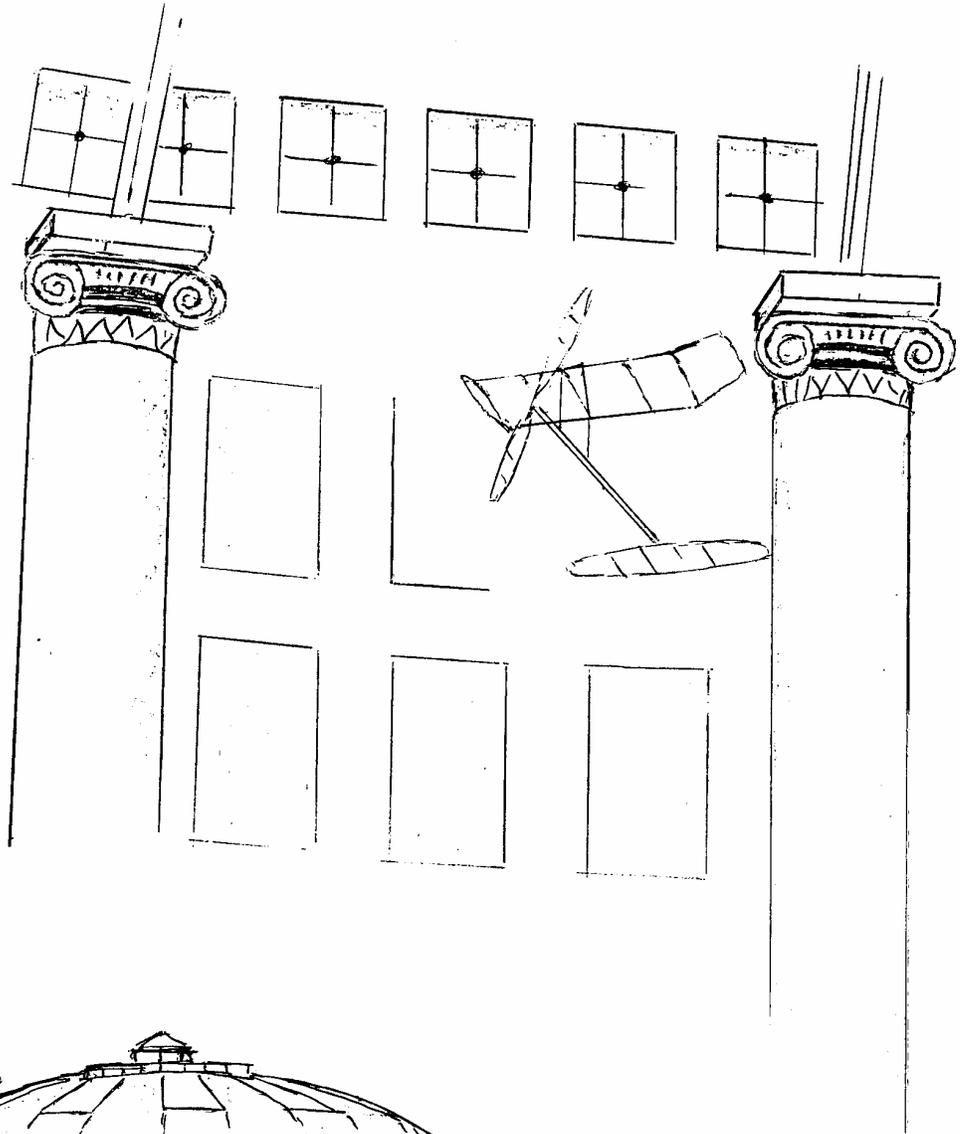


INDOOR

NEWS and VIEWS

ISSUE # 104



WEST BADEN SPRINGS
INDIANA

From The Editor's Desk

This issue's cover reflects a magic event that I missed, but many were fortunate enough to attend indoor flying in the West Baden Springs atrium. Flying there was a fixture when Ralph Tenny was editor, but the site had fallen into disrepair for a long time. Thanks to the efforts of Walt van Gorder, modelers were allowed back as part of a 'Fly Me to the Moon' theme weekend.

A second keynote event was the Akron F1D Team Trials, which were flown under nearly outdoor conditions, and also was an outstanding showing by our Junior Team under tough conditions.

A great article by Matt Chalker and photos tell the story. Rounding out the issue are the final installments of the Steve Brown prop article and quarter motor flying by Lt. Col. Bob Randolph.

On Bruce McCrory's initiative, we add a roving column for how-to, opinion and dissent, called Golden Nuggets, as well as reviving the Contest Calender. Let us know what you think.

- Carl Bakay

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Cover art by Carl Bakay

Ladies and Gentlemen and Donors of all Ages;

For the first time in all the years that I have been modeling we have a complete junior team to compete in Romania next year. Those three are Doug Schaefer from the Dayton, Ohio area, Parker Parrish from the Atlanta Ga. area and Ben Saks from Shaker Hts, Ohio. They along with the five that did not make the team are fantastic people and superior builders and trimmers of models, as witnessed by the times produced in the Akron Airdock over the Labor Day weekend.

This then is a notice that under the aegis of the INAV, the NFFS and the AMA, we are starting a fund to help defray the expenses of this group going to Romania next year. If the rules are followed all donations will be tax deductible.

- 1] Checks are to be made out to the NFFS and noted for the Jr. indoor fund.
- 2] The checks are to be mailed to Dr. Vernon D. Hacker M.D., 25599 Breckenridge Dr. Euclid, Ohio 44117-1807
- 3] He will list the donors in his confuser [ed. computer] and send donors a thank you listing it a tax deduction
- 4] At varying intervals he will forward the collated checks to Homer Smith, Treasurer, NFFS for deposit.
- 5] All donors will be thanked again in the INAV.

Hack's phone is 216-486-4990. His email address is vhacker@pol.net

RESULTS OF THE F1D TEAM TRIALS AT AKRON, OHIO

2001 USA F1D Junior Team Selection Finals

Contestant	Best	2nd	Total	Fnl	Rgnl	Score
1 Doug Schaefer	29:42	27:55	57:37	1000.0	98.65	1098.65
2 P. Parrish	28:05	26:37	54:42	949.38	100.00	1049.38
3 Ben Saks	27:55	26:51	54:46	950.54	91.37	1041.91
4 M. Chalker	26:38	26:11	52:49	916.69	100.00	1016.69
5 David Rigotti	26:26	25:23	51:49	899.33	89.91	989.24
6 Brian Johnson	25:25	25:23	50:48	881.69	100.00	981.69
7 Joey Sipple	21:06	21:03	42:09	731.56	77.00	808.56
8 Jeff Daulton	23:32	18:03	41:35	721.72	76.20	797.92

2001 USA F1D Senior Team Selection Finals

Contestant	Best	2nd	Total	Fnl	Rgnl	Score
1 Jim Richmond	34:54	34:28	69:22	1000.0	100.00	1100.00
2 L. Cailliau	33:54	33:16	67:10	968.28	100.00	1068.28
3 Steve Brown	33:01	32:31	65:32	944.74	100.00	1044.74
4 D Slusarczyk	32:07	31:15	63:22	913.50	97.08	1010.58
5 Tom Sova	31:12	30:32	61:44	889.96	100.00	989.96
6 Stan Chilton	31:45	28:32	60:17	869.05	100.00	969.05
7 Larry Loucka	29:40	28:53	58:33	844.07	86.41	930.48
8 Bill Hulbert	26:24	26:09	52:33	757.57	76.91	834.48
9 T. Goldstein	26:16	25:22	51:38	744.35	82.74	827.09
10 Rich Doig	26:59	23:18	50:17	724.89	99.72	824.61
11 Larry Mzik	24:27	23:56	48:23	697.50	85.76	783.26
12 Joe Kehr	18:42	17:58	36:40	528.59	95.19	623.78
13 Jerry Combs	14:58	14:57	29:55	431.28	82.56	513.84



Four Juniors and Six Records

For the first time in many years the United States Indoor Championships at Johnson City Tenn, was attended by more kids than the kids from New Smyrna, Tenn.. That group represents a FAC club sponsored by their church and led by their minister. Every year they have come with a variety of models. The quality varies considerably but the better ones are quite competitive. Three years ago a twelve year old young lady won the coconut mass launch. This report is not to be about that group but it is to be about the Junior Cleveland Clowns and their activities during the five day contest. The Cleveland Free Society was very well represented at the open level by at least seven members, including president Vern Neff. The four junior flyers consisted of Dave Rigotti Jr., Alex and Wayne Johnson and Ben Saks, all of whom conducted themselves in a gentlemanly manner Every one of them earned recognition as being excellent competitors and also of being helpful to the others flying in their age group.

I will start with a report about the activity of the youngest of the group, that being Alex Johnson. Alex placed fourth in Unlimited SO [science Olympiad] and third in the limited SO event his times in other events included 10:33 in Penny plane, 11:33 in Limited penny plane. Brother Brian also did well. His 5:42 in the Unlimited SO event was second and he won the F1D event with a record flight of 22.2' and first place among the junior flyers. He also did 11:59 in limited penny plane. The most outstanding performances were by Dave Rigotti Jr. His first win was the around the pale race. In this event his time of 3:55 seconds beat all those entered. In SO David took first place in the middle school division, the unlimited division and also first place in the mass launch. It should be noted at this point that our kids really were the class act in the SO events. To continue with David's story 9:46 in ministick, best Jr and new record; 11 th in limited penny plane with a 13.56 and another record, 15th in penny plane and another record at 13: 31 David also got 12th in F1d and a new Jr. Record of 20.07. His 12th in intermediate stick was again the best Jr. That performance gave David four records. And lots of hardware to take home. Our fourth member of the young Cleveland Clowns Ben Saks entered seven events.. His most notable result was in helicopter. In this he took first place over all and set the record for his age Eleventh over all in FID was good enough to be 2nd in the Jr/Sr class with a two flight total of 39:46. Second place in Jr/Sr EZB was taken with 21:03 and lastly 2nd in Jr/Sr. standard catapult glider.

I would hope that one or more of them will be on the first full junior team to compete in 2002 Slanic, Romania

The following will pertain mostly to Science Olympiad Planes although there is some applicability to other models.

It is very common question among the SOers, Why does my plane wobble. The most common problem is an unbalanced prop. The second most common reason is one of the following four problems.

1. If the plane did not always have a wobble then the most likely cause is a bent prop shaft after the plane has hit something. This leads to a prop that will not track properly. Straightening the shaft is required..
2. The shaft not being a tight fit through the hub is another common cause of a nontracking prop. This is especially common when the prop shaft has been reduced in diameter from that comes with. a plastic prop hanger [bearing], or when one uses a cut down 9 inch prop. The cure is to fill the hole in the hub with something relatively soft, such as a thin insulation from copper wire or balsa. It is important not to fill the hole with Cyano because it is difficult to drill for the smaller shaft. The drill likes to follow the path of least resistance. And frequently will not go straight through. The insulation or balsa can be glued in place. Don't use too much! !..
3. Also, it is not uncommon to find that the prop shaft is not firmly held in place on the front of the prop. If one is using the common plastic prop hanger as a bearing and there has been a change in the diameter of the prop shaft, a severe wobble can occur if one does not fill and redrill the hole to fit the shaft.
4. The most uncommon causes for wobble are related to either the blades not being at the same pitch or one blade is flaring more than the other. Out of pitch blades can be diagnosed with a pitch gauge and then twisted to match . Asymmetrical flaring of the blades is the most uncommon of all the causes of prop wobble. . For which there is no easy fix. Assuming that you can identify the culprit some glue on the flaring blade can help or scraping the non flaring blade might help. In case of doubt, throw it away.

Build Your Own Micrometer Balsa Stripper for Indoor Models

by Roy Bourke (CAN)

(from SAM 86 Speaks) as printed in Indoor News May 1996

Of all the designs I have seen of strippers for indoor sizes of balsa wood the most accurate is the micrometer type, where sheet balsa is held flat, and a cutter block is passed along a guide bar which is positioned by a micrometer. Ray Harlan markets a micrometer stripper which uses actual 0-1" micrometer barrels to position the guide bar. Most commercial micrometers have a 40 TPI thread on the barrel, which means that one revolution of the barrel represents 0.025" movement of the guide bar. This is a highly accurate positioning system, but the resolution of 0.001" in the graduation of a micrometer barrel is usually not needed, and of course the range of motion of the guide bar is limited to the 1" range of the barrel. The sketches detail a similar stripper which uses readily available 1/4-20 threaded rod as the micrometer. The 20 TPI rod advances or retracts the guide bar by 0.050" per revolution. Simple dials with only 10 graduations each yield an easy-to-read scale resolution of 0.005". The dials are fairly large in diameter (compared to a micrometer barrel) so the 0.005" graduations are spaced widely enough that it is very easy to interpolate a reading to 0.001". And the 4" screw length gives the guide bar a range of motion of more than 3", so a 3" wide sheet of balsa can be stripped without repositioning the sheet.

Dimensions of this type of stripper are not at all critical, and can be adjusted to suit your own preference and the sizes of sheet you are most likely to strip. The dimensions shown are those of my own stripper, but feel free to change them. The length and width of the base board should be chosen to accommodate the largest balsa sheet you want to work with.

