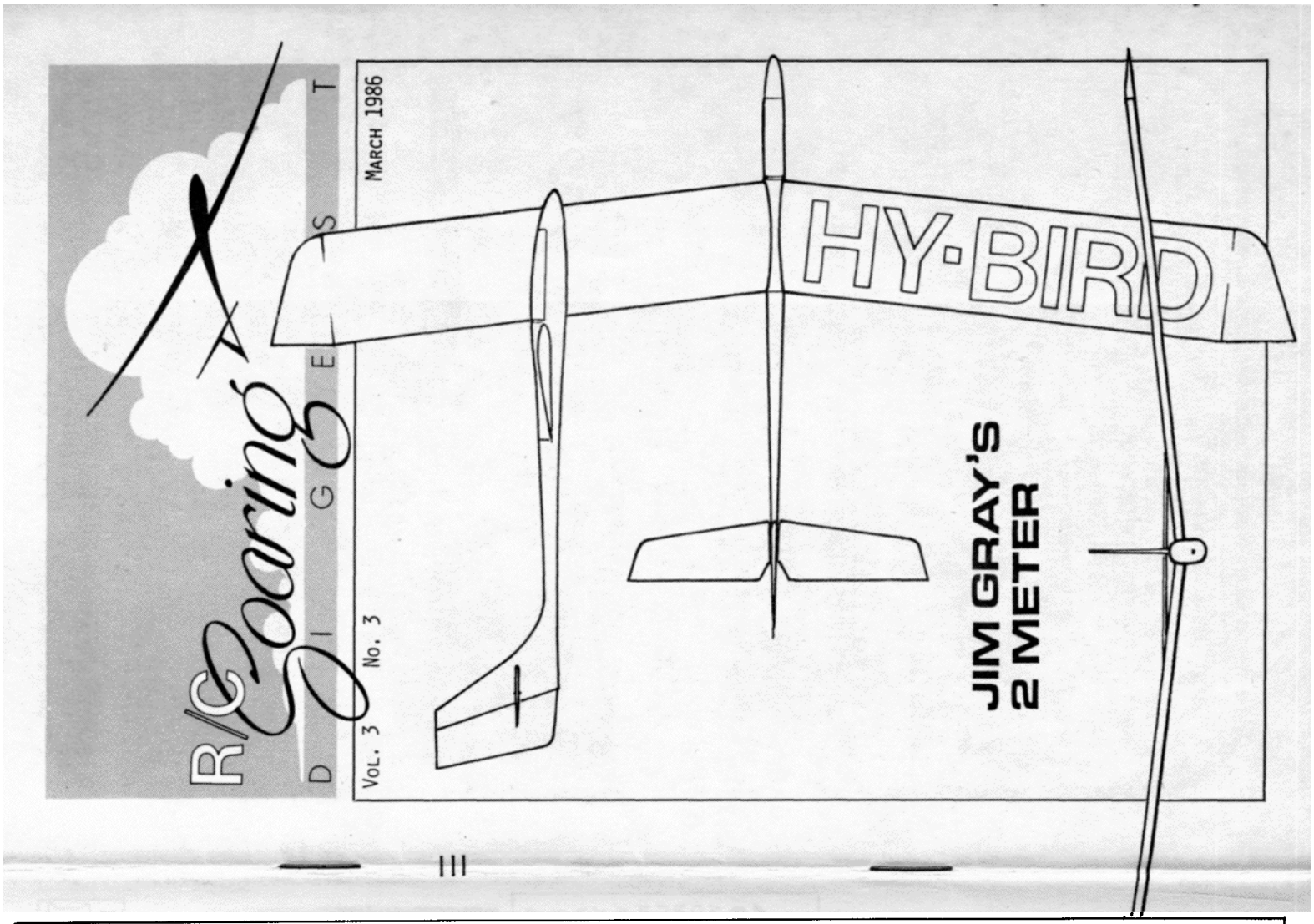

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SUN FUN '86

FLORIDA - HOME OF THE TANGERINE, THE ORANGE, AND THE GRAPEFRUIT... AND GIGANTIC THERMALS, AS WELL. PEGGY AND I TOOK A WINTER VACATION AND DROVE OUR NEW DODGE CARAVAN SE 4,200 MILES IN EIGHTEEN DAYS! "VACATION", YOU ASK? WELL, DEFINITELY YES. OUR GOOD FRIEND, RICH BONNELL, BUILDER OF WINDSONGS AND TELLER OF TALL TALES ABOUT FLORIDA SOARING, HAD BEEN TRYING TO GET ME TO COME DOWN TO SEE HOW THE "PTERODACTYLS" FLY, AND BOB GRACEY OUR TENNESSEE FRIEND HAD BEEN AFTER US TO VISIT HIS AREA FOR SOME SUPER SOARING. FINALLY, IT ALL CAME TOGETHER ON JANUARY 10TH, AND WE LEFT THE FROZEN NORTH FOR THE SUNNY SOUTH. ON THE WAY, WE STOPPED TO VISIT FRIENDS IN ELMIRA (WHERE HARRIS HILL IS LOCATED) AND SAW A VERY NICE MOTORGLIDER UNDER CONSTRUCTION BY HOWIE TRAMPENAU. HE IS A FORMER MODEL BUILDER AND CRAFTSMAN , AND HIS LITTLE 39-FOOT, ROTAX POWERED SAILPLANE IS A BEAUTY. IT OUGHT TO BE FLYING THIS FALL. BUILT OF SPRUCE AND PLYWOOD, IT IS REALLY A BIG MODEL, AND COULD BE BUILT BY ANY GOOD MODEL BUILDER. I HOPE HE PRODUCES PLANS FOR IT.

NEXT, WE JOURNEYED DOWN INTERSTATE 81 TO MORRISTOWN, TENNESSEE, WHERE BOB GRACEY LIVES. A FEW TIMES WHEN HE HAS BEEN UP HERE TO VISIT, HE HAS SPOKEN VERY HIGHLY OF THE WEATHER AND THE FIELD HE FLIES FROM. WELL, IT WAS NO EXAGGERATION: TEMPERATURE IN THE 60'S UNDER BRIGHT SUN, AND THERMALS EVERYWHERE. WE FLEW ALL AFTERNOON FROM A 'PRIVATE' AIRSTRIP BELONGING TO A FLYING FARMER, AND THE SOARING WAS SUPERB! BOB DIDN'T LIE. WHILE IN THE AREA WE WENT TO SEE GREAT SMOKEY NATIONAL PARK - SOMETHING THAT IS AWE INSPIRING AND BEAUTIFUL, EVEN IN WINTER. BOB'S SAILPLANES INCLUDED THE STEPP TWO, AN OLD PARAGON, AND SEVERAL OTHERS, ALL OF WHICH GOT A GOOD WORKOUT FOR SEVERAL HOURS UNDER THE BLUE SKY. BREAKFAST HIGHLIGHT OF THE VISIT WAS THE BREAKFAST BAR AT SHONEY'S - A RESTAURANT CHAIN - AND ONE OF THE BEST WE'VE SEEN ANYWHERE. HIGHLY RECOMMENDED.

