November 2008 Vol. 25, No. 11

CONTENTS

November 2008
Vol. 25, No. 11

Front cover: Michael "Chainsaw" Knight's Supra flies overhead at the CVRC Fall Fest 2008. Michael copied the taped-on nose pattern from similar work done by Connor Laurel on his own Supra. Sorta makes it look like the front of the fuselage was molded from a crash test dummy.
Photo by Bill Henley
Canon EOS Digital Rebel XT, ISO 400, 1/1250 sec., f7.1, 85mm

Back cover: Seen at the CVRC Fall Fest 2008 — the new Sprite, a contest-oriented two meter sailplane based on the Supra and soon to be available from Kennedy Composites.
Photo by Bill Kuhlman
Konica Minolta Maxxum 7D, ISO 100, 1/640 sec., f6.3, 35mm

R/C Soaring Digest

Managing Editors, Publishers — B² Kuhlman

Contributors — Peter Carr, Tony Estep, Piet Rheeders, Les Stockley, Curtis Suter, Lothar Thole

Photographers — Dave Garwood, Bill Henley, Mark Nankivil, Curtis Suter

Contact — rcsdigest@themacisp.net
Web: http://www.rcsoaringdigest.com
Yahoo! group: RCSoaringDigest
AIM screen name: RCSDigest
Microsoft Messenger: rcsdigest

_____

R/C Soaring Digest (*RCSD*) is a reader-written monthly publication for the R/C sailplane enthusiast and has been published since January 1984. It is dedicated to sharing technical and educational information. All material contributed must be exclusive and original and not infringe upon the copyrights of others. It is the policy of *RCSD* to provide accurate information. Please let us know of any error that significantly affects the meaning of a story. Because we encourage new ideas, the content of each article is the opinion of the author and may not necessarily reflect those of *RCSD*. We encourage anyone who wishes to obtain additional information to contact the author.

Copyright © 2008 R/C Soaring Digest
Published by B2Streamlines <http://www.b2streamlines.com>
P.O. Box 975, Olalla WA 98359
All rights reserved

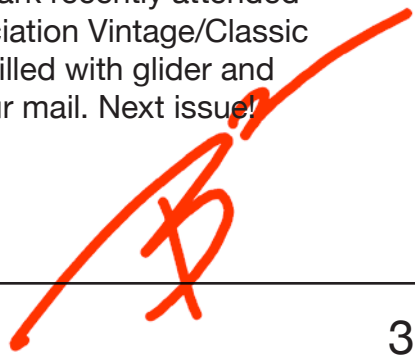
In the Air

At 134 pages, this is by far the largest issue of RC Soaring Digest ever published. The size of this issue is due in major part to the fantastic photographic prowess of Bill Henley and Mark Nankivil. Each provided more than 600 photos, so you can imagine the difficult time we had going through more than 1300 images and choosing the best for publication. We hope we've captured the spirit of the CVRC Fall Fest and the LSF World Soaring Masters so attendees will have a substantial record of these events and those who were not able to be there will be enticed to attend one or both of these events in the future.

"The Tool Room" is now staffed by Lothar Thole, an Australian well grounded in electronics and a person with a deep appreciation for tools of all kinds. Lothar is already active in obtaining new tools for review, and has provided a description of his own specialized sanding fixture for this issue of *RCSD*.

For those of you missing Mark Nankivil's full size sailplane walk-arounds, we hope the next issue of *RCSD* will keep you sated for a while. Mark recently attended the Wabash Valley Soaring Association Vintage/Classic Sailplane Regatta, and two CDs filled with glider and sailplane photos just arrived in our mail. Next issue!

Time to build another sailplane!



CVRC Fall Fest 2008

Photos by Bill Henley


TRANSMITTER
IN


TRANSMITTER
JR
Icon

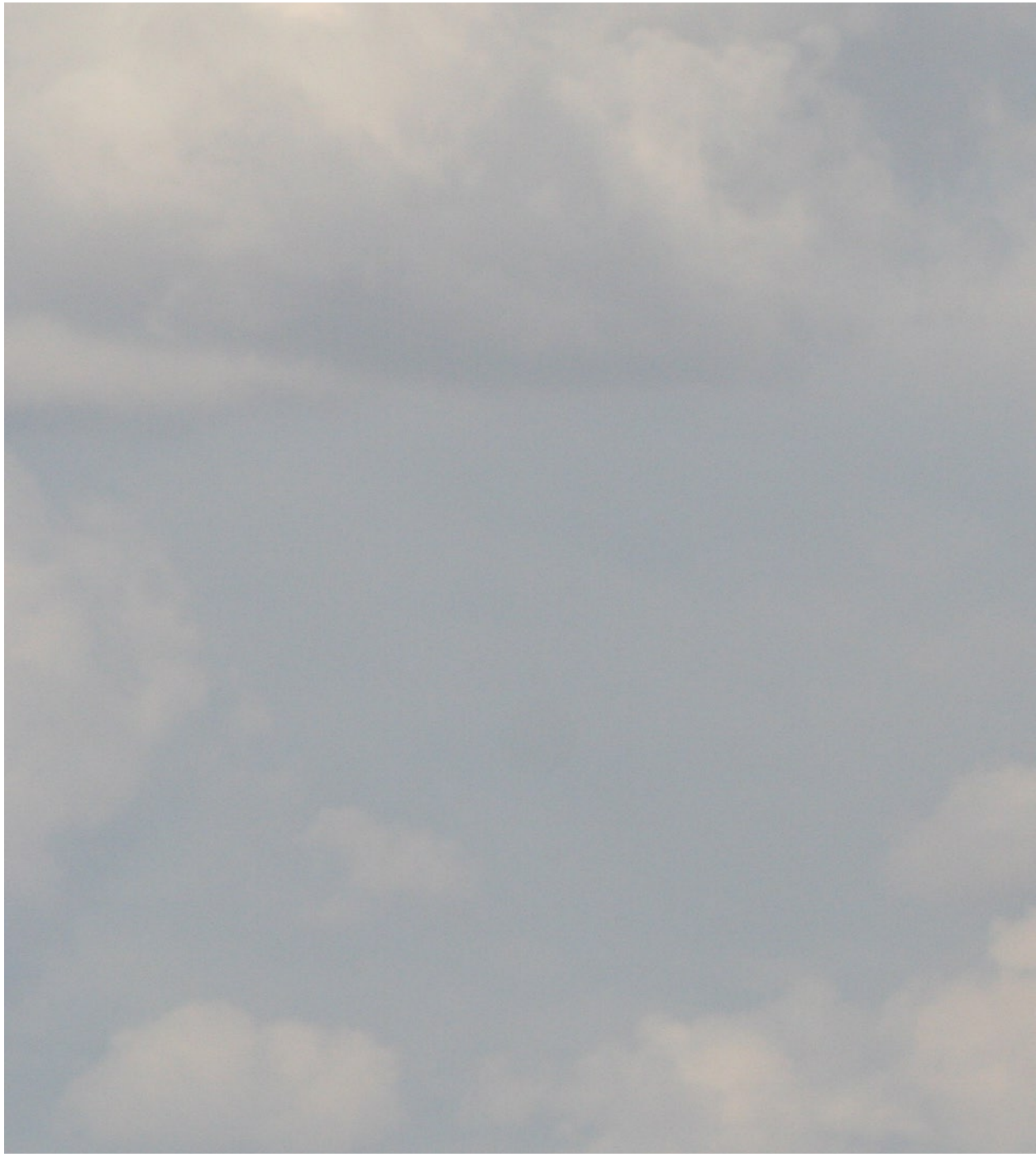

King of the Road
Futaba


JR 9303
$300. obo


327694


SUPRA

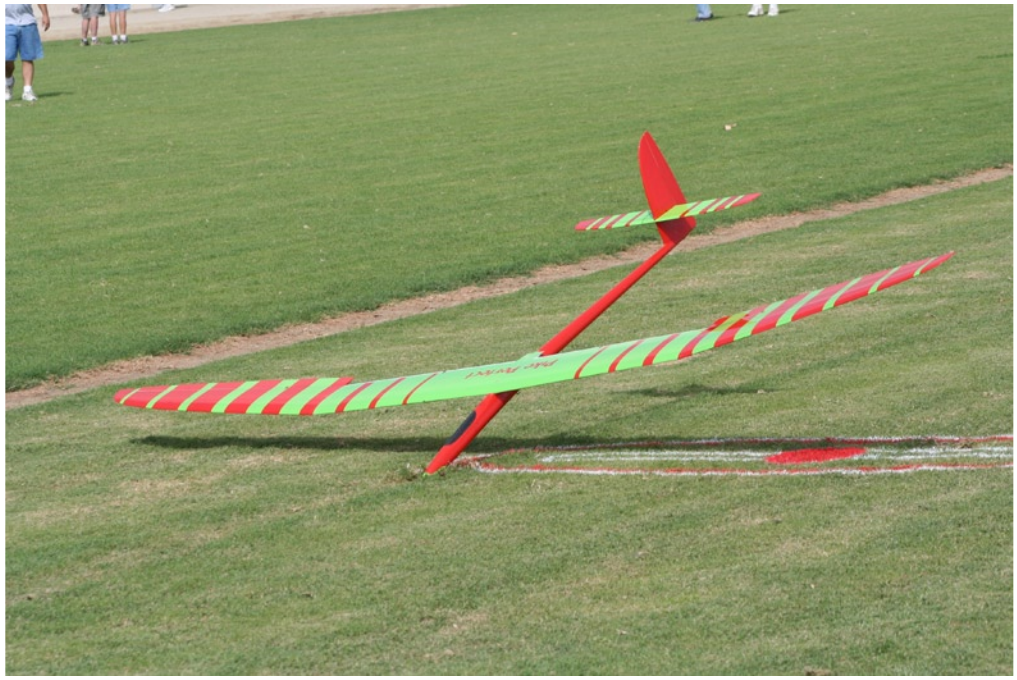

Vampire



SHADOW


SHADOW


SEIKO
TIME KEEPER
START/STOP
COUNT UP
DOWN
STOP



League of Silent Flight
World Soaring Masters

By Tony Estep

What is the LSF World Soaring Masters?

It's the biennial shoot-out designed to draw top soaring pilots from everywhere on the globe. Featuring meaningful cash prizes (up to $2500), a world-class cast of characters, a tight and well-run organization, and the beautiful AMA flying venue, this year's incarnation of this event (the second ever – first was 2006) promised to be a beauty.

And one of the great beauties of this is open entry, meaning that any pilot can sign up and have his chance to fly against the very best. For three days, fourteen rounds in all, pilots line up in groups of seven to ten, launch more or less simultaneously, and scratch to make the task time (12 minutes in this case) and hit the landing spot. But you'd better be on your form, because your score will be normalized against the high scorer in your group, and your group is certain to contain at least one, and probably a handful, of the world's best.

Ninety-one of us gathered in Muncie from September 19 – 22 to battle it out under gorgeous skies and light prairie breezes. Event organizer Tom Kallevang, CD Mark Nankivil, and a superlative supporting crew from the League of Silent Flight put on a contest worthy of the name Masters, and the World was validated by entries from literally all around the globe.

The following is my diary of the three days as I experienced it.

First day. The weather was perfect, perfect, fabulous for the first day of the WSM.

I needed good weather, because I rolled into Muncie at 1 a.m. and dragged my sorry carcass to the AMA at 7 a.m. I was in a bit of fog before it even started, but the adrenalin of the day soon kicked in, and it was a marvelous day as I will try to describe.

The field for this event is unbelievable, the greatest field in soaring. Maybe as good as at the WCs, since many of the WC flyers are here. The whole Turkish team (three guys), Philip Kolb, David Hobby, Jojo, and just about every top U.S. flyer except DP. Our junior team was well represented with Jeff and Cody, who are near the top of the leader board.

The task was 12 minutes all day long, starting before 9 a.m. and ending after 5 p.m. Soft, weak lift was the order of the day, and you had to just scratch it out in many rounds.

My home club, the Mississippi Valley Soaring Association, is represented by Glauco Lago, Brian Molloy and me. Brian has been flying in bad luck all day, suffering from low launches including a pop-off. Glauco hung around the top of the leaders for a long time, making his time plus a couple of 80 point landings (that's the max). I made all my times six for six), but landings averaging below 70 put me around 30th place!

To show you how tough it is, it was very common to stand around when the round scores were posted and hear some guy complain, "Damn, I made 980 points and I dropped down two spots." I can attest to that, because it happened to me too.

Some of the top flyers took nasty hits in the early dead-air rounds. Tom Kiesling (WC team member) and Larry Jolly (previous WC team member) dropped hundreds of points and are scratching to climb back up the leader board -- but any lost points means a flood of guys rush ahead of you. There are a number of highly-ranked pilots in the bottom fourth of the standings (about 85 pilots in the event).

To give you one more illustration of the crowd at the top, Jo Grini (Norway's top pilot) scored 1000, 1000, 1000, 1000, 1000, and 941. Sounds good? Twenty-second place! The top guys have essentially perfect scores (in fact, Kolb has 6000: 6 flights of 12 minutes and an 80 landing, I believe).

The pits are full of two designs: Supras and Pike Perfects. I don't have a count, but I would say that the Supras slightly outnumber the PPs. When you account for the very limited availability of the PP, it seems that it is even more highly desired than a Supra.

There are a number of Espada RLs this year, as the supply now seems to have loosened up a little. They are all sporting the redesigned bigger stab and rudder, which apparently solves the handling complaints some have registered. Running between thermals, the plane moves as if it had a jet in the tail, without seeming to lose any altitude.

The event system is essentially the same as that of the NATS, with the same impound and round-calling method. The main difference from the NATS is that the annoying safety fence between pilot and landing spot is not here, even though we aren't allowed to use skegs. This makes it much more convenient to get to your landing tape; you can stand right on the spot if you want. This offers the extra little feature that your skegless plane can slide into your leg and turn your landing into a zero in a fraction of a second.

Launching is a key element in such light air, and at no time did the wind come down the winch line. The prevailing wind was across at nearly 90 degrees, but we also had direct downwind launches a few times (I enjoyed one of those). Since the thermals were weak except in the middle of the day, this made for some anxious moments.

I've enjoyed meeting and talking with lots of guys whose names are familiar but whom I've never met or only had slight contact with. That's part of the beauty of this whole event. The cash prizes and the worldwide promotion have stirred a lot of interest, and given all of us a chance to experience this terrific occasion (thanks, JR and other sponsors!).

Day 2. On the surface, today seemed similar to yesterday, but the conditions were actually quite different.

Yesterday the sun warmed the field progressively through the day, and there was abundant lift for anyone who searched downwind. Today, the first rounds were flown in nearly dead air from downwind launches, and many groups had little or no lift, resulting in a

number of burials (including one in which I participated, the bad way). Then the winches were re-oriented and the sun came out, and thermals popped. But at day's end, the air went limp and once again there were short flights and guys getting buried.

As a result, the standings got shaken up a little. Some climbed, some sank; Glauco jumped up to 15th! He probably can't get to the fly-offs (top 10), but if he can hold on to his place it will be a magnificent result for our flying buddy and his hand-built Supra. Glauco has represented MVSA wonderfully with outstanding flying and his usual good-will ambassador demeanor. It would be a coup if he could somehow make the flyoff, but even if not, he's had a great weekend.

The highlight (or low-light) of the event so far was a protest from a flyer representing some of the international pilots. It seems that in FAI events, the landing points are awarded based on the position of the nose of the plane, irrespective of whether or not the plane shed parts or landed upside down. Yep, you read it right -- you can come bouncing in, have your canopy and stab fly off, and flip upside down, but if your nose is on the spot when the dust settles, you get the full landing score.

Anyway, CD Mark Nankivil convened an anonymous jury of experienced flyers, and their decision was to go by the FAI rule. As a result, some guys who had been given zero landings now got some points. The actual effect on the standings may or may not have been significant, but it gave everybody in the pits plenty to chatter about while waiting for their group to be called.

The cream continues to rise to the top. Philip Kolb finally had a round of less than 1000 (he scored a 997 in one round), but remains on top. Cody Remington has crept into second place, passing Joe Wurts. Arend Borst, Jon Padilla, Skip Miller, Jim Thomas, and Mike Lachowski are other names at the top.

Unfortunately I suffered a hideous disaster flight that scored less than 400 points, and plummeted from 32nd place (my all-time high) to somewhere in the 50s. At the end of the day I was exhausted and woozy, and had the misfortune to be drawn at random to fly in a little contest they were holding with Horizon Hobby's new Radian electric EPP sailplane. I didn't make my time, and to make it worse I flew right over the landing spot and scored a miserable zero, embarrassing the hell out of me in front of the beer-sodden, jeering spectators.

Equipment. As I mentioned, the TD competition world at the moment is (more or less) dominated by Perfects and Supras. There were more Supras here; at the WC there were many more Perfects than Supras, the difference being availability in different locations. The planes fly differently but are equally competitive; they look different, but from the point of the airflow rushing past the plane, there may not be that much difference. Of course there's a crop of new planes as well, but the big performance increments seem to have flattened out.

It's sort of sad to think, but we seem to be at a flat spot with respect to design changes in planes. There were so many changes, so fast, for a while, but now everybody is using the same software and the same materials, so when they look for an optimal design they all get pretty much the same answer. This is not the case in dynamic soaring, which is where the big changes are taking place.

The trend to the JR 9303 on 2.4 was noteworthy. The 2.4 setups that I looked at closely had multiple remotes. As I mentioned, JoJo had a lockout, so it can happen, but it was momentary and could have happened with any radio at the distance he was flying.

Day 3. Today's grand finale of the WSM was grand indeed. Rain was forecast, or at least overcast, but instead we got a great day with nearly dead air in the morning and breezy thermals a little later.

We started by flying the final two rounds leading up to the flyoffs. Glauco held on to his 15th place standing with two good flights. And we had another local hero to cheer for, Jim Frickey. Jim is a long-time

standout who has won MVSA's Gateway Open contest several times.

As it turned out, Jim did indeed make the flyoffs with two excellent flights of 997 and 1000, so maybe the road to the big leagues is via the Gateway Open Championship. Jim, a long-time Stratos flyer, is now flying a Perfect. Throughout the contest he was limping and in some pain as a result of injuries he suffered in a work-related accident, but he has been working hard on his recovery and is doing very well, and was flying in his top form.

Tony's Calcutta Idea. After the two morning rounds, there was a suspense-filled hiatus while we waited for the announcement from the scorer's trailer, telling us who had qualified for the flyoffs. The rules provided that the top ten flyers would fly five more rounds, man-on-man, to decide the Grand Champion and the other places. I whiled away the waiting time by talking up the idea of a Calcutta.

This situation lends itself so naturally to a Calcutta, it was a doggone shame that Federal statutes would have locked us up if we had one. A Calcutta is a pool that works like this: the organizer auctions off each of the finalists in no-limit bidding; then at the end, the bidder who bought the first-place winner gets the lion's share of the kitty, say 60%, the second-place owner gets 25%, and the third-place owner gets the remaining 15%. At fishing tournaments the pots run into the tens of thousands. I was just kidding, but my proposal was good for some laughs to fill the nervous moments.

Flyoffs. At last Mark read out the names, each accompanied by a big cheer from the bystanders. The guys who heard their names called burst into huge grins: Mike Smith, Murat Esibatir, Joe Wurts, Ben Clerx, Jim Frickey, Jeff Walter, Arendt Borst, Bob McGowan, Jo Grini, Cody Remington. Murat from Turkey, JoJo from Norway, Arendt from Canada, and Joe flying under the colors of his newly adopted country, New Zealand. Of the six U.S. flyers, Cody and Jeff were former members of the Junior WC team. Ben and Mike have flown in international events, while a flyoff this prestigious was a first for Jim. Bob is a bit unusual; he has long been a top West Coast flyer, but his family's biggest success on the international stage so far was that of his son A.J. McGowan, who finished 3rd among juniors in this year's WC in Turkey. The planes that made the flyoff were three Perfects, four Supras, two Aspires and Cody's well-worn Espada RL.

I was an official timer for the flyoffs, as I had been in 2006, and once again had a front row seat for the excitement. And as always, there was some excitement. It started, unfortunately, right on the first launch, with Frickey popping off the towline -- he said it was the first one he'd had in years. It was sad to see indeed, after fighting so hard for so long to get into the top group. Not long after Jim landed, it became apparent that guys were having a hard time making the time. Ben Clerx, Jo Grini, and Jeff Walter were all down low, far away, and scratching after just a few minutes.

I was the timer for Ben's flight, and he just kept pushing downwind, circling occasionally but getting nowhere. There's a paved control-line circle about a quarter mile downwind, and he finally wound up just on the far side of it, just above treetop height, and started circling.

The amazing thing to me was that even though his circles were so far away and the danger was so pressing, Ben flew with perfect smoothness and minimal control inputs. The plane stopped sinking, but it sure didn't seem to be climbing. His caller, Thomas Cooke, was coaching him: "..better on that side...push back a little...it's coming toward us and out to the right..."

Just next to us, I saw Jeff Walter set his transmitter on the ground. He stood up and announced, "Well, that sucked." Then he went off to find a golf cart to retrieve his plane, which had landed off-field.

When I looked back, I couldn't see Ben's plane at all. I checked to see where he and Thomas were looking -- way up, back toward us and to the side. The thermal had popped, and the wind up there was actually in the opposite

direction from what it was where we were standing. Ben climbed to the sky, then zipped back with a cloud of other planes to stab the spot at 12:00.

So it went. The lift got better, and it became a landing test. The launches were set up so that everyone was up within about a 20 second interval, so the landing zone was a mass of fast-flying planes all trying to hit the spot at more or less the same time. A mid-air seemed certain, but none ever happened.

Joe Wurts avoided mid-airs by using a landing pattern I had never seen before. He set up upwind and flew in tight, high-speed circles until there was only 15 seconds to go. Then he would dive hard toward himself, but with flaps partly extended; going only a little past the far end of the tape, he'd wheel on a wingtip, pull the flaps all the way down, and come in about from about 8 feet of altitude with the nose steeply pitched down while his caller intoned 6...5...4...3...2...1... At the spot: Wham!

Throughout the contest, everyone was stabbing the landings. Skegs weren't allowed and the ground was hard, so the landings were spear jobs. The trick was to get the energy and altitude so you could dive steeply for a short distance, not building up enough speed to damage the plane. Most of the landings sounded like a slamming screen door. There were lots of jokes about the brilliant idea broached on RC Groups of having three landing judges for each flyer, handing out style points. It would have worked out fabulously at the WSM; we just would have needed 30 trained judges with identical standards, someplace for them to stand, a few extra computers, and a couple of extra hours to tabulate the scores. By enduring these few minor inconveniences, we could have enjoyed the full esthetic benefit of this marvelous concept.

The winners! After the first couple of rounds of the flyoffs, the air suddenly got sweet, and the expert lineup had no problem climbing out on every launch. As a result, it became a precision time and landing contest. When all the scores were sorted out and tabulated, the winner was 1.1 points ahead of the second-place flyer, scoring 5983.1 against 5982.0!

Here's the outcome:

Bob McGowan	5983.1
Arend Borst	5982.0
Cody Remington	5978.8
Mike Smith	5974.0
Murat Esibatir	5967.6
Joe Wurts	5964.2
Ben Clerx	5717.9
Jo Grini	5695.3
Jim Frickey	5094.4
Jeffrey Walter	4558.8

Bob received a check for $2500 for his first-place finish. Congratulations to Bob, and to all the other outstanding pilots who climbed to the top of this Masters contest.

You had to be there. Kudos to Mark Nankivil, CD for this top-of-the-line event. Many workers are involved, and all get a vote of thanks, but in the final analysis it doesn't work unless the CD has things in hand. There was money on the line, there were pilots who traveled 13 time zones, there were wind shifts, rules disputes, cantankerous personalities, complicated logistics, commercial sponsors with their own interests to promote, and a lot of guys who are used to being king of their corner of the soaring universe, wherever that may be. The CD is at the focal point of all of it, and Mark was everywhere at once, making things work.

Certainly JR and the other sponsors had to be delighted at the tremendous overseas support of this event. I had the great pleasure of meeting Philip Kolb, one of the great guys of this sport, designer of the Pike Perfect and multiple Eurotour champ. With Philip came Murat and two other members of the Turkish F3J team, and there were other Canadians and Australians as well, including WC David Hobby and Canadian WC team member Doug Pike. Philip and David both were bitten by disastrous flights in the late rounds that bounced them out of the flyoffs. Philip

had 997 or better in 13 out of 14 rounds, but somehow got himself downwind and low, scored about 600 in round 10, and ended up 17th, a disappointment similar to what he had suffered in the F3J World Championships. But the multi-Eurotour champ is a great sport as well as a great flyer. He participated in the flyoffs as Murat Esibatir's caller.