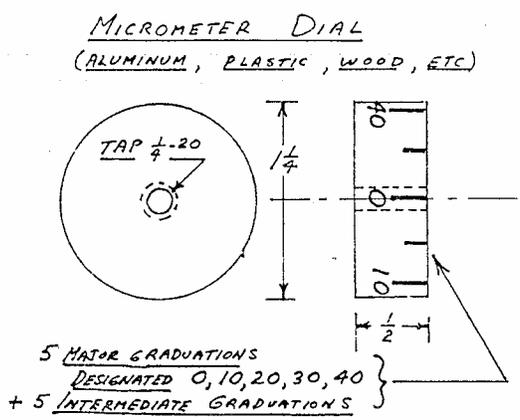
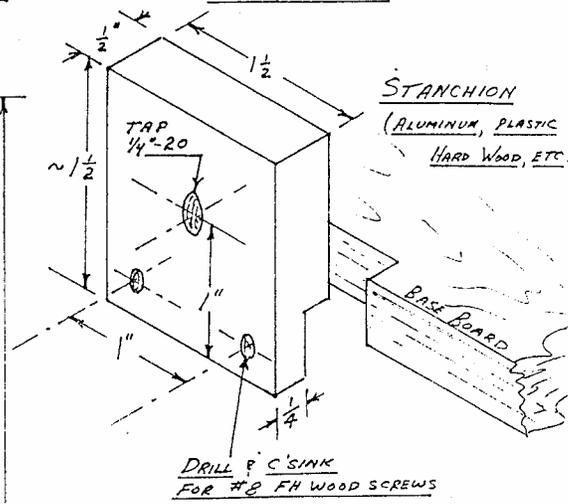
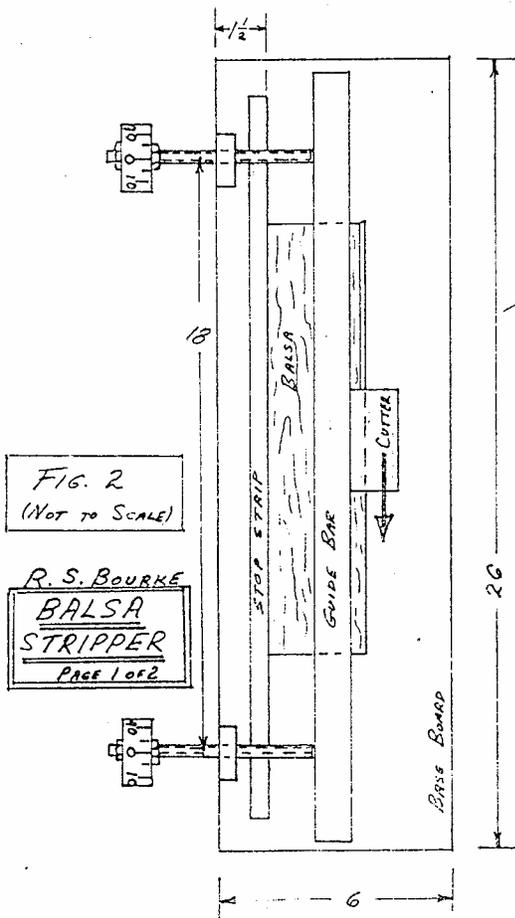
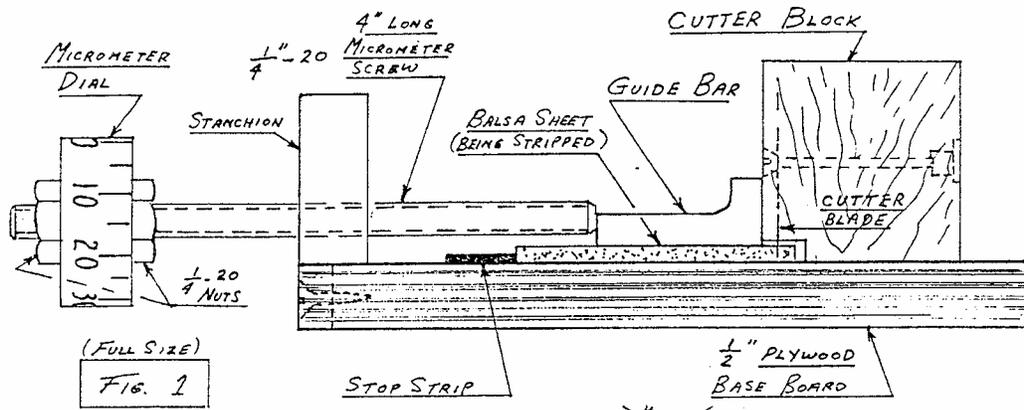
Similarly, the materials used in the construction are somewhat arbitrary. I used aluminum for the stanchions and the dials, but plastic or wood can also be used. If you use wood for the stanchions I would suggest embedding a 1/4-20 nut in each stanchion rather than trying to tap a thread in a wooden hole. The guide bar should be straight and of a stable material like aluminum, so I wouldn't recommend wood for it. Mine was cut from a piece of aluminum angle, but rectangular stock would work just as well (1/4 x 1 1/2; 3/8 x 1 1/2, etc.). The stop strip is simply a thin metal or plastic strip (approx. 0.025" thick) cemented to the base board, against which the balsa sheet is held while stripping.

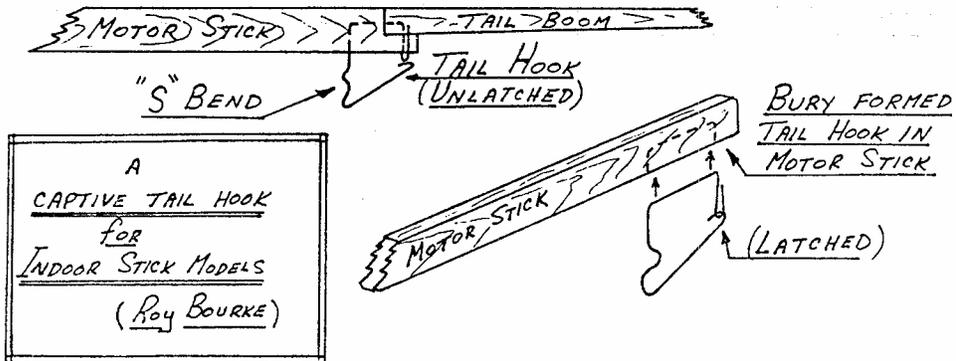
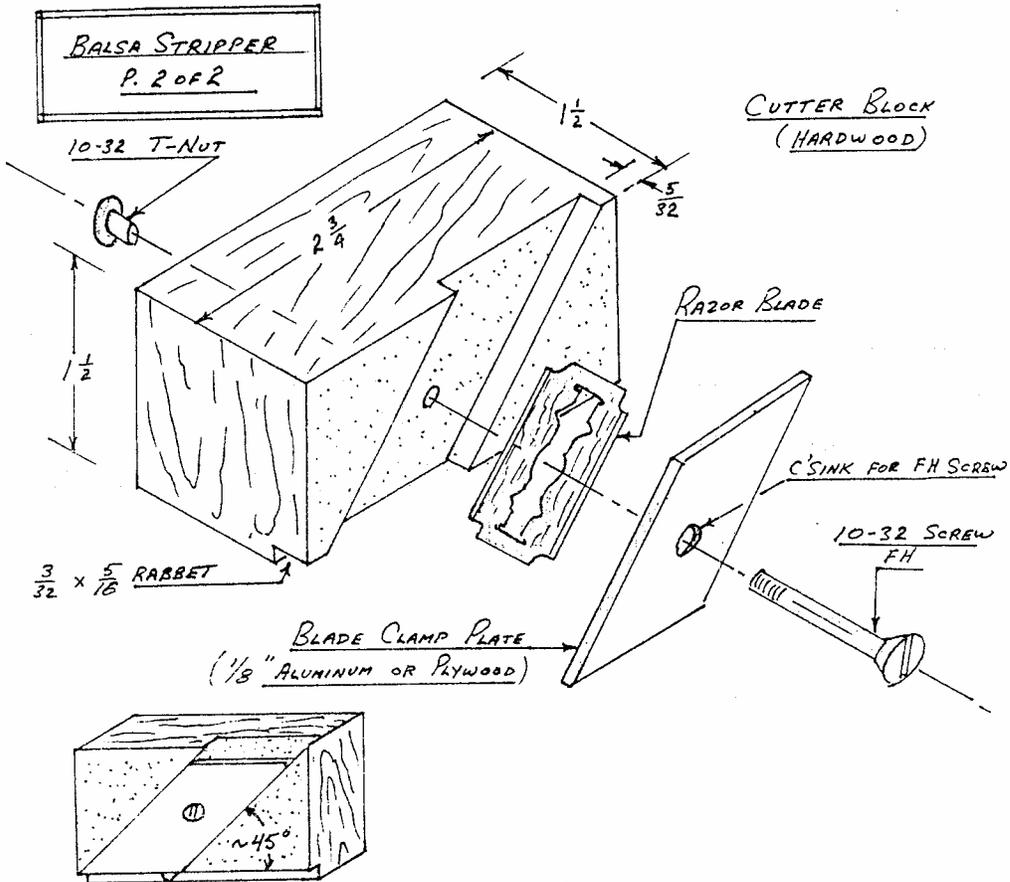
The only hard part in the construction is making a dial with 10 evenly spaced graduations. I used an engraved cylindrical dial of aluminum only because I had access to the equipment necessary to make them. But a simple disk-type dial in plastic or plywood would also work. Graduations could be inked on paper and cemented to the face of each disk.

For the cutter block a variety of blades could be used, but I have found the double-edged blue blade carbon steel to give the thinnest cuts and the most accurate results. The maximum width of the strip and maximum thickness of sheet balsa are determined by the size of the rabbet cut into the bottom corner of the cutter block. Some design compromise is necessary here because if too wide a rabbet is cut the block may accidentally rock, and if the rabbet is too high the unsupported part of the cutting blade may bend, producing a wavering cut. If a large range of strip cutting is desired it may be necessary to make more than one cutter block, using heavier blades for the larger strips.

In use, the balsa sheet to be stripped is held against the stop strip, the bar positioned approximately, and a scrap strip is used to straighten the edge and register the bar position. Then the micrometers are backed off the required amount for each strip cut. The micrometers can be backed off in differing amounts, producing a tapered strip, very handy for tapered wing spars. If you use tapered sheet balsa you can produce double-tapered wing spars. Also, if you replace the cutter block with a template held against the guide bar you can slide accurate multiple wing ribs using a sharp knife or razor blade against the template.

1. Ray Harlan 15 Happy Hollow Rd., Wayland, MA 01778, USA.





THE BRITISH F.1.D. TEAM TRIALS FOR THE 2002 INDOOR WORLD CHAMPIONSHIPS: CARDINGTON: AUGUST 27TH AND SEPTEMBER 9TH.

- Nick Aikman

For some time, hanger 1 at Cardington was the spiritual home of U.K. indoor duration flying. Sadly, it is now in a derelict state with many cladding panels missing and from some angles it looks like a sieve. Luckily, duration flying has continued in hanger 2 for the last three years, so access to one of the world's great and historic high sites has continued, during the warm summer months.

Unfortunately, 'shed' 2 is not ideal as it is now two thirds full of tall, full-sized buildings, built for fire research and explosive tests. The remaining area of clear floor space up to the roof is directly behind the main doors and removal of their outer seals together with a constant 8 inch gap down the middle can often produce extremely turbulent flying conditions if the wind is from most directions other than North. On some days, even a Limited Pennyplane finds the going tough!

As usual, the Indoor Nationals took place over our August Bank Holiday, this year Sunday the 26th and Monday the 27th. Although other classes were flown, those entering the trials hoped to spend time on Sunday, fine-tuning F.1.D.'s in preparation for the first contest flights on the following day. The second half of the trials were scheduled for September the 9th, two weeks later.

Bernie Hunt has lead the way developing this class, making a 33 minute flight with 'Big Square' (see INAV 103) last year. Everyone else was therefore playing 'catch-up', both with model design and with construction and effective use of V.P. props that 'Guru' Hunt calculated were necessary for optimum performance. As I came back to F.1.D. this Spring, after a break of fifteen years I was definitely tagging along behind everyone else.

Because of the problems with the doors, little time was available earlier in the year to refine designs built to the new rules. There are now about twenty F.1.D. flyers in the U.K. although only 8 entered the competition. Some flyers made use of smaller halls for trimming and testing. In June, Bob Bailey made flights of 31 and 32 minutes at the annual French International at Bordeaux, under a 30 metre ceiling. Ron Green also joined the new '30 minute' club at Cardington with several flights over the half hour. Both used V.P. props.

So, as the weekend approached, we all watched the weather forecasts anxiously, but I suspect that Laurie Barr, 'Archbishop of Cardington' had a word with a higher power because on both days the air was good by Cardington standards, although slightly smoother on Sunday.

On practice day, it was generally thought that a 2 flight total over 60 minutes would be needed to make the team and also that Hunt, Green and Bailey were still 'ahead of the game'. Derek Richards and John Tipper in particular had problems with V.P. settings while Geoffrey Lefever and I had little V.P. experience and elected to stay with flaring fixed pitch props.

So, on the Monday, battle commenced. Originally 3 flights were planned but the indoor technical committee decided to run 4 rounds of an hour and a half each, in case the second half on September 9th was literally blown away. Indoor technical committee chairman Mike Colling acted as C.D. and all models were weighed and checked dimensionally before each flight. Motors were also weighed retrospectively and included the weight of lube and O-rings.

Round 1 found Ron Green needing to add more ballast to his best model and with only eight of us, the pace was leisurely. As the rounds ticked away, it became obvious that the 60 minute estimate was accurate. Derek Richards lost his baffled expression of the previous day after close examination of his V.P. prop hub revealed that the rear bearing had come loose; once fixed, he quickly made two flights over the half hour.

With considerable sideways drift at most heights and the 'jetstream' down the length of the hanger, only Hunt made a long, no touch flight with exactly 34 minutes – his best yet. Everyone else needed much deft footwork while peering into the gloom up among the rafters and Green, Bailey and particularly Lefever made several excellent steers to save long flights. As hard hats are mandatory fashion accessories to comply with health and safety regulations, lengthy steering is often accompanied by a loud crash as one's headgear falls to the concrete floor.

At the half way stage, after 4 flights, 6 flyers had bettered 30 minutes and 4 had 2 flights over the half hour. On this occasion Ron Green's more intuitive approach gave him the high time of 34.06. exceeding Bernie Hunt's fearsomely analytical 34.00. by 6 seconds. It was felt by most that the trials had probably been decided on that first day unless miraculous conditions materialised 2 weeks later. So, the second weekend of September the 9th arrived and the weather forecast was ominous enough to stop Bernie Hunt and myself from making the effort to go. I decided to save virtually new models for the 'Cargolifter' international in Germany later in the year. Laurie Barr decided to take over as C.D.

In the event, although the conditions were reasonable early in the day, they deteriorated later and made it difficult for anyone to improve their times. The drift was fearsome and unpredictable and much steering was needed to keep models away from the girders.

John Tipper was closest placed to leap-frog into the team. Having reduced the pitch settings on his prop mechanism his model was performing better than before. Unfortunately, a steering mishap at high altitude damaged a wingtip on one good flight and on his last attempt an improvement to 32.38 was not enough to lift him into third place. Geoffrey Lefever was even more unlucky. Having changed to a V.P. prop, one good flight hung right in the apex of the hanger and his other best effort ended high up on the doors, (usually, models are blown away from them!) was ballooned down 50 feet and then still did 26 minutes with a damaged tail. No-one else managed to improve their flight times due to the ferocious drift.

So that was that. The end of the first 55 centimetre F.1.D. trials at Cardington. Bernie Hunt had already stated that he would not be imprisoned in the cold, dark, salt mine again and so was happy to relinquish his place. The team will therefore be Ron Green, Bob Bailey and Derek Richards, with John Tipper as reserve. All are seasoned campaigners at W. Champs level

Some technical details might interest others also battling with the new rules. All models flown were Y2K or Y2K2 covered and all were unbraced. There is no doubt that these 'floppy' wings are much better at handling full torque with virtually no back-off. No models exhibited any sign of the aerobatics reported elsewhere although I provided the only exception and learnt the effectiveness of stick bow in handling power late in the first day. By pruning the stick bracing to give more slack, my earlier staggering climb disappeared and an immediate improvement to a modest 25 minutes was the result. Lefever and Bailey used boron reinforced mainspars while the rest of us relied on stiff wood. Complete wing weights came out between 0.27 and 0.31 grams.

Hunt, Tipper, Richards and Barr all flew variations of 'Big Square' with a fuselage length of around 31 inches. The 'Norfolk Mafia' of Green and Lefever plus Bob Bailey and I flew longer (around 34 inches), more elegant designs with curved swept outline tails.

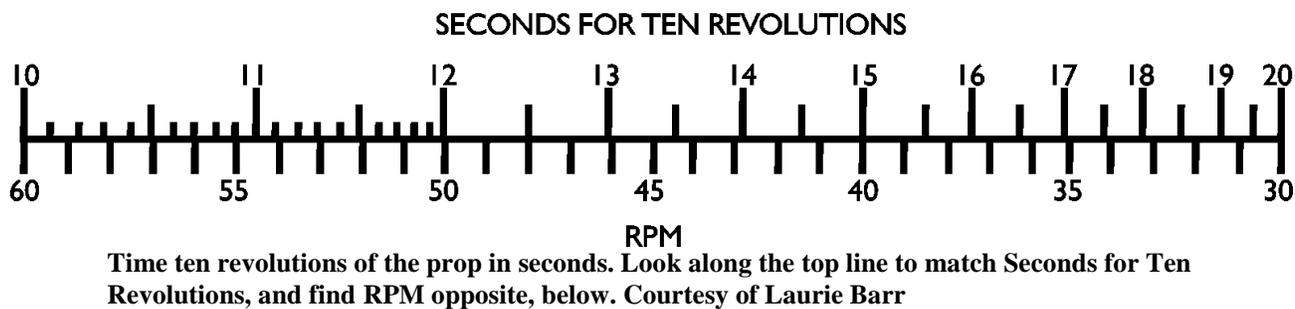
All models used underslung tailplanes with tip dihedral, held on posts, to increase the horizontal separation between wing and tail. Ron Green's winning design was the most extreme in this respect (see plan) with 5 inch wing-posts and 2 inches on the tail. With 9 to 10 inch sticks, an extension of up to 6 inches, full length booms of 17 to 18 inches plus a V.P. prop and plenty of boron reinforcement, light building is needed to get down to weight. Lefever and Green used boron prop outlines and V.P. prop mechanisms also separated into 2 types. The 'Big Square' contingent used screws for adjustment, together with wound, kevlar thread hinges as developed by Bernie Hunt. The rest used a Basic Steve Brown hub, replacing the top stop screw with a system of rolled tissue tubes of varying diameters, held against the actuator arm on a tiny piece of wire stuck into the hub.

