "V" block or a partially closed vise to center and support the newly fashioned rod end, take the 6p nail used as a center punch and lightly put about three indents in both the dowel end of the aluminum coupler and the yellow nyrod end of the coupler. This will make a mechanical joint to reinforce the glue joint. I have never had a rod pull apart with this technique.

Arrange the pushrod into your fuselage and estimate the correct length. Cut to fit and use the yellow nyrod and aluminum tube to complete the pushrod. Make sure that you have enough red nyrod outer sheaths on the 1/8" wood dowel for support before you finish the end of the pushrod as the red nyrod support sheaths will not fit over the aluminum tube. I have been able to make a spiral cut in a red tube and screw it onto the dowel when I screwed up, but this is no substitute for planning ahead.

The final step is to screw a threaded 1/16 rod to fit from the end of your push rod to your servos. I finish this rod up with a "Z" bend or just use a right angle bend and a nylon push-nut keeper for the servo wheel.

The red nyrod support sheaths are glued to the fuselage sides or other supports as required. I have used epoxy & microballoons, hot stuff & baking soda, but my favorite glue is GE silicon rubber. Just be very careful NOT to get any on the wood dowel as glued down pushrod don't work very well.

I have used this pushrod system for many years. The system has proved itself many times over. Sometimes, after a hard crash, the only intact things are the pushrods.

Don Anthony
7562 Langmuir Ct.
Dublin, Ca. 94568

Press Release
...from NorthEast Sailplane Products

Northeast Sailplane Products is pleased to announce two exciting new sailplanes to be added to their extensive catalog of RC sailplane products and accessories.

The popular Chuperosa handlaunch glider by Culpepper Models is now available with a SD7037 airfoil. The SD7037 has one of the best sink rates and lowest drag at thermal speeds of all airfoils tested by Selig. The kit also is available with a new 2 meter wing kit which provides outstanding glide performance and turning that must be experienced to be believed. The Chuperosa recently took first place in the 1990 NATS handlaunch class as flown by Rusty Shaw. These new Chuperosa versions are available exclusively from NSP.

NSP is also pleased to announce availability of the new Sabre by Dodgson Designs. This advanced sailplane combines the latest in technology with ease of building to produce a truly wonderful ship. The Sabre uses a SD7037 airfoil, and features a 121 inch wing with simple Shuemann planform, fiberglass fuselage, and foam tail group with single piece obechi sheeting. With performance similar to the famous Lovesong, this kit is sure to be a contest winner.

For more information contact Northeast Sailplane Products at (802) 658-9482.

NorthEast Sailplane Products
16 Kirby Lane
Williston, Vermont 05495

Understanding Thermal Soaring Sailplanes

Part 3

continued

...by Martin Simons

Camber and thickness

If it is allowed that minor errors in construction are unavoidable but also that they need not always have deleterious effects on performance, it seems reasonable to suppose that that major features of the wing section, rather than the finer details, should be considered first.

The two most important features of the wing profile, for the model flier, are camber and section thickness. It has to be said, as it has been said many times before, that these features of a profile cannot safely be judged by eye, and most of the common, extremely old-fashioned terms used, even now, by modellers, such as 'semi-symmetrical', 'undercambered', 'flat bottomed' and even 'Phillips entry', etc, are highly misleading from the aerodynamic viewpoint. To choose an aerofoil section on the basis of such phrases is to choose wrongly. It is a pity that experienced model fliers, and even respected writers who by now should know better, still confuse beginners, and perhaps confuse even themselves, by retaining such sloppy terminology.

There is some excuse for 'flat bottomed' because such wings are easy to build on a simple table or board, but that is the only significance this term has. Similarly, an undercambered section may require special care in attaching covering to a wing, since the film, fabric or tissue tends to pull away from concave areas. 'Semi-symmetrical' is strictly a contradiction in terms; a section is either symmetrical or it has camber. It cannot be semi-cambered, so it cannot be semi-symmetrical. (Consider whether it is possible to be 'semi-pregnant'!) The term, 'bi-convex' is slightly better, but it still does not indicate what the camber of the section actually is. (A fully symmetrical section, for instance, is bi-convex.) The term is unhelpful except when jigging the leading and trailing edges on the building board.

Phillips was an English experimenter of the 19th Century, whose work has long ago been surpassed. The Phillips entry, as patented by him in 1891, was in any case not remotely like the so-called 'Phillips entry' beloved by some confused model fliers today. How this strange muddle entered model flying terminology is rather a mystery, but it has existed since at least 1938 in the literature. It was wrongly applied then, as it is now. Anyone using this term is self-convicted of being a hundred years behind the times and mentally confused into the bargain!

The camber of a wing section is measured from the camber or skeleton line. This is the line which lies midway between the upper and the lower surfaces of the profile. Whatever methods may have been used in designing the profile as a whole, the camber can be found accurately enough for practical purposes by locating the mid line, and measuring its maximum distance from the true chord line of the section. Even a profile devised by drawing curved lines round the traditional bootsole, can be analysed for camber in this way. So can a modern section worked out by advanced computing techniques using 'panel methods' and the latest boundary layer theories. Two sections may look very different (for instance they may differ in thickness), but if they have exactly the same camber they will behave very much alike in the air.

Sometimes the maximum camber of a section may be stated clearly along with the ordinates, or in the numerical system used to identify the section. It is usual to express the maximum camber as a percentage of the chord. Thus, for the famous NACA 4 digit series of profiles, the first figure always indicates the maximum camber in percent, 4412 has 4% camber, 2412 has 2% camber, 6409 has 6% camber, 0010 has no camber (symmetrical) and so on. A camber of 8% is very high, 1% or less is small. Zero camber, of course, applies to all symmetrical sections.

The exact shape of the camber line and whether the curvature of the camber line is evenly distributed or concentrated more towards leading or trailing edge, are less significant factors than the total amount of camber. This is not to say that the form of the camber line may be ignored, but the first thing to consider is the total amount of camber. Its distribution is quite secondary in importance.

The same applies to the thickness. Once the maximum thickness of the wing profile is known, it may be useful to consider whether the equation which was used to work out the exact form to fit round the camber line was intended to encourage a larger or smaller proportion of laminar flow in the boundary layer. But even now it is not really known what effect these details have on the performance of the wing at model sailplane speeds and sizes, whereas the basic thickness, expressed as a percentage of the wing chord, clearly does have an important influence. On model aircraft, sections between 8 and 15% thick are usual but there is no hard and fast rule about these limits. They are quite often exceeded for various reasons.

Martin Simons
13 Loch Street
Stepney
South Australia 5069

A Special Wing Tip

...by Gert Kamffer

Here is something to think about when making foam wings...

I have found that the Koto veneer that is available locally is too thin to give enough strength to a wing without the help of a main-spar. The idea of this design is to keep it as light as possible, and extra glass would only add to the weight. Some years ago I got some aluminum litho-sheets from a printer...sheets 100 X 60 cm and 0,3 mm thick. First, I tried making U-shaped beams but had difficulty, as the taper got thinner. I had intended putting two U-shapes back-to-back, but ended up making two L-shapes. To get the epoxy to hold properly, I drilled some 5 mm holes at regular intervals.

The foam blanks were lined with polythene sheet and the cores were assembled with the litho-spars and epoxy and allowed to cure in the blanks, suitably weighted, before skinning. The finished cores were given Jelotong leading edges before being covered with a single layer of the Koto veneer. Only one litho-strip was used in the polyhedral panels.

The proof of the pudding is that it survived a mid-air meeting which gashed the wing right up to the main-spar without damaging the spar itself. The nice thing about a foam wing is that it's so easy to repair. All I did was to saw a square piece out of the wing, glue another piece of foam back in and replace the leading edge past the break on either side, sanded it to shape and veneered over the top. Except for glue-drying time, it didn't take more than forty minutes! Despite the 9 oz./ft^2 wing loading, the repaired wing can still handle semi-F3B launches...

Southern Soaring Club
Southeaster *Newsletter*
Editor: Dave Hayward
14 Roseberry Road
Mowbray 7700 South Africa

Towing by Hand-Held Winch

...by Peter Stevens

Hand towing has been part of the model gliding scene since the early days of free flight. The technique enjoyed popularity in radio control soaring until the advent of bungee and the electric winch, advantages of which are obvious.

Introduction

The basic principles of hand held winch towing should be familiar to all readers of *RCSD*, and it is my opinion that these basics cannot be learned by reading. You need to observe the technique demonstrated by an experienced team: once seen, never forgotten. What can be learned by reading are those little pointers, tricks, and outcome of experience tips which can be added to the basic knowledge. This is the main purpose of my articles.

For launching smaller, lighter models (say, 3 kg (6.6 lb.) and below), handtowing has a lot going for it. For instance:

1. Low cost
2. Long lasting, maintenance-free equipment
3. Uncomplicated, easily stowed
4. Potentially, with practice, more feel in the system. This could avoid breakages to wings or line.
5. When launch is finished, the line is wound in and, therefore, is in nobody's way.

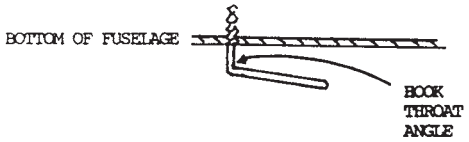
There is, to my mind, really only one drawback in that hand launching requires a "tow-er" who can, on light, windy days, run like stink over 50-80 metres while pulling the load of a glider and for practice reasons, the glider weight is limited. Well, perhaps that's two drawbacks, but you know what I mean.

