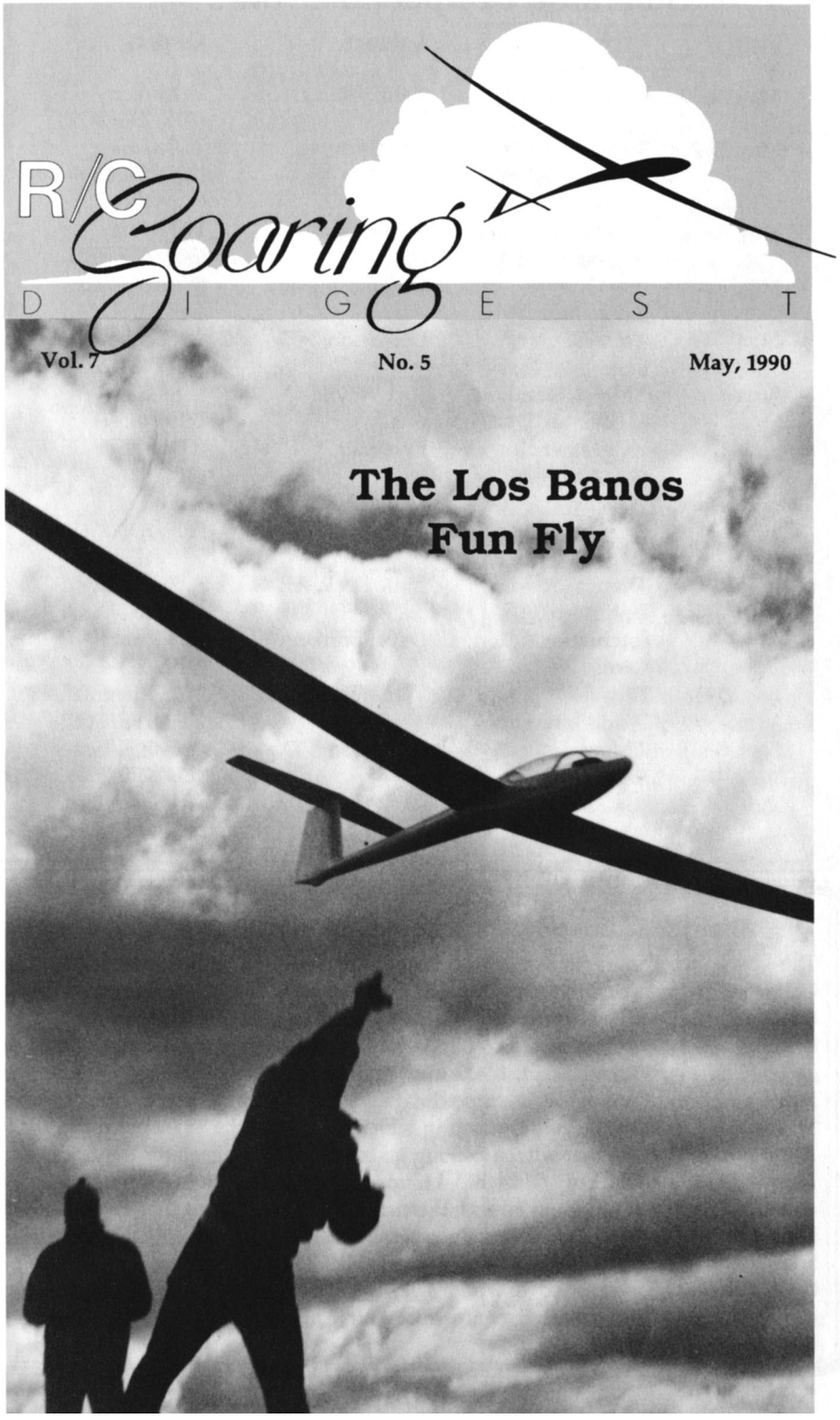
R/C Soaring DIGEST

Vol. 7 No. 5 May, 1990

The Los Banos Fun Fly



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Schedule of Special Events

Date	Event	Location	Contact
May 19-20	Cross Country	Calif. Valley, CA	R. Mullen (805) 736-5777
May 25-27	Thermal Soaring 2 Meter, Unlimited Sport, Scale	Morriston, FL	T. Beckman (305) 252-0014
May 25-27	International Scale Soaring Fun Fly	Richland, WA	Wil Byers (509) 627-5224
May 26-28	F3J/Open RadioGlide '90'	Oxford, England	(None Listed. Call RCSD.)
June 2-3	Cross Country Sugarloaf Classic	Dickerson, MD	G. Dickes (301) 484-2627
June 3	2 Meter, Standard & Unlimited (LSF Regional)	Fort Wayne, IN	B. Steele (219) 485-1145
June 3	Hand Launch	Riverside, CA	I. Douglas (714) 621-2522
June 9-10	Western U.S. R/C Soaring Championships Unlimited	Modesto, CA	R. Lenci (209) 838-3869
June 9-10	Thermal Soaring Unlimited	Little Rock, AR	R. Stanfield (501) 851-1697
July 7-8	International Slope Race	Davenport, CA	Ray Kuntz (213) 645-4269
July 21-22	F3J World Interglide	Warwick, England	Sam Hitchman (0926) 651511
Sept. 8-9	2 Meter & Open	Richardson, TX	Chuck Fisher (214) 270-2634 Jack Hamilton (214) 348-4669

About The Cover...It's A Beautiful Site!!!...by Jerry Slates

The Los Banos Reservoir, one of the best slope sites I have ever seen in Northern California, is approximately a two hour drive from the San Francisco Bay area. To reach this California State Park from the Bay area, go south on Interstate 5 to Highway 152, and then go east, in the direction of Los Banos, for two miles. Turn right at Vota Road, and go 1 1/2 miles to Pioneer Road. Make a left on Pioneer, and go 1 mile to Canyon Road. Make a right on Canyon. It is approximately 5 miles to the Park. (Note: There are Reservoir signs.) At the gate is a box in which to deposit the $3.00 per car entry fee. Although the Park Ranger will be making his rounds, paying is on the honor system at the gate. Driving to the top of the hill, I found myself 200 feet above the reservoir with either forty acres of flat grass land to thermal on, or three slopes that can be flown in almost any wind. How did I find out about the site? Well, Mick Carlin of the South Bay Soaring Society planned this Fun Fly. Thanks, Mick! I hope to return with a plane next time! Mick Carlin is on the cover with his SPEED ASTIR, and more photos of this special day appear later in this issue. For more information about the park, the Park Ranger can be reached on (209) 826-1196.

The Soaring Site

Does Your Mailing List Reflect the Correct Address for *RCSD*?

There is still a significant amount of mail being forwarded from P.O. Box 1079 in Arizona. Unfortunately, as you know, the post office will stop forwarding, soon. In some cases, the mail will be "returned to sender". In others, alas.

So, if you could take a moment to check your records, particularly in the case of advertising & newsletters, and note the address change, we would appreciate it. For those of you that have already made the change, thanks! We keep the mail current but, if you haven't heard from us, did you send it to P.O. Box 1079? The correct address is P.O. Box 6680, Concord, CA 94524.

On another note, we wanted to say thanks to those of you who have written us notes on your renewals & club newsletters, or have written a letter of acknowledgement. These notes and letters really make our day! Thanks!

Read & Enjoy,

Jerry & Judy

The RCSD Database

Do You Have Any Comments or Suggestions?

I number of sailplane enthusiasts have logged onto the Bears Cove BBS. Several of you have taken downloads, and I wanted to find out if the downloads were effective and to find out if you are satisfied with the database.

I would appreciate your input on this in order to make the database as user friendly as possible. Please send me your comments, both positive & constructive.

Lee Murray
1300 Bay Ridge Road
Appleton, WI 54915

About RCSD...

RCSD is a reader written-publication. The articles & letters are freely contributed to *RCSD* in order to provide:

"The widest possible dissemination of information vital to R/C soaring to enthusiasts all over the world."

It is the policy of *RCSD* to provide accurate information, but if we print a factual error, we want to make it right. Please let us know of any error in *RCSD* that significantly affects the meaning of a story. The opinions expressed are not necessarily those of *RCSD*. Please see the back cover for subscription costs and additional information.

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The Masters of Soaring Tournament Results

March 17 & 18
Las Palmas School,
Covina, CA
...by Don McColgan

The weather Gods smiled on the SWSA field for the opening of the 1990 Masters of Soaring contest. 80+ degrees and a beautiful blue sky framed by the snow covered San Bernardino and San Gabriel mountains, provided the setting for the Top Guns of Gliderdom shootout. Contestants came primarily from Southern California, but there were also entries from Florida and Pennsylvania. The contest was co-hosted by SWSA and TOSS at the SWSA field. C.D. Pete Olsen started things off with a simple little three minute ice breaker. The poorest flight score of the 26 entrants at the end of round one was five seconds off! Four missed the 4 foot by 20 foot landing box.

Rounds 2, 3, 4, & 5 were a 22 minute add-em-up, no flight over 7 minutes, and with the same landing box adding 20, 30, or 40 points to your total.

Rounds 6, 7, and 8 [Well they came to fly didn't they?] provided the competitors with an option of a 3, 5, or 7 minute flight, with a corresponding 300, 200, or 100 point landing as measured with the standard 25 foot tapes.