The future of flying in Hanger 1 is in peril as the building is up for sale and all work there has stopped. Sadly, the first report I write about Cardington may also prove to be the last.

RESULTS.

	RESULTS.			TOTAL.
1.	Ron Green.	31.40	“ 34.06	“ 65.46
2.	Bob Bailey.	32.35	“ 32.30	“ 65.05
3.	Bernie Hunt.	34.00	“ 30.33	“ 64.33 *
4.	Derek Richards.	32.17	“ 31.49	“ 64.06
5.	John Tipper.	30.31	“ 32.38	“ 63.09
6.	Geoffrey Lefever.	31.01	“ 29.34	“ 60.35
7.	Nick Aikman.	25.37	“ 22.21	“ 47.58 *
8.	Laurie Barr.	6.36	“ 25.28	“ 32.04 *

- Flew First four flights only.



A Junior's Indoor Story

First, let me introduce myself and give a little background info. My name is Matt Chalker, I'm 16 years old, and live in Centerville, OH, a suburb of Dayton. I've flown AMA event for approx. one year, and Science Olympiad (SO) for about 4 years. Currently, I fly most AMA duration events especially F1D. During the team finals, some of the older guys told me that I should write this, as it shows just how easy it is to get into indoor and hopefully would be a little interesting as well. Maybe I'll look back on it when I'm 50 and remember just how great this time of my life was as well.

The first indoor rubber powered airplane I ever built was for SO, the first year Wright Stuff was an event for SO. That was during my 7th grade year, about 4 years ago. I believe it was a Wright Flyer kit from Midwest Products, which if you have never seen one can be compared to a 10 gram EZB. It is kind of funny looking back on it now, because I remember how the entire year my goal was to get a 1 minute flight. If I remember correctly the best I got was 55 seconds on a stock 6" prop, with a 12" loop of 1/8" rubber. That was the first time our middle school team made it to the national competition, and I remember when going there seeing a lot of models that had chords around 5-6" and absolutely destroyed me in the competition. I had never seen anything like it, and asked many questions (which if you have ever flown with me, you notice that I continue to do). One team that I asked about told me of "a guy out in Oregon who sells stuff for this". Little did I know that this was the beginning of a long career in indoor, assisted by Mr. Lew Gitlow.

The next fall, I phoned up Lew, and throughout several conversations, he taught me many new techniques and also sent me several pennyplane kits and pre-stripped rubber. I built many models out of these kits and finally began to learn about some "real" indoor models. With unpitched, unshaved, 6" plastic props, and a 12" loop of rubber (That was the max) I believe I was doing about 1:40 or so, good enough for 10th place at our nationals that year.

Nationals was held in Chicago that year, and it was the first time I had seen an actual AMA model. The night before the national competition, there is always a large swap meet between all the teams that come. That year it was held in the Chicago museum of Science and Technology. In that museum there is a large atrium/hall in which Tom Sanders flew a ministick. I remember how I was totally amazed by seeing something fly for longer than 8 minutes. Seeing that flight inspired me to order a ministick kit from Lew. I never got around to finishing it, as I could not figure out how to exactly cover with the Mylar film that is included in the kit and got extremely frustrated trying to do it just like tissue covering.

Over that summer, I poked around the Internet, trying to learn as much as possible about indoor. Eventually I found freeflight.org, the NFFS's official web page, which turned out to be a godsend, as it contained many links to different sites. One of the best sites I found was Don Slusarczyk's web page, which worked out well, because I used his SO design extensively.

During the next year, which was my Freshman year in High School, I ended up using both Don's and Lew's design for almost the entire year. By the end of the year I had a biplane that was based on Lew's plans and it ended up doing 3:30 seconds at nationals. Good enough for 7th place that year, to bad they only gave medals to 6th place. Earlier that season I had broken 4 minutes with a model that was based on Don's design at the Nutter Center, one of our local arenas. About a month earlier, I had received Joe Mekina's phone number from another SO kid on the Northmont High School team. This was wonderful, as then he and Bucky Serviates began helping us a lot and I probably wouldn't be involved in F1D now without them.

That summer I built several outdoor models, however I never really competed with them. I did have some fun with them, but not nearly as much as indoor.

The fall of my sophomore year, 2000, I built another ministick and an A-6 from Lew, which I flew quite a bit and had a large amount of fun with. Then it was time for SO again, and this past year I flew mainly Akhiro Danjo's design, or modifications of it.

Perhaps the greatest experience I have ever had in Indoor occurred to me at our Regional SO competition this past year. As I was packing my models up, Mark and Doug Schaefer came over to me and invited me to go to the Flint indoor contest with them. They encourage me to build some EZB's for it and go with them to see the full breadth of indoor. I called up Lew and ordered wood for several EZB's.

I had about a month to prepare for Flint, so I had the chance to build quite a few models. They included, if I remember correctly, 3 EZB's, a LPP, a ministick, and a new SO model. (I build pretty quickly.) I had a great time up at Flint, and ended up going to Buffalo and USIC with Mark, Doug and Joey Sipple as well. I really can't thank them enough. They, along with Bucky have helped tremendously, and I know for a fact that I wouldn't be into indoor flying.

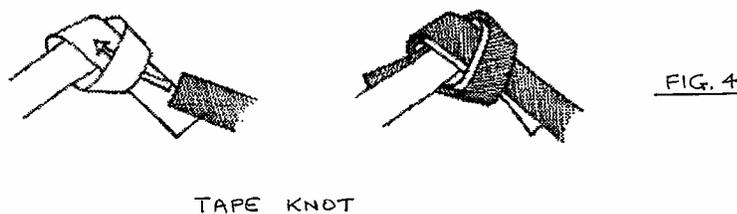
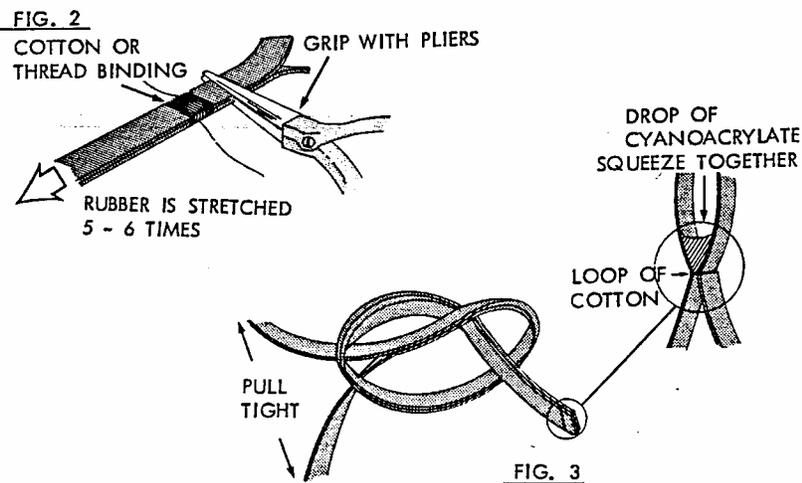
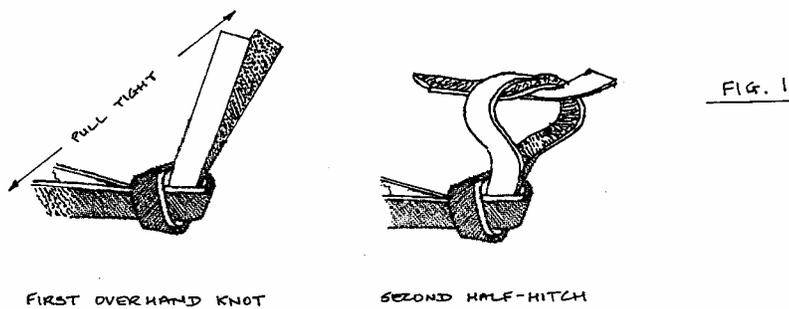
Hopefully this will inspire a few beginners to do both AMA events and F1D. I built my first F1D for USIC, and that was only about 2-3 months after building my first decent AMA model.

I also have another issue I wish to address, the so-called "Junior Problem". I don't believe there is such a thing. I've read through almost all of the old INAV's on the archive CD, and have noticed that throughout the years, there has always been a "Junior Problem", yet the sport continues and I believe, is about to go through a major growth.

One article stands out in my mind very clearly, the one written by Nick Leonard Jr. I remember the first time reading that, I was very upset as I believe much of what he wrote was completely untrue. What he says about teenagers is not completely true. As a matter of fact, the night before I wrote this, I went to a "dance party" in this case, our homecoming, which I enjoyed thoroughly. Yes, the music was loud, you could feel it, the gym was hot, I was sweating like a pig, the music wasn't what Nick would enjoy, mostly rap, but I, an indoor flyer, loved it. I like my music loud, I like playing Nintendo and Playstation, I am very messy, extremely messy, but I am an indoor flyer. In his article, Nick said that most teenagers are lazy, rebellious, and destructive. This is not true at all. It is just that indoor isn't for everyone, some people enjoy it and others don't. The trick is finding the ones who do enjoy it, not criticizing those who do not. The way I think that we will find other juniors who will participate in indoor is through SO. I urge every indoor flyer, whether you are world class or just beginning, to go out and ask the local schools if they have a Science Olympiad team and ask if you could assist in coaching the Wright Stuff event. I know many, many people are already involved, for this I thank you, but many are not as well, and it would mean so much to many kids if you did this. There are SO teams all across the nation and there is NO better way to get new fliers involved with the sport.



Matt Chalker at Akron



FROM OCT 2000 "WING-TIM"

•The Finny Plane, by Bill Gowen

In the late Winter of 1997 my son John came home from school one day and announced that I would be a coach for something called Propeller Propulsion in a competition called Science Olympiad. After puzzling as to what this was about for a couple of months and getting no contact from his school, I finally was sent one page of rules for what I was astonished to find out was a competition for indoor rubber powered airplanes. Having left the hobby 35 years earlier, and never competed in indoor competition, I naturally felt that I was supremely qualified to coach this event!

John and his friend Bert were selected to be the propeller propulsion team and we set to work building a plane. We eventually wound up using a Peck ROG expanded to fit the rules and less it's landing gear. The airplane was supposed to weigh 10 grams. We didn't have a scale that would measure anything that light. I think that optimistically the airplane may have weighed 6 or 7 grams. The regional competition had already passed before we got started, so we jumped into the fray at the Georgia State Finals. Someone during the competition told the judge (who didn't check anything else during the competition) that everyone's motors were too long. The rules specified a 12" motor, but this one contestant convinced the judge that this meant a 12" piece of rubber tied into a loop. After cutting all our motors in half, John put up a flight of about 30 seconds and became Georgia State Champion for 1997.

When the 1998 competition rolled around, we knew we were the best and set out to prove it. For the regional competition we had a tiny low wing model that flew for over a minute! About this time I discovered Lew Gitlow's book "Indoor Flying Models" and began to understand that we knew nothing about what we were doing. I designed a new airplane that took maximum advantage of the rules and actually incorporated some indoor principles. John and Bert managed a 2:08 flight to win the state championship for 1998. They were closely followed by a team from Booth Middle School. This was to be our last success against the fine Booth team, coached by Dave Ziegler.

For 1999, I became interested in adapting a successful high performance indoor airplane to the Science Olympiad rules. In Lew's book I found a design for an F1D by Bob Gibbs. The airplane struck my fancy and I drew it up in AutoCAD and scaled it down to fit the SciOly rules. John Barker, who mentored us over the last few months, taught me over the telephone how to build a rolled motor stick. Since the 1999 rules specified a minimum weight of 8 grams, with no chord limit on the wing, this seemed like a good way to save weight. The rolled tubes worked great but caused a great deal of friction with other teams who have insisted to this day that it is impossible for kids to build airplanes with rolled tube fuselages. Fortunately, no one told my kids that they couldn't do it, so they did! The 1999 airplanes were wonderful machines and clearly superior to anything else that we saw. Unfortunately, the state competition for that year was held in a room that featured high power A/C units that ran all day and blew John's airplane out of the air on both his flight attempts.

For 2000, the rules specified a maximum wing chord and limited some of the other dimensions for the airplanes. About the same time, I became interested in indoor endurance airplanes using tip plates on the wing instead of dihedral. It made a lot of sense to me that in an area limited event with a reasonable weight limit that a rectangular wing of maximum area would be the best way to get wing loading down. My understanding of tip plates is that using tip plates on a wing will reduce or eliminate the spanward airflow that causes loss of efficiency at the tips. Also, tip plates would substitute for dihedral by resisting side slipping and thereby providing roll stability. Whether all this actually works or not I'm not in a position to say. However, my experience with flat wings has been mostly positive to date. The sole exception is that I have not been able to make a successful EZB or FIL with this technique.

The 2000 rules did not specify how many wings you could use, so John built a flat wing biplane with tip plates. John had to drop out of the competition due to other commitments. A substitute flyer came in at the last minute and flew the biplane in the state finals. It was a very reliable and competitive airplane but got off course during the first official attempt and landed on the running track at Emory University, 25' above the floor. An attempt at a second flight failed as the airplane was damaged while trying to beat the clock.

After the state finals I was approached by the Chamblee High School team about helping them prepare for the 2000 SciOly Nationals. They built a biplane version of the FinnyPlane and a monoplane version that used a 2-surface airfoil. Glenn Garrett flew the mono FinnyPlane to a second place finish with a time of about 3:45.

For 2001, the rules were changed to require a minimum airframe weight of 10 grams. I felt that a 10 gram airplane probably would be ok with a solid fuselage. I helped two sixth grade girls, Jo Warren and Kara Miller, build a 2001 FinnyPlane as their first model airplane. The airplane was built in 4 hours. It's first fully wound flight was a 2:57 in a 22' flat ceiling gym. I entered this flight in Don Slusarczyk's postal contest for an 8th place finish. The girls took first in their regional competition with 2 identical flights of 2:25. At the 2001 state finals, they had the best two flights of the day but broke the wing during their official attempt. In the 2001 state finals, the Westminster High

School team built a FinnyPlane on their own and did 2:37 for 5th place. Glenn Garrett ballasted his 2000 model up to 10 grams and did 3:02 to become the State Champion. (These 2 times include the 10 second landing bonus).

The FinnyPlane is in some ways the antithesis of what most people recommend as a first model. It has a very long fuselage and a CG that is well behind the wing. However, the model is exceptionally easy to build. The wing and stab ribs are identical. The flat wing simplifies building and covering. The solid tip plates are easy and durable.