TRUCKING ON DOWN INTERSTATE 75 TO TAMPA, WE SET UP AN APPOINTMENT WITH RICH BONNELL AND HIS BUDDIES WHO FLY IN THE TAMPA - ST. PETERSBURG AREA. THERE WERE JOHN GUNSAULLUS, KALE HARDEN, LEON KINCAID, WALT GOOD, ED BURTON, AND MANY OTHERS WITH WHOM WE FLEW AND FLEW AND FLEW. IN FOUR DAYS I WAS SOARING FOR THREE OF THEM, AND - YES - RICH WAS RIGHT ABOUT THOSE PESKY PTERODACTYLS (PELICANS) WHICH ABOUND. IN FACT, THE PINELLAS SOARING ASSOCIATION HAS BEEN RENAMED THE PELICAN SOARING ASSOCIATION...AND IT IS AN APT NAME I THINK. THE PELICANS DO BOTH THERMAL AND RIDGE SOARING, AND CAN BE SEEN SOARING ALONG THE BREAKWATERS, THE CAUSEWAYS AND BRIDGES, AND EVEN IN THERMALS...WHERE ONE DAY I SAW OVER 100 OF THEM IN A GIANT POSSE OR PASSEL, IF THAT'S WHAT YOU CALL A GAGGLE OF THEM. THE "TYPE B" BUZZARDS ABOUND, AS WELL, AND THEY SOAR EQUALLY WELL IN THERMALS BUT AREN'T SEEN AT ALL RIDGE SOARING.

I FLEW THE BIG SCOOTER OF LEON'S, WALT'S SAMUN, A SMALLER SCOOTER, AND THE PIVOT, AS WELL AS MY OWN HY-BIRD, WHICH DID OKAY IN THAT ESOTERIC CROWD OF FINE MACHINERY. OH YES, ONE MORE THING: ED BURTON'S AUTOMATIC FOAM CORE CUTTER. FANTASTIC! I'VE ASKED HIM TO DO AN ARTICLE FOR RCSD. YOU'LL LOVE IT. NOW IT'S BACK TO THE GRINDSTONE, BUT WHAT THE HECK...WE'RE ALL SUNBURNED AND SOARED OUT! THANKS, PELICANS!

HY-BIRD, A 2-METER HYBRID.....JIM GRAY

FOR SOME TIME NOW I'VE BEEN FEELING GUILTY; A BEAUTIFUL FIBERGLASS FUSELAGE HAS BEEN SITTING IDLY IN ITS PACKING BOX WHERE IT'S BEEN FOR A COUPLE OF YEARS, EVER SINCE MY FRIEND BRUCE ABELL SENT IT TO ME FROM AUSTRALIA. ABOUT A YEAR AGO I SAW SOME OBECHI-VENEERED FOAM WINGS FOR A TWO-METER SAILPLANE SOLD BY VIKING MODELS. THEY LOOKED GOOD TO ME, SO I CALLED JERRY SLATES AND ASKED HIM ABOUT THEM. HE CLAIMED THEY DID A FINE JOB, SO I ORDERED A PAIR ... PROMISING HIM A FLIGHT REPORT. LITTLE DID HE KNOW HE'D HAVE TO WAIT A WHOLE YEAR FOR IT!

JUST ABOUT A MONTH AGO, THINGS BEGAN TO SLOW DOWN ENOUGH FOR ME TO DARE ENTER THE WORKSHOP AND GIVE IT A GOOD HOE-ING OUT PREPARATORY TO BUILDING SOMETHING, AND THERE SAT BRUCE'S FIBERGLASS FUSELAGE GOADING ME. I HELD THE WINGS UP, TRYING TO DECIDE WHETHER THEY SHOULD PLUG IN TO THE FUSELAGE, OR WHETHER THEY SHOULD BE ONE-PIECE AND SIT ON A SADDLE CUT OUT FROM THE FUSELAGE. BEING SIMPLE BY NATURE AND ESCHEWING THE COMPLICATED, I DECIDED FOR THE SECOND OPTION. THAT DONE, I WONDERED WHERE AND HOW THE CUT-OUT SHOULD BE MADE. GRADUALLY, THE IMAGE OF A SWEPT-BACK WING TOOK PLACE...MEANING THAT THE C.G. AT THE ROOT COULD BE FARTHER AFT THAN USUAL (BECAUSE THE C.G. AT THE MEAN CHORD PROJECTED TOWARD THE ROOT YIELDS THIS ARRANGEMENT). THAT DONE, I OPTED FOR SIMPLE RUDDER/ELEVATOR RATHER THAN RUDDER/AILERON. BUT WHAT TO USE FOR EMPENNAGE? I WANTED AN ASSEMBLY JOB RATHER THAN A BUILDING JOB, SO SCROUNGED THROUGH MY PARTS BOX. HMMM...A SAGITTA 900 RUDDER...A SAGITTA 600 STABILATOR...OUGHT TO BE ABOUT RIGHT.

NOW YOU'RE GOING TO THINK I'M CRAZY, BUT THE WHOLE THING FELL INTO PLACE BY "EYEBALLING" IT. NO PLANS AT ALL...JUST A COUPLE OF QUICK CALCULATIONS FOR 7.5 DEGREE SWEEPBACK PER PANEL, AND THE SAME AMOUNT OF DIHEDRAL PER PANEL. A FEW YEARS AGO, MY O.F.B. AND I HAD A "BUNNY" WHICH WAS A SUPERB FLIER...AND IT USED SWEEPBACK, SO I COPIED THAT IDEA.

THE WINGS, BY THE WAY, ARE CONSTANT CHORD PANELS, SO IT WAS NO TRICK TO BEVEL THE ROOTS FOR SWEEP AND DIHEDRAL, BLOCK THEM UP AND COVER TOP AND BOTTOM WITH FIBERGLASS/EPOXY. THAT'S RIGHT - NO SPARS. I DID THE SAME THING WITH A "WINTERHAWK" 100-INCH A FEW YEARS AGO, AND IT'S STILL GOING STRONG, ALTHOUGH IT PROBABLY WOULDN'T STAND A GORILLA WINCH LAUNCH.

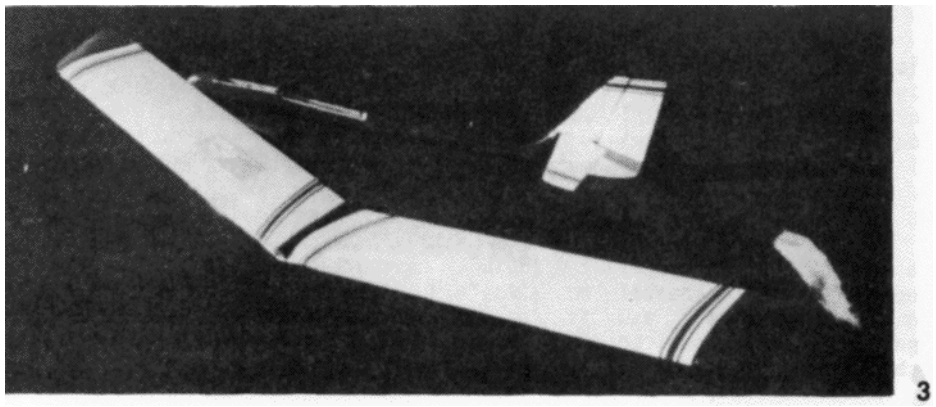
I PUT SOME BULKHEADS INTO THE WING SADDLE CUT-OUT FOR STRENGTH AND RIGIDITY, CUT OUT A CANOPY FOR RADIO GEAR ACCESS, AND BUILT A FIN ONTO THE STUB ALREADY MOLDED IN PLACE. THE WING IS HELD IN PLACE BY A STEEL PIN AT THE LEADING EDGE THAT INSERTS INTO BULKHEAD AND CANOPY, AND A STEEL BOLT THROUGH A BONDED-IN PLYWOOD PAD AT THE TRAILING EDGE, MATING WITH A SIMILAR PAD IN THE FUSELAGE. RAILS FOR THE SERVOS WERE ADDED TO THE FUSELAGE AT THE AREA UNDERNEATH THE WING, AND THE RECEIVER AND BATTERY WERE PLACED IN THE NOSE AHEAD OF THE WING...WITH PLENTY OF ROOM FOR FORE-AND-AFT (TRIMMING) MOVEMENT. A TRIAL FIT OF PARTS SHOWED A NICE BALANCE AT THE CALCULATED C.G. WITH ONLY ABOUT 4 OUNCES OF WEIGHT IN THE NOSE. THIS CAN BE REDUCED, BUT IT ALLOWS THE BATTERY TO BE MOVED BACK A BIT AND AFFORDS FLEXIBILITY IN PARTS PLACEMENT.