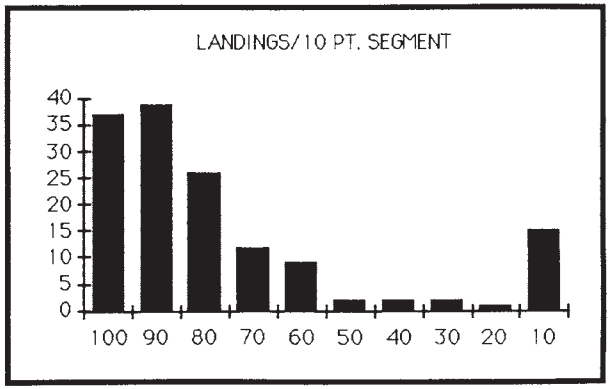
The thermals varied from light in the morning, to poor, to hat suckers later in the day, as the normal 5 to 10 MPH Westerlies came up. At the close on Saturday the leaders were: 1. D. Edberg, 2. B Agnew, 3. B. McGowan, 4. C. George, 5. T. Koplan, 6. J. Wurts.

Sunday brought an 8:00 start in nearly flat calm. The only problem with the lift was that planes could easily go out of sight. Six rounds were flown: 1, 2, & 3 being 3, 5, and 7 minutes, with 20, 30 or 40 points added by the "box" landing. Rounds 4, 5, and 6 were 3, 5, or 7, with a corresponding 300, 200, or 100 point landing bonus measured by a standard 25 foot tape. Almost all fliers chose the 7 minute option, as it was obvious that the landing scores would be the discriminator.

And the winners are:

1. B. McGowan	8591 pts.,
2. T. Koplan	8570 pts.
3. J. Wurts	8560 pts.
4. C. George	8548 pts.
5. D. Edberg	8519 pts.

That is tight competition after 14 rounds of flying. Almost any one in the top half Sunday morning could have won, as all of the fliers were superb. The chart shows how the landing scores were distributed. Visualize the X axis as a landing tape with the 100 point end to the left. The graph represents 145 landings on the 25 foot tape.



The SWSA team sincerely enjoyed hosting the contest and the company of a really great bunch of competitors. We are looking forward to a bigger and better contest next year.

Don McColgan
972 Vanderbilt Ave.
Claremont, CA 91711

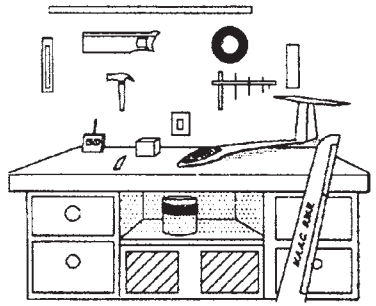
A Video Review

John Clarke's Foam Wing & Vacuum Bagging Video

...from the Workshop of Bob Welwood

Interested in trying out some of these newer foam cutting and vacuum bagging methods that we've all been hearing about? Not quite sure of what's exactly involved, and don't have access to a local expert for help? If so, John Clarke's new video "Foam Wings & Things" is a worthwhile resource. This video is 1 hr. & 10 minutes of how-to methods, entertainment, and with several handy tips thrown in as well.

The first section covers the various aspects involved in fabricating good foam wing airfoil templates. To begin, many of us (including John), use computer programs like Chuck Anderson's to precisely plot out our airfoils. The templates themselves are fashioned from 1/8 phenolic board with the plots adhered directly to them. John next uses the "NOR RAY" Hands-Off foam cutting method to produce his cores. He also advises us to employ platform templates throughout this process to enhance production accuracy and reduce steps for any subsequent production runs. Next is a demonstration of accurately cutting slots for tubes, spars, etc. into the cores using his own hot wire cutting method. This system is favored due to its ease and the accuracy of the final results.



Now that we've got these nice cores, it's time to get started on applying balsa skins with epoxy, and using a vacuum bag to securely clamp the skins to the core while curing. I'll not detail these layup methods here, as you'd best get your own copy of this tape to see them for yourself. John covers topics including balsa skin preparation, epoxy mixing and application, making suitable vacuum bags, and incorporating an air wick into the bag for problem-free bagging.

One additional thing I felt that John might have emphasized in this segment of the presentation is the great importance of minimizing the amount of direct skin contact by epoxies. Wear rubber gloves! Developing allergic sensitivity to epoxies can severely limit and probably end our enjoyment of this favorite pastime.

To get your copy, send $10.00 plus $3.50 P&H to:
Mr. John F. Clarke
911 Covert Avenue
New Hyde Park, N.Y. 11040

Just in case you might need some inspiration...John has included some nice footage of a scale contest held in June '89 in New York State. There's also a detailed demo of a very neat method of retaining all-moving stabs... much better than the traditional flight pressure mode. This alone might be worth the price of the tape!

I would recommend that anyone who is currently thinking about trying these methods, but is somewhat unsure of the steps to use and the materials needed, get yourself a copy of this tape for your reference library. The information, entertainment, and overall value provided by this video is great.

Bob Welwood
14615 21 Street
Edmonton, Alberta
Canada T5Y 1V8

On The Wing

...by B [2]

"Nurflugelseglers tell no tales" — Ken Bates

Lest we devote too many of our columns to European endeavors, particularly those going on in Germany, we've decided to trace the evolution of Ken Bates' thinking concerning tailless sailplanes by describing some of his designs.

Ken Bates' name is synonymous with tailless aircraft here in the United States. His notoriety began with the "Windlord", a Standard Class (elevator and rudder, plus flaps) plank type sailplane which used the NACA 23009-75 airfoil. The "Windlord" won several contests, and a construction article for it appeared in the March, 1978, issue of *Model Aviation*. With its relatively constant chord wing, radially ribbed wing tips, and "balsa block" fuselage, the "Windlord" was easily constructed. With its very light wing loading, the "Windlord" was an excellent soarer.

The "Manx" was also a plank, but of higher aspect ratio than the "Windlord". With a span of over 3.6 meters, it was definitely in the Unlimited Class. Ken used the NACA 23112 section with a modified camber line which had its crossover point at 75% chord. Some difficulties in maintaining the proper lower airfoil surface contour led to problems on early flights, yet once the solution was found, other problems began to arise. First, the nose had been built too long, so the moment of inertia got larger as weight was added to the tail in an effort to balance the airplane, and pitch authority suffered as a result. Second, the roll spoilers, used instead of ailerons, degraded performance each time they were used, and would not work at all when the ship was inverted. The "Manx" was finally destroyed during experiments to determine if it was sensitive to rearward tow hook location — it was.

Ken then began what turned out to be a several year excursion into swept wing designs, eventually achieving success.

Early experiments with swept wings pointed to stability problems. Ken started by using the same airfoils that he had used on his planks, and he began to feel that perhaps it was cross span flow that was hindering the reflexed sections' abilities to result in a stable platform. Additionally, Ken found the combination of wing flex and torsion (as described in "On the 'Wing...", *RCSD* 6/89) to be very difficult to control, and he began a long search for a method of building stiff, torsionally rigid wings.

The "P" series of swept wings generated a lot of information regarding the behavior of swept 'wings on tow, methods of achieving coordinated turns, and increasing thermaling ability. Tow problems occurred because the winch did not feel the load of the 'wing, even when the 'wing was fully stalled. Ken's "P1" went through three variations, finally having a TD .051 engine installed; it proved to be both fast and aerobatic. "P2" was an exact scale Northrop N9M with a "simplex" symmetrical airfoil of 14% thickness. It had a bit better performance than the "P1". "P2" eventually was modified for electric power. Both "P1 " and "P2" had spans of about 60 inches.

"P3" used a NACA 0012 section on a span of 104 inches, but the biggest departure from its predecessors was the use of rotating wing tips for elevon control. Ken felt that this would prevent tip stall on tow, even if full up was given, as the wing tips would be flying at a lower angle of attack than the main part of the wing. The first flight of "P3" was in April of 1982. Difficulties on tow persisted, however.

Low height on tow was a common problem of the "P" series, and the only visible hope was the use of a high speed winch that would catapult the wings into the air to a height matching their tailed competitors. Also in Ken's thoughts at this time was the use of undercambered rather than symmetrical sections. Ken felt that once the tow problems were solved, 'wings could be very competitive in F3B and XC.

The "P3-B" featured a span of 125 inches, a root chord of 15 inches, and a tip chord of three inches. Control was once again by "tipalons.". Tow problems had been reduced and a 60° initial climb angle was achieved, and height off tow was starting to get near that of a tailed sailplane. Good stability and high airspeed were maintained. But due to susceptibility to damage, and flutter problems, Ken decided that "tipalons" were not a good control method.

At this point Ken was looking for a competitive F3B 'wing design. "P4-A" and "P4-B" were Styrofoam free flight models designed to test out potential airfoils. The "P4-A" used the Eppler 180 and turned out to be very stable and have a good glide angle. The "P4-B" used the Wortmann FX60-100 (undercambered) section and was very difficult to keep trimmed.

By 1986, Ken had flown the "P4-C". This 'wing used the Eppler 205. At the root the section was upright, at the tip it was inverted. By "stack sanding" the ribs, Ken was able to transition smoothly from one section to another. Forgetting about the aerodynamic washout caused by the inverted section, Ken put four degrees of geometric washout into the wing. The total aerodynamic washout then totaled about ten degrees; probably too much. Ken had difficulty turning the beast, and three degrees of dihedral didn't help the situation. For the first few flights, he would actually stall the glider, and then recover it headed in another direction!