The model is also very easy to trim and very reliable. Jo and Kara's model was trimmed in my house and needed no other adjustments until just before the state competition. If the airplane is set up as shown on the plan, all that is left to do is fly it on about 400 turns to set the cruise attitude to almost stalling. When the cruise is set, power can be increased in steps up to the maximum desired level. We have launched the tube fuse version at .9 in-oz of torque and the solid fuse version at .7 in-oz without problems. Rubber used throughout the 2001 season was .093 TanII (5-98). Glenn's airplane would probably have done more time on smaller rubber as it was running out of turns at 3 minutes. The pressures of being a high school Senior kept him from doing the experimentation to get his times up.

Building the Finny

This is a very easy airplane to build, but most first time builders will need some mentoring to be successful. Young builders with an airplane or two in their experience can probably handle it on their own. The local Dunwoody HS team built a Finny with just telephone help after building one plane on their own. I'm going to skip covering techniques and making tissue tubes and maybe some other steps to keep this article from turning into a book.

Glue

I use CA for almost everything. CA is heavy. Weight is not good. The answer? Use only a LITTLE BIT! Use THIN CA! Use FRESH CA! Make some application tools out of scrap wire by cutting pieces 3" or 4" long and bending about 1/4" of the end to 90 degrees for a handle. Get some label backing material or other non-stick material and squirt a few drops of CA onto it, making a little puddle. Dip the end of the wire into the puddle HORIZONTALLY. Hold the wire VERTICALLY and you will have a tiny drop of CA at the bottom of the wire. You can place this precisely where you want it to go. The two pieces of wood that you are joining must be touching. You must put the drop of CA directly on the joint line. The resulting joint will be many times stronger than the wood.

The Wing and Stab

Cut all the parts out of 6 pcf maximum sheet wood. Don't buy stripwood. It will be too heavy! Cut out several spars and select the ones that are the most uniform and the strongest. Test the spars by carefully bending them with first one side up and then with an adjacent side up. They will be noticeably stronger in one direction than they are in the other. Turn the spar so that it is stiffest when bending vertically. Mark the top of the spar. If one of your best pair of spars seems stronger than the other, put an additional mark on that spar.

A rib template can be made by drawing a 14" radius arc on a piece of paper, and then gluing the paper to a thin piece of metal. I use aluminum flashing material for this. Cut the sheet metal along the arc (scissors will work on flashing) and smooth the edge with a file. Slice the ribs 1/16" thick along the edge of the template. Tape the plan to a flat surface and place the wing spars on the plan with small weights. Locate the spars with the marked side up! If one spar is stronger, make it the leading edge. Glue the tip ribs in place first and then the intermediate ones. Run a double edge razor blade under the glue joints to separate the wing from the plan.

Cover the wing and stab with LIGHT condenser paper. You can buy this from Don Slusarczyk or Lew Gitlow. The light condenser paper weighs about 2/3 as much as normal condenser paper. Cut tip plates out of the lightest 1/32" sheet you can find and glue to the wing and stab. Glue on wing posts and stab posts, keeping them perpendicular.

The Fuselage & Front Bearing

Tape the fuselage outline to a piece of 1/8" or 5/32" balsa with the bottom edge of the fuselage along the edge of the balsa sheet. Cut along the top outline (the top outline is an arc). Bend the rear hook out of .020 wire leaving the top of the hook straight. Push the wire up through the motor stick, bend the top over as shown and CA into place. Add the scrap of balsa to brace the hook. Cut the tail boom out of the lightest piece of 1/8" balsa that you can find. Glue to the top of the motor stick as shown. Glue on the front stab tissue tube and the front wing tissue tube.

The front bearing can be whatever you are comfortable with. My preference is an aluminum penny plane bearing from Lew Gitlow. You can also use a plastic prop hanger, but these require some modification. If you want to go

this route, cut as much plastic out of the hanger as possible. I remove all of the plastic on the sides except for a thin box to hold it all together. Fill up the prop shaft hole with CA and drill a new hole for an .020 wire prop shaft. Drill this hole so that there will be no downthrust in the bearing when you're done. Shape the front of the fuse so that when the plastic bearing is put on, you will have 2 to 3 degrees of left thrust.

Prop

Use either a 9" grey Peck Polymers prop or a 9" blue prop. Remove as much plastic from the hub as possible and thin the blade until the prop weighs about 2.5 grams. This is the hardest part of the whole building process. I also remove part of the blade toward the center of the prop. Be sure to remove all of the plastic used for the free wheeling mechanism. Glue an .020 wire prop shaft into the prop with CA. Bend the shaft as required to get both blades to the same pitch and to get both blades following the same path.

Final Assembly

Place a tissue tube on the bottom of the rear wing post. Hold the motor stick vertically with the front up. Hold the wing by the front post. Slide the front post into the tissue tube glued to the motor stick. Pinch the rear tissue tube against the motor stick with your thumb and finger and put a TINY drop of CA where the tube touches the stick. When this CA has set, you can release the rear tube and remove the wing from the motor stick. I don't like for wings to fall off so I put a fillet of CA on both sides of both wing tubes. The stab is installed the same way as the wing.

Hold the airplane nose up again and lay a piece of light 1/16" square balsa from the leading edge of the wing to near the bottom of the front wing post. Glue this brace at both ends and trim off any excess wood. Repeat on the other side of the wing. Hold the airplane nose down and lay another piece from the trailing edge of the right wing to the wing post. Glue this piece to the trailing edge only. Carefully sight along the right wing panel and push or pull on the brace until the leading and trailing edges are parallel. Hold the brace in this position and glue the brace to the wing post. Repeat for the left wing panel except that the left brace will be used to pull (or push) washin into the left panel before gluing to the post. Hold the plane level and facing you and check the wing alignment. If it's not right, cut the braces loose and try again. If you set the wing up this way with four braces, it will most likely stay in alignment forever. If the alignment stays put, so will your trim settings!

Flying & Competition Hints

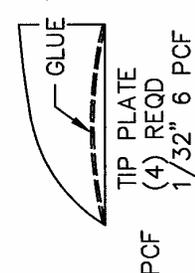
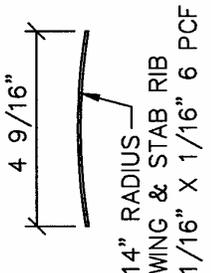
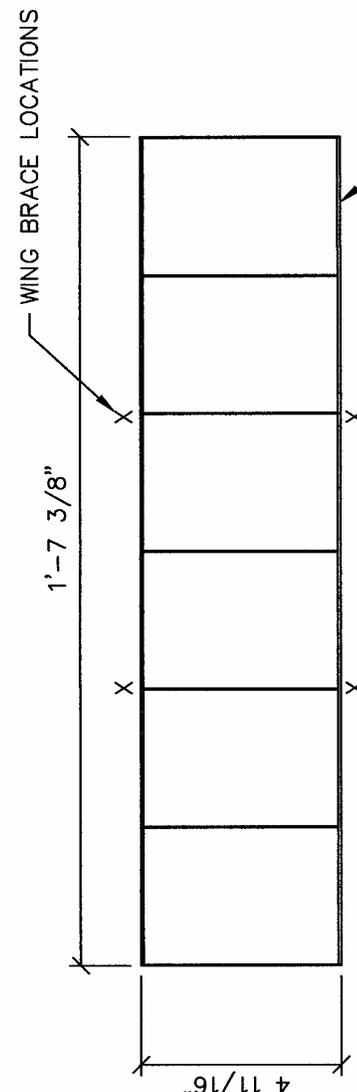
Best results to date have been with .090 rubber. If the wing spars are strong, the Finny will take any torque that .090 rubber can deliver. The flight pattern should stay very stable right up to maximum power.

Practice, practice, practice! Find your best rubber, prop, torque, trim, etc. before you compete. Take the airplane to the flying site completely ready to fly. There is usually so much confusion before the event starts that the least amount of trimming that you can get away with is desirable. Always think in terms of simplifying your tasks when you are competing.

My kids wind motors off the plane using a torque meter. Getting the wound motor on the plane is a potential disaster. After my 6th grade girls lost their state final due to a motor loading problem, I will now teach teams to have ONE person do the motor transfer. It is too difficult for two people to coordinate their movements and accomplish this task without breaking the airplane. Teach your kids to hold the airplane by the nose bearing with the rest of the airplane pointed away from their body at all times. Teach them to walk with the airplane in a flying attitude, again holding it by the nose. If you are able to be with them when they compete, tell them that the number one goal is to enjoy how their airplane flies. If they win something that is just icing on the cake!

The 7 minute time limit for making 2 flights has been changed for the 2002 competition. The new rules specify that the 7 minutes begin when the first flight is launched. Make sure that your judges understand this change. If the airplane gets damaged while preparing for the first flight, you should be allowed time to fix it. If a motor or two break before the first flight, it should not be a cause for panic.

A final note - if you are able to have any influence on the way your local competition is run, I encourage you to push the organizers for permission to waive the 7 minute time limit. Tom Sanders gave me his OK for waving this rule at the Georgia High School finals for 2001. We had a wonderful competition! I will be happy to provide more information to any one wanting it. Bear in mind that even if you are successful in getting this rule waived, you should teach your team to work within the letter of the rules. As they advance through the competiTion it is always possible that at some point they will have to deal with the time limit.



TRIM

SET WING PARALLEL TO BOTTOM OF MOTOR STICK
 RAISE STAB TRAILING EDGE 1/4" REFERENCED TO BOTTOM OF MOTOR STICK
 CG SHOULD BE AROUND 1" BEHIND WING

2-3° LEFT 0° DOWN THRUST

1/4" STAB TILT (HIGH ON LEFT SIDE)

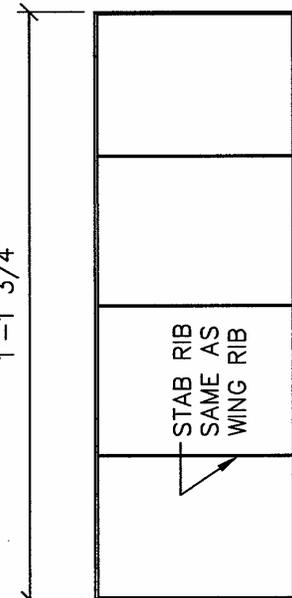
TEST FLY AT ABOUT 400 TURNS

ADD UP TRIM AT STAB UNTIL STALLING OCCURS THEN TAKE UP TRIM OUT UNTIL STALLING STOPS.

INCREASE POWER GRADUALLY. IF PLANE SPIRALS IN AT HIGH POWER ADD MORE WASH-IN TO LEFT WING

NOTE

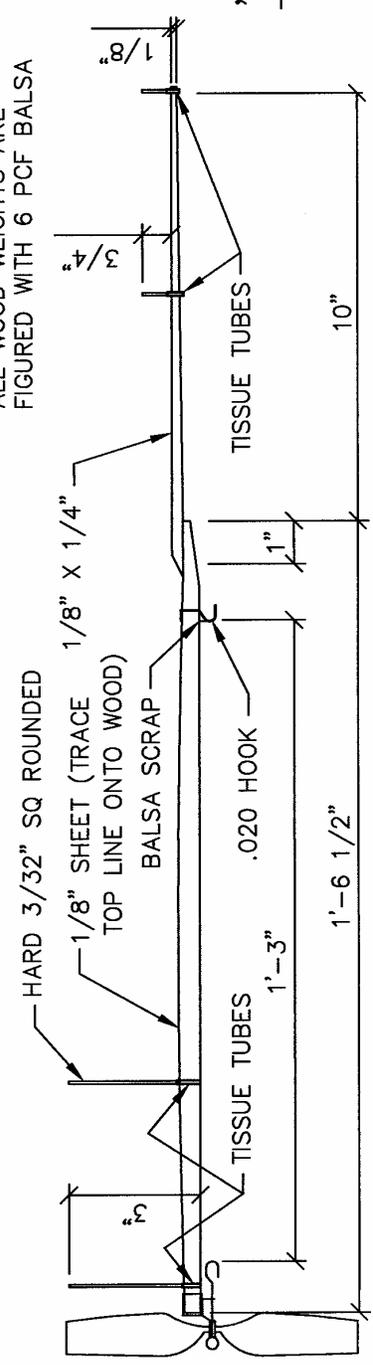
USE 1/16" SQ. BRACES FROM L.E. AND T.E. TO WING POSTS. SET INBOARD WING AT 1/16" TO 1/8" WASHIN WHEN GLUING BRACES.



MOTOR - 15.5" .090 TAN II
 PROP - 9" GRAY PECK OR 9" BLUE CUT TO 7 3/4" MAX AND THINNED TO 2.0 GRAMS

TARGET WEIGHTS (GRAMS)

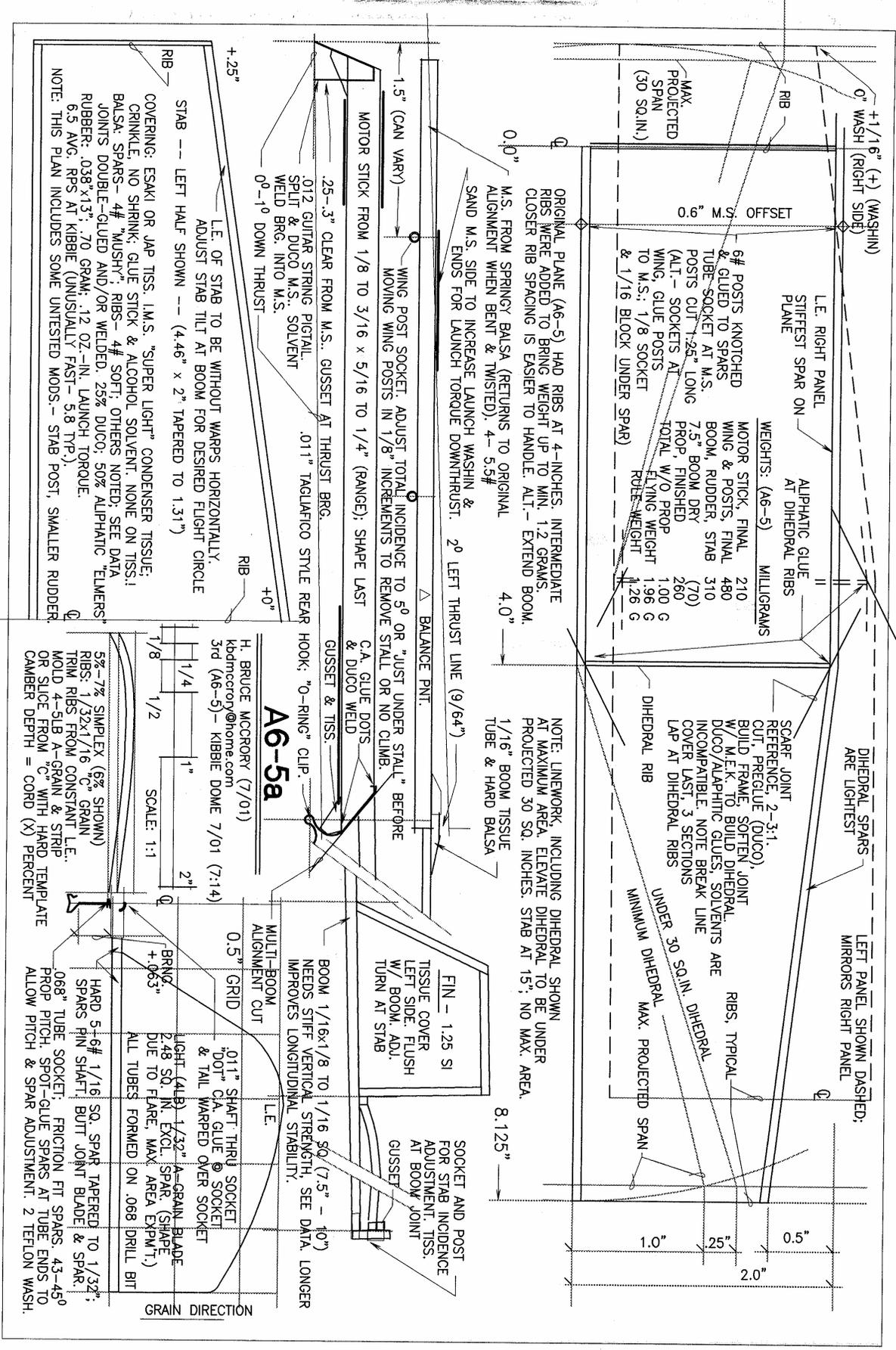
WING WOOD	.4
GLUE AND COVER	.5
STAB WOOD	.3
GLUE AND COVER MS	2.0
BOOM	.4
PROP ASSY	2.5
TIP PLATES	1.4
POSTS AND BRACES	.5
LANDING GEAR	.5
TOTAL	8.8



"FINNY PLANE"

DESIGNED AND DRAWN BY
 BILL GOWEN

SCALE 1" = 4"



WEIGHTS: (A6-5) MILLIGRAMS

MOTOR STICK, FINAL	210
WING & POSTS, FINAL	480
BOOM, RUDDER, STAB	310
7.5" BOOM DRY	(70)
PROP. FINISHED	260
TOTAL W/O PROP	1,000 G
FLYING WEIGHT	1,96 G
RUDDER WEIGHT	1,26 G

NOTE: LINEWORK, INCLUDING DIHEDRAL SHOWN AT MAXIMUM AREA. ELEVATE DIHEDRAL TO BE UNDER PROJECTED 30 SQ. INCHES. STAB AT 15°, NO MAX. AREA.