One of the pleasures of this great event is getting to chat with some internet buddies and other friends new and old. I got to meet master craftsman David Hauch, got to see David Hobby again, got to talk a bit to Arendt Borst and meet some of the other international guys, got to see a former MVSA flying buddy Marc Gellart, swapped stories with Arizona's John Erickson, and so on. Arendt is a lifelong modeler who told me he started as a kid with stick and tissue rubber power planes. "I think I'll keep going," he said with a smile. In addition to being an F3J World Champion, he was the only guy to successfully limbo the little electric Radian through one of the hospitality tents.

Some flying buddies whom I see only rarely, Tom Broeski, Jack Strother, Jeff Walter, and Gene Trevino, were all kind enough to time for me, and all four helped me a lot (three 12s and an 11:30 -- I should get those guys to coach me more often!).

What more can I say? You'll have another chance in two years, so start planning now. Fly in it, be a helper, be a spectator, or just go for the hot-dog cart at lunchtime. It's worth it.

Last random thoughts:

Skip Miller, long time Airtronics dealer, won the JR 9303 in the raffle...

Mike Smith made nearly a complete landing approach inverted, just rolling upright in time for the final few seconds countdown...

Many of the top flyers were using 2.4 at tremendous distances... they had multiple remotes in their planes... JoJo had a lockout and near-crash, but got it back and calmly climbed back up to regain the lost altitude...

Some really good flyers ended up on the second page of the scoresheet, and a few even worse...

Despite crowded air, no mid-airs until the last day when one guy flew too long in the launch area and another zoomed right through him... the wreckage of Dr. Dan's orange Icon was collected on a plastic sheet in the pits for the viewing pleasure of the bloodthirsty mob...

The 12-minute task turned out to be important...I made 4 flights of more than 10 but less than 12 minutes, and I'm sure others did as well...

A bunch of the international guys came in on a jet arranged by Mustafa Koc, who is a prominent businessman back home in Turkey...

In the third round of the flyoffs, at the peak of intensity, Joe Wurts made a pathetically low launch, at least 100 feet below the gaggle... they went left, and he went right... while they were climbing, he walked to the scorer's tent and collapsed into a lawn chair in the shade...once comfortably settled, he flew ba ck to the left and specked out... "I wanted to let them clear out," he explained...

While holding his plane ready to launch, JoJo took a look down the launch line, decided he had a minute to spare, and rolled a cigarette, and got it lit just in time for his turn to throw... in the middle of a later round he put the transmitter under his arm while he dug out a cigar and lit it...

The languages in the pits were a mixture of German, Turkish and English with a wide variety of accents... as a former New Yorker, it gave me a good feeling...

David Hobby, unused to braided lines, had all sorts of launching problems, but mostly overcame them, twice recovering from a 100' launch to max out... but in the final round, something went wrong (poor battery connection), and he wound up zeroing out trying to save another launch disaster...

Did I mention how deadly those lunchtime chili dogs were...?


Alpine
SOARING ADVENTURE 29


SUPRA


avea


Chef


A.S.S.


SUPRA


SUPRA


100N


Pike Perfect


JR
BRASIL


Thousand Oaks
Soaring Society


National Championships
2006


POWER BY
Pike Perfect
Gordy Soar


AIRTRONICS


BEKO

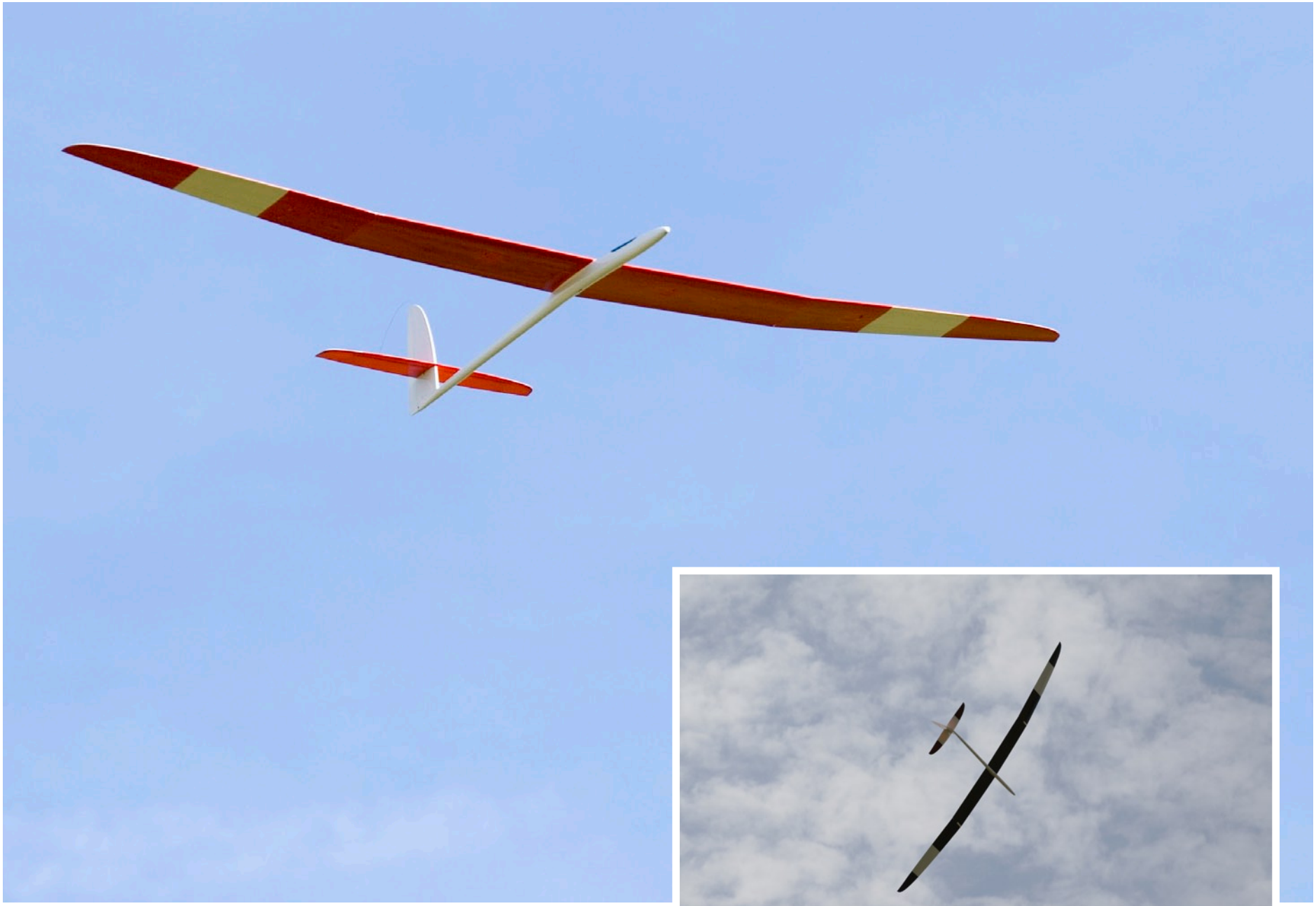

Pike Perfect

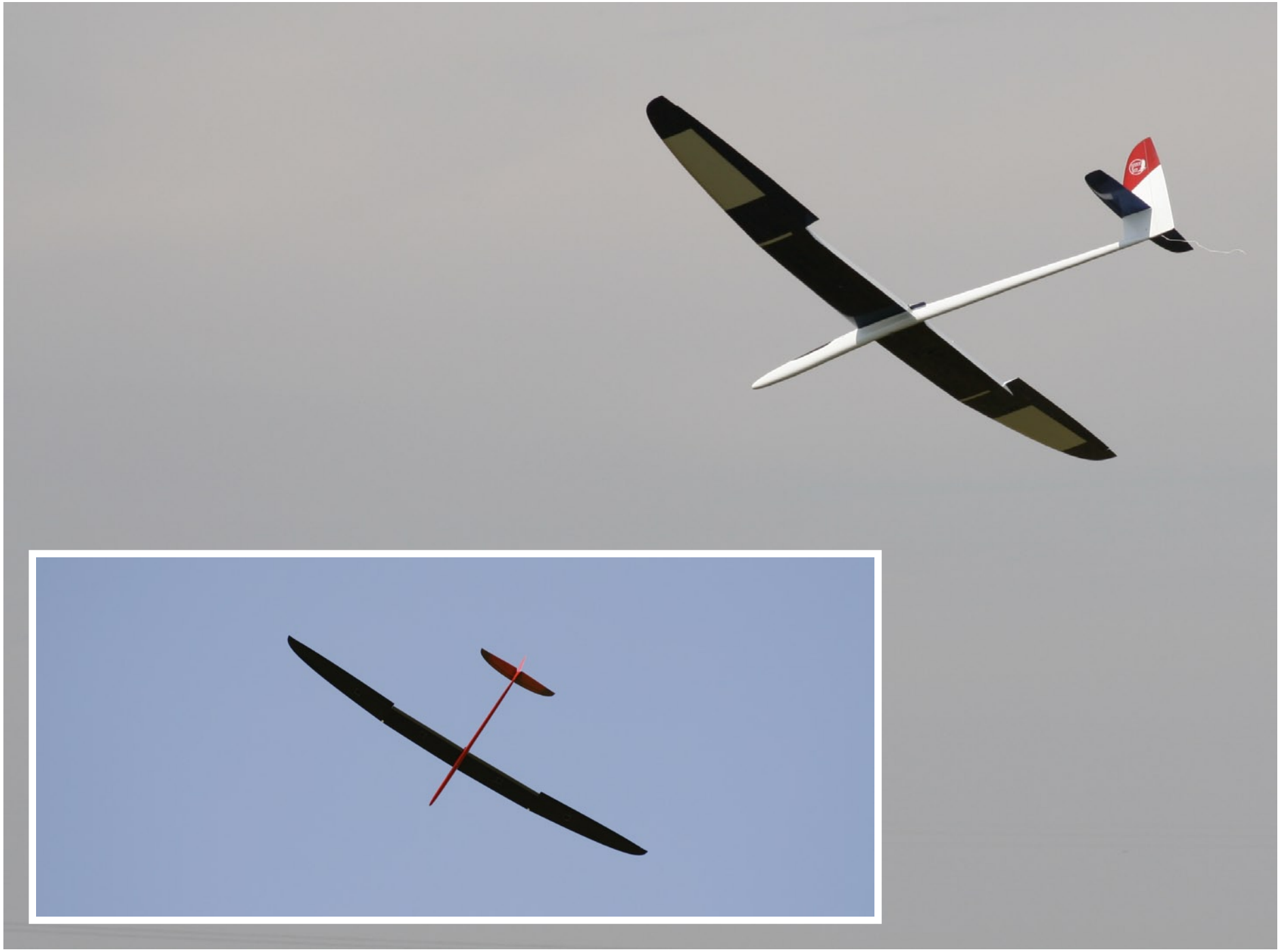

SPEKTRUM


SUPRA
Supra


SUPRA
6


Pike Perfect






JR
feel the difference!


SHADOW


SHARON Pre 3.7


Miles


SPRITE


Kennedy


SPRITE


FAI F3J


B-DIAN

2008 World Soaring Masters

Sept 19 - Sept 21, 2008

Finals

Mark Nankivil - Contest Director

Place	Contestant	Qualify	Round 1	Round 2	Round 3	Round 4	Round 5	Total
1	, , Bob McGowan	997.1	1,000.0	999.0	994.0	996.0	997.0	**5,983.1**
2	, , Arend Borst	1,000.0	989.0	994.0	1,000.0	1,000.0	999.0	**5,982.0**
3	, , Cody Remington	999.8	997.0	992.0	997.0	996.0	997.0	**5,978.8**
4	, , Mike Smith	997.0	994.0	996.0	990.0	998.0	999.0	**5,974.0**
5	, , Murat Esibatir	998.6	999.0	987.0	992.0	999.0	992.0	**5,967.6**
6	, , Joe Wurts	996.2	995.0	1,000.0	975.0	998.0	1,000.0	**5,964.2**
7	, , Ben Clerx	995.9	994.0	747.0	992.0	999.0	990.0	**5,717.9**
8	, , Jo Grini	988.3	722.0	999.0	999.0	996.0	991.0	**5,695.3**
9	, , Jim Frickey	996.4	170.0	990.0	992.0	974.0	972.0	**5,094.4**
10	, , Jeffrey Walter	987.8	0.0	991.0	622.0	969.0	989.0	**4,558.8**

The Tool Room

by Lothar Thole, lothar.thole@gmail.com

Simple home made tools and jigs can make the difference between an average and a superb finish on your model. The time taken to build the jig is more than made up by better control of the sanding, cutting or drilling task at hand.

Faced with sanding the leading edge of the built-up wing on my 2m Wind Dancer builder's kit, I decided to make a simple jig to hold an X-acto sanding block at any desired angle while sanding.

The jig consists of some simple aluminium brackets fixed to the X-acto sanding block on one side, and a timber base block on the other. An aluminium guide strip is screwed to the work bench so that the jig can be slid back and forth against the guide on its base block while sanding.

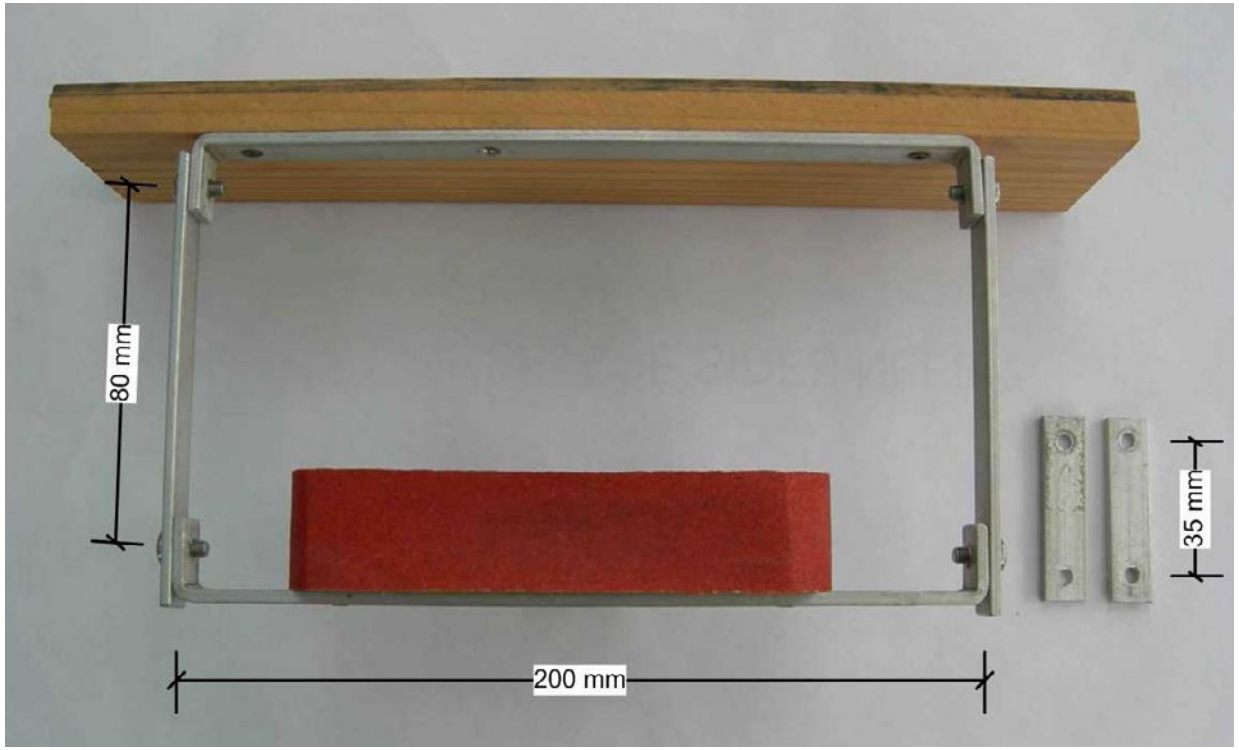


Photo 1

Photo 2

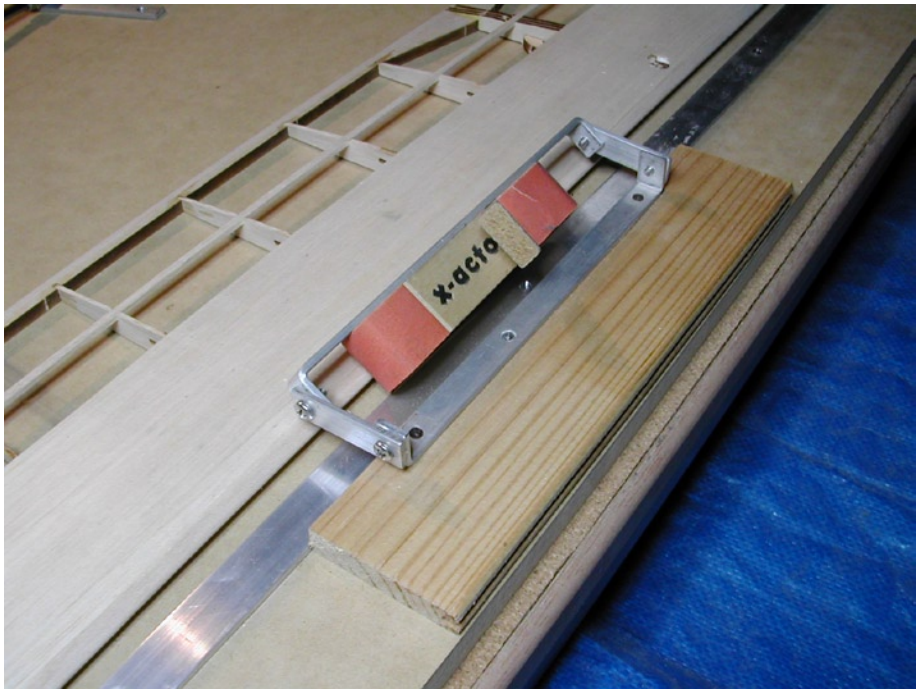


Photo 3

The size of the materials needed is not critical. For the base block I used a scrap piece of timber approximately 270 x 60 x 12mm. The brackets can be made from 13 x 3mm aluminium stock, which should be available from most hardware stores, and consist of two U-shaped brackets and two sets of fish plates for different sanding applications. Refer to Photo 1 for details. The two U-shaped brackets are drilled and tapped for M4 screws.

The sanding guide is made from a 1m length of 20 x 3.3mm aluminum stock, and is drilled and countersunk in four locations. I use a sheet of 19mm MDF as a sacrificial surface for my work bench. The guide can be fixed near the long edge (using 10mm timber screws) for sanding the leading edge of a wing, or near the short edge for sanding the dihedral angle at the root of the wing.

Leading Edge Sanding

The jig is assembled using the two 35mm fish plates. The jig is positioned against the guide bar so that the guide bar is between the jig and the leading edge of the wing to be sanded. This guarantees that the sanding block cannot bite deeper than intended. The wing is moved closer to the sanding block in very small steps, sanding away small amounts at a time. Only four or five angles need to be set, the remaining edges can easily be smoothed off by hand, giving a very even result along the entire leading edge. Refer to Photos 2 and 3.

If the wing is tapered, the wing tip can to be shimmed up so that the top of the leading edge is horizontal. It is best to tape the shim block to the wing tip so that the angle remains constant as the

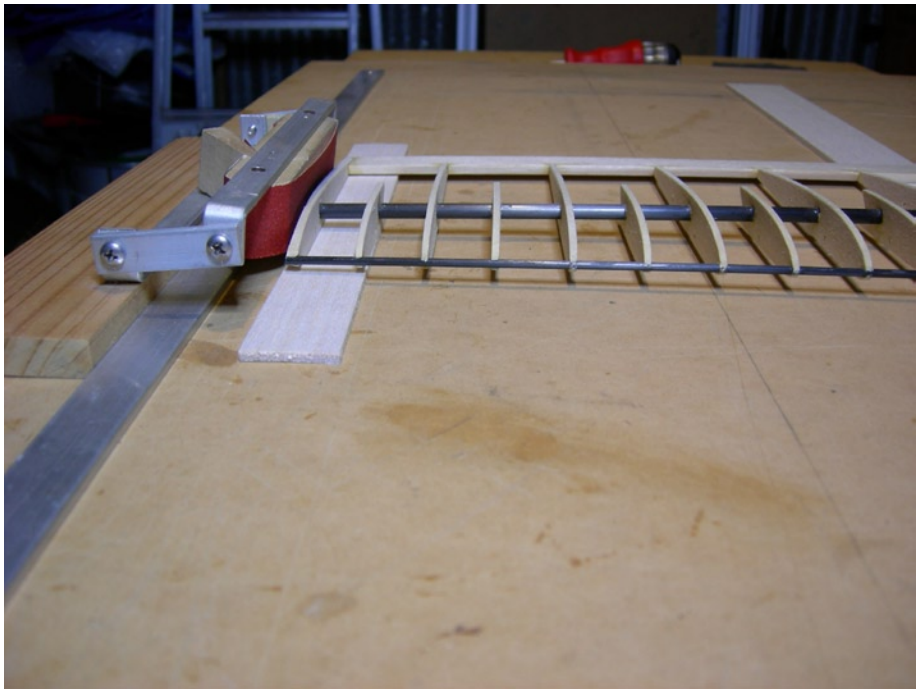


Photo 4

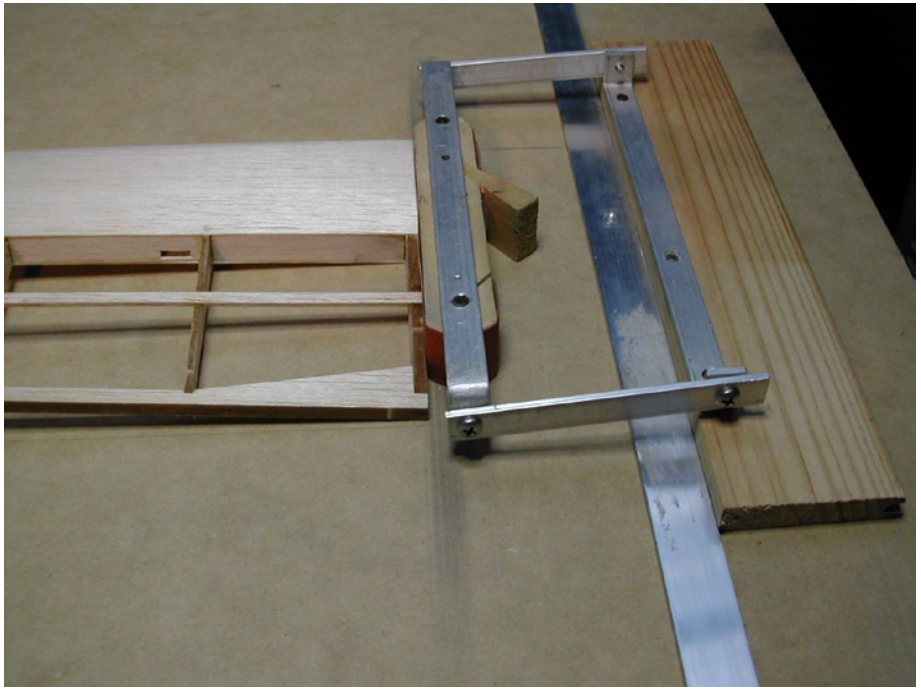


Photo 5

wing is successively moved closer to the sanding jig.

Dihedral Sanding

Without the jig it's very difficult to achieve a straight edge, especially if the wing has a carbon spar in it. The hard point sands more slowly than the ends, resulting in a banana-shaped root if sanding free hand!

Dihedral sanding can be accomplished in one of two ways:

a) The wing is positioned horizontally on two scrap balsa spacer sheets to lift it slightly off the building board. The jig is fitted with the two 35mm fish plates, and adjusted to the dihedral angle. The jig is again positioned against the guide bar so that the guide bar is between the jig and the wing root to be sanded. The wing is slowly fed towards the jig until the dihedral angle has been achieved. Refer to Photo 4.

b) The jig is assembled using the two 80mm fish plates. The longer fish plates allow the sanding block to sit flat against the building board. A spacer block is positioned under the wing tip to set the correct dihedral. Refer to Photo 5.