"After repairs", drag rudders were added. The ship now turned, but the glide suffered. Additionally, if the turn was made too tightly, the glide degraded into a spin. A number of consecutive problems while attempting to tow at high speed resulted in an equal number of crashes and eventual destruction of the "P4-C". A couple of lessons were learned, however: (1) Watch the washout and pay particular attention to the zero lift angles when doing the computing; and (2) Dihedral causes control difficulties in thermal turns, so reduce it to zero and use sweep if more yaw stability is needed.

By now convinced that yaw-roll coupling was the major cause of his swept 'wings' problems, Ken did some redesign work. When attempting to get good launch height, *...continued on page 6*

The Texas Soaring Conference

A National Tournament Open To Everyone
September 8-9, 1990
Two Meter & Open / Sportsman & Expert
7 Minute Duration with Landing Bonus
University of Texas, Dallas Campus,
Richardson, Texas (Dallas Area)

Chuck Fisher	Jack Hamilton
11485 Dumbarton	11216 Sesame St.
Dallas, TX 75228	Dallas, TX 75238
(214) 270-2634	(214) 348-4669

A Simple Trip Test

...by Jim Harger

I came up with a simple test on how to tell whether or not a trip is going to affect your plane.

- **At the flying field, test fly the plane without the trip, and trim for a straight and level flight.**
- **Install the trip on the right wing, only.**
- **Test fly the plane again, without changing the trims.**

If the plane turns and/or banks to the left, the right wing is producing more lift and/or less drag, and the trip is helping. If it turns to the right, it is producing more drag/less lift.

You could also compare two different trip positions in the same way, by placing one at 20% on one wing, and at 40% on the other.

I tried the test on my E-214 equipped open class plane, and it confirmed what the Princeton tests have shown us: At low Reynolds, it is a definite help.

Jim Harger
1911 Wolcott Dr.
Columbia, MO 65202

On The Wing...continued

a 'wing must be able to withstand high launch speeds. The problem until this point had been that when the 'wing began climbing steeply it would also roll into the ground. Additionally, since Ken was looking for a contest airplane, he had to come up with a design which was inherently stable enough to not require high-tech stabilizing methods.

The design that eventually met these criteria was the "Keeper". "Keeper" had a two meter wingspan and used an Eppler 205 for the root section. The tip was also a 205, modified to reflex form by Ken. Four degrees of twist were used, along with ten degrees of sweep. The big departure from previous ships was with the incorporation of anhedral. Anhedral cured the "yaw-roll" coupling problems of previous designs and allowed for zoom launches of such velocity that the elevons would flutter. Even cross-wind launches proved not to be a problem.

"Keeper" had very good performance. It was able to thermal well, and it had 92% of the dead air time of the conventional tailed sailplane that Ken tested it against, a two meter, E 205, flat winged Pilot "Harlequin" with ailerons.

By the end of 1986, Ken had built, flown and sold the "Sabre", a combination plank and swept wing using a slightly reflexed Eppler 205 and sporting a central fin. It flew well, but even with two large spars and thick balsa sheeting, flutter was still experienced when bringing the ship back upwind from a thermal. Not wanting to go to a foam core wing, Ken stuck with wood construction, but it seemed as though any increase in torsional strength brought on added weight which just couldn't be tolerated.

By the end of 1987, Ken had solved many of the problems which had plagued him from the beginning, and he had a new 'wing which towed and flew extremely well. The following points outline the improvements incorporated: (1) The torsional rigidity of this new 'wing had been drastically improved with a new spar system. To give some idea as to this new spar's torsional rigidity, Ken recounted the following experience... During construction it was found that the spar had been built with one degree too little twist; Ken tried to put the added degree of twist in while sheeting the wing and couldn't do it. (2) No dihedral was used. Rather, the 'wing was built on a flat surface and there was a small amount of anhedral built in due to the tapered wing. The anhedral eliminated all of the yaw-roll coupling difficulties on tow, and no keel was needed. (3) Elevons were placed in the outer third of the wing, for Ken had previously found that if they extend further inward there is increasing adverse yaw. Another advantage with this set up is that no differential was needed. (4) This model was not a pure flying wing, as it had tip fins. Quite often, when banking steeply and flying slowly, a true flying wing will slip in the direction of span and fall to the ground. The tip fins on the new 'wing eliminated this behavior entirely. (5) Ken added a "bat-tail" to the 'wing. This was accomplished by simply extending the root section with additional material so that it followed the mean chord line of the airfoil. The trailing edge was then formed to produce a nice graceful curve leading from the center of the wing to the straight trailing edge. This smoothing of the quarter chord line very much improved the 'wing's thermaling ability. (6) Sloppy linkages cannot be tolerated, so the servos were mounted in the wings with direct connections to the control surfaces.

At one of the MARCS Symposiums Ken said that he at times "couldn't see the forest for the trees", and that solutions to problems are obvious once discovered. A couple of things seem very clear to us, however; Ken learned from his experiences, whether they were successes or failures, and he has always shared with others what he has learned. In that regard, Ken Bates stands as a model for others to emulate. Unfortunately, we've not yet had the chance to meet Ken personally, but we are certainly eager for the opportunity!

Model	White Sheet FW Special	SOAR-TECH	MARCS Symp.	Misc. Sources
Windlord	FWS #1 (#7)		1985	MA, 03/78 * Werner, 1984 ** Pers. corr.
Manx	FWS #1 (#7)		1985	Werner, 1984 **
P1-A, B, C	FWS #2 (#20)	#1		
P2	FWS #2 (#20)	#1		
P3	FWS #2 (#20)	#1	1985	
P-3B	FWS #2 (#20)	#2		pers. corr.
P-4A, 4B	FWS #2 (#20)	#2		
P-4C	FWS #3 (#36)	#4 & #7	1985	
Keeper		#7	1987	
Sabre			1987	Pers. corr.
'87 'Wing			1987	

White Sheet Flying Wings Specials: Sean Walbank — Editor, 29, The Gardens, Acreman Street, Sherborne, Dorset DT9 3PD, England

SOARTECH: Herk Stokely, 1504 Horseshoe Circle, Virginia Beach VA 23451

MARCS Symposia Proceedings: Walt Seaborg, 1517 Forest Glen Road, Oregon WI 53575

* = Construction Article: Full size plans available from *Model Aviation*.

** = "Nurflugelsegler Ferngesteuert" by Reinhard H. Werner, Neckar-Verlag GmbH, Klosterring 1, 7730 Villingen-Schwenningen, Federal Republic of Germany

The table outlines the various sources of information used for this article:

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

An Update On The Casio #510

...by Wil Byers

We soaring pilots are kinda of a different lot. We're always looking for some gadget or way to increase the performance of our gliders and sailplanes.

We're always looking for that one small item which, when installed, will mysteriously cause the model's L/D to jump to 60:1. Yes, we want to become the Nimbus 3 of the model community, racking up win after win. Well, I've purchased just such and item from Hobby Dynamics • P.O. Box 3726 • Champagne, IL 61826-3726 • Phone 1-800-458-0241.

Yes, performance seekers you are about to be made aware of the single most important item to improve L/D since the invention of the airfoil. Think about your upcoming wins and how you will feel taking home all the marbles. Then, order yourself the CASIO #510 digital watch with built in barometer and altitude functions.

Now, all the foolishness aside, this is a great watch with a couple of very nice functions built into it that are unequivocally compatible with increasing your ability to understand and enhance the performance of your model. And, these functions *...continued on page 8*

The Casio...continued

will also aid you in developing better flying skills and techniques which, when applied, can promote your chances of taking home all the marbles or maybe even a trophy.

The CASIO #510 is a digital watch that looks very similar to most other digital watches. Although it is approximately the same size and weight, it is packed inside an attractive flat black case. There are some very impressive semi conductor circuits and absolutely amazing machine level programming routines, which separate this watch from all the others as far as a soaring pilot is concerned. The functions include the Barometer, Altimeter, Depthmeter (in case you crash into the water), Multi-Alarm, Countdown Alarm, and a Stopwatch. I think that you will immediately recognize these functions as being important to the R/C soaring enthusiast.

The Barometer

I'll only discuss three of these functions, as the others are pretty much similar to other watch functions. The first function which I was attracted to was the barometer. The barometer functions as a relative indicator and not as an absolute indicator. It's superb to be able to look down at your wrist and to be able to tell if the barometer is rising or if it's falling. For example, I can look at my watch and tell instantly if the relative atmospheric pressure is rising and, additionally, I can see what the pressure has been doing over the last 18 hours. Thus, one should be aided in making some type of intelligent analysis of what direction the weather is going to take, and whether or not to load the models into the car and head for the favorite flying site.

Also, the watch not only gives you a trend of what the pressure is doing but, when switched from the time function to the relative barometer function, it will display the relative pressure in millibars (5 millibar increments). And, when asked to by the simple press of a button, the sensor will store a memo reference of the relative pressure.

The Countdown Alarm

Another feature built into this unit, which is directly applicable to R/C soaring, is the countdown alarm. It can be set anywhere from 1 second to 24 hours. This feature lets you program your watch to do things like beep you when you have exceeded a 7 minute flight, or to beep you at two hours if you are trying for your LSF level 5. Or, maybe you would be wise to set it when you leave the house for the flying field. Then, you will know when to head for home, so the wife doesn't have you sleeping with Rover again.