THE WING PANELS, ESPECIALLY SINCE THEY PASS THROUGH THE FUSELAGE, WERE NOT LONG ENOUGH TO MAKE A TWO-METER SPAN, SO I CARVED WINGTIPS OF BLUE FOAM. THE TIPS ARE SIMILAR TO THOSE USED BY RALF DECKER IN THAT THEY CONTINUE THE BOTTOM SURFACE UNBROKEN AND FLAT, BUT SLOPE DOWN FROM THE TOP OF THE WING TO THE EDGE OF THE TIP. IN PLANFORM, THEY SLANT BACK AT ABOUT 45 DEGREES. TIP-TO-TIP SPAN IS APPROXIMATELY 78".

AFTER ADDING THE TIPS, I COVERED THEM WITH A VERY LIGHT NON-WOVEN CLOTH OBTAINED FROM AEROSPACE COMPOSITES (AN RCSD ADVERTISER) AND A MIXTURE OF WHITE GLUE AND WATER, SANDING BETWEEN COATS AFTER ALLOWING THEM TO DRY THOROUGHLY. A FINAL SANDING AND COVERING WITH TRANSPARENT RED MONOKOTE.

THE WINGS WERE LIGHTLY SANDED, BRUSHED AND WIPED, AND THEN COVERED WITH WHITE MONOKOTE. I ADDED STRIPING IN RED AND BLACK, PLUS AN RCSD DECAL ON THE RIGHT WING. YOU CAN GET YOUR OWN RCSD DECAL IN LIGHT AND DARK BLUE, PEEL-AND-STICK MATERIAL:(SEE AD IN THIS ISSUE).

THE FUSELAGE WAS BRUSH-PAINTED WITH WHITE HOBBY POXY UNDERCOATER, FOLLOWED BY BRIGHT RED HOBBY POXY PAINT. THE USUAL PREPARATORY SANDING, AND SANDING WITH WET-OR-DRY PAPER (400 GRIT) BETWEEN COATS, WAS DONE. A WHITE UNDERCOAT MAKES THE RED MUCH BRIGHTER THAN A GREY UNDERCOAT.



HY-BIRD (CONTINUED):

I WAS CONCERNED THAT THE GENEROUS DIHEDRAL, PLUS SWEEPBACK WOULD CREATE A 'DUTCH ROLL' PROBLEM IF THE VERTICAL TAIL SURFACE WAS NOT LARGE ENOUGH, SO I PURPOSELY MADE THE VERTICAL FIN AND RUDDER LARGER THAN IT WOULD NORMALLY BE ON A 2-METER SAILPLANE.

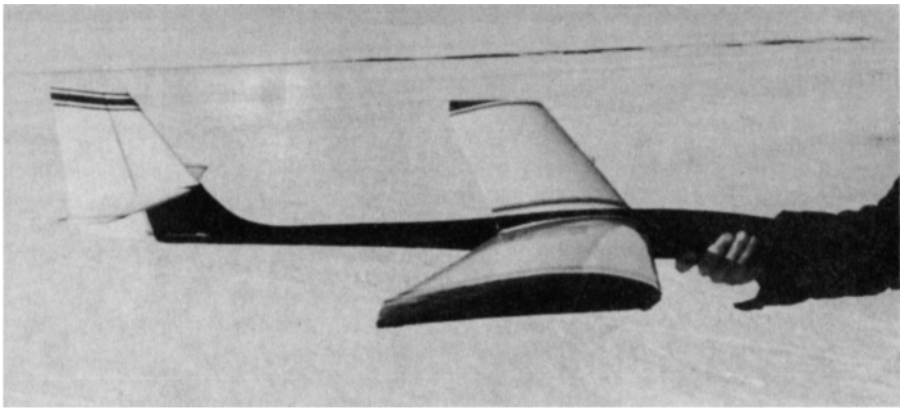
THE TOW HOOK IS OF THE HIDDEN VARIETY; I.E., RECESSED INTO A CAVITY IN THE BOTTOM OF THE FUSELAGE. TOWING LOADS ARE TRANSFERRED FROM THE HOOK TO A BULKHEAD AND THENCE TO THE FUSELAGE ITSELF. AS YET, I HAVE NOT MADE AN EXTERNAL SWITCH, BUT PLAN TO DO SO WITHIN THE NEXT WEEK OR SO.

FLYING:

TODAY WAS THE DAY TO TEST FLY, AFTER WAITING A WEEK OR SO FOR DECENT WEATHER ON A WEEKEND. THE DAY WAS COLD AT 15 DEGREES, BUT THE SUN WAS BRIGHT AND THE SKY CLEAR...AND, BEST OF ALL, NO WIND. I TOOK THE HY-BIRD TO THE SILVER RANCH AIRPARK WHERE MY FRIEND TY SAWYER LIVES, AS WE DECIDED TO DO THE TEST FLYING THERE. ALL IN READINESS, TY VOLUNTEERED TO RUN WITH THE SAILPLANE BUT NOT LET IT GO...SO HE COULD FEEL WHETHER IT WANTED TO LIFT OFF NOSE OR TAIL HEAVY. AS HE RAN AND I 'STEERED', THE HY-BIRD LIFTED SMOOTHLY OUT OF HIS HAND AND CONTINUED STRAIGHT AND LEVEL WITH NO ZOOM OR DIVE. APPARENTLY, THE STABILATOR SETTING (WHICH I WAS CONCERNED ABOUT BECAUSE OF THE THREE-DEGREE WING INCIDENCE) WAS EXACTLY RIGHT, AS WAS THE C.G. LOCATION. ANOTHER TEST GLIDE, AND IT REACTED THE SAME WAY...WITH A STRAIGHT AND SMOOTH FLIGHT OUT OF HAND AND TO THE GROUND SOME DISTANCE AWAY. THE SNOWBANKS TENDED TO CREATE OBSTACLES, AS DID THE RUNWAY LIGHT EXTENDERS IN THE FORM OF SOLID STAKES DRIVEN INTO THE SNOW. HOWEVER, ALL WAS AVOIDED AND A GOOD LANDING MADE - WITH A FANTASTIC, NO-STOP SLIDE ON THE PACKED SNOW FOR ANOTHER 100 FEET.

THE HIGH-START WAS OUT AND READY, SO TY LAUNCHED WHILE I STEERED AGAIN. UP AND AWAY IN A NEAT, STABLE CLIMB, NO CORRECTIONS NEEDED. LIFT OFF AT THE TOP WAS SMOOTH AND EASY, AND THE FUN BEGAN. TURNS IN BOTH DIRECTIONS, MILD ZOOMS AND DIVES, WITH NO TENDENCY TO TIP STALL. THE AERODYNAMIC 'CLEAN-NESS' WAS APPARENT, AND PENETRATION WAS EXCELLENT AT 10 OUNCES PER SQUARE FOOT WING LOADING (4 SQUARE FEET AND 40 OUNCES).

ON THE SECOND HIGH-START LAUNCH, TY FLEW IT AND MANAGED A SIX-MINUTE THERMAL FLIGHT - BELIEVE IT OR NOT! HY-BIRD IS ALL I HAD HOPED FOR, AND I EXPECT YOU'LL BE SEEING US ON OUR PROMISED TRAVELS IN 1986.