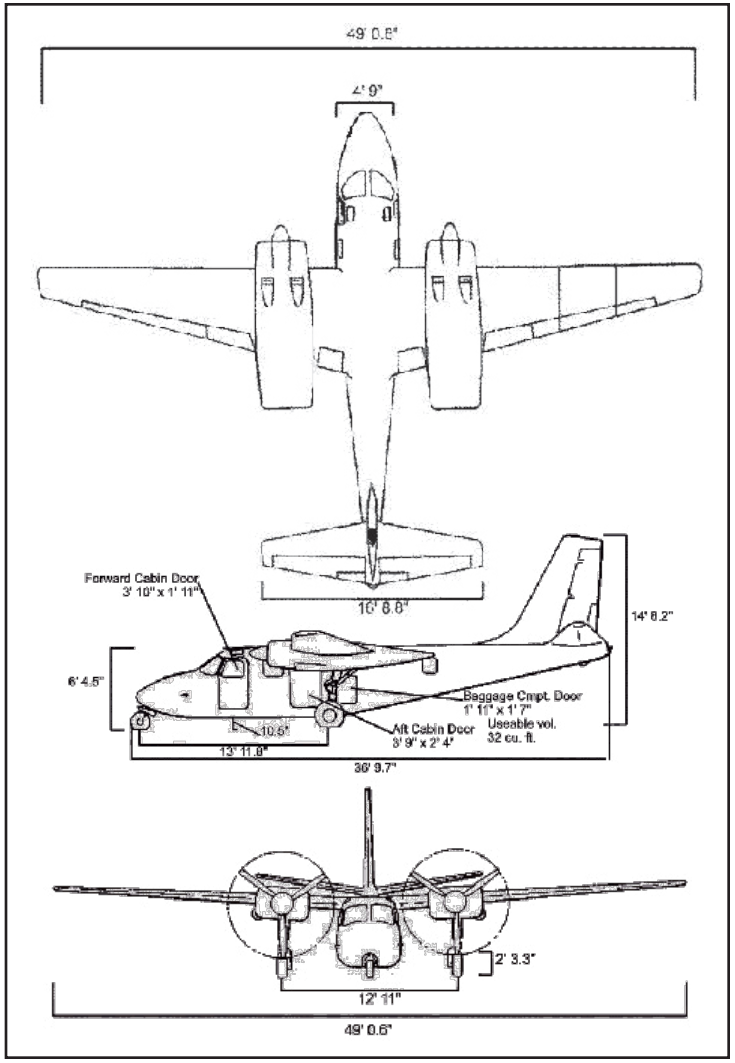
I also prefer to cut any carbon spar tubes to the correct dihedral and install them so that they will still be set back a small amount after sanding is complete. This avoids any problems and makes it much easier to sand the root to the correct dihedral.

I hope this simple example will encourage you to make simple jigs when building your next plane, enabling you to achieve a level of finish that will be admired at the flying field!

PSS build log

Rockwell *Aero Commander*

Piet Rheeders, pietlewis@absamail.co.za



3-view <http://www.aoc.noaa.gov/aircraft_rockwell.htm>

Part 1

Last night I started with scratch building my slope PSS Rockwell Aero Commander and I hope to have it ready for the PSS weekend in October in about five weeks time. I have decided that as I go along to photograph and post as many times as I can, so hold thumbs for me. Here I go!!.

Rockwell Aero Commander The History

Why on earth an Aero Commander?. Well, this plane as some of you might remember was flown by Rockwell's chief test pilot, Bob Hoover, always dressed immaculately in a suit - 1970 to1990. The air shows those days were held at Lanceria about 20 Km northwest from were I stay in Randburg and I use to attend these air shows regularly. Bob Hoover used to do the most amazing aerobatics with this twin and some of them I will always remember.

For instance, on takeoff he would take up the total length of the runway. Half way down the runway he would retract the undercarriage with out actually lifting off the ground (ie, the underslung belly of the Aero Commander only 1 or 2 feet off the deck and then at the end of the runway he would pull hard up into a vertical climb until the Aero Commander would disappear out of sight. The P.A. announcer would then inform you that he would come in from the south to start his aerobatic routine, and while everybody was looking towards the south he would come diving in, both engines stopped and props feathered, from behind our backs, nearly touch the runway, then pull up into a slow roll with both motors still not running. Only after the completion of the slow roll would he start one engine and then the other.

Other maneuvers included an 8-point roll with only one engine running, as well as loops and stall turns. One of Bob's favored stunts was to fly a barrel roll maneuver - a positive 1g maneuver - while pouring some ice tea into a glass on the dashboard. To see a short video clip of this go to this link <http://www.patricksaviation.com/videos/ipsckid/1591/> (45 sec) or view the full video here <http://www.madskies.com/198/bob-hoover-stopped-engine-aerobatics/> (2min 55sec).

Once he stopped the engines and feathered the props, the Aero Commander became nothing other than a full size PSS plane and therefore the reason and my choice to build and fly this model for PSS Weekend in October. Another point that should count in favor of this design is that the AR of the wing is nine and that is on par with most model aerobatic slope soarers.

Building the Slope Aero Commander

The first thing to do was to get a good three-view drawing of the Aero Commander and first prize is one with dimensions (even if it is in feet). This I managed to find it by typing in the word "Rockwell Aero Commander" in my browser search box and this time I must have been lucky. The very first hyperlink had everything I needed. <http://www.aoc.noaa.gov/aircraft_rockwell.htm>

From this drawing you can now scale down to the wing span that you want. If the real aircraft has a span of 49ft and you want a 7ft wing span, then this is 7/49 = 1/7, or one seventh scale. Seven feet is about 2.15 meters.

So any full size dimension on your 3-view drawing must now be divided by seven. I'll use computer printer paper to draw out the model 3-view and then make some small changes to make it look right. The tips on the Aero Commander look very narrow so I will make them a bit wider, and if the fuselage looks too wide I'll make it a little narrower. The tail plane area may also need a bit more area to be on the safe side.

Once happy with the model 3-view you can start with the construction. Before I continue I make an estimated calculation on the wing area and wing loading. In this case 910 sq in = 6.3 sq ft. At 10 Oz/per

sq ft wing loading the all up weight will be 63 ounces and at 16 Oz/per sq ft. 100 ounces (4.0 lb to 6.0lb) or (1.8kg to 2.7kg.)

This will only be a guide and one cannot really tell what the model will weigh in the end at least you will have a goal to work to.

I plan to make this model out of foam and glass and if possible do not want to remove the foam inside the fuse, so I will use a lightweight foam and glass to lay up the fuselage once foam has been shaped to the 3-view plans.

Once I have done this I will publish Part 2 of the slope Aero Commander. For now I am off to the workshop.

Part 2

With exactly 40 days to the PSS slope I guess that there are many modelers hard at work constructing and building their slope power scale planes.

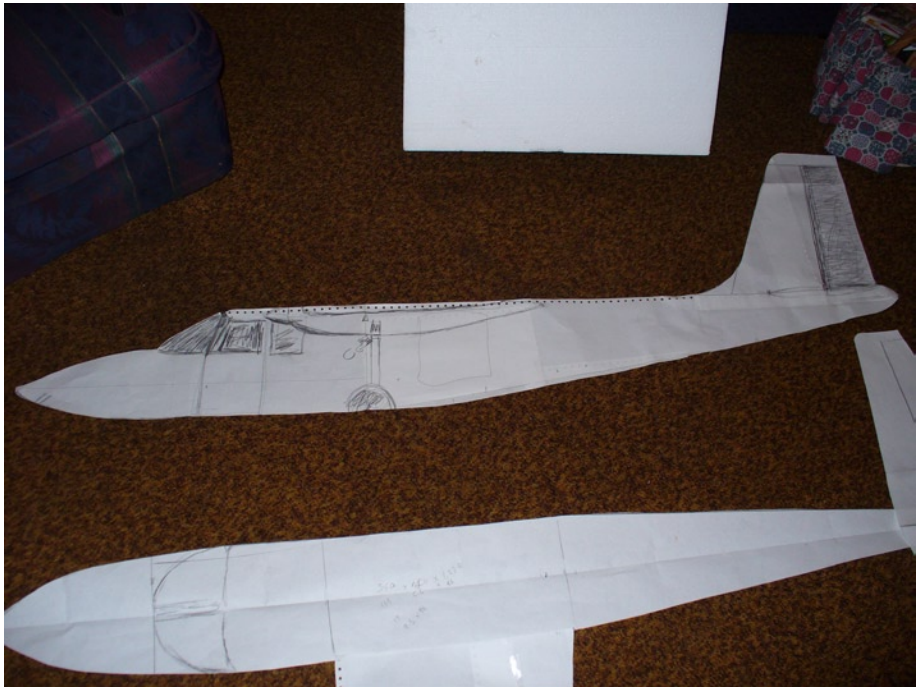
Not being the fastest builder, I will have to work faster that I normally do.

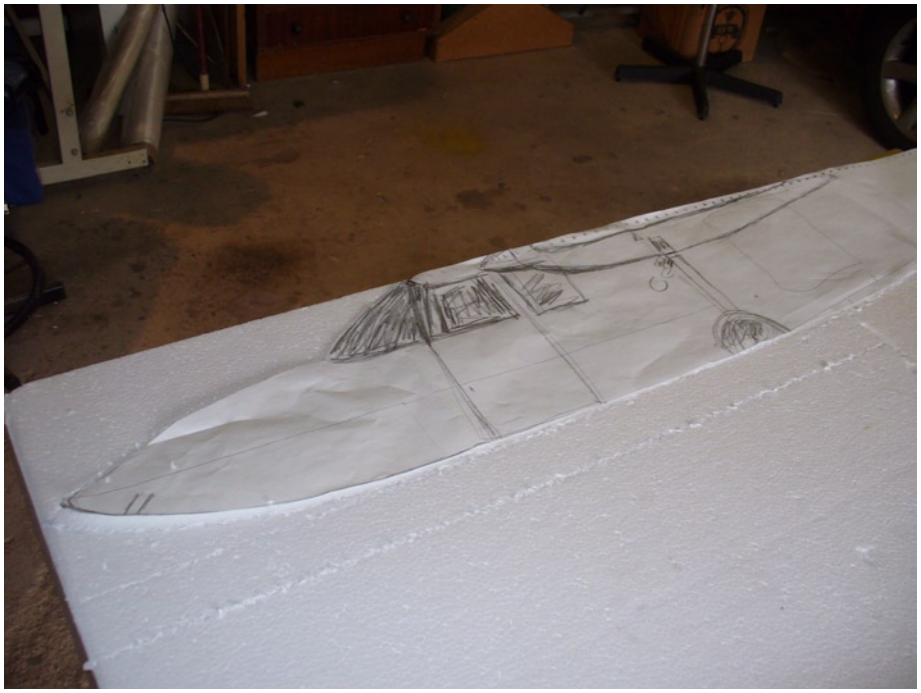
Fortunately I have most of the materials, so I am of to a good start.

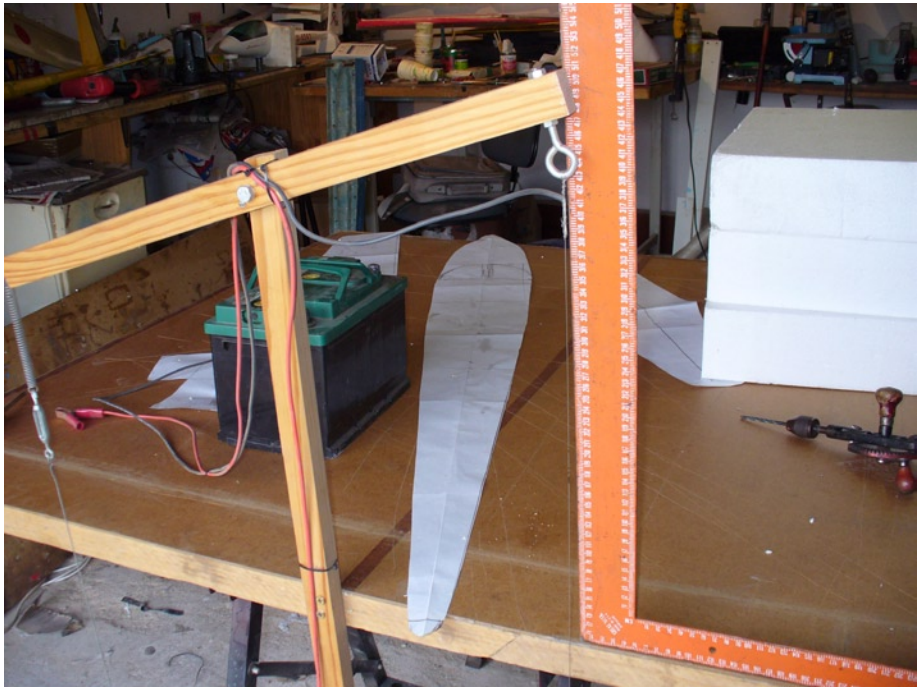
At work we install a lot of new equipment and I collect some of the packing materials that are worthwhile keeping. I had three of these foam blocks and reckon that density must be close to 16 DBM. Laying out my side view fuselage drawing found that two of them nearly cover the length of the fuselage. So I had to add about a 75mm piece to fit it all in. I also had to double the sides to make up the width of the fuselage.

I used 5-minute epoxy glue to glue all the pieces of foam together.

Then using a cutting bow mounted on its side and temporarily fixed to the work bench at 90 degrees I can cut out the side view and top view of my scale drawings that are marked out on the foam.







My cutting bow is 700mm long and a 12v DC car battery will give the correct voltage and can handle the current that the cutting wire needs. Be careful of the toxic fumes when cutting foam.

Once this is done comes the creative and messy part. You have to round the corners to get rid of the box shape looking fuselage, taking care as to also make sure that the symmetry of the fuselage does not go out of shape. The fuselage of the slope Aero Commander is on the big side, so after finish shaping it I was happy to find that the fuselage a this stage weighed 250 grams.

The next step was to add some carbon tows to strengthen the fuse. Ideally, to get a good finish, grooves are made in the foam and then tows placed in the groove and wetted out.

In my case I just laid them on the outside. I used 163 gram cloth to glass the fuselage over and once it is cured and dry I will decide if the fuselage needs more strength .

While cutting the foam I also cut the blanks for the tail and rudder as well as the two dummy engine housings. Next step will be to spray paint the fuselage and then make the templates for the wings, tail and rudder.

Part 3

The famous Rockwell Aero Commander that Bob Hoover flew for at more than 2500 air shows and demonstrations now has a proud home under the wing of the just as famous Concord at the Smithsonian National Air and Space Museum. Bob donated this, his personal Aero Commander, to the museum after he lost his flying license at the age of 73.

Last night I started plotting out the wing sections that I want to use on the Slope Aero Commander. I prefer the plotter over a laser printer because I found in the past that some laser printers do not scale the dimensions inputted correctly. According to HP, the plotter can plot accurately up to 1/1000 of an inch. Any way, no way one can cut the resulting template that accurately.

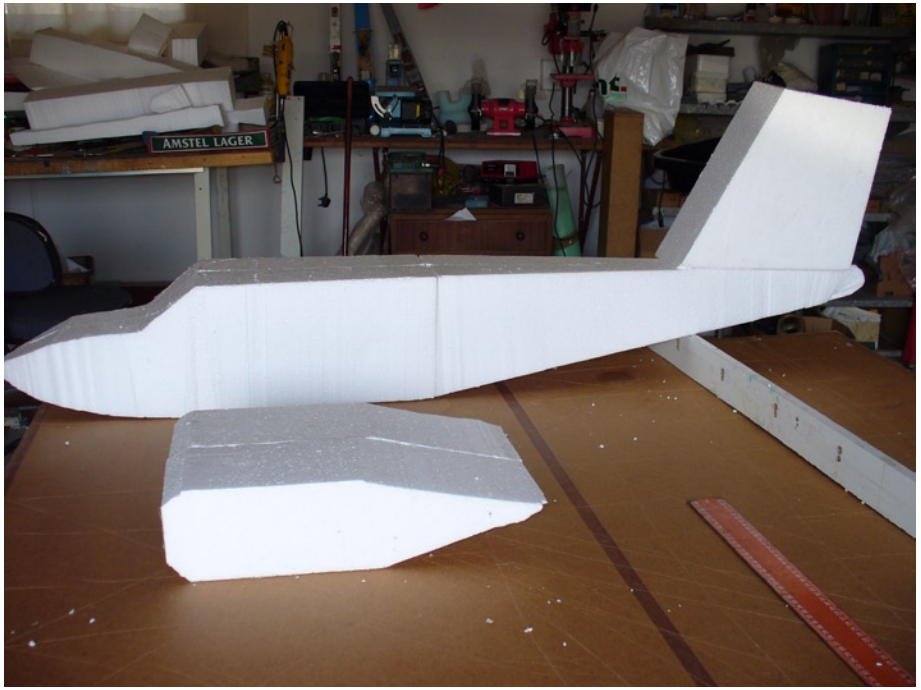
I plot all the Templates twice as I intend to use them in my automatic foam cutter.

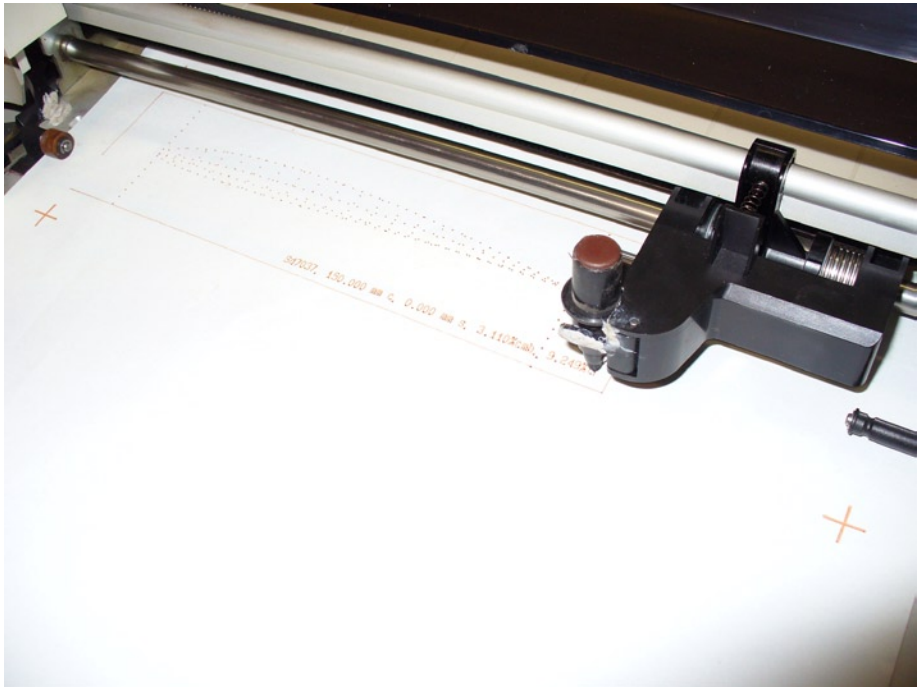
These paper templates once cut out will now be transfer onto Formica and cut to shape. Once all the templates are complete I will start cutting the tail, rudder and wing foam cores.

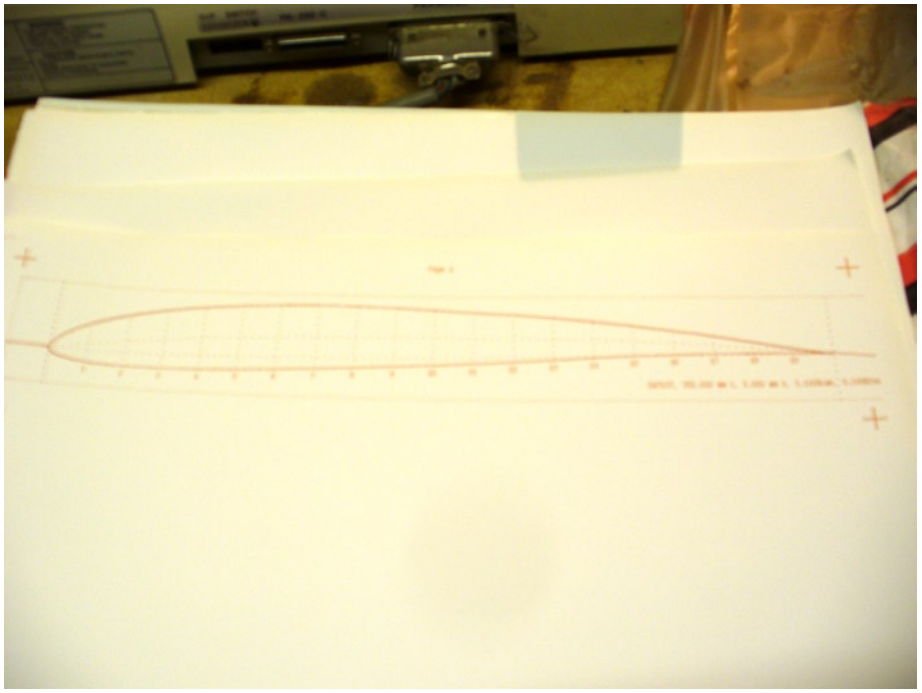
I have no stock of polyester foam, but will order some shortly. In the meantime, I still have to spray paint the fuselage. Sometimes you need the wind and sometimes not.

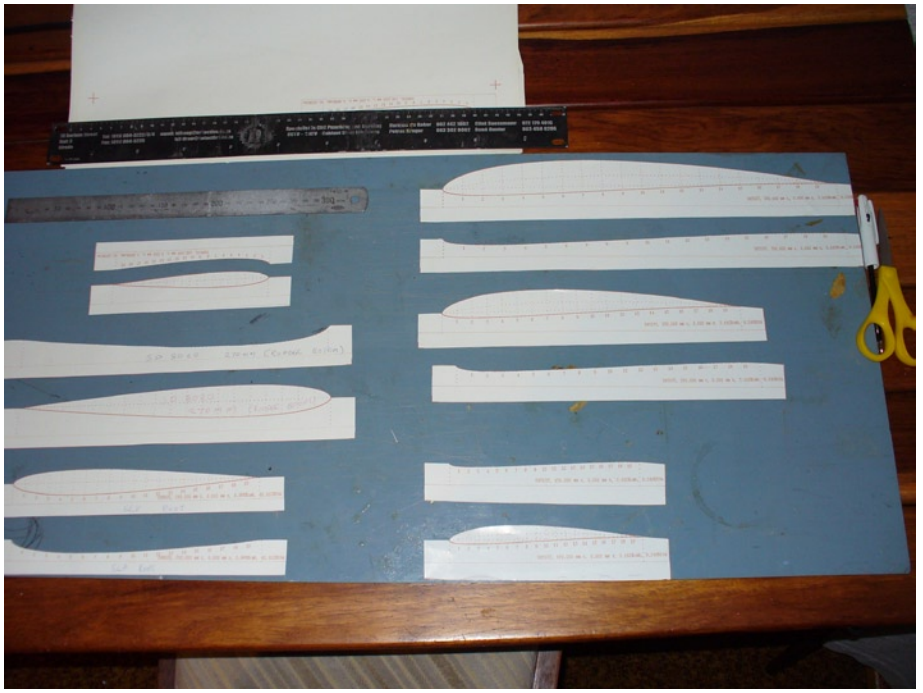
Part 4

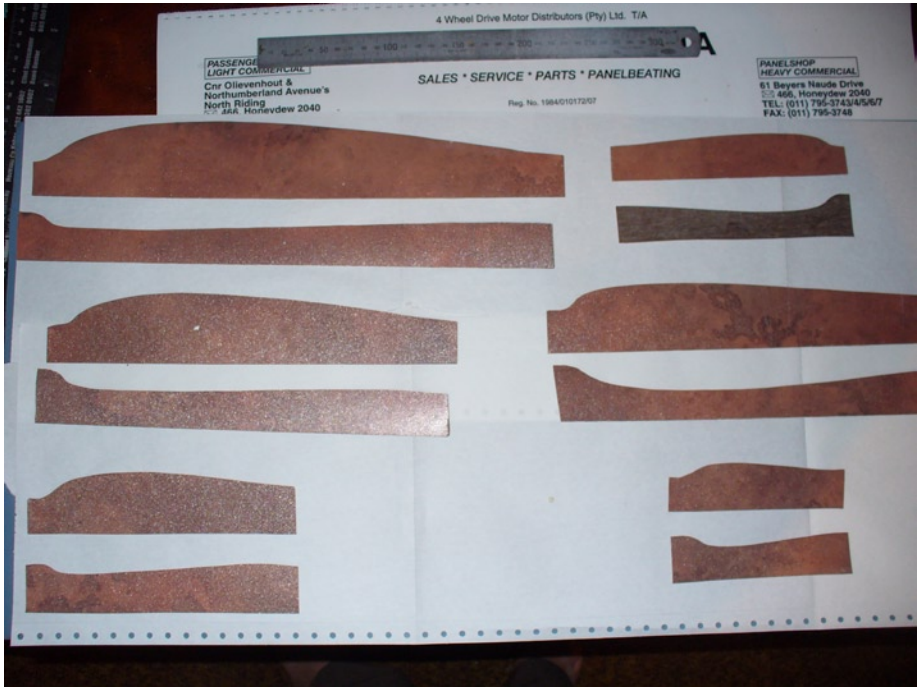
Friday night I completed cutting the wing, tail and rudder templates and I also prepared the fuselage for spray painting on Saturday. I used 1 K primer and added thinners to make the mix so that I could paint it on with a paint brush. I gave the fuselage two coats with second coat thinner than the first coat and lightly sanded the fuselage after the first coat. Before I start the











spray painting I will lightly sand the fuselage down with a lighter grade of sandpaper.

I can only get the foam for the wing next week, but I have cut the blank blocks for the rudder and stabilizer. So no holdup as yet and the work can go on. I hope to cut the stab and rudder on Saturday as well.

Part 5

I mentioned in Part 4 that the fuselage needed spray painting and this I managed on Saturday morning early as there was just about no wind to start off with. The finish came out not too bad, but in order to get it perfect it will require much more time and work.