The Altimeter

The special function, which really closed the canopy on this watch for me, is its altimeter. The altimeter is unique. It is automatic and is constantly updating the altitude. The watch apparently arrives at the altitude via an algorithm based on the relative pressure. The watch displays the altitude in increments of plus or minus 20 feet and is surprisingly accurate. It can track altitude over a range of -13,120 ft. to +13,120 ft. This altimeter function lets you take spot measurements at the press of a button, while it also affords easy adjustment of the reference altitude, which would be important if one was trying to establish some idea of altitude gain. Also built into this amazing function is an altitude alarm which, when set, will give a nice audible beep for five seconds after one has reached a preset elevation.

All this is nice, but what if you aren't wearing the watch and it just happens to get stuffed in the nose of your model? Hey, no problem. CASIO has designed into this model a maximum altitude memory. Yes, this little puppy will remember where it has been and tell you, when it comes home to rest. This is a very useful function, as I am sure you are aware. It lets you get a good feel for how high you've been, how high the slope or field is you are flying from, or the approximate altitude of your model's last flight. Ever hear of a thing called density altitude? This watch just might help you realize what...*continued on page 20*

Weight Saving???

Via Verbals
The Club Newsletter
of The Soar Valley Soarers

Having recently built a wing of 750 square inches for use on a glider intended for 30 minute electraslot, I wondered how much weight could be saved by using Litespan instead of Solafilm. The wing followed normal construction principles of 1/16th sheet top and bottom, back to spars of 1/16th by 3/4 spruce tapering to 0 inches at the tips, with webbing of Rohacell. The trailing edge is built up from 1/16th sheet and capping on ribs. All weighing was done on an electronic postal 2kg scale, with a resolution of 1g.

The relative weights are as follows:

Litespan:	0.0185 g per square inch
Solafilm:	0.0398 g per square inch
Solatex:	0.0531 g per square inch

(Sorry about mixing my units, but I find it easier to weigh in grammes and measure in square inches.)

Total covering weights for the 750 square inch wing (i.e., 1500 square inches) are thus:

Litespan:	27.75 g
Solafilm:	59.7 g
Solatex:	79.65 g

With the above figures, a saving of 31.95 g could be made by using Litespan BUT, as in all things, you do not get something for nothing.

Conclusions:

Wing, bare	240 g
Wing, bare plus Balsaloc adhesive	260 g
Wing, covered with Litespan	295 g

Wing covered with Solafilm, would have weighed 240 + 59.7 = 299.7 g

Guess what, folks? I have saved 4.7 grammes. Was it worth the hassle????

(Answers on the back of a 5 £ note to David Andrews...)

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

Jer's Workbench

Three Tips from the Workbench

One

For cutting out those slots for spars in foam wings, try using a Dremel tool with a router attachment. Use a regular Dremel router type cutting blade of the right width for the spar. Set up a fence with a piece of straight spruce pinned in place at several locations as a guide. Set the correct depth on the Dremel router and take your time! After a couple of times using this trick, you will wonder how you ever got along without it.

Two

Tired of getting ripped off buying that magic filler stuff that costs too much? Try going to your local hardware store and getting regular white spackling. It costs 1/8th the price. You just add a little water to get the consistency you want, and it sands just the same. Be sure to let large quantities dry over night to be on the safe side.

Three

Ever thought about having that long or odd shaped sanding block that you needed for that one particular job? Try making your own out of 2x4s or balsa blocks. All you do is select the size and shape you want and then cut out what you need (flat, contours, or airfoil shaped). You can get the long sandpaper in lots of grades from the rent-all store and all you have to do is decide what you really need. I use some lines marked on the workbench at pre-determined angles as guides, and then I clamp the work to the bench and sand away with my long sanding blocks. Flat, straight roots on foam wings are so easy!

Understanding Thermal Soaring Sailplanes

...Cutting Vortex Drag

...by Martin Simons

To reduce the vortex drag of a wing of a given area, what is chiefly required is a **large span**, and accordingly, a **narrow chord**, that is, a **high aspect ratio**. The aspect ratio of any wing may be found by dividing the span by the average or mean chord. **Doubling the aspect ratio cuts vortex drag in half.** The high aspect ratio not only reduces the absolute strength of the tip vortices but moves them further apart, so greatly weakening their influence on the central parts of the wing.

A further saving of vortex drag, perhaps as much as 5 or 6 percent, can be achieved by using a carefully worked out tapered planform. The best planform from the vortex drag point of view has an elliptical distribution of chord. That is, the chord at each point along the span is the same as would be the chord of a perfectly elliptical shape. It is not necessary for the wing to be an actual ellipse providing the chords conform as closely as possible to these proportions. In practice, a moderately tapered wing that approximates to the ideal shape is almost as good.

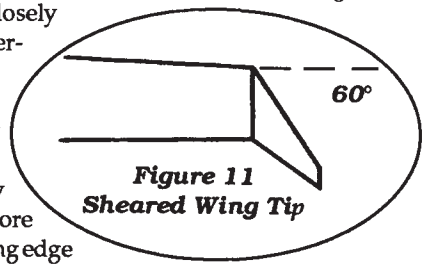


Figure 11
Sheared Wing Tip

Some slight further advantage may be gained by using a planform with a straight trailing edge. There is some evidence that a wing which is slightly crescent shaped, that is, swept back progressively more towards the tips with the taper confined to the leading edge and a raked or 'sheared' outermost end (Figure 11), produces less vortex drag than one which carries taper on both leading and trailing edges. However, such a planform carries certain disadvantages too. Swept back wings are more prone to tip stalling, than straight forms. The chances of flutter are also greater. All wings bend up and down in flight as they meet varying loads, gusts, changes of trim, etc. This is not harmful providing the bending does not actually overstress the structure. With sweep back, especially if the angle of sweep increases outwards, any bending also changes the angle of attack of the outer panels. This can produce a force in phase with the natural torsional resonating frequency of the wing, so that what begins as a normal bending initiates a violent twisting and bending oscillation. (This has in fact been a serious problem for several types of full-sized tailless sailplanes with sweepback.) Experiments in this direction should be carried out with some caution.

Further small gains might be achieved by using special devices such as winglets and wing tip sails, although the value of these for model and full-sized sailplanes has not been proved. To ensure that the winglets do not create more drag than they save, careful design is required. When these devices are used in full-sized aviation they are usually tested in the wind tunnel or experimentally in flight before being finalized. This is not normally practicable for the model flier. When correctly placed they do reduce the vortex drag for a given wing span, but the same gains can be always achieved by extending the wing span slightly and so increasing the aspect ratio. Winglets and tip sails could be of benefit when competition rules place a firm upper limit on wing span. Then a vertical winglet may reduce vortex drag without infringing the rules. In the existing F3J rules, however, there is no span limitation so winglets are probably not useful. Some recent theoretical and wind tunnel research also suggests that a sharply raked or sheared tip, fitted to an ordinary straight wing, saves some vortex drag (Figure 11). It is certainly worth experimenting with such tip shapes since they can be altered on a 'cut and try' basis without much effort.

The benefits, if any, of special tips, winglets, and other vortex drag saving devices, are greatest when the wing concerned is of low aspect ratio. In such a case, the vortex drag is very large and saving a few percent of this does represent a considerable benefit to the total drag of the aircraft. On a typical sailplane, however, the usual high aspect ratio has already cut the vortex drag to a relatively low figure. By using special tips there should be a further saving but this will not represent the same proportion of the total aircraft drag and may not be noticeable in practice. Nonetheless, there is nothing to be lost by trying to save even a small amount of drag in these ways.

Thus, saving vortex drag mainly involves changes to the wing in plan view, especially increasing the aspect ratio and tapering, with some possible further gains from keeping the trailing edge straight and special wing tips. The aspect ratio is by far the most important of these, wise choice of taper is next in importance, and the other devices are somewhat problematic.

Scale effects and model size

Cutting profile drag requires attention to the wing section, but this cannot be considered in isolation.

For all aircraft, and particularly models, there is a complicated interaction between wing section, wing chord and speed of flight which is usually termed the **scale effect**. In very general terms, a wing with small chord moving through the air at low speed, will always be less efficient than a larger one moving faster. Hence, reducing vortex drag by using a high aspect ratio invariably increases profile drag because it reduces the wing chord. What might be gained on the vortex drag swings, may be lost on the profile drag roundabout.

The scale effect is normally expressed in terms of the Reynolds number. The Re number may be worked out by simple arithmetic. If the speed of flight is known and the chord of the wing is measured, the Re number (under standard atmospheric conditions at sea level) is found by multiplying the speed, in metres per second (V), by the chord in metres (L), and multiplying the result by 68459. Thus for a model flying at 12 m/sec with a wing chord of 0.25 metres (25 cm) the Re number becomes:

$$V \times L \times 68459$$

that is:

$$12 \times .25 \times 68459$$
$$= 3 \times 68459$$
$$= 205377$$

The crucial factors are the chord and the airspeed. [1]

The scale effect is more noticeable on models than full-sized aircraft since the wings operate in a range where quite small changes of Re can produce large variations of profile drag, particularly at the low speed, small chord end of the scale. The smaller the Re, the more serious this becomes. It is also to be remembered that tapering a wing to save vortex drag by approaching the elliptical chord distribution, inevitably means the Re number at the tips is reduced and with small models this can be serious enough to cause the tips to stall prematurely. At very low Re numbers, the airflow tends to separate altogether from the wing, so a planform that might otherwise be very good, may, if used on a small, slow flying model, prove quite unsatisfactory. If the wing has a rectangular planform, with chord everywhere the same, the Re number for the whole wing is the same as the local Re at each position. But if the wing is tapered, the Re at the tips will be smaller than at the roots. The important factor here is the taper ratio of the wing. If the root chord is twice the tip chord, a taper ratio of 1 : 0.5, the Re number at the root will be twice that at the tip. If the taper ratio is 1 to 0.25 , that is, if the root dimension is four times the tip *...continued on page 12*

Understanding Thermal Soaring Sailplanes ...continued

chord, the tip Re will be a quarter of the root, and so on.

