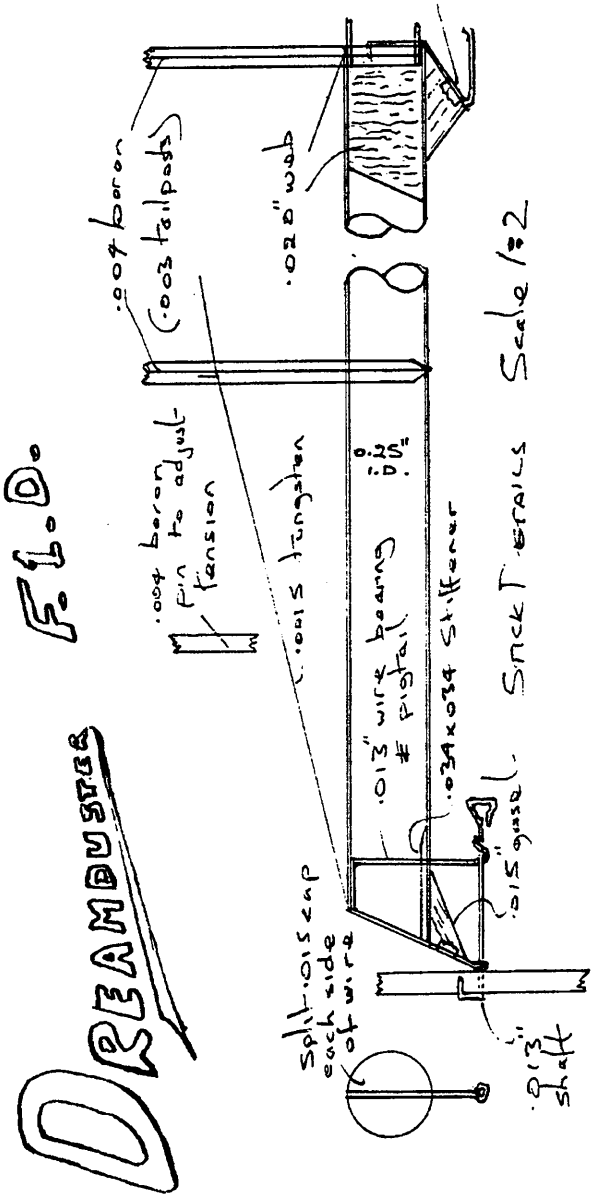
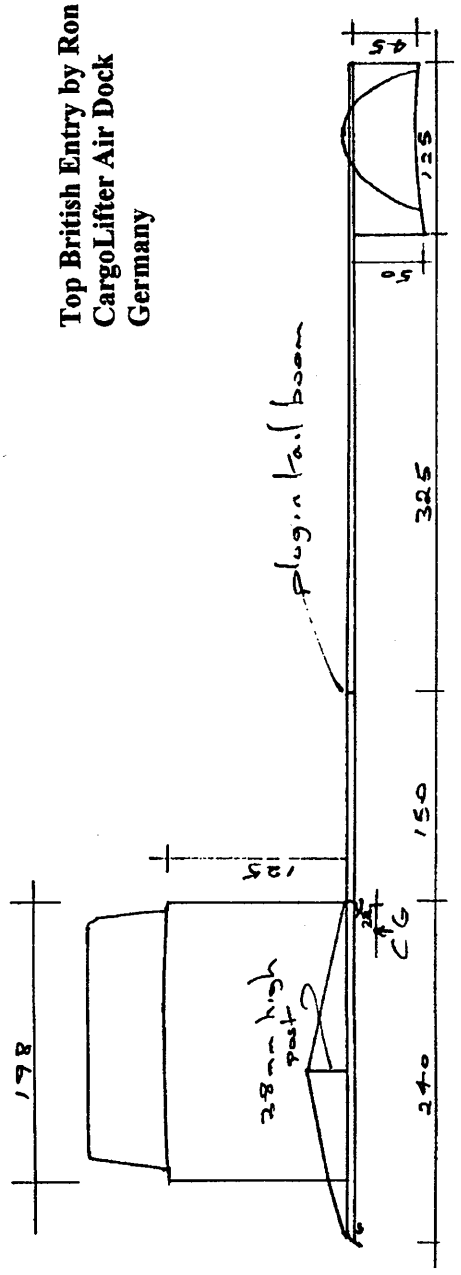
INDOOR

NEWS and VIEWS
ISSUE # 105
January 2002



Top British Entry by Ron Green
CargoLifter Air Dock
Germany



From The Editor's Desk

As Garrison Keelor would say, "It's been a quiet week." The hectic, page-cramming and multiple contest reporting of the last few issues seems to be almost past. Thirty-two pages each was a lot, by anyone's standards, and although this, too is a full issue, I think we're tapering off. You, our readers, have outdone yourselves in providing INAV with material.
Only one major indoor 'event' is reported in this issue – the German Nationals at the Cargo Lifter site. But what an event it was, with the best from 8 nations competing in the space-age hangar with its huge, 320 foot ceiling. Laurie Barr, Nick Aikman, and Karol Vins have been great in providing all the results, plans and stories. We present the Cargo Lifter details for your inspection by our contributing editor, Nick, and plans for two of the top entries: Ron Green's Dreamduster F1D and Bob Bailey's 35 cm model. Laurie Barr's Big Bazooka winning F1M model was published in Issue #96.
We have also managed to include some long overdue legal eagle and embryo, thanks to Newt Bollinger of the MIAMA club.

- Carl Bakay

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From The Membership Desk

Hectic time lately. Getting my new venture Tru-Weight Indoor Balsa up and running has consumed more time than expected and now I am having to make like a kid in school and do my assignment the night before it is due.

INAV has started another new program to reach out and attempt to introduce kids to this fabulous hobby. We have partnered with Ray at Indoor Model Specialties and Jake at Specialized Balsa Wood to have a flier that promotes INAV and the Jr subscription included in the orders Jake is shipping the Bambino kit Ray produces. The idea is that Jake primarily serves the science contest market where the sport of indoor flying is not well known and Ray's kit is specifically for Science Olympiad. So far we have gotten some Jr subscriptions from areas that I am not aware of a strong indoor community and I think these fliers may be the medium that got the word out. The flier is a ½ page sheet with a great drawing of an EZB showing the flight and reaction forces that was drawn by Steve Gardner and the wonderful drawing of West Baden done by Carl Bakay that was the cover of the last issue. If you want to see the flier point your browser to http://www.IndoorDuration.com/INAVorderstuffer.pdf Feel free to print off a stack of these fliers and distribute them to people that may have an interest in learning more about the sport and to juniors that are looking for a way to learn more about this hobby.

As always we can use your articles, pictures, ideas, plans, and tips to help us fill the next issue of INAV with the great information you expect. Remember, what is old hat to you is probably a revelation to another reader.

Tim

A review of Joe Maxwell's new book "The Secrets of Aids for Advanced Aeromodelling"

World renowned balsa wizard Joe Maxwell has done it again with another must have book. Joe is known for the tremendous balsa items he produced such as solid balsa F1B wings and F1B prop blanks, Indoor prop blocks and matched prop molds and various other intricate items made of solid balsa. The general thought was that Joe used computer controlled equipment to produce these amazing items. Now that Joe is out of the business he has written a book that explains the real methods he used.

Joe explains how he used common basic wood working tools to efficiently build complex items through the use of special jigs and fixtures. Nothing that he explains is beyond the realm of the average hobbyist. He tells how he uses a radial arm saw to build perfectly formed indoor prop blocks. This alone is worth the price of the book for the serious indoor flier.

The book has many pictures that illustrate the concepts that are explained very well in each chapter.

Contents

GBP 9.00 in the UK, GBP 10.00 or US$15.00 elsewhere.
The easiest way to get a copy is to send bills (not a check).
Sorry I don't take credit cards. Price includes postage.

Joe Maxwell
11 Windsor Place
Stirling
FK8 2HY
Scotland
U.K.

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- Every sheet you get is exactly what you ordered

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http://www.F1D.biz

ALL AGES "SCIENCE OLYMPIAD WRIGHT STUFF" CONTEST RESULTS

SUNDAY-OCTOBER 7, 2001 @ SCRIPPS RANCH COMMUNITY CENTER, SAN DIEGO

JUNIORS (UNDER AGE 18)

NAME	RND 1+LND'G	RND 2+LND'G	RND 3+LND'G	BEST TOTAL	PLACE
JORDIE MANN	2:15 + 0	2:50 + 10	2:36 + 0	3:00	1
JUSTIN CHARTRON	2:19 + 10	2:27 + 10	2:23 + 10	2:37	2
ALEX NELSON	2:14 + 0	2:33 + 0	2:20 + 0	2:33	3
SAUMIL SHAH	2:06 + 10	2:08 + 10	2:22 + 10	2:32	4
NICOLE WEBSTER	2:14 + 10	2:04 + 10	1:54 + 0	2:24	5
CODY ALLEN	2:12 + 10	0:23 + 10	2:13 + 10	2:23	6 TIE
ALEX PREISSER	1:04 + 10	2:01 + 10	2:13 + 10	2:23	6 TIE
KIAN SAMII	1:47 + 0	2:13 + 10	0:22 + 0	2:23	6 TIE
AARON GROSS	1:37 + 0	2:09 + 10	1:49 + 10	2:19	9
JOHN WU	1:50 + 10	1:24 + 10	2:08 + 10	2:18	10
KYLE ADLER	1:03 + 0	2:04 + 10	0:26 + 10	2:14	11
PETER DUAN	1:05 + 0	1:22 + 10	1:50 + 10	2:00	12
ANTHONY IVES	1:06 + 0	1:25 + 10	1:34 + 10	1:44	13
KEVIN TIROHN	0:23 + 10	0:38 + 10	1:33 + 10	1:43	14

SENIORS (OVER AGE 18) NOTE: *SOME WAY, WAY OVER 18*!

CEZAR BANKS	1:22 + 0	3:01 + 10	3:20 + 10	3:30	1
JOHN HUTCHISON	2:25 + 10	1:53 + 0	2:35 + 10	2:45	2
BRIAN FINLEY	1:42 + 10	2:06 + 10	2:20 + 10	2:30	3
JOHN OLDENKAMP	2:05 + 10	1:59 + 10	0:26 + 0	2:15	4
HOWARD HAUPT	1:49 + 10	2:02 + 10	0:40 + 0	2:12	5
GREG HUTCHISON	1:54 + 10	1:02 + 10	1:59 + 10	2:09	6
DICK BAXTER	0:21 + 0	1:11 + 10	1:51 + 10	2:01	7
GUS DEL CASTILLO	0:59 + 0	1:24 + 0	1:34 + 0	1:34	8
LEE TIPPS	0:25 + 0	1:13 + 10	1:31 + 0	1:31	9

STUFF WORTH NOTING: TAKING A CUE FROM OTHER MECCAS OF SCIENCE OLYMPIAD WRIGHT STUFF LIKE CLEVELAND, SEATTLE AND ATLANTA, WE TOO (SCALE STAFFEL AND SAN DIEGO ORBITEERS) DECIDED TO HOLD AN UNOFFICIAL CONTEST BASED MOSTLY ON 2001 RULES AND ALLOWING AN "OVER 18" GROUP TO ALSO COMPETE AND ADD TO THE FUN. OUR SITE IS A BIT DOMED, 32.5 FT TO ITS OBSTRUCTED HIGH POINT AND 26.5 FT CLEAR.

MOVER AND SHAKER ROGER WILLIS, A MEMBER OF BOTH CLUBS: a) ARRANGED PUBLICITY, ie SAN DIEGO 5TH DISTRICT COUNCIL MEMBER BRIAN MAIENSCHEIN TO PRESENT AWARDS, b) DONATED THE JUNIOR TROPHIES AND TEN "HARLAN BAMBINO" KITS AND c) ACTED AS HEAD TIMER AND STARTER. SANDY PECK AND DAUGHTER VERA DID THE CONTEST DIRECTOR CHORES SMOOTHLY AND EFFICIENTLY JUST AS THEY DO AT SAN DIEGO'S OFFICIAL S.O. CONTESTS. VOLUNTEER TIMERS FROM BOTH CLUBS WERE ALWAYS AT THE READY.

AS IT TURNED OUT, MORE THAN HALF THE JUNIORS WERE MIDDLE SCHOOL STUDENTS WITH NO PRIOR MODELING EXPERIENCE. YET ONLY 23 SECONDS SEPARATED 2ND FROM 11TH PLACE. MIDDLE SCHOOL SCIENCE TEACHER BRIAN FINLEY FINISHED 3RD IN SENIORS WITH HIS FIRST TRY, TOO! NO DOUBT THE HANDS ON MENTORING BY DAVID IVES, CEZAR BANKS, JOHN HUTCHISON, GUS DEL CASTILLO, JOHN OLDENKAMP AND FUDO TAKAGI (WHO ALSO MADE THE SENIOR AWARD PLAQUES) PLAYED A BIG PART. BUT LUCK ALSO ENTERED IN. A ZERO FOR LANDING SCORE ALMOST ALWAYS MEANT A CAPRICIOUS CEILING BUMP WHICH PUT THE AIRPLANE INTO A WALL OR HANGUP, THUS STOPPING THE CLOCK.

THE BIGGEST AND MOST MEMORABLE HAPPENING THOUGH, WAS WATCHING THE MIDDLE SCHOOL KIDS' FACES AND BEHAVIOR DURING A GOOD FLIGHT. THEY WERE SO LIT UP THEY JUST GLOWED! SAUCER SIZE EYES, YELPING AND CLAPPING, JUMPING AROUND. WHAT A HIGH! I SHALL BE VERY SURPRISED IF MOST OF THEM DON'T ENTER THE OFFICIAL SCIENCE OLYMPIAD PROGRAM NEXT SPRING 2002.

- CEZAR BANKS

THE OPEN INTERNATIONAL MEETING AT THE 'CARGO LIFTER' HANGER: BRIESEN – BRAND: GERMANY: OCTOBER 13th AND 14th.

From any point of view this was undoubtedly one of the most successful and enjoyable indoor duration meetings ever. Over 70 competitors including 15 juniors attended, from 9 countries. From Great Britain in the West to Israel in the East, we congregated at what is undoubtedly the best indoor 'cathedral' in the World, 40 miles South of Berlin.

The organisation and hotel accommodation were both excellent, and so was the spirit of friendship and co-operation. Language barriers dissolved as everyone spent 2 days flying in indoor paradise. New World high times were recorded in F1D, F1L and 35cm classes and although the atmosphere was competitive, it was also relaxed and gregarious.

Ten of us made the 'Cargo lifter' pilgrimage from the U.K. John Tipper, Laurie Barr and Geoffrey Lefever took cars and 4 passengers, together with several dozen model boxes, crossing the channel by ferry to mainland Europe and then onwards. Bernie Hunt and Roy Wilson flew, having entrusted their models to be chaperoned by car. As I was AWOL from academic university duties, my schedule was tight and so I also elected to fly, taking my models with me.

This was my first model flying trip abroad and I was nervous about possible damage, especially with increased security after the events of September the 11th. A new, small, lightweight foam-core box was built to hold 3 F1D's and two F1L's on trays. A clear window, reinforced corners and several layers of bubble-wrap completed the package. Despite 3 phone calls to British Midland Airways, explanations of the delicate nature of my luggage and agreement that it could be carried as hand baggage, on arrival I was dismayed to find that the box would be consigned to the cargo hold. The neurotic and totally negative check-in clerk would not relent and so, uttering dark threats to sue the airline, I insisted on loading the box personally. This was the only glitch and changing to Lufthansa at Frankfurt, I was treated like royalty, the model box was even given a seat of it's own. It is therefore still possible to travel with indoor models but good packing arrangements are even more important than ever.

Although we had seen pictures of the new hanger before, nothing prepared any of us for the reality. The 'Cargo lifter' concept is to build a new generation of huge semi-rigid airships, 800 feet long and capable of carrying loads up to 160 tons. The brand new hanger is situated on a derelict soviet airbase and is claimed to be the largest self supporting structure in the world, 320 feet high, 640 feet wide and 1,100 feet long. In cross section a perfect semi-circle, each end of the building has hemispherical clamshell doors while the straight central section is composed of a minimal steel structure covered by a double layer tensile membrane. This is designed to maintain a constant temperature of around 64 degrees C. all year round.

So, we were flying in a building over twice the height and three times the width of Cardington. Parked at one end was the CL 75, a perfectly spherical developmental balloon/crane capable of lifting 75 tons and only 15 feet smaller in diameter than the hanger height at Akron!

Throughout the weekend, a constant stream of tourists were given the 'Cargo lifter' Experience, with a video presentation, exhibition, coach tour of the facilities and chance to buy the T shirt.

Classes flown were F1D, F1L, F1M and 35cm with plastic covering. As with a World champs, the best 2 times from 6 attempts were counted as the score for each event. This meeting was also used as the German team trial for the Slanic event next year. Flying began at 8.00 am and contest flights 2 hours later. Attempts in any class were possible at any time over the two days with flying ending at 8.00 PM on Saturday and 5.00 PM on Sunday evening. Because of the controlled temperature inside, the air never really became buoyant. It did improve in the early evening on both days, maybe because of the good weather outside. Vast batteries of lights clustered in the ceiling were switched on around 6.00 PM and may have raised the temperature near the roof by a few degrees. Because of the huge floor area and minimal drift, not one model hung up all weekend. Balloon steering was only necessary as models descended over the rows of competitors tables.

With so many models airborne at once, it was sometimes difficult to track and time the right one. Against the cream coloured, central membrane, models literally disappeared, even at low altitude. This problem was made worse by the fact that many planforms in all classes were almost identical.

41 flew in F1D, 28 in F1L, 12 in F1M and 6 in 35cm. I was particularly impressed by the number of junior flyers in F1D and F1L, and also in the standard of construction of many of their models. Several juniors were female and the youngest was only around 8 years old – hope for the future of indoor duration.

The 'Brit Pack' did particularly well, winning all classes except F1D. 'Archbishop' Barr won F1M with his trusty 'Big Bazooka' model and this class was only contested by British and German flyers, suggesting that it has yet to catch on in some other parts of Europe. This is a shame as it is certainly a good way to try out some of the complex constructional techniques that are required for F1D.

F1L was dominated by the British, who took the first 6 places. John Tipper built a model especially for this competition. Constructed using his stiffest wood usually reserved for F1D and beautifully covered with Y2K2, John made two flights over 27 minutes to win the class. One of these flights, observed through binoculars, reached a height of around 300 feet, only a few feet under the girders, right in the middle of the hanger. 27.07 is a new World best in F1L.

British flyers also took the first 3 places in 35cm. Earlier in the year, Geoffrey lefever had urged Bob Bailey to build one of these diminutive models and even gave him some wood. Bob then went on to make flights of 32 and 33 minutes to win the competition. John Tipper flew his latest tandem to good effect to take 2nd and Geoffrey took 3rd, probably wishing he hadn't said anything!

As expected, F1D was the most hotly contested class. German flyer Peter Kuttler made 3 flights on Saturday with a best high time of the meeting of 35.32. This has been submitted as a new World record. He then left, having to go to work on Sunday! The next day he was relegated to 2nd place by Lutz Schramm who steadily increased his times by 1 minute increments, ending with a higher 2 flight total. I didn't see these models and so cannot describe them. Ron Green took 3rd with a new copy of his very successful machine that put him at the top of the UK team trials (see plan). Ron had spent some time earlier in the year building and testing freewheeling, folding and feathering F1D props in anticipation of the height available in the hanger. In the end however, his highest time and new UK record of 35.25 was made with a fairly conventional fixed pitch propeller with boron outlined blades.

There was a fairly even split between braced and unbraced and between microfilm and the Y2K/2 films. Andras Ree had at least 1 unbraced model and as the main proponent of the recent rule changes, he confessed that he never expected the new models to climb so high or fly for so long. The new rules certainly seem to have caught on and the variety of planforms visible shows that there is still plenty of scope for design experimentation. John Tipper took the unofficial altitude record again; his longest flight reached an estimated height of 260/270 feet but still came down in less than 34 minutes.

All of the UK flyers had trouble blowing motors; maybe we were winding them harder than others. Several of us had at least one fully wound motor break on the model. Bernie Hunt did much damage to one motorstick and Derek Richards re-braced a damaged stick, wound again and then had the same thing happen immediately. Ron and I escaped lightly, only doing slight, repairable damage. As we were both winding to around 38gram/centimetres with no back off the luck was running with us. Bob Bailey went to launch his last F1D flight when the rubber exploded just before launch and wrecked the front end of his best aeroplane.The May '99 batch does seem to have a delayed action fuse at times. This wasn't helped by having to take a nerve wracking afternoon stroll out to the centre of the hanger with a fully wound motor.

The most innovative design came from Dieter Siebenmann, making a return to F1D after several years absence. He flew a fairly short-coupled machine with very high wingposts, a drooping tailboom and a motorstick angled to give roughly 10 degrees downthrust relative to the wing. The tailplane had a very wide chord and the propeller was fairly conventional in diameter but with short, paddle shaped blades with a moulded carbon fibre outline, placed on the ends of a long mainspar. Despite these extreme details, the model still did over 33 minutes and had perhaps the most vertical initial climb angle of all.

The event was planned and efficiently organised by Gerhard Woebbeking and a small band of helpers. Gerhard was gracious and untiring throughout, as well as being a fine dinner companion. On behalf of all the UK flyers, I thank and congratulate him for all his efforts. Two previous meetings had shown the potential of this site and it is planned to hold 4 meetings a year in future (airships permitting), one of these will be an Open International. A hot buffet was available throughout both competition days and on Saturday evening there was a banquet with robust local food at a nearby Hostelry. The final awards ceremony was an amiable affair, with prizes and certificates to third place for junior and senior winners. A constant update of scores was posted from a laptop.

Afterwards, in a final session of testing, only the UK flyers remained. Having won 35 cm, Bob Bailey took the same aeroplane (see plan) and went for the 'big one'. With a fully wound motor (3000 turns), he was about to launch but the stick showed signs of buckling. A deft smear of cyano' later and the model took off safely and climbed away. It quickly became miniscule to the naked eye and almost impossible to spot, appearing intermittently in the glare from the internal lights. Minutes ticked away and the model still showed commendable reluctance to come down. Packing up stopped as we all peered upwards and when 30 minutes came and went, the plane was still at about 100 feet. Descending slowly, it finally deadsticked at about 40 feet and with the motor hanging conveniently from the rear hook, landed with the watch showing 36.23. An unbelievable time and a fitting finale to the weekend's proceedings. Bob is now wondering if 40 minutes is possible. Over to him for some details:

This model started life as a scaled down version of my old rules F1D which had on occasions flown extremely well. I preferred the layout to a tandem model, for which, getting the CG in the optimum position poses a very difficult structural problem. Guidance was sought from Geoff Lefever and John Tipper in terms of wood sizes, prop diameter and pitch etc. before starting.