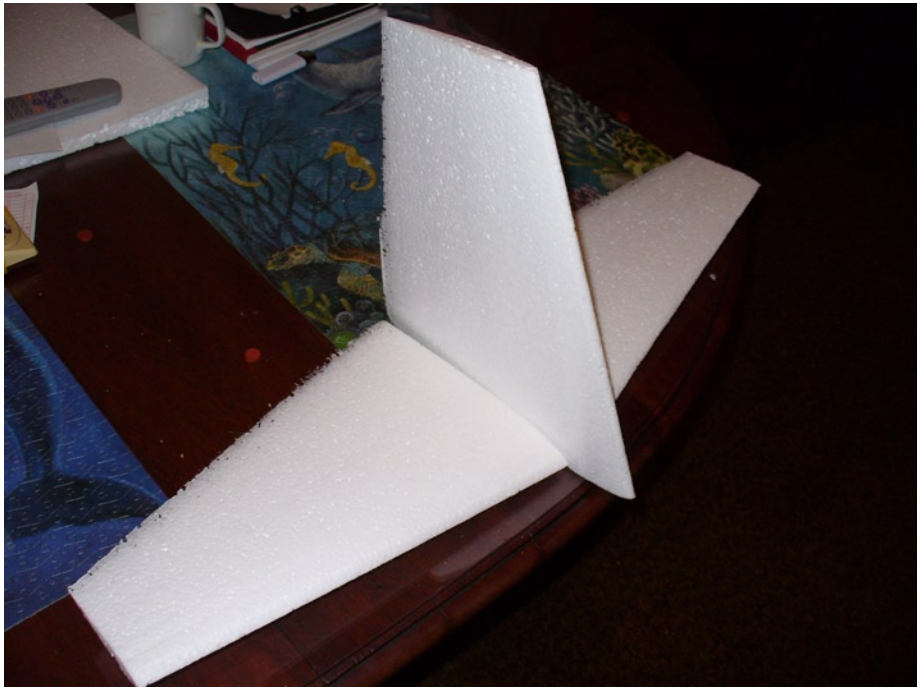
At this stage I am more concerned about the weight and I need to move on to making the flying surfaces. I managed to cut the vertical tail and cut out of newspaper the templates for the windows that I will stick on with vinyl film. This still looks too big and I will trim the final shape of them down a bit. (I hope that rudder looks more streamlined now, Mike.)

On Sunday I could not get much done because of the Silverton leg of the HTL, but last night I was chipping away at this build again.

Part 6

I guess that I am not alone in burning some midnight oil trying to beat the deadline for the PSS slope weekend in October and the recent heat wave we have been experiencing is not helping, making a person feeling energy-less during the day.

With 30 days left there is still time left and last night I finished off most of the foam cutting with only the outer tips remaining to be cut.



I hope to start bagging the tail and rudder this weekend.

I am not going to cover the foam cutting (or feather cutter) as this will be a lengthy posting on its own, but in the picture you can see what my foam cutting table looks like.

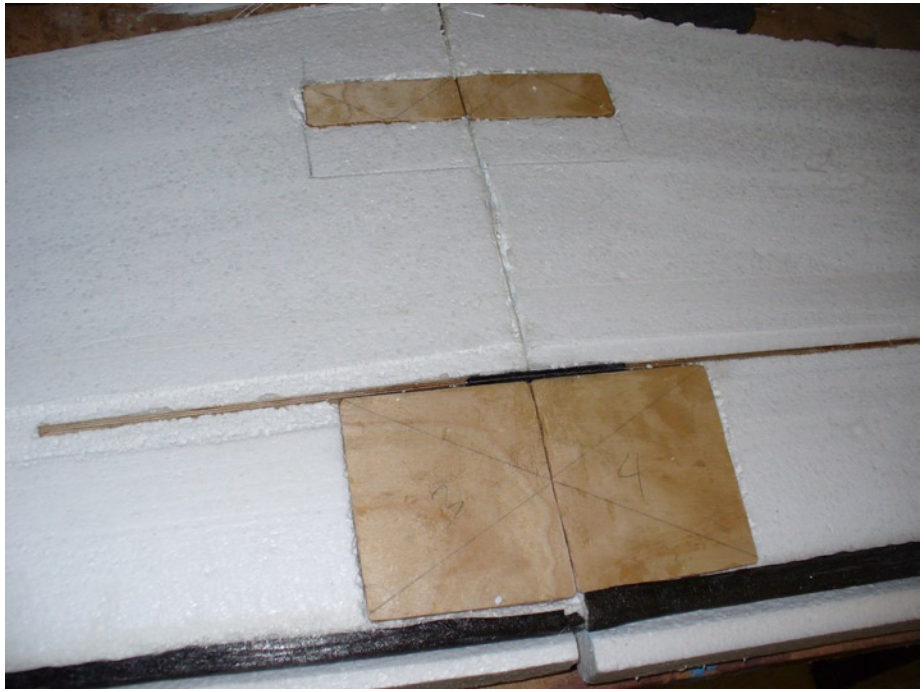
Part 7

This weekend I managed to complete the stabilizer and rudder construction.

I still have to cut out the elevator and moving part of the rudder as well as the hinging.

More about that in a later build.

I started with the wing on Saturday, sanding in the grooves for carbon tows that will form the spar caps and formed the carbon L.E on the center panel.



I joined the center sections and laid in the bolt beams in the bottom of the center section of the wing.

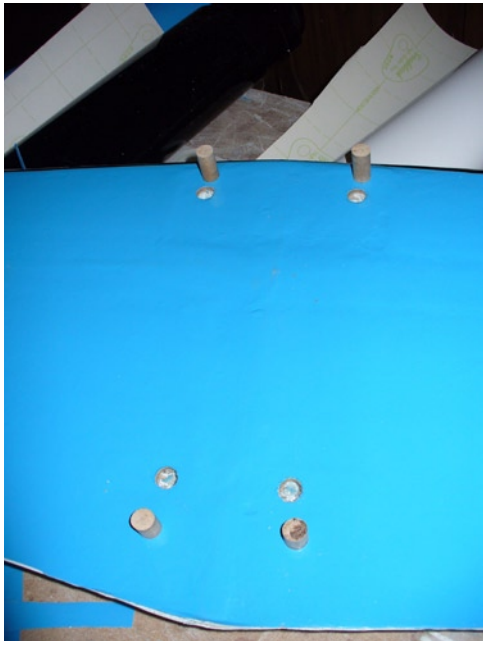
Note that the bottom spar cap and ply dihedral keeper all join up on this beam. Once the wing is bagged, 13mm dowels with clearness holes for the 5-6mm bolts will be inserted through this bolt beam. The 4 X 5-6 mm will be used to secure the wing to the fuselage.

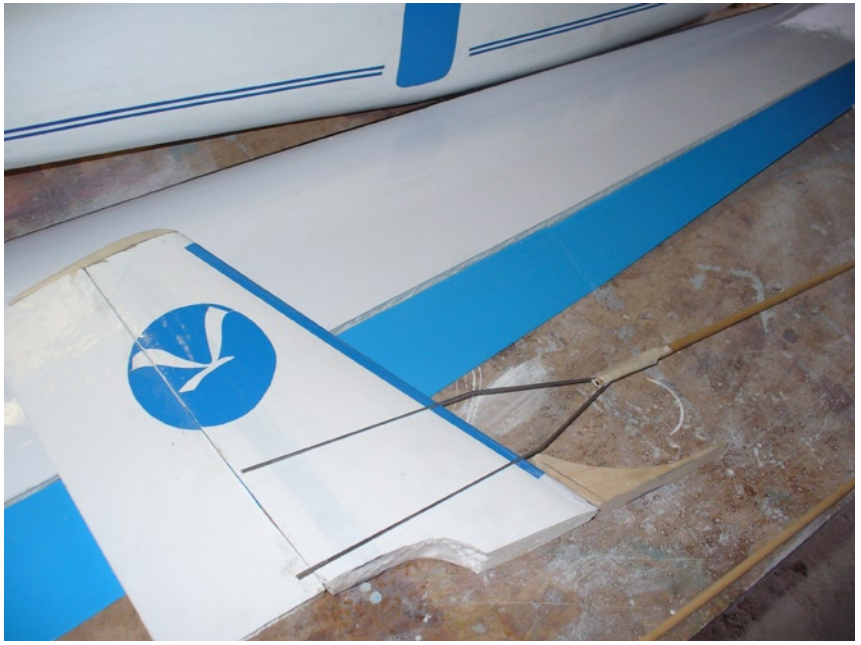
I hope to complete the wing construction this week. Still 25 days left. It is going be a close call to finish this baby on time.

Part 8

Twenty days gone and less than 20 to go.

I managed to get the wing done today, and as far as the schedule is concerned I am falling slightly behind, but with a public holiday coming up on Wednesday I should be back on track. In the meantime I have cut out the wing , tail plane, and





vertical fin seatings in the fuselage so there is progress.

The airframe is now complete and next step will be cutting out and hinging of the moving surfaces.

Part 9

Got a lot done today and with Mark De Klerk helping me things just went much smoother and faster. Thanks Mark. I have completed the engine cowlings as well as the fuselage bolt beams that will hold the wing down.

The wing will be held down by two 6mm bolts in front of the wing and two 5mm bolts in the back.

The corresponding holes and 13mm dowels were aligned and fitted in the wing, and wing balsa block tips glued on, but still to be sanded and rounded off.

Still have to cut out and hinge the ailerons, flaps and elevator surfaces, but like I mentioned before, I am running still slightly behind schedule but I can see the light at the end of the tunnel.

I plucked the courage to weigh all the parts constructed so far:
Wing = 1.2kg (this is on the heavy side, but still this is a big wing 2.4m span and 350mm root ,150mm tip.
Rudder and stab = 250 grams.

Fuselage = 1kg with no foam removed yet, painted and finished - this surprised me
All up weight without equipment and nose ballast = 2.5kg.

Add another say 700gr for RC equipment and ballast and I am looking at +/- 3.2kg all up weight. I don't think this is too heavy, but it will require a good wind on Volkies to be on the safe side for the maiden flight.

Two weeks and two days to go - time to move into top gear. More on the Slope Commander in Part

Part 10

With all the silicone hinging done but the elevators, I now started with the servo tray for the rudder and elevator . The aileron servos and flap servo will be mounted in the wing. More or less on track with this build now and I should be finished by the end of this week.

Part 11

With only five days left, I am just about done with this build - only the engine cowlings need to be mounted in their correct positions.

Dummy props and undercarriage will be removed before launching. So far 35 days has come and gone since I have started this project.

For what it is worth I have collect the following data:
Wing Span : 2.4 Meters (100 inches)
Wing Area: 1000 sq inches +/- 6.3 sq feet.
Wing AR =9
Wight: 3.3 to 3.5 kg 7 to 8 Lb
Wing Loading : 18 to 22 oz /sq feet

Radio : 4ch - rudder,elevator,ailerons and flaps.
Battery: 4.5 A/h, 5-cell nicad.
Power : Needs lots of wind on Volkies this Saturda,y so wish me good luck as I go.

Part 12

Piet and the Slope Aero Commander
Fiinished at last

Today exactly 40 days ago I started with the Rockwell Aero Commander PSS project, and I can now say that it was a very challenging experience for me.

This morning I was up at 5am to complete the two main dummy undercarriages, after all it has to stand on it own legs before it can take to the air. The blog and posting that I did kept me focused and although I made many mistakes and where I would normally give it up for a bad job, I carried on thanks to Glen, Izak, Deon, Mike, Mark, Evan and everyone else that did leave comments on the blog. That kept me going.

I sincerely hope that the wind will blow this weekend and that I will at least have a good chance to fly the Aero Commander. This for me will be the cherry on top of the cake so by Monday we will know and like Mike said It is now a “Fly or Die” situation.

Like with many a model RC glider that I have maidened before, one has all these questions in your head, like “Is it too heavy,” “Hope I have the CG in the right place,” and “Will the control movements be OK?”

But for now I am taking out tonight my ever so understanding wife Jenny for a well deserved dinner. She had to put up with me being more in the workshop over weekends and working on the Aero Commander at strange hours of the night and mornings. The worse case occurred when on the 18th of September I forgot all about or 33rd wedding anniversary and I promised my co-worker Phillip Otto that I would help to cut his wings that night. But I somehow survived the situation and hope that I can make up for it tonight.

To all the other crowd - ETB and DMAC and many other builders - that burned the midnight oil and worked by the MOB clock that Izak put on the ETB Blog, I hope all your planes will be ready for the PSS weekend and that all your efforts will be rewarded.

Piet contemplating... “Is it too heavy,” “Hope I have the CG in the right place,” and “Will the control movements be OK?”

Results of the static judging at the Eastern Thermal Busters PSS Fest at Volksrust: Piet Rheeders 1st for his Aero Commander, Mike May 2nd A10 Warthog and Herman Weber 3rd for his Provost T3 Hunting jet.

The Secret Life of Servos

by Peter Carr, WB3BQO@localnet.com

A servo broke one of its gears the other day. No big thing, just a minor repair.

I unscrewed the servo from the sailplane and began disassembling it. It was a Hitec HS-85 with many flights on it. Now, I know that Hitec will repair their servos. They are very good about that. But I wanted to see exactly what had gone wrong.

Two things were apparent.

First, the inside of the servo was fairly dirty. Its service over several years of hard flying had caused all sorts of dirt to be caught in the gear grease. This seemed to be from wear in the inside of the case top where the small gear locator pins are socketed.

Second, the gears themselves had considerable play, especially the small one on the motor shaft. The servo was just plain worn out.

After the inspection I was amazed that the servo worked at all. It had performed normally up until the gear broke and gave no indication of the aging of its innards. It was leading a secret life of quiet desperation until it finally couldn't take any more.

Servos are the muscles that move the various parts of a model. Most of us take them for granted, checking them for wear occasionally or just replacing them when they quit.

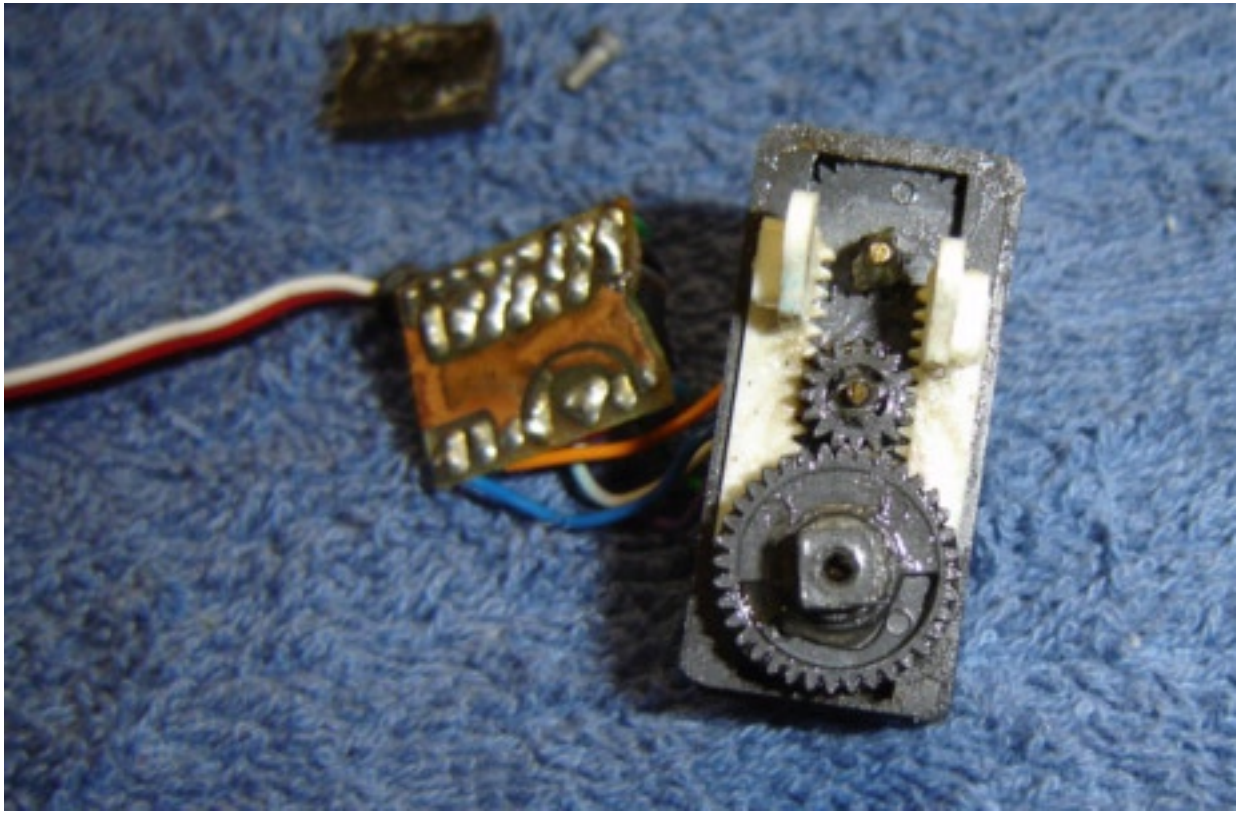
Increasingly, these muscles are installed in places where repair or replacement is very difficult, such as inside sailplane wings and at the tail in fuselages.

It wasn't long ago that flap servos were permanently epoxied into wing cavities. It was a major pain to pull them back out if a gear broke. Things are better now because of much stronger gears. Still, it is wise to know what goes on in the life of a servo.

Servos come in a staggering number of sizes, strengths and configurations, all suited to increasingly specialized applications.

In today's aircraft it is very unusual to find four servos, all the same size, installed. In fact, electric planes use throttle controls that vary the motor speed without an actual servo as is standard with glow engines. That said, it becomes a real task to choose the right servo for the individual application in your next dream ship.

The vast majority of servos have rotary outputs. This means that the output arm



This is the gear train of the Bantam rotary/linear servo. The two flat gears ride the side of the smaller round gear and move in opposite direction giving push-pull action.

swings around in a semi-circle pushing or pulling on the control pushrod.

The Pattern people had real issues with this system so some radio manufacturers added computer compensation to the servo controls that made them seem to move in a linear fashion.

Many years ago ACE R/C brought out a linear servo called the Bantam. It was actually a rotary servo with a pair of flat gears added to the output shaft to give linear as well as rotary output.

An identical unit was sold by Litco which had a different circuit board but the same mechanics. These early servos were small and reliable for their time but were slow by today's standards.

Early servos started using a feedback pot from electronics such as radio volume controls and it's been that way ever since.

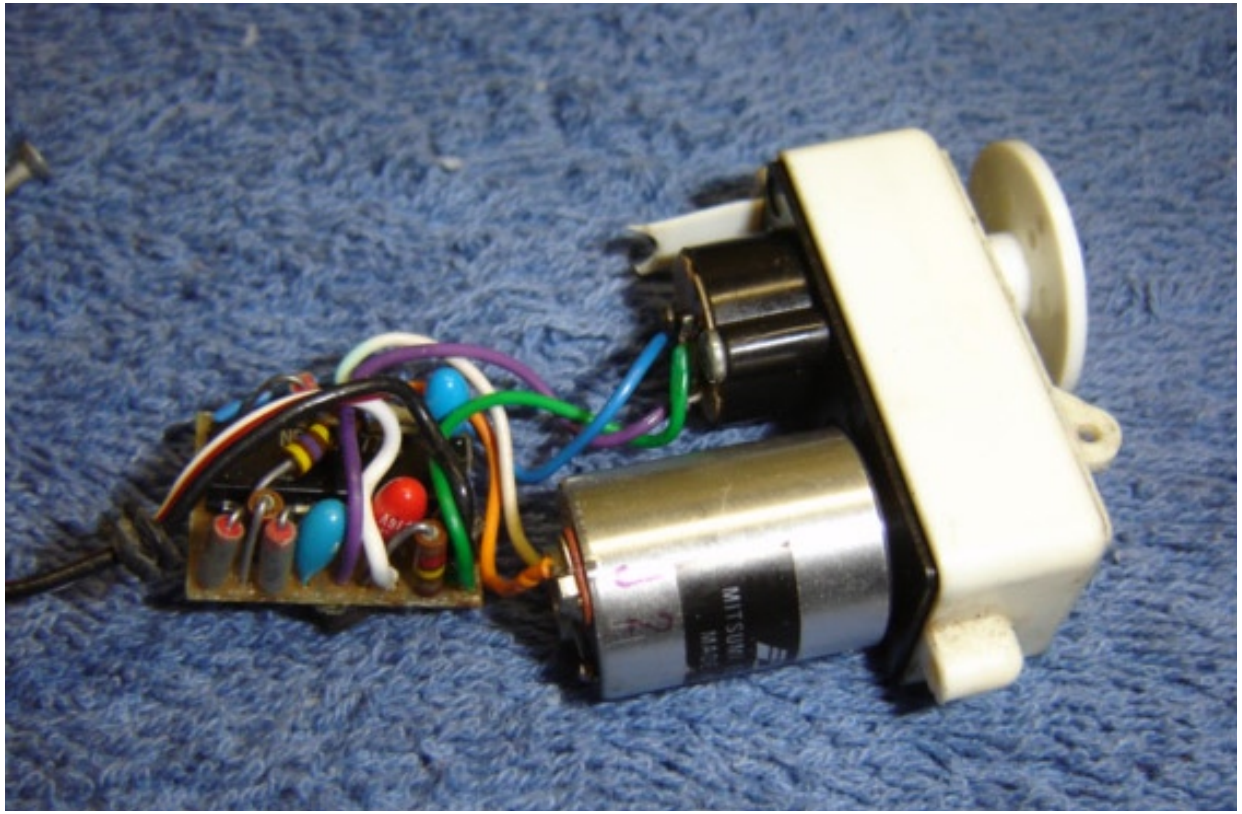
Linear action is a more efficient method, but the feedback problem needs to be solved.

The motor is the heart of a servo. The first ones were used in hi-end film cameras to advance the film. Since the load of the film was small, these motors were not expected to work hard. In addition, they didn't work continuously, only when a picture was taken, so heat buildup didn't matter.

The motors in the current crop of servos have to be extremely small and light, dissipate heat very well and draw as little current as possible. The development of a whole new generation of vastly more powerful magnets have made motors stronger and lighter. Their output torque is multiplied by gears that give both power and resolution at the output arm.

All servos use a data pulse from the receiver decoder to tell them where to position the output arm. This pulse is from 1 to 2 milliseconds in length and it usually updates 50 times per second. Some radio systems update more often to offer higher resolution, but the 50 Hz recurrence frequency is used in the average radio.

The pulse comes into the servo via a three wire cable from the receiver. The cable carries <>+4.8 volts, ground, and



Here is the bottom end of the Bantam servo with the circuit board at left, the motor in the foreground and the feedback pot in the black holder just above it.

the data pulse. The motor ground and the signal ground are combined at the black wire.

In the top of the servo case is the gear train that connects the motor to the output arm. Under the output shaft is a variable resistor or “pot” that is mechanically connected to the shaft. As the output shaft and arm move, they change the resistance of the pot and this tells the circuit board where the arm is presently positioned.

The incoming signal from the transmitter may want the output to be in a different spot so the difference between the “where is” and the “wannabe” is the error signal. The circuit board determines which way the motor must rotate to move the arm to zero out the error. All this electromechanical action has to have enough power to move the control against the stress of flight.

In older servos the circuit board was made by printing copper paths on a nonconducting board, then drilling holes for the parts. This “through-hole” construction took up space and was not mechanically substantial. The old Bantam had this type of board and several wires that connected the motor, pot and incoming signal/power lines.

As servos got smaller and motors became stronger circuit boards were redesigned to use integrated circuits with enough power dissipation to operate them.

At the same time, these boards used surface mount technology (SMT) parts that laid down flat on the board and were soldered to pads instead of holes. A side benefit was that robots could assemble these servos from start to finish which greatly increased reliability and lowered costs.

Large scale planes may use two servos mechanically connected in parallel to power a control. This gives twice the power while the linkage allows a single servo to run the control if the other one fails. Since current draw in high power applications is dependent on input voltage, some modelers use 5-cell packs. In fact many servo specifications rate the servo at 6 volts rather than 4.8.

This is the gear train of a modern servo. the individual gears are supported by metal bearings. The feedback pot has a keyed shaft that connects it to the main gear at upper left.

Handlaunch glider pilots, at the other extreme, may use 3-cell batteries with their incredibly light ships. Receivers and servos will operate on the reduced voltage but servo power suffers. The good news is that the air load of these ships is normally quite light so servos don't have to work very hard.

Servo gears are made either from plastic or metal. Plastic gears break fairly easily but don't wear very much. Metal gears are many times stronger but will wear, causing some loss of resolution. Engine vibration levels as well as impact damage can determine which type to use.

In years past the servo feedback pot was a high maintenance item. Since the metal pot wiper was moving right along with the output arm it would scrape the carbon resistive element. This created dust which adhered to the element surface and caused a "soft" resistance level. The result was a servo that "hunted" at a certain spot such as neutral. This was especially true of servos in gas engine aircraft with big props or poorly balanced/mounted engines.