THE OLD AND THE NEW

A Comparison of Two Airfoils, An Eppler 205 & A NACA 2512

Althaus' first volume of Profilpolaren fur den Modellflug (PfdM) shows data that indicates the older NACA sections should exhibit pretty good performance on our sailplanes. For example the NACA 2412, which he measured, shows the lowest drag at low Cl of any airfoil tested. Altho he didn't explicitly measure the E205 he shows data for a "Flat-Bottom" E193, which is very similar indeed to an E205.

There are good theoretical reasons why the older sections, which have a turbulent boundary layer, might be better than the new ones, which tend to be laminar at our Reynolds numbers (Re), but tests of these sections on actual model sailplanes are scarce.

In order to see whether the expected performance can actually be realized, I made a second set of wings for a Sagitta 900 which I have flown for several years. The original wings are, of course, a pretty good reproduction of the E205, and by simply taking off one wing and replacing it with another it's possible to get comparative data without wondering if other factors are upsetting the results. The section for the new wings is the NACA 2512. I used this rather than the 2412 because the bottom is flat and I'm as lazy as anybody else. The relocation of the maximum camber from 40% to 50% chord is relatively minor.

Care was taken to exactly duplicate the planform of the original wings and the templates for the ribs were computer drawn. In addition I made several female templates of the airfoil so that the final sanding could be carefully controlled to assure an accurate section. The construction was identical with the E205 wings, except, of course, that the 2512 is considerably thicker than the E205 (12% vs 10.4%), and that required a little internal modification of the root construction. I built exactly the same spoilers as well so any influence there would be duplicated. In addition I cleaned up all the nicks and bangs of the E205 wings and recovered them for good measure.

The completed 2512's came out quite well. They have exactly the same polyhederal and planform, but they ended up 2 oz. heavier, mostly because of differences in the density of the wood. To compensate for this I flew the E205's with 2 oz. ballast in the fuselage. There was one other difference: the incidence of the 2512's is slightly greater, so I normally re-trimmed the stabilator two turns of the clevis nose-down for the 2512 when I changed wings. No changes were made to either the airplane (fuselage and tail feathers) or to the wings, except for one change to the 2512, noted below.

RESULTS

The first thing I wanted to test was the minimum sinking speed of the two sections. Because atmospheric turbulence can seriously upset any attempt to measure this in the real world, I flew exclusively in the evening or morning, and only on days with virtually no wind. I also used a Hi-Start stretched to a controlled length in every case, and I alternated flights - 3 with one airfoil followed by 3 with the other. The results were than graphed.

Two things were immediately apparent. First, the 2512 had a distinct tendency to tip stall violently on launch. It could be controlled by holding the nose lower, but it was clearly much more sensitive than the Eppler. Second, assuming a good launch, neither wing has any discernable advantage over the other in times back to the ground.

Since the 2512 had to be held more nose-down on launch (and therefore didn't launch as high) there was an implication that its L/D might be slightly better at high Cl. However since the tip stall was limiting performance there was a real question as to how much use it was.

The next tests were to fly the airplane off a winch and do what we all do; look for lift. Once again the tip stall was apparent, but now it also showed up while circling in a thermal. It was not uncommon in the first few flights to see the airplane suddenly drop a wing. On the other hand I had the impression that if I could avoid the stall, the performance was somewhat better than the Eppler. It was however just an impression, because it was impossible to make precise measurements.

At this point it seemed to be a good idea to try to find some way to improve the stalling characteristics of the 2512. The reasons for a violent stall have long been known and many methods are available to alleviate it. I tried two, viz: washout and stall strips.

The washout, quite unexpectedly, made very little difference. Rather than attempt to reason why, I tried the stall strips. For those of you who are not familiar with these, let me explain.

The reason for a violent stall is that the flow on the upper surface suddenly detaches at the leading edge, leaving the entire surface with a separated flow. This causes a sudden loss of lift, and a huge nose-down moment. Since this usually occurs on one wing before the other, that wing drops rapidly - the "tip stall."

Stall strips are short (about 1 inch in this case) strips of wood or metal with a triangular cross section attached to the leading edge of the wing. One angle points forward, the other two are faired to the wing. What this does is promote boundary layer separation at the strips at a lower angle of attack than the rest of the wing. As the angle of attack increases, the flow first separates at the strips, and then spreads to the rest of the wing from the strips. The result is, hopefully, a more gradual stall.

I first tried two strips, one on each wing and the improvement was quite apparent. I moved them around to find the best location and found that is seemed to be in the middle of the inboard part of the wing, altho it wasn't critical. More tests revealed that altho the stall performance was distinctly better, it still wasn't as good as the 205.

All the while this was happening I also tried to evaluate the performance at low Cl, since that is where I expected the greatest difference. I flew the wings for about 6 months this way and gradually came to the conclusion that the penetration with the 2512 was indeed better, and that the airplane seemed to simply stay in the air longer with the 2512. Again tho, that's an impression and I can't prove it with hard numbers. Certainly the 2512's were no worse.

About 7 months ago I decided to tackle the stall problem again. In the real world I fly a Mooney 231, and if you are familiar with it you will know that it has four stall strips, two on each wing. Since other Mooneys have only two there was the clear implication that if some are good, more might be better.

With four strips, all on the inboard sections of the wings, the difference was dramatic! The airplane absolutely refused to stall any way but straight ahead, and gently at that. The wing now seems to be as good as one can expect and is in no way inferior to the 205. In fact I would rather take it to a contest (and have) than the 205.

What have the stall strips done to the high Cl performance? I have not had the opportunity to repeat the first tests, and with winter here (early sunsets and high winds) it will be a while before I do. I suspect there will be little change because whatever loss comes from the strips will probably be made up by higher launches, but that remains to be demonstrated.

How do the wings compare? First; the Eppler has the advantage of simplicity - no stall strips. Second; the 2512 has the advantage of being thicker, which is stronger; about 54% stronger. Third; the 2512 penetrates better and seems to go farther on a foot of altitude, and since the 205 is good at that anyhow, that's saying a lot.

It would be very interesting if others tried similar things. I will supply computer templates for anyone who wants to experiment and agrees to report the results. What I have done is really only preliminary, and more, and more quantative testing would be of value.

David B. Fraser
1335 Slayton Drive
Maple Glen, PA 19002

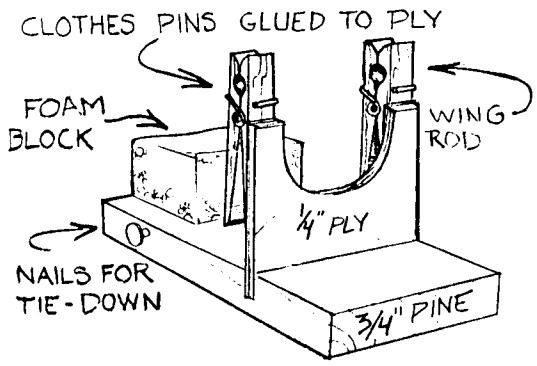
CORRECTION

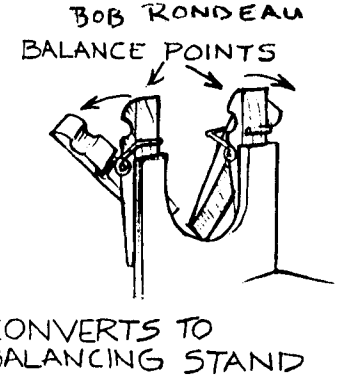
AERO TOW FANS: The December 1985 issue of RCSD had an article about aerotowing of RC sailplanes, written by J.L. Smith. Unfortunately, I neglected to include his address with the article. Because MR. Smith has some excellent aerotow release hooks available for sale, I am correcting this oversight now. You can write to J.L. Smith, 3 - 1760 Taylor Avenue, Winnipeg, Manitoba, Canada R3N ØN8 for a list of prices and specs.