I could never understand why, when the F3B fraternity was having such a hard time over power winch systems, so much so, that the hassle threatened the very existence of F3B as a viable international class; that the rule-makers did not simply say — "enough — back to Handtowing".

Provided that all lines are certified as being the specified length (usually 150 metres), and this is easily verified, there is simply no opportunity for hassle.

The Glider End

The glider hook installation for handtowing should, ideally, be of the releasable type. If a fixed hook is to be used, the throat angle should be larger than for power launch systems. This allows for easier release at the top of the launch where air speeds tend to be lower



Hook Detail

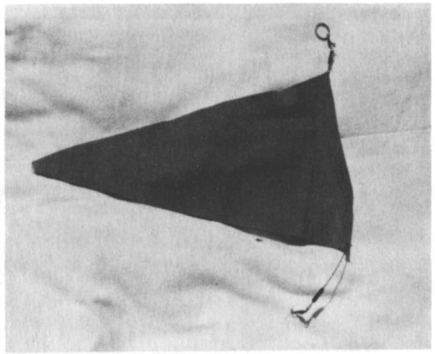
and hangups are more common than with powered winch systems.

The Line

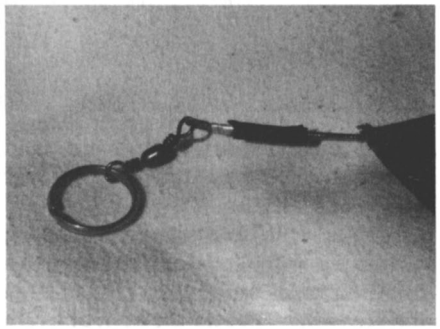
Monofilament nylon fishing line is most commonly used because the breaking strain/weight ratio is very favorable. Breaking strain should be 50-80 lb., but try to use a low figure because this saves weight — important in 'no wind' conditions. Remember that near the top of a good launch you have the weight of about 150 metres of line hanging from the bottom of your model!

The main problem with monofilament line is that some types slowly break down under ultraviolet (u/v) radiation, i.e., sunlight. This breakdown can be detected as a white, powdery substance which forms on the surface. So, at all times, when not in use, keep the winch in a black plastic bag.

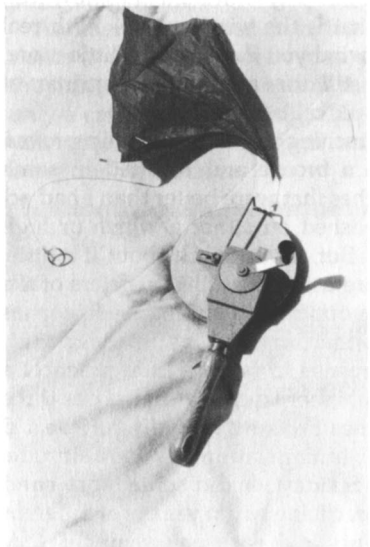
At the end of a flying session, pay out and wind in through a wet cloth or sponge. At the end which connects to the glider, you should have a strong ring, usually a key ring, a swivel — once more from the fishing tackle store, and a bright-colored flag to indicate line release.



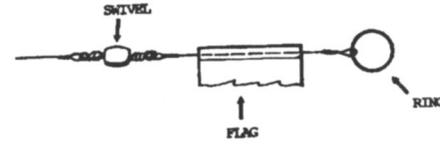
A pennant with swivels either end, and key ring to go onto glider hook.



Key ring & fishing line swivel. Simple!



All you need — typical hand-launch equipment.



There are many winches on the market, and points to look for are a robust gearbox, drum and line guide. A plastic drum is not a good idea. Other features, like shape of handle, etc. are up to personal choice.

Peter Stevens
91 High Street
Northchurch, Berkhamsted
Herts, England HP4 3QL

A reel of line — quite good enough for the job.

Winch Line Hand Towing

...by Gordon Jones

When I got interested in the F3J Thermal Duration contest format I had never done any hand towing. Some friends had been into Nordic competition some years back and explained the basics to me and it didn't seem all that difficult.

Others I talked to indicated that it was going to be really hard and would cause all sorts of problems. But, most of these folks had never done it either, so I figured there is only one way to find out and that is try it. Plus, Poncho Morris and I were putting on a demonstration F3J contest so it would be best if I had some experience so that we could demonstrate the technique and be fully prepared.

The next step in preparation for this event was to familiarize everyone with hand towing so there would be no surprises. Since this was the phase that warranted the most questions from those who had never hand towed (myself included), I built four towlines of 80 lb. test monofilament with 3 X 18 inch pennants to use for practice at the contest. I had heard varying opinions about the weight of the line and settled on the heavier stuff because there would not be too many problems with launching the "lead sleds". This turned out to be a wise choice. Don Chancey and I tested this set-up one Saturday morning with two ships of varying weights...his at 65 ounces and mine at around 50 ounces. We encountered no difficulty in launching either in varying wind conditions. Actually, the day was perfect for what we wanted to do, as the wind was light and variable in speed. With his heavier Bounty Hunter, I jogged about 10 strides and he would throw the airplane. I would continue jogging about 10 more strides and full tension would be achieved. From that

point I could just turn around and stand there holding the line taut until he flew off the end.

I should note here that when I say jog I mean just that. You don't have to run a hundred miles an hour to launch even the heaviest ships and the light ones are really a breeze. There is one factor that comes into play with launching, however, and that is the wind speed. With real light wind you have to jog a little more, but it still does not require a sprinter of Olympic caliber.

Launching my 50 ounce ship proved to be a breeze and resulted in some launches that were better than I had accomplished on either a winch or high start. But, if you think about it a little, you are using the full 150 meters of the line as opposed to pulling the line in, as on a winch, or down, as on a high start. This results in (with a little practice) a much higher launch. After about three launches, I was even zooming off the end and obtaining some really good altitude.

On Sunday we did some more hand tow practicing with a variety of different airplanes and each one went up very well. The heaviest of the lot was Poncho Morris' 80+ ounce design with a 12 ounce wing loading. He used a little flap and it was about the same as Dons' at 15 ounces lighter as far as pull and launch height. We launched several different planes in this fashion, and I think the most interesting response was on the launch of a two-meter ship when the pilot said, "That's better than the winch." Ahh, another satisfied customer!

A few of us got together on the following weekend and did some more hand towing with several of the guys trying to decide which ship to fly at the contest. Almost everyone decide to fly the plane they usually fly as launching by hand towing was not hard nor any different from the winch or high start. We launched a variety of planes from a Falcon 880 to an Oly II and all did very well. During this outing we got several people into doing the towing to show them how easy it was and to get some practice for the contest. This exposure to hand towing proved to be great. We not only got some practice for the contest and introduced hand towing in an uncomplicated environment, but we introduced another facet of our hobby to other modelers.

Another plus gained from this experience is that you don't have to take all the time to set up the winch if there are only a couple of you flying. This gives you more time to get in the air and enjoy more quality air time.

F3J "Texas" Style

...by Gordon Jones

Sometime back I read an article in *Sailplane* (the NSS publication) about F3J Thermal Duration, and was fascinated by the format of the contest and the simplicity factor. I have always been one who thought that simple was better and, with all the required technology that has been showing up in the normal AMA and SMTS events, why not try something simple?

I began by talking to Poncho Morris to see if he had a copy of the proposed FAI rules that I could look at and get an idea of what this event looked like on paper. I was surprised to find that he, too, was interested in trying out this format, and he got a hold of a copy of the rules so we could see what was going on. We were both intrigued by the simplicity of the rules and the timing features of the format that would make for a fast moving contest.

I talked to Al Scidmore, who had written the original article, about the problems that he had encountered while running his contest. This would alleviate some of the problems already encountered and make for a smoother running contest. His advice was most helpful and provided some areas that needed watching. I also asked him about minor rule changes to meet local conditions and how that was received. He had modified things a bit and it had worked out well. I also asked him about launching and if you needed "Superman" to haul the towline. He stated that, with very little breeze, you could launch at a short jog and get a real good launch out of it. This has proved to be very true as, prior to our contest, I and some others tried it out with good success.

I then sat down and, with the rules proposal in hand, wrote a set of local rules with the only real changes being

the establishment of a normal field boundary that, in our case, ended up to be approximately the same size as the proposal stipulates. We also used an AMA standard landing task instead of the large circle in the original proposal. It was decided that this provided a better task with a smaller target to increase the competition factor. Another feature of the proposed rules that we didn't use was the fly-off rounds, as we wanted to shorten the event to a fun fly. I then brought it up as a proposed fun fly event at a club meeting and stated that Poncho and I would host the contest for those that were interested. I also passed out a copy of the rules to everyone and even put them in the club newsletter to spread the word to those that did not make the meeting.

At the contest we went about the pilot's briefing a little differently from normal as we first explained the rules in great detail and discussed all the parameters involved. We then explained the field layout and the signals that would be used to signify the start of the slot and the indications of time remaining to be used in each slot. We established the four launch points at approximately 150 feet apart and situated two landing areas to the outside rear of the launch area to keep congestion to a minimum. Our in-depth pilots meeting answered a lot of questions and is a real good idea the first time that you run one of these contests. This gets everyone on the same sheet of music and elevates a great deal of confusion. In addition, we held a second pilot's meeting at the end of round one to clarify any misunderstandings in the rules.