DIHEDRAL RIB UNDER 30 SQ. IN. DIHEDRAL MAX. PROJECTED SPAN

DIHEDRAL SPARS ARE LIGHTEST MIRRORS RIGHT PANEL

SCARF JOINT REFERENCE: 2-3:1 CUT. PREGLUE (DUCO), BUILD FRAME, SOFTEN JOINT W/ M.E.K. TO BUILD DIHEDRAL. DUCO/ALIPHATIC GLUES, SOLVENTS ARE INCOMPATIBLE. NOTE BREAK LINE COVER LAST, 3 SECTIONS LAP AT DIHEDRAL RIBS

RIBS, TYPICAL

ORIGINAL PLANE (A6-5) HAD RIBS AT 4-INCHES. INTERMEDIATE RIBS WERE ADDED TO BRING WEIGHT UP TO MIN. 1.2 GRAMS. CLOSER RIB SPACING IS EASIER TO HANDLE. ALT. - EXTEND BOOM.

M.S. FROM SPRINGY Balsa (RETURNS TO ORIGINAL ALIGNMENT WHEN BENT & TWISTED). 4- 5.5# SAND M.S. SIDE TO INCREASE LAUNCH WASHIN & ENDS FOR LAUNCH TORQUE DOWNTHRUST.

20° LEFT THRUST LINE (9/64")

△ BALANCE PNT.

WING POST SOCKET. ADJUST TOTAL INCIDENCE TO 5° OR "JUST UNDER STALL" BEFORE MOVING WING POSTS IN 1/8" INCREMENTS TO REMOVE STALL OR NO CLIMB.

C.A. GLUE DOTS & DUCO WELD

GUSSET & TISS.

H. BRUCE MCCORRY (7/01) Kdmccor@home.com 3rd (A6-5) - KIBBIE DOME 7/01 (7:14)

FIN - 1.25 SI TISSUE COVER LEFT SIDE. FLUSH W/ BOOM. ADJ. TURN AT STAB

SOCKET AND POST FOR STAB INCIDENCE ADJUSTMENT. TISS. AT BOOM JOINT

GUSSET

BOOM 1/16x1/8 TO 1/16 SQ. (7.5" - 10") NEEDS STIFF VERTICAL STRENGTH, SEE DATA. LONGER IMPROVES LONGITUDINAL STABILITY.

0.5" GRID MULTI-BOOM ALIGNMENT CUT

0.11" SHAFT THRU SOCKET "DOT" C.A. GLUE @ SOCKET & TAIL WARPED OVER SOCKET

LIGHT (ALB) 1/32" A-GRAIN BLADE 2.48 SQ. IN. EXCL. SPAR. (SHAPE DUE TO FLARE. MAX AREA EXP. T)

ALL TUBES FORMED ON .068 DRILL BIT

HARD 5+6# 1/16" SQ. SPAR TAPERED TO 1/32" SPARS PIN SHAFT. BUTT JOINT BLADE & SPAR.

.068" TUBE SOCKET. FRICTION FIT SPARS. 43-45° PROP PITCH. SPOT-GLUE SPARS AT TUBE ENDS TO ALLOW PITCH & SPAR ADJUSTMENT. 2 TEFLON WASH.

COVERING: ESAKI OR JAP TISS. I.M.S. "SUPER LIGHT" CONDENSER TISSUE. CRINKLE. NO SHRINK. GLUE STICK & ALCOHOL SOLVENT. NONE ON TISS. Balsa: SPARS - 4# "MUSHY"; RIBS - 4# SOFT; OTHERS NOTED. SEE DATA JOINTS DOUBLE-GLUED AND/OR WELDED. 25% DUCO. 50% ALIPHATIC "ELMENS" RUBBER. .038"x1.3". .70 GRAM. .12 OZ.-IN. LAUNCH TORQUE. 6.5 AVG. RPS AT KIBBIE (UNUSUALLY FAST - 5.8 TYP.).

NOTE: THIS PLAN INCLUDES SOME UNTESTED MODS - STAB POST, SMALLER RUDDER

L.E. OF STAB TO BE WITHOUT WARPS HORIZONTALLY. ADJUST STAB TILT AT BOOM FOR DESIRED FLIGHT CIRCLE

STAB --- LEFT HALF SHOWN --- (4.46" x 2" TAPERED TO 1.31")

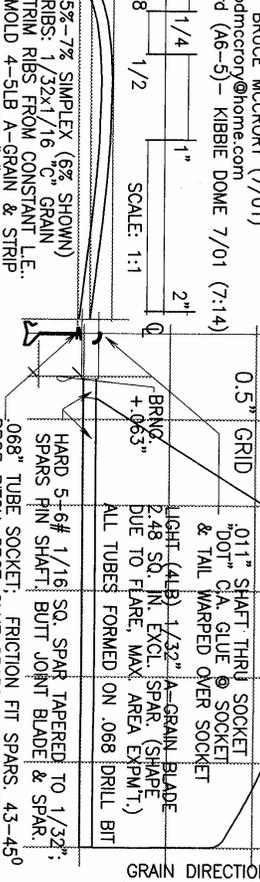
RIB

0° WASH (RIGHT SIDE)

0.6" M. OFFSET

6# POSTS KNOTCHED & GLUED TO SPARS. TUBE SOCKET AT M.S. POSTS CUT .925" LONG (ALT. - SOCKETS AT WING, GLUE POSTS TO M.S.: 1/8 SOCKET & 1/16 BLOCK UNDER SPAR)

ALIPHATIC GLUE AT DIHEDRAL RIBS



A6-5a

DATA	DEFLECTION*/	PIECE PART
PART/DESCRIPTION	Stiffness Coef. (A6-5)	WEIGHTWEIGHT
<u>WING 5a2 Complete</u>	(480mg)	.48g
L.E. Spar	9.5"x.067x.066; 4.52lb	1.1"/SC-82 .05g
T.E. Spar	8.375x.0625x.065; 4.47lb	1.1"/SC-70 .04g
Dihedral Spars (4)	4.5x.063x.065; 4.12lb	---/SC-63 .08g
Ribs at 2" (5)	.033x.063 3.46lb	.03g
Framed Weight		.18g
Covered (Jap. Tissue)	.0083g/sq. in. x 31 SI=.257g	.46g
Posts (other balsa)	1.25"x.065x.066; 8.4lb	.02g
<u>STAB 5a2 Complete</u>		.22g
L.E. Spar	9.5x.066x.065; 4.66lb	1.3/SC-66 .05g
T.E. Spar (Best at wing LE)	9.0x.065x.065; 4.03lb	1.0/SC-92 .04g
Ribs at 2" (3)	.033x.063 3.46lb	.02g
Framed Weight		.08g
Covered (Jap. Tissue)	.0083g/sq.in. x 15 SI=.125g	.22g
<u>BOOM 5a2 Complete</u>	7.75x.0625x.133-.110-.075 (equal meas.)	(B.R.S-310mg) .09g
Blank	7.75x.0625x.133; V-.3, H-.9	(70mg) .05g
Rudder	.01g; Incidence Post-.066x.065x.25; 4.8lb	.01g
<u>PROPELLER 5C Complete</u>	(Mine are larger than the average.)	(5b-260mg) .24g
Blades (2.47 sq. in. ea.)	.032 thick; 4.9lb "A" grain - try for 4 lb.	.17g
Spar (other balsa)	6.0x.063x.065; 4.8lb	.04g
Shaft & Hub/Socket (Socket is the hub; balsa chips may be used as shims.)		.03g
<u>MOTOR-STICK 5a2 (trimmed)</u>	.087x.110-1.29x1.83-1.05x1.55	(210mg) .17g
Blank (other-3/16 "A")	5.875x.133x.183; 4.02lb	.15g
Steel, Tissue, Socket, gussets		.05g
<u>TOTAL WEIGHT - Trimmed</u> (with Jap tissue!!! A personal goal.)	(1.26g)	-N/A- 1.20g Yes!

*Deflection in inches using 480 mg rubber band; based on "The Hobby Shop EZB", INAV #90.

TARGET/WEIGHT ESTIMATES (Above wood is weak, intentionally. 4.5-5 lb with lighter tissue is better.)

M.S.- .17-.25g; Wing- .39-.49g; Prop.- .23-.28g; Stab- .18-.24g; Boom/Rudder- .09-.15= 1.06+ g. Try to keep plane, less prop., under 1.00 gram. Jap & domestic tissue is heaviest at .008+ gram/square inch. Condenser Tissue is lightest at .0036g & .004g. All but "other balsa" was from a quarter sheet at 4.02 lb density. Slicing & sections varied density from 3.5 -4.7lb. Hunt/Taylor stiffness coefficient (SC) test ranged 67/quarter sheet to 50-90 for parts. Poor!

DESIGN- Target was 8:1 wing aspect ratio, minimum weight in wood, long tissue span and simple, knockdown for storage. Have fun, change it. Experiment. Projected wing area is most critical. Plan, calculate, and record; it's part of building. Standardize materials. A6 was my first plane. It taught me a lot without being a finicky subject.

It's easier to draft plan on bond than copy. I glue it to FoamCore board, cover with kitchen wrap; then using stripped 1/2"x1/16 balsa strips outline the frames using map pins. As spars are cut and final weighed, each is pressed to outline using scrap balsa and pins. No pins through structure! All but prop is built on the plan. Plastic wrap prevents gluing to board and Exacto knife pops spars from outline frame.

CONSTRUCTION- Weight goal is 1.2 grams (less than a standard 1-7/8" paper clip at 1.24g), or slightly under. Targets are ranges. Focus heaviest weight to wing's leading edge post, and lighter moving away. Weight is hardest thing to overcome. Trust the weight, deflection and density. I changed how I moved and touched. It's weak wood but a strong plane due to required 1/16" minimum spars and tissue. Deflection is a way to describe member stiffness and select better wood parts. MOTOR-

STICK wood is critical. It must be light, yet stiff, springing back to original shape when bent and twisted. STRIP wood for waste and several planes, sorting for weight and stiffest for wing main spars. Wood is standard hobby shop material. Tube sockets are 1"-1.5" jap tissue rolled on .068" diameter drill bit using Duco cement. Posts are chamfered at tip and twist-trimmed into the sockets. Lick the post tip for tight fit. Weight (grams) / avg. inch volume x 3.81 = density in pounds.

MECHANICALLY, the prop shaft/thrust bearing fit must be frictionless. A smooth, unbound shaft/bearing fit will haul a barge competitively. After forming and before mounting, test both bearing and shaft by "flick-spinning". Clamp wire bearing with tape and shaft when mounting to M.S. to prevent the wire legs from bending. **TOOLS-** include double-edge razors, steel rule, dial calipers (indispensable), cheap stripper, 80, 180, 400 grit sanding blocks and balance beam scale accurate to 5 mg. I've never used a commercial thrust bearing. I have my own way of building thrust bearings but INAV #101 has several good methods, or buy from Harlan & IMS. Disclaimer: This design represents a level of experience of less than two years. Opinions, errors, and techniques are subject to preferential change -- and welcome. Good flying, Bruce McCrory

THE F1D CHALLENGE
By Lt. Col. Bob Randolph

Partial Motor Test Flights

from July 1993 INAV

I have to credit the former World Champ and microfilm supplier Erv Rodemsky for getting me interested in partial motor testing in about 1983. I use this technique extensively, and make very few non-official full motor flights. This saves time, rubber, and models. In my opinion, it is the "Royal Road" to successful FAI and other indoor model flying. I also use it when I fly cabin and mini-stick very successfully.

The basic concept is quite simple. For example, a quarter-sized test motor requires a test stick that is exactly three-fourths of the distance between hooks, and that is weighted to exactly three times the lubed weight of the quarter motor. Since only one-fourth of the full motor turns can be put in, the model should climb to one-fourth of the full-motor altitude and one-fourth of the full flight time.

The good news is that four times as many test flights can be made. The bad news is that any errors you induce through inaccurate procedure or faulty estimation of altitude will be compounded.

Make a $\frac{1}{4}$ test stick that is $\frac{3}{4}$ ths of the distance between the hooks of your model. I suggest you also make a balance with moment arms in a 3 to 1 ratio to be able to quickly add the right amount of clay to the $\frac{1}{4}$ test stick to match the $\frac{1}{4}$ motor you fly. Incidentally, always use lubed test motors for the balance and always center the clay on the mid point of the test stick. Failure to do this will affect the model balance, or worse, crush your motor stick.

We are trying to determine the optimum motor that will result in the most time for the existing temperature and conditions. After you find the optimum motor, back off turns and launch torque, you can expect that a full motor of 4 times the length and weight will fly close to 4 times the altitude and duration achieved. Since Cat I and II require ceiling scrubbing and beam tapping for competitive flight times, I will cover my modified test stick procedures in a future article.

The following is how I flight test a new ship. I make up 8-10 $\frac{1}{4}$ test motors (use one o-ring) close to the best guess as to the right length and thickness. Let's say this is a 4" loop of 0.070" Tan. I would also make a 4" 0.068" and 0.072", plus a 3.5 " and 4.5" of these same thickness. Balance the test stick for the motor to be used and put in 100 turns. Adjust wing incidence under this cruise power. Adjust circle size if required and check on the ship's cruise altitude. If not enough nose up, adjust more negative incidence in the stab. This will mean readjusting wing incidence. You are looking for a floating cruise where the nose stays up to load the prop and reduce its RPM. Too much will produce a mush requiring more cruise power.