Incidentally, Mr. Smith would like to share a Toledo booth with a sailplane/glider manufacturer or dealer, or other interested party, to display some sailplanes that he will be importing from England. If anyone is interested, please contact him directly.

FUSE HOLDER / BALANCING STAND

BOB RONDEAU





Some tricks with Fiberglass Fuselages.....Bruce Abell

" When the fuselage is free from the mold, it should be thoroughly washed and scrubbed and sanded with 400 grit wet-or-dry paper to remove all traces of mold release agent and provide a 'key' or 'tooth' for the paint to adhere.

" Cut and fit light-ply bulkheads. I use three of them, made from 1/8" light ply (plywood faces, balsa core). One is placed aft of the T.E. of the wing where I grip the 'fuz' for launching. It saves the risk of crushing the glass here, especially when you're giving it the 'urge' on the winch. Another is placed about 3/8" forward of the wing L.E. and the last one about 3/8" aft of the wing L.E. This placement strengthens the fuselage where the wing leading and trailing edges butt against it, and help prevent damage when digging in a wingtip on a 'pirouette' landing. These are appropriate for a wing-fuselage arrangement where the roots butt against the sides of the 'fuz', but not adequate for a situation where the glass is cut out to receive a one-piece wing. In this case, position the formers right on the leading and trailing edge locations .

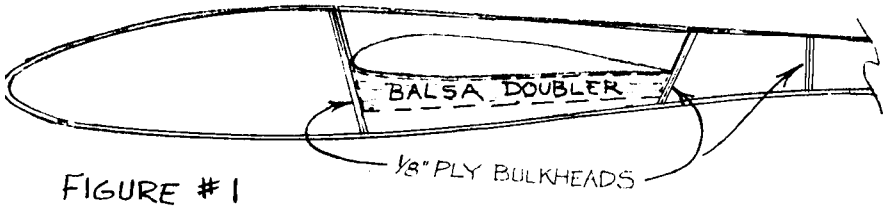


FIGURE #1

" Also, I's be inclined to add a 1/8" thick by about 3/4" wide balsa doubler as a wing saddle. All the areas where the gluing (epoxy adhesive of course) is to be done on the fuselage should be roughened where possible with 100-grit paper to help the glue to 'key'. Be aware that not even epoxy adhesives atake too well to properly cured G.R.P., whether it be epoxy or polyester resin that is used with the glass cloth.

" The bulkheads have to be fitted by the 'cut-and-try' method, and I usually fit them by screwing a specially-made tool (see Figure 2.) into the center and sliding it down the fuselage into position and checking the fit. File a couple of flats on the head of a No. 8 x 1" wood screw, flatten the end of an appropriately-sized piece of brass tubing, and solder the wood screw in place. Solder a 'T' handle on the other end, and you have a beaut tool for inserting bulkheads into confined spaces.

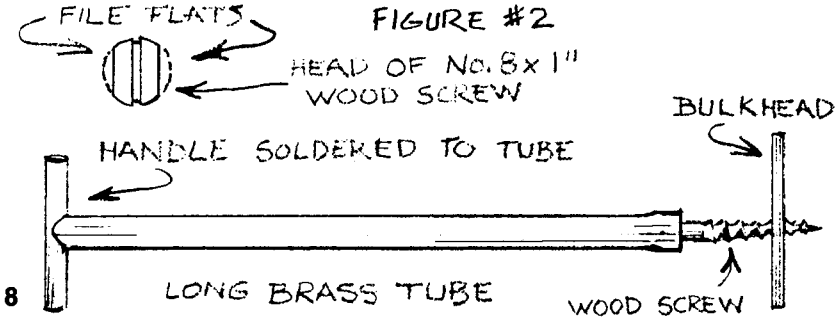


FIGURE #2

" I'd recommend throwing away the retractable towhook and doing what Phil Bird does on his LB3. He buys a fairly large steel screw hook from the hardware store and cuts and reshapes it as shown in Figure 3. He then screws this through the bottom of the fuselage into a hardwood block glued into place inside the fuselage bottom. It is then very easy to reposition the tow hook as needed to get the optimum position. If you want to have it flush with the bottom of the fuselage, then see Figure 4.

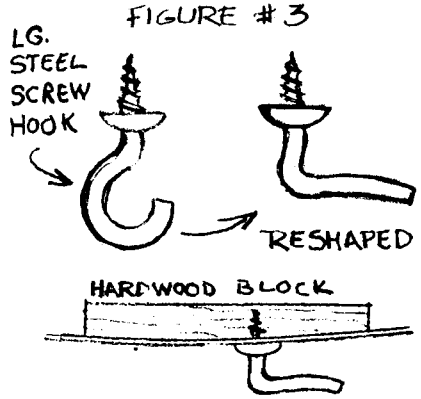


FIGURE #3

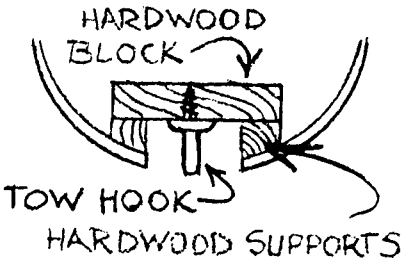
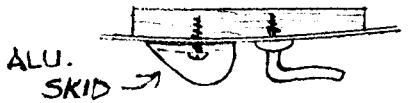


FIGURE #4



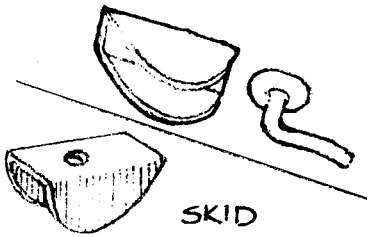


FIGURE #5

" I find that the towhook is usually only about 1/4" ahead of the C.G. Another way to prevent a projecting towhook from landing damage is shwon in Figure 5. Fit a bent aluminum skid in front of it by screwing it to the hook mounting block. Simple and effective."

Aerotow revisited.....J. Lee Smith

"Dear Jim: Just about two days ago (18 October 1985) I got some information from Martin Spackman (which is) essentially the same as I had written before. The article was written about a year and a half ago, and some of the things I described in my last letter are up-dates of towing methods. Martin describes the use of .60-powered models for towing 100" span gliders, which will appeal to a larger base of interest than just the 1/4-scale crowd. Obviously, the thing to do is for glider fliers to make contact with the local power club and solicit candidates for tug pilots...someone will be interested."

***

M.A.R.C.S. National Sailplane Symposium.....1985.

Al Scidmore sent along some information about the symposium that might interest you. Some highlights of the event were: Unprecedented snowstorm - increase in attendance - Walt Good visit - show and tell - Friday morning flying - Ramada Inn 'Relaxing' - possible delay of next symposium for one year - cross-country soaring panel was 'tops' - Professor Stull's discussion of thermals - 1985 Proceedings to be available in Spring of 1986.

A schedule of events, panels, and discussions is included so that we can see what we missed.

Saturday, November 9, 1985

Registration and "Get Acquainted" hour-
Coffee & Doughnuts

Welcome & Announcements

"Introduction to Aerodynamics"
Frank Baker

"F3B Australia"
Dan Pruss

Lunch at Heritage House included in admission

"Meteorology for soaring"
Prof. Roland Stull

"Adhesives"
Bryan Rivers
U.S. Forest Products Lab.