The contest itself was almost anticlimactic after all the preparation that had gone into it. There were 14 entrants with a variety of aircraft from a handlaunch to a Windsong. The two drawbacks to the contest were the lack of a breeze and the 101 degree temperatures. This made for more work than we would have liked, needless to say. The club had done some experimenting with the normalization of flight times by flight group earlier in the year so that part of it was easy. The idea of the group launching and flying during the same time period took some getting used to, but that didn't last long, either. The end result was rave reviews for the format and the speed of the contest. It was decided that another F3J event should be held in cooler weather and that an F3J contest should be added to the contest schedule for the coming year. This way we can introduce this format to others around the state and hopefully it will gain the attention I think it deserves.

As a final note, we learned that it takes people helping out in the right areas to make this format work and a good pilot's briefing prior to the event is a must. While this format lends itself to a team format, rotating the timers and towers through the rounds also rotates the experience which helps the learning curve for the flyers that have little or no experience at this type of contest. If you are planning to hold an F3J contest and want any additional information give me a shout. I'll be glad to help any way I can.

F3J - RC Thermal Duration

Object: To provide a man-on-man competition for radio controlled thermal soaring gliders. A minimum of three qualifying rounds are flown with each round subdivided into slots. The scores in each slot are normalized to give meaningful scores irrespective of changing weather conditions during the round.

General Rules:

Competition Flights

1. The competitor shall be allowed at least three official flights.
2. The competitor shall be allowed two attempts for each flight.
3. An official attempt at a flight commences when the model has left the hands of the competitor or his/her helper under the pull of the launch apparatus.
4. If for any reason the official attempt at a flight is timed at less than 60 seconds in duration the competitor will be allowed a second attempt, which must be made within the allocated time slot.
5. The flight is cancelled and recorded as a zero score if the model loses any part in flight, except where this occurs as the result of a mid-air collision with another model or towline.
6. The flight is cancelled and scored as a zero if the model does not come to rest within the designated field boundaries.

Landing:

1. The loss of any part of the model during landing will result in a zero score for the landing.
2. The landing task used will be designated by the contest director prior to the start of competition.
3. Competitors must remain outside the landing area during landing in order not to impede other competitors.
4. The landing will result in a zero score if the model does not remain upright when it comes to rest.

Rounds and Slots:

1. The flying order for the initial round shall be arranged in accordance with the radio frequencies in use to permit as many simultaneous flights as possible.
2. The flying order shall be scheduled in rounds subdivided into time slots (see appendix A for sample matrix).
3. The contest director shall attempt to minimized situations where competitors fly together more than once.
4. Competitors shall receive a maximum of five minutes preparation time which is counted from the announcement by the contest director to take position at the designated launch area.
5. The time slot shall be of exactly 10 minutes duration.
6. Audible and visual signals shall be given at the start of the time slot, and when 8 minutes have elapsed.
7. The end of the time slot must very positively be indicated both audibly and visually.
8. Any model airborne at the completion of the time slot must land immediately.

Launching:

1. The contest director will designate a launch area. Models must be launched upwind of the designated launch area.
2. The launch of the model shall be by hand-held towline only.
3. Any model launched prior to the start of the time slot must be landed and relaunched within the time slot. Failure to comply will result in a zero score for that round.

Scoring:

1. The flight shall be timed from the moment of release from the launching device.
2. Time will cease when the model first touches the ground or touches a ground based object (i.e. tree), or completion of the time slot.
3. The flight score will consist of one point for each full second of flight time.
4. A penalty of 30 points will be deducted from the flight score for overflying the end of the time slot for up to a maximum of one minute.
5. A zero score will be recorded for overflying the end of the one minute penalty time.
6. Landing score will be designated by the contest director based on the landing task used for competition.
7. No landing points will be awarded if the model overflies the end of the time slot.
8. The competitor who achieves the highest aggregate of points i.e. flight points plus landing points/less penalty points, will be awarded a corrected score of one thousand points for that slot.
9. The remaining competitors in the time slot will be awarded a percentage of the slot winners total score calculated from

...continued on page 31

Power Scale Soarers An Introduction

...by Alan Hulme
Founder Member, PSSA

Power scale soarers, often abbreviated as P.S.S. models, are models of full sized jet, rocket and piston powered aircraft designed to fly primarily as slope soarers, but also in some cases from towline or bungee launches.

The scope for flying a wide variety of designs is almost limitless. Models known to have been successfully flown include such widely differing types as the Lockheed U-2, the Boeing B-52, North American P-51D "Mustang", Republic "Sabre", Avro "Vulcan", BAe "Hawk", Junkers JU-87 "Stuka", SE 5A, and DC-3 "Skytrain".

When selecting a design, consideration should be given to several preferred features often found in the layout of full sized aircraft. These include a good moment arm (ie, 1 1/2 to 2 times the average wing chord between the trailing edge of the wing and the leading edge of the tailplane), a good wing area, a good length nose (around 3/4 the average wing chord), and a few high drag features such as bulky jet aircraft air intakes and fixed undercarriage. Examples of good WWII aircraft are the North American "Mustang", Kawasaki Ki-61 "Tony", Focke-Wulf Ta 152H, and Supermarine "Spitfire Mk 24". In the jet field there is the Boeing B-52, Republic "Thunderjet", North American "Sabre", and the Grumman F-20 "Tigershark".

Many other aircraft can be used for P.S.S. models although it may be necessary to slim down air intakes or increase wing or tail areas slightly. Such alterations should be minimal, otherwise the overall appearance of the aircraft compared with its full sized counterpart may be destroyed.

Wing loadings are very important and, to a large extent, dictate the model's suitability for flying in various wind speeds. As a general rule, aim at a wing loading of around 16 oz. per square foot. Models of lower loading will perform in windspeeds of 8 - 10 mph and upwards, whilst those of loadings around 24 - 30 oz. per square foot often require minimum wind speeds of 15 - 20 mph. The moral is to build lightly and not to add unnecessary over strengthening to your model. These figures are only a rough guide, since the aerofoil section plays a significant part in determining the performance of the model.

The Clark Y and Eppler 205 flat bottomed sections are often used. In order to provide a scale root section thickness, you can increase the standard depth of section by up to 1/3rd without appreciably altering performance to a detrimental level. These flat bottomed sections, by providing good lift, help to achieve reasonable flight performance when flying in light winds of 8 mph and upwards. Models using these sections will, of course, fly equally well in up to gale force winds and may give good scale like aerobatic performance.

Another popular wing section is the semi-symmetrical Eppler 374. This requires slightly higher winds than the flat bottomed sections for good flying performance, but is more aerobatic for aircraft requiring this performance.

Most modelers of P.S.S. aircraft either scratch build their models from their own design plans or build from plans commercially available of well tried P.S.S. models such as those provided by B^2 Streamlines. There are, of course, a few kits available for P.S.S. models both in the U.S. and U.K. most having fiberglass fuselages and veneer or balsa covered foam wings.

The majority of builders in the United Kingdom prefer to employ either composite foam and balsa fuselages or those of built-up balsa. Wings often have soft balsa or obechi veneer covered polystyrene foam wing cores with 1/4" soft balsa sheet tail surfaces. The most popular finish is the heat shrink film such as Solarfilm or Solartex with or without added color applied by brush or spray. Aluminum colored Solarfilm overcoated where necessary with olive drab or brown/green camouflage produces a realistic weathered effect when scratches, resulting from rough landings, rub away the spray paint from the silver Solarfilm surface.

Another technique for building fuselages which has gained popularity in recent years is to cut the fuselage shape out of two lightly sandwiched sheets of polystyrene foam using ply formers to determine the correct cross section shape. Where the fuselage demands several marked changes along its length, several formers and separate foam blocks may be necessary. After the blocks have been lightly joined together and shaped to accurate former shape, they are separated and hollowed out for lightness to give a wall thickness of around 1/2" - 1". After rejoining, the sections are clad in a 1/16" soft balsa skin to produce a light weight fuselage assembly. A 6 ft. span Gates Lear Jet and a 13 ft span B-52 have been built using fuselages employing this technique.

Yet another method of construction of particular use for fuselages with complex shapes such as the Grumman "Cougar" and "Intruder" is to carve the fuselage shape from a foam block. After sanding to final shape, the whole is covered with brown tape. After smoothing the surface with a warm iron, the whole fuselage is coated with wax, left to dry, and then covered with 3 layers of glass fiber. Immediately after glassing, one coat of epoxy or polyester resin is applied. After sanding, some of the brown tape is cut away and the foam is dissolved with acetone to leave a lightweight shell ready for Solarcoating. This method has been successfully used by a Belgian P.S.S.A. member on various jet aircraft P.S.S. models.

Finally, a foam fuselage may be clad in brown wrapping paper instead of balsa. This obviously reduces the cost of construction although the resultant finish is not quite so dent resistant as with a balsa clad foam fuselage. The system is first to ensure the foam fuselage has been surface-filled and is smooth using household polyfiller. The surface is then given a full coat of white PVA glue or wallpaper paste onto which the strips of wrapping paper are applied. The smoothed down paper is then given an overall coat of PVA glue to seal it. A finish of colored emulsion paint or car spray paint is then applied in the appropriate color scheme.