It also follows from the above that the scale effect is different at different flight speeds. The faster the model flies, the higher the Re, and the more efficient the wing becomes. A radio controlled model sailplane with tapered wings is therefore quite likely to experience a range of different Reynolds numbers from around 50,000 for the wing tips at low speed, up to about 400,000 for the roots at high speed. (These figures compare with Re upwards of a million for full-sized powered light aeroplanes.)

It is a good general rule that the larger a model is, the more efficient it will be, all other things being equal. This is certainly true for sailplanes.

The large sailplane

To illustrate the kind of improvements in performance that result simply from increased size, example polars have been calculated using a computer program (written some years ago by the author), which relies on wind tunnel test results for the wing profiles concerned and makes proper allowances for planform and taper, Reynolds number variations at different points spanwise and different airspeeds. No allowance whatever has been made at present for parasitic drag. The results are therefore not to be taken as representing any real sailplane, but only as a comparison of a large wing with a smaller one which is otherwise identical. The parasitic drag caused by stabilizing surfaces does depend to a small extent on the profile or section of the mainplane. Wings with larger camber tend to increase the loads to be carried, for balance, by the tailplane and as mentioned above, if the tailplane carries some load, it creates more drag. However, this does not normally make a large difference and can, to some extent, be offset by careful arrangement of rigging angles and trimming. It may be assumed, as a general rule, that the sailplane with the best wing will be the best sailplane, if other proportions are approximately equal.

The largest total projected surface area allowed by the F3J rules is 150 sq dm or 1.5 sq metres. An allowance of 10% has been made for the stabilizer, so the wing area used in these calculations is 1.35 sq metres. A wing span of 4.5 metres then gives an aspect ratio of 15. Tip chord of the example wing is 17.5 cm. and root chord 35 cm., a taper ratio of 0.5. It is assumed that the wing loading is 3.0 kg/sq m,. This gives an all up mass of 4.05 kg., well within the 5 kg limit. Dimensions for Wing 1 are given in Figure 12. A small wing, Wing 0, for comparison is exactly half this size. The aspect ratio is still 15, so the area of Wing 0 is 0.3375 sq m. To give the same wing loading, 3 kg/sq m, the mass is 1.0125 kg. (The Imperial dimensions are: Large wing, 14.76 ft span, 2092 sq ins area, weight 8.93 lbs, wing loading 9.8 oz/sq ft. Small wing, 7.38 ft, 522 sq ins 2.23 lbs., same wing loading)

Table 1
Performance Polar for
Wing Number 0
Clark - Y - PT
Wing Loading = 2.99 kg/sq. m.
Span = 2.25 metres, Aspect Ratio = 15
Root Chord = 17.50 cm.
Mid Chord = 16.50 cm., Taper Ratio = 0.50

Velocity Metres/Sec	Sink M/Sec	L/D Ratio
21.89	2.833	7.73
15.48	1.295	11.95
12.64	0.791	15.98
10.94	0.646	16.95
9.79	0.521	18.77
8.94	0.448	19.96
8.27	0.401	20.61
7.74	0.373*	20.77*
7.30	0.927	7.87
6.92	0.834	8.29
6.60	0.751	8.79
6.32	0.685	9.23

Table 2
Performance Polar for
Wing Number 1
Clark - Y - PT
Wing Loading = 3.00 kg./sq. m.
Span = 4.50 metres, Aspect Ratio = 15
Root Chord = 35.00 cm.
Mid Chord = 33.00 cm., Taper Ratio = 0.50

Velocity Metres/Sec	Sink M/Sec	L/D Ratio
21.92	2.301	9.53
15.50	0.891	17.39
12.65	0.543	23.31
10.96	0.395	27.71
9.80	0.333	29.41*
8.95	0.311	28.79
8.28	0.293	28.25
7.75	0.282	27.48
7.31	0.278*	26.30
6.93	0.815	8.50
6.61	0.734	9.00
6.33	0.670	9.44

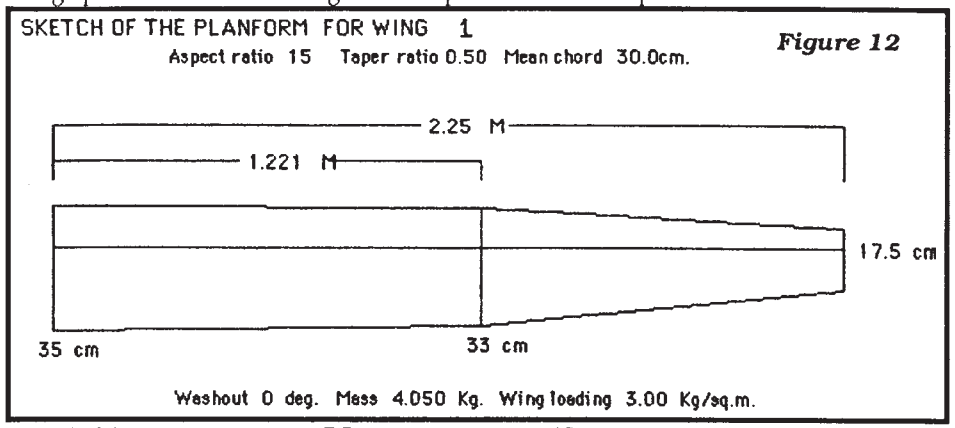


Figure 12

The well known Clark Y wing section is used to begin with. This does not imply that the Clark Y would be the best possible choice of aerofoil for any model although, as will appear in further discussion, the Clark Y, despite its great age (designed in 1920), remains quite hard to beat at least for the slower parts of the sailplane polar curve.

Wind tunnel results on the Clark Y-PT from the Princeton research results by Michael Selig, John Donovan and David Fraser, published in **Soartech 8,** *...continued on page 23*

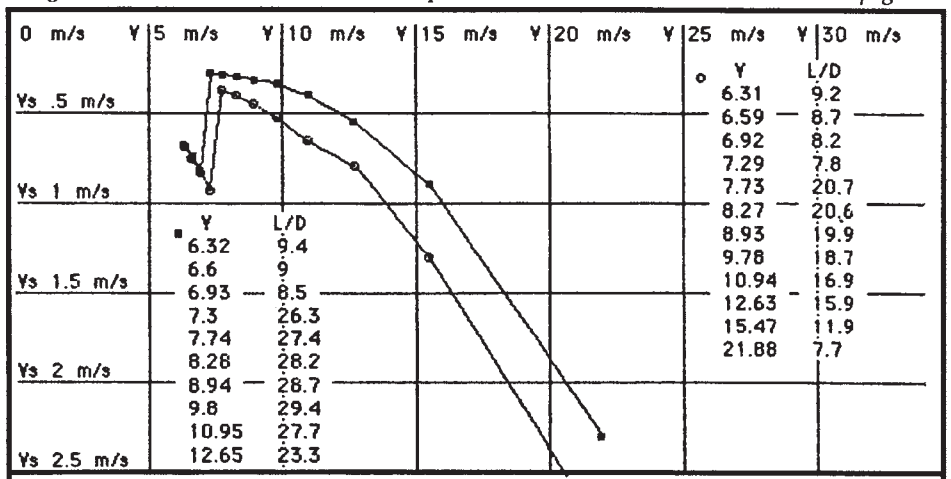
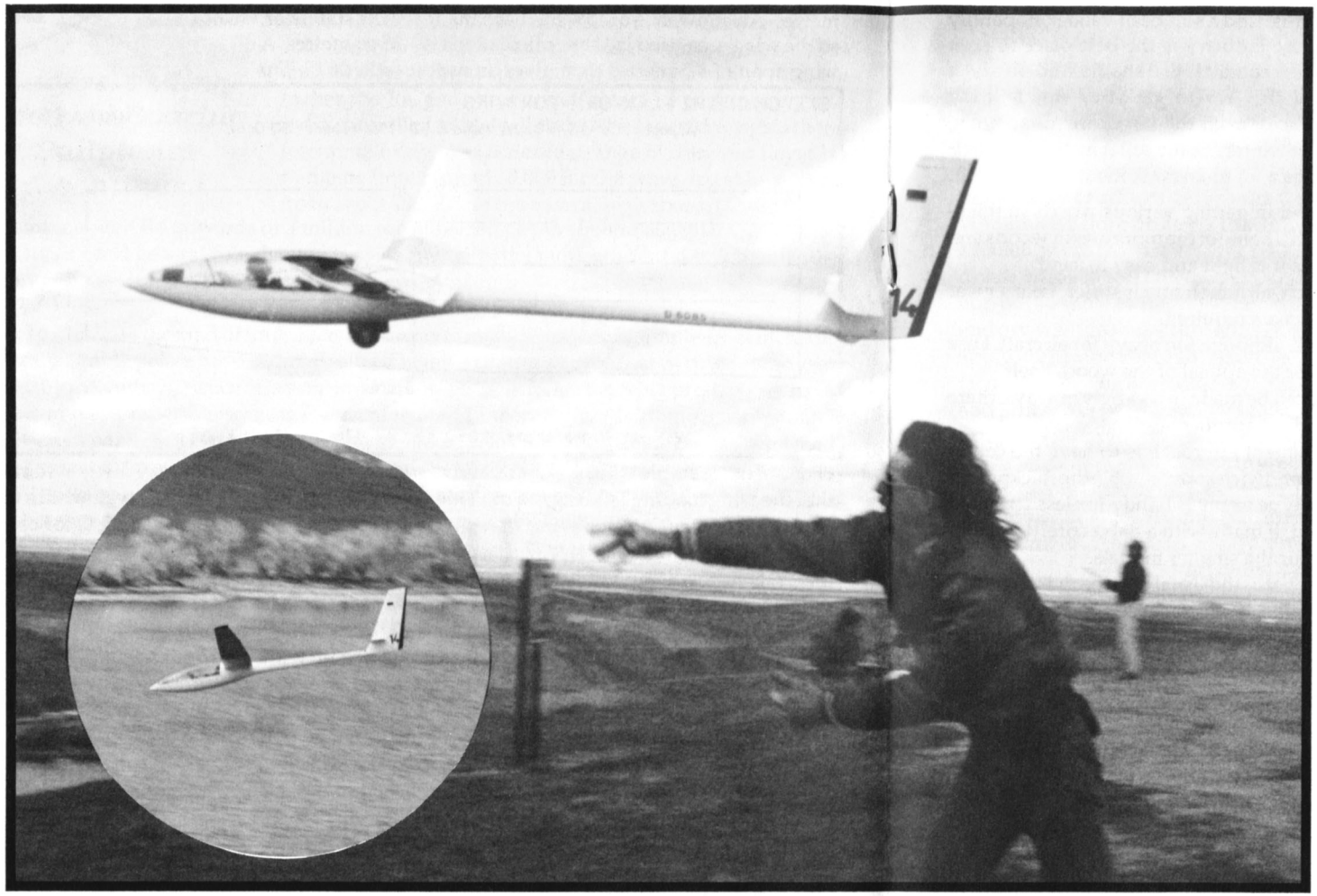