"Flying Wings"
Ken Bates

Cross Country Panel
Flynn, Rossow, Bates
Watson

"Variometers"
Jack Hiner

Sunday, November 10, 1985

Table Clinics--Show and tell

Discussion of table clinics

"Super Wings"
Wayne Custer

Lunch break

"Fiberglass Fuselages"
Bob Sealy

"Flight Path for F3B Speed Run"
Discussion of Airfoils
Michael Selig

"Contest Strategies"
Terry Edmonds, Scott Christensen Greg Seydel

Raffle

Informal Show and Tell,
Socialize, Swap, Trade, Sell

The photos show Dr. Carl Mohs opening the symposium, standing at the lectern and greeting the guests and panel participants. The cross-country panel, seated, shows Pat Flynn, Stan Watson, Noal Rossow, Ken Bates, and Mark Stedham shows animated discussion and much joviality among the members. Apparently, cross-country is fun...even talking about it is fun.

For further information about these popular symposia, you may write to Professor Allan K. Scidmore, 5013 Dorsett Drive, Madison, WI 53711. Copies of the Proceedings are $5, and I believe you can still obtain the 1983 and 1984 Proceedings.

SFVSF POSTAL RC CROSS-COUNTRY SOARING COMPETITION ANNOUNCED

Los Angeles, California, U.S.A., December 26, 1985 -- The San Fernando Valley Silent Flyers (SFVSF), the club which created Model Sailplane Cross Country Racing in 1975 today announced a Postal RC Cross-Country Soaring Race to be held worldwide during the month of August, 1986.

The stated purpose of the event is to encourage and promote participation in this sport which has recently acheived provisional status by the Federation Aeronatique Internationale, the world aeromodelling sport-governing body located in Paris, France.

The concept for the event is very simple. Any flier in any location in the world can enter. Any time during the month of August, 1986 each flier can make as many attempts as desired, flying at locations entirely of his own choice. The results of his best attempt is forwarded to the organizers in the U.S.A. to arrive no later than September 30, 1986. The winners will be announced shortly thereafter.

SFVSF POSTAL RC CROSS-COUNTRY SOARING COMPETITION — OFFICIAL RULES

1. TASK:

The task is Straight Line To A Goal with a distance of 30 kilometers.

2. OFFICIAL FLIGHT:

All flights will be made during the month of August, 1986 at the location chosen by the competitor.

3. OFFICIAL TIME:

Time starts when the sailplane leaves the towline and ends when the sailplane first touches the ground at the end of the course.

4. EQUIPMENT:

Any RC sailplane which meets current FAI size and weight specifications is allowed. Any type of fixed (stationary) ground-based launch device may be used. On board telemetry (such as Thermal Sensors) are permitted so long as local laws are met. On board stabilizers are permitted.

5. FLIGHT DOCUMENTATION:

The following documentation is to be submitted with your entry:

a) Flight Time in Hours, Minutes, Seconds, rounded down to the nearest whole second.
b) A Road Map showing clearly your course, start-point and finish point.
c) A brief description of your flight signed by a member of your crew.
d) A Postal Money Order or (check drawn on a U.S. bank), payable in U.S. Funds in the amount of five (5) dollars.
d) Optional: Photographs of you, your plane and your crew.

6. ENTRY:

Entries must be received no later than September 30, 1986. Send all entries to:

SFVSF POSTAL CONTEST
c/o Mr. Ed Slobod
9626 Jellico Ave.
Northridge, CA 91325
U.S.A.

7. PRIZES AND AWARDS:

Every contestant who submits a complete entry package will receive an official Certificate of Participation.

Handsome, Engraved Wall Plaques will be awarded to the top three (3) contestants. The decision of the organizers in determining winners is final.

Dreaded Drag Discussion...Fuselage, Interference and Miscellaneous

1. Symbols used:

C_{DO} = Profile Drag coefficient
C_F = Skin Friction Drag coefficient
S = Area
B = Width
D = Depth
L = Length
N = Number of Intersections
Re = Reynolds Number

Suffixes Used:

w = Wing
f = Fuselage
t = Tail
r = Roughness
m = Miscellaneous
i = Interference

2. Drag

2.1: Fuselage $C_{DOF} = C_{FF} \times S_F/S_W$

where C_{FF} is obtained for the Ref from Fig. 1. Note: unless the nose is of laminar shape (Ref. 1) and is of the nose cone variety with joint at wing leading edge, use the fully turbulent flow line.

$$S_F = 1.33\ L_F\ (B_F + D_F)\ K_F$$

where K_F = 1.10 for a full-bodied box (Wanderer, e.g.)
= 1.0 for a "tadpole" box
= 1.0 for a full-bodied circular fuselage
= 0.9 for "tadpole" circular fuselage (Decker)

2.2: Wing/Fuselage Interference

$$C_{DWFI} = (N+1)K_I(C_{DOW} + C_{DOF})$$

where K_I = .015 to .020 depending on aerodynamic 'cleanliness' of the joint or intersection.

2.3: Tail Interference

$$C_{DTI} = (N+1)K_I(C_{DT})$$

2.4 Roughness

$$C_{DR} = R(C_{DOW} + C_{DOF} + C_{DOT})$$

where R is obtained from Table 1 but should not be less than 0.1 in value.

2.5 Miscellaneous

C_{DM} = 0.001 to 0.003

covers such items as gaps, tow hook, antenna, switch, skid, rubber bands, horns, push rods, etc.

2.6: Total Profile Drag Coefficient

$$C_{DO} = C_{DOW} + C_{DOF} + C_{DOT} + C_{DWFI} + C_{DTI} + C_{DR} + C_{DM}$$

Now, by using the table and the Figure 1, you can actually add up all of the drag factors for your particular sailplane and determine its total profile drag coefficient.

TABLE 1 ROUGHNESS FACTOR R

POLISHED	SPRAY PAINTED	UNPAINTED METAL	MATTE CAMOUFLAGE	NIGHT BLACK	R
VERY SMOOTH (1)	SUPER FINISH (1)	\	\	\	0
\	VERY SMOOTH	VERY SMOOTH	\	\	0.075
\	GOOD	GOOD	\	\	0.15
\	ABOVE AVERAGE	ABOVE AVERAGE	GOOD	\	0.225
\	NORMAL	NORMAL	ABOVE AVERAGE	\	0.30
\	MODERATE	MODERATE	NORMAL	GOOD	0.375
\	POOR	POOR	MODERATE	ABOVE AVERAGE	0.45
\	\	\	POOR	NORMAL	0.525
\	\	\	\	MODERATE	0.60
\	\	\	\	POOR (2)	0.675

NOTE: (1) WIND TUNNEL MODEL STANDARD
(2) MY AIRPLANES – OR SO I'M TOLD (E.C.)

This, of course, is not the entire story of drag, because there is also induced drag (drag produced by generation of lift) and skin friction drag caused by the wing moving through the air.