The prop ribs are split in the middle and attached to the sides of the spar, to ensure the covering is flush with the spars. This technique is also used on my F1D props. There appears to be a distinct climb advantage compared with the usual construction where the ribs are attached to the top of the spar, leaving a gap. I also decided to take on the challenge of building a VP prop in the style of those that Ron Green, Geoff Lefever and I use for F1D. To my knowledge this had not been done before. Initial testing showed that the tailplane was too stiff since it showed no sign of bending; I replaced it with a lighter one covered in microfilm and then a third, covered in Y2K2 film, for more robustness and ease of handling.

Further discussion with Geoff pointed to a larger wing and I chose a chord giving about the same aspect ratio as that for a new rules F1D. This seemed to show a significant improvement. Further testing at home to optimise the prop pitch indicated that a pitch of about 19 inches gave significantly lower power consumption on cruise than higher values. The main trimming took place in a low ceiling site, this also being used to test the VP prop. Conditions at Cardington had not been good enough when time was available. I found out in time that the 35 cm contest (F1P) at the 'Cargo lifter' hanger outlawed microfilm and the prop was accordingly recovered with Y2K2 film.

Nick Aikman 10.12.01

Deutscher Aero Club e.V. - Sportfachgruppe Modellflug

Deutsche Saalflugmeisterschaften 2001 13./14. Oktober - Cargo Lifter Werft

F1L

Name, Vorname	Nationalität	Jugend	1	2	3	4	5	6	1. Wert	2. Wert	Gesamt	Platz
Tipper, John	GBR		23:00	23:51	27:07	27:02			27:07	27:02	54:09	1
Jones, Geoff	GBR		19:54	22:38	25:33	26:35	25:50		26:35	25:50	52:25	2
Barr, Laurie	GBR		21:20	25:03	24:55	24:41			25:03	24:55	49:58	3
Hunt, Bernhard	GBR		00:00	00:00	00:00	23:38	22:05	23:49	23:49	23:38	47:27	4
Wilson, Roy	GBR		22:05	23:03	22:44	22:40	19:08	23:20	23:20	23:03	46:23	5
Derek, Richards	GBR		22:24	20:36	00:00	21:28			22:24	21:28	43:52	6
Bundesen, Uwe	D		06:59	18:08	22:49	18:45	19:45	21:01	22:49	21:01	43:50	7
Treger, Ivan	SWK		20:38	22:04	15:06	20:52	20:19		22:04	20:52	42:56	8
Schlosser, Benno	D		19:21	20:15	20:53	18:54			20:53	20:15	41:08	9
Feifer, Ladislav	CZE		15:11	17:00	20:07	20:27			20:27	20:07	40:34	10
Lotz, Rainer	D		18:39	18:58	21:27				21:27	18:58	40:25	11
Nimptsch, Werner	D		18:31	17:10	21:43				21:43	18:31	40:14	12
Kaplan, Mikita	CZE		16:32	17:05	18:30	21:23	17:49		21:23	18:30	39:53	13
Markiewicz, Jerzy	PL		15:14	13:50	15:25	18:52	19:30	19:45	19:45	19:30	39:15	14
Kaplanova, Gabrida	CZE	J	08:39	19:03	17:04				19:03	17:04	36:07	15
Kaplanova, Klara	CZE	J	17:26	16:48	00:00	14:50	17:36		17:36	17:26	35:02	16
Rimas, Steponeas	LT		13:35	14:18	15:25	15:23	16:53	18:05	18:05	16:53	34:58	17
Ignas, Valikonis	LT	J	05:39	14:05	15:02	15:54	16:01		16:01	15:54	31:55	18
Kaplan, Mikita sen.	CZE		09:10	13:20	14:41	17:09			17:09	14:41	31:50	19
Dambruskas, Ernestus	LT	J	06:56	07:53	00:00	13:45	13:43	17:27	17:27	13:45	31:12	20
Feifer, Lukasz	CZE	J	12:17	00:00	00:00	17:40			17:40	12:17	29:57	21
Vilius, Steponenas	LT	J	10:40	10:59	11:02	13:33	14:58	10:07	14:58	13:33	28:31	22
Wächter, Bruno	D		10:54	14:07	13:55				14:07	13:55	28:02	23
Juozapas, Cybas	LT	J	12:07	12:51	13:00	12:56	13:56	12:45	13:56	13:00	26:56	24
Pukowiec, Michal	PL	J	00:00	00:00	00:00	07:59	16:40	00:16	16:40	07:59	24:39	25
Vaidotas, Veta	LT	J	09:59	11:18	11:21	09:58	08:45	12:35	12:35	11:21	23:56	26
Mejzlik, Petr	CZE	J	07:09	01:52	05:57	12:40	08:12	09:29	12:40	09:29	22:09	27
Rogowski, Mariusz	PL	J	00:00	00:00	00:00	09:00			09:00	00:00	09:00	28
Aikmann, Nick	GBR		00:00	00:00	00:00				00:00	00:00	00:00	29
Bailey, Bob	GBR		00:00	00:00	00:00				00:00	00:00	00:00	29
Green, Ron	GBR		00:00	00:00	00:00				00:00	00:00	00:00	29
Kaidotas, Veta	LT	J	00:00	00:00	00:00				00:00	00:00	00:00	29
Leferer, Geof	GBR		00:00	00:00	00:00				00:00	00:00	00:00	29

Deutscher Aero Club e.V. - Sportfachgruppe Modellflug

Deutsche Saaflugmeisterschaften 2001 13./14. Oktober - Cargo Lifter Werft

F1M

Name, Vorname	Nationalität	Jugend	1	2	3	4	5	6	1. Time	2. Time	Total	Platz
Barr, Laurie	GBR		17:16	17:35	18:51	18:18	19:47		19:47	18:51	38:38	1
Lotz, Rainer	D		16:49	18:14	18:38	18:36	19:04	18:36	19:04	18:38	37:42	2
Schlosser, Benno	D		16:57	17:04	00:00	16:34	16:09	16:52	17:04	16:57	34:01	3
Bundesen, Uwe	D		16:34	15:59	16:48	17:06	16:05		17:06	16:48	33:54	4
Tipper, John	GBR		00:00	00:00	00:00	14:49	17:08		17:08	14:49	31:57	5
Hasselmann, Johannes	D	J	15:37	15:41	14:23	13:56	13:58		15:41	15:37	31:18	6
Nimptsch, Werner	D		00:00	00:00	00:00	15:10	15:34		15:34	15:10	30:44	7
Wächter, Bruno	D		10:22	13:09	15:09	14:05			15:09	14:05	29:14	8
Klinck, Alfred	D		12:47	13:11	00:00	13:30	13:05	13:24	13:30	13:24	26:54	9
Luxemburger, Jürgen	D		11:06	11:35	10:15				11:35	11:06	22:41	10
Green, Ron	GBR		00:00	00:00	00:00	15:38			15:38	00:00	15:38	11
Jones, Geoff	GBR		00:00	00:00	00:00	13:21			13:21	00:00	13:21	12
F1M ltd.												
Schlosser, Benno	D		14:01	14:22	15:21	14:27	15:39		15:39	15:21	31:00	1
Lotz, Philipp	D	J	12:21	13:44	14:35	14:29	14:21		14:35	14:29	29:04	2
Hasselmann, Johannes	D	J	13:34	13:48	14:06	13:54	11:36		14:06	13:54	28:00	3
Feger, Jens	D	J	11:42	13:50	14:01	12:50	11:40	12:34	14:01	13:50	27:51	4
Wächter, Bruno	D		11:14	13:13	12:15	10:52			13:13	12:15	25:28	5
Luxemburger, Jürgen	D		08:47	09:54	10:20	08:39			10:20	09:54	20:14	6
Steigerwald, Friedbert	D		08:12	08:35	09:47	08:49	09:17	00:00	09:47	09:17	19:04	7
Viezeus, Ekkehard	D		06:17	06:32	07:58	07:19	08:51	08:01	08:51	08:01	16:52	8
35 cm (P1)												
Bailey, Bob	GBR		32:03	00:00	00:00	33:19			33:19	32:03	65:22	1
Tipper, John	GBR		28:18	26:09	30:19				30:19	28:18	58:37	2
Lefever, Jeof	GBR		24:01	20:31	24:51				24:51	24:01	48:52	3
Nimptsch, Werner	D		19:56	21:30	22:34				22:34	21:30	44:04	4
Strattner, Werner	D		17:26	17:56	19:26	20:02	20:34	19:59	20:34	20:02	40:36	5
Viezens, Ekkehard	D		00:00	12:24	07:05	13:10	12:13	12:43	13:10	12:43	25:53	6
Klinck, Alfred	D		15:34	00:00	00:00				15:34	00:00	15:34	7

Deutscher Aero Club e.V. - Sportfachgruppe Modellflug

Deutsche Saalflugmeisterschaften 2001 13./14. Oktober - Cargo Lifter Werft

F1D

Name, Vorname	Nationalität	Jugend	1	2	3	4	5	6	1. Wert	2. Wert	Gesamt	Platz
Schramm, Lutz	D		29:27	30:26	31:59	32:06	33:03	34:25	34:25	33:03	67:28	1
Kuttler, Peter	D		27:29	31:51	35:32				35:32	31:51	67:23	2
Green, Ron	GBR		26:30	31:19	31:20	30:56	35:25		35:25	31:20	66:45	3
Tipper, John	GBR		00:00	00:00	00:00	29:40	31:39	33:30	33:30	31:39	65:09	4
Siebenmann, Dieter	SUI		30:38	33:19	31:32	29:56			33:19	31:32	64:51	5
Treger, Ivan	SWK		23:50	27:30	29:06	21:35	31:09	32:40	32:40	31:09	63:49	6
Keller, Peter	SUI		31:31	31:17	29:32	31:39	30:55		31:39	31:31	63:10	7
Hunt, Bernhard	GBR		28:30	30:12	31:25				31:25	30:12	61:37	8
Richards, Derek	GBR		25:04	30:45	27:39	28:44	29:44		30:45	29:44	60:29	9
Merkt, Thomas	D		22:47	27:11	27:39	21:01	28:33	31:42	31:42	28:33	60:15	10
Lefever, Geof	GBR		29:56	00:00	00:00	26:33	27:50	28:59	29:56	28:59	58:55	11
Sukosd, Zoltan	HUN		27:58	27:32	29:59	28:22	26:12	28:35	29:59	28:35	58:34	12
Bailey, Bob	GBR		23:24	28:52	29:37				29:37	28:52	58:29	13
Nimptsch, Werner	D		28:17	26:13	29:36	28:47			29:36	28:47	58:23	14
Orsovai, Dezso	HUN		26:14	28:10	29:37	27:03	27:31		29:37	28:10	57:47	15
Lotz, Rainer	D		24:22	25:43	26:46	27:22	28:42	29:02	29:02	28:42	57:44	16
Krause, Marian	D		22:48	23:08	26:12	27:16	27:54	29:13	29:13	27:54	57:07	17
Miron, Ran	ISR		24:45	24:27	22:09	26:43	29:10	27:21	29:10	27:21	56:31	18
Schönfelder, Karl	D		20:40	18:33	23:01	24:28	29:39	26:46	29:39	26:46	56:25	19
Aikman, Nick	GBR		22:57	27:29	00:00	28:28	26:54		28:28	27:29	55:57	20
Kaplan, Mikita	CZE		22:24	22:55	26:09	23:46	29:40		29:40	26:09	55:49	21
Dihm, Jan	PL		24:48	22:11	25:52	24:42	24:26	26:48	26:48	25:52	52:40	22
Shenkar, Ruben	ISR		20:36	22:16	20:49	23:41	25:54	26:11	26:11	25:54	52:05	23
Ree, Andras	HUN		23:07	23:52	00:00	25:00	26:01		26:01	25:00	51:01	24
Sukosd, Tamas	HUN	J	19:21	18:43	16:30	20:30	26:28	24:00	26:28	24:00	50:28	25
Rimas, Steponenas	LT		20:16	24:33	24:51	23:54	23:03	24:55	24:55	24:51	49:46	26
Vitaljus, Salogubovas	LT		18:15	23:38	23:34	24:16	24:08	25:19	25:19	24:16	49:35	27
Ciapala, Edward	PL		22:39	19:50	25:08	24:16	01:57	23:07	25:08	24:16	49:24	28
Filek, Jakub	PL	J	23:58	24:01	24:41	22:01	23:28	23:20	24:41	24:01	48:42	29
Klinck, Alfred	D		23:03	22:52	23:11	19:08	22:37		23:11	23:03	46:14	30
Markiewicz, Jerzy	PL		20:36	21:17	21:51	18:27	23:02	22:47	23:02	22:47	45:49	31
Kaplanova, Klara	CZE	J	18:26	25:09	00:00	18:18			25:09	18:26	43:35	32
Markunas, Martynas	LT	J	10:22	16:58	18:26	19:28	21:06	21:26	21:26	21:06	42:32	33
Rogowski, Mariusz	PL	J	18:40	19:58	19:51	16:59	21:13		21:13	19:58	41:11	34
Pukowiec, Grzegorz	PL		17:20	18:01	20:46	17:18	18:38	17:58	20:46	18:38	39:24	35
Gytis, Tyla	LT	J	19:09	18:34	00:00	11:08	16:46	16:02	19:09	18:34	37:43	36
Pukowiec, Michal	PL	J	10:05	18:49	18:01	11:37	16:48		18:49	18:01	36:50	37
Ignas, Valikonis	LT	J	19:08	17:13	17:12	17:37	14:13		19:08	17:37	36:45	38
Feifer, Ladislar	CZE		13:14	16:10	00:00	20:06			20:06	16:10	36:16	39
Dambruskas, Ernestus	LT	J	10:16	12:46	18:23				18:23	12:46	31:09	40
Stanczak, Marek	PL		00:00	00:00	00:00	09:53	12:50	13:51	13:51	12:50	26:41	41
Barr, Laurie	GBR		00:00	00:00	00:00				00:00	00:00	00:00	42

Posted by Vern Hacker on the indoor mailing list:
The Balsa tree grows in the Rain forest[Jungle;Tropics] It grows all the time and does not have annular rings. There are some differences that are ring like that reflect differences in Rain fall not temperature changes as we see in our maples etc. This was confirmed to me by the head of the Holden Arboretum

I have confirmed what I posted. The rings in a balsa log are not annular, but represent differing growth rates mainly related to the amount of rain in the rain forest. Hack

In Search of the Perfect Sheet of Balsa

By Tim Goldstein
tim@IndoorDuration.com

For the past 2 years or so in my normal compulsive and excessive manner I have been talking with fliers, researching methods, looking for sources, experimenting with techniques, and buying equipment to get myself a supply of top quality indoor balsa. This search has had many twists and turns and the pursuit has often times taken over my time that should have been spent building planes. Initially my quest was focused around finding the supplier that would ship me the exact wood I needed and eventually turned into developing a method to be that supplier for myself. Along the way I have spent much time, effort, and money. This article is an attempt to document what I have tried, what I have learned, what is working for me, and what has been a dead end.

In the beginning God created perfect balsa. Then we had the deal with the apple and now we have to scrap and fuss to find a decent piece of wood. My search started as a result of my coming back to the hobby of indoor flying and I had the good fortune to get a copy of INAV 90 with Larry Coslick's article on the Hobby Shopper EZB. In that article he describes a process of building a relatively competitive EZB using only hobby shop wood. Much of the process revolves around selecting the best parts of the wood and then carefully sanding them to thickness. Having had a tiny bit of experience with indoor about 10 years ago I knew that real indoor wood was very expensive and this idea of using regular sheets seemed quite appealing. So, I dug into my stack of light balsa I collected over the years when I had the occasion to visit the LA area and stop in a Superior Balsa (http://www.superiorbalsa.com). From that I was able to pull out a couple of sheets that looked more promising than the normal hobby shop stock and I proceeded to start building a Hobby Shopper. The results were encouraging, but I realized I needed a larger stock of light wood to select from. Some browsing through magazines, searching the Internet, and calling around lead me to Lone Star (http://www.lonestar-models.com). They had a pretty reasonable price on contest grade balsa and a good reputation of delivering wood that was what you ordered. Out came the credit card and I soon had about $100 worth of contest wood on the way. I waited expectantly. When the wood arrived I was pleased with what I got. Densities ranged from mid 4# to just over 6# and the grain was decent. I proceeded to build some Hobby Shoppers and they came in at the target weight and flew well. I was happy.

With a little success under my belt I now wanted to get the weight of my Hobby Shopper models down a little to get the times up. I decided that my 250 mg props would be a good place to start. I dug through my growing pile of light wood which I had carefully graded for density and picked the lightest I had. I proceeded to sand it down until I could read the newspaper through it and then washed it in water as instructed and let it dry. On a lark I decided to weigh this piece of Ecuador gold and was shocked that my mid 4# piece was now 5-1/4# wood. How disappointing. I had used a brand new piece of paper and gone very slowly with as little down pressure as I could. Oh well, It was my best piece of wood and while heavier than it started it was still lighter than what I had used previously. The prop came out about 25 mg lighter than past attempts. I continued to build using pieces I laboriously sanded down and started paying more attention to the before and after weight. I started to reach the conclusion that while I could easily sand down 5# wood with very little density gain, that was not true of low 4# wood. Time to do some more thinking about the whole wood thing.

I reached the conclusion that maybe I should try some of the expensive indoor wood and see if there was really something to it. Out came an order sheet and the checkbook and soon they were on the way to the supplier. Expectant waiting followed and was rewarded with a box on my door step. I eagerly open it up and the thought jumps in my mind, this is not much wood for all the money I spent. I take it off to the workbench to touch, study, caress, weight, and measure the sheets. I go though my 15 or so sheets and find that they are not exactly what I ordered. There were a few sheets that were the density I expected and there were a few sheets that were the thickness I expected, but unfortunately they were not the same sheets. Oh well live and learn, but for the most part this wood was lighter than anything I was able to sand down myself. Off to build a new prop with this costly lumber. Well, the new prop finally allows me to break the 200 mg barrier and is actually about 185 mg. Definitely an improvement over the sanded down stuff and my times continue to improve.

I start thinking some more about this indoor wood thing. It seems like there really is something to having the wood sawn to the proper thickness and not sanded. I started asking around about sawing indoor balsa and it seemed to be a black art. There were a few select wizards that were cutting successfully, but no one wanted to talk in detail about how they did it and what worked. The few references I could find all indicated that indoor balsa sawing was done with a circular type saw and not a band saw. This gave me a place to start. It was time to experiment.

It seemed that a lot of the mystery around wood cutting was the actual blade. I figured that choosing the blade I wanted to use would be a good place to start. From the little bit I could find the saw blade needed to have no offset on the teeth and be hollow ground to give some clearance. I started looking at wood blades and could not find anything that seemed to meet this description. Another one of my hobbies is metal machining. Through this I was familiar with a circular type blade that seemed to meet all the requirements. It is referred to as a jewelers saw or slitting saw and I knew they were available in a variety of diameters from 1" on up 5" diameter and range of thicknesses from .010" up to .125". This sounded like just the ticket and I just happened to have a few .020" x 2" blades on hand. So I mounted one up on an arbor and put it in the chuck of my metal lathe and tried cutting some sticks off of an 1/8" sheet and it worked great. Now I just needed a bigger diameter blade and some balsa blocks to experiment with. I jumped on the Internet and ordered some .030" x 4" blades from a tool supplier and stopped in to a local hobby shop to find the lightest block they had.

A week or so later I was ready to test out what I thought would be a great way to slice indoor wood The machine I was using is a Shoptask 3 in 1 metal machine and the cross feed has 12" of travel. I have converted the machine to be a computer controlled CNC unit. . I again set up the blade in the lathe and now attach a 6" long x 1-1/4" thick balsa block to the cross slide and instruct the computer to feed it through at 5 inches per minute. The blade starts cutting into the wood and the cut is looking good until I have the blade complete into the wood. Then things go drastically wrong! The blade is suddenly wobbling all over the place and the smell of scorched balsa hits me. Of course the computer could care less and it is still trying to feed the wood into the blade that now is looking like a rotating potato chip. I am desperately diving for the stop switches to stop the feed and the spindle motor before something breaks. I get everything stopped and it is just a mess. Gouged, singed balsa, warped blade, and what a stink. I stand there assessing the damage for a few minutes and while I am watching the blade miraculously start straightening out and goes back to the proper shape. Curious. Post mortem analysis reveiled that the blade has so little clearance with the slight hollow grinding that it was rubbing against the balsa block. Once enough of the blade got into the balsa wood the heating effect of the drag was greater than the cooling of the blade on the part that was not in the cut. The ensuing expansion caused the blade to warp. Once the blade was allowed to cool it contracted and regained it's shape. Great lesson, only about $30 wasted and now I was at a loss regarding how to cut balsa.

Good fortune came my way. I heard of a book offered by Joe Maxwell of Scotland titled "Balsa for Indoor Models" (now out of print, but Joe is allowing INAV to publish excerpts from it). Quickly my money was in the mail for a copy. What a great book! It covered so many aspects of balsa that were a mystery including a complete chapter on how Joe went about cutting indoor wood. I was now convinced I could master the art as there was nothing Joe was doing that was beyond a mere mortal. The major difference in approach between Joe and I was in the blade. Joe was getting his results with a Dewalt Thin-Kerf carbide blade. (Kerf is the width of the cut made by the blade – Ed.) Even with that name the blade has a .095" or so kerf, but Joe thought that the wood wastage was more than offset by the smooth finish and zero density gain he was getting. So armed with new knowledge and after some e-mail exchange with Joe I was in search of some carbide blades to try. While looking I saw some carbide saw blades that were designed for use on battery powered circular saws that were 5 – 6" in diameter and only had a .065" or so kerf. These appealed to me as the size was more appropriate for my equipment and the thinner kerf was attractive. So, $50 latter and I had a few different brands of these cordless saw blades to try. Back into the workshop I headed. This time I was ready for the worst as I instructed the computer to feed the wood into the blade with the kill button in my hand. The saw entered the wood and just kept on cutting to the end. No problems at all!