Figure 13 o B = 2.25m A.R. = 15 M = 1.01 kW/S = 2.9 kg/sq.m.
▪B = 4.50m A.R. = 15 M = 4.05 kW/S = 3 kg/sq.m.



Above: John Dvorak is launching Pierre Dumenil's Italian jet fighter.

The Los Banos Fun Fly

...Photos by Jerry Slates

Top...Left
Richard Tiltman launching Rich Spicer's SB-10 (insert is also the SB-10)

Bottom...
Left: Brian Chan is checking the trim for the first flight of this ASK-18.
Center: Pierre Dumenil & his SG-38
Right: Brian Chan is holding Tom Overton's KA-6.

Making Your Own Plywood for Scratch Building

...by Ray Reiffer

I started making my own plywood several years ago because, as a scratch builder, I found it fun to make as much as possible, and I used to make boats that required a lot of plywood in larger sizes. By making your own plywood, you have an option of choosing which woods you want. Not only can you finish the sailplane in the finish of your choice but, because the cost is so low, you have the ability to expand your project horizons.

To get started, you must find a source of veneer, hopefully for free. The furniture industry is the best place to start looking and, with a few contacts, you should find plenty of materials to work with. Try to get your wood in the summer, as most places, even the larger manufacturers, burn it for heat in the winter. Some sell it as scrap to their employees, so it helps a lot to know someone in the field.

I have been successful in getting various woods in thickness from .025" to .125". Some of the more useful woods are:

- Mahogany, as it is light and easy to sand.
- Cherry & Birch, although much stiffer, take a nicer finish with less coats required.
- Walnut & Oak, although too heavy for aircraft, I use them in boats for the appeal of the wood, itself.

Although plywood can be made in a variety of ways, there are a couple of standard approaches.

- The most frequent approach is to have the center layer of a 3-ply sandwich about double the thickness of the skins. This type of ply is handy for less stringent applications and, if made with a Balsa core, it is a nice light plywood for the smaller models.
- For more strength, the usual approach is to have 5 layers of the same wood, with each at 90° to the previous layer, of course. Depending on the material thickness and the number of layers used, almost any situation can be dealt with easily.

Glues

Almost any kind of glue can be used, but some are better suited than others.

- Generally, white glues are fine. However, because of their tendency to dissolve in water, they should not to used for our work subjects.
- Powered resins are my favorite. In particular, I like the U.S. Plywood-Weldwood brand. This glue is waterproof, and my boats have survived 18 years of use without glue failure. There is one catch in obtaining this resin today, as there is a different manufacturer. (Dap, a very good glue, is not nearly as waterproof. However, there are 2-part versions available that are completely waterproof.)
- Epoxies are great if you can afford to use them. The benefits are in that you save time and there is no water problem.
- Contact cements are great.

The Type of Glue Used

Plastic resin glues make a very stiff and hard to cut plywood. The epoxies, whites and contacts follow in suit. Plywoods made with contact cement will be more flexible although the cement does harden over time. This does not mean that the layers will separate, however. I use this method on boat hulls, because the wood can be twisted around more easily. Conventional glue is used for securing the frame work.

Preparing the Wood for Gluing

The sheets should be sanded, especially if the materials are real thin, as any surface problems will show up as a problem later. Sanding to bring the grain down on a lot of woods is required anyway, and it also helps the gluing process. Be careful not to sand across the grain on thinner materials, as the wood itself may split apart along the grain. It is helpful to remove the dust by knocking the wood on the work surface or by vacuuming. Try to avoid rubbing it off with a damp rag, as this pushes the dust back into the open grain. Take the time to size and edge the laminated sheets, as this will help in the alignment and gluing process later.

Applying the Glue

Brush on a nice even coat on each side of each piece to be glued. Thus, for 3-ply, you would put glue on 4 surfaces. Allow the water based type glues to sit in the open air for a couple of minutes before bringing the individual pieces together. I work on a waxed board for smaller pieces that are around 1'X2'. This allows for easy clean-up later after the glue has dried. Using lots of newspapers, and changing them frequently, prevents glue contamination of the show surfaces. When using contact cements, brush on a coat and let it soak in and dry well into the tack stage. (This glue seems to evaporate away on raw surfaces.) Then, apply the second coat and, again, let it dry several minutes. The humidity is the controlling factor. Now you are ready to put the pieces together. Start by aligning one of the corners, and proceed to press together while working from the starting point. Once assembled, you can press it or roll it with a hand-held roller like the one used in printing.

Pressing the "Stack Up" for Flatness

A lot of pressure is not required if you are using epoxy or contact glue. The more conventional glues require considerable pressure in order to bond them well. It is very important to achieve as equal a pressure distribution as is possible.

Equally Spaced Clamps or Weights

It is a big time saver to stack up several pieces to be clamped or pressed, so that they can be done all at the same time. Use equally spaced clamps or weights. Using balanced torque on the clamps will do just fine. Back up your clamping with cover materials that are as flat as you can find or make. This helps to provide an even pressure on the plywood. My favorite method is to use a small hydraulic jack, which I sit on the "stack up". The spacer should reach the steel beam supporting the house. Now, by applying pressure, the whole stack of plywood can be squeezed at the same pressure.

Keeping Your Plywood Flat

This can be a problem if you are in too much of a hurry and open the clamps too soon. As the plywood is being pressed, there is little air circulation, and it is hard to dry. However, if you place long strips of newspaper between each layer of wood, the newspaper will draw the moisture out of the wood pack. A properly placed fan will help to dry it out nicely. Without a fan, it will take several days using the paper method, for your plywood to come out beautifully flat.

In Summary

When using water based powered resins, the brush can be saved if you put it in a container of water as soon as you can. Be sure to work some water into the brush. You can come back later and finish the job by adding soap. Most epoxies clean up with alcohol, but should be followed with soap and water. Making plywood can be fun, easy, and inexpensive. It has been quite some time since I have bought any plywood. Of course, if weight is your top priority, this method will not beat out the new light plys that are available, today.

♣ ♣ ♣

Readers, Ray sent a piece of 1/8" 3-ply with the article. It is a very impressive piece of work! Ray says, "Get some veneer, and give it a try. I'm sure you will be surprised to see how easy it is to make your own plywood." A neat idea!

Jerry

Ray Reiffer
9060 80th Ave.
Zeeland, MI 49464

The Vision Radio Modified

...by Eric Sanders

The Airtronics Vision radio, although state of the art, still has its shortcomings. The one feature which I was counting on was the ability to use the radio with my five far less expensive 7-channel Challenger FM receivers (one of the best receiver bargains around).

Airtronics advertises the fact that the Vision can be run in both PCM and PPM modes, but the PPM mode they use isn't compatible with Futaba, World Engines, Challenger, and probably other FM receivers. Although the original ATRCS unit allowed you to switch between using Futaba or Airtronics type receivers through a menu item, the Vision does not support this function. This left me stuck with five unusable receivers. What was born out of my frustration and never ending need to customize everything is this simple hardware modification that will allow you to switch between the two transmitter modes. Let me mention from the start, however, that although this modification isn't difficult,

It will most definitely void your warranty if it's still in effect!

Some electrical experience is also needed, so if you don't feel comfortable poking around with a soldering iron, I'd advise you to recruit a friend with experience to help you out. Well, enough preaching. Let's upgrade our Vision radio.