Competitions for P.S.S.A. models are best kept as simple, low key fun fly events. A 1/72nd scale plan or larger of the full-sized aircraft together with 3-view color representations or color photos of the full scale subjects are used by judges to compare the model for accuracy. Judges stand outside a 20 ft. circle with the model at the centre. The flier may be asked to hold the model for the judges in each of the 3-views as shown on the plans to assist in comparison. Up to 100 points are awarded for static and flying with no more than 50% being allocated to static points.

The flying rounds often include 2 flights. Each are of around 10 minutes duration. The first round consists of straight flight parallel to the slope, a circle, a figure of eight, a landing approach, plus 1 or 2 maneuvers for which the full scale aircraft is capable. These later maneuvers are nominated by the pilot before commencing the flight. These are often a loop and a roll but could be a dive bomber attack or circular progressive search pattern.

The final 10 minute flight has a pattern

...continued on page 31

The TEMPEST

...by Scott Metze

I have been producing the TEMPEST sailplane since 1981. At last count, there were 198 of them. In addition to the ready-to-cover & paint or finished versions, I have a semi-kit that contains a fuselage, canopy, turtledeck and complete instructions.

To give you some background, I moved from San Clemente a number of years ago to Tehachapi, California where I began working at Scale Composites (Burt Rutan's Co.). For the next three and one half years I worked on projects such as the Starship, Special Mission Transport, Pond Racer, Sail America and other programs where I learned a lot about composites and composite design. Today, I have put this experience to work for me.

Currently, I build the TEMPEST sailplanes, help other home builders build their full-size airplanes, do miscellaneous tooling projects, and repair full-sized gliders. It really keeps me very busy!

The TEMPEST is available in several different versions. They come with "V" tail or "T" tail options with any combination of rudder, elevator, ailerons and flaps. There are additional options available for the wings. In addition, there is a semi-kit with a recommended wingspan between 60" to 78" and a 2 to 4 channel combination.

The hills are 500' high or better here in Tehachapi, and the wind blows 25 knots or so every day. The thermals can easily exceed 1500' a minute. This makes for the great consistent flying that can be seen on the video tape that I have available. The video clearly shows how the TEMPEST handles in different flying conditions. It can also be seen performing aerobatic rolls and flying inverted through portions of the tape. The TEMPEST is an all-around sailplane that I consider highly competitive under most flying conditions.

Scott Metze
P.O. Box 1569
Tehachapi, CA 93581
(805) 822-7994

Scott's Models
TEMPEST Options & Prices

Option	Functions	Ready-To-Cover & Paint	Finished
1. V-Tail	Elevator, Ailerons	$227.00	$361.00
2. T-Tail	Elevator, Rudder	$252.00	$373.00
3. V-Tail	Elevator, Ailerons, Rudder	$304.00	$406.00
4. T-Tail	Elevator, Ailerons, Rudder	$314.00	$423.00
5. V-Tail	Elevator, Ailerons, Rudder, Flaps	$358.00	$473.00
6. T-Tail	Elevator, Ailerons, Rudder, Flaps	$371.00	$488.00

Additional Options

- 60" to 80" wing of your choice at no extra cost!
- Polyhedral or flat wing of your choice!

Video available for $15.00
Jack Chamber's Airfoil Pack...$12.00
TEMPEST Semi-Kit...$69.00

All prices include S&H.

The Jack Chambers Story

...by Scott Metze

In addition to the TEMPEST, I also offer Jack Chamber's Airfoil Pack and I would like to tell you the story behind this very influential person in my life.

Jack was born in 1942 in Laguna Beach, California. He began building Jetco hand-launch gliders at the age of 10. At 14, he built his first surfboard. This led him to working for Hobbie Alter at the age of 15 where he began making surfboards.

Today, Jack builds wind tunnel models for a living. He is probably one of the highest skilled professional wind tunnel model builders in the United States. He has worked on projects that include the new and forth coming National Aero Space plane, a 60' span B1-B radar cross-section model, and the F20-Tiger Shark wind tunnel models.

It was in 1962 that Jack began designing R/C gliders and R/C glider airfoils. According to Jack, this began with a rubber only model that led to the Mariah. Jack's Mariah was completed in 1969 and, in 1976, the Mariah won 1st place at the MACS show in California. I met Jack in 1976. We met at American R/C Helicopters in Mission Viejo where I was working at the age of 16.

Those of you that know Jack and have had the chance to see his Mariah fly know of its great inspiration! To date, the Mariah has had four sets of wings built for it. All of these wings have different airfoils and workmanship that I have not seen comparable, anywhere!

The R/C airfoils that Jack has designed have been used on many gliders throughout California. I used many of the airfoils myself on the 198 TEMPEST sailplanes that I have produced since 1981: JC-11, 13, 14, 15, 16, 18, 19, 20, 22. All of these airfoils met with terrific success.

About a year ago, I saw the Quabeck airfoil that was used on the sailplane that took first place at the F3B Championships in 1983. As you can see, the two airfoils are very similar. No wonder the TEMPEST flies so well!

Jack is currently working in Ontario, California. He is still designing R/C airfoils and airplanes. If you are interested in finding out what he is up to, he says that he would enjoy hearing from you. Jack's address is 1085 Blue Bird Cyn. Rd., Laguna Beach, CA 92651. He is not much for writing, so please enclose a phone number.

The Jack Chambers Airfoil Pack (32 pages) is available for $12.00 from Scott's Models. There are a total of 15 different sections plus sixteen tip sections. The sizes range from 3 inches to 8 inches.

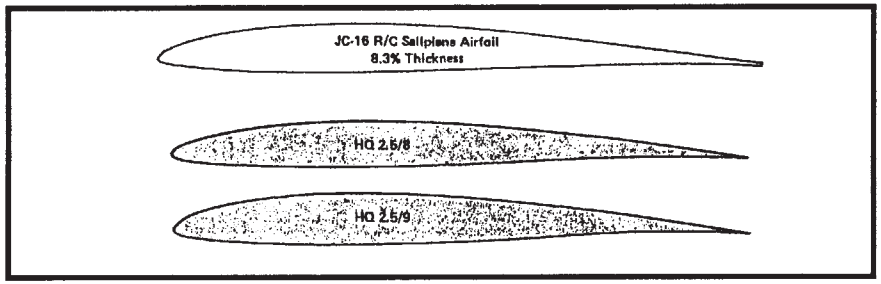
...continued on pages 22-23

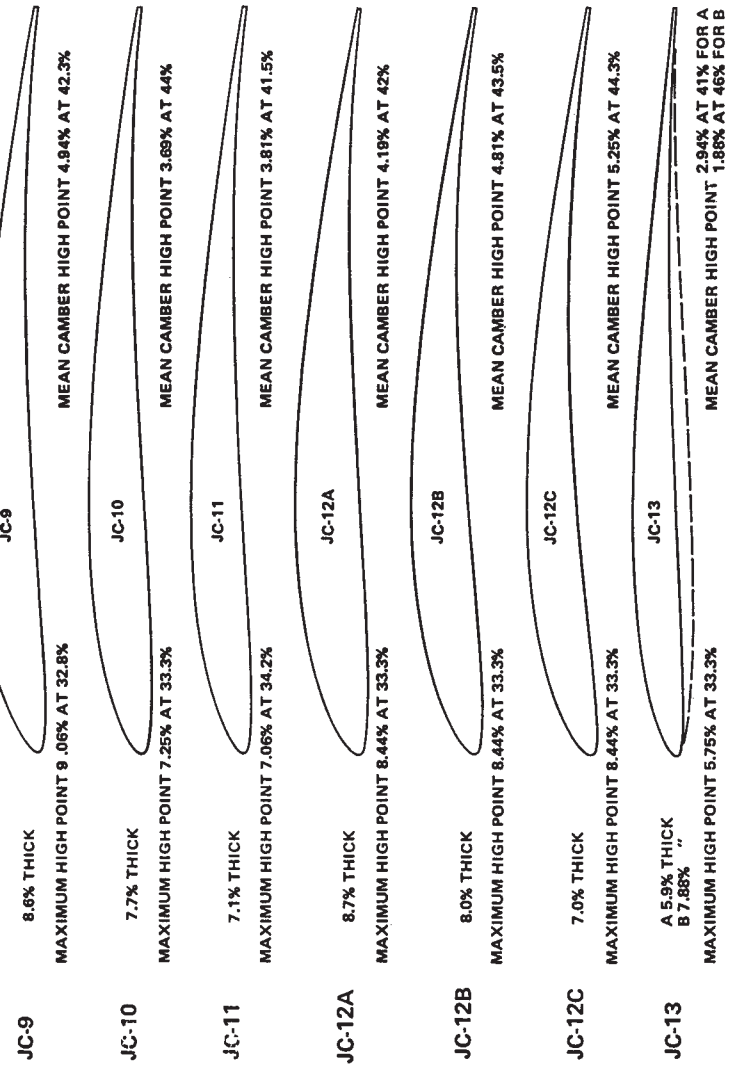
Model Jelene Phillips holding the Tempest. Photo by Scott Metze.