INDUCED DRAG MAY BE ESTIMATED BY:

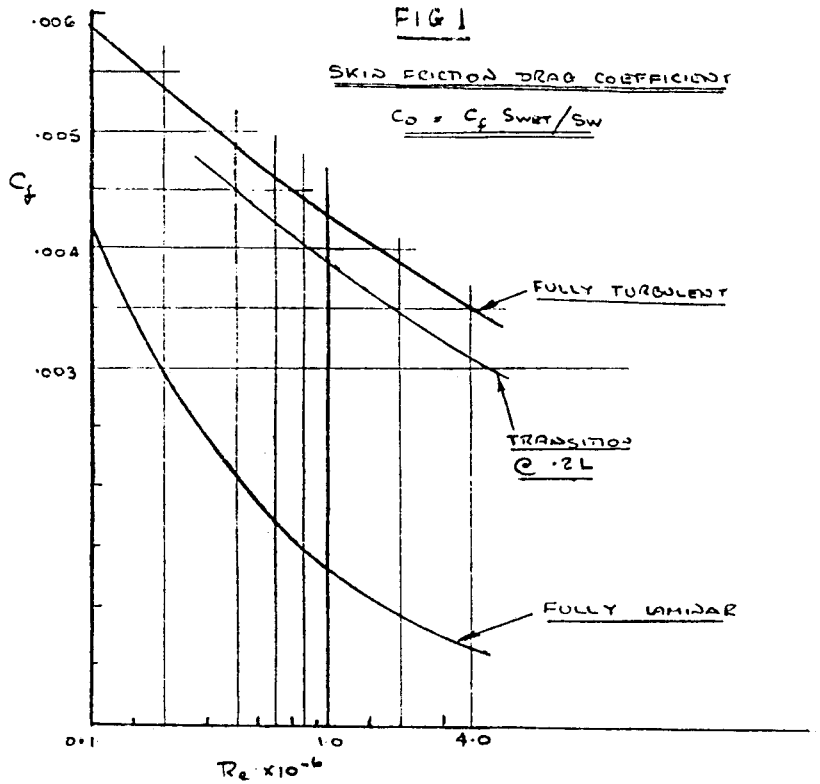
$$C_{DI} = \frac{C_L^2 \times K}{3.14 \times A}$$

WHERE K IS AN EFFICIENCY FACTOR, AND MAY BE TAKEN APPROXIMATELY AS 0.9; A IS THE ASPECT RATIO OF THE WING, AND C_L IS THE LIFT COEFFICIENT FOR A PARTICULAR ANGLE OF ATTACK.

FOR TOTAL DRAG, C_{DI} MUST BE ADDED TO C_{DO} IN 2.6 ABOVE.

YOU ARE NOW IN A POSITION TO ESTIMATE THE L/D OF YOUR PRIDE AND JOY.

SELECT A CRUISING LIFT COEFFICIENT (C_{LC}) FOR THE AIRFOIL OF YOUR SAILPLANE; LET'S ASSUME IT IS ABOUT 0.3 (EXACT FIGURES CAN BE OBTAINED FROM THE AIRFOIL LIFT/DRAG PLOTS). SQUARING THIS VALUE GIVES 0.09 , AND MULTIPLYING BY 0.9 YIELDS 0.081. IF YOUR SAILPLANE HAS AN ASPECT RATIO OF 12, MULTIPLY THAT BY 3.14 TO GET 37.68. NOW, DIVIDE 0.081 BY 37.68 TO ARRIVE AT THE C_{DI} WHICH IS APPROXIMATELY .002.



ADD 0.002 TO ALL OF THE ABOVE DRAG FIGURES C_{DO}, TO GET TOTAL DRAG. FINALLY, DIVIDE THE C_L YOU CHOSE BY THE TOTAL DRAG TO GET THE L/D AT THAT PARTICULAR C_L. FOR ANY OTHER C_L, YOU HAVE TO DO THE SUMS ALL OVER AGAIN. WHEN YOU PLOT THESE ON A GRAPH YOU GET WHAT IS KNOWN AS A POLAR DIAGRAM FOR YOUR OWN SAILPLANE.

TYPICAL L/D VALUES FOR AN R/C SAILPLANE ARE LOWER THAN YOU HOPED FOR, AND OFTEN ARE AROUND 15:1 OR LESS. IF YOU ASSUME TOTAL DRAG OF ABOUT 0.02, WHICH IS A BIT ON THE LOW SIDE, AND DIVIDE YOUR C_L OF 0.3 BY THAT VALUE, YOU GET 15 - THE L/D.

IT WOULD BE WORTHWHILE TO WORK OUT SOME NUMBERS ON YOUR OWN. FOR EXAMPLE, YOUR CRUISE C_L MAY BE UP AROUND 0.6 INSTEAD OF WAY DOWN AT 0.3. THEN THE DRAG COULD BE AS MUCH AS 0.04 AND STILL YIELD 15:1.

ERNIE CURRINGTON & JIM GRAY

SLOPE SOARING THE PIVOT

John "Buzz" Benson

One of the hottest items in the hand-launch category these days is the new Pivot from Dodgson Designs (RCSD Sept. '85). This 17oz., 60", wingeron controlled sailplane is drawing stares of admiration everywhere it flies. Its mechanically coupled rudder and wingerons make it a wonderful performer in low level thermals; its slow, circling turn has to be seen to be believed. And the famous Dodgson eye for shape and form is clearly evident in this latest addition to his line.

After seeing the Pivot prototype, and its designer, at the Nats last summer my buddy Ray Boguslav and I decided we had to have a pair. I ordered a kit at once and Ray, in a fit of excess, decided to have one built for him by our chum Jim Thomas. My plan was to check out Ray's and then build my own, modified as needed for the low, sea-front slope soaring that has become my passion.

Trouble was that right about then Ray had to move to a new place and got all caught up in the madness of digging out and settling back in. His shiny, new Pivot was perched on top of the piano, first in the old house and then in the new, and was scarcely

flown at all. I'd see it whenever I dropped in. It looked like a perfectly formed sea bird that had never been given the spark of life. My own Pivot, still in pieces in its box, started to moan at me from the corner of my shop. Finally, I couldn't stand it any more.

Next visit to Ray's, while admiring the new curtains and the oriental rug, I made him a proposition. "Let me take the Pivot, just for a couple of hours, and fly it from a slope. If I so much as scratch the finish I'll buy it from you, cash money, on the spot." He was dead tired of having me bug him to fly the thing. "Take it." he said, and me and the Pivot were out the door.

That day, sunny and blue skied, the wind was just right for our biggest slope. I scarcely had to throw the model from the rim. It seemed to rise out of my hand with a sigh. The bird had been given life. And what a bird it was! Dodgson's combination of light wing-loading, wingeron control and E387 airfoil proved to be utterly magical.

In our usually windy conditions I had been evolving a preference for sleek, heavy ships that flew like short-coupled javelins. Maneuverability counted for everything, stability was low on the list and high lift performance had been lost in the shuffle. Suddenly I found myself flying a model with decisive control, a remarkably wide speed envelope and an airfoil that acted like a skyhook. I stood amazed, watching the Pivot fly itself around the sky. Soon a little voice began whispering in my ear, "Don't you dare give this plane back to Boguslav."

Our best slope is also our worst for landings. All you can do is dive into a patch of scrub right at the rim. In light air it's not too bad but this time it just didn't come together. I thumped it in quite hard and scrambled through the brush to retrieve it.

"By golly; couple of scratches in the finish; nice little ding in one leading edge; guess I'll have to buy it from old Ray after all." Money changed hands that evening.

While flying that day I'd noticed that the coupled rudder produced a turn that was a bit too slow for tight slope work. In rolls as well the rudder was working against me. For the next session I immobilized the rudder with tape and disconnected the rudder push rod from the servo wheel. With this set up, elevator and wingerons only, there was a distinct increase in maneuverability and a crisp pylon turn could be made with ease. I began to wonder what it would be like to take out the wingeron differential as well.

The following day a new servo wheel was fitted with no differential throw. Tossing the plane for trim I noticed an odd sort of stall once or twice but just clicked in a bit of down and flew a little faster. This got rid of most of the problem and I figured that the fast glide of the slope pattern would do the rest.

Now, rigged like a two control sloper, the Pivot became a different creature. Roll control was dazzling. And no matter what contortions you put the model through all you had to do was keep the speed up, return to level and watch that 387 wing groove you back into stable flight. It was like having a safety net.

For aerobatics the authority of wingeron control opens up whole new areas of invention. After a stall turn I found it possible to throw in an axial roll or half roll while still descending vertically. On a thirty foot slope this is something to behold. And with all that control and bouyancy you'd be surprised at just how small a slope you can really fly.