Background Information

First off, a basic understanding of how your radio operates and identifying what we need to do to suit our needs is helpful. The microprocessor reads the voltage levels (i.e. position) of your joy sticks and switches, and produces a meaningful series of pulses that represent what it saw. (One pulse is produced per channel.) The width of these pulses are changed to reflect the changes in stick position. These pulses are fed to the RF dec, which then sends the signal out as radio waves. The receiver picks up the signal, interprets the pulse widths, and drives the servos, accordingly. The pulses going to the RF deck are the key to our problem. The original ATRCS unit allowed you to switch the polarity of the pulses between positive and negative using a Futaba/Airtronics menu item. Since this option isn't available to us Visionites through software, we'll have to invert the pulses through hardware. We'll want our switch to be inaccessible during normal flying, too. (Accidental switching while flying will definitely suck your plane out of the sky.) Pulse inversion will be handled by a common and inexpensive 7486 IC chip. Without getting too technical, this chip takes two inputs and produces one output. If one of the inputs is left unconnected, then the output is exactly the inverse of the input. If one of the inputs is grounded, the output is exactly the same as the second input. By intercepting the pulse train coming from the microprocessor going to the RF deck, we can invert the pulses with a flick of a switch.

The Operation Begins

Now, clean off your work bench, take a deep breath, and lets start the operation. If you take the battery out of your vision radio, you'll see a round hole in the plastic on the back cover of the radio. This is the perfect place to mount the switch. It's easy to get to, yet inaccessible while flying. (After all, removing your battery while flying surely isn't recommended!) Remove the RF deck and take the back coverplate off of the radio. There are two screws on top, four in back and two on the bottom. Carefully cut out the bottom

of the hole. Your Dremel tool, set on low, should work good for this. Round the edges of the DIP switch with a file until it fits snugly in the hole. You want to make sure that, before you glue it in place, the small switch arms lie below the surface of the plastic. If you don't, you won't be able to put the battery pack back in without hitting them. Use epoxy to glue it in place. If you want to use a super glue, be sure it's the thick type. A thin super glue will flow inside the switch making their settings permanent. (Trust me. I know this from first hand experience.) Only one of the four switches will be used. I'd recommend either two in the middle. If you can find a single switch DIP, all the better. Cut the unused pins off flush with the bottom of the switch, leaving two pins opposite each other. Bend the remaining two pins outward. You'll need to do this for clearance reasons.

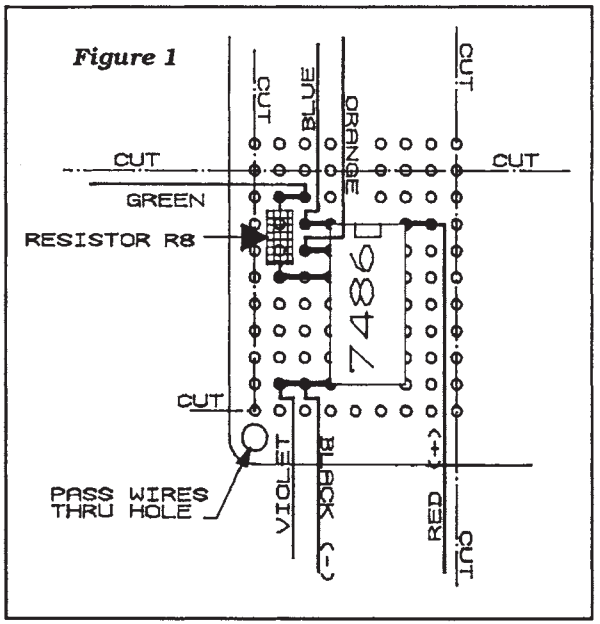


Figure 1

Looking from the back, in the lower left side of the Vision circuit board, you'll see a resister with R8 labeled next to it. Carefully unsolder and remove it. Put it aside for now, as we'll be using it later. This is where the pulse train will be intercepted and reinjected.

Next, we'll assemble the small PC board as shown in Figure 1. Before going on, study the wiring diagram carefully. The wire color labels are, of course, arbitrary, but help in keeping your wiring straight. Cut out the small section of PC board according to the lines indicated. You can mount the 7486 chip in a socket or solder it directly to the PC board. Make sure you orient the chip correctly. However, notice the notch on the

...continued on page 20

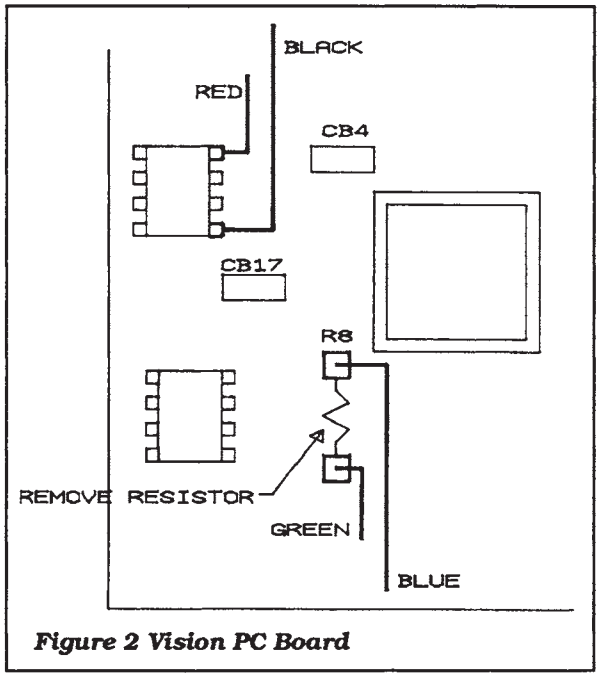


Figure 2 Vision PC Board

chip in Figure 2? There should be a notch, dimple or a stripe on one end of your ship.

Be careful you don't get the chip too hot while soldering if you're not using a socket.

Vision...continued

Cut the lengths of wire to about 6" for now, except for the orange and violet wires...cut these to about 8". Solder the wires to your small PC board, neatly routing them through the hole in the corner. After wiring, the finished board should be able to fit mounted on the inside, of the left side of the transmitter, as viewed from the back. The board will have to be positioned as far towards the top as possible, without touching the vision's horizontally mounted PC board, in order for the back cover to clear. File off excess material from your PC board until it fits.

The 6" wires should be cut to appropriate lengths as you go. Solder the wires according to the color labels shown in Figures 1 and 2. The red and black wires are power and ground, which we'll tap off of pins 5 and 8 of the IC shown. The blue wire runs to the top pad of resistor R8. This is our signal wire from the microprocessor, and is wired to one of the inputs of our 7486 IC. The green wire goes to the bottom pad of resistor R8. This is our 7486 IC output, which is fed to the RF deck. Leave the orange and violet wires 8" long, and solder each of them to a post on the DIP switch. (It doesn't matter which.) Tape them down and off to the side in order to hold them in place. The orange runs from the switch to the second input; the violet runs to ground on the board.

The Moment of Truth

Check and recheck to be sure that your IC chip's position and wiring are correct. Glue the small PC board in place with a dab of silicon glue, making sure that it's not touching any other components. Build up a small mound of silicon glue over the wires and pins of the DIP switch in order to insulate and protect them from breakage. When the glue has dried, put the transmitter back together being careful not to pinch any wires in the case. With the DIP switch in the "off" position and PPM mode selected from your menu, the radio will control Futaba and like receivers. Move this switch to "on" when using PCM mode or PPM mode with Airtronics receivers.

In Summary

Well, I hope this little hack was of value to you. If you have any questions, please drop me a line. Last off, I'd like to send my greetings to all the members of CASA. They're a swell group of folks and I really miss their company and flying expertise since moving from Virginia. Hope to see you all the the September Open Guys!

Eric Sanders
3904 Traine Drive
Kettering, Oh 45429

Casio...continued

kind of air conditions you will be flying in...Thick verses thin!

Lastly, I measured the weight of my watch in its band and it weighed 39 grams (28.35 grams in an ounce). While the face measured approximately 1.5" X 1.5". However, if one chose, they could easily remove the watch from its band and significantly reduce the size and weight, thereby allowing it to easily fit in almost any model without penalty.

One further point about this amazing little device. It is a semiconductor device and most probably depends on some kind of field effect transistor and its changing gm0 (forward transconductance). Thus, it will be affected by temperature. Additionally, it is utilizing relative barometric pressure and, therefore, cannot be expected to give absolute values.

However, this watch is well worth the $89.95 price tag, especially if one is shopping for a new watch, anyway. If you should not be able to find one of these great value items, please don't hesitate to send me your Rolex and I will return to you promptly a CASIO #510.

Wil Byers
632 Meadows E.
Richland, WA 99352

A Product Report

The Sucker Kit

...by Gordon Jones

"When I first heard about the "Sucker Kit", I was one of those who thought that the name was probably a real indication of what would happen to the buyer. Was I ever wrong!"

A friend in our local club, The Southwest Soaring League, had purchased a video tape of the sucker kit along with the kit. He showed it at a club meeting one night, and while the video made it look simple (realize that the pros were doing the demonstration), there were some aspects of the process that required some further attention. I asked numerous questions of the member who had the kit, but he could shed little light on the process as he had just begun using it. So, I called up the phone number listed in the advertisements and really lucked out; I talked to one of the wives of the gentlemen who are selling the Sucker Kit. This worked out very well, because I got unbiased answers in simple terms with answers that translated into the information I was interested in obtaining. Boy, wives are great! To make a long story short I purchased a Sucker Kit with some extra bags, and started experimenting with various techniques and different material combinations.