Now I had a blade that seemed to be cutting just fine, but I was limited to a 6" block. Time for some more head scratching and scheming. I was convinced that the consistent feed that the computer controlled equipment delivered was something that would be very beneficial to top quality results. This meant that I needed to cut the wood on a machine that had a maximum 12" of travel. A little more looking it over and the thought occurred to me that I could get enough travel to cut a 12" long block if I were to move the table on a diagonal. Normally this would be out of the question on a manual machine, but with the computer control it would be easy. To take advantage of this I would have to put the blade in the mill spindle sitting horizontally and pass the wood through it diagonally and then lower the quill for the next cut. I didn't see any reason this would not work so I set it up and tried cutting the hobby shop test block I had. Wonder of wonders, I was getting nice consistent sheets of mid 5# balsa! They were a little more coarse on the surface finish than the commercial Indoor balsa I had purchased, but it was very usable and I cut it myself. I proceeded to build some parts with it and they worked great.

With some successful results under my belt I decided to start looking for some light balsa logs to cut and began thinking about what a machine optimized for indoor balsa cutting would look like. I found a vendor that claimed to have some under 5# balsa block so I order $100 worth. It was very costly on a board foot basis, but they delivered what they promised. I was happy and bought another couple hundred dollars worth while they had some light material to sell. On the machine side I analyzed what is was that allowed me to get the results I did.

Some of the attributes that I felt important was an automatic feed to get consistent cuts, moving the balsa on a fixed track so that the blade stayed centered in the kerf, a cross feed to set the sheet thickness that had a sub-thousandth of an inch resolution, a very stiff spindle to reduce vibration, and a smaller than normal blade diameter (All the balsa cutters I could get to tell me anything admitted to using a 10" saw) to help eliminate vibration in the blade. I then created a design for the carriage portion of a

dedicated balsa cutter and set out to build it. It has a 24" lengthwise feed with a 6" cross feed. The carriage is moved with ball screws that are driven by stepper motors. The contraption was completed and tested and it did indeed move as expected and looked like it would do the job of moving the balsa block past the saw blade perfectly. Now I needed to come up with a spindle and drive system for my balsa cutter. My two requirements for the spindle was that it allowed speeds in the 6000 – 8000 rpm range and that it was very stiff. I started thinking about how I could build a unit that would accomplish these goals and every design I could come up with require more complexity than I was willing to create. I then started looking if there was a commercial spindle I could use. About this same time I ran into a deal on a 5500 lbs computer controlled Bridgeport series II milling machine. I jumped at the opportunity and was soon the proud owner of some serious iron. Unfortunately, I had no place to put it. This quickly led to a decision to buy a 10' x 20' storage shed and to remodel the house. The goal was to end up with half the car garage as a metal working shop and a wife that was happy to have it that way. This endeavor put all hobby projects on hold.

Once the house was about done and Bridgett (the Bridgeport) had been moved into place I set to work getting her running. I quickly realized that the 30" of travel she offered would let me cut 18" strips of balsa quite easily. Out came the credit card and an order was placed for an arbor to fit the saw blade to the machine. Once the blade arrived I was ready to give cutting another try. I took my test piece of balsa and attached it solidly to the table. The motor was spun up and the computer was commanded to go. The blade parted the balsa and the cut was better than I had previously achieved. I proceeded to cut off a number of sheets of B grain stock in thickness from .008" on up. Success seemed at hand. I took my balsa in the house and compared it to the commercial indoor wood I had. Close but no cigar. While the wood had no visible saw marks the carbide blade was just not sharp enough to cut cleanly with the RPM of the machine. So close I could taste it, but a little more scheming still required.

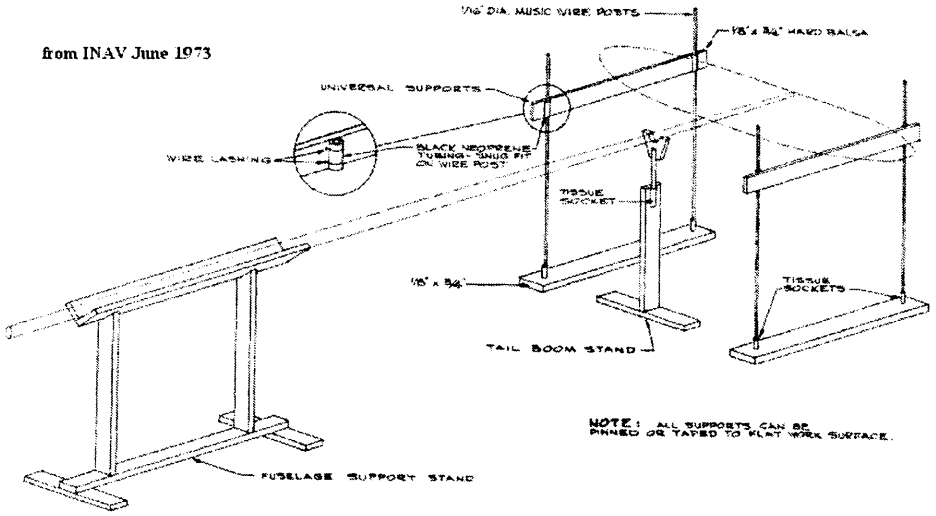
E-mail exchanges with Laurie Barr and an brief explanation of cutting techniques from Stan Chilton got me thinking that I needed a steel blade to get a clean cut. Stan uses a wood working blade that he has reworked to his specification. Laurie pointed me toward 6" x .0625" metal working slotting saw blade. I had never seen ones quite that large a diameter, but armed with the knowledge that they existed I was on a quest. I found a German made cobalt steel blade that seemed to fit the bill. Was a little pricey at $85, but thought I would give it a try. Of course it took a different sized arbor than the previous blade so that was added to the order for about $35. At the same time I decided the results were encouraging enough that I would buy the industrial type dust collector with the optional 5 micron filter bags that Stan Chilton told me would cure the gagging on balsa dust problem. The dust collector and the blades arrived and I was ready to try again.

Out with the balsa block and power up all the equipment. Punch the button on the computer and the block heads to the blade. Wow this is great, the dust is streaming off the blade and into the dust collector hose just like smoke. No gagging, Stan was right. Even more important, the balsa sheet now looks spectacular. It is as smooth on the surface as the best I have from the commercial indoor source. I finally feel I have this balsa cutting thing figured out.

What did not work for me:
Cutting on a table saw
Carbide blades
Hand feeding
Small diameter thin blades

What is working:
HSS blades
Computer controlled feed
5 micron filtered dust collector
Tramming the blade a few thousandth

from INAV June 1973



FUSELAGE AND BOOM ASSEMBLY JIG

UPCOMING CONTESTS FOR 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 elsewhere in this issue)

ILLINOIS - CHAMPAIGN
April 13 - 14 2002 Midwestern States Indoor Championship. Category III flown at Univ. of IL ROTC Armory. Hosted by the Chicago Aeronuts. Most events from HLG to F1D including Science Olympiad & FAC. AMA license required. $20 advance registration, $25 on site, $1 Jr & Sr. CD: Robert Warmann, 245 N Oaklawn Ave, Elmhurst, IL 60126 Phone (630) 834-9075 Make check payable to Chicago Aeronuts Entry form is available as a link in the Contest section of http://www.IndoorDuration.com

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. Fun fly style format allows lots of time for low stress flying. 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

MICHIGAN – FLINT
May 5, 2002 Eighth Annual Spring Fling with 20 events, including Science Olympiad with mass launch. AMA and FAC events. Everything from catapult glider to F1D. Site: Inside Swing Golf Dome, Burton, Michigan. CD George Lewis, 3602 St. Clair Hwy, China Twp., MI 48054. 810-329-6833.

NEW YORK – ROCHESTER
Rochester Indoor Flyers have indoor flying sessions on alternate Sundays from 12 til 5 pm at the New Covenant Fellowship, 2070 Five Mile Line Road, Penfield, NY. Contact Bob Clemens, WNYFFS President at robert.clemens@worldnet.att.net for details.

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.

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.

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*Lakehurst note:
Due to the change in security caused by the events of September 11, 2001 you now must have an ECIM membership card in addition to an AMA card to access the Lakehurst site. Contact Rob Romash as listed above for details.

UNITED STATES INDOOR CHAMPIONSHIPS 2002 SCHEDULE

	730	3:00	6:00	6:30	10:00	
	IHLG P-24 LAUNCH					
	STD CATAPULT AT 2:30*					
WEDNESDAY	UNLIM CATAPULT	INTERMEDIATE STICK		INTERMEDIATE STICK		
29 MAY 2002		35 CM*		35 CM*		
	UNLIM RUBBER SPEED*					
	RTP SPEED*					
	STRAIGHT LINE SPEED*					
	RACE TO THE ROOF*					
	7:30	1:00	4:00	4:30	10:00	
	FAC PEANUT*					
	BOSTONIAN					
THURSDAY	HIGH WING MONOPLANE*	F1D		F1D		
30 MAY 2002	PIONEER*	HAND LAUNCH STICK		HAND LAUNCH STICK		
	MORDERN CIVIL PRODUCTION*	CABIN ROG		CABIN ROG		
	WW I MASS LAUNCH, 11:30*					
	BOSTONIAN MASS LAUNCH, 12:30*					
	7:30	12:00	3:00	3:30	6:00	10:00
	SCIENCE OLYMPIAD*					
	MINISTICK					
FRIDAY	AMA SCALE	EZ-B		EZ-B	F1L	
31 MAY 2002	MINISTICK MASS LAUNCH, 11:30					
	DIME SCALE*					
	PISTACHIO*					
	KIT PLAN SCALE					
	7:30	1:00	3:00	3:30	7:00	10:00
	FAC SCALE*					
	GOLDEN AGE*				AUUTO GIRO	
	COCONUT SCALE*	PENNYPLANE		PENNYPLANE	HELICOPTER	
SATURDAY	NO CAL SCALE*	MANHATTAN		MANHATTAN	ORNITHOPTER	
1 JUNE 2002	AMA PEANUT SCALE				A-6	
	WW II MASS LAUNCH 10:30				A ROG	
	COCONUT SCALE MASS LAUNCH, 11:30					
	SCIENCE OLYMPIAD					

	730	11:30	12:00	3:00
SUNDAY	LIMITED PENNYPLANE		LIMITED PENNYPLANE	PREPARATION TO
2 JUNE 2002	F1M*		F1M*	DEPART.
				BUILDING MUST BE
				CLEARED BY 6:00 PM *= NON AMA EVENTS
				HAVE A GOOD YEAR"

IF NECESSARY RETRIVIAL PERIOD

2002 AMA INDOOR NATIONALS AND THE EIGHTEENTH UNITED STATES INDOOR CHAMPIONSHIPS
"MINI-DOME" - EAST TENNESSEE STATE UNIVERSITY
JOHNSON CITY, TENNESSEE
MAY 29-JUNE 2, 2002

NON-AMA EVENTS REGISTRATION
Send Entry Payable To:
USIC 2002, 112 TILLERSON DR NEWPORT NEWS, VA 23602

Name: _____ AMA # _____

Street: _____ JR [ ] SR [ ] OPEN [ ]

City: _____ State _____ ZIP _____ Phone: [ ]

I hereby certify that I understand all of the rules under which I will compete and will diligently follow the Official AMA Safety Code as well as any rules that may be established on site and will apply the use of accepted common sense in all my flying and affairs at the contest site.

Signature: _____

FEES

Entry fee (includes one event)	$12.00		_____
Jr & Sr entry (includes one event)	$1.00		_____
Additional events, OPEN	$5.00	x____	_____
Additional events, Jr & Sr	$1.00	x____	_____
P-24 Mass Launch	$3.00		_____
8" Table & 2 Chairs	$16.50	x____	_____
Dormitory cost. ($35/night/room) (Single or double occupancy) *	$35.00	x____	_____
	Total Fees		$_____

ENTRIES MUST BE POSTMARKED BY MAY 13, 2002
LATE ENTRY FEE OF $10.00 PAYABLE ON SITE

DORMITORY HOUSING WILL BE IN THE LUNTSFORD APTS, No linens will be provided, so bring your own sheets, pillows, towels etc: A $25.00 fee will be charged for lost or unreturned keys, NO EXCEPTIONS. You must recruit your own room mate

Please indicate Dormitory reservations for nights of :							
	May	May	May	May	June	June	
	28	29	30	31	1	2	
Single							
Double							

NON-AMA EVENTS
[X] Events entered
[ ] A6
[ ] 35 CM
[ ] DIME SCALE
[ ] NO CAL
[ ] GOLDEN AGE SCALE
[ ] HIGH WING MONO
[ ] UNLIM. RUBBER SPEED
[ ] COCONUT SCALE
[ ] WWI & WWII MASS LAUNCH
[ ] FAC SCALE
[ ] FAC PEANUT
[ ] PIONEER
[ ] MOD. CIVIL PRODUCTION
[ ] PISTACHIO SCALE (MIAMI)
[ ] P24 MASS LAUNCH

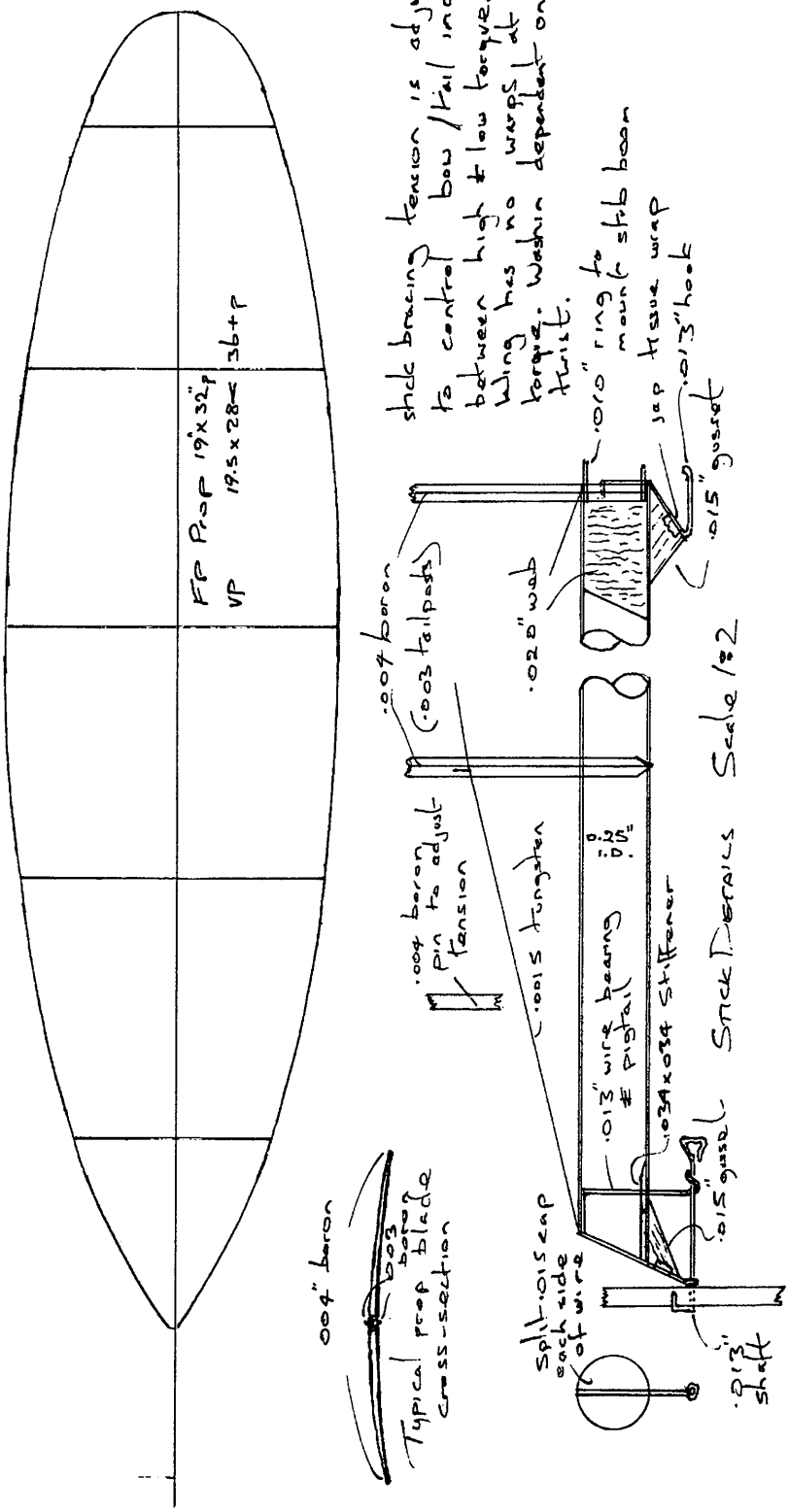
Entry fee for 3 events below is $5 for all three.
[ ] ROUND THE POLE
STRAIGHT LINE SPEED
RACE TO ROOF
[ ] F1L
[ ] F1M(F1DB)

In case of emergency, please contact:
Name: _____

Street _____

City _____ State ____ Zip _____

Phone: _____



Typical Weights.

Stick & stub boom	0.39 gm
Boom	0.15
Wing	0.30
Stab	0.13
FP prop	0.22
VP prop	0.23

Typical Wood Sizes.

Stick	0.013"
Stub boom	0.010
Boom	0.009

Wing.

spars .090" > .055 x .034

tips .055 > .035 x .030

ribs .060 > .045 Andrews x .025

Stab.

spars .050 > .035 x .029

tips .029 x .029

ribs .030 x .024

Note

Wood density & sizes very dependent on stiffness

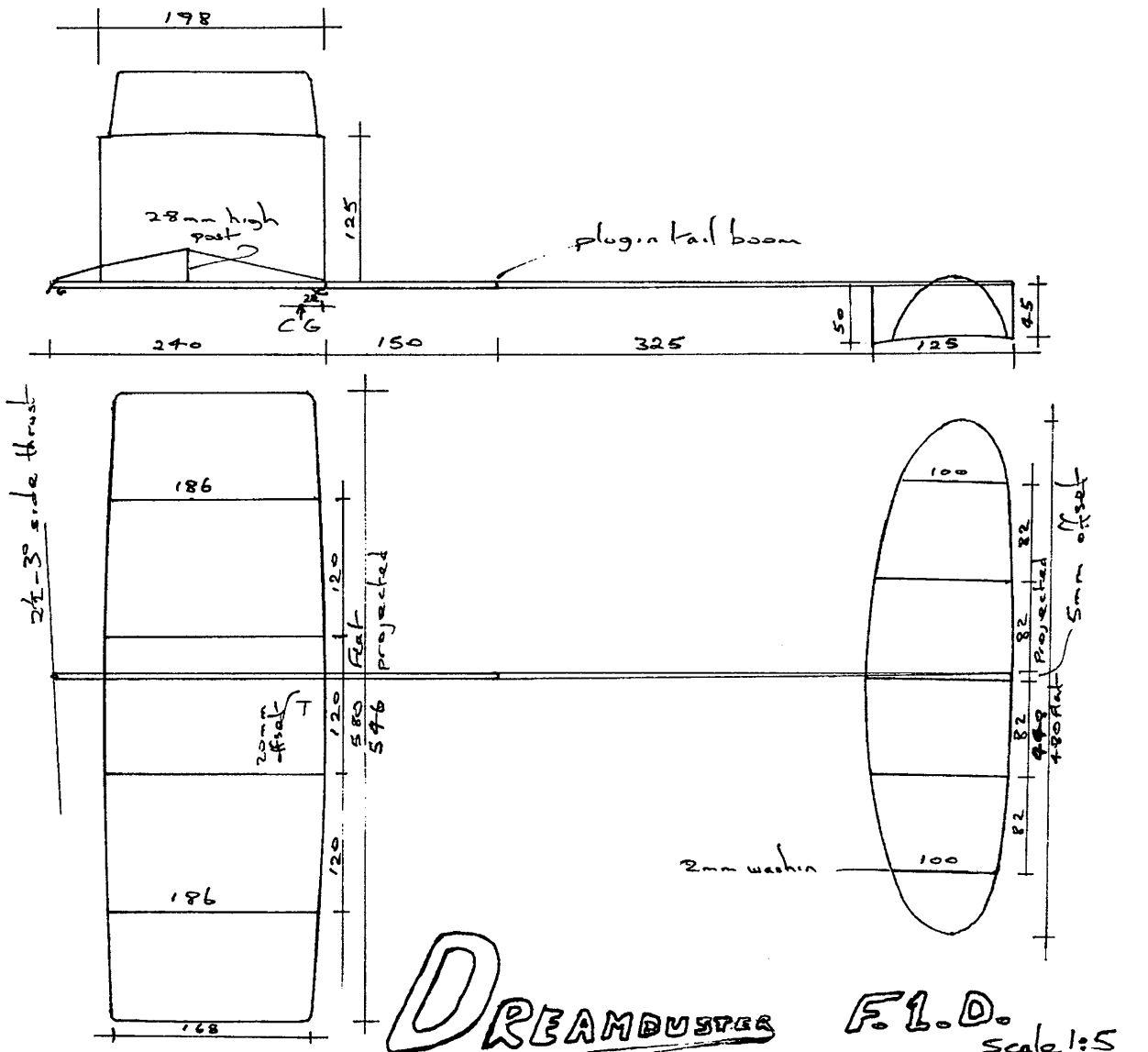
Prop

Outline .004 boron

ribs .024 x .024

spar 0.070" dia > .032 + 2 .003 boron

V.P. hub similar to Steve Brown but wire top stop & jap tissue tubes to allow adjustment or replacement of blades



DREAMDUSTER F.1.D.

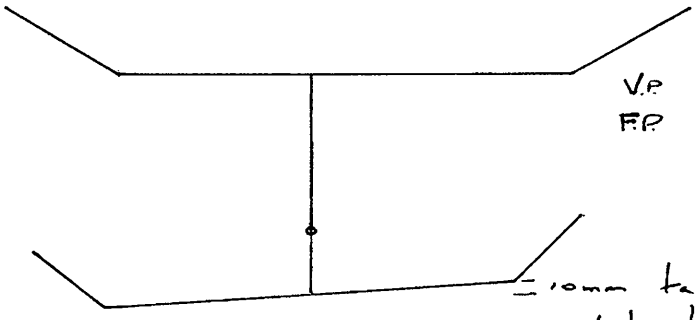
Scale 1:5

designed & drawn by Ron Green

Best times to date.