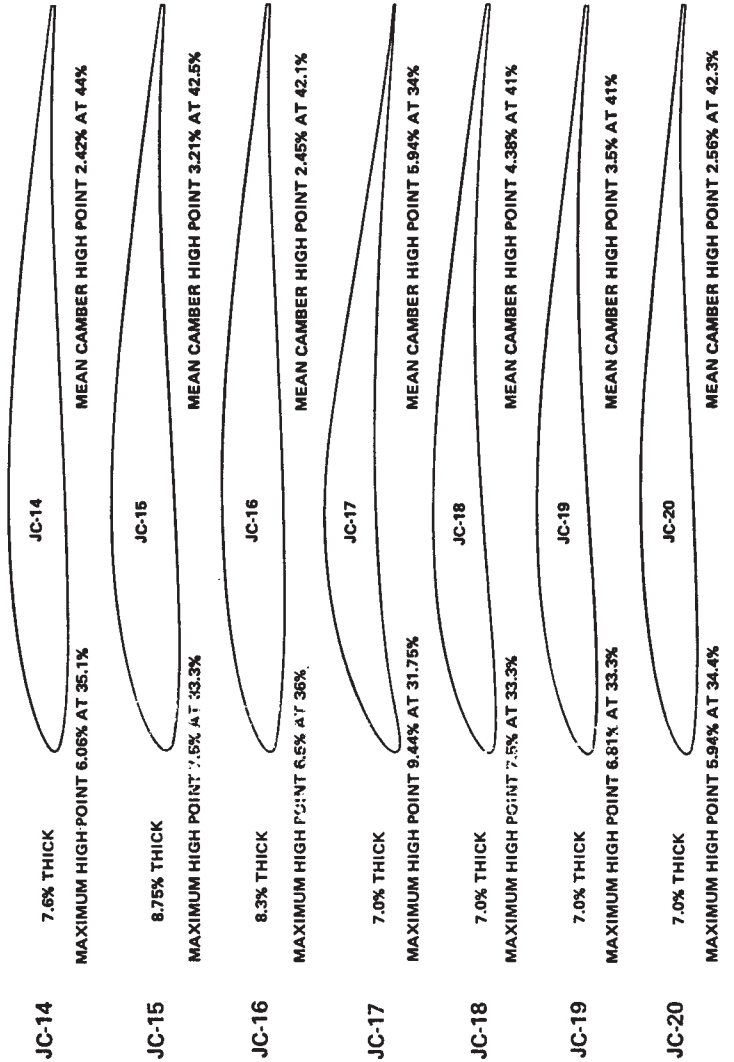
R/C Sailplane Airfoils As Developed By Jack Chambers

...from Scott Metze

On the right: A comparison between the JC-16 & the HQ airfoils.







Vinylwrite Stencils

...by Wil Byers

How long have you been looking for and wondering how to do, a quality painted lettered finish on your favorite model? Lettering that will indicate what the name of the model is, your AMA number, add stars to the design, your team name, class of aircraft, or maybe your country of origin. If you've been looking as long as I have, it has been a long, hard search. Well, look no further because the answer has finally arrived in the form of Vinylwrite stencils.

Stencils have long been a troublesome finishing detail for me, and I imagine for a number of you. I've attempted to use them in the past, but usually avoided it because they were difficult to make and usually did not result in a first quality finish. Oh, I've tried techniques such as Frisket paper or Mac Tac cut into a stencil, but all attempts were a lot of work and not what I was really after in terms of quality. You may or may not be aware of these techniques but, basically, one copies or draws the design on the Frisket paper or similar material and then cuts it almost completely out, leaving just enough around the area to be removed to provide some rigidity while being applied. Next, one transfers it to the model where the finishing cuts are made to the stencil and the area to be painted is removed. After which one would mask around the stencil and then spray the model, wait for the paint to dry, and then remove the Frisket stencil hoping that every thing went alright, because if it didn't all you could to do was sand it down and repaint! I've also listened to lengthy details of how to use liquid masking film and even witnessed some stunning results. But, no products have, until recently, been marketed which would do what I was asking it to, and do it easily.

Well, now because of computers and X/Y plotter technology, applied in a variant form, a stencil product has arrived via Vinylwrite. This product fills my purchase requirements of easy to use, having a variety of designs and sizes, made of a paint resistant material possessing an adhesive which is also paint resistant, good value for my dollars spent, and providing a quality finish when applied and used properly. Yes, Vinylwrite stencils can and will do all the above for you on that special model sitting on your work bench.

Vinylwrite is a small company located at 16043 Tulsa Street, Granada Hills, CA 91344, phone #1-818-363-7131. It is owned and operated by Art and Cynthia who are friendly, model oriented people. They started their business after Art discovered the wonders of a vinyl cutter tied to a computer. He purchased one, taught Cynthia how to run it, bought some vinyl, and began initially producing vinyl lettering which could be applied directly to one's aircraft. This was and is a really nice product that can dress up any model very quickly in many colors and styles.

But, even though I could apply these vinyl letters to my painted models and then even clear over them, it wasn't quite like using paint on paint. So, as you can imagine, I was very pleased to learn, while talking with Cynthia on the phone one day, that they could reverse their product and I could use it as a stencil. This was a major leap in the right direction. Since that time. Art and Cynthia have been able to obtain a dedicated stencil material from their supplier which is even better than the original product: the one I had been so satisfied with up till then. The advantage of this new stencil material being its lower, yet sufficient, adhesive tack that provides a strong bond, yet is unaffected by paint, thus allowing them to stay on the model during painting, but providing for easy removal when the painting is finished.

Stencils applied to wing, but prior to masking with newspaper.

I've applied and used these stencils to paint letters and details on both my scale ships and my sport slope ships with great results. Furthermore, they have been very user friendly, without the previous mistakes and repaints required.

Sound good do they? Well, they are and you should consider them for your next paint job, whether it be scale or sport, power or glider. However, read on for a bit of an explanation on how to use Vinylwrite stencils and some of the pitfalls to avoid. Also, when you receive your package of stencils, open the package and take out the instructions. Then take a few minutes, with a good cup of coffee, to read them thoroughly. The instructions provided are very helpful, providing details which you think you might already know but, if you don't, could result in that previously talked about repaint.

First off you will need to order your stencils. This to me was the hardest part as there are so many combinations available. They offer lettering as small as 1/2 inch in height all the way up to 5-1/4 inch, slanting from 0 to 45 degrees forward or back, differing lengths, and even mirror image. Plus, they have a number of styles ranging from Helvetica Bold to Brush Script. Additionally, it will be required of you to take a few minutes to use the simple formula they provide to determine exactly what length of lettering you require and if it will fit your particular application. The entire process is quite simple and if you have any doubts about how your stencil will look after it is cut, Vinylwrite will be happy to do an ink on paper of your particular design for a very small additional charge. They send you the ink on paper that you then either approve or disapprove after which your stencils will be cut just as you want them. The ink on paper is great because you have a chance to make changes before committing the design to vinyl which is much more costly if you don't approve of the design.

Once they have arrived, the fun begins provided the model is appropriately prepared. By "appropriately prepared" I mean that the surface the stencil is to be applied to should be smooth, free of dust and dirt, cleaned with an approved degreaser wax remover such as Prep Sol, and be laid out in such a fashion that the stencil gets placed where you really want it to go.

Smooth is important! A good smooth base coat will provide a surface that the stencil can be applied to and thus obtain positive adhesion along all edges where the sprayed paint will meet the stencil. You may even want to take extra care to provide a very smooth surface by wet sanding the surface with 600 grit wet or dry sand paper, being careful, of course, not to sand through the base coat. Note, however, if you utilize this extra step, you will have to clear coat the model after the stencil is painted in order to get back the gloss you lost to the wet sanding.

Next, take a few minutes to clean the

finish with a degreaser to remove all your finger prints and any other contamination that got on the model while you were handling it. Then take out a new tack rag and tack rag the entire surface to be painted using your good eye to see that all dust and dirt have been removed.

A procedure, which is easy to overlook but a necessary step none the less, is that of laying out where the stencil will be placed on the model. A few minutes spent on this step will result in a professional look with balance and symmetry. Use a hard pencil for this process, because the marks it leaves can easily be removed, from those areas which don't get covered with paint, by some wax or polishing compound and a bit of elbow grease. Begin by marking the stencil with indexing marks, and then do the same for the wing, fuselage, or empennage, or for that matter any part that the stencil was going to be applied to.

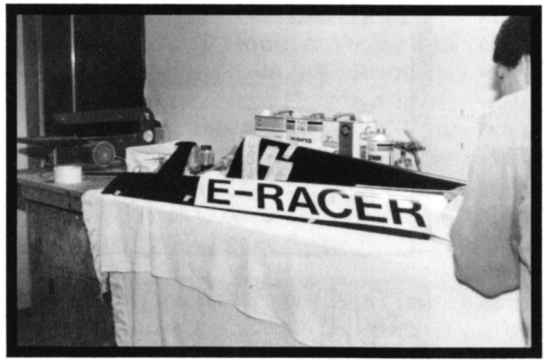
The following procedure can be done with one person for smaller stencils, however, when applying large stencils, I believe the process can be simplified by the addition of an extra hand from the wife, child, or friend. Begin by applying the transfer tape, which is shipped with your stencils, to the stencil following the directions provided from Vinylwrite. Next, remove the protective backing that the stencil came attached to. Now, you and your helper, if using one, take care and locate the stencil over the location where it is to be applied by using your indexing marks which will be visible through the transfer tape. If you are satisfied that this is where the stencil is to be placed, cautiously press the center of the stencil down and then continue pressing out towards both edges and the ends. Once you have lightly pressed the stencil down through the transfer tape take a moment and rub it down firmly, everywhere, making sure that you have good adhesion prior to the removal of the transfer tape. If you have gotten this far along, the rest is a smooth glide!