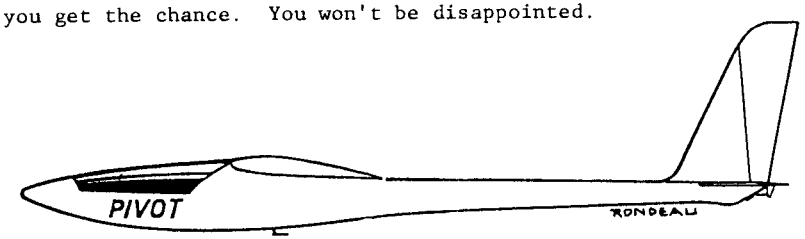
Late in the fall I decided to install a third servo and see how the Pivot would respond to three axis input. The fuselage had plenty of room for another Futaba S33 and the gain in maneuver-

ability was appreciable. Procedural turns became an excercise in elegance; bank with wingerons, pull a little up elevator and follow through with rudder. Stall turns gained great precision and the whole range of moves was sharpened with the addition of the third control.

In the course of all this flying I did occasionally encounter that nagging little stall. After some head scratching I was able to figure out just what it was. With differential throw one wing pivots strongly down (the trailing edge comes up) while the other goes up only slightly. This means that the up-pivoting wing experiences only a minor increase in its angle of attack. With equal throw both wings move equally up and down. The up-going wing, therefore, experiences a sharp increase in angle of attack. In some cases this makes the up-going wing stall and lose lift at the same time the down-going wing is losing lift as well. A flat, mushy, no-control stall results. By and large, however, a fast flight mode and elevator accelerated turns are sufficient to overcome the problem.

It is, in general, risky to make alterations to another designer's work. I exchanged letters with Bob Dodgson about my modifications and was pleased to learn that he had first flown the Pivot without differential and without the (coupled) rudder. In thermal work these features proved indespensible but Dodgson thought slope flying might be better done without them.

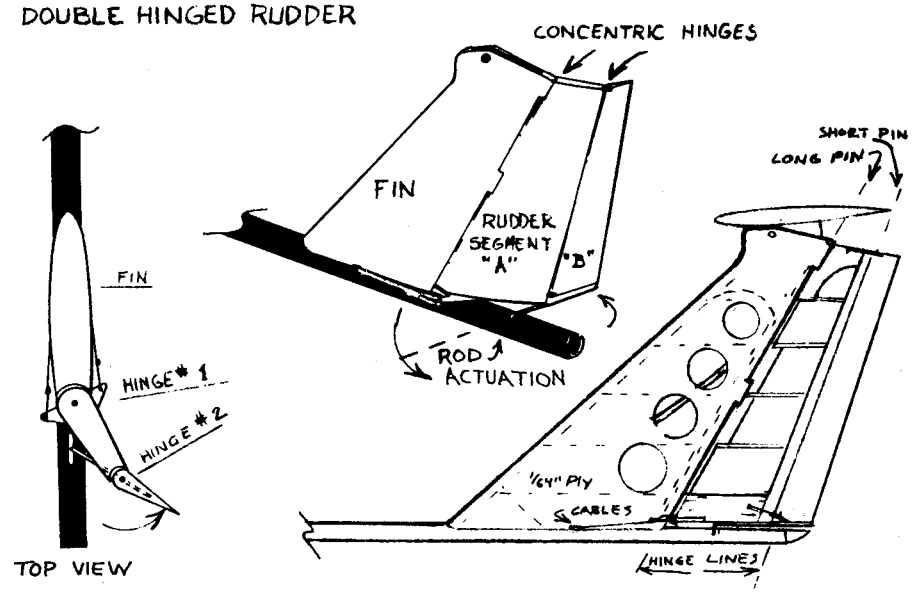
Orders for the kit, Bob says, are pouring in like mad so lots of you will soon be getting to know this fine model. And once you've flown it from the field don't hesitate to chuck it off a slope if you get the chance. You won't be disappointed.



Still More BLP...Bob Rondeau

Well, I'm finally getting down to the nitty gritty with this sailplane. The pod & boom are in primer with just a few low spots to fill. The servos are fitted as is RX and Battery. T-tail is in place and the wings are roughed in.

My latest achievement is the double hinged rudder. I have wanted to try one of these things since reading an article in Soartech by Hewitt Phillips. According to Mr. Phillips, the double-hinged rudder has several things going for it. #1 The lift on the rear segment carries forward onto the rest of the verticle tail creating increased side force greater than the rear segment alone. #2 The rear segment acts like a trailing edge flap, allowing at least as great a deflection as the forward segment before the rudder stalls. This affords increased effectiveness within the unstalled-low drag region.



Following the drawings in the Soartech article I constructed a couple rudder assemblies and arrived at a design that was firm and positive although somewhat fussy to build. The rudder/fin hinge is a concentric pin hinge built in to the LE/TE . Both pivot points should be concentric to give equal throws. The aft segment has a similar hinge but lighter construction and simple top & bottom pins.

An actuator rod of 1/32" music wire is inserted in the bottom of the rear segment projecting forward under the forward segment where it bends 90 degrees into a slot in the extending boom. As the first segment is activated (by conventional cable) the rod slides and pivots in the slot, turning the rear segment. By adjusting the rod length, the ratio of deflection can be fine tuned. At this point it works perfectly with 1 to 1 deflections to about 15 degrees with a smooth return to center. The thing reminds me of a robotic hand and is pure poetry to watch. I hope to have some good photos of the finished plane for the next installment and then its on to test flights!

Bob Rondeau 73 Main Street, Brattleboro, Vt. 05301

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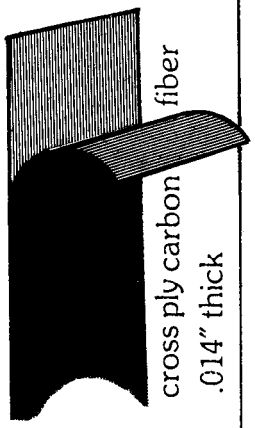

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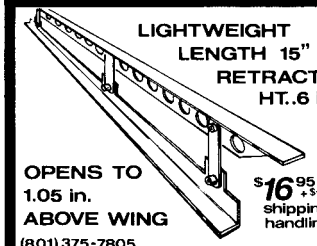

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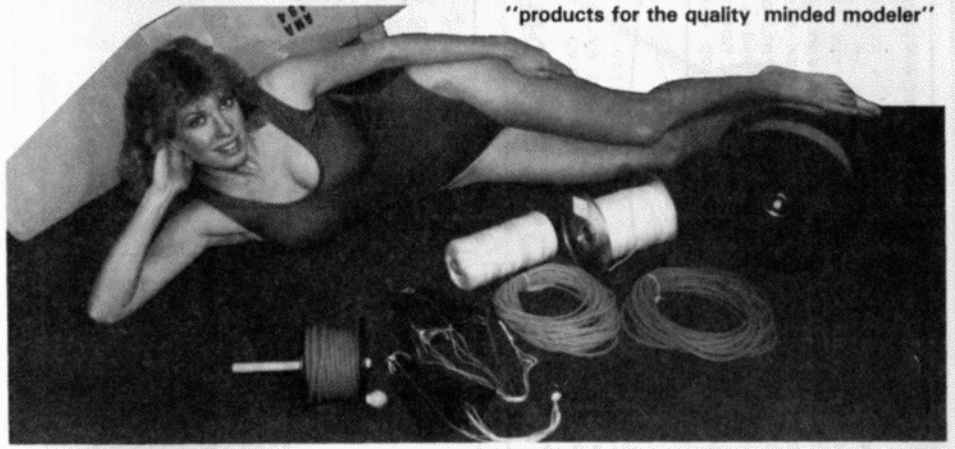

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