V.P 34:06 Cardington GB

F.P 35:25 Cargolift Germany

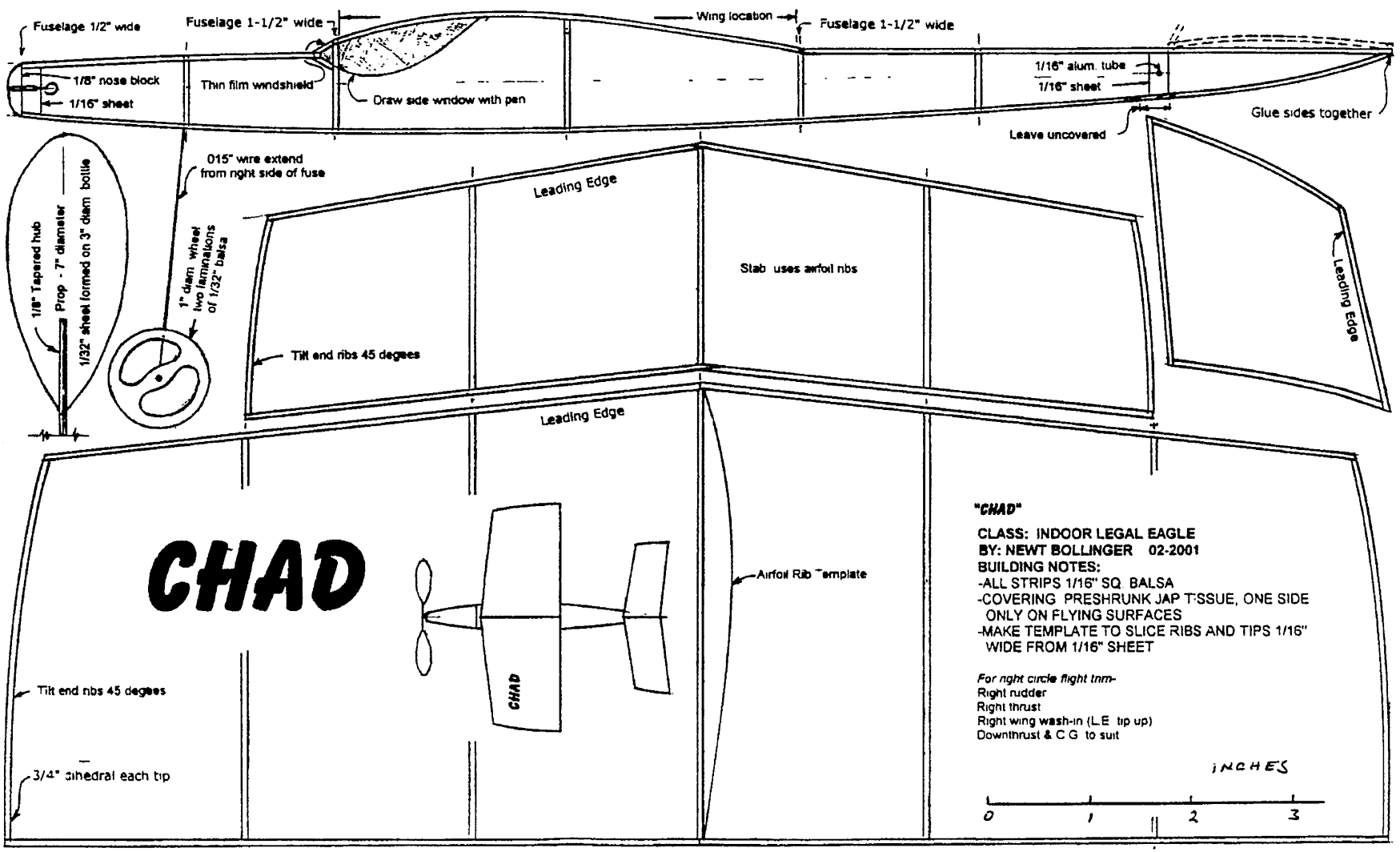


±10mm tail tilt

but adjust for size of site

front view

Enlarge 164% to Legal Size



THE INDOOR LEGAL EAGLE EVENT

DRAWING REQUIREMENTS

1. Drawing must fit on one side of one sheet of legal size (8-1/2" x 14") paper.
2. No component parts drawing may be superimposed or overlap another and must clear one another and the edge of the paper by at least 1/8 inch.
3. Wing(s) and stabilizer must be drawn full span, tip to tip and fuselage drawn in its full length from nose through tail in one piece.
4. Fin(s) may be drawn where space allows and not necessarily attached to the side view.
5. Landing gear must be drawn in its place on the side view showing its full length.
6. No top or front view is required.
7. Drawing must be presented to C.D. on demand.

DESIGN REQUIREMENTS

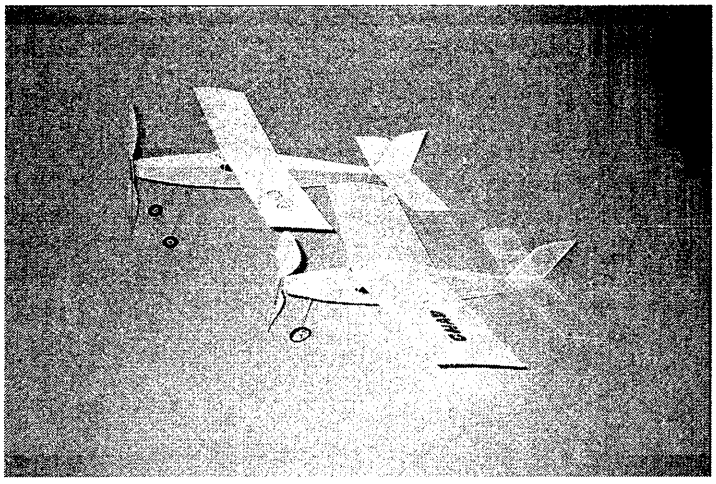
1. Smallest wood size to be 1/16 inch square except for propeller.
2. Fuselage measured to its outside surface must contain a space 1" x 1.5" x 3".
3. Fuselage must have a cabin or open cockpit with a raised windshield of at least 30 degrees of clear or translucent material. Cockpit must be actually open, with a headrest or canopy.
4. Flight surfaces; Leading and trailing edges cannot parallel each other.
5. Tip outlines must have no straight lines except for stabilizer where a twin fin is used.
6. If twin fins, or two wings are used in the design, parts may be built in duplicate over the same drawing.
7. Jap tissue required on all non-sheeted, open framework surfaces except for fuselage surfaces covered by a flying surface directly attached to the fuselage and areas involved in an open cockpit or minimum access area to the motor. No ultra light film covering to be used, unless used for windshield or windows. Flight surfaces may be single or double covered.
8. Landing gear must use at least one 1 inch diameter wood wheel.
9. Use of motor stick(s) or tube(s) O.K. and if used, must be shown on the side view in one continuous length in the proper position.

FLYING

1. Models must R.O.G. from floor or any solid place designated by C.D. on contest day.
2. Total of best 3 flights out of 5 wins and delay timing of 20 seconds with two delays in succession as one official, per AMA rules.

Updated: June 28, 2000

Photos of Chad and DNA, supplied by Newt Bollinger of the MIAMA group. Contact him at Newtsworld@aol.com/ For more details on building and flying



ANNOUNCEMENTS !!! ANNOUNCEMENTS !!!

Electric Indoor Free Flight event, official as of Jan. 1, 2002.

Submitted by: Bob Wilder AMA 14951

Model Specifications. The models shall be powered by no more than two (2) Nickel-Cadmium 50 mA cells and may weigh no more than one ounce. There shall be no other restrictions on model size or configuration.

Scoring. Scoring shall be based on the duration of the best single flight of three attempts. An attempt shall consist of any flight longer than 20 seconds.

Time shall be recorded in minutes and seconds with fractions of a second dropped. Timing shall begin when the model is hand-launched and ends when the model touches the floor or contacts any part of the building and ceases transitional movement for longer than 10 seconds.

==========

Call for Papers for the 2002 NFFS Symposium

see us at: www.freeflight.org/

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.

Bucky Servaites, editor
7660 Duffield Circle, Centerville, OH 45459
(937) 433-0975 servaites@aol.com

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

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 1 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

Tan II status

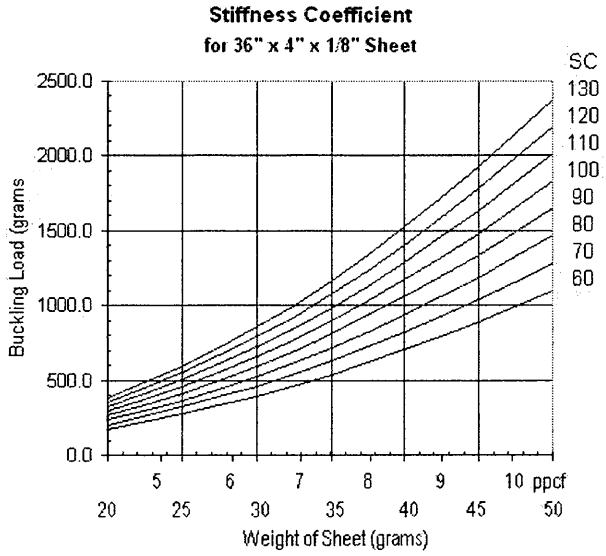
Dear FAI Customer,

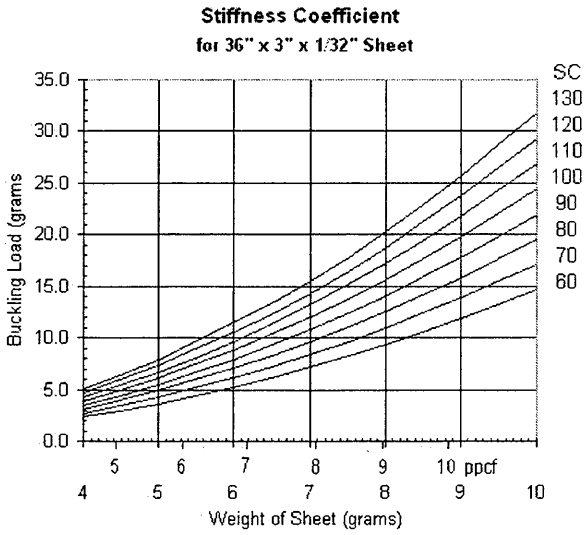
We are currently out of good 1/8", 3/16", and 1/4" contest rubber. We do have some 3/32" and 1/16" that are good.
Due to the collapse of the rubber thread business for golf balls, we currently have two factories downsizing into one factory at a new location. The net result is that the next production lot will not be available until approximately November 30th. This order will be for 1/8" only, and if it meets specs, the other sizes will be available at the end of the year, or early in January 2002.
Good News: Our same Tan II Q/C and sales management team will be in place at the new location.
Bad News: Due to the lower demand for a critical synthetic additive (golf ball related), we can expect a noticeable increase in cost of Tan II. Our factory or we do not know the amount of this increase at this time.
John Clapp

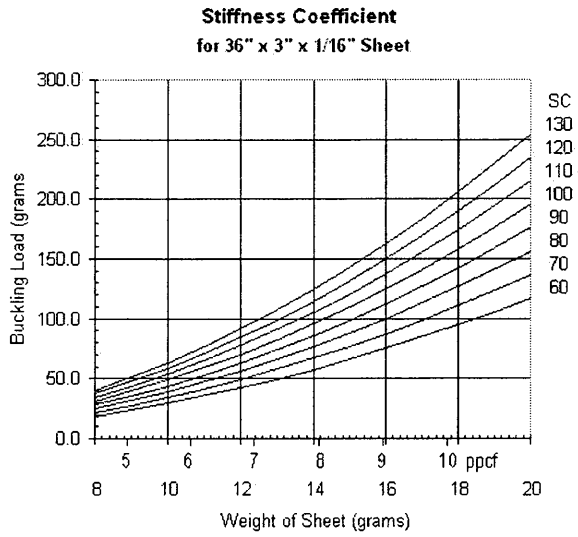
STIFFNESS COEFFICIENT CHARTS

You may remember the chart at right. It was from a series of articles in INAV #103, reprinted from the Norwind News. Many readers have pointed out that the 4-inch wide by 1/8" balsa sheet was not the best example. So we created two more charts to cover the more common 1/32" and 1/16" indoor sizes, in 3-inch widths.

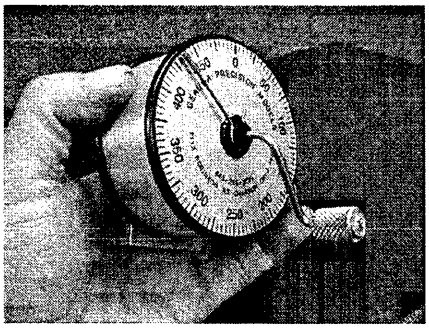
We also increased the stiffness coefficient range to 130, and included a pounds per cubic foot density scale along the bottom. To get your own copy of the EXE file to experiment further, check out www.indoorduration.com and click on Utilities.

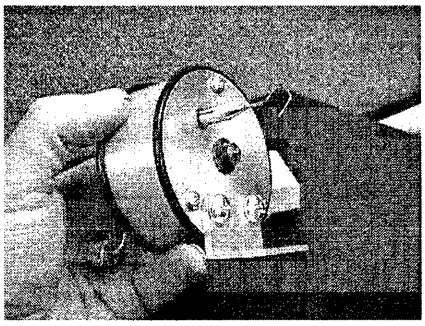


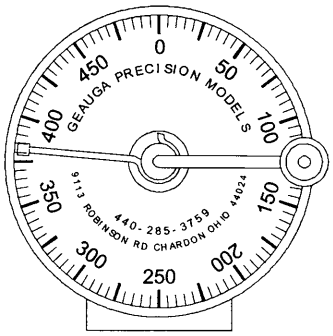




Geauga Precision Fills Void for Indoor Flyers







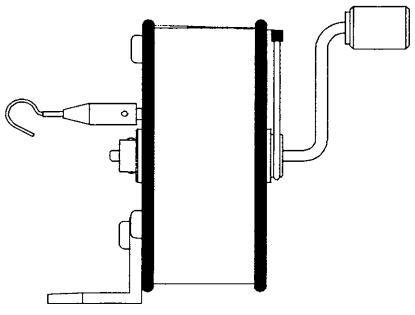
Bob Wilder's retirement from the indoor winder business a couple years ago left a big void in the supply of quality winders for indoor flyers. A year ago it wasn't uncommon to hear stories of used Wilder winders selling for substantial premiums over their original new cost. Fortunately that situation changed for the better in March 2001. That's when Geauga Precision Models of Chardon, Ohio announced plans to produce winders similar to the excellent winders formerly produced by Bob. Since then, the better part of 100 flyers have had their winder needs met by Geauga Precision.

Actually Geauga Precision manufactures four different winders. In 20:1 and 10:1 they produce winders almost identical to the Wilder design. They have the same basic configuration with aluminum housing and integral turns counter. They do differ in appearance by incorporating a couple of "O" ring trims that happen to provide a better grip on the housing and provide some protection against dents and dings that winders suffer when they hit the floor.

In addition to the basic winders, Geauga Precision offers enhanced version winders in both 20:1 and 10:1 ratios. These two versions incorporate a unique sliding gear lock that allows the user to securely lock both the input and output shafts of the winder with the push of a button. When used with a stooge this feature provides the user with a simplified technique for transferrng a wound motor to the airplane.

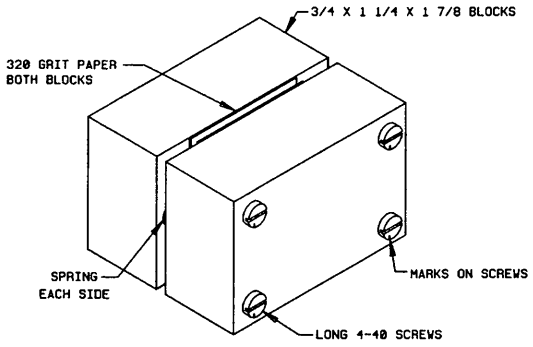
Standard on all winders are two 8-32 tapped holes for attaching the winder to your favorite mounting or stooge. Optional, is a ready made foot and socket combination that make attachment to your stooge as simple as installing two #10 X 3/4 wood screws (provided). Included in the cost of any configuration winder is the choice of either .031 or .047 inch wire used to make the output hook. With this choice you can pretty well tailor your winder to the type of motors you're winding. A second output hook is optional. The cost of the basic 20:1 non locking winder is $95.00, and the 20:1 locking winder is $110.00. There is a $20.00 premium for 10:1 versions, and the optional mounting system and optional second output hook are each $15.00. Shipping to U.S. addresses is $7.00.

Also, in 2002 look for GPM to offer a premium quality prop bearing for models 3 grams and up. This bearing will offer top performance with unparalleled durability and ease of use.



For more information or ordering, contact Wayne Johnson at:
Geauga Precision Models
9113 Robinson Road
Chardon, Ohio 44024
Phone : 440-285-3759
E-mail : johnsonwd@earthlink.net
Additional information under links at http://www.IndoorDuration.com

A WING POST SANDER by Ray Harlan



Recently I devised a wing post sander that works so well I had to pass it along. After 40-odd years of indoor building I got tired of sanding posts to get good fits in tissue tubes. I always liked round posts and have not gone with the rectangular-post crowd. The sanding rig I came up with not only gets posts round (to .0002" or better!), but can let you ease into a very nice tight fit on the tube.

Start with two wood blocks about 3/4 x 1 1/4 x 1 7/8. Tape them together and drill .089 holes near each corner. Mark the blocks so they can be matched in the same positions later. Separate them and open the holes in one block to .120. Tap the other block 4-40. Even though the blocks are wood, if the screws are long (1 1/2") the threads will hold just fine. Mark the inside faces of the blocks between the upper and lower screws so counterbores can be drilled to hold the springs. Choose two light springs to hold the blocks apart against the screw heads. Drill counterbores so the springs have good clearance and the springs hold the blocks apart about .2" with no load. Glue two one-inch wide strips of 320 paper to the inside faces of the blocks. Assemble them with the springs in place and run the screws down until the faces of the blocks touch. Now put a mark on each screw head in the same spot relative to the block (e.g. down). If the screws are backed off the same amounts, the blocks will stay parallel.

To use the sander, first shape extra-length posts to a rough octagon shape by planing or sanding off the corners of square stock. Start with a piece that is at least .010" over the required final size, so the sander can round it without having any low flat spots. Put the post in a drill press or electric drill by lightly holding it in the chuck. Run the drill at low speed (about 600 RPM). Open the sander blocks so the post fits in loosely and slowly run the sander up the post and back again. All of the screw-head marks should be in the same position. Close the screws 1/8 turn and repeat the sanding. Be careful not to twist the block so as to put a bending load on the post. Repeat this process until the post is a tight fit in the tissue tube. Remember, each 1/8 turn reduces the post diameter about 003". The final passes will have less than 1/8 turn changes on the screw. When finished, twirling the post in a dial thickness gage will show no movement of the needle, and the posts will be the same diameter their full length. Even Middle School Science Olympiad students have used it successfully.

Ray Harlan

The following was posted by Bernard Hunt on the Yahoogroups Indoor mailing list:

There is a lot of folklore about what grain (more accurately described as medullary ray orientation) is best for particular duty (wing spar, wing rib, solid motor stick etc).

There is pretty full decription of the mechanical properties of balsa (density, strength, stiffness etc)in the scientific literature. Balsa is
highly anisotropic in that its properties vary strongly with direction. Here are some data from a standard textbook on timber for 12lb density (200 kg/m^3) balsa:

E Lengthways	6300	G LT	203
E Radial	300	G LR	312
E Tangential	106	G TR	33

Where E= Youngs modulus and G= shear modulus.
Lengthways= along the trunk and parallel to the TRUE grain.
Radial= from the centre to the outside(the direction in which the medullary rays run).
Tangential= parallel to outer circumference (or bark) of the tree.
The plane Lengthways-Radial (LR) is one we call "C grain".
The plane Lengthways-Tangential (LT) is the one we call "A grain".
The anisotropy is even more extreme for lower density balsa.
Strength properties follow a similar pattern to these stiffness properties with the added complication that tensile and compressive properties differ.

These data tell us:
Balsa is 20-60 times stiffer along the true grain than across it.
A "C Grain" balsa sheet is 3 times stiffer across the sheet than an "A grain" sheet.
The stiffness of a spar or sheet along the true grain is exactly the same whether it is "C" or "A" grain. You should not be able to tell them apart on an Euler buckling test.
Balsa has great stiffness along the true grain for its weight but it is poor in shear. This means that resistance of a spar or stick to twisting is not naturally good - you need to make them thick.

GOLD NUGGETS

THE PLEASURES OF FLYING INDOOR MODELS

By: Laurie Barr, laurie.barr@lineone.net

I started building model aircraft that flew (sometimes!) around 1945. Being war time, all materials were scarce but you could still get small cabin duration model kits, and so after the first one actually flew, I was hooked. From that moment on, my first love was always rubber-driven models, mostly small lightweights, and later on, much larger high performance unlimited duration types, all of my own design.

During this period of my life, marriage and children came along, as well as starting my own business. This was a magic time, which was completely fulfilling, and the whole family went everywhere, including caravanning to a World Champs in Gothenburg, Sweden in 1971 when I was a Wakefield team member. Eventually I became less addicted, especially after a hard day's flying, when it usually meant haven to compete in an unlimited flyoff, which also meant long hours searching for the model, quite often without a result. Often too, you did not always win, even though you knew you should have; remember, this was in the days before binoculars and tracker bugs! It was like testing flashbulbs!

At about this time I became attracted to indoor duration, which had all the things I loved about model flying; moreover you did it all in the same airspace, the right model won, and you did not have to become an athlete to compete on equal terms. All the structures were low tech; the only difficulty was being able to lift sheets of microfilm but, oh how rewarding to get perfect rainbow colored frames of film, lifted and stored.

Coming up to date, at 73 years old, I can still compete indoors on equal terms, the materials are still mostly low tech, and the only "techy" material is boron, which is simple to use. The flying of these models to World Champ standard does require a lot of control over prop pitch and diameter, rubber/launch torque, etc., but it is all manageable with out having a degree in maths.

As the rules for the previously exacting F1D have been changed, to make construction and transportation easier (the models are now smaller, with a higher minimum weight), and with the advent of the plastic film known as YK2-2, virtually any class of indoor duration model is within the ability of reasonably competent model builders.