Peak $\frac{1}{4}$ motor flying time will require a fully broken-in motor, but I must admit I break in these little motors by flight tests. You do not want to out climb the site, so start out with all the turns it will take, but back off so that the launch torque is 25 units. If this is still too much power, use your steering pole to prevent out-climbing your site. Better to only climb half way up and keep increasing launch torque slowly. You can't really tell if a motor is the right size until you reach full height. Upon landing, the turns remaining will indicate if you have too much or too little power. A non-VP prop should have about $\frac{1}{3}$ row of knots left. A good VP prop will have very few turns left. For either type of prop, going deadstick before reaching the floor means the motor is too powerful. Whether to correct this by reducing the thickness or increasing the loop length depends on the flight time you achieved. Keep in mind that we are seeking flight repeatability, so you must be precise in your winding and test stick technique. I like to use several motors of the same size as they can rest and recover fully between flights. The three most important factors for FAI flying are practice, practice, and practice.

F1d Prop Construction, continued

by Steve Brown

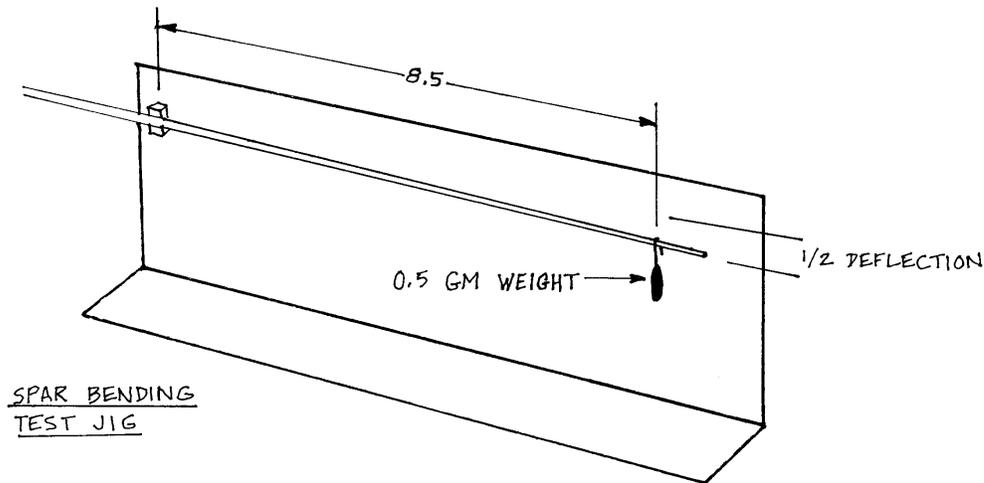
Prop spar

Cut the spars in matched (side-by-side, similar sized) pairs from a pre-tapered sheet of 5.5 lb. "A" or "AB" grain balsa. The easiest way to do this is to obtain 12" tapered wood from IMS. Only a few of the sheets will be suitable. All are tapered too much for F1d prop spars, so you'll need to sand them to the appropriate dimensions. You can cut the spars with the Harlan stripper, or, as I do, by "eye" using a heavy metal straightedge.

Once you have several matched pairs of spars cut to roughly similar sizes, orient the spars with the narrow dimension front-to-back and the wide dimension on the sides. This orients the grain structure for maximum front-to-back stiffness. Cut a diagonal joint either by eye or using the Mini Miter Box described by Bruce Kimball in INAV #102. Glue the spar pairs together with unthinned aliphatic resin glue applied with a toothpick. Using aliphatic resin glue for this one joint will later allow you to soak out a bent prop shaft with acetone without running the risk of dissolving the joint.

Once the center splice has dried (2 to 3 hours) locate and mark the center of the splice with a felt tip pen. Then place ink marks at 2" intervals on both spars from the center to the tip. Begin sanding using 320 grit paper on a 1" X 5" sanding block. Sand the wood on all 4 sides until the cross sectional dimensions at corresponding 2" intervals on each side are the same when measured with a dial thickness gauge. Each spar is slightly different, but I typically start with a dimension of about .068 X .075 at the center and taper to .035 square at the tips.

Once you have the spars tapered equally on both sides place the spar with the narrow dimension oriented top / bottom into a test jig as shown.



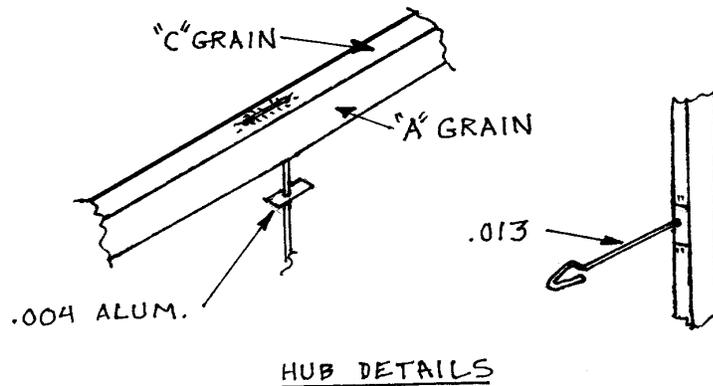
This jig is described in detail in Larry Coslick's "Hobby Shopper EZB" article in INAV # 90. Hang a 0.5 gm. weight exactly 8.5" from the center. Look for deflection of about 1/2" at 8.5". Sand the spar lightly until you get exactly the same deflection on both sides. You may need to reduce the center section to induce more bending. Spars that bend excessively (more than 3/4) will probably be too soft.

For fixed pitch props drill a .012" hole through the exact center of the spliced spars. I intentionally drill this hole slightly undersized for a .013" prop shaft. Cut a piece of .013" music wire about 1.5" long and form a 90 degree bend at one end. Be certain the leg is bent 90 degrees and is at least 0.2" long.

[For VP props don't install a prop shaft. Proceed at this point to construct your VP mechanism with these spars. Cut and discard the spliced joint area. Once both spars are installed into the VP mechanism go to Assembly, below.]

Cut a large piece of aluminum from a soft drink can and sand both sides with 220 grit paper to remove the paint. Drill a .013" hole in the aluminum. Using scissors cut a rectangular plate from the aluminum with the hole in the center. The exact size of the plate isn't critical, but I typically make them about .060 wide X 0.1 long. Finish the plate by squeezing it lightly with flat-jawed pliers to flatten it and deburr the edges with a file or sanding block. The plate will greatly strengthen the joint between the shaft and spar and will also function as a bearing surface.

Insert the prop shaft through the hole in the spar and place the plate on the opposite end. Apply Ambroid or Duco liberally to the shaft, the bent leg of the shaft and to the back face of the plate before pressing everything together. Apply moderate pressure to the bent leg area to slightly imbed the leg into the wood of the spar. Immediately check the shaft with a triangle or square to assure it is at exactly 90 degrees to the prop spar. Reorient and apply extra glue as needed. Allow to dry for 30 minutes. Recheck for squareness, then re-apply more glue to the shaft leg and around the edges of the plate. The strength of this joint is critical – it's not the place to save glue weight.



Allow this structure to dry for an hour. Then bend the prop hook shape and cut off the excess wire. Before bending the hook I put a thrust bearing (Harlan) on the shaft and mark the point of the first bend on the wire 1/16" behind the pigtail of the bearing. Be careful when "eyeballing" the position of the first bend, since it's all too easy to make the bend in the wrong place and later find that it's not long enough to fit in the thrust bearing.

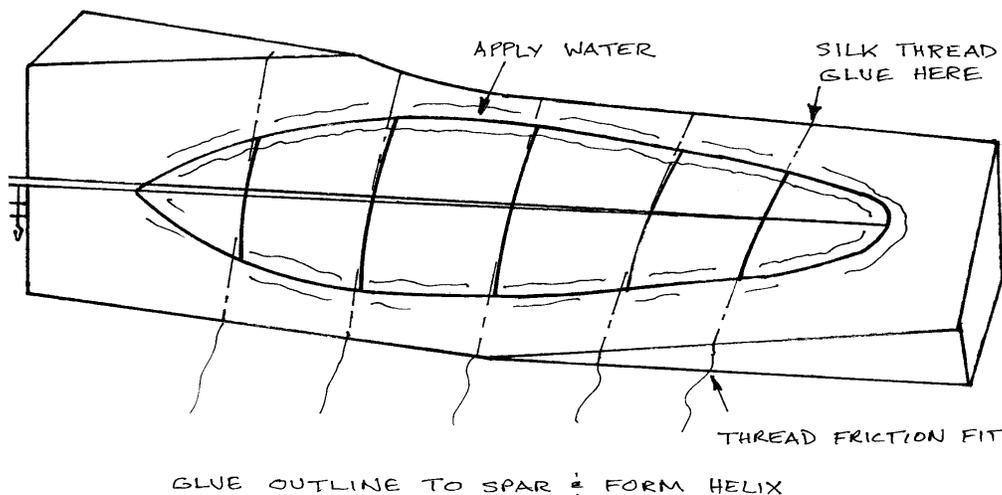
I use the classic "Richmond" hook shape, but a "S" shape will work as well. If you use a "S" hook it may be easier to form the "S" hook first and then insert the shaft into the spar and bend the 90 degree "leg." I've experimented with many hook shapes and have never seen any advantages to any particular shape beyond ease of rubber hook-up.

Assembly

Shim the block under the front or back edges to place the 45-degree point for the desired "pitch" (measured with a triangle and a square) and then set the adjustable shaft stop to 90 degrees with a square. Place the spar on the block and secure the shaft against the stop with masking tape if you don't have a spring retainer on the stop.

Lightly tape the spar to the block with 2 or 3 pieces of 0.1 X .75 strips of low-tack masking tape (blue painter's tape or drafting tape). Make sure it is straight. The spar should lie flat against the block for its entire length. You may need to reposition the pivot of the rotating prop shaft mounting to assure the spar will lay flat against the block. Cut the spar to the desired length using the reference ink marks on the block face.

Place the blade outline on the spar. Beginning at the tip, align the centerline ink dot on the outline with the "line" formed by one edge of the spar and double glue the tip and each rib station working from the tip to the hub. Press the outline to the block face as you glue. This will form the helix.

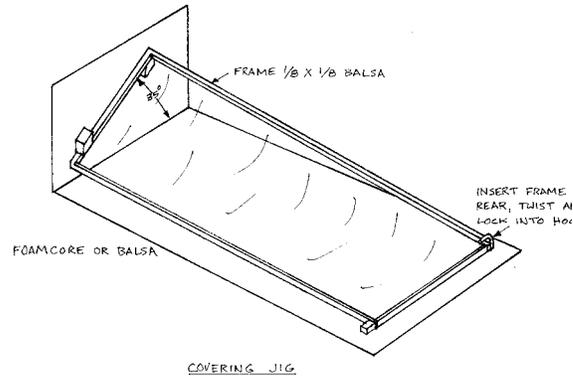


Allow 30 minutes for the glue to dry once all the rib stations have been glued. Then, using a ¼” round soft bristled brush loaded with water, paint water over the outline, but not the ribs. Soak the wood thoroughly. **Caution:** Blot any excess water from the tip with a Kleenex. Do not allow water to puddle at the tip or it may cause the outline to soften and kink. Draw the threads over the rib stations and secure the structure to the block face with gentle downward pressure. Dry at least 3 – 4 hours. The longer the structure is allowed to dry while it is “strapped” to the block by the threads, the better. Then complete the second blade.

Covering

I use a “wet” covering method since I am used to working with microfilm. Larry Coslick has described a “dry” covering method using spray glue in previous issues of INAV.

I use a prop covering jig as illustrated. The jig can be constructed of any available material, such as foam core, balsa or corrugated cardboard. Make the frame out of 1/8” or 5/32” square balsa. Reinforce the corners with balsa gussets. I usually make several of these frames since they are easily broken and having more than one speeds the covering process.



Unroll Y2K or Y2K2 plastic film on a flat sheet of the yellow foam rubber used in furniture. This will minimize the strong static attraction that characterizes the thin plastic films. The plastic should be as flat and taut as possible. Spray one side of the wood frame with 3M 77 glue and place it on the plastic film. Cut with a 15 – 25 watt soldering iron or cautery. Place the plastic covered frame in the jig. Twisting the frame will create a lot of slack.

It is critical that the wood outline of the prop, the tops of all the ribs, and the tip and hub points of the outline be very wet. Using a ¼” soft bristle brush, wet the outline with saliva or “sticky” water (water mixed 50/50 with white wine or water with some egg white mixed in). Plain water does not secure plastic well. Move rapidly – all of the top and sides of the outline must be wet simultaneously. Immediately place the wet outline face down on the plastic film. Press it down lightly and make sure that the entire outline is in contact with the film.

Wait 2 to 3 minutes then cut the covered outline free of the frame with a soldering iron or cautery. Cut from tip to hub, cutting one side, then the other. Leave a tiny portion of the tip uncut to prevent the outline from flipping up out of the jig. Make certain the film is cut at the hub end (bump it lightly with the iron to be sure) then finally melt the uncut portion at the tip.

Seal the edges of the plastic to the outline sides by working saliva under the edges with a loaded brush. Then place the wet, covered prop blade back on the prop block. Draw the threads over the rib stations and dry for at least 3-4 hours. Repeat for the other blade.

Excess slack can be removed by drawing a small brush loaded with “sticky” water or saliva over the rib stations. Do this after everything has dried thoroughly.

Finally, place the new prop on a pitch gauge and tweak the spar as needed to assure that the blade angles are identical for both sides. Check the prop in the field when flying. Props always move as weather conditions change and you should check pitch at least once every flying session. Add one .050” diameter Teflon washer to the shaft before flying.

This article includes techniques developed by Cezar Banks and Bob Randolph.

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Catapult Glider Launching

Theories

By Kurt Krempetz

In my pursuit to get a catapult glider flight time up, it was clear to me that getting to the top of the ceiling of a building I was flying in was very important. I always noted that all the gliders that were turning the best times were launched and transitioned very close to the ceiling. I started thinking about some of the basic fundamental laws of physics, trying to understand how to get the gliders higher. Was it just getting a stronger rubber band or stretching the band out further? Maybe it was the weight of the model? Did the strength or flexibility of the model have any effect? Did the drag of the model matter? These issues still puzzle me today, but I believe I am starting to understand the parameters better. With experimentation and applying some fundamental laws of Physics I believe I am starting to appreciate the parameters that matter. Understanding these parameters/issues should help us get better flight times, something we are all trying to achieve. The theories I present below may not be correct; I don't claim to be a theorist. One of the reasons for this article is to get feedback and find possible errors in my thinking. So any constructive comments you have are appreciated. My e-mail is krempetz@home.com.

First lets imagine "the perfect launch". I envision it as the glider going straight up vertically from my hand to the ceiling and just an inch below the ceiling it runs out of speed and comes to a stop. Just as it stops the model does some sort of snap and....now it is flying level and at its gliding speed. If you told me this is possible a few years ago, I would have thought your were crazy. But at my first catapult glider contest I watched in amazement as Bob Warman consistently had his model performing "the perfect launch".

Now I started to think about the perfect launch and how it related to simple physics. To start the model has no energy. You stretch the model and rubber band out and now all the energy is stored in the rubber band. You release the model and the energy from the band gets transferred into the model, mainly into kinetic energy or motion. Then as the model is climbing it is being resisted by gravity and drag. So if I assume all the energy in the rubber band gets converted into kinetic energy and that in turn gets converted into potential energy, I can use some simple physics equations to predict what the model should do. Note I ignored drag, basically because I didn't know how include it. I get back to drag later. Remember high school Physics?