Next, remove the transfer tape by peeling from a corner very gently. Remember, these are stencils you are applying and not permanent letters. A bit of caution will prevent you from inadvertently pulling up that wonderful stencil. Once you have completely removed the transfer tape, I suggest you take a burnishing tool made of plastic or smooth wood and rub down the edges of the stencil where they will meet the freshly sprayed paint. This will guarantee that no paint seeps up under the stencil and spoils the edge of a letter or design. However, if this should happen it can be repaired, if small, and I will tell you about that later.

Now, you are ready to mask around the stencil itself and to apply some paint. So, do just that using masking tape and appropriate masking paper. I often use newspaper for this purpose and it works just fine.

With all the above done, one can begin to apply paint to the stencilled area. I spray epoxy paints and have had no trouble with it attacking either the stencil or its adhesive. Therefore, I believe most other paints would also be compatible. One step I have found effective when painting not only stencils but any project, is to wet the floor around the area I am painting in. This step is amazingly effective in preventing dust from becoming airborne while one moves about spraying the part or parts.

Apply paint initially in a light dust or fog coat to the stencilled area. Wait a few minutes to allow this dust coat to dry to a tack and then come behind it with a light wet coat which just obtains a glossy shine. Now, wait approximately 10 to 15 minutes, depending on the temperature at which you are spraying, and then finish by applying a full wet coat obtaining a wet gloss look. Be very careful on this final wet coat as it is easy to get too much



Transfer tape being removed from stencil.

paint and thus develop a run. If you do get a run in the paint don't panic and just move along, waiting to repair the damage after removing the stencil.

After you have finished with the final coat of paint to the area stencilled, leave it to dry completely. Once the paint is dry you may remove the masking tape and paper which masked the stencil itself. Now you are ready to remove the stencil.

Begin removing the stencil by lifting one corner. After you have developed an area, you can get a firm hold of start by peeling on a oblique angle to the stencil. This will facilitate an easier removal, especially in in those areas where the stencil will be butting up against the freshly stencilled area. Continue removing the stencil slowly and in small portions at a time. Avoid trying to remove it in one long pull as this may cause the stencil to tear at such an angle that it is tearing into the painted area and could result in small chips being taken out of this area. You will, of course, develop some of your own techniques and I am only suggesting what has worked for me.

Once you have removed the complete stencil you may have a small amount of masking adhesive left behind. This will most likely be from the masking tape and not from the stencil itself. However, this is not a major problem in that it is easily removed by the use of a small amount of Prep Sol on a soft cloth.

Above, I mentioned that you might accidentally get a bit of paint up under the edge of the stencil if you inadvertently did not get the edges down everywhere. If this happens, there is a fix. Remember: a fix is just that and care will be needed in order to render your fix unnoticeable. However, if the area where the paint bled is a large one, it may be better to sand to the base coat and begin with a new set of stencils. But, assuming the problem is only a small spot, where the paint has gotten under, you can fix it nicely. Begin by removing as much of the paint that has bled by scraping with a sharp razor blade, being extremely careful not to cut into the base coat. Once you have removed as much as you dare with this step, use some 400 grit wet or dry paper double back taped to a sanding stick, to sand ever so carefully, through the paint which has run under the stencil onto your base coat. Be very cautious with this step and examine often to see that you are removing only the paint which has violated your design.

Now, assuming you got a small run in the paint as you were spaying it. What should you do? This is also an area which can be fixed fairly easily. Depending on the size of the run, you will have to sand it out utilizing wet and dry paper and a sanding block. I use either 600 or 400 wet or dry paper, wet. Be extremely careful with this process while you gently sand the run flush with the rest of the finish. If one is not, you are sure to sand through the paint which adjoins the run and thus expose your base coat; which means you will be having to start over. After you have removed the run, sand the entire model using 600 wet or dry paper, wet. Once you have *...continued on page 30*

Flight Evaluation
ME 163 KOMET

...by Rick Palmer

...Photos by Barry Williams

Oh boy, a rocket plane. This was my first thought as I was asked if I would like to try this slope glider from Gary Anderson's stable of kits.

Specifications

Wingspan:	44"
Wing Area:	300 Sq. In.
Flying Weight:	34 Oz.
Radio:	2-4 Channel

I knew what this kit would look like. I had seen bits and pieces in books and airpower documentaries. The full size Komet seems to have been a dangerous aircraft for the Germans to fly, take off, land, fuel and, yes, even clean. The fuels used to power the rocket motor, if not properly handled would, if fact, explode! One of the other problems that I thought was ironic was that the pilot could go through a good mission only to suffer spinal injury upon what would look to others as a normal landing. Sounds like a mean machine? Well, get ready. The kit's a lot better!

Building

The wings of the Komet are just as simple as can be. These are foam with balsa leading and trailing edges and covered again with balsa. The wings have a joiner tube so, as you can guess, the wings can be removed for transport. Watch carefully when installing these, as the root end of the foam wing has already been cut to permit the proper amount of dihedral. If you glue the joiner to the wrong wing or upside down...well, you should get my point.

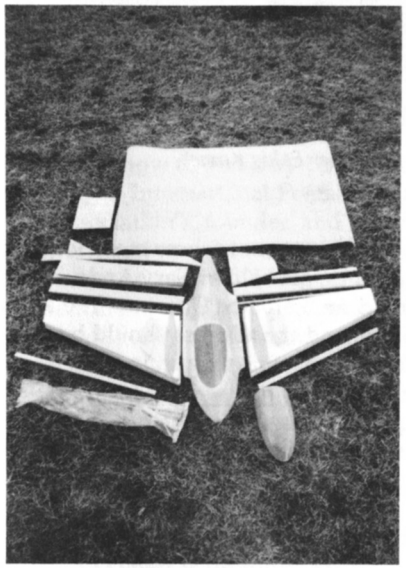
The Komet, being a flying wing, uses elevons and these, in turn, must have a reflex angle to make it fly. When I went to shape the wing tip block, I worried I might not get both sides equal in the amount of reflex so I used the block as the measuring guide in this way. Taking a ruler, I set it on top of the wing next to the wing tip block. The last third of the airfoil will allow it to set flat. Mark where the ruler ends up on the block, and then measure up from there the amount of reflex to be used. Then, use the ruler to mark from the sub-trailing edge to the reflex mark and sand the tip to your hearts delight. Ta-da.

The fuselage should be a piece of cake to anyone who has worked with a fiberglass fuse. I was a little upset with the number of pinholes to be filled. I spent a lot of time trying to get a real smooth finish. It now has a nice finish, but it did come out a little bit heavy. I went over the flying weight of 24 oz., but it hasn't hurt a bit. What I have found out is that the flying weight posted in the instructions and ad may be wrong and, in fact, could be as high as 34 oz. Believe me, 34 oz. will not affect its gliding.

The rudder is attached to the top of the fuse and it is left up to you to choose if you want to make it functional. I left mine fixed, but I might change it over some time later. If you are worried, it will fly just as great without it.

Now, the landing skid (And, that is what the full-sized Komet had...just a landing skid.) is somewhat of a weak point. It is just 1/4 inch balsa and, if you land in a crab angle, it might break. In the instructions, it states that if you land in rocky or hard areas you might want to trim off a little of the skid and add spruce in its place. I was thinking that one might make a sandwich of 1/8 balsa and 1/16 plywood. Ah, who knows! Mine has lasted so far.

Installing your radio gear should bring a smile to your face. YOU WILL HAVE LOTS OF ROOM! However, you have to be a little inventive to bolt down the battery and receiver. I made a small bulkhead just the size of my 550 ma battery and installed hooks for rubber bands to hold it. I left a hole in this bulkhead so as to be able to add weight, if needed. Well, lets go flying.



Flying

I took the Komet to a place called Greens Peak. The elevation is 10,520 ft. The first flight was made in a wind speed of about 30 to 35 mph. Why so much? Well, all I can say is that I was looking forward to flying this pup and, from the looks of the design, I was not at all worried that it wouldn't fly.

In fact, I did not even give the Komet a test glide. I held it up by the landing skid and checked to see if the wings would stay level. Then, I gently let it go. It went out about 10 yards and started gaining altitude and more speed. For the first 10 seconds it was flying itself. I went into working turns to try to judge how it would roll and, then, started remembering words in the instructions. You know the ones about being careful on the controls to start with? These are good words to remember. The Komet can and will turn with some speed. Rolls are very fun and very fast! At about this time, I started running back and forth across the hill for my camera person, Barry Williams. He would tell me to fly by here and there and to try to come in closer. It was easy. You just point and go, or so I thought. In all this fun, I failed to realize that I had changed my course across the hill.