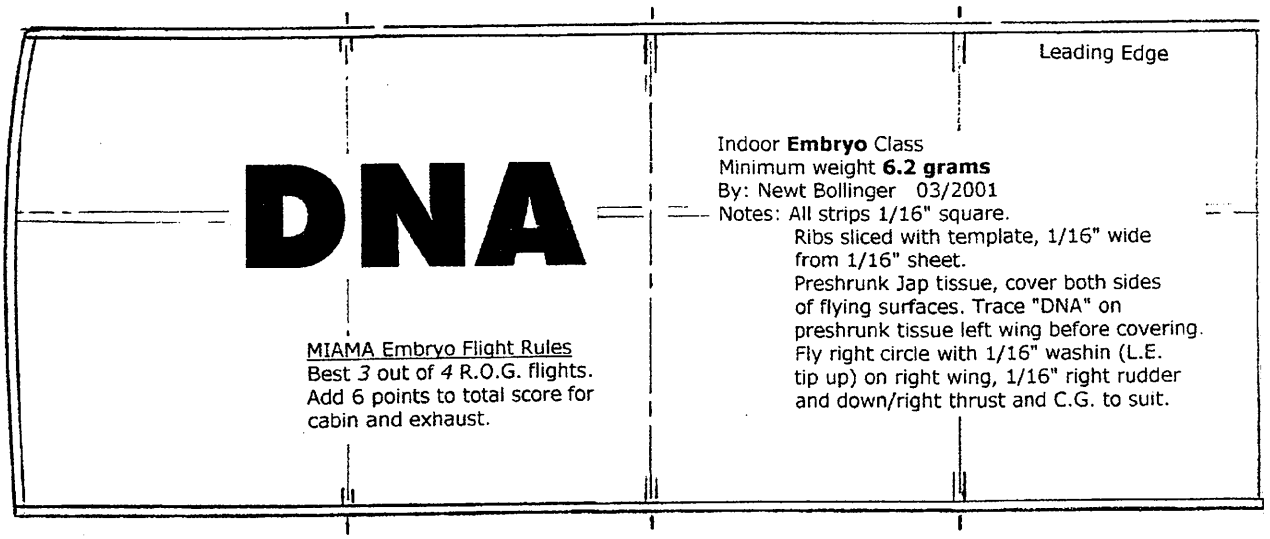
Regarding other materials, these are available, both in the U.K., U.S.A., and elsewhere, and you can further enhance your stock of spar wood by hunting down sheets of 4 lb to 6 ½ lb balsa at your local model shop, which apart from thin quarter-grained motor stick and tailboom stock, can be used to make the rest, such as super stiff spars, ribs for all types of models, and for fuselages on EZB and Pennyplane, etc.

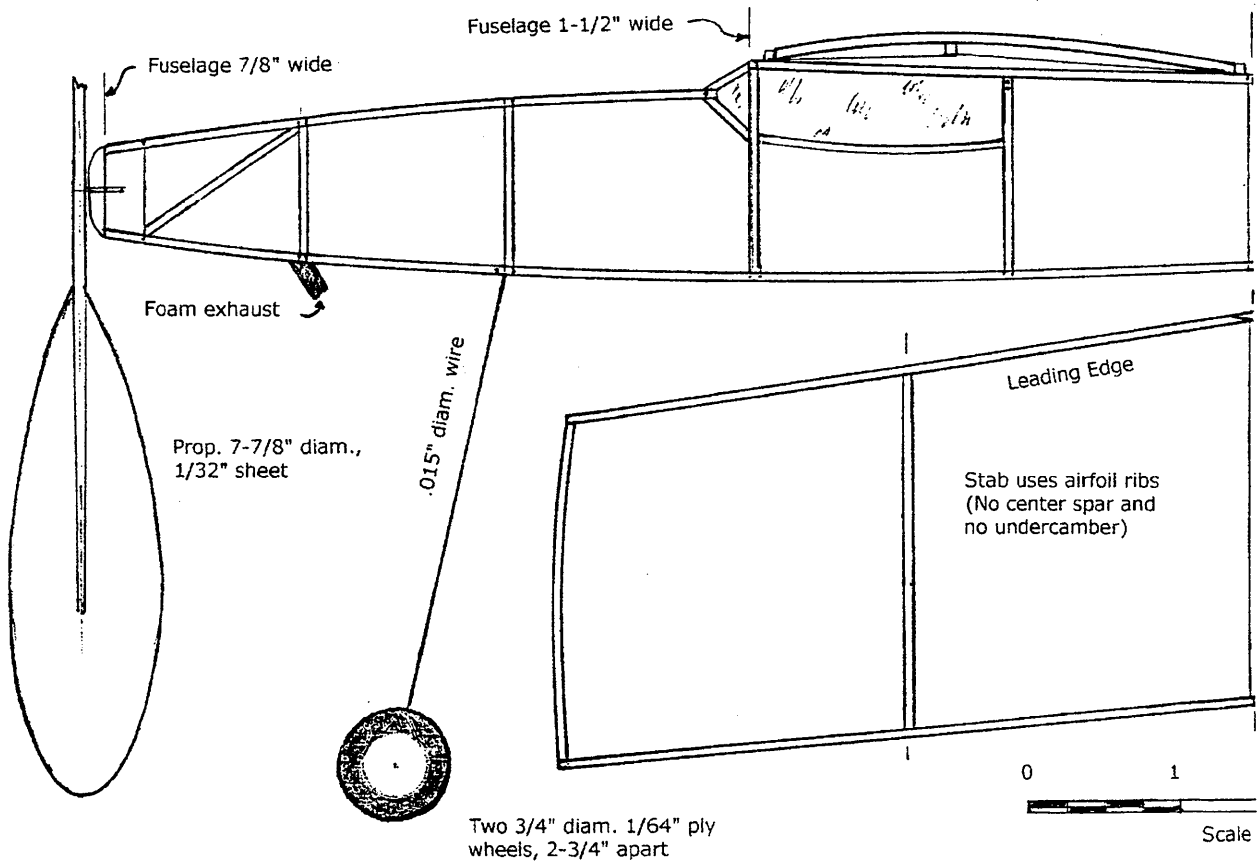
Many of the really keen indoor types have their own special sheet of super wood which they found in a local model shop. Typically this will be straight grained, very white, but crucially has the strength of normal wood in the 8 to 10 lb range!, but is much lighter.

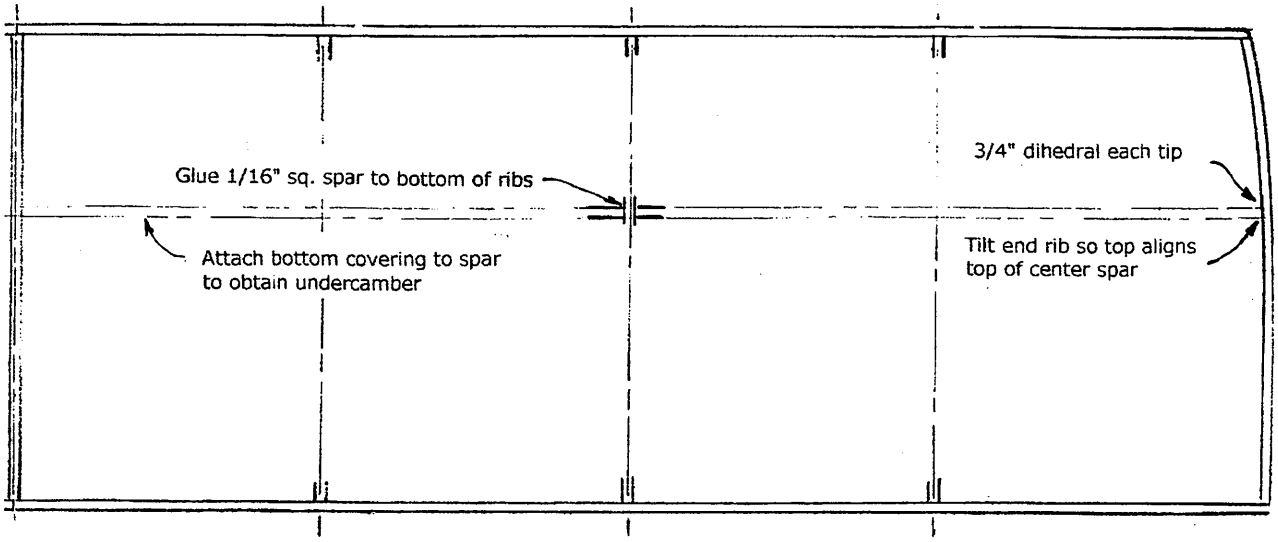
I am to be found in local model shops, with a small, battery powered postal scale to weigh promising looking white sheets of 1/8th, 3/16th and ¼" balsa wood, and using the formula of weight in ounces x 108, the sum of which is divided by the total sum of the thickness x width x length, which will give the sheet weight in pounds per square inch. You then take the selected sheet(s) home to test their tensile strength. (see Norwind News articles on stress testing in Issue 103, ed.)

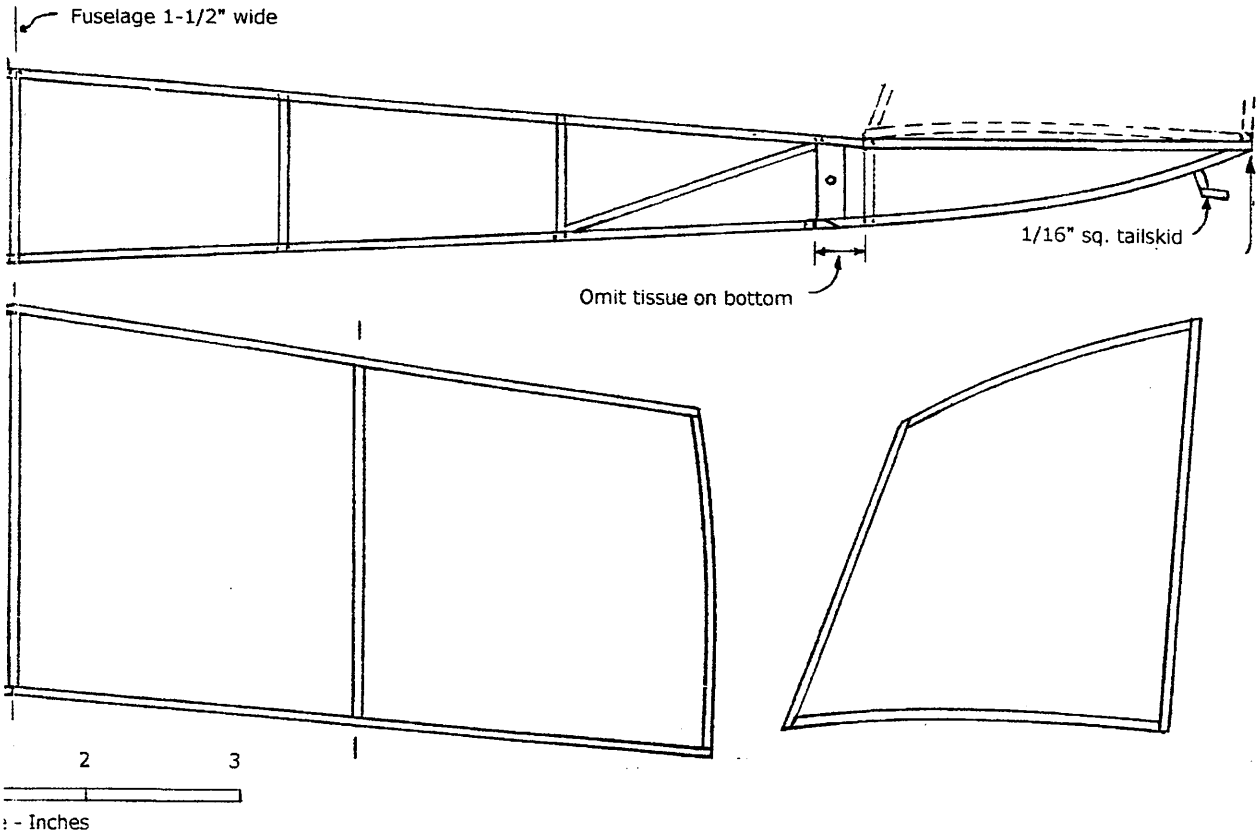
The building and flying of indoor duration models is quick and easy once you have the "feel" for it, and it takes only a couple of models to become competent. Indoor flyers are friendly, and will help you with all kinds of advice. They are avid users of the Internet, and will give up their latest performance-enhancing ideas freely.There are many indoor events at sports halls etc. being organized throughout the U.K., the best of which (as far as duration flying in high ceilings) are at Cardington in Bedfordshire, and the Velodrome, at Manchester.

I can thoroughly recommend that you come inside and enjoy the true delights of indoor flying, which was pioneered by some of the all-time greats of our hobby, such as Carl Goldberg, Frank Zaik, Max Hacklinger, Karl- Heinz Rieke, Bob Copland, Reg Parham and others. In the U.K. I recommend you get in touch with John Tipper, who has all the materials you will need, and also sells starter kits. His address is John Tipper, 23, Green Lane, Chichester, West Sussex, P019 4NS, Tel: 01243773346.


Leading Edge
DNA
Indoor **Embryo** Class
Minimum weight **6.2 grams**
By: Newt Bollinger 03/2001
Notes: All strips 1/16" square.
Ribs sliced with template, 1/16" wide from 1/16" sheet.
Preshrunk Jap tissue, cover both sides of flying surfaces. Trace "DNA" on preshrunk tissue left wing before covering.
Fly right circle with 1/16" washin (L.E. tip up) on right wing, 1/16" right rudder and down/right thrust and C.G. to suit.
MIAMA Embryo Flight Rules
Best 3 out of 4 R.O.G. flights.
Add 6 points to total score for cabin and exhaust.


Fuselage 1-1/2" wide
Fuselage 7/8" wide
Foam exhaust
.015" diam. wire
Prop. 7-7/8" diam., 1/32" sheet
Leading Edge
Stab uses airfoil ribs (No center spar and no undercamber)
0
1
Scale
Two 3/4" diam. 1/64" ply wheels, 2-3/4" apart


Glue 1/16" sq. spar to bottom of ribs
3/4" dihedral each tip
Attach bottom covering to spar
to obtain undercamber
Tilt end rib so top aligns
top of center spar


Fuselage 1-1/2" wide
1/16" sq. tailskid
Omit tissue on bottom
2
3
- Inches

ORIGINS AND PROPERTIES OF INDOOR BALSA WOOD

BY

JAKE ZIMMER, Owner www.SpecializedBalsawood.com

If you have ever wondered where balsa wood comes from and how many different properties it may have, this is the article for you. Ninety percent of balsa comes from Ecuador, and the other 10% originates from Costa Rica, Colombia, Peru and a few places in Asia. Balsa trees are quite large and fast growing. Many people consider them weeds because of how fast they grow. Balsa trees can reach heights of over 90 feet in years instead of decades. Normally at least 6 years of growth must occur before a balsa tree is harvested. The trees can become several feet in diameter, but only the outer portion of the tree can be used. For this reason, you don't see very many large blocks of balsa. Some of the larger and older balsa trees are off limits to balsa tree harvesters so there is little chance of getting blocks over 6 inches thick from a plantation. Everything that I receive for manufacturing comes from plantations instead of rain forests. I would assume that the other manufacturers do the same thing, but it is always a good thing to check. When plantation trees are harvested, I sort of think of it as someone mowing their lawn and selling the clippings for mulch since the trees grow back shortly after being planted. A process such as this seems to be quite environmentally friendly and supportive of native animal species. After the trees have been cut down to the right lengths, they are stripped of bark and rough cut to the proper dimensions. Next, the blocks are kiln dried for around 2 weeks and stacked on palates for ease of mobility and shipping. The palates are loaded into a semi container between 20 and 40 feet long and brought to a ship for transport to their final destination. Each shipment must be fumigated and checked by port authorities before being allowed into the US. Checking for illegal substances may damage portions of the shipment and leave several select blocks with holes bored through them. Two common scenarios exist for why balsa may have holes in it; either a bug could have eaten its way through the balsa, or a block of balsa may have been drilled and checked by port authorities. After arriving, the container is usually unloaded onto another truck and shipped to its final storage area. I end up sorting the balsa by size, density, and quality before it is stored for later use. The process of importing balsa is quite time consuming and costly after shipping is calculated into the cost of the raw balsa materials.

The density range for balsa is quite substantial. The lightest balsa I have ever found was 0.3375-grams/ cubic inch and the heaviest balsa was 9.6-grams/ cubic inch. Light contest grade and heavy RR Industrial Grade balsa are very hard to find. I have sorted several thousands of balsa sticks from different sources and have only found a small percentage of the extreme densities. When determining the appropriate density category for balsa, I use the following standards to separate balsa into 5 basic categories. Contest grade is balsa under 6 pounds per cubic foot, light is 6.5-10lb/ft^3, medium is 10-13lb/ft^3, heavy is 13-16lb/ft^3, and RR Industrial Grade is any balsa over 16 pounds per cubic foot. Grain patterns on light balsa are spread farther apart than those on heavier balsa. Depending on how the balsa is cut, the grains may either be straight or slanted. Most of the time, trees just grow that way, but every once in a while a block may be mistakenly cut at an angle. Structures, for example would demand straight grains to optimize weight-bearing efficiency. If someone is using the slanted grains for decoration however, they don't usually care what the grains look like as long as the material is considered balsa. There are different colors of balsa. The color usually depends on the density and the origin of the balsa plantation in general. Light balsa is light colored, and heavier balsa is more grayish in color. Contest grade balsa usually has discoloration spots when located around the bark of the tree. If the bark is not removed quickly enough, the balsa may become even more discolored than it usually would. So that's the basics for selecting densities of balsa, and a quick answer to the question "where balsa comes from?" Many more things are involved in the processing balsa in the cutting field and manufacturing, but this should give the average balsa model enthusiast a good intermediate understanding of the materials they are dealing with.

About Y2K films
By Gene Joshu

The first film we received was a gift of sorts. Sort of like a kick in the butt. What to do with it? Try to get someone to help or advise how to unroll this stuff. It wasn't easy to learn how to handle this stuff. How are we going to sell this stuff, what to call it, how much should we charge, is there any more of this stuff in the universe, who knows? One problem at a time and now we have Y2K Film. What to do with the money? We decided to support indoor flying with the profits, especially juniors and science Olympiad and where there is need.

Now we're selling Y2K Film, where do we get more? Where did the first come from? We decide to limit the film to two rolls a year to each buyer. In general, it worked out fine.

We got a lead on the second roll. It's lighter that the first roll; Y2K2. Now we sort of have an indirect route to the film so without saying anything we relax the two roll limit. Some of the European countries have a hard time buying the film because of the expense, so we sent them batches of six to eight rolls to keep the cost down and also send some free rolls for the junior teams. Almost one half of all our sales are foreign.

Now in 2002 the supply seems fairly certain. The quality is the big question. It's a little like the rubber supply. We can't get exactly what we need and so we are always looking for a lighter or equal film to what we already have. We don't limit to two rolls per year anymore either. We don't want to sell one person 10 or 12 rolls just for himself because no one needs that much and there is too much effort into rolling off the film just to let it set on a shelf. We think we are reasonable, try us.

As of now we have Y2K, Y2K2, and PPP film which is heavier than the others, but lighter than some of the other films available.

PPP Film (Penny Plane Plastic)
1025 Cedar St
Catawissa MO 63015
.7 micron film that is economical and easy to apply.
12" x 50' rolls
$25.00 per roll
Price includes shipping

Y2K Films
4514 Meadow Ln
Red Bud IL 62278
Y2K (.5 micron) or Y2K2 (.3 micron)
12" x 25' rolls
$33.00 per roll Domestic
$35.00 per roll Foreign
Price includes shipping

A New Method of Joining Prop Spars

Steve Fujikawa
sfujikawa@ase.w1.com

I have never been satisfied with the customary method of joining 2 prop spars with a scarf joint. Spars joined in this manner have their thickest dimension parallel to the shaft and the blades glued on along the spanwise edge. There are a couple of things wrong with this. First, a rectangular cross section spar is in theory intended to take loads parallel to the deepest dimension and we're applying them at an average 45°, an inefficient use of the beam's section. Second, if the spars are double tapered, the blade longitudinal axes are not exactly radial, a negligible aerodynamic inefficiency to be sure, but more importantly it complicates blade set up by not being able to sight along the length of both spars to determine straightness.

The new method eliminates both shortcomings by orienting the spars at 45° to the shaft while providing a full span reference line for alignment, and in addition presents a more stable mounting surface for the blade by allowing gluing to the flat top of the spar rather than the edge. It is compatible with both sheet wood and built up props. And the wood joint is simple and requires no compound mitering.

Referring to the illustrations, notches are first cut in the top of the spars at the hub. Experimentation will show that the notches can be interlocked in a right or left hand manner. We only want the right hand as shown, so get this right before you glue it! The spars are glued using a straightedge and a flat benchtop for alignment. A filler piece is added to the bottom side at the hub to provide a flat surface for the thrust bearing. The location of the exact geometric center of the spar is at the center of the joint. Initially I thought that drilling square through the joint might be complicated by the harder glue deflecting the drill, but this is actually not a problem.

The hub itself thus created is extremely stiff and some weight could be saved by shaving off a little wood from the overlapping section, if desired. In theory, a lighter weight spar could also be used as its section is now being employed more efficiently.

When the spars are joined using a straightedge, a perfectly straight full span reference line is created for gluing the blades. I like to check blade alignment by sighting spanwise along the prop spar. Straight lines drawn down the longitudinal axis of the blades should appear perfectly co-linear, any blade misalignment is immediately apparent.

When gluing the blade to the spar, lay the spar top flat on the blade axis and put a single drop of glue at the 45° point. When then placed on the pitch gauge the angular distribution should be very nearly perfect, and completing the gluing is easy.

I suggest that this joint also be used with the EZB blades described in INAV #96 pp. 16-18. The author had the right idea with gluing the blades flat but the described wedge doesn't facilitate pitching or alignment. Although a straightedge/benchtop can't be used as a gluing jig with the blades already attached, blade alignment and pitching will still be simplified.