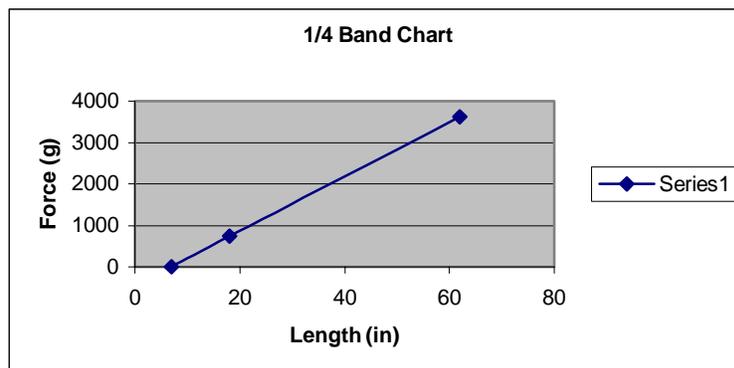
Potential Energy equation: $E=m*g*h$; where E=energy, m=mass of model, h=height
Kinetic Energy equation: $E=1/2*m*v**2$; where E=energy, m=mass of model, v=velocity
Work equation: $E=F*d$; where E=energy, F=force of the Rubber Band, d=distance.

As an example I will use my Modified Upsweep glider I flew at the NATS 2001 in Johnson City, Tn. The mass of the model was 11.3g, and I used two 1/4" bands- 7" loops to get in close to the ceiling. Actually hit the ceiling a few times, 116 ft. You can also relate height to velocity by setting the potential energy equation=kinetic energy equation and get:

$$h=.0334*v**2 \text{ where } h=\text{height in ft, } v=\text{speed in mi/hr.}$$

Plugging in some numbers say 100 mi/hr as a launch velocity; $h=.0344*100*100=344$ ft. Maybe my estimate for launch velocity is wrong and I will assume 60mi/hr. Then $h=.0344*60*60=123$ ft. Interesting note is mass drops out of the equation. Personally I think the glider max. speed is in the 100-150 mi/hr but maybe I am wrong. But lets continue with this logic. Next I could measure the energy in a rudder band, right? I took one 1/4" band with a 7" loop and hung some weights on it then measured the distance the band stretched from the weight.

Below is the data;



The energy in the rubber band is the $F \cdot d$. Since the force is changing with distance the energy is the integral or area under the curve. For a straight line which my band data happen to be close to, the area under the curve is a triangle or $1/2 \cdot (F_2 - F_1) \cdot (d_2 - d_1)$. Plugging in the numbers I find $E = .5 \cdot (3624 - 0) \cdot (62 - 7) = 99660 \text{ g-in}$. Now I used two bands at Johnson City so I double the Energy and get 199320 g-in.

Now using the potential energy equation I can predict the height of the model:

$$h = .08 \cdot (E/m); \quad \text{where } h \text{ is the height in ft,}$$

E is the energy in gram-inches,
 m is the mass of the model in grams.

Plugging in the numbers simple physics predicts $h = .08 \cdot (199320/11.3) = 1411 \text{ ft}$ This is clearly off by a factor of 10. You can also use the kinetic energy equation to predict the velocity: $v = 1.58 \cdot (e/m)^{.5}$ where v = speed in miles per hour, E = energy in gram-inches, and m is the mass of the model in grams.

Plugging in the numbers $v = 1.58 \cdot (199320/11.3)^{.5} = 210 \text{ mi/hr}$. Again seems too high.

Remember I ignored drag, and this factor is a logical explanation for the numbers calculated above being off so much. Actually if you believe the calculations are correct then drag is the dominant factor. I found that very interesting and have worked very hard on reducing the drag in my models this past year.

Junior F1D Team Finals, Akron, OH 2001 **by Matt Chalker**

This was my first experience as a Team Finalist for F1D models, and I have to say, I had probably enough different experiences and learned enough for 10 team finals. Before I went, I read several other people's articles on their experiences and they helped calm my nerves when bad things happened, and trust me, they happen. So hopefully, this will help other future finalists out as well.

First, a little about the site. For anyone who hasn't been there before, the air dock is absolutely amazing. I had never even seen a blimp hanger before, let alone fly in one so it was quite awe inspiring. It is 179' high, 1175' long, about 250' wide and dirty as all get out. It has a lot of character as well as size. There are huge piles of stuff sitting on the ground that look like they have been there since the 60's and some of it probably longer. And the dirt layer makes it impossible for people like me to walk around barefoot, so alas, I had to wear shoes that weekend, which was quite the disappointment. Also, every day there are quite a few doors/large gaps that need to be closed off to make the site less turbulent. Not much though, as several of us learnt in the morning hours.

Test flying on the first day proved to be fruitless, as we could actually feel the wind on the ground. Steve Brown actually mentioned to me that he had never seen the air so bad in the dock. Around the time the rounds began at 12 or so, the air had calmed down some and most people began test flying and because of this late start, most people didn't get first round flights off. I personally just put up a full-motor test flight and had someone else time it so it would be counted as official.

The largest problem I had was stalling on launch, from a motorstick that was quite a bit too strong. Steve showed me how to loosen the bracing wire and bend some downthrust into a Harlan bearing. That extra downthrust helped immensely and allowed me to post a 22:22 in the 2nd round, amazing how just that little bit added almost 7 minutes to my time! The model still had some issues with stalling on launch however, and I kept fighting with it the entire contest and not until the final day did I have enough.

Meanwhile, over in Camp Schaefer, Doug was hard at work (as usual), posting a 27:43 in the 2nd round and a 29:42 in the third round, which at the time was tied for the high time of the contest, with Larry Cailliau. Absolutely amazing, but if anyone I would expect Doug to do it, as he can do some amazing things with a little balsa wood and some plastic.

For my third round I added a little extra downthrust, decreased my rubber size and ended up posting a 26:03. The model climbed to around the 5th level catwalks, maybe a little less, which is about 150' high. It deadsticked and landed with about -40 turns on the rubber, so I had some improvements to make, but at least I didn't have any damage to repair, but several others didn't fair quite as well. I forget who had what damage when, but there was quite a few destroyed models, or in Jeff Daulton's case, model parts, many model parts ☺.

Sunday morning, the second day, the air was still quite turbulent, but not quite as much as the day before and several of the more adventurous fliers (including myself) put up some scary test flights. That morning John Kagan, our hardworking CD, showed up with a pretty hoarse voice. There must have been something with the dirt or in the air, as I wasn't feeling 100% that weekend either. But anyways, he had a hoarse voice and it was slightly humorous because he wouldn't admit that he was getting sick although it was blatantly obvious that he was.

As the day went on, the air got considerably better although the drift was still present. I put up a pretty early official flight that round, as I was trying to avoid the mass herd of models in the air, and the shortage of timers that occurs towards the end of the rounds. This was a BAD idea. I thought the big drift was only on the lower levels, but as I discovered, this is wrong. I launched relatively close to the east wall, thinking the drift was towards the west wall, which it was, up until 75 feet. Once the model got above 75 feet, it tried to play tag with the east wall and see

just how close it could fly to it without getting hung. Quite a few people were watching that flight and some said that it actually flew between the girders on one of the circles. I missed several steering attempts, as the model was at 140 foot and over a large pile of boxes and junk on the floor. I eventually caught it with my balloon, just in time because on the next circle it probably would have hit that crane jutting out of the side of the wall. Once I had it, Tom Sova led me through the mass of junk on the ground, which I couldn't have done without his help. I moved it to the middle of the hanger, and it ended up landing at 27:something and minus the prop stop it was 26:38, so a good time, but a terrifying flight. Maybe that taught me not to launch during high drift times.

If I remember correctly, shortly after that flight landed, Steve Brown launched the most interesting/funny/scary flight of the weekend. He told me that he was getting a little frustrated with his model not climbing like it should, so he took 2 turns off the high pitch screw and 1 turn off the pre-load screw, this is where ½ turn is quite a bit to take off. To say the least, the model got quite well acquainted with the roof. I think it was at the roof in 3 or 4 minutes, and stayed there for at least 15 minutes, hitting it a lot during that time. Eventually Steve did a 170-foot steer, which is amazing how easy he made it look. The rubber fell off the model at 110 foot and who knows at what level it deadsticked at.

For my 5th round, I tried to repeat the round before, but without the walls or balloons becoming involved. I couldn't quite achieve that, and landed with a 23:18.

Around the same time as the 5th round, I began talking to a lot of people and I noticed that, unlike everyone thought would happen from the rules change, there were a lot of really creative and different designs. For example, Tim Goldstein had a braced-unbraced model. Similar to putting Boron on a wing spar, but using a technique somewhat similar to motorstick bracing. Another thing I noticed was a large number of beautiful models, and my personal favorite was Larry Cailliau's, which I thought looked absolutely perfect with it's crinkled Y2K2 that had a pretty much solid gold coloring. The point of my talking about talking to people is that it is important, but it distracted me from MY model, and hurt me in the next round.

I put up a few half-motor flights as well, and began to get frustrated. My RPM went up by almost 20 and the duration was shortened by a lot. I put up a flight towards the end of the round just to have an official, but it deadsticked at 19 minutes with the same rubber and prop that had done over 26 minutes. I got confused and had no idea what to do. I went back to my grandparent's house to try to figure it out, and the only thing I could think of it that I must have accidentally bumped the incidence down a little, causing it to not hang on the prop correctly. On Monday I put the incidence back into the wing and it flew just like it should. A good reason to remember to put that re-stickable glue on the wing posts every time you fly.

For the first 2 flights on Monday I increased the pitch on my prop and by the end of the 8th round was putting up 14+ minute half motor flights. I was looking forward to trying to play with Doug on having the high time for juniors in the contest, but then the final round happened to my model.

I wound up a well broken in motor with enough turns for 29-29:30, hoping to deadstick and glide for a little while. I launched and had some of the same trouble I had all weekend, no turn on the launch. It actually flew straight across the width of the hanger, all the time me not worrying about it because before it had always pulled out of it and started its turn. Instead, this time it ran straight into the wall, but as luck would have it, it just bounced off and flew back out of the wall in the opposite direction. It was over one of the indoor buildings now, and of course it got its turn back, so I couldn't catch it with my balloon, letting it fly back into the wall again. It got stuck right on the ridge where the clam shell doors met the walls of the hanger at 2:30, so I had to wait until Parker landed to see if I would make it on the team. And once he landed, I dropped into 4th place.

I went over to talk to Bill Hulbert about climbing onto the building to retrieve my model, and he said just as long as someone watched me. Mark Schaefer was watching me, and just as I got to the top of the staircase Jeff Daulton walked in with my model (sort of) in his hands. I didn't understand how he retrieved it, but he didn't really retrieve it. Apparently they saw it fluttering around in the wind outside, and picked it up. I couldn't believe that my model had flown/gotten sucked outside! After some more investigation, I discovered that there was a large gap between the clamshells and the wall where a rubber skirt used to be. It was about 1 foot wide and I assume the model was sucked through this gap. Many people were saying they had never heard of a model flying out of a building before, especially a F1D, especially at Akron.

To say the least, the weekend was quite the experience and I learned a ton there. The thing I have to say is that Indoor Modelers are quite possibly the most hospitable people out there. Steve Brown helped me a ton, even to the point of his not putting up a flight in one round. I couldn't be flying without all the help I have received. All of the adults are completely accommodating and wonderful. Also, the competition from the juniors is fierce and the three who made the team are wonderful builders, flyers and good friends of mine. Everyone who competed did a great job, and I have to compliment them all as everyone made excellent progress and I'm already looking forward to trying to make the adult team in future years.

•BY BOB WARMANN

Why should a finish be put on an indoor balsa glider flight surfaces? Not for protection but rather for drag reduction at launch velocity and the increase in altitude attained from the launch. The desired finish will eliminate all peach fuzz like fiber from the surface, seal pores, fill grain cavities and not increase weight significantly. The method to be described meets all of these requirements without requiring an additional ton of elbow grease. Really find it difficult to believe it took me 60 years of building gliders to discover that my furniture finishing technique could be used on balsa wood.

My finishing method requires changes in the wing and tail fabrication. They involve the thickness and degree of smoothness of wing, horizontal and vertical stabilizers. Surfaces are all finished to a dimension, which is 0.015 of an inch thicker, than the desired finished thickness. Example: the wing trailing edge is to be 0.020 inches thick, make it no thinner than 0.035 inches. Finish sanding all fabricated components with 220 grit sandpaper. The rough surface will make the final finishing easier. Wings, which have bass wood or bamboo leading edge reinforcement or were constructed of several pieces of wood glued together should have excess surface glue removed. Use a solvent to soften glue and a single edge razor blade as a scraper to remove the softened glue before sanding of wood with 220 grit paper. Tip: small vertical stabilizers are difficult to hold while sanding; leave a handle on it by not cutting bottom edge of vertical stab from sheet until part is finished and ready for attachment to the glider. The flying surfaces as now sanded are ready for finishing.

The glider finishing method I use is a variation of the woodworker finishing technique called "French Polishing". Surfaces to be finished are wet sanded with the finishing solution used as the sanding lubricant. The wet sanding will produce a slurry consisting of the solution and abraided wood particles. The slurry is produced by removing 7 to 8 thousandths of an inch of wood from the surface. Sanding both surfaces in thus manner will result in a 15 to 16 thousandths of an inch reduction in the part thickness. It now conforms to the desired finished thickness. The slurry produced by wet sanding with successive grits of paper will be worked into all indentations in the wood. The slurry functions as wood filler, however, when dry, it will only require a light sanding with 600 grit paper to complete the finishing. Polishing with 1600 grit paper can be done but I usually quit with 600 grit.

The finishing solution used must be compatible with adhesives used to assemble the glider. Wet sanding must be done on a clean, flat, hard surface that is resistant to the finishing solution. I have found glass to be the most satisfactory. Sandpaper must be backed with a flat firm block. Mine are fabricated from extruded aluminum rectangular pipe. Glue a different grit paper to each surface. Undercambered wings require a block with some curvature to work the concave surface. Blocks using glass bottles or wood trim moldings are satisfactory. I use oak door threshold stock for mine, but only use undercambered wings for lower ceiling gliders. The finishing solution used consists of polyurethane and mineral spirits mixed in approximately equal parts. Depending on the polyurethane used, the mixture may require adjusting. The polyurethane I used was purchased at the local paint store, McClosky brand. Use the gloss finish and only enough to bond the slurry to the surface after drying. Polishing solution can be applied to surface with cloth, tissue or brush before wet sanding.

Try the method on a vertical stabilizer first. The step by step method of finishing is as follows: 1.

Apply urethane-mineral spirit solution to one side of stab, completely covering surface.

2. Use a 330 grit block. Wet sand in circular pattern the complete side. Remove approximately 0.005 inches of thickness and work slurry into wood grain. Should the slurry become too thick, add more solution.

3. Use a 400 grit block. Wet sand in circular pattern the complete side. Remove approximately 0.001 inches of thickness. Should the slurry become too dry, you will start rolling small hard balls of material, which will groove wood. Should this happen, apply more solution and continue sanding.

4. Use a 600 grit block. Wet sand in circular pattern but with light pressure. Try to work only the slurry and not remove surface wood. Stop sanding before surface is dry enough to allow rolling of slurry in small rolls or balls. Complete sanding by removing excess slurry with several strokes with grain.

5. Repeat steps 1 through 4 for other side of stab.

6. Allow 4 hours for finish to dry.

7. Dry sand both surfaces and edges with 600 grit block.
8. Lightly sand with 1600 grit (surfaces and edges).
9. Repeat steps 1 through 8 for 'wing and vertical stab. Leave handle on vertical stab until finished. Leave wing flat until finishing is complete.

This finish has not resulted in any problems in gluing parts with nitrate, butyrate, cyanoacrylate, epoxy, or aliphatic resin glues. When attaching wing to fuselage I remove finish from the bottom of the wing, (sand flat at dihedral joint).

What does the finish weigh? I have no idea. However, this is the only method I have ever used where the finished glider component weighs less after finishing than its original weight. You can verify this by weighing piece parts before and after finishing.