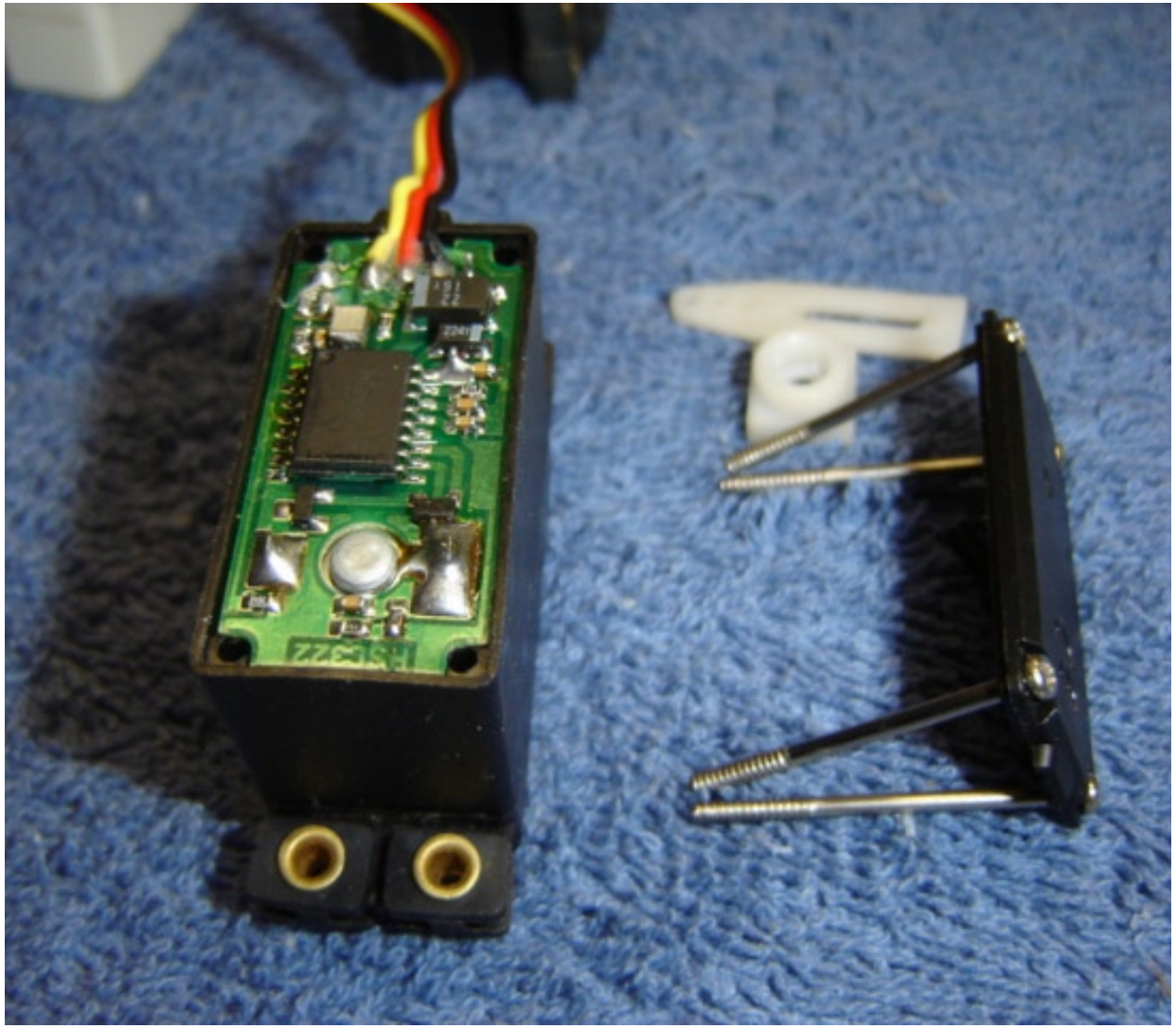
It's been a long time since I found a bad pot in a servo so they have come a long way toward reliable operation. Still, the pot and the gears of a servo are the two weakest links in the unit.

Servos come with a connector at the end of the connecting cable. Most are compatible with either Futaba or JR radios. These connectors have pins that are crimped onto the individual wires. I routinely cut off the connectors and splice the servo to the cable inside the wings of sailplanes so that nothing gets unplugged accidentally.

It is possible to wire the wing cable directly into the servo circuit board, but it is not recommended. As you can tell from the photos, it's really tight quarters in there and it's easy to fry something.

I also use shrink tubing over the soldered connections to insulate them and to prevent breakage. Back in the day, there was no shrink, only spaghetti tubing or bathtub caulk to protect connections. Things are much better now.

Servos normally have a travel of 45 degrees each side of neutral. If the control trim is at one end this can exceed



This is the bottom end of a modern servo with the SMT mounted parts on the circuit board. The small flat board gives more room for a bigger motor in the same size case.

45 degrees in one direction. If the ATV submenu on the transmitter is varied you can increase the total throw of the servo quite a bit further than 90 degrees.

In some applications, such as flying stabs, the movement of the fuselage bellcrank can be limited by the cutouts for the stab pins on the rudder sides. If the throw of the servo exceeds the total deflection of the bellcrank, binding will occur. This mechanical stop puts a terrible load on the servo and its parts. Since the load translates into heat generation the servo may fry under these conditions. Remember, the motor is the major heat producer and is trapped inside a plastic case with no easy way to vent its heat. If it's a really hot day and the ship has been sitting in the sun the heating problem only gets worse.

Servo mounts are a much misunderstood part of the unit. Most all mounts have metal eyelets inside rubber grommets that are inserted into holes in the mount. There are usually either two or four of these grommets and they are supposed to cushion the servo from vibration. The bad part is that the servo may move under load which makes precise control very difficult. There is a tradeoff between vibration dampening and control precision.

Sailplanes have very little vibration aside from landing shock. I normally hard-mount the servos to the rails, especially

Flaps and ailerons are easily damaged on landing.

The strange thing is, I've broken more wing servo gears by handling the wing during assembly or transport than on landing.

on big surfaces such as the rudder. I've broken gears on rudder servos, but none of the damage would have been prevented by using grommets at the mounts.

I like silicone rubber for attaching servos inside wings since it allows fairly easy removal and peals right off the case. It also adheres well to plastic where epoxy tends to get brittle and break.

Up until now, analog servos were the only choice. Now there are also digital servos which are a great development in both power and precision. Their electronics are different from analog, but the input control data is the same. They do draw considerably more current than analog servos and need larger diameter wiring all the way to the receiver. In addition, they can be programmed individually for special tasks.

Some very large ships with digital servos use separate batteries for the servos remotely located in the wing to reduce voltage drop through long connection cables. Others use a 5-cell or larger battery pack with a regulator at the receiver to increase servo power.

As with any servo, the application dictates the type and size of servo to be used.

While looking at the photos it's easy to see the evolution of design of servos over the years.

Early on, it was a matter of making the aircraft fit the available radio/servo combination that was available. Later, a radio system came with servos all the same size and special needs required the purchase of special servos. About the same time, several manufacturers sold kits of servos for home construction. Modelers could now build and repair servos the same way they built and repaired the rest of the ship.

When specialized motors came into use along with surface mount circuits and robot manufacturing, it became hard to justify repairs when replacement was so cheap. Even the feedback pots got so good that they no longer needed periodic cleaning. As a result we now have a system of control of our models that would startle and amaze the modelers of 30+ years ago.

The HS-85 servo that started all this will be retired and saved for parts. I am also going to remove and disassemble the other servos in the sailplane since they are all the same age. It will be interesting to put it all back together and see if I can detect any difference in the steering.

Even if there isn't much change there will be more confidence that the ship is really in good condition.

That should make future trips to cloud base even more fun.

Building and Using an Automated Foam Core Cutter

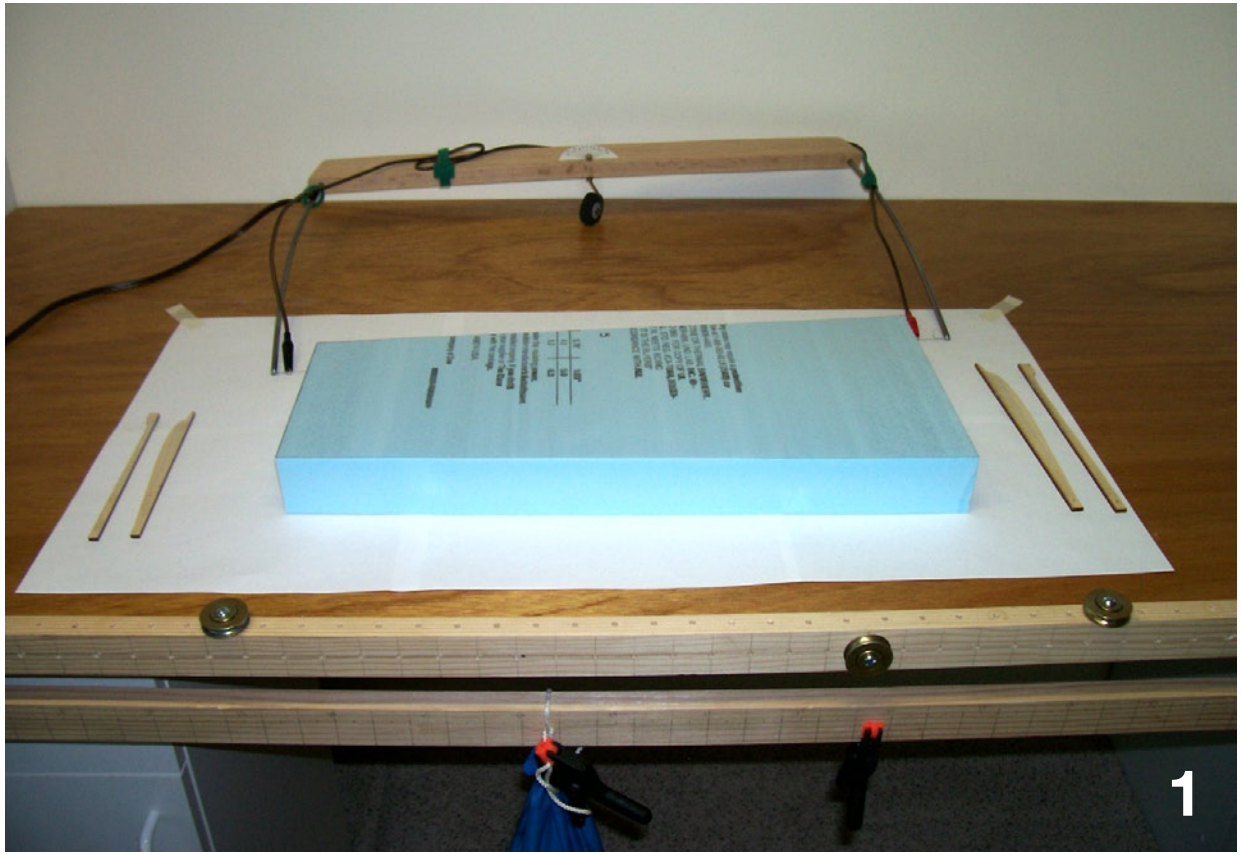
by Curtis Suter, suterc@msn.com

I have always been interested in cutting my own foam wing cores and have attempted several times to do so with varied results.

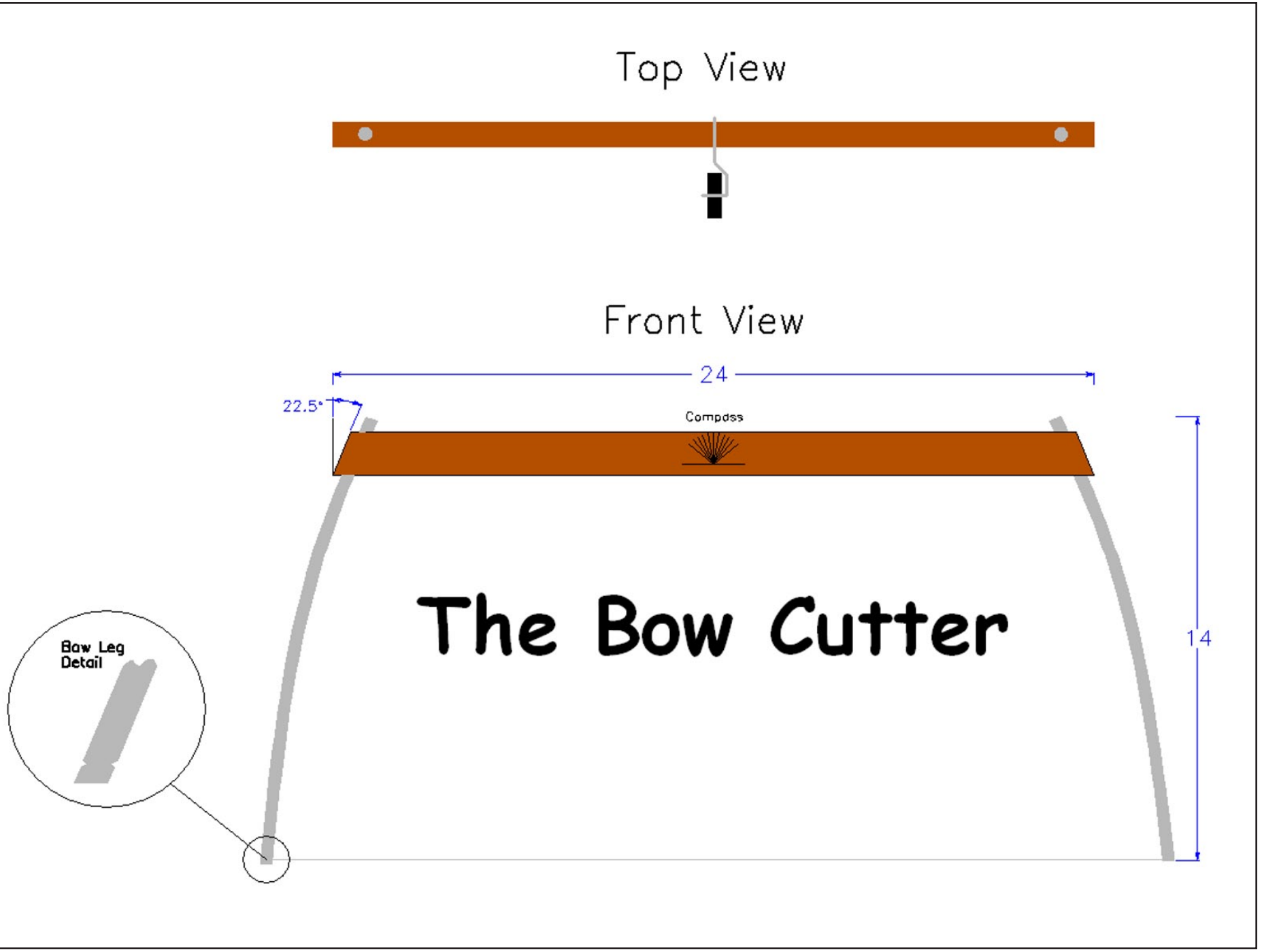
If your time is worth more than your available cash on hand, then please purchase a Tekoa Feather/Cut, as the reviews I've read are nothing but the best, but for me it's more than I wanted to allocate of my model budget.

When I decided I wanted to build my own hands-free foam cutter the research was difficult. There were more variations than words in this article, and I just couldn't find one method that I really liked the best. There was always something that I liked better with another's setup; assembly price, method, design, materials etc…

This brings me to this article, a "single source" that will walk the reader through purchasing, building and setting up and cutting foam wing cores.



Here's a photo of what we're constructing - the Bow Cutter, the Automater, a foam core blank and templates.


Top View
Front View
24
22.5°
Compass
14
Bow Leg
Detail
The Bow Cutter

I certainly can't take any more credit for this other than putting together this article. The ideas, methods etc… are from other sources. At the end of this article, credit has been given to those sources I've used, and my apologies to anyone I've left out.

First you'll have to go shopping. Once home from obtaining all the materials it took me about three hours to construct both the "Cutting Bow" and the "Automater," both for less than 40 US dollars! Then after wasting some foam testing temperatures, techniques, etc… I have now very effortlessly cut some beautiful and accurate foam wings for a discus launch glider (DLG).

Let's get started. Here's your shopping list:

Parts List

Cutting Bow Parts

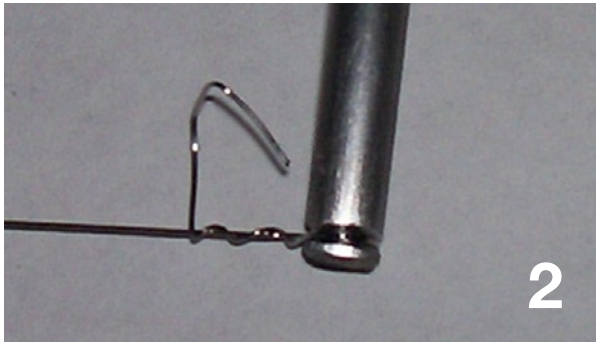
1 each 1 1/2 x 3/4 x 60 inch hardwood for the Bow Cutter handle; I used Oak
1 each 1/4 x 36 inch music wire i.e. spring steel hardened and tempered for Bow Cutter Legs
Hot wire; I used .016 diameter stainless steel fishing leader (Single Strand Wire from Cabela's)
Tailwheel assembly; wheel, axle and wheel collars

Automater Parts

2 each 1 1/2 x 3/4 x 60 inch wood stringers for the Fixed and Swing Arm; I used Pine
4 each 1 1/4 inch diameter pulleys for the Automater
4 each washers so the pulley won't bind against the fixed arm
String for the Automater; I used some winch string I had on hand
Screws to secure the pulleys to the Fixed Arm
Screws to secure the Fixed Arm to your work bench
1 1/2 inch bushing for the Swing Arm
1 3/4 inch nut and bolt for Swing Arm; bolt is inserted into bushing
3 each small clamps used for holding the strings to the Swing Arm
One pound of dead weight used to pull the bow cutter through the foam; I used a bag of dry beans
Small Clips; I used alligator clips

Making the Cutting Bow
(plans on opposite page)

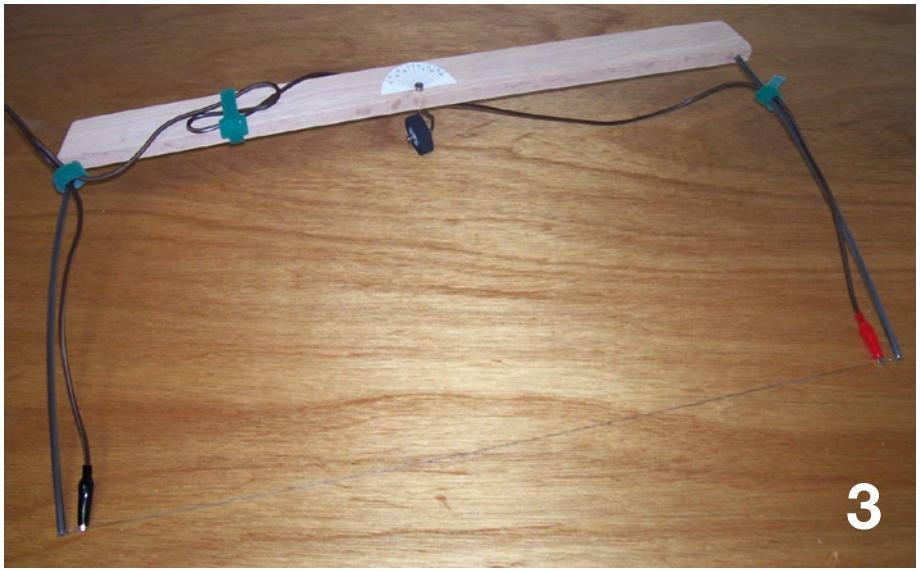
Now that you're back from shopping let's build the Cutting Bow. We'll need the 1 1/2 x 3/4 x 60 inch hardwood which is the bows handle. Cut it to the dimension shown on the plan which is 24". This will allow you to cut about a 20" span. The left over piece should be 36" and this will let you cut a 32" span core. Yep, you get two bows for the price one piece of hardwood. The bow legs are swappable between the bow handles. Now cut a 22 1/2 degree angle into each end of the bow handle. Approximately 1/2 inch in from the end drill a 1/4 inch hole down through the handle parallel with this

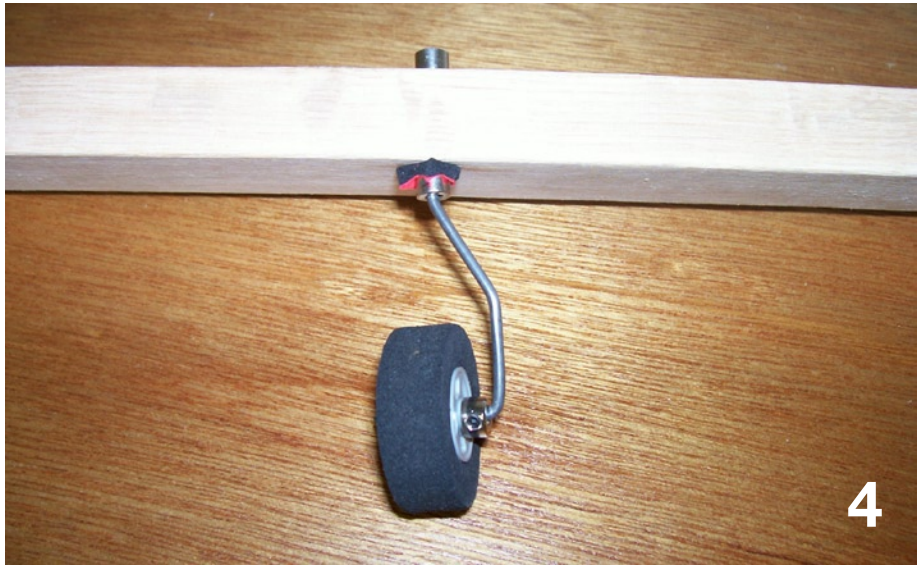


angle. The 1/4 inch diameter music wire should slide in and out of the handle but not be overly loose. Now take the music wire and cut it into two 14 inch lengths. Then file a groove about 1-2 millimeters in on each end of the wire all the way around. This will hold the cutting wire in place.

Now insert both legs into the handle and take your .016 diameter single strand wire and wrap around one leg and twist it a few times to hold it in place as shown in Photo 2. Now pull it tight till the ends of both legs are vertical under the bow handle where the legs exit and tie off as before. Your wire should "twang" when plucked. The beauty of this setup is that when the wire expands/contracts during heating/cooling, the tension in the music wire legs automatically adjusts the cutters tension. So there is no forgetting to loosen the tension from the bow before turning power off! Brilliant!

Congratulations, you have now made a cutting bow!





I guess we're not quite done as we do need to add a wheel which is required for the automated process. See Photos 3 and 4.

The height or size of the tailwheel is not critical; I used what I had on hand. Drill a hole in the handle; bend some wire for your axle and using wheel collars attach the wheel to the bow handle. The wheel needs to be adjustable but then be able to hold its setting during the cut. I accomplished this with a small piece of receiver foam as a friction pad which I lock the wheel collars against.

I'll explain how to align the tailwheel once we start cutting cores.

Now we're done with the cutting bow.

Making the Automater

(Plans on opposite page)

Cut the two lengths of pine to 52 inches each. With the leftover scrap cut a length to four inches which will be used to connect the Fixed and Swing Arms together.

Now let's drill some holes!