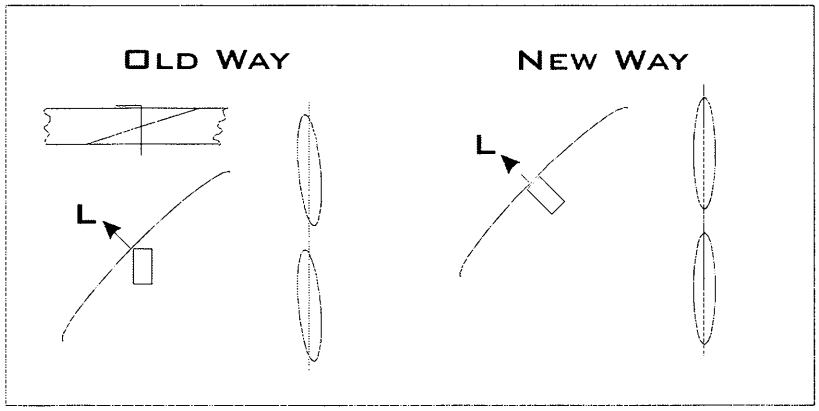
INAV fund drive to support the Jr F1D team

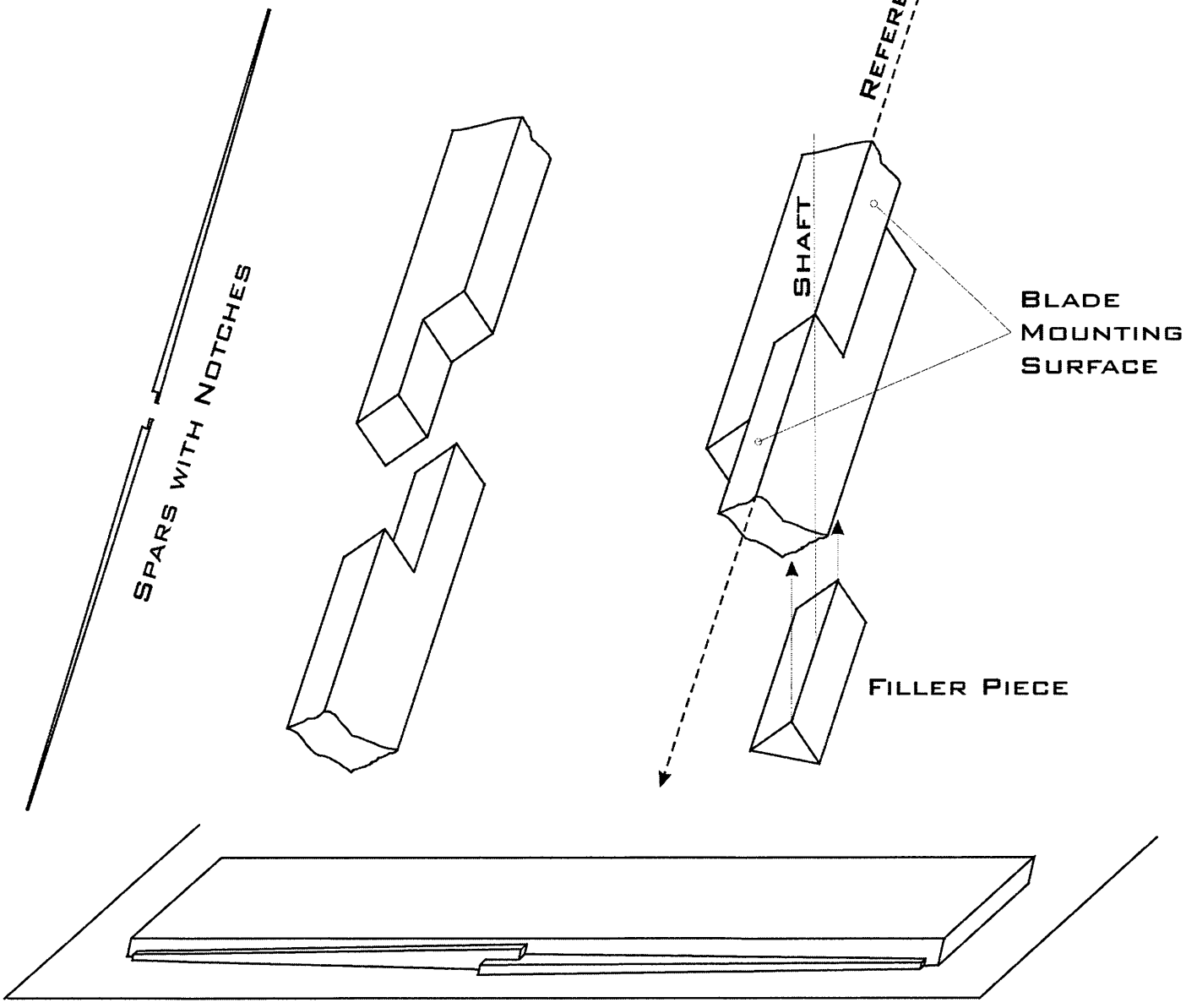
So far we only have 12 donors to support this worthy cause. This is your chance to put your money where your mouth is in supporting our first ever full junior team to the World Championship. Donations are tax deductible. Make checks out to NFFS and mark that it is for the INAV Jr Team Fund.

Mail to:
Vern Hacker
25599 Breckenridge DR
Euclid OH 44117

Contributors will be recognized in a future issue of INAV. Take a collection up next time you fly and get the money in!

A New Method of Joining Prop Spars





Gluing the Spars with a Straightedge

BALSA: A Beginner's Journey Into Hell

By: H. Bruce McCrory, 12/28/01

A while back a friend emailed me. He had cut into a new block of balsa from Lone Star Hobbies. It had an S.C. of 130. The best I had at the time was SC 108 – average. Shortly after, another email, SC 141.

SC is short for Stiffness Coefficient, a method of selecting and categorizing balsa based on one of its most desirable characteristics, stiffness. The stiffest wood goes into wing spars and booms. For its weight, stiff balsa will keep these structural members rigid where weaker or heavier, bulkier wood can flop and twist. The rest of balsa is identified by degrees of "punky", "mushy" and "takes-a-set". Finding the "best" has been the most frustrating, challenging experience I've had, other than trying to become a millionaire. I'm only a year into this search for the "Holy Grail" as I've come to call it.

I have a love/hate relationship with balsa that goes back to my first balsa purchase for my first plane about two years ago. Since then, I have sliced, diced, and quartered 3 and 4-foot sheets; spent hours and wasted .07-inch sanding a bandsawn sheet for a .010" prop blade that ended up a pound denser than the raw block. I've razor-cut perfect .010" c-grain sheets with no waste but damaged strength. My garage has boxes of wood that some day may be useful in some specific application, but are useless for EZB. Test strips from each sheet were cut and shattered, looking for motor sticks. I even have some failures from another Grail seeker. My search sent me to some of the most interesting of places and characters. Throughout this journey I've learned a lot and realize I know less as I learn more. Each discovery brings new questions and problems to be solved. For me the search, resolution, and discovery is ninety percent of the enjoyment of this sport/hobby.

The real nightmare started when "Doc" Dona gave me a copy of Larry Coslick's "Hobby Shop EZB", INAV #90. Larry describes going down to his local retailer, picking through balsa, finding some clear, clean sections of wood in the ideal 3/32nd –inch sheet and cutting some EZB motor sticks. Generously he picked an average weight blank from the sheet and describes how to test it for "stiffness" using coins, sticks and thread. Easy.

Wrong! A year later, after hundreds of motor stick blanks, I'm still searching for that elusive bugger that meets Larry's motor stick specifications. It has been a costly venture. The grapevine news says Mr. Coslick works pretty hard to find his motor sticks, too.

This I do know. When you pick up, or cut, a sheet of the best – or, rather the stiffest - balsa, you won't recognize it unless you know what to look for. If you know, it will be instantly recognizable. I have accumulated a lot of wood in a short time. It takes practice and a lot of failures to begin to identify useful balsa through self-training. If you buy mail order, the only difference is the experience and care taken by the handler collecting your order. I always stop by my favorite stores periodically, but finding a stiff piece of balsa will be more accidental than picking through the stock for what is best. Ninety percent will be bad or mediocre and the rest will be "average" based on the Hunt/Taylor Stiffness Coefficient test. (See Issue #104 – ed.)

Discouraging? Not really. I'm learning to work around the problem – if it is one – and discovering the unique qualities of even the poorest of my poor balsa. INAV #104 is testimony. I picked my poorest 4-pound (4.06) sheet of "Contest" grade balsa hovering at SC 50, built three A6 planes for the published plan and will attempt the world duration record next summer at Kibbie with one of them. You don't need the "best" wood to be competitive. There are many other factors that influence model performance, and balsa is the least important. [That last sentence is the most important in this article.]

Yes. I finally found a stiff sheet – a block actually. It isn't the Holy Grail, but at SC 120 and better it will suffice. There is a lot of information block number 5.7A - as it is labeled - can reveal about the structural properties of balsa. No. 5.7A filled the missing link next to poor, mediocre, and good stiffness rating. It was so good to me that I stopped hacking away the surface on my bandsaw and sent it to Tim Goldstein to custom cut. I'm still not sure that he will do this sort of thing commercially, but beautifully finished sheets of 5.7A returned with my first orders from Tru-Weight Indoor Balsa, Tim's new venture. And, the scraps! Insist on return of scraps if the cuts are to be A, C. Half the block disappears in dust and odd sized wedges. Tim puts a lot of work

into each sheet he cuts for sale, also. They are individually numbered, weighed, and rated for stiffness. Exactly what I did with half of the 40 odd sheets from 5.7A. Like reading geological history, this is what my good block tells me, so far:

1. Except for a half-inch band of hard wood that bisects the block tangentially, like a growth ring, the 2-inch depth is consistently stiff. This tells me that SC is not an isolated strip in otherwise mediocre wood. If the sheet or block is mediocre, no band of gold will likely be hidden in it.

2. I think the Stiffness Coefficient test as presently designed is useful in only a limited range of density. The hardwood band, which Tim groused about, could be an entire book or graduate thesis in my mind. The a-grain cuts went right through the band losing only .051-inch of wood in each cut. The Stiffness Coefficient story, with its flaws, speaks loudly from the 11 sheets. Outside the band, average density is 4.5 pounds, and SC- 126. Through the hard band, density climbs to 10.4 pounds with a geometric decrease in stiffness to SC 80. I have no reason to think stiffness would change relative to density. But this premise is tainted by an earlier discovery dealing with Mini-sticks. My first mini used an 11-pound, SC 70 motor stick that weighed less than any lower density sticks I've built since. It holds higher torque than lesser motors that have snapped the other sticks. There is more, but enough of block 5.7A.

The architects of the SC test admit it is most accurate in 1/8-inch by ¼-inch strips. This size does not fit my methods of stripping structural members. It is also difficult to convince a dealer to permit stripping wood for a test to determine if he or she has any decent balsa. Since the density range for most indoor construction is 4 – 6 pounds, the Stiffness Coefficient test probably is the most accurate way to select balsa stock for structural members. It offers nothing to understanding the requirements of individual parts for a plane, however.

The important lesson from my journey so far is that only by building and testing, with very detailed records, will my competitive passion improve. Most critical is to know as accurately as possible the strength and physical properties of each individual part. The records can be reviewed for any future modifications. The only way to do this is to test each part by deflection under load. Coslick's previously mentioned article describes deflection and is a very good example of record keeping. I've added twist to my construction records. Twist, or torsion resistance, in a wood strip is primarily a carryover from an architectural background and is very important to sizing motor sticks. This is also Larry's sequel to the "sticks and coins" test for selecting motor sticks. Twist is calculated by very similar methods used in a torque meter. The strip replaces the tension wire and weight is added to a moment arm with pointer at one end of the strip.

What about the super stuff, the "best" balsa? Are you at the store? Yes? It's in front of you. Bob Randolph didn't have great wood. He knew how to fly planes. Steve Brown doesn't SC test his wood. He inspects it visually, feels the bending tension in spar wood stock, and watches the bend from dead load on motor tube sheets. Steve also tests spars by deflection. Other fliers I watch closely are no different.

Wood options are numerous. What is needed to achieve the desired end? Answer: optimum structure, which can be either stiff or weak wood. The search for the Holy Grail is still very much a part of my time, but far more is spent learning how to fly, studying rubber energy characteristics, plane design, and other, more important aspects of construction.

Editor's note: To answer if Tim Goldstein has earned the right to our respect in the balsa-cutting field, one has only to read about his own search for the Holy Grail in this issue. Check out his Tru-Weight Balsa site for yourself at www.f1d.biz. As a novice stiffness tester, I can vouch for Bruce in the fact that there is a whole lot of S.C. 60-90 wood out there. Once found, anything over 110 should be treasured. But don't throw away your less-than-contest-best wood. Give it to one of the many S.O. or T.S.A. mentors who may be helping youngsters in your area. I'm certain they will find a use for it.

On EZB Motor Sticks

Bill Dodson

"Does anyone here fly EZB's?"
"Yes, the fellow at the end of the line. Just follow the sound of the cussing..."

Few things are more challenging in indoor modeling than finding a light EZB motor stick. I built my first model from the IMS kit, then ordered a bunch of indoor balsa from Mr. Gitlow. I had been sent a copy of INAV #90 by a generous modeler, and started slicing and testing wood bits with the intention of building a .6-.7 gram Hobby Shopper EZB. I sliced a motor stick sized stick off the bottom of a piece of IMS fuselage stock, trimmed it to size, and it met the deflection tests. It only weighed .145 grams, and my model came out to .515 grams finished. It climbed right up and out of sight in the rafters at Tustin never to be seen again. I then proceeded to try and duplicate this feat (the model, not the rafters), but could not even come close to that motor stick's weight or stiffness, even from the rest of the motor stick stock sheet. My lightest effort came out to .185 grams, and was not adequately stiff.

I spent many afternoons and evenings going through contest balsa in hobby shops, and brought home a bunch of promising pieces, and I thought a lot about the subject. What I wanted was a way to test 9" lengths of 1/4" by 3/32" balsa right off to tell if I had a winner or not, without having to go to the trouble of turning them into motor stick blanks first. I have tons of blanks – my best pieces to date came from a 1/4" thick piece, so I could not just slice them out directly, as one can from 3/32" sheet. It stands to reason that if you test a fuselage blank for stiffness in bending, a strip of wood in "pre-blank"condition could also be tested, I just needed to know what deflection to look for. I tried some sanity check calculations to see if the problem can be brought from the realm of the abstract into engineering terms. From the Hobby Shopper article, the dimensions of a finished motor stick are roughly:

.094" thick, 8.5 " long
.150" high at the nose increasing to .225"about 2.8"back
.120"tall at the tail end

To calculate its volume:

$V = .094 \times [(.150 + .225) / 2 \times 2.8 + (8.5 - 2.8) \times (.225 + .120) / 2] = .142$ cubic inches

Assuming 5.5 lb density balsa, this motor stick should weigh:

W = 5.5 lb / cu. Ft / (1728 cu in/cu ft) x .142 cu in x 453.6 grams/lb = .205 grams
(Eavg = 220,000 psi)
5.0 lb balsa -- .186 grams (Eavg = 180,000 psi)
4.5 lb balsa -- .168 grams (Eavg = 140,000 psi)
4.0 lb balsa – .149 grams (Eavg = 100,000 psi)

Since I have sheets of 3.8 lb wood, a .145 gram motor stick is possible, but can one reasonably expect to find a piece stiff enough? J. H. Maxwell gives us the following formula for average balsa stiffness (Eavg) as a function of its density, which I added to the above listing :

$$Eavg = 0.08 \times (Density - 2.75) \times 1{,}000{,}000 \text{ psi} \qquad \text{(eq. 1)}$$

Larry Coslick, in the Hobby Shopper article, writes that a good fuselage stick should deflect no more than (.120 - .051) = .069 inches when a 31.9 gram weight is applied to the top of the stick, or when a 10.7 gram weight is applied on it's side. I will assume that the 8.5 " motor stick is supported 1/10" in from each end, for an unsupported length of 8.3".

To estimate the value of E required for the fuselage stick, I turned to NASTRAN, a finite element analysis software package used to calculate structural deflection and stresses, and for aircraft flutter analysis. It is akin to hunting mice with a Bazooka, but it has been far too long since I have used my brain to derive a closed form solution. I modeled a 5.5 lb/cu. Ft. balsa beam (Eavg = 220,000 psi) to the requisite dimensions, broke it into some 400 solid elements, and applied the proper loads (Figures 1 & 2). Running the model, I obtained:

Volume = .142 cu. In.
Weight = .205 grams
Vertical Deflection = 0.072" for a 31.9 gram load
Lateral Deflection = .096" for a 10.7 gram load

Which checks out well for volume and weight, but requires a sanity check for the deflection values. To this end, I also modeled a .094 x .25 x 8.5 and a .125 x .25 x 8.5 strip of 5.5 lb balsa (Eavg = 220,000 psi) in NASTRAN, to compare the results to the beam deflection equation for a rectangular strip:

$$\text{Deflection} = (\text{Load} \times \text{Length}^3) / (4 \times \text{Thickness} \times \text{Depth}^3 \times E) \qquad \text{(eq. 2)}$$

Distance between pivots = 8.3" ("Length") – this assumes the sticks bridge the pivots by .1" on each side. Since the deflection is proportional to the length cubed, this dimension is important to the final result.

I found a passable closed form solution for the deflection of a tapered beam and attempted to express it in spreadsheet form. I input the same constant width and depth sticks for a sanity check:

	HAND CALC	NASTRAN	SPREADSHEET
.094 x .25 x 8.5 beam:			
Vert Def -- 32.9 gram load	0.031	0.031	0.031
Lateral Defl – 10.7 gram load	0.074	0.074	0.074
.125 x .25 x 8.5 beam:			
Vert Def -- 39.5 gram load	0.023	0.023	0.023
Lateral Defl – 10.7 gram load	0.031	0.031	0.031

From the above table, we can at least conclude that the NASTRAN and spreadsheet results for the straight beam are reliable. For a Hobby Shopper motor stick made from average stiffness 5.5 lb wood we calculate:

	NASTRAN	SPREADSHEET	
.094 x .150/.225/.120 x 8.5 fuselage:			Difference
Vert Def -- 32.9 gram load	0.072	0.082	14%
Lateral Defl – 10.7 gram load	0.096	0.095	---
.125 x .150/.225/.120 x 8.5 fuselage:	0.054	0.062	14%
Vert Def -- 39.5 gram load	0.041	0.041	---
Lateral Defl – 10.7 gram load			

From this table we see the hazards of collecting enough information that the various answers conflict. Had I used either method by itself I could have believed my answers were perfect. This is the danger of trying to predict reality from mathematical approximations – they are just approximations. There is great value in these approximations, however, for predicting general trends, as we will see shortly. I tend to go with the NASTRAN results (NASTRAN costs $120,000 and is specifically for structural analysis, EXCEL costs $200 and is very general purpose, and, of course, I - the weakest link - generated the inputs for both) for deflection, as I am not sure how well the closed form deflection equation handles a lot of taper. NASTRAN handles any shape pretty much the same way and gives good results provided the input is correct. The spreadsheet, however, can be posted for general public use, and one can always reduce the output by 14% or so.

Using the constant section beam bending equation above we derive the following relationship for scaling bending deflections (eq. 3) :

$$\text{Defl} / \text{Def2} = \text{Load1} / \text{Load2} \times \text{Length1}^3 / \text{Length2}^3 \times \text{Thick2} / \text{Thick1} \times \text{Depth2}^3 / \text{Depth1}^3 \times E2 / E1$$

We can now determine the wood stiffness required to meet the Hobby Shopper deflections Larry wrote up in his construction article. Using the NASTRAN results, to get .069" deflection in both directions for a Hobby Shopper fuselage of the same dimensions, the balsa stiffness required is:

E2vert = E1v x Def1v / Def2v = 220,000 x .072 / .069 = 229, 565 psi
E2side = E1s x Def1s / Def2s = 220,000 x .096 / .069 = 306, 087 psi

This answer mirrors what I have seen in motor stick testing, that is; "It is relatively easy to find a motor stick stiff enough vertically, by very hard to find one that meets the side bending requirements".

Assume for the moment that balsa stiffness is the same in either direction. To size a motor stick that meets the Hobby Shopper requirements with the same E in both directions, we use equation 3 above (or the spreadsheet) to solve for the ratio of depths required, which turns out to be an ~ 15% reduction in overall height, but requires E = 352,000 psi to meet bending requirements. If we keep the same vertical dimension, we can get a motor stick that meets the bending requirements by going to a width of .111" from .094", and now we only need a stiffness value of 184,000 psi to meet deflection criteria. The following table details the motor stick weight and stiffness ratio required for various densities of balsa for these two cases:

Volume = 0.124cu.in.
Stiffness Required = 352,000Psi

Wood Density =	6.0	5.5	5.0	4.5
Motor stick Weight =	0.195	0.179	0.163	0.146
Average Stiffness (Eavg) =	260,000	220,000	180,000	140,000
Stiffness Ratio Required =	1.35	1.60	1.96	---

Going this route, I doubt we could come up with a viable motor stick. If we leave the height the same, and increase the width to .111", we get:

Volume = 0.168cu.in.
Stiffness Required = 184,000Psi

Wood Density =	6.0	5.5	5.0	4.5
Motor stick Weight =	0.264	0.242	0.220	0.198
Average Stiffness (Eavg) =	260,000	220,000	180,000	140,000
Stiffness Ratio Required =	.71	.84	1.02	1.3

One can measure the directional stiffness of an un-tapered blank, and input these in the spreadsheet to get some direction on what size the final blank should be to meet stiffness criteria, and how much it should weigh. Although the spreadsheet can handle it, I have not experimented with tapering the stick in width as well as in height. It would be interesting to see if there is any advantage to doing this.

Tweaking motor stick dimensions for 140% stiffness wood in my spreadsheet (dividing vertical deflection numbers by 1.14 to match the NASTRAN results) gives a weight of .190 grams for a straight-sided motor stick blank in balsa densities from 6.5 to 5.0 lb. Weight increases slightly for 4.5 – 4.0 lb wood to .195 and .200 grams. From these numbers it appears that a .185 gram motor stick from a good piece of wood is possible, and that anything much lighter (if we hold to the same stiffness requirements) is exceptional. This agrees well with my experience testing dozens of motor stick candidate strips, and finding that many of those that meet stiffness weigh over .225 grams (those go in to my giveaway box). I'd like to know how this matches other people's experience.