My gliders are finished by this method but I stop at Step 7. Finishing beyond this point really does not result in any increase in performance.

Here are a few tips for those individuals who must have that mirror like finish: and all glider components to size using your own method but stop at 400 grit paper. Save all your sanding dust. Now do Step 1, then sprinkle sanding dust lightly on solution applied in Step 1. Skip to Step 4 and complete procedure through Step 9. You will now require a hook and loop hand-sanding block, a foam pad and a 4000 grit Abralon pad. Use the hook and loop hand block with the foam interface pad, the Abralon pad applied over both and charged with the polishing solution. All that is required now is a ton of elbow grease. Abralon is available from Mirka Abrasives Inc. (800-843-3904) and from Woodworkers Supply Inc. (800645-9292).

2001/2002 INTERNATIONAL POSTAL CONTEST from 1st Oct 2001 to 31st March 2002

The postal contest we have been holding across Canada for the last six years, no longer achieves its original objective of attracting interest from across the country.

I have decided to give it one more try and will accept entries from around the world. To do this I will keep the pure duration events as FAI events and include two scale events that appear to be popular outside N. America.

Thus the events for the 2001/2002 season are:

F1L (International Easy-B)

F1M (F1D Beginner/ International Pennyplane)

FAC Peanut Scale

NoCal (profile) Scale with a minimum weight of 6.2 grams without rubber motor and built to FAC rules.

I have assumed that most flyers have regular access to spaces with Category I ceilings (less than 8 metres) and all times will be factored to that height, even though they may have been flown in higher ceilings. Most of the above classes have rules regarding dimensions, minimum weights and maximum rubber weight. I propose to run the contest on a trust basis and will assume that all flyers will abide by the rules so that I do not create the problem of requiring the flyer to provide me with a certification by a third party that his models comply with the rules.

The contest will start on 1st October 2001 and finish on 31st March 2002. Any flight times from 31st March should be sent to me as soon as possible after that date.

Entries should include the ceiling height, the flight time and, in the case of the scale events the name of the full-size aircraft that the model is scaled down from. The entries can be sent to me by e-mail or fax or snail mail as follows:

e-mail henderson98@yahoo.com

Fax (416) 481 0016

Regular mail W.Henderson
15 Joicey Blvd.
Toronto, ON
Canada M5M 2S8

I will advise you later as to which web site will be used to publish the results.

The following sign-up list was sent to us by Dave Thomson, and we thought it would be of interest.



EVENT PARTICIPATION LIST FORM 11

Event Name Demonstration - West Baden
 Sanction No. 01-2014 Date(s) 11-12 Aug 01 No. of entries - this event

PLEASE PRINT ALL INFORMATION LEGIBLY

	Name	Place	AMA #	Address
1.	JAMES I. MILLER		89382	107 LORELEI DR FAYETTEVILLE OH 45188
2.	Vince E Sadwick		617491	69 Woodside Dr Bergen NY 14416
3.	DAUG BARBER		56270	MAPLE SHADE NJ
4.	BILL GOWEN		615737	2105 HERITAGE HTS, DECATUR, GA 30033
5.	DAVID ARONSTEIN		97976	16620 SW 130 ROSE HILLS KS 67133
6.	Jam Sava		473169	5325 Washcroft Sylvania OH 43560
7.	Fred Pellier		MMAC9125	3160 SUSSEX CMT WILD SW OH
8.	Roy White		6300	1025 Cedar Catawissa Mo.
9.	MARK SCHAEFER		721320	6654 Deepstown Fairbairn OH 45338
10.	DOUG SCHAEFER		680152	
11.	Walter P Van Doren		19912	5669 VICTORY VIEW LN CIN. OH 45233
12.	LANNIE L. KINDER		45633	P.O. Box 208 WINDFALL IN 46075-02
13.	LES HALLGARTH		319629	847 GLEN Echo DR, ANDERSIN IN 46012
14.	G. R. NOLIN		12306	663 WOOD HILL DR FAIRBANKS OH 45324
15.	Jeff Daulton		711773	7620 West Van Datta Cir, Centerville, OH 45459
16.	Mae W HATTENMORE		39457	2348 S. 700W, NEWALEXANDRIA IN 46663 OH
17.	CARRY KOUSKA		12210	3398 OROSELWOOD TR WILCOUGHBY OH 44115 S
18.	CARRY MAIK		3687	117 Sycamore Dr Fairbairn OH
19.	Joey Sippel		714758	2026 East St. Rt. 36
20.	David Thomson		8410	5432 Huff Rd Cincinnati OH 45247
21.				
22.				
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CD INSTRUCTIONS

Submission of this form by the Contest Director is necessary for compliance with insurance requirements. This information can aid you in your promotion of future events and settlement of any event problems. The Contest Director retains the copy and returns the white original sheet(s) within seven (7) days to AMA Headquarters, attached to Form 10.

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Call for Papers for the 2002 NFFS Symposium



The Symposium is presented annually by the National Free Flight Society. The primary purpose of the Symposium is to promote and encourage the investigation, discussion, and documentation of the technical and theoretic side of free flight. Papers addressing historical, administrative, documentary, and philosophical aspects of the sport are also welcome. Outstanding models and modelers are honored.

See us at: www.freeflight.org/

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 (937) 433-0975
servaites@aol.com

UPCOMING CONTESTS FOR 2001/2002

2001/2002 INTERNATIONAL POSTAL CONTEST from 1st Oct 2001 to 31st March 2002

F1L , F1M , FAC Peanut Scale, No Cal (profile) Scale
(see complete details on this postal contest on page 27 in this issue)

CONNECTICUT - NORWICH

Nov 11 & Dec 1 Norwich FAC Indoor Flying Session at Teacher's Memorial JHS, 9 am to 2 pm.
Contact John Kaptonak 860-442-9003

FLORIDA - TAMPA AREA

Dec 1-3 MIAMA Meet - Florida State Fairgrounds Exhibit Hall, 45 ft ceiling, US 301 and I-4
Dec 8-9 Ditto Flying Session
Dec 29,30 MIAMA Meet – Delta Indoor King Orange, Tampa, FL, Rich MacEntee 813-729-1524

FLORIDA – ST. PETERSBURG

February 2,3 MIAMA Meet - 230ft Tropicana Dome, St. Pete, FL. All AMA/FAC Events. No trophies-just challenge. No pre-registration. Snailmail info: send #10 SASE 34 cent stamp to Dave Linstrom 4016 Maguire Blvd Apt 3314 Orlando FL 32803 (407) 894-3097 Online:per AMA District I thru IV NewtB newtsworld@aol.com V-VII RikC gdnchoate@aol.com IX-XIII & Canada/Overseas davidlinstrom@cs.com Include snail address & phone in email. 3rd annual meet in awesome public site. Practice for 2002 Jr & Sr F1D Team pending USIC Style Race to Roof Event Call MIAMA Hotline Doc Martin (305) 858-6363 Jan 26 to confirm before traveling.

GEORGIA – ATLANTA

Nov. 10 TTOMA Indoor Meet – North Springs High School, Sandy Springs, GA (not confirmed)

IDAHO – MOSCOW

July 27 – 30 Kibbie Dome Indoor. A 4-day contest with the Wally Miller EZB contest (1.2 gm) flown in the middle of the main event. All AMA and FAI events flown. This is a world class 145' ceiling site. Normally an FAC contest is held at the same time. CD Andy Tagliafico at 503-452-0546

MASSACHUSETTS – CAMBRIDGE

Evening Indoor at MIT –Flying from 6 pm to 10 pm at MIT's Dupont Gym, the corner of Vassar and Massachusetts Ave. in Cambridge, Mass. Call Ray Harlan at 508-358-4013. Nov. 3, Dec 8, Jan 5, Feb 2, March 2, April 6, May 4

NEBRASKA – BEATRICE

Nov 17 Nebraska Indoor Championships, sponsored by the Nebraska Free Flighters Club, for EZB, Ltd. PP, Kit Plan Scale, Bostonian, Unlim. Cat. Glider, HL Glider, MiniStick, Peanut. Site: City Auditorium. John Pakiz CD, 4411 Parker St., Omaha, NE, 68111. Ph 402-556-1432.

NEW JERSEY – LAKEHURST

Indoor Flying at Lakehurst – The East Coast Indoor Modelers (ECIM) have the use of Hangar #1 every week from sunup to sundown. The hangar is 800 ft. long by 250 ft., and 180 ft. high. To join ECIM. Contact Rob Romash at 856-985-6849. E-mail cgrain1@yahoo.com . Dues are \$15 a year with a current AMA card.

OKLAHOMA – OKLAHOMA CITY

Okie Fliers Indoor Schedule. All events held at the National Guard Armory, 200 NE 23rd St., Oklahoma City.
Nov. 10, 2001 -- 14 g. Bostonian, WW-II No-Cal Mass Launch, Junior's Choice
Dec. 16, 2001 -- 7 g. Bostonian, WW-II No-Cal Mass Launch, Junior's Choice
Verify site access by phone before leaving home: Heith Leafdale 405-722-2767 Mike Buchanan 405-381-2474

TENNESSEE – JOHNSON CITY

May 30 – June 3 AMA/NFFS Indoor Nationals, Johnson City, TN. Flying is in the MiniDome fieldhouse of East Tennessee State University. No Contest Director as yet. Stay posted.

WASHINGTON - SEATTLE

The Boeing Employees Free Flight Model Flying Club (Hawks) have published their Northwest Indoor Flying Schedule. Events alternate between the Everett and Oxbow Recreation centers at the Boeing plant. Contact Keith Varnau in Seattle, WA at 425-717-5669 or 425-885-2335 evenings.

GOLD NUGGETS

KNOW YOUR TORQUE METER

By: H. Bruce McCrory, kbdmccrory@home.com

Eighteen months ago I quickly learned that three things are necessary for rubber-powered flight. They are: first, a device that provides sufficient forward thrust to overcome the physical properties that prevent a plane from staying in the air, e.g., propeller, articulating wing. Second, rubber with the appropriate energy, expressed as torque, to drive the thrust device. And, third, an airfoil that takes advantage of the thrust to provide lift and stability sufficient to keep the other two from going out of control, or falling to the ground. Physics and aerodynamics simplified.

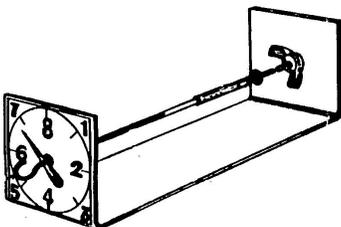
At first, rubber sectional area and length fed to me by others were enough to keep my planes in the air. The torque meter was simply a hook for the other end of my rubber loop and the dial graduations provided a means to prevent over winding and breaking the rubber once I figured out where on the dial it usually broke. I began collecting rubber, and the different batches responded differently in turns, energy, breaking point and flight times. The torque meter was growing into the most important piece of equipment I had – and I couldn't communicate intelligibly with anyone about rubber or energy. Cross section, length, turns, and weight weren't enough – without time consuming testing, which didn't help – to be able to fly the torque dependant classes like EZB or F1-D.

I needed to be able to read my meters in standard measures of force. For me this was inch-ounces of torque. For most of the world, it was metric grams-centimeters of torque. I contacted Jim Jones, the manufacturer of my meters. Even he said the standardized graduations were not important, but I knew better. He gave me the information I needed.

Simple. Anyone can calibrate any meter. All it takes is 15-minutes, a couple strips of 1/8-inch hard balsa, some modeling clay, thread and a scale.

I'm not a machinist, nor a physicist and this may not be exactly correct. Torque is a measure of energy (rubber energy) as mass/force against a material of known torsion strength that will bend and return to the same pre-bent state when the force is released. The only caveats are that the indices (dial face graduations) be the same angle for 360-degrees and the force not extend beyond 360-degrees. Greater stress will damage the tension material's structure (usually music wire) and subsequent readings will be in error.

For convenience, I will use inches and ounces, and my Jim Jones meters.



My meters have eight standard, numbered graduations in 360 degrees (0 is also 8) and ten fractions between the numbered grads. To start the calibration with everything being equal – zero – I needed a lever arm that balanced so I could add weight to one end that would spin the weighted end 360 degrees.

Two strips of hard balsa about 1/8 inch square exactly twice the length in inches as there are the number of graduations are needed. It's 16-inches for my meters. Mark the exact mid point of the strips. Glue the two strips together keeping glue away from the center. The center is slipped over the meter's hook, between the strips, and centered on the torque wire shaft that the pointer is attached to. Glue a strip of thread to one end of the balsa lever so it hangs over the end. Weight in the form of clay will be attached to the thread to make the arm turn 360 degrees.

Mark the zero point of the meter when it is at rest (with no load). If the pointer is adjustable, set it to zero. If the meter is home-built, with no zero adjustment, the pointer is on the zero setting; mark it as zero and determine the number of equal graduations you want, remembering to make the lever arm twice the graduations, in length. Don't get carried away, ten is plenty.

Force the balsa arm over the hook and center the mid-mark on the shaft center. Wedge the arm so it won't slip. My meters rotate clock-wise for indoor flying. The right side of the balsa balance arm has the thread. Hopefully the balance arm is balanced, but you probably will need to add weight to one arm to balance the pointer at zero. Rotate the meter in the opposite direction the pointer will turn for readings, or the arm with the thread. When you add weight it is best to have the "weight arm" ultimately at horizontal when the pointer turns the full 360 degrees. Weight or clamp the meter down.

Twist the arm with the thread in the direction it should read. For me, that is clockwise. Add clay weight until the pointer rests on zero, 360 degrees. Remove and weigh all the clay from the thread. As necessary, convert the weight to ounces.

This weight is the inch-ounces for one graduation. To get the actual inch-ounces of torque, multiply the dial reading by this weight. For example, the weight required to read number eight (360 degrees) on my Jim Jones "A" meter at eight inches is 0.0963 ounces. A torque reading of 6.5 on the dial face is: $6.5 \times 0.0963 = 0.6256$ inch-ounces (in.oz.). This meter is used for mini-stick, A6 and EZB. A meter reading up to 1.0 inch-ounce will handle nearly everything flown indoors. If I had a home-built meter, I would add the actual torque directly onto the dial face. As it is, I memorized the factor and multiply.

Now, I can communicate with the rest of the world, know what total energy of rubber means, and wind my EZB's to .12 inch ounces and fly competitively. HBM, 10/14/01.

F1D Team Trial, Akron, Ohio 2001



Akron Air Dock is 1145 Ft Long



Larry Loucka & Tim Goldstein



Junk Everywhere



The Junior Team: Doug Schaefer,



Parker Parrish,



And Ben Saks



Joe Kehr



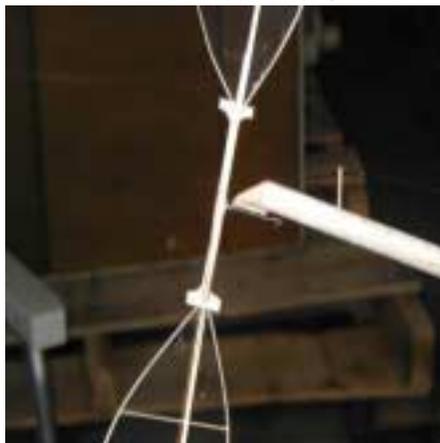
Jim Richmond took First Overall



Larry Cailliau is in Second



Steve Brown grabbed Third Place



Jim's V D Prop



Fifth Place Junior Dave Rigotti

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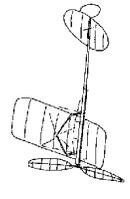
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