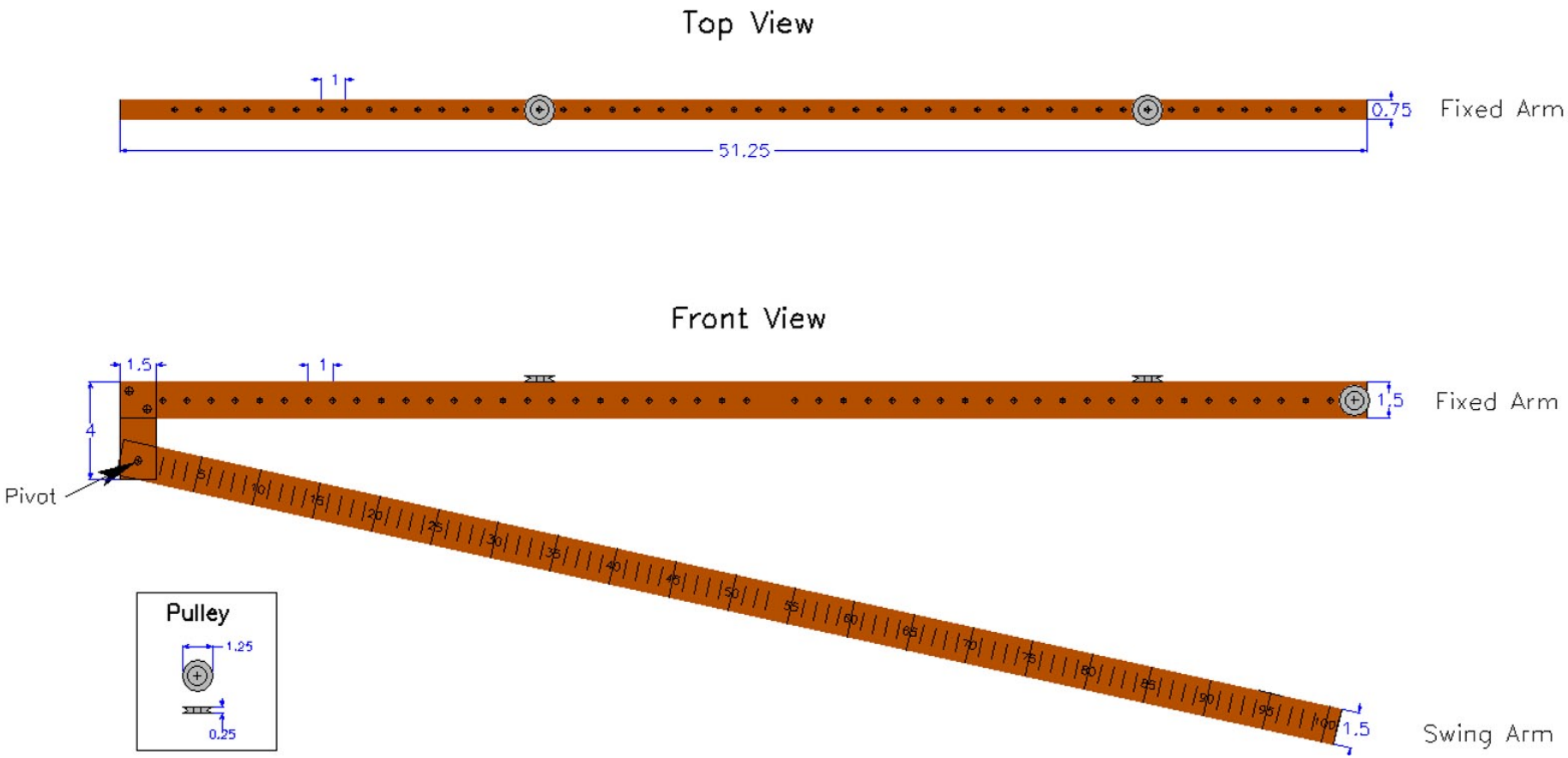
The holes aren't really necessary at this time, but I found it easier to just get them out of the way. These holes are 1/4 inch deep pilot holes which the pulleys will be screwed into; this prevents cracking the wood when screwing the pulleys in place. See Photo 5.

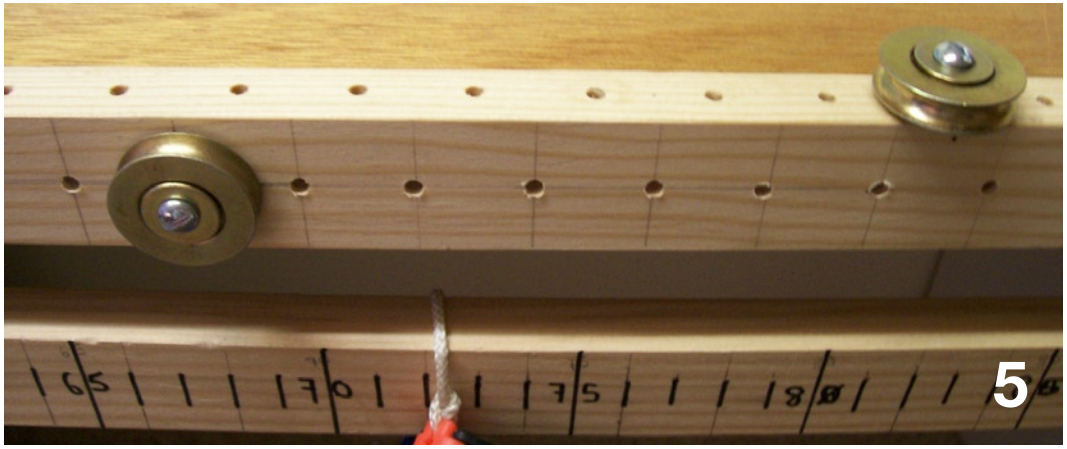
Take one piece of pine and this will be the fixed arm. We'll be drilling holes in the top and front of the arm. The holes I drilled are one inch apart and offset by 1/2 inch between the top and front holes. Start drilling where you like as it's not critical.

The pulley on the front, far right side, should be flush with the end of the fixed arm, see plans. This pulley will never be moved, but the other three pulleys will move depending upon the core size you're cutting.

Take the four inch long piece of pine and the swing arm, align them as the plans show and drill a hole through both pieces which will accept the bushing. Insert the bushing and screw together with the nut and bolt. The arm should rotate freely. Now secure the four inch piece of pine to the fixed arm with two screws. See Photo 6.

The Automater





Take two screws and secure them part way into the ends of the two arms as shown in Photo 7. Take a piece of string and make a loop the length that will allow the swing arm to stay in place parallel with the fixed arm which makes setting up the automated process easier.

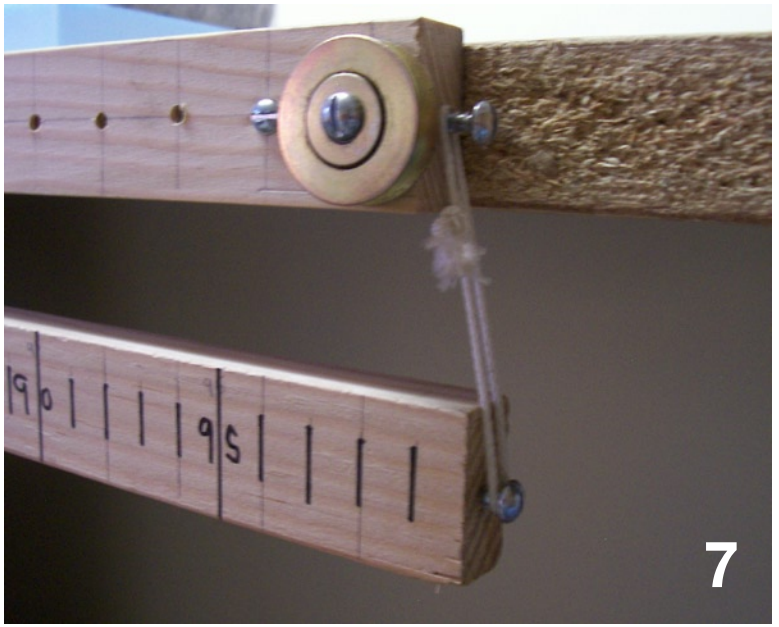
We need to calibrate the swing arm in percentage of its length. With a ruler, measure from the center of the pivot to the end of the arm, you should have just over 50 inches. The pivot will be zero percent and at 50 inches will be 100%. This means that every 1/2 inch is 1%. Mark the entire length of the swing arm as shown on the plans and in Photos 5 and 7.

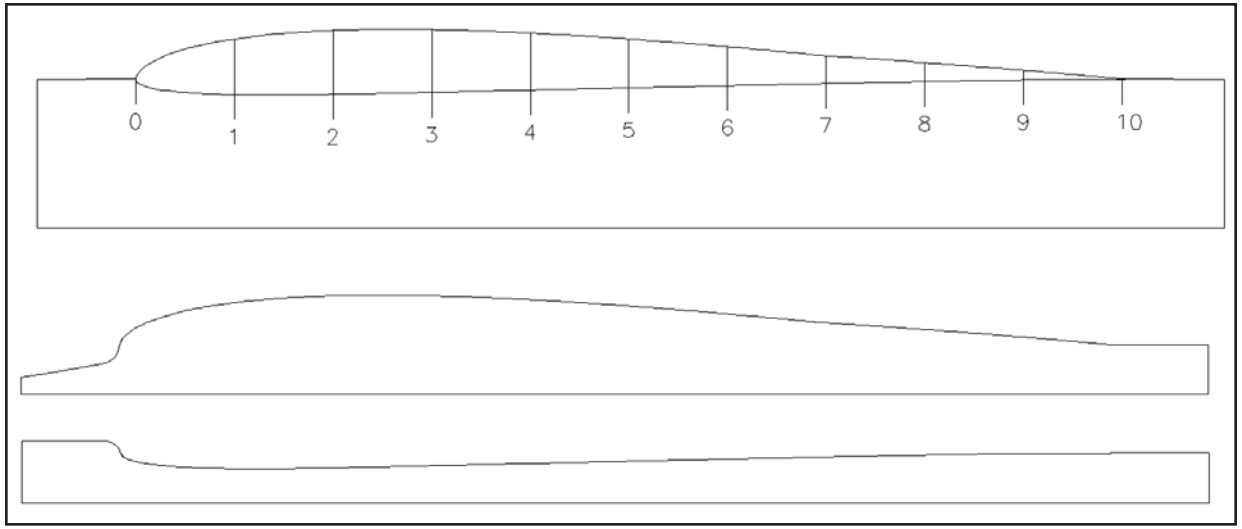
Secure the fixed arm to your bench with two screws so that the top of the fixed arm is slightly above the table and it doesn't affect the operation of the pulleys.

Congratulations, you've now built an Automatic Foam Bow Cutting System!!!

Now that the build is all done it's time to setup the Automater and make our first cut.

This article isn't intended to be about templates or power supplies, but I would like to take the liberty to briefly explain how I'm making my templates and the power supply I'm using.





Templates

I purchased a computer program called Profili a few years ago and what a great airfoil program it is. Please see the manufacturer links at the end of the article.

First I choose the airfoil I wish to use, type in the chord length, washin/out, i.e. twist, and then export the file to my computer aided design (CAD) program for editing. I then send this file to a laser cutter.

I change the leading and trailing edge entries in the CAD program so the cutter wire has a less acute angle over the leading edge. See the above plots. The top airfoil is what comes out of Profili, the bottom two are how I change the leading edge entries.

At the end of the article there are two photos showing the leading edge against the templates, you'll notice there is minimal sanding that's required to the leading edges.

The laser cutter I used is Laser Edge "Precision Custom Laser Cutting and Engraving." I'm very impressed by their service, support, and product. However, I may go back to cutting my own templates as they have a minimum order of $50 and it could easily get expensive, but the accuracy of your airfoil is all about the templates. Decisions, decisions….

This might be a good time to add that if you have an airfoil that transitions from one airfoil to another across the span, then simply cut your root and tip templates to the different airfoils and chord lengths. When your cut is made the airfoil transition is completed. Same with wash-in/out i.e. twist; simply raise or lower the tip template prior to the cut and the twist is automatically cut.

Profili is very good at making accurate templates that are easy to use and automatically allow for twist.

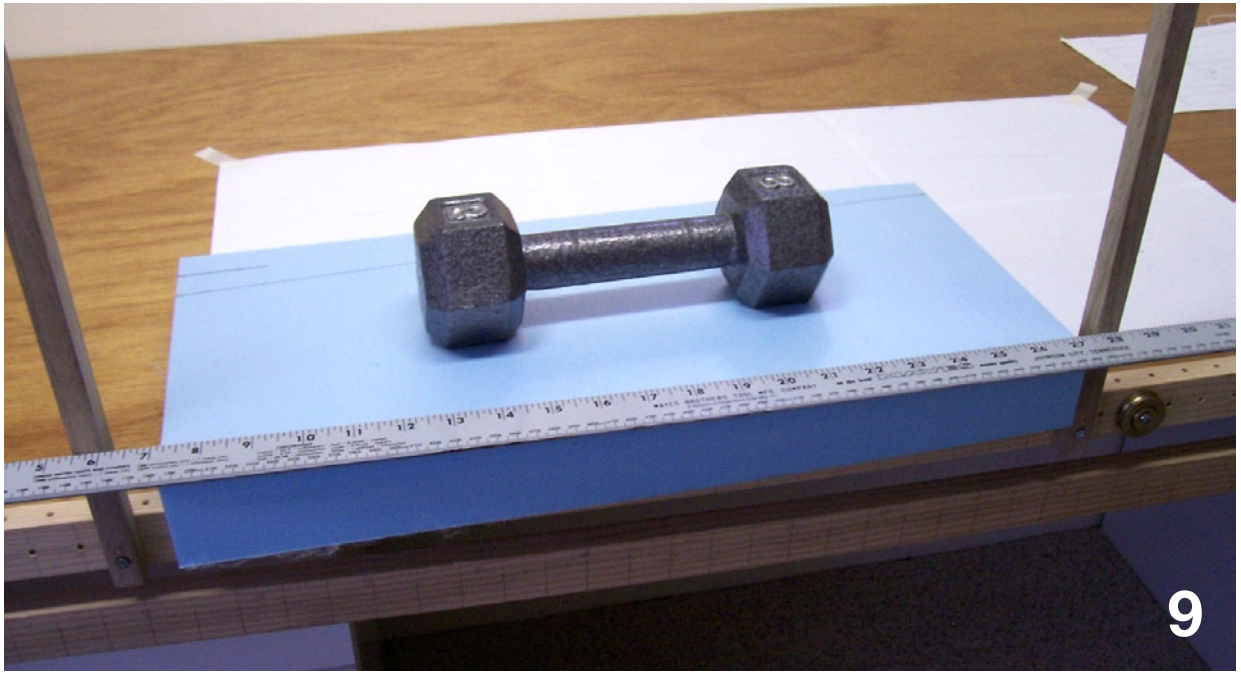
Power Supply

All that's required in a power supply is either AC or DC with a stable current supply. It seems that building a power supply isn't too difficult or expensive; Charles River RC has plans for a simple power supply with Radio Shack part numbers. <http://www.charlesriverrc.org/articles/tools/joedydruliafoamcutterps.htm>

I'm using my AstroFlight 110D battery charger as my power supply. There is an undocumented feature that allows the charger to be placed into "test" mode thus bypassing the peak detection. I've found that approximately 1.9 amps on my 20 inch bow works flawlessly. I'm using a household power cord from the power supply to the cutting wire.

David Forbes sent me a photo of his power supply setup. He uses a Harbor Freight speed control Part #43060. He then plugs the speed control into a 24VAC 1.5amp transformer. David says, "Best place to find one is a junk shop. 24VAC is not that common, and before I found this one I was using a 12VAC

8


9

one. I'm not sure I could tell a difference, and these are commonly used to power halogen desk lamps." See Photo 8.

It's very important that the user is isolated from the power source, especially since he/she is holding onto the steel bows during the cutting process. As an added safety measure the bow legs could have heat shrink placed over them as a safe hand hold.

"Please be careful as some power setups can supply dangerous voltage."

Preparing the Foam

I'm using two inch thick blue foam from a major hardware store. First I cut the block of foam to the planform by drawing the planform onto the foam block, leaving 1/4 inch more foam on the leading and trailing edges than the desired wing chord. Then I cut the foam to the exact span I'm using.

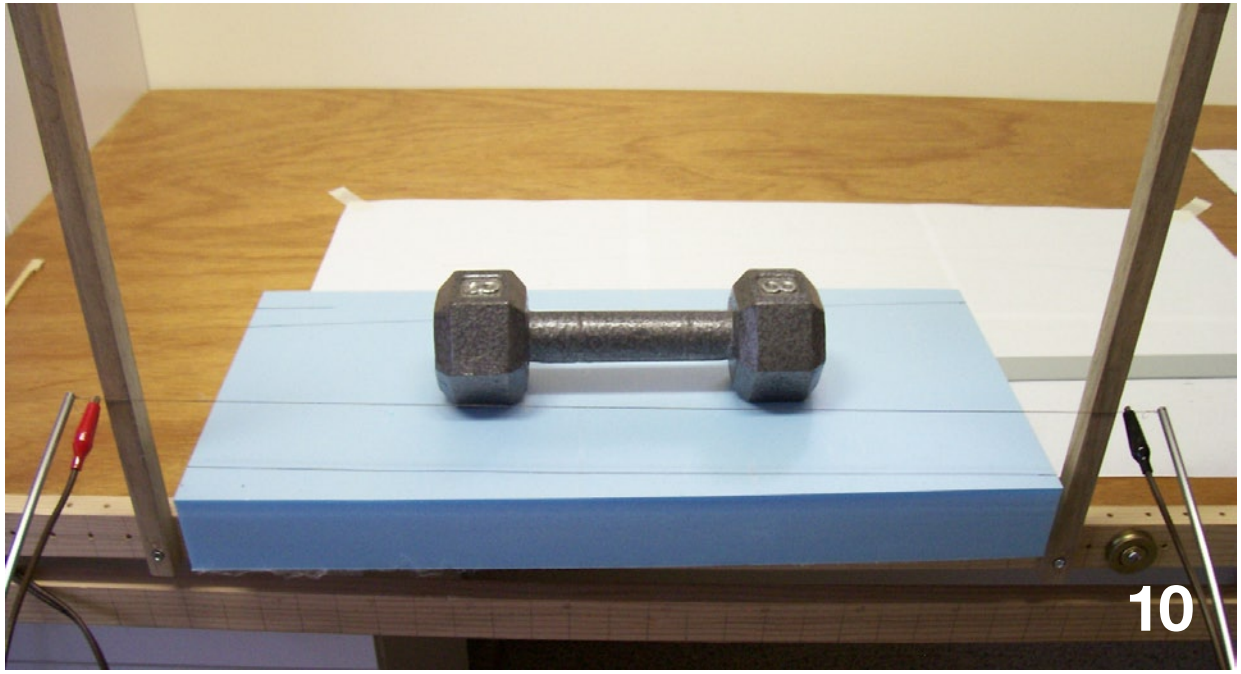
To do the actual cutting, I take two 1/2 inch square by 12 inch long pieces of wood stock and screw them vertical to the front of my workbench. This allows me to lay a ruler down on my cut line then heat up my bow and make the cut. See Photo 9.

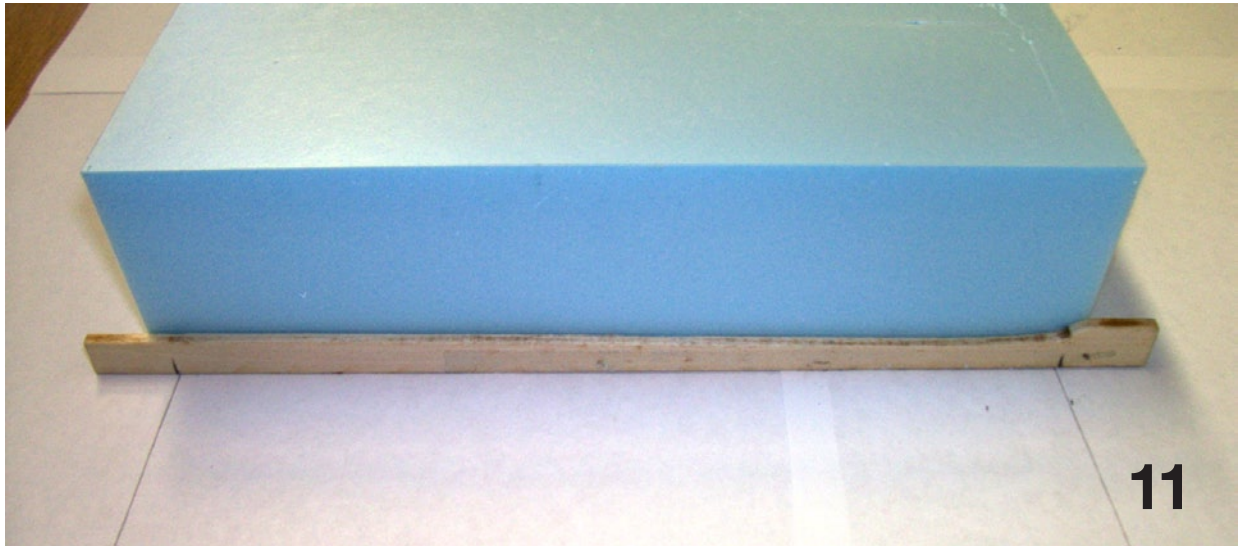
Then I take my hot wire and apply pressure against the vertical wood pieces and guide the wire down the foam while allowing the weight of the bow to make the cut. See Photo 10.

Setting up the Cutter

Now we have a block of foam that's the exact span of the project and oversized by 1/4 inch on the leading and trailing edges. I then tape down a large sheet of paper, larger than the core, on my building board and draw a reference line connecting the root and tip leading and trailing edges respectively. Note: Ensure the trailing edge is parallel with the fixed arm. This line is used to align the top and bottom templates.

The templates are marked with the leading and trailing edge station lines,





0 and 10 respectively. The goal is to get the cut to begin and end evenly at these station marks. I use a 1/2 inch leading and trailing edge ramp so the template should extend beyond the front and rear of the foam by 1/4 inch, since I've oversized the foam core leading and trailing edges by 1/4 inch. See Photo 11. This is the root and shows the reference lines drawn on the paper aligned with the zero and 10 marks on the template.

Lay the core down with the trailing edge to the rear of the table parallel with the fixed arm. For a tapered wing the trailing edge of the core is always parallel with the fixed arm and the bow cutter will be angled when the cut starts. The cut is made from the leading to the trailing edge, and the bottom template is cut first. I weigh the core down with some heavy weights to prevent the core from moving and for removing warps that are inherent in the foam during the cut.

I secure the templates to the foam core using 3M Scotch ATG 924 adhesive transfer tape. Perhaps a better method of attaching and aligning the templates is to use a small pin, nail, rivet, etc… Lay the top and bottom templates together and drill two small holes in the template, one forward and one aft and insert the pin through the templates and into the foam block to hold them in place. Then when you swap templates from the bottom to top the holes in the foam will maintain the alignment.

Align the bottom of the template at the 0 and 10 station marks with the line drawn on the paper and secure it to the foam even with the bottom of the foam and hard against the table. If you're using a pin then insert the pins through the template and into the foam.

If there is any wing twist, Profili will automatically print the template with the required angle. If your airfoil program doesn't print templates with a twist angle then the user will have to determine this when attaching the tips template to the foam blank.

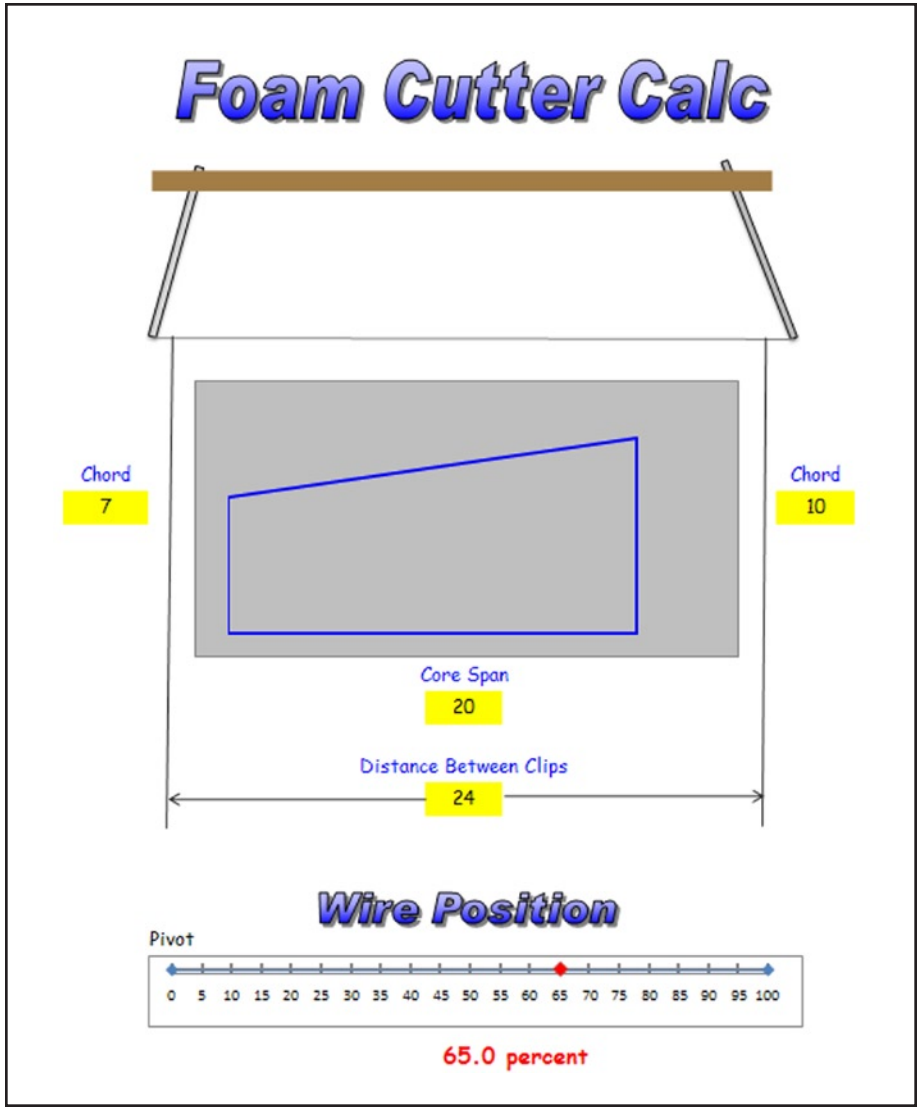
Now the foam block and templates are aligned but where do we attach the strings to the swing arm and where do the pulleys go?