This study assumes uniform density across the motor stick. If you follow Larry's advice and cut a motor stick out of the "light" area of a good balsa sheet, but with a touch of darker and stiffer wood around both edges, you could beat the weight numbers. The .145 gram motor stick I had was from a dark/light striped band on the edge of a sheet of IMS fuselage stock.

Other non-wood factors contribute to the success of an EZB motor stick:

Installing the propeller shaft and rear hook at exactly the right distance below the motor stick is critical. If this distance is increased at all by sloppy building you will have too much down thrust with full winds, and the model will either dive into the floor, or speed up enough for a wing tip to tuck under. If either one is much off center the motor stick will want to bow sideways under a fully wound motor. You can turn this to your favor by bending the rear hook a little to one side or the other to help fight a bowing tendency in the motor stick.

When walking out to launch on a fully wound motor, wait until just the moment before launch to hook up the motor to the rear hook. This will prevent the stick from taking a set in the minutes before launch. You can also bow the stick away from a problem direction immediately before launch.

The lighter you build a model, the less rubber/torque it will require, and the less stiff the motor stick will have to be. For a very light model, say under .45 grams, you might be able to relax the motor stick stiffness a tad. A lot of weight can be saved in other areas if pursued with some thought and diligence. Look closely at models that are turning in higher times in contests and you will see a lot of tiny details that shave off weight.

I would also recommend a tail boom that flexes no more than 3/4" under the recommended test load. The high value of over an inch mentioned in the Hobby Shopper article was inadequate for my models, while the 3/4" test booms have been fine.

Editor's Note: Bill's spreadsheet associated with this article can be found at www.indoorduration.com under "Utilities". The Hobby Shopper article by Larry Coslick can be found in the same site under "Articles", or from the INAV archive CD in Issue #90.

Balsa Facts

Botanical Name: Ochroma pyramidale

VITAL STATISTICS: Tropical Height 80 feet to 90 feet tall with a trunk diameter of 12 to 14 inches. A medium-tall, thin tree, balsa grows extremely fast. It is ready to harvest in 5 to 6 years from planting. The best balsa wood comes from younger rather than older trees. Balsa trees are widely distributed throughout Central and South America, from southern Mexico to southern Bolivia and Brazil. Ecuador, however, has been the principal area of growth since the wood gained commercial importance. It is often grown there in 5,000 acre balsa tree plantations with on-site milling and production facilities.

A very surprising feature of balsa is that it can withstand some corrosive chemicals better than stainless steel! Balsa's value is chronically underestimated because of its association with model building and novelties - most familiarly that most wonderful toy from our youth, the model airplane glider. In fact, only 10% of balsa production goes into models and novelties. Balsa has a long list of very interesting uses. Due to its buoyancy it is primarily used in floatation devices, life preservers, rafts, boat hulls and speed boats. Due to its light weight it is used in aircraft flooring, recreational vehicles, off road vehicles and subway cars. Also, in artificial limbs, bathtub and shower stall bottoms and theatrical props. Due to its porosity it is used in insulation, cushioning, sound proofing, vibration modifying and other musical and theatrical needs

WHY IS BALSA WOOD SO LIGHT? The secret to balsa wood's lightness can only be seen with a microscope. The cells are big and very thinned walled, so that the ratio of solid matter to open space is as small as possible. Most woods have gobs of heavy, plastic-like cement, called lignin, holding the cells together. In balsa, lignin is at a minimum. Only about 40% of the volume of a piece of balsa is solid substance. To give a balsa tree the strength it needs to stand in the jungle, nature pumps each balsa cell full of water until they become rigid - like a car tire full of air. Green balsa wood typically contains five times as much water by weight as it has actual wood substance, compared to most hardwoods which contain very little water in relation to wood substance. Green balsa wood must therefore be carefully kiln dried to remove most of the water before it can be sold. Kiln drying is a tedious two week process that carefully removes the excess water until the moisture content is only 6%. Kiln drying also kills any bacteria, fungi, and insects that may have been in the raw balsa wood.

IS BALSA THE LIGHTEST WOOD IN THE WORLD? No! Most people are surprised to hear that botanically, balsa wood is only about the third or fourth lightest wood in the world. However, all the woods which are lighter than balsa are terribly weak and unsuitable for any practical use. The very lightest varieties don't really resemble wood at all, as we commonly think of it, but are more like a tree-like vegetable that grows in rings, similar in texture to an onion. It is not until balsa is reached that there is any sign of real strength combined with lightness. In fact, balsa wood is often considered the strongest wood for its weight in the world. Pound for pound it is stronger in some respects than pine, hickory, or even oak

Joe Maxwell

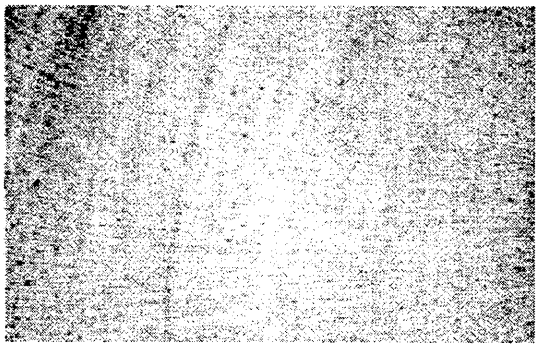
From his book
Balsa for Indoor Models

3 . Grain

What we call grain is, to be more precise, the position and orientation of the cells which make up a piece of wood. These cells fall into two main categories, Longitudinal and Radial. Longitudinal are those cells which were vertical when the tree was growing, and consequently run lengthwise in a sheet or a strip. Radial, as the name implies, are cells radiating from the centre of the tree, and so they lie at right angles to the longitudinal cells.

The cells in the longitudinal direction are further divided into two varieties, namely Fibres and Vessels. Of these, the fibres are the more important since they give the wood its strength, and the thickness of their was determines its density. In balsa, the fibres are thin-walled and enclose a high proportion of air, making the wood very light. Vessels are the long tubular ducts through which the sap flowed up the tree. Botanically, balsa is a diffuse-porous hardwood, which means that the vessels are evenly distributed rather than being concentrated in annular rings, as they are in softwoods.

All this description of cells is more readily understood if you look at a transverse section through a block, similar to the one shown here.



The photograph is actually of a thin slice from the end of a plank, lit by a back light to show up the grain.

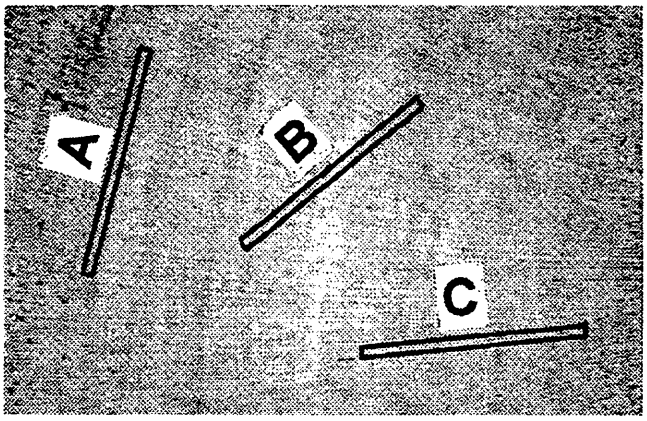
Visible in this photograph of the end of a plank are the growth rings, the rays, and the pin-holes formed by the vessels. Note how the rays are bent.

A section like this cuts through the vessels and fibres, and, although the fibres are too small to be distinguished by the naked eye, the vessels show up as pin-holes scattered about randomly. Also clearly visible are the rays which appear as fine lines fanning out across the block.

Another feature of this section is the pattern of rings, seen as light and dark shaded arcs. These are not annular rings which, in low density balsa, are about 1'/z° apart. Rather they are the result of seasonal changes as the tree was growing, and I prefer to call them growth rings. Mostly, the rays pass through the rings at 90°, although this angle can vary slightly.

Sometimes it is difficult to see the grain on the end of a block, because it has not been cut with a fine saw. The solution is to clean up a small area with a sharp knife or a razor blade, then dab it with a damp tissue. This will make the grain stand out.

To illustrate the practical application of this knowledge of grain, the ends of three different sheets have been drawn on the end-grain photograph to show how they would lie within a plank. Sheet A is tangential to the rings, sheet C is in line with the rays, and sheet B is somewhere in between.

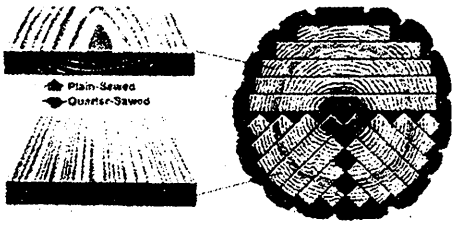


The position of each sheet within a plank determines its grain. A is tangential to the rings, and C is line with the rays.

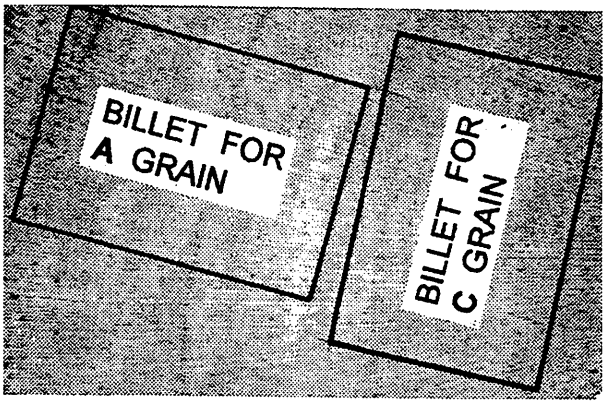
Using the letters A, B and C to identify the grain of sheets is a long established practice, and its origin is another interesting piece of Indoor history.

In 1933, when JASC0 started to produce balsa specifically for Indoor models, they found that some of the sheets could easily be rolled into tubes for motor sticks, while others were stiff and tended to crack when rolled. Examination of the two types of sheets revealed that there was a variance of 90° in their grain. To differentiate the grain cuts they introduced a code in which A indicated the easy-to-roll stock, C was the stiff cut, and B was for general use. Later, they discovered, from a Belsaw catalogue, that their grain coding agreed with the way logs are sawn in the timber industry.

Plain and quarter sawed. These timber trade terms correspond to A and C in Indoor balsa.



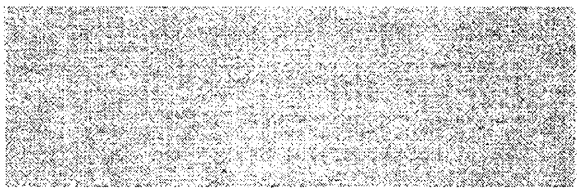
The Belsaw diagram shows that A grain corresponds to plain sawn and C to quarter sawn (now generally called quarter grain). Note, however, that, of the quarter grain boards, only the middle one is actually in line with the rays. This is a point I shall return to later.



Billets must be cut from a plank at the correct angles to yield the different grains of sheet. This involves some awkward sawing and a lot of waste.

The planks, as they are received by the Indoor balsa specialists from the importers, may have been cut from any part of the log, and, as a result, every plank has a different pattern of rays and rings on its ends. From these the sawyer has to extract the billets from which he will saw the final sheets.
To yield sheets with the required grain, the billets must be correctly orientated in the plank, and this often necessitates sawing at some very awkward angles, as well as generating a lot of unavoidable waste.

The illustration shows how two billets, one for A grain sheets and the other for C grain, might obtained from a plank. Given a suitable billet, A grain sheets are relatively easy to produce. A series of parallel cuts will result in sheets all of which will be A grain, and will look like the one shown here. You can see that it is fairly featureless except for the vessels, which appear as darker lines.

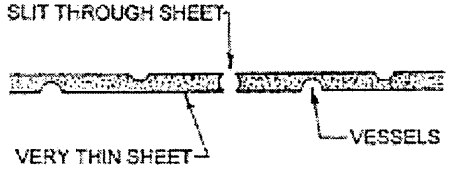


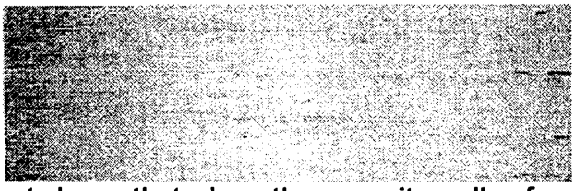
A grain sheets are featureless, except for the vessel lines. The longer these lines are the better.

Long vessel lines are desirable because they indicate that the sheet was cut in line with the longitudinal grain. If the vessel lines are short, the grain is running through the sheet at an angle, and strips, such as spars or motor sticks, cut from it will be weak.
For a sheet to be true A grain, the rays should run through it at 90° to the surface at, or near, the centre line. The only way to check this is to examine the end of the sheet with the aid of a magnifying glass.
A grain has two main attributes - its uniformity and its flexibility across the sheet. Uniformity results from the fact that the whole sheet was growing at, more or less, the same time. When a number of strips are sliced from an A grain sheet, there is a good chance that they will all have the the same density and stiffness. The flexibility allows the sheet to be bent to very small radii without cracking. This is particularly helpful in rolling tubular tail booms.

In this enlargement of a small area of the end-grain photograph, the vessel holes show up clearly, and can be measured.

In very thin sheets, you will often find slits going right through. This occurs when the thickness of the sheet is less than the diameter of the vessels. Then the opposite walls of those vessels which happen to come midway in the thickness will have been cut away, leaving gaps through the sheet.
To put this into perspective, I have enlarged, by a factor of 2 a small area of the transverse section photograph. In this, the vessel holes show clearly and can readily be measured. The average actual size is 0.02" diameter, so any sheet with a thickness less than that is liable to show slits.

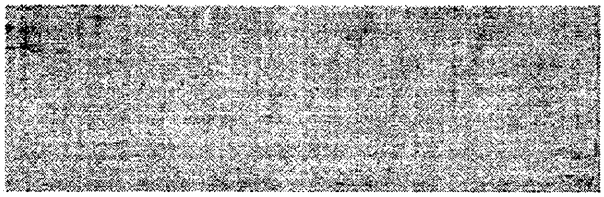




Greatly enlarged section of a very thin sheet shows that where the opposite walls of a vessel are cut away, the result is a slit right through. Slits can be clearly seen in the photograph below of a 0005" sheet.

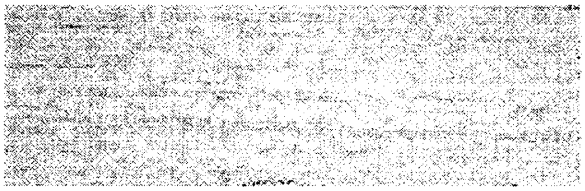
This phenomenon can appear in sheets of any grain, but it is more prevalent in A grain. This is because, although the vessels are tightly packed between the rays, they are less constrained radially. Thus the holes tend to be oval, rather than round, with the longer axis in the radial direction, that is through the thickness of an A grain sheet.
C is a more complex grain. Strictly speaking, a C grain sheet should be sawn in line with the rays, but we can reasonably relax this a little and say that any sheet that is within 5° of the rays is true C gain. Sheets complying with this definition look like the one shown here, where the rays appear as narrow stripes running right across. As the angle between sheet and rays increases above 5°, the stripes get shorter, then become mere speckles, and, eventually, disappear altogether.

In C grain the rays are parallel to the surface of the sheet, and appear as stripes running right across.



[If you would like to see perfect C grain, find a block with a split in it, and open up the block along the split. The split will almost certainly be radial, and perfect C grain will be revealed]
When a billet for C grain is sawn in parallel cuts, only two, or at the most three, sheets (depending on the thickness) will be true C grain, with an extensive pattern of stripes. All the other sheets will be speckled, to a greater or lesser extent.
In order to produce more C grain sheets from a billet, the angle of the saw has to be adjusted every few cuts. This process is time-consuming, as well as being wasteful, so - understandably - the main producers of Indoor balsa avoid it. It is significant that, in their literature, Micro-X, I.M.S. and SIG all describe C grain as "mottled" or "speckled". This is a misconception, fostered by the supplies people, to justify the sale of sheets with even a hint of speckling, as C grain. To be realistic, speckled sheets should be termed CB grain, and any sheet sold as C grain ought to display a good proportion of distinct stripes.

When the rays run through the sheet at an angle, they appear as speckles. Such sheets should be called CB grain.



Another common misconception is that C grain and quarter grain are one and the same thing. Reference back to the diagram on page 16 shows that not all quarter grain sheets (or, in this case, boards) are in line with the rays. Thus speckled sheets may correctly be regarded as quarter grain, although they are not true C grain. Paradoxically, all C grain sheets are quarter grain, but not all quarter grain sheets are C grain.
A further problem in producing C grain sheets is that the rays, as seen on the end of a billet, are often not straight, but bent. Also the pattern of rays may be twisted, from one end of the billet to the other. All of which explains why a complete sheet of C grain is a rarity.
Stiffness across the sheet, which is the main attribute of C grain, is simply due to the rays acting as stiffeners. Note, however, that although the rays give stiffness across the sheet, they do nothing to improve the stiffness lengthways. Bending tests I conducted on A and C grain motor sticks, cut close together in the same piece of balsa, showed that they were exactly equal in stiffness.
The combination of longitudinal fibres and lateral rays makes C sheets a kind of natural plywood. In fact, a good way of deciding where to use C grain is to imagine that you are designing a very large Indoor-type model with no weight constraints, and then think "Would I use plywood for that component?"
Two obvious applications are propeller blades and tubular motor sticks, where another quality of C grain comes into play.
That is its ability to maintain a curve after it has been formed. If the rays are bent by some moisture/heat process, they will retain that shape after drying and cooling. This means that propeller blades will keep their camber, and motor sticks will stay circular and resist crushing.
For some motor sticks C grain may be too stiff and the rays too prominent to permit forming to the radii required. In these cases it is advisable to use CB grain.

Grinding Indoor Wood

Ray Harlan

Although I have only a little experience grinding indoor wood, I was asked to write a short article on the subject. I am fortunate to have an old, mechanical Brown and Sharpe (ca 1956) that I bought cheaply some years ago. When Stan Chilton told me he was grinding wood, I asked about the particulars and he even supplied a 2" wide wheel of 60 grit aluminum oxide. I built a vacuum chuck for it, but wasn't inspired to grind wood until talking with Tim Goldstein last year. I had been hung up on balsa dust getting everywhere, which I didn't want on my other good machines. He assured me that the dust was minimal, which is true. However, if a lot of balsa is to be ground, some sort of dust vacuum is useful.

The vacuum chuck is just a piece of ¾" x 2" x 18" aluminum with .040 holes every ¼". It is relieved on the bottom and a tapped hole in the end of the plate holds a hose barb. The bottom reliefs let air get to this exit port but provide stiffening webs so the top surface remains flat under vacuum. The aluminum plate is epoxied to a ½" plate of steel that is held to the magnetic chuck. After building the chuck, it must be ground on the machine to get the top surface flat and parallel to the travel. Don't use the balsa-grinding wheel.

My first attempts at grinding seemed quite successful, until I discovered that the finished .006 balsa (for EZB props) appeared to have hinges running along the sheet. Close examination under a microscope showed that several rogue grains were sticking out of the wheel and nearly slicing through the balsa. They couldn't be felt on the wheel. If metal was being ground, they would have popped off immediately, but the balsa didn't offer enough resistance. A couple of touches to the running wheel with 320 paper managed to dislodge them and the wheel has been fine since. I am not sure of the best wheel to use, but generally a hard wheel (silicon carbide) would be chosen. It might not have rogue grains. A coarser wheel would not load as easily, but the present wheel isn't bad. I blow off the imbedded dust every few sheets.

To grind wood, I place it on the vacuum chuck and add strips of paper if the sheet is narrower than the chuck, so no holes are open in the chuck. The hose from the chuck goes to a shop vac, which provides plenty of downward force to hold the balsa. The wheel is started, brought down to just touch the surface of the wood and the table is hand traversed at a speed of about 4"/sec. For each new pass, the wheel is lowered .001-.002" until a surface sheen can be seen over the whole sheet. Grinding leaves a very smooth, almost polished, finish. When the whole sheet has this, there are no low spots. The sheet is turned over and the other side is ground. Usually only .002" needs to be removed from this side to remove saw marks (the chuck pulls the wood down and forces the bottom to be flat, so grinding the first side gets a uniform thickness). The final thickness will be uniform to .0002" or better!

I have not tested the density or stiffness coefficient of a sheet before grinding it, so I don't know how grinding affects these. To get density of the unground sheet, the thickness must be accurately known and it often varies several thousandths. Furthermore, the surface roughness will influence the measurement. The stiffness coefficient also depends on the density. There would be a large uncertainty in these parameters before grinding.

Some might think that the polished surface must be, in part, due to crushing cells when grinding. In looking at the surface under a 30-power microscope, I don't see any evidence of this; it may take higher power to assess it. One test could be performed with a sheet of, say .025 A-grain balsa. It could be ground flat on both sides and the density measured. Then it could be ground again, taking off .005 total and the density again measured. This could be repeated several times until the sheet was about .005 thick and all of the density measurements could be compared. If the surface were compacted by grinding, it would increase the density near the surface. One would expect that this crush layer would be a fixed thickness, not proportional to the sheet thickness. Therefore, as the sheet got thinner, the density should increase, because the crush layers would be an increasingly higher proportion of the total sheet thickness. If the test shows a constant density, there is no crush layer. I haven't made this test, but the thin wood ground (.006) had a density of 4#/cuft, so the effect, if present, can't be very significant.