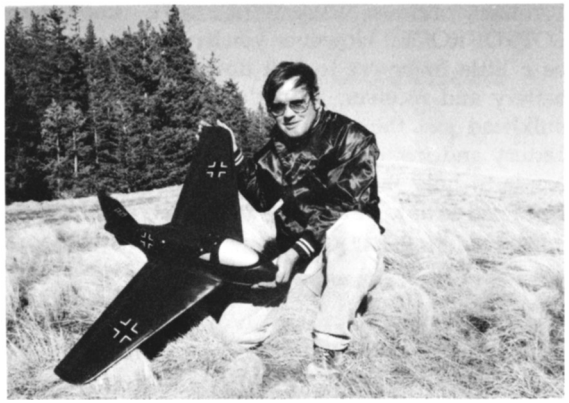
The wind was now coming into the Komet at a 45 degree angle. In the next pass, at about 6 to 8 foot off the deck, a gust picked up the right wing and I was now in a knife edge and fading to the left. I went into hyper mode and gave right and back stick. BOOM! WOW! What had happened was the Komet responded all right. In my panic I gave too much aileron and went past straight and level a 180 degrees more and flew into the ground upside down from about 6 foot. Damage report: small dent in the nose, servo tray loose, and paint damage. THAT WAS ALL!!! For as bad as the crash looked, there was no damage to either wing, landing skid or rudder. It was a scary way to find out how tough it was. In all, it took two evenings worth of work and it would fly again.

The Komet has a lot of flight time, now. Loops and rolls are great. If you set yourself right, you can tail slide, but let the Komet pick back up ample speed before flying away. It does not seem to tip stall on me, more as it tended to be less in control if I tighten up a turn or loop too much. But, I've got to say, it will do them SMOOTHLY. In landing the Komet, do not slow it down too soon, If I used too much back stick, the Komet would start a deep sink and I would have to pass on the landing and go around to try again.

In Summary

In all, the Komet flies just as good as I had hoped it would. For the size of the body,

Komet ...continued



Rick Palmer & his Komet.

it still has speed. It rolls so fast in fact that, if you want more, you can set the elevons for just a bit more. I'd advise a dual rate radio if this is the case. As with other flying wings I've had, it will be easy to fly if you let it keep airspeed and not bang the control sticks too fast. If I was to do anything different, I'd change the landing skid. I'm still afraid it's going to break. Don't worry if you build it heavy. I got so carried away with making a nice finish, I did not worry how heavy the Komet would be. At 34 oz. of weight, it performs like a champ and it looks neat as hell in the air. I would have to give the Komet, a VERY GOOD rating, as it was easy to build, looks great, and performs as I had expected.

If you want one of these mean looking machines, get hold of Gary Anderson at American Sailplane Designs. The kit is $69.95, and the address should be elsewhere in this fine magazine.

Rick Palmer
Box 1513
Springerville, AZ 85938

Stencils...continued

accomplished this it will be time to tack rag the entire model and give it a coat of clear.

Coating with clear will result in a beautiful finish and only take just a few more minutes to do depending, of course, on how big the model is. It is a simple process. Begin with a fog coat which you let dry for about ten minutes. Then, follow the fog coat with a good flow coat, which will bring the finish to a gloss. You can either quit at this point or do a bang up job by waiting for this coat to thoroughly dry and then sanding it with 600 wet just until you cut through the clear to the base coat. Next, tack rag again and apply one additional coat of clear obtaining a nice gloss. Voila! You have now completed detailing your model with an additional touch of class afforded only through the use of Vinylwrite Stencils.

Interested in obtaining these results? Give Vinylwrite stencils a try. The process of lettering your model will be greatly simplified and the results will be very rewarding. Remember to prepare your model properly and lay out the job before you begin! Have fun! that is what the hobby is supposed to be about.

Wil Byers
Rt. 4, Box 9544
W. Richland, WA 99352

Power Scale...continued

decided by the flier and is judged for flying program content completed not only as appropriate to the full sized aircraft but, also, for spectator appeal. At least 50% of the total points are allocated to the 2 flying rounds.

* * *

Some four years ago, the Power Scale Soaring Association was formed in England to unite P.S.S. flyers through the medium of a quarterly newsletter. This contains latest news on world wide P.S.S. flying developments including model design, construction methods, event reports, etc. Further information on how to join may be obtained by sending an International Postal Coupon to the Association's founder and newsletter editor: J. Alan Hulme, 52 Mountway, Waverton, Chester CH3 7QF, England. Current membership for USA and Canadian members is 15 Pounds Sterling per year. The international membership now exceeds 100.

It is hoped that many more modelers will try their hand at building and flying power scale soarers, which are not only relatively cheap and quick to build, but really look like their full-sized counterparts in flight. Don't delay, make your next project a P.S.S. model.

(Typed & provided via B^2 Streamlines...Thanks!!!)

Alan Hulme / PSSA
52 Mountway
Waverton, Chester
CH3 7QF
England

F3J...continued

their own total score i.e.

Competitor's own score X 1000
Highest points total in slot

Equipment Requirements:

Towlines:

1. The length of the towline for hand-held towing shall not exceed 150 meters.
2. The towline must be equipped with a pennant or parachute. The pennant or parachute must remain inactive until the release of the towline.
3. Towlines for each flyer must only be run out during the competitor's five minute preparation period.
4. After release of the model from the towline the towline must be retrieved without delay.

Other Equipment:

1. An airhorn of a type that will be loud enough to be heard over the field must be available to ensure competitors can be advised of the start and completion of the time slot.
2. A stop watch for timing the slots and any overflights must be available.
3. Landing indicators or tape for the type of landing task to be used.

Gordon Jones
214 Sunflower Drive
Garland, Texas 75041

Classified Advertising

For Sale:

4 Meter DG 202 Sailplane by Hersperger & Ambühl, imported from Switzerland, Obechi-covered wings, stab & rudder, carbon fiber reinforced wing spars, built-in double fence spoilers, white gel-coated fiberglass fuselage, and light tint blue canopy...$375.00

Multiplex Fiesta, 127 1/2" span, 90% completed, with built-up wings and fiberglass fuselage...$125.00

Sal Iasilli, 75 Walnut Ave., E. Norwich, NY 11732

(516) 922-7432 (After 6:00 P.M. Eastern Time)

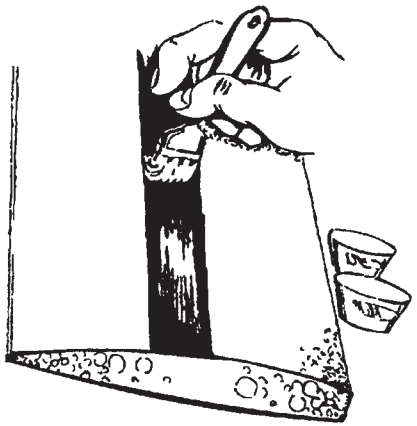
New Product News Release

EZ LAM ©

...from Aerospace Composite Products

EZ LAM © is the first epoxy laminating resin that is specially formulated for model aircraft use. This two part, 2:1 mix resin and hardener is specially blended for use with lightweight fiberglass, carbon fiber, or Kevlar™ cloth. Its low viscosity allows it to flow easily into the weave of the cloth. EZ LAM © cures to a hard, high strength, gloss finish, and sands easily. EZ LAM © is ideal for use with .58 ounce fiberglass cloth over balsa sheeted foam wings, or for use with 2 ounce glass cloth over bare molded styrofoam "foamie" type models. EZ LAM © may be thinned with 99% Isopropyl Alcohol for applications where a lower viscosity is desired.

The 1 1/2 pint EZ LAM kit retails for $18.00 and the 1 1/2 quart EZ LAM kit retails for $26.OO. Call or write to Aerospace Composite Products, P.O. Box 16621, Irvine, CA, 92714; (714) 25O-11O7 for additional information.



Classified Advertising

For Sale:

ASW 20-L by Fiber Glas Flugel • 4.2 M all glass high performance sailplane...$750/B.O.

DG 300 • 4.6M glass fuselage & rudder • Obechi wing...$550/B.O.

Steven C. Chan D.D.S.
19660 Phoenix Ln.
Huntington Beach, CA 92646
(714) 968-2451 (after 5:00 P.M. PST)

Just a Thought...from Gordon Jones

Using a piece of 3M AntiSkid tape makes a good hold for your fuselage when launching. And it comes in several colors too.

Plan your radio layout so that you can use the same receiver configuration and not have to do a lot of servo reversing when changing planes. Plus, it is less work to do it the same every time.

An Open Letter to:

D.O. Darnell
Model Construction Videos
4227 E. 83rd Street
Tulsa, OK 74137

June 27, 1990

Dear D.O.:

Let me first commend you on the excellent job you did on the *Building the Falcon 88O* videotape. I placed an order two or three weeks ago, received it very quickly, had a chance to watch it once, and turned around and sold it two days after I received it. Sounds odd, I know, but here's the story.

After ordering your tape, but before receiving it, I got a phone call from another S.B.S.S. member asking if the Falcon 88O came with building instructions. After telling him that it did not, I proceeded to tell him about the *Building the Falcon 88O* videotape I had ordered. He responded, "Hey, when ya get it I'd like to make a copy of it. Talk to ya later, bye."

Well, he called me back on Sunday — two days after I'd received the tape — and asked if I had it. I was watching the tape when he called. He explained to me that he was in the midst of a construction dilemma that the tape might solve and could he borrow it; come get it; make a copy; where do ya live will I see ya at work...etc.