If we were cutting a constant chord wing, i.e. the root and tip chords the same, we'd simply attach both strings to the 100% point. Then when the swing arm is lowered both root and tip would cut at the same speed.

However, we're cutting a core that has a different root and tip chords, so we need to slow down the shorter chord cutting speed. The idea is to get the cutting wire to enter the leading edge and exit the trailing edge at the exact same time. If this doesn't happen the airfoil is compromised. Let's say the root chord is 10 inches and the tip chord 7 inches. The smaller chord is clipped to a percentage less than 100% so that as the swing arm lowers during the cut, the smaller chord will cut at a slower rate.

So let's see how to determine what percentage to attach the smaller chord too. It's pretty easy but it does require some math.

The long chord will always be clipped to the swing arm at the 100% point. To determine where to clip the short chord is where the math is involved. Very simply, if you divide the short chord by the long chord and multiply by 100 you'll get close, then you can test the cut as explained later and adjust from there.



However, it's quite more complex than that, so I've written a small spreadsheet in Microsoft Excel called "Foam Cutter Calc" that allows you to enter the dimensions of your setup and it'll give you the exact location where to clip the string to the swing arm for the smaller chord. See my website to download the Calc - the link is at the end of this article.

If you don't have MS Excel here's the formula:
First we need to determine a value we'll call R1:

R1 = (Long Chord – Short Chord) / Core Span * ((Length between the Pull Clips – Core Span)/2)

Then to find the actual percentage where the short chord clips to:

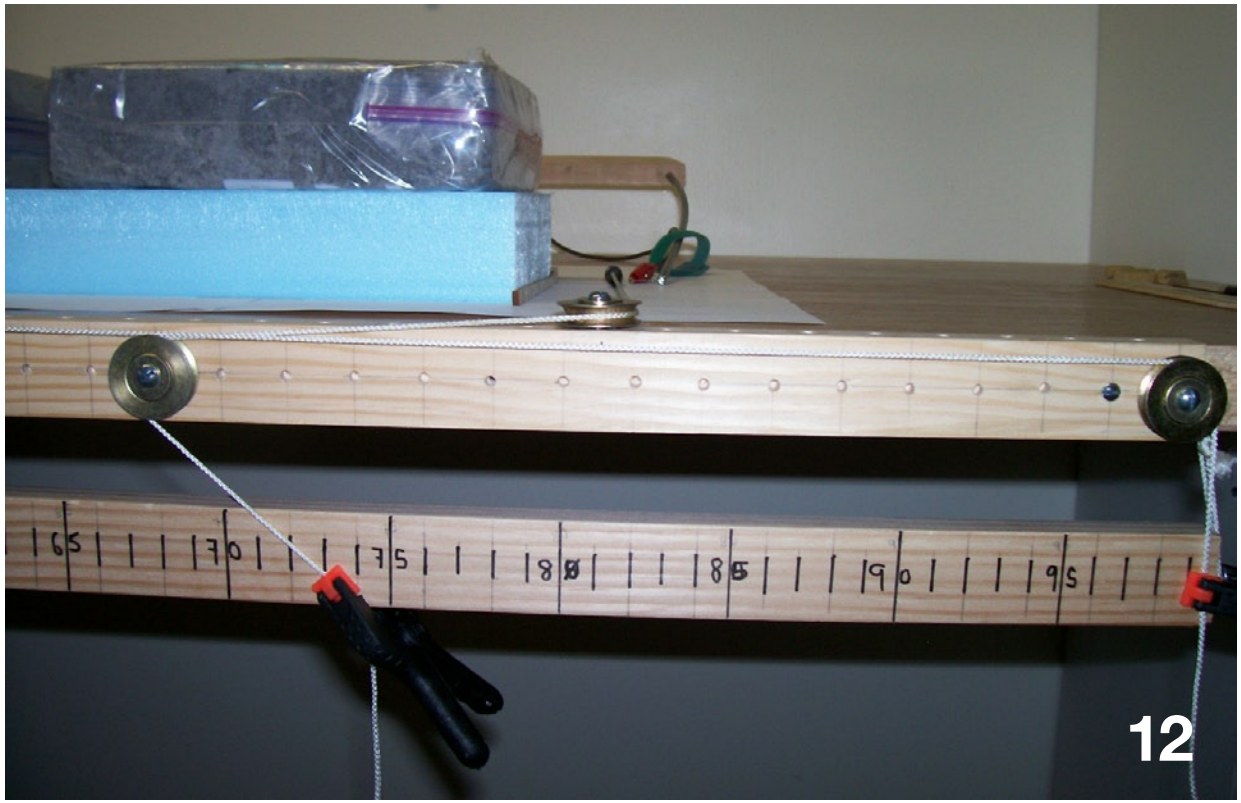
(Short Chord – R1)/(Long Chord + R1)*100

Example:

Say our planform has a 10 inch and 7 inch chord with a 20 inch span and the pull clips are 24" apart. The simple math would give us a 70% clip point. The accurate formula results in a percentage of 65%. If you used the simple formula you could then narrow down the exact clip point by testing the cut. A snapshot of the Foam Cutter Calc spreadsheet is on the opposite page.

Now that we know where to attach the strings let's route them through the pulleys and clip to the swing arm. Cut your string into approximately two lengths of 60 inches each. This string is used to pull the bow cutter through the foam. It's attached to the bow cutter wire with your alligator clips.

Take the bow and center the cutting wire on the templates so it's butted up against the leading edge. The pull strings need to pull perpendicular to the fixed arm and the clips should be just outside of the core blank - not out by the ends of the bow. Attach the clips to each side of the bow cutter wire and route straight back to the top of the fixed arm, then screw in a pulley to the top of the fixed arm so the string can be routed to the right. Take another pulley and secure to the front of the fixed arm at the far right end. This is the only pulley that will never move. It's our 100% pulley that the long chord attaches to. Take the string that's on the larger chord and route around this pulley and attach to the swing arm via your clip. Then route the short chord and clip to the 65% on the swing arm.



When we cut the other half of the wing the larger and smaller chords swap sides, just swap where the strings attach to the swing arm by rerouting the strings through the pulleys - the clip positions do not change. The strings will cross on the cut that has the small chord on the right, but this isn't an issue. See Photo 12. The strings are crossing just above and to the right of the left pulley in this photo.

Testing the Cut

The setup is all done so let's make the cut.

The last item in our shopping list is the bag of beans, or weight. See Photo 13. I use a one pound bag and attach this to the 50% location on the swing arm. Obviously the closer the weight is to the 100% point the faster the shorter cut will be.

With my setup of .016 gauge wire, one pound bag at the 50% point, and 1.8 amps using blue foam, I get a perfect cut. You're looking for about 3-5 seconds per inch for your cut; however this varies depending on if you're counting the larger or smaller chord.

This really is all about trial and error and keeping notes, as changing any one of the items above will affect the cut.

Don't be afraid to jump in and waste some foam!

The tail wheel is set so the bow doesn't move laterally to either side during the cut. Set the wheel so that it tracks about perpendicular to the leading edge of the foam core as it's laid out on the table, or pointed slightly towards the longer chord. It's a trial and error setting. If you see the bow moving to one side or the other during the cut you can turn the wheel to straighten it up.

Here's how to accomplish the test. Carefully remove the weight off the top of the foam core and place one weight behind the core to prevent the core from moving aft. Place the cutting wire butted up against the leading edge of the templates, adjust your strings and clip to the swing arm with even tension.

With power off, I hold the bow handle and remove the short piece of string that's holding the swing arm to the fixed arm. Place the wire on TOP of the foam and while holding a little pressure to the bow cutting handle allow the cutting wire to slide aft as if it were cutting. The wire should enter and exit the leading and trailing edges at the same time. If the wire doesn't exit evenly you may need to readjust where the smaller chord string is attached to the swing arm. Continue adjusting and performing tests till you're confident the cutting wire entry and exits are timed perfectly.

Making the Cut

Now that the tests work fine, make sure the core hasn't moved and put the weights back on top of the core evenly. Then butt the cutting wire up against the leading edge of the templates, realign the tracking wheel, and make sure the strings are properly routed through the pulleys and they are secured to the proper locations on the swing arm with even tension.

Now let's make our first cut. Apply heat to your bow by turning on the power supply. Your wire should not turn red, if it does, you have way too much heat.

I hold the handle with one hand and remove the string that's holding the swing arm to the fixed arm, then I take both hands and place on the bow legs near where the cutting wire is attached and place them on top of the templates and slowly guide them into the foam.

Once the wire is fully into the foam I let go and watch the magic work. Be ready to catch the bow and/or the swing arm when the wire exits the trailing edge. Make sure you turn power off the bow after the cut.

Please be Careful and Safe with the hot wire and power supply. You're dealing with currents that can kill and a hot wire that will burn through your skin very quickly!

Photo 14 shows the system ready to make the cut.

We're half way through the bottom cut in Photo 15.

In Photo 16, notice how the strings are routed. The short chord is on the left and it's attached to the 72% point on the swing arm. I'm actually cutting a different core than the example I used in "Setting up the cutter," which is why it's not attached to the 65% point in this photo.

Photo 17 shows the hot wire halfway through the top cut.

The hot wire is just about off the trailing edge in Photo 18. Looks like it'll come off the trailing edge evenly. Great!

That's it!

It's really simpler than what it takes to read this article. It's all about trial and error, so don't expect your first cut to be flawless.

Here's the proof. In Photos 19, 20, and 21, no sanding has been done to the core.

Photo 19 shows the completed core.

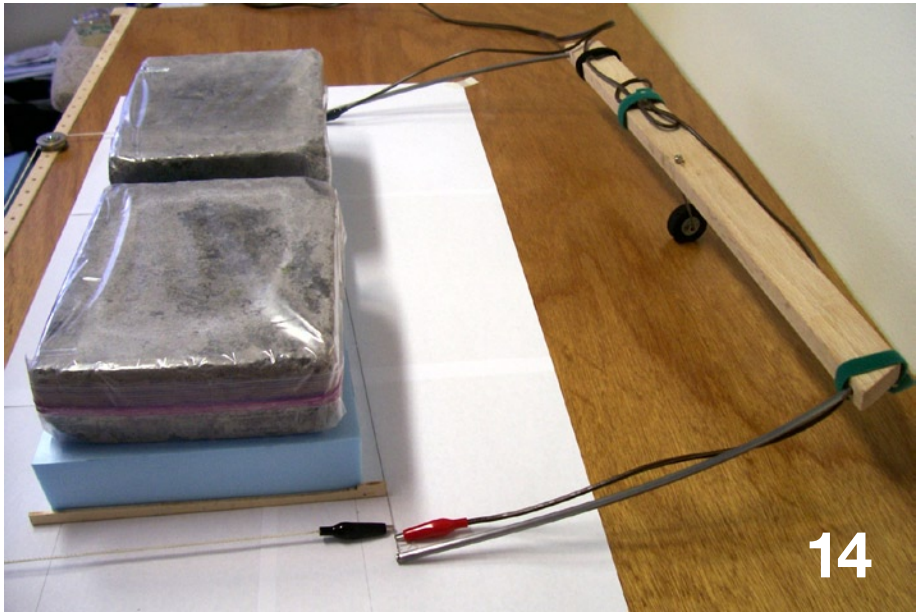
The root section, using an AG455ct airfoil, is shown in Photo 20.

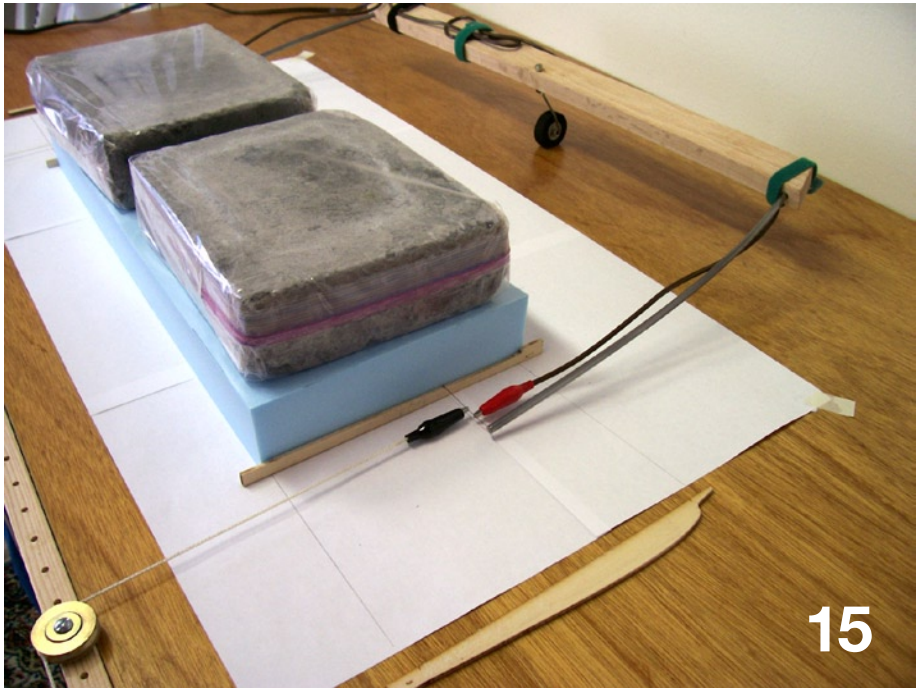
And here's the tip section in Photo 21. The tip section is an AG46ct airfoil.

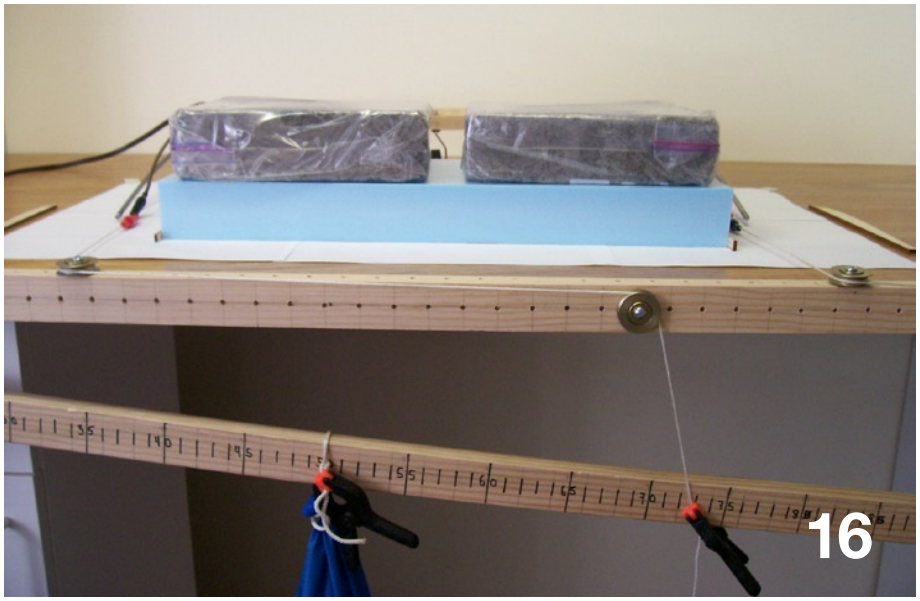
Tips and other Techniques

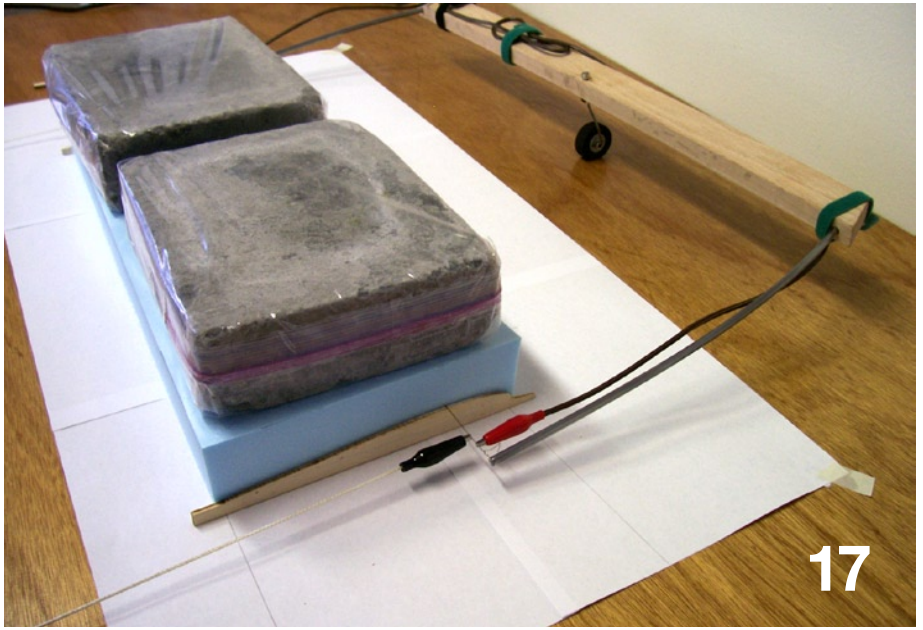
1) When cutting the lower airfoil the pull on the wire tends to cause the lower leading edge to be pulled through the foam at an angle and not cut the exact airfoil shape, so I apply a little down and forward pressure to the bow till the wire has passed this area of the airfoil, then I let go.

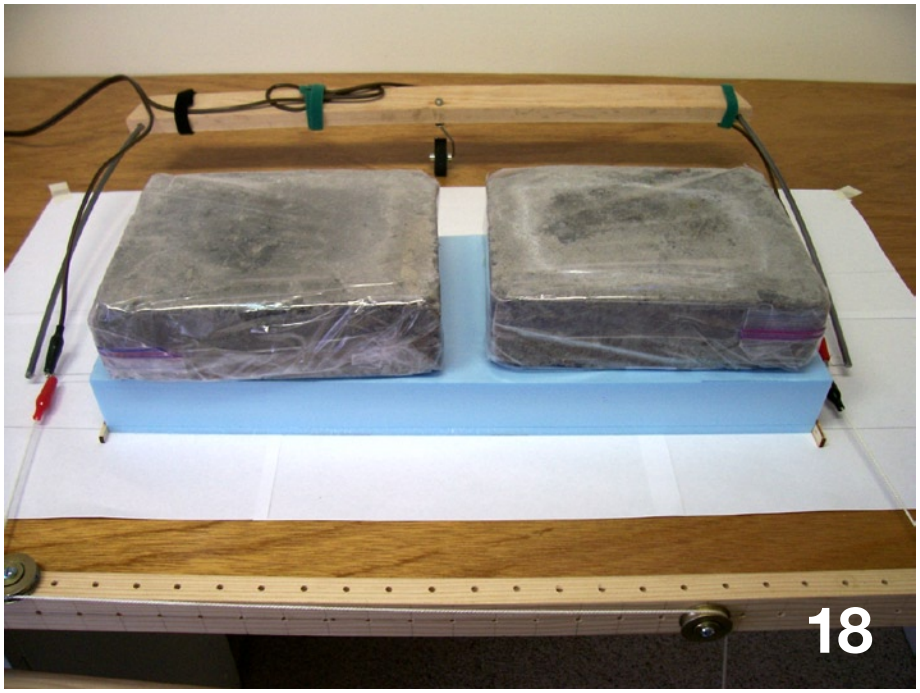
I've read where a two ounce lead fishing weight is attached to the bow legs to help with this. Then when the top airfoil is cut the weights are either removed or slid up the bow legs towards the handle to remove the pressure. See figure 26 and 27 for an example of the weights.



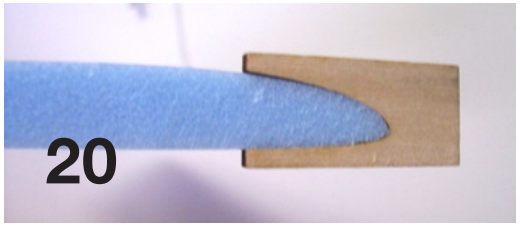


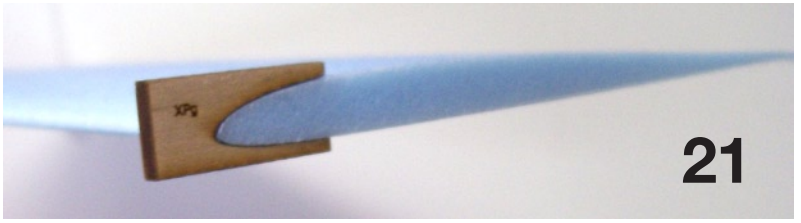

16

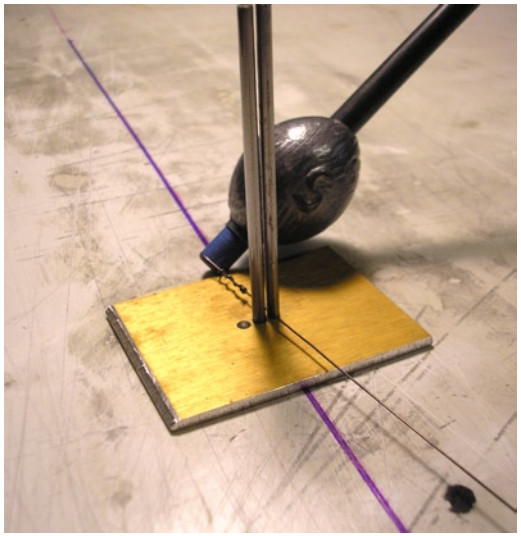

17


18


19


20


21



2) Another method of cutting cores that have a large taper such as DLG wingtips or tail feathers is to use the bow cutter on a pivot. David Forbes sent a photo of this method, see Photos 22 and 23. He states that there are no calculations to do as you only use one string and attach it to the 100% point on the swing arm. The swing arm allows for a nice smooth even cut. The photos are self explanatory.

3) David Forbes substituted his pull string from the swing arm to the cutting bow with a pliable silicone wire which doubles as his source of power for his cutting bow wire thus eliminating the household extension cord I have running down my bows handle.

4) Some folks have had good success with hanging their cutting bow from the ceiling by a string attached to the handle instead of using the tracking wheel; they suggested a high ceiling such as 10 feet was required. See Figure 26.

Credits

I'd like to thanks the folks at RCGroups forum; David Forbes, Jon Stone and Phil Barnes for their input and the Charles River RC website for hosting the Minnesota Radio Controlled Soaring Society (MRCSS), tutorial on building a Hands-Off Foam Cutter.

If a picture is worth a thousand words then a video must be worth a million; I highly recommend Phil Barnes and Bill Haymaker's video on "Vacuum Bagging Made Easy" which not only has a lot of foam cutting tips but then shows in detail how to take your professionally cut cores and vacuum bag them into a flyable product. Which is what this is all about, flying!

Manufacturer Links:

Curtis Suter's Website <http://h1.ripway.com/cloudyifr/index.html>

Tekoa Feather/Cut <http://www.tekoa.com/home.php>

Vacuum Bagging Made Easy Video <http://home.paonline.com/hayman/PAGE2.htm>

Profili <http://www.profili2.com>

Laser Edge <http://www.laseredgecutters.com>

Astro Flight <http://www.astroflight.com>

Charles River RC <http://www.charlesriverrc.org>

Thanks to Herk Stokely, David Forbes, and Chip Baber for reviewing this article.

If you've enjoyed this article or build the automated foam cutter from I'd certainly appreciate feedback of your experience.

The 2008 FAI F3J World Champs

A Kiwi's perspective

by Les Stockley, stockley@slingshot.co.nz

Foreword

This is my story of the worlds, it contains my opinions and impressions, not necessarily those of the team or anyone else...

Making the Team

Well, I guess it all started about two years ago, when I bought my first dedicated thermal model after many years of F3B orientated aircraft.

I had been thinking for some time that I'd like to go to a world champs and with the impending arrival in New Zealand of Joe Wurts, people started taking an interest in the possibility of sending a NZ F3J team again for the first time since 1998.

Another thermal model was bought before the trials so I was well equipped and subsequently made the team after the two days of trials. Joe couldn't fly for NZ yet due to FAI stand down rules, so he became our very valued and experienced team manager. The full team was myself, Scott Chisholm and Sven

Zaalberg as pilots, Joe as manager and Paul Chisholm came as a team helper/ mechanic/tower.

Early on, the team began to realize the huge amount of expense (around $6000-8000 each) that we were looking at to get us and our gear to Turkey, and so we embarked on a fundraizing plan, based around a raffle of modelling goodies. Many favours were called in and asked of various suppliers, and we ended up with a pretty good selection of prizes at no cost to the team itself. Tickets were designed, printed, stapled and sold. Nearly 400 tickets were sold and a good deal of team funds were raised which really helped us on the way. T-shirts from Dave Larsen at ESP were made and sold as well to raise more funds, and a team shirt was designed for the team to specifically wear at the worlds. Personally, I also started a second job in the evenings 2-3 days a week so that I could have the required amount of funds to go, and also buy another model to have a fully competitive fleet. We approached big businesses and airlines for assistance with airfares or excess baggage costs, but were turned down by all, very disappointing considering the record profits some are making.