I must say that everything that they had said and demonstrated in the video was true! I have had exceptional luck with every process that I have attempted. Now I am not from Missouri, but I am skeptical of things that are easy the first time around. I have used blue foam, white foam, obechi, balsa, and glass cloth...all with super results. With a 1/8 X 3/8 spruce spar structure, ala the earlier article in the October 1989 issue of *RCSD*, the completed structures are super strong and at the same time light enough that you don't have to worry about weight (12 oz. per panel for a 110 inch wing). I think that the best results have come using blue foam with obechi sheeting and the spar setup mentioned above. I find that the tradeoff in weight versus strength is excellent. I do add some carbon fiber to the trailing edges and over the spars to add some strength, but this does not add enough weight to write home about. The white foam works as well, but it is not quite as sturdy. I use epoxy resin in every application and have found that if you pre-soak and squeegee off the excess resin in the carbon fiber, as you do the obechi, you end up with an almost indestructible wing. In addition, you can use this process for stabs and fins if you want to go all the way with this method. Think of the sailplane that only has about 10 pieces of wood in the whole thing and how much easier the building process goes (in time and work). If you plan out the building every night or building session you can set it up so that you make the last thing you do a bagging process so that you get more quality time in other areas (like doing things with your wife or girlfriend, and staying out of hot water).

A couple of things to mention that are not really highlighted in the video that make a difference in the process. Purchase the wide variety of 3M caulk, as it will be less apt to leak and is easier to work with. I use a wallpaper roller to do the sealing with and these are inexpensive and readily available at any hardware store. If you are bagging a wing with undercamber use the bottom core for alignment, and be sure to use clamps and some sort of straight stock for the trailing edges. It will work if you only put a straight edge on the edge of the sheeting with some weight, but this is a lot better in the long run. I suggest some spruce (as the video instructs you to), or some straight metal stock will work as well. When you are through evacuating the bag of air do not just leave the pump closed and wait for things to happen over night. Close off the line with the line clamps that are supplied and check the vacuum level every so often using the pump gauge. Using the pump itself will work for a while, but the seals will deteriorate down the road and you will be better off in the long run not to work the pump too much. As I said, I have *...continued on page 23*

Flatland Fun Contests

...by Don Anthony

AS A FLATLAND CONTEST DIRECTOR, I have wrestled often with the issue of bringing variety and fun into the same ol' thermal contests associated with us "flatland" glider guiders. Over the years I have conducted, participated in or heard about a variety of thermal or quasi thermal *fun* contests. I would like to share some of this inventory with the readers in the hope that one or more of these contests will be used by their local club to liven up their Saturday contest & fun fly.

Chicken Fly

This little gem and all its variations is sometimes more fun for the spectators than it is for the pilots. The basic idea is to determine how well the pilots can trim their planes for stable flight and prove it!

RULES: A timer is required for each pilot. After launch, the pilot has a short period of time (usually 20-30 seconds) to get their plane trimmed out for stable flight.

The **timer** then "resets" the clock and restarts the clock when the pilot hands them their transmitter to hold. Flight time stops when the pilot grabs back their transmitter or the plane goes out of visual range or hits the ground or a ground based object. Note: Once the pilot takes back the transmitter time stops, and that is the pilot's flight time for that round.

A target time is chosen for each round. This target time may be, for example, 5 minutes. If, by chance, the plane is still airborne when time is called, the pilot gets max flight points. If landing points are also part of the contest, the timer hands the transmitter back to the pilot who is free to land at whatever landing scheme the CD has decided upon.

A *variation* is for the timer to hand the transmitter back to the pilot with one or two minutes to go. The pilot then has this time period to set up for a conventional precision/duration landing.

Another variation combines this concept with team effort via a wife, husband, girl or boy friend, or other fledgling flyer. In this team scenario the pilot has (x seconds) to trim the plane and then hand the transmitter to their team mate pilot for the remainder of the flight. This may or may not include landings.

In all fairness, it is probably a good idea to divide the club into two classes for this type of contest. One class has polyhedral planes, the other class has flat-wing aileron ships. My own observation is that, quite often, a polyhedral ship will max out on time. Aileron plane's free-flight time, on the other hand, is usually measured in seconds before the pilot desperately grabs back the transmitter.

Time Flies When You're Having Fun Contest

This is another little gem that involves perception. The basic idea is to see how good a person's sense of time really is.

RULES: A contest format is decided upon. This may be any standard precision or precision-duration mix. I usually run a 3-3-5-7 or a 2-4-6-8, or whatever seems right for the day. A landing format is also decided upon. My current favorites are a line landing or zone landing.

Usually, I allow the pilots to fly their rounds in any order, and decide after the round which task they flew.

Time starts upon separation from the launch line. The timer starts his clock, but CAN NOT talk to the pilot except for a hazard warning or information about lift somewhere else on the field. *NO time information is allowed until the pilot HAS LANDED*. A major point of this contest is to see how accurately the flyer can sense time. *...continued on page 23*

have been used as the basis for this exercise. (The - PT indicates Princeton Tests.) Obviously, the results coming from the computer can be no more reliable than the wind tunnel test figures. There is no reason to suppose that the tunnel tests are seriously in error, but it would be unwise to assume that they are perfectly exact or that the profile actually used on a model, will be exactly the same as that tested in the Princeton wind tunnel. (More will be said about this in Part 3.)

With all these reservations, the general trend of the results is very clear and is not significantly changed if a different wing profile, or even different wind tunnel, is used. Figure 13 shows the resulting polars for large and small wings, Tables 1 and 2 display the rates of sink and L/D ratios numerically, with significant maxima and minima indicated. The large wing has a very considerable advantage at all flight speeds. The large wing stalls at a slower airspeed and also has a much better minimum sinking speed. The smaller wing has a sharply peaked polar curve, indicating a critical 'one speed' trim for minimum sink and best L/D just above the stall, whereas the larger wing has a flattish top to the polar, and hence would be easier to fly efficiently in thermals. The L/D figures, for the wing only, show the larger wing achieves L/D max of better than 1:29, compared with 1:20.8 for the smaller model (Tables 1 & 2). At higher speeds, the larger wing remains markedly superior.

Adding the drag of fuselage and stabilizers to these wings would reduce the actual performance of both but the advantage of the large model would not disappear. If anything, the larger aircraft would lose less in proportion. Presumably the radio control equipment could be housed in the same space, or very nearly so. The fuselage of the large model, although it would be longer, could have a cross section no larger than that of the smaller model, and so would have a lower parasitic drag in proportion to the size of the wing.

The first, and perhaps the most important aerodynamic improvement for a thermal soaring sailplane, therefore, is to build large. Sheer size brings with it several important disadvantages, including cost and time spent in building. For reasons of safety, a large model may also require extra care in structural engineering. Some simple stressing calculations to prevent collapse in flight should be done. Towlines for launching need to be strong, and so on. Large models also are less maneuverable than small ones, so in certain situations may be out-turned by small, handy aircraft. Not least, difficulties in transporting a large model sailplane to and from the flying site may arise.

It also needs to be pointed out that the large model cannot legally be ballasted to very high *...continued on page 24*

Understanding Thermal Soaring Sailplanes ...continued

Contests ...continued

And this can get real interesting. I have seen five minute tasks completed in two minutes and two minute tasks completed in five minutes. I have also seen a sprinkling of flyers complete their tasks within a few seconds of perfect.

♣ ♣ ♣

More Contests Next Month... Will Include Don's "Bomb" Drop! Thanks, Don. Jerry

Don Anthony
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Dublin, Ca. 94568

Sucker Kit ...continued

had a lot of success with the "Sucker Kit" and I am one sucker that believes. If you do purchase one and have any problems be sure to call and get some help. The folks at Composite Aircraft Engineering & Supply are more than willing to help out any time you ask.

Gordon Jones
214 Sunflower Drive
Garland, Texas 75041

Understanding Thermal Soaring Sailplanes ...continued

wing loadings, since the 5 kg mass limit applies. The wing loading used in the above calculations, 3.0 kg/sq m., is quite low, but the model weighs over 4 kg. Adding ballast to bring this total to 5 kg increases the wing loading to 3.7 kg/sq m (12.1 oz/sq ft.) This is still quite moderate. Successful model thermal soarers have been flown with higher loadings than this.

Despite these problems, the performance advantages are such that thermal soaring sailplanes for major international and national contests will almost certainly be built up to the largest sizes permitted under the rules.

Further improvements

Given two sailplanes of maximum total surface area (1.5 sq m) and similar weight, the one which has less drag will still perform better than the other. Further work has to be done to establish the best compromise between the 'swings and roundabouts' of vortex and profile drag, and the choice of wing profile also has to be considered.

♣ ♣ ♣

[1] If British Imperial units are still used, the Re is found from V [ft/sec] x L [ft] x 6360.

Martin Simons
13 Loch Street
Stepney
South Australia 5069

Looking for Others in the Area

Dear Readers,

We received the following request from the New Hampshire/Maine area:

"Do you know of any active R/C sailplane types in the White Mountain area or nearby in western or southwestern Maine? We are just starting an R/C club here in the Conway area, but I'm afraid there aren't many glider guiders in the crowd. Most of the members are power types, and my main interests are soaring and electrics. As usual, I may be the odd-man out. Anyway, if you know of any active sailplane pilots or clubs in the area, I'd appreciate the info."

(signed), Jack Russell, P.O. Box 369, Madison, New Hampshire 03849

Response: Is anyone in Jack's area? Jerry

A Coming Event

For those of you who need to plan ahead... The 1990 Torrey Pines Scale Fun Fly will be held September 1-3, 1990
More to come per Charlie Morey, the Publicity Chairman.