I'll tell ya, D.O., I squared my shoulders and said, "Look, I've got a problem about making copies of this tape. It isn't just this tape it's any tape and even computer software. This D.O. Darnell has got an excellent product here. One that I believe is good for the hobby and good for the industry. If we copy the tape, and others copy it, not only will he not make money and stop making tapes but others may see it as a losing proposition also. I'd really like to see more tapes like this."

To prune a growing story, I sold him my tape for what I paid for it and now I need another one. Please find enclosed my check for $29.OO for your *Building the Falcon 88O* tape. Please send it to my home address: Rick Rohlfing, 2O2 Bahia Court, San Jose, CA 95119.

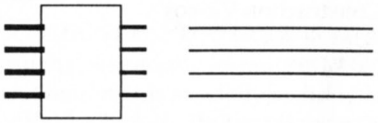
Thanks for your prompt handling of my order. I look forward to receiving my second tape. I wish you the best of luck in this venture and hope that other people see the value and importance of your efforts.

Sincerely, (signed)
Rick Rohlfing,
Secretary, South Bay Soaring Society

With all the servos floating around and with everyone swaping them out for different uses, the following wiring diagram can be used to remember how to wire an aileron servo or other applications.

Gordon Jones
214 Sunflower Drive
Garland, Texas 75041

SERVO WIRING DIAGRAM



AILERON SERVO WIRING DIAGRAM

News Release:

Acme Aircraft Inc. has multi-task R/C fiberglass & composite Sailplane fuselages. For more information on what fuselages are available, send SASE to:

Chris Corven
2400 Elwood
Berkley, MI 48072
(313) 541-5042

Dave Corven
61501 N. Ridge Trail
Romeo, MI 48065
(313) 656-1879

Pre Registration Form
1990 TRI CITY COLUMBIA CUP
SLOPE RACES
MAY 24,25,26, 1990

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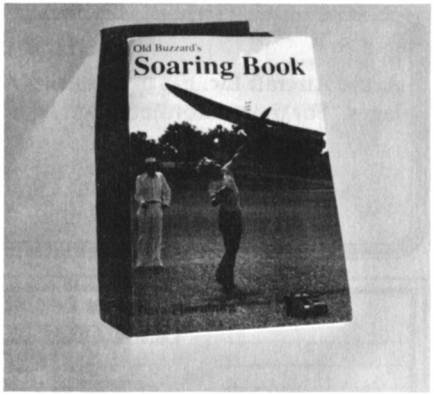
BOOKS IN REVIEW
...by Jerry Slates

Old Buzzard's Soaring Book



By this time, I'm sure that all of you have read Byron Blakeslee's column in the May, 1990 issue (page 38) of *Model Aviation*. If you can't remember and you're into great books, you may want to take a moment and read it now.

I not only agree with what Byron has said about Dave's new book but, when I received the book, I realized that the way in which Dave had written the book was truly unique. I had trouble putting it down after the first page. When the hitchhiking buzzard hopped in the car and slammed the door, the conversation began!

"What do you know about soaring?"

If you're interested in keeping up with the Old Buzzard and want to know where this unbelievable conversation leads and what you can learn about soaring, you can obtain the book from:

Pony X Press, 5 Monticello Drive,
Albuquerque NM 87123
$14.95 plus $1.50 S&H
Call (505) 299-8749 for Visa, MC or COD shipment.

Dealer discounts on 10 or more copies. The book is well written and easy to read and understand. We're hearing rave reviews from others who got their books right away.

Illustrated Encyclopedia of General Aviation,
Second Edition
written by Paul Garrison.

Available from Tab Books —
$24.95 & S&H
Blue Ridge Summit, PA 17294-0840
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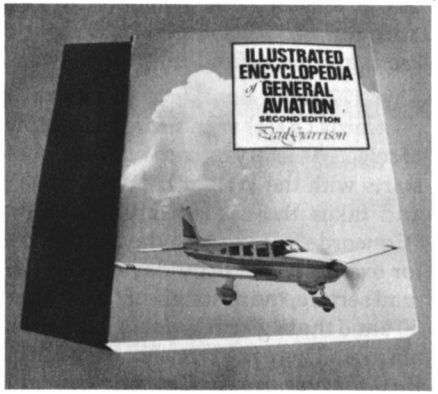
(In PA or AK, call 717-794-2191)

I have been adding to my reference library on the subject of R/C soaring and related reference aviation materials for many years.

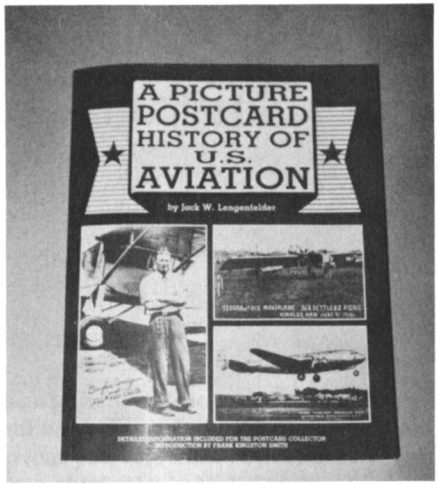
However, I have found that technical terms on aviation are not always found between the pages of the encyclopedia/dictionary. So, I was quite pleased to be able to add this illustrated book containing the best part of 500 pages to my technical library.

This easily read book contains both diagrams and photos to illustrate terms, types of aircraft flown and listings for aviation organizations/departments and publications.

Although this encyclopedia is intended for full-sized aviation, it is readily applicable in the R/C soaring modeling,



Books In Review
A Picture Postcard History of U.S. Aviation



Written by Jack W. Lengenfelder, this book is available from Almar Press, 4105 Marietta Drive, Binghamton, NY 13903, (607) 722-0265 or 6251. The cost of the book is $12.95 per copy plus $2.00 P&H in U.S. & $4.50 P&H outside U.S. (New York res. add 7% sales tax). "Discounts are available on fund-raising projects."

This 122 page book is a collection of postcards (200+) with a few paragraphs of selected history on each one. The book starts with the Wright Brothers in 1903 and takes the reader through to the "Concorde" of modern day. It covers, for example, the early days of the U.S. mail service, the nostalgia of the 20's and 30's and the beginning of the commercial airlines. There is a rare shot of a Curtiss P-40, the type used by General Chennault and his Flying Tigers, without the Shark-Mouth motif on the nose.

I found the book to be interesting and easy reading. If you are a deltioligist, additional reference information is provided which includes the value of each postcard.

Books in Review

Are You Looking For Martin Simon's Books?

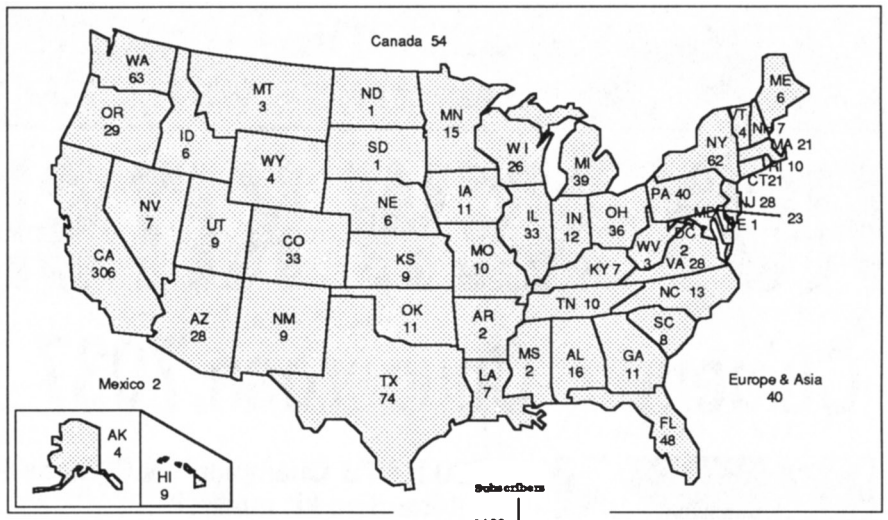
The World's Vintage Sailplanes 1908-1945
Kookaburra Technical Publications Pty. LTD (Only)
P.O. Box 648, Dandenong, Victoria, Australia 3175
("Available for $58.00 including post. and wall chart." —Australian dollars)

Airflow
Zenith Books, P.O. Box 1, Osceola, WI 54020
(800) 826-6600 (WI, Canada & Overseas orders call 715-294-4448)
$18.95 plus S&H and applicable tax
(Published in Australia — Jacaranda)

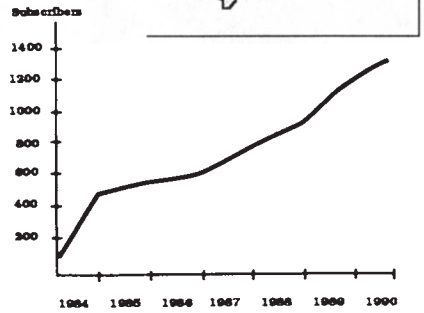
Model Aircraft Aerodynamics
Zenith (See above)
$27.95 plus S&H and applicable tax
(The publisher is Argus Books Limited, 14 St. James Road, Watford, Herts., England.)

Model Flight (Listed as *Aerodynamics of Model Aircraft Flight*)
Zenith (See above)
$18.95 plus S&H and applicable tax
(The publisher is Argus Books Limited)

Readers: You might want to check your local hobby shop's book section for the last three books. Jerry)



R/C Soaring Digest Subscribers (August, 1990)



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