The team members took the opportunity to fly together at competitions whenever possible to learn each other's way of doing things. Because all the others lived in Christchurch and I was in Auckland, I travelled down one weekend and we had a dedicated practice weekend together and we arranged for the AirNZ dragon boat team to come and spend a few hours each day towing for us so we could concentrate on our flying.

Getting There

Model boxes were built and packed and eventually it was time to leave for Turkey. All the others flew AirNZ to London and British Airways to Istanbul, while I flew Emirates up through Asia to Dubai and then onto Turkey. Luckily we all arrived with our models intact and no missing gear, unlike many of the other teams. One of the Aussies had his model box lost for quite a few days - that's completely lost, not "we know its still in xxx and it will be here tomorrow" but, "actually we have no record of it anywhere" lost. It turned up just in time for the worlds. Amazingly, through some careful packing and distribution, the team incurred no excess baggage fees anywhere along the way, either. Most of the German team flew to Turkey and a van was despatched to cart all their models and equipment, but somewhere along the way Turkish customs decided that to bring all that stuff into the country was going to cost EUR$17,000, that's about NZ$35,000 in customs fees/bonds. Not surprisingly the Germans weren't too happy about that and some of the locals helped them with talking to customs, but I think they still paid much of it in the end.

One area where we saved a lot of money was in transport. Initially it was looking like we would need three rental cars at around NZ$2500 each for the two weeks, however the organizers put on bus transport each day from the hotel to the flying field and return. We had the Dutch team also staying at the same hotel with us, and so our driver stayed at the hotel, too. This gave us some flexibility to go out to dinner or stop off at supermarkets, etc., on the way home. The cost for this was NZ$200 per person for the two weeks, so allowed us to make huge savings to our team funds.

The hotel we stayed at was about 30 minutes drive to the field each day and could best be described as basic but comfortable. We had no airconditioning but after a few days we acclimatized, what were a little harder were the train tracks about 20m from our rooms which saw quite heavy use, no worse than camping at the Nats, though. Sven and I took turns taking the first shower as if you were second, halfway through it started to run cold. Washing was done in the sink and we spent the weeks dodging clothes hanging across the room on some left over tow lines. We had cable TV in the room, 157 channels to watch, all in Turkish, though.

Waiting for transport on our first day in Turkey.

Our compound

Practice and the SporYapi Cup

We had seen photos of the flying field, but even so, when we arrived it was quite a sight. It was tucked away up a dirt road in amongst trees being grown for furniture. The field itself was used for “instant lawn” growing and was about 400m in each direction, bordered by trees on three sides and the entry road and a canal on the other. Land outs were going to be costly.

We were one of the first teams to arrive and the set up was amazing. Each team had been allocated a covered area about 10 x 5m and fortunately we were placed next the Aussies so the weeks saw plenty of the usual rivalry flying across the fence.

We unpacked and setup our models while checking carefully for damage. The organizers provided security on the field each night and so we left our models set up in our tent area for the two weeks, only taking them apart to check for damage/loose connections halfway through the contest.

Once the models were together and all radio commands checked, it was time to spend a couple of hours in the sun laying out, measuring and checking our towlines.

Joe had sourced some Japanese-made line he felt was superior to the european Speedline commonly used. This turned out to be a good choice especially in the calmer morning conditions when were able to use a thinner, lighter line to get good launches. In the windier afternoons we went up only one size which was still considerably thinner than what other teams were using so we had less line drag through the air.

Team New Zealand. Back row L>R: Dave Kalamen, Joe Wurts, Paul Chisholm, Kelly Johnson
Front row L>R: Sven Zaalberg, Scott Chisholm, Les Stockley

We spent the first two days practicing and getting the models trimmed to the hotter weather conditions and ourselves getting used to the calm mornings and windy afternoons to the point we were happy. A fair amount of our practice time was spent on landing, as at this level landing accurately and on time is crucial.

Our third day there was the start of the SporYapi Cup, a short two day contest the organizers were using to test their equipment and logistics setup and it gave the pilots a chance to sort things out in a contest environment and to get used to launching and landing alongside 14 other models at the same time. For Scott and I it was our first time flying in

Dinner overlooking a lake with the Aussies, Japanese, Dutch, and the Kiwis.

such traffic and it took a bit of getting used to.

Although the team didn't do too well, Joe made it into the fly offs in this event and ended up finishing 5th out of 177. I felt pretty good about the event as I won two of my four slots including one flight of 9:57.3 seconds with a 100 landing so I knew we were likely to be competitive come the worlds. I also made a stupid mistake with failing to check switch positions after launch and ending up landing very early in one round, but it was actually good as it meant that switch was checked after launch all through the worlds and not left in the wrong position again!

The day before the world champs was set aside for processing, the team managers meeting and the opening ceremony. Model and transmitter processing took until about 4pm to get through all the teams. We had no problems so had a fairly relaxing day measuring and double checking our tow lines and gear for the world champs and going over our models one last time.

The previous night we had gone out to dinner with the Aussie, Dutch and Japanese teams. Somewhere along the night a bit of beer was consumed and the trash talk started and ended with the NZ and Aussie pilots putting $50 local each into a hat, with the highest placed team taking the lot to provide their drinks at the banquet. At one point the bet may have also involved singing national anthems whilst in undies but it appears this disappeared from the bet somewhere along the way, thankfully.

The World Champs

So dawned Monday morning, and Day 1 of the world champs themselves. Luckily all NZ pilots had later slots so we got to watch the first few groups to suss out the conditions. I honestly remember very little of this round but we all got a good score in first up to settle the nerves. In the worlds the groups were usually about 8-10 pilots, a few less than during the SporYapi so things were a little more comfortable out on the flight line.

Joe Wurts flying while Scott Chisholm spots during the SporYapi Cup.

During the SporYapi Cup

Through a little bit of good fortune and some wheeling and dealing we had managed to secure the use of the USA junior team tow people, Dave and Kelly. These guys were absolutely awesome. Great towers and they checked lines after each launch as well, always turned up on time and were a huge asset to our team. We really can't thank them enough.

Round 1 seniors took until lunchtime and then the junior competitors came out to fly just as the afternoon sea breeze really kicked in. This caused quite of a bit of carnage for them with some midairs and models not handling the launch loads. With some trepidation we went out in the wind for Round 2 and all proceeded to put in another good round. In this round I experienced the most amazing launch I have ever had. The wind was quite strong, something in the order of 25km/h and with the brute force of our towers we got the wings of my Supra bending a hell of a lot further than they ever had before. It was quite amazing to watch as I was pretty much along for the ride until the time came to zoom off the line. I think Joe said later that was as much as he had ever seen a full carbon Supra bend, and it was pretty cool to discover my models structural limits are way higher than I thought they might be. All pilots again scored well and on to Round 3 for seniors, the organizers giving the juniors a break from flying in the winds. Round 3

Breakfast at the hotel

Joe checking his share prices (or emailing home).

went well for Sven and myself, but Scott flying in the last heat of the day had what appeared to be a radio problem way out at altitude with the model starting to spiral in. Luckily he got control back in time and managed to make it back to the field for a landing, albeit a couple of minutes early to at least save the model.

Day 2 started with two rounds of juniors and it became obvious the organizers were trying to let them fly in the calmer mornings and keep the seniors back until the more challenging afternoon winds.

Round 4 went well for us all and Round 5 was looking good until Scott's Perfect had the boom structurally fail during the tow. "Ohhh f#%*" was the first thought and then while Scott flew the remaining bits of the model he had little control over down to the ground, Joe and I were taking the wing bags off his spare (we always took at least two models out for each round) and turning it on, once the radio program was changed the spare was launched within one minute of the original launch and Scott got a flight in which got him good points to keep his score up there. Bloody good work really.

At the end of Day 2 Sven was in 1st, I was 3rd, Scott 30th and the team holding 3rd overall. We were pretty happy with how things had gone so far!

Day 3 unfortunately didn't go quite so well as the previous. Round 6 saw Sven and I have a turn at some bad luck. Sven was the unfortunate recipient of a random line break early on in his launch. We decided not to risk a flight from such low level in the conditions and he was

Measuring lines

Paul (holding fuse) starts the repairs to Scotts Perfect

Team session on rebuilding the Perfect

called down for a relaunch on the spare line. He flew the model straight into my hands as I waited next to the safety line, once I caught it I walked forward to Joe who had the line ready, hooked up and away the towers went again. He took a full tow and we got the second launch off the line less than 40 seconds into the slot. Awesome.

In my slot we had no definite call on which way to the thermal before launch like we normally did. We actually had a simple code for which direction to go, as we had noticed during the SporYapi that when Joe told us to go somewhere, 4-5 others would immediately follow. So I ended up trying to cover two

different groups and got a bit caught in the middle. I turned for the tree line to see if I could work the slope, but just couldn't quite "get it" and landed a couple of minutes early.

Fortunately, once six rounds had been flown we were able to throw out our worst score so after round 6, Sven was still in 1st, I was still in 3rd and New Zealand still comfortably held on to the 3rd team place.

Looking at the scores for Rounds 7 and 8 shows nothing spectacular happened, some good solid scores, only thing of note is that I had a 90 point landing which dropped me from 3rd to 13th which was a small concern as only the top 11 were going to forward to the flyoff. I had to keep flying consistently and hope a couple of people tripped up along the way.

During Day 3 we also set about rebuilding and repairing Scott's broken Perfect in case it was needed as a back up. Sub spars were remade and fitted, big delaminations glued back down to the spar, and the broken fuse repaired and new pushrods installed. One wing tip was pretty badly crushed for the last 8 inches or so and that took a bit of cyano and filler to return to something looking respectable and smooth.

Day 4 started with the usual very calm and light lift experienced in the morning. It got a little sporting when in his flight Sven was circling with a group at about 150ft altitude when his and another model tried to occupy the same space at the same time. He spun a few times and lost near half his height before it was back under control. All controls felt OK, so he continued on with the last couple of minutes of the flight and not until he landed did we see that the leading edge had a decent bite taken out of it near the tip joint. So having just finished the repairs to Scott's, Paul was pressed into service repairing the area with some carbon and glass and thanks to the South Africans for loaning some 2hr epoxy.

Rounds 9 and 10 were flown this day and the scores show that we all did well, only minor slip was Sven getting his first non-

Two of the best towers we could have hoped to borrow, Kelly Johnson and Dave Kalamen. These guys were awesome.

100 point landing and costing himself nearly 20 points which dropped him to 6th place. As a team we were tightening our grip on 3rd place with a healthy lead over the chasing 4th place team of nearly 600 points and we were only 100 points behind the 2nd placed team.

The afternoon of Day 4 the organizers had planned as a no fly time, and held a contest with Multiplex Easy Gliders for the top five senior and junior pilots. They were given a kit with servos installed and they had one hour to build, trim and test fly prior to the contest. They used bungees and flew 15 minute rounds and generally had a lot of fun. Reigning two time world champ Dave Hobby won this event and got to keep his Easy Glider.

He subsequently went on a search and donated it to one of the South African juniors, a nice gesture.

The final touches were done to the repaired Perfect of Scott's and after the Easy Glider contest finished we gave it a pretty strong launch and it all held together. Scott reported that it flew OK and we were all happy that he was back to three models and had a windy weather backup should the need arise. Amazing what can be achieved by a determined group on a field in the middle of Turkey. If you were at home you probably wouldn't have bothered rebuilding it.

Day 5 of the worlds and we were looking forward to the last two rounds. Sven needed one more good flight to ensure he would make the flyoff, while I needed two good flights and to hope that a couple of others fell by the wayside during the day. Scott was, I think, pretty resigned to not being able to make the flyoffs and was flying to keep the team place up there and you never know your luck if the wrong things happen to the right people.

Round 11 Sven started it off with nailing the 1000 for his slot which assured him a flyoff place, Scott had a good flight and a 990+ score to keep his chances alive.

Then came my turn. Although it was later in the morning, so it wasn't the dead air hang and there was a bit of thermal movement around, once again we had no call before or immediately after the launch on which way to go.

Joe and Sven constantly fed me information about what the other pilots were up to and what luck they were having, it was soon time to cover them and go for the tree line about halfway through the slot when it became apparent that the area I was in wasn't working too well.

Joe called me to an area of lift right at the road end of the tree line. I went down the road and turned back into the field at the expected time and flew through it - nothing, no wing tip rise, no extra energy, big fat nothing. By this time I was down to about 120ft and getting quite desperate. Just as I came through the expected area and had no luck, a small group was circling in very light air at the far end of the tree line about 200m away. So I headed down the trees to the area, arriving not far above the tree tops. I made one turn in the area with the other gliders and got a very small bump but as I rolled out of the far side of the turn, one tree higher than the rest came damn near to my Supra. I really didn't have any good depth perception so I asked Joe and Sven if they thought I'd be clear to do another turn and got nothing positive in reply, so I made an immediate decision to abandon another turn in case I ended up in the tree, and to return home about two minutes early, but get a good team score down to help keep our third place.

After landing I knew that was it for me. I couldn't make the flyoff now and I was a bit down and emotional at that point. In immediate post-flight discussion we deduced that the circuit I flew to put me into the expected thermal actually took me slightly downwind of it, and so I had essentially flown a lap around it, just outside the area of lift. Talk about frustrating as I realized what could have happened if I had either turned a little tighter or turned 20m earlier. I sent a quick text home as I knew people were up waiting to see the results and got some supportive ones back which was great. The one positive was that the team position hadn't been seriously hurt and we still had a good lead back to the 4th placed team.

Round 12 came and we still had some work to do to ensure we kept our 3rd team place with at least two of the three of us needing to make our times to ensure the placing. Sven and Scott were up before me and they both got good flights which completely took any pressure off me for the team score. Conditions were still unusually calm for this time of day and we didn't have a solid call on which direction to go after launch. I had felt a small wind shift before launch and trusted what I felt and had learned during the week and

headed out to an area over the canal that had worked for us previously. The way to fly this area was to cruise across and up wind in the best minimum sink mode you could until you got an indication, usually a small wingtip rise, you then turned hard into the lift dropping more camber and hoping for the best. One of two things would happen, you would either take 3-4 turns and a height gain of 10-20 feet before the lift dissipated, or you could keep turning while slowly gaining height if the lift stayed together, until you found yourself about 500-600m downwind of the field and generally topping out at about 600 feet or so when the lift dropped off or you decided not to travel any further downwind. Time to clean up the wing and head back up the canal track into the wind on the journey back to the field, maybe stopping to make a few more turns in lift if you needed the height before coming back to the field to set up for landing.

In this final round I contacted the lift and got a good thermal out and easily made the time and followed that up with a 100 landing which was a very satisfying way to end the contest for me. In the process I had taken out a couple of higher placed competitors, but not enough others made mistakes and so I ended up 19th, which really isn't too bad. Scott was just a couple of places back in 22nd with his earlier bad luck in the week not being able to be overcome, but Sven was comfortably into the flyoff, placing 5th.

More importantly, New Zealand secured the 3rd place bronze medal for the teams competition. We had set ourselves a target of being on the podium and flew accordingly all week, and to actually make it was one of the best feelings ever.

Beating the Aussie team by a significant margin was good as well. We could taste the beer already.

The FlyOff

So our focus then became on doing whatever we needed to give Sven a chance at winning the flyoffs. New lines were made up for the flyoffs, measured, checked and then double and

Me flying during the last round with Joe.

My last round landing.

triple checked for any nicks or rash that could cause them to break which would be disastrous.

The first two flyoff rounds were flown that afternoon and I remember little about them except that Sven did OK in them staying right up the top of the leader board. And so it was a very satisfied New Zealand team that had a few beers that night.

Saturday morning brought the next four flyoff rounds and we knew conditions would be a little tougher in the early morning calm, but Sven had a very light Perfect which he was familiar with and put it to good use. On one round he landed a minute or so early, but luckily two models had a midair and so the slot was reflown. In the reflight Sven flew out the slot in good lift and nailed a good score.

I forget exactly which round it was that morning, but it was one of the most amazing flights I have seen and to be a part of it was pretty cool. A downwind launch saw all the competitors head out over the upwind tree line and contact a small area of lift. These thermals were very small and dissipated quickly after only a few turns, with all 11 models in nearly the same place I don't know how there weren't midairs in this round, but I do remember Sven using about 15-20 different bits of lift to complete this flight - some really amazing stuff to watch.

At this level the only way to win is to be off the line first and land last. This might give you a 1-2 second advantage, but you run the risk of taking too low of a launch for the conditions or running overtime on the landing. There were some very short launches going on, and some people were really pushing to the limit their landing at the end of the slots.

The final round of the flyoffs came and this would be good as once Slot 6 was completed the pilots could drop their worst score which would shuffle things up a bit. Conditions were good and Sven took a short launch into good lift and had no trouble flying out the time. However, despite landing extremely

After Sven's landing in the last round of the flyoff. The expression says it all, note landing tape in background measuring the 95 landing that cost him 3rd place.

well all week he missed the 100 for only the 2nd time by just a few centimetres which, if he had hit the 100, would have seen him improve his score by about three points, which would have been enough for 3rd place.

As it was, he finished in 4th place, a brilliant effort.

The ASC Cup

This event was flown after the world's flyoffs were finished. The top five senior and junior fliers went on to fly in this contest. The slots were extended out to 20 minutes and by this time the wind was up a bit. Sven flew very well in this event, in the 2nd round he was very low after just a few minutes, but managed to work his way back up and fly out the round. Unfortunately, there was a transcription error and his score was typed into the computer as only nine minutes something when it should have been 19. At the prize giving, people we knew Sven had beaten were placed 3rd, and as the 1st place winner was announced Sven almost started to step forward but someone else was announced much to our surprise.

Despite approaching the CD after the ceremony and again later at the banquet, our team manager was unsuccessful in having the result changed, so Sven will have to be content with the moral victory on that one.

Prizegiving and Banquet

After a pack up and clearing out of our tent area, we had just enough time for a quick shower and back on the bus for the closing banquet. The banquet was held near the flying field in a wooded area, with tables and chair, lights and serving area, and the bar being set up in amongst the trees. Quite nice to be out of the sun.

A meal with typical Turkish food was had by all and then on to the drinking and general merriment. Jack Daniels and Finlandia Vodka were sponsors of the

event and provided free tasting all night long as well as the local beer, Efes, which was a tasty drop.

For some the Karaoke stage called, some good performances and some not so good and, unfortunately, some of it was caught on video which will provide entertainment for years to come. Much discussion, talking and reliving of the weeks events were done, but drinking took most of the priority that night. All too soon it was time to head for the bus as our driver was taking the Dutch team back to Istanbul for an early morning flight. More fuelled discussion took place on the bus, lots of "could've, would've, should've" apparently, not that I remember all that much of the drive. ;-)

The following morning we awoke to rain for the first time since we had arrived and our bus back to Istanbul. After nearly three hours on the bus with the Russian team, and Paul somewhere off ahead with our model boxes in a van, we were happy to see him waiting outside the airport, managing to fend off the helpful porters trying to help him with the boxes (for a small fee of course). The rest of the team were leaving back to Heathrow that morning and I was staying on in Istanbul for a week of sightseeing, so we said our farewells as they disappeared into the lines and I tried to find a taxi big enough for my model box.

Afterthoughts

Models - A survey form went around at the worlds for us to fill out with our model and radio details. People are always looking to see what the popular models are and what the top pilots are flying. Some 100 Pike Perfects and about 40 Supra were the top models in terms of numbers. The New Zealand team flew a mix of Perfects and Supra with Scott also using a full carbon Superior as well. At no time did we feel we had the wrong model for the conditions. I maybe could have done with a lighter glass wing Supra for the early morning slots, but I actually ended up flying my old full carbon Supra for all rounds with a dry weight of 1.95kg, and sometimes ballasted up to about 2.2kg for some of the afternoon rounds in the wind.

Another team photo at the banquet, this time with the promo girls!

Myself with Joe Wurts and Daryl Perkins at the banquet.

The new Mibo Xplorer that won in the hands of Feigl was flown by a select few and seemed to perform well obviously.

I do not recall seeing any wing structural failures during the week despite models being tested to their limit. Some models did suffer from wing flutter during the dive and zoom phase of the launch, most also likely that substandard radio installs were to blame allowing slop in the controls, and also builders not tying the servos to both top and bottom skins to prevent flutter. Most of these ended up with damage as the wing controls generally became ineffective.

Much has been said of the structural failures of the Supra tailplanes suffered by some, but it must be remembered that launches were extreme and those having the problem were dipping steep with a VERY sharp pull up at which point the tail would fold or blow off altogether. After seeing a few I did start backing off on the zoom to ensure I didn't suffer the same fate as I'd rather give up 20ft of height to make sure I didn't have to relaunch or have model damage.

Dihedral angles seem to be on the increase for F3J models. The requirement to be able to fly and circle smoothly while at long distance are driving the change. Most Perfect pilots had the aftermarket increased angle joiners in and reported better handling in thermal turns. Most Supra pilots also flew with the 5 degree joiners in the tips except for a few (mostly from the same country) who actually preferred the flat wing and had no dihedral in the tips. You could just see the handling was bad by comparison, so I would hate to have been trying to fly it.

Radios - Radio gear seemed a pretty even spread between JR and Futaba with a few others such as Multiplex around. The Europeans and Aussies prefer the tray styles of the Graupner/JR sets and it seems the rest of the world use the "normal" style radios. Spread spectrum was quite common, being used by maybe 15-20% of competitors

The Air and Tactics – One of the features of F3J is that there can be no perfect score in a round. To enable you to beat your competitors you must come off the launch line fastest and time your landing to the last possible moment, and hit the 100 consistently.

Our team plan was to fly fairly conservatively, taking full tows and aiming to land two seconds early each round. The idea was to be a competitive team and get a podium place and the individual results would sort themselves out. We started the week doing this, the only exception being when Joe had a solid call on a close thermal and would call us off early to go straight to it, saving

Our team plan was to fly fairly conservatively, taking full tows and aiming to land two seconds early each round. The idea was to be a competitive team and get a podium place and the individual results would sort themselves out.

a second or two of tow time. Our towers and our line were among the best there - we certainly weren't at any disadvantage in the launch department.

Some pilots really pushed the limits in terms of how close they were to over-flying the slot when landing at the end. The rules state the glider must have made contact with the ground when the slot ends and some were caught out and some got away with it. Some videos taken by spectators during the flyoffs show a fairly significant over-fly by at least one that went unpunished. I also witnessed one pilot fly through the safety area on the way to an early landing at about waist height that went unpunished, despite the officials watching him do it. I guess this is the one area that lets F3J down in that it's entirely dependant on the officials to pick up these transgressions and they are often an interpretation of the rules and so are hard to judge at the time.

One of the biggest disappointments at the worlds would have to be the tree line behind the tents, and that the prevailing wind blew at right angles to them creating a small area of slope lift which many used to support their flights until the next thermal came along and they were able to get away.

Although we did on occasion use the trees when all else failed, it certainly was frustrating to read the signs before launch, find the lift that was generally light and work it to the point where you were at comfortable height, all the while being fed information about your competitors doom, only to complete the flight and find others in the slot failed to find the lift and spent 6-7 minutes sloping the trees and still made the time. I feel if the tree line wasn't there, many pilots would have had some 4-5 minute flights and some very low scores. Joe predicted at the start of the week we could lose 200-300 points and still make the flyoff, but in the end if you were 60 points back out of a possible 11000, you were out of it.

The Wrap Up

For me it was an interesting comparison to our Nats where we fly for five days, from about 8am to 5pm or so. For the worlds we left the hotel about 7am and got back each night around 9pm, for 11 days straight. Surprisingly, I'm still quite keen to get out for flying, but setting up a winch seems a little foreign now, much easier to give Kelly and Dave beer!

In all it was an experience and very cool for us to get up onto the podium for a team place, beating some much more experienced teams along the way, which is amazing considering Scott and I had never flown a full on F3J contest or hand tow until we got to Turkey. Guess it shows the skills from our normal NZ competitions transfer pretty well.

We had some good luck at times, but we were well prepared, had good launch equipment, and I think we approached the week with the right attitude and had a lot of fun along the way. Having Joe as our team manager/helper/launcher/lift spotter certainly helped, but it was us pilots that still had to put the aircraft in the right place at the right time.

Finally a huge thanks must go to our sponsors without whom it would have cost us a lot more to go.

Matt Lord at RC Bandit
Dave Larsen and ESP Screenprinters
AucklandSoar
Gliding Canterbury
FoamWorks
Horizon Hobby/JR USA
Kennedy Composites USA
South Island MAA

And also thanks to those who bought raffle tickets, bought shirts, gave donations, or helped in any way to get us there.

For myself though, the biggest thanks would have to go to my wife, Gypsy, and the children for putting up with me away so many evenings working the second job, days away practicing, and also being away for the three weeks itself. I truly appreciate it.

As we taught Joe to say, it was "saweeet."