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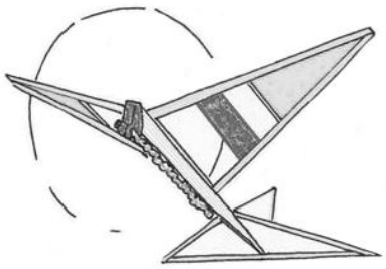
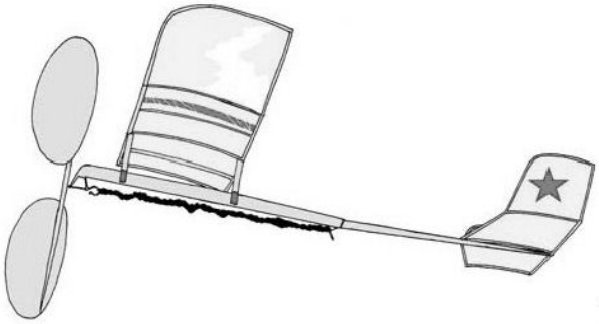


Delta Dart



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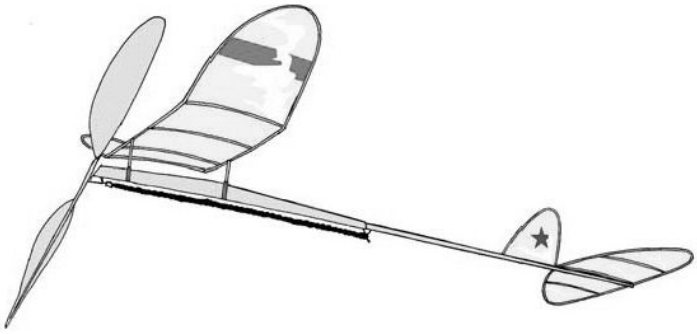
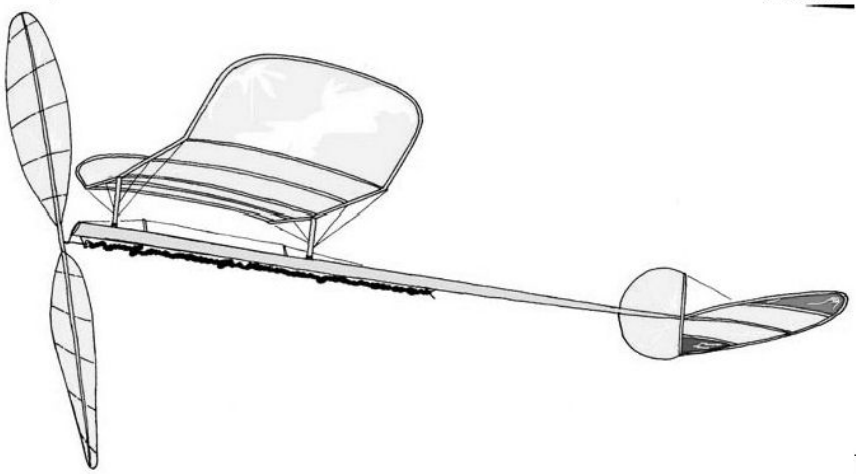


EZB



F1D

From the Membership Desk:

Another 2 months have passed by and I still am as behind on projects as ever. Progress is being made on a number of fronts and some that involve INAV.

First up I need to announce a rate increase for INAV. This increase is effective immediately and any subscriptions or renewals received at the old rate will be prorated based on the new rate. There are a number of reasons we need to have this increase. The primary reason is that our printing costs have increased. For the past year I have been able to print INAV for only the cost of the paper. With an upgrade in the printer I was using the machine has a new contract and we now have to pay a per page fee. While it is still a sweetheart deal and about 1/6 the cost of having them printed at a commercial shop it is still an increase in our costs. We are also anticipating a postal rate increase in the next few months and need to have the funds available to cover this cost increase. Finally at the current rate we are stretched putting out 5 issues per year. The increase will give us the funding to not only cover the increased expenses, but also fund a 6th issue this year. Considering the quality and content that Carl has helped me get into INAV I feel that even at the new rate this newsletter is still a bargain and I expect that your continued support will confirm this.

One of the items of progress to note is that through the generosity of Jerry Murphy of Colorado Springs I have been able to fill in a few more holes in the INAV archive. Jerry was able to provide a number of issues from 1961 and even one issue from 1960. He also provided a couple that were missing from 1969 and 1970. I am still searching for a few issues that Jerry did not have from 1960 & 61. If you have any issues from those years please let me know so they can be scanned for the archive to preserve them for the future. I will be releasing an update to the archive later this year that will include the additional back issues and the recent issues that were published after the archive was created. Time frame is likely to be late fall or early winter. Existing archive owners will be able to get the update for a nominal charge to cover the media and postage.

We are continuing to pursue ways to increase awareness of INAV and increase the subscriber base. One avenue that is yielding results is a promo flier. Ray Harlan, Y2K Film, Specialized Balsa Wood, Jim Jones, and Geauga Precision Models are putting this flier in with orders to help spread the word about INAV. To enable current subscribers to help I have put an Adobe Acrobat ,pdf file of the flier on my website. You will find the link to it on the top of the INAV page on http://www.IndoorDuration.com Print it and pass them out. I am still amazed that after 40+ years of publication many people don't know INAV exists. The fact that we are back stronger than ever is also news to some. Another avenue we are just starting to explore is trying to get INAV sold in hobby shops. To that end we have added a per issue price on the front cover. The next step is to contact some local shops and see if they will add INAV to their newsrack. If you are friendly with a shop that may be willing let me know and I will pass along the details on this program.

The rush of the contest season is almost upon us. I will be flying at Lakehurst over the Memorial day weekend and at the Kibbie Dome event. I hope to see some of you there. Off to cut some wood and get some new planes built.

Tim

PPP Film (Penny Plane Plastic)
1025 Cedar St
Catawissa MO 63015
.7 micron film that is economical and easy to apply.
12" x 50' rolls
$25.00 per roll
Price includes shipping

Y2K Films
4514 Meadow Ln
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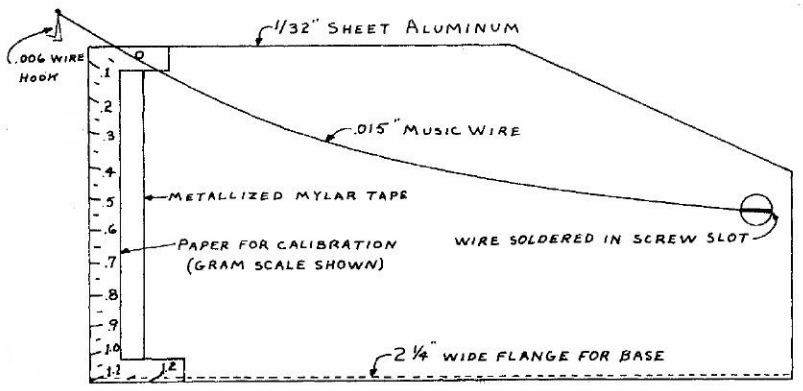
Unless specifically stated, INAV does not endorse any products or services advertised herein. Sample ad copy should be sent to Tim Goldstein at the above address for publishing details.
To the woman with a program to

Simple Scale

Jim Richmond submitted the scale design shown below, which was patterned after ones used by the Czech team at the 1968 World Champs in Rome. Although this is not a new idea, it bears repeating. This type of scale is as accurate as you make it (typical with most indoor scales) and indefinitely repeatable to that same accuracy. It is also capable of being packed in small spaces and rugged enough to be on the dependable in the flying site - which can't be said of most scale designs. Note that this design has a "mirror scale" similar to precision laboratory meters; this is done by using metallized mylar tape adjacent to the scale. In practice, you align your eye so the pointer appears to cover its reflection in the "mirror", and thus errors due to parallax are eliminated. If you are really finicky about weights, make a second spring for the other side of the scale, using smaller wire. For example, .008" diameter wire would be about 4 times as sensitive (full scale deflection of .3 grams), and would permit greater accuracy in weighing lighter parts.



REMEMBERING MIAMA FOUNDER DOC MARTIN
by Dave VTO Linstrum

On January 12, Doc Martin (after a battle with cancer) left his beloved Earthly flying sites to spiral up and fly with the angels near the ceiling. He is survived by son Matthew and daughter Lilah plus 3 lovely grandaughters.

Doc was born in 1927 in Philly, living as a youth near the Fred Megow kit factory. He built Dime Scale models when they were only a dime, starting a lifetime love affair with free flight. He earned a DDS at Penn School of Dental Medicine and established a dental practice in Coconut Grove (Miami) in 1953 continuing thru 2001.

He founded the Miami Indoor Aircraft Model Association in 1973 as a means to organize local flyers in competition. He found local flying sites such as the Opa Locka Blimp Hangar (a WW II structure) and various college gyms. Later his site search expanded to locations in Tampa Bay like MacDill AFB, Delta Air Hangar Tampa Airport, US Coast Guard St. Petersburg, and the huge Tropicana Dome (231 ft ceiling) in downtown St. Pete. He had hoped to fly at the 3rd Annual MIAMA meet there.
Monthly MIAMA contests were held at all those sites from Sept to May, with a wide variety of AMA & Flying Aces events. Doc was the sole Scale Judge.

Thirty-one years ago, he began publication of the monthly newsletter THE HANGAR PILOT to advise club members of upcoming meets, give results, and educate them about indoor flying. He prided himself on having a building plan in EVERY issue. His final effort #216 had a Tom Swift Red Cloud Airship on the cover and a Peanut Scale Polish PWS-11 by maestro Pres Bruning. There was also scale data for the Swiss Comte AC4 Gentleman- an excellent scale subject. The newsletter was a clear expression of his feelings, with often pungent remarks and educational items.

Doc's first love was Pistachio Scale, which he instituted as a USIC Event and an annual Postal Meet the MIAMA INTERGNATS. At first he invited flyers to mail their models to him- he recruited clubsters to proxy fly them. Lately he tried a postal meet format, with modelers flying at home and simply sending in their times. He built his own Pistachios, winning often. His favorite Goldwing canard homebuilt will be proposed as a donation to the AMA Museum in Muncie. It is a USIC winner.

I first met Doc at the 1972 AMA Indoor Nats at the Madison St Armory, Chicago.
He had a group of Martin MO-1 in bright silver & chrome yellow US Navy livery. They flew like homesick angels. He then attended all the Nats, and was at the 1980 Indoor World Champs West Baden IN. He also flew at that site at various Record Trials.

I had the pleasure of being Doc's travel companion often, first to the 1978 F1D World Champs at Cardington Airship Shed UK. Bud Romak took home the trophy then.
We shared many motel and ETSU dorm rooms, most recently at the 2001 USIC.

Doc was always a great dinner companion, with an opinion on everything-especially politics. He had a dry sense of humor- perhaps due to his being an Anglophile. He often flew at Old Warden and Middle Wallop FAC/SAM meets in the UK, then continued to the Ediburgh Jazz Festival. Dixieland Jazz was a passion. He often built models while listening. He built quickly but well on a desk in his 2nd story den in the live oaks.

His service to the AMA was as MIAMA President and Indoor Contest Board member. He earned the AMA Distinguished Service Award from VP Jim McNeill and the Blue Max medal of the Flying Aces club. His shop was filled with models and trophies.

For the story of Doc's Hangar Pilot publication, see the article in the Jan 1996 NFFS Digest. There is a good photo of him with his beloved Goldwing in FAC and Pistachio sizes. He is wearing surgery scrubs- his favorite comfy flying costume.

All who knew Doc saw him as a free spirit. His contributions to free flight were myriad and the MIAMA club will never be the same. He was our guiding light.

Subject: SCAT Electronic News 5 Feb 2001 issue 673
Date: Wed, 06 Feb 02 14:58:12

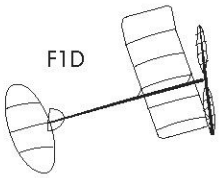
Tan II update
==========
Author : faimodelsupply@cyber-quest.com

It turned out that the first trial batch of Tan II at the new factory location was a very good product. The output of the first run was quite small as most of the rubber was scrapped during the run. This problem was due to a difference in geometry of the transfer equipment at one rolling mill in the production process and nothing to do with the
polymer chemistry or curing of our product. We met with the factory production team and reviewed possible " fixes " to this situation. The end result is that a new trial batch of 1/8" has been scheduled for delivery to us by February 27th, and test results should be available by approximately March 4th.
As a result of this meeting, the factory has asked us (and our customers) to consider changing the thickness spec to .030" instead of .042". Factory QC as well as the
Production Manager feel that this thickness change would allow them to do a better job producing Tan II. ALL AGREED THAT A THICKNESS CHANGE WILL NOT BE MADE UNTIL TESTS CAN BE RUN ON SAMPLE STRIPS BY A FEW MODELERS.

And received March 2, 2002

A new 1/8" test run due to be received by FAI late next week. If that run goes well, a large batch of all sizes will be received in about 45 days. We are also planning to have " sport rubber" for the non contest fliers for less cost.
We are coming out with TAN SPORT ! First batch due in with Tan II about the end of this week.
First batch of both will be 1/8", if all goes well next batch will have 1/4" Sport plus all other sizes of Tan II. TAN SPORT will be much lower in cost

Thanks, John



Ode to F1D Indoor Model
by Warren Williams

Please no sneezes, my Indoor Gossamer flying on delicate breezes,
go drifting and still lifting. Up, up and away as if if to stay,
freezes for a second or more - shut the door!
Some think it's boaring when we go soaring,
but how shall the hanger be when we pass the center Free
and into the open reams of meanacing beams.
Oh Lord, bring on the balloon, so I can play a tune and guide my drifted gifted
from the floor and out of danger evermore.
It don't break the speed of sound but it does go around hoping
it 's caught in time to center, yes, it's a contender and is better now
as the watches keep ticking, WOW!, who's kicking.
I'm still peaking above the catwalk, while I slowly walk amazed at the prop
as it fly, aloft in it's low pitch phase.
My time is rich, better than a 40 hitch, let it be 50, I won't change tho pitch.
My effort has paid off, as I trade off tough -
My plane is down, unwound, checking the time of this rhyme,
am I a 50 minute buff? Enough, Enough.

UPCOMING CONTESTS FOR 2002

GEORGIA – ATLANTA

April 27 Peach State Indoor Champs – North Springs High School – all events as above
CD David Mills 404-350-9438

May 18 TTOMA Indoor Meet – North Springs High School, I-285 & Roswell Rd., Atlanta, GA
all AMA events, A-6, S.O., No Cal, Hangar Rat. CD Gary Baughman 770-419-0416

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. An FAC contest will be held at the same time. CD Andy Tagliafico at 503-452-0546

ILLINOIS – CHAMPAIGN

April 13, 14 2002 Midwestern State Indoor Championships. Sponsored by the Chicago Aeronuts. To be flown at the University of Illinois Armory, a great Cat III site. $20 entry fee if done by mail by April 1, $25 if done on site, $1 for juniors and Seniors. If you'd like an entry form mailed to you please contact Bob Warmann by phone or mail or Geoff Bower by email at gbower@uiuc.edu

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. March 2, April 6, May 4

MICHIGAN – FLINT

May 5, 2002 Eighth Annual Spring Fling with 20 events, including Science Olympiad with mass launch. AMA and FAC events. Everything from catapult glider to F1D. Site: Inside Swing Golf Dome, Burton, Michigan. CD George Lewis, 3602 St. Clair Hwy, China Twp., MI 48054. 810-329-6833.

MICHIGAN – STERLING HTS

Heritage Jr. High School, 37400 Dodge Park Road (Corner of 16 Mile) Sterling Heights, Michigan 48312 Friday evenings 7:30 - 10 p.m. For info: Don Lang 586-751-3281

April 12 Contest night -- Limited Penny Plane -- A 6 - No Cal - Mini Stick

April 26 Contest night -- Jetco,Blatter, FAC Peanut Scale, Rubber Speed, Handlaunch , Standard Catapult

NEW YORK – ROCHESTER

Rochester Indoor Flyers have indoor flying sessions on alternate Sundays from 12 til 5 pm at the New Covenant Fellowship, 2070 Five Mile Line Road, Penfield, NY. Currently scheduled Sundays are 3/3, 3/17, 4/7, and 4/21. Contact Bob Clemens, WNYFFS President at robert.clemens@worldnet.att.net for details.

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. Must be a member of the ECIM with your membership card to gain access to the site due to new security policy. Contests held on Memorial Day weekend, July 4 weekend, and Labor Day weekend.

OHIO – KENT

April 7, 2002 6th Annual Indoor Contest at the Kent State U. field house, located ca. 30 miles southeast of Cleveland. Sponsored by the Cleveland Free Flight Society. Cat. III site. AMA events include standard catapult glider, EZB, LPP, ministick, and 7 g. Bostonian. Also 10 FAC events and an SO event. Entry fee is $25.00 at the door. Contest CD's are:

Michael Zand
5803 East Ash Road, Independence, OH 44131
216-524-3480 imzand@hotmail.com

Larry Mzik
117 Sycamore Drive, Painsville, OH 44077
440-357-7361

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. CD Abram Van Dover. 112 Tillerson Dr., Newport News, VA 23602

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.

INTERNATIONAL CONTEST CALENDER
Courtesy of Gert Brendel,
Indoor Flight International

BMFA Scale Indoor Nationals 21.4.02	Nottingham, Un. Kingdom	Pre-Entry for Open CO2/Electric, Open Rubber, Peanut, Pistachio. Free Entry for Kit Scale, Mass Launch, Air Race. Fun Fly Hall All day. Swapmeet. Nottingham University Sports Centre. Contact Charlie Newman on 01865 873020
Belgrade Cup F1D 25-26.5.02	Belgrad, Yugoslavia	Entry fee US$30. Contact: Vojislav Stojkovic, St. Kralja Petra 70, 11000 Beograd, Yugoslavia Tel: +38 111 18 96 27, fax: +38 111 18 64 43, email: l.s.d.@Eunet.yu
Concours International 22-23.6.02	Orleans, France	F1D, F1L, F1M. Entry fee EUR 15.- 1 model, EUR 8.- next model. Contact Jacques Delcroix, 41, Allee du Coudray, 45160 Olivet, France Tel: +33 2 38 63 49 57, fax: +33 2 38 63 49 57
3rd Concours International 29-30.6.02	Bordeaux, France	F1D, F1L, F1M . Entry fee EUR 16.- 1 model, EUR 8.- next model. Contact: Jean-Pierre Darrouzes, 27, avenue Kennedy, 33600 Pessac, France Tel: +33 5 56 36 95 44
BMFA Indoor Duration Nats 25-26.8.2002	Cardington, Un. Kingdom	PROVISIONAL DATE AND VENUE: Saturday - F1L, F1M. Sunday New Rules F1D, 1st 2002 World Champs Team Trials. When attending, you MUST contact Laurie Barr on 01628 487544.
Interscale 2002 6-8.9.2002	Prostejov, Cz. Republic	Open Indoor Scale F/F. Contact: Ing. Tonda Alfery, email: astra@uhbrod.anet.cz

INAV Jr F1D Team Fund Drive
Here are the supporters to date. We have all heard enough hot air about the junior problem. Now that we have some let's do a better job of supporting them. Send your contribution to: Vern Hacker, 25599 Breckenridge Dr, Euclid OH 44117-1807 Make your checks payable to NFFS and mark INAV F1D Junior Fund in the memo.

Up to $49
Jack L Karn
Stuart Wecckerly
Steve Greibling
Douglas Oleson
Gordon Strickland
Bill Leppard
Jeff Aaron
Charles Stiles

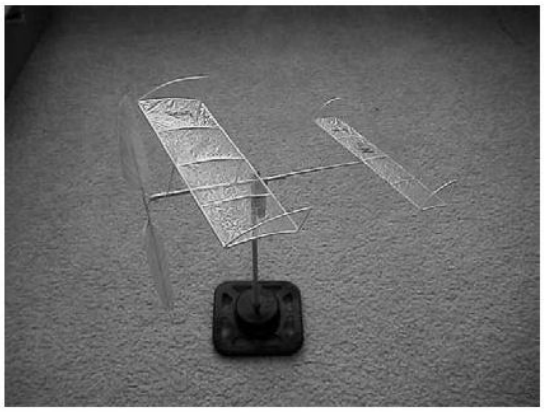
$50 - $99
Ceszar Banks
John Wereb
Vernon D. Hacker
Kermit Walker
Vern Neff
David Kazdan

$100 - $299
Gene Joshu
Lew Gitlow
Larry Loucka

$300 and up
INAV (from last team fund drive)
Hardy Broderson
Bob Stalick
Ken Spliller
Tim Goldstein
Larry Parsons

Poonker Notes:

By Rob Romash
CGrain1@yahoo.com



The Poonker arose from a need to get a ministick to the top of the hanger at Lakehurst. I needed a plane that could climb rapidly without the attendant stalling like the little minies usually do. Construction is typical depending on wood strength. My wing does have a tiny bit of flex on launch augmenting the adjustments built in. This ministick is an evolution of Joe Krush's K-777 which is always a consistent performer.

The prop was formed on a 2" dia. cylinder which is made from a thin deformable styrene, when the prop is put on about an 18 deg angle, I then deform the tube to give it a more radical shape: more twist is evident at the base of the prop rather then the tip. I also run a bit less pitch then is usual I am not sure how much, I use the looks-about-right method and am always tweaking depending on the mood of the aircraft. Walt Van Gorder says it looks pretty low.

I use a lot of space between the rubber and the motorstick so as to avoid hang ups. Be sure to have the wingtips very straight as to avoid any drag. Wingtips are covered on the inside using separate pieces of mylar this makes for a very clean transition at this joint. On launch it does a lot of flying on these tips. I adjust to conditions as I fly this thing so the plans show about what I had that day.

Conditions were in the low eighties and in the afternoon when the high time was set. You have to get a lucky day to do big times. There were several flights over 14 min with Poonker the same day but it wasn't until early afternoon that conditions became optimum. This ship runs on smallish rubber that has the living bejeezus wound out of it; for these flights, learning to wind until the next turn on your winder is the last is important, I also massage the knots before launch this helps a good deal with getting this rubber to unwind all the way.

Poonker works well in the hanger but I have trouble keeping it out of the ceiling at Johnson City. This is where I will tweak in more pitch and make it do some tricks before the climb. I think this design will work well for low ceiling with a bit more prop area and a bit more airfoil.

www.Indoorduration.com, Tim Goldstein's site, has an updated plan of Poonker with a bit more in the way of sizes and I encourage all to go get it. This ministick was named after my late cat Poonker who never would give a passing glance to my models flying around her head but would bring me a dead bird on a weekly basis, go figure. Any questions feel free to call me anytime 856 985 6849.

(Note: The photo is of my plane, not Rob's – Carl the Editor)

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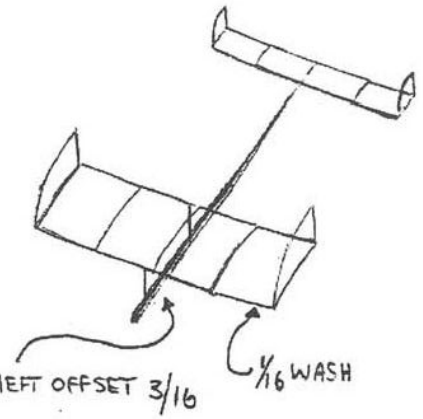
THE POONKER MINISTICK

BY ROB ROMASH



WING 7" CHORD 2.5"

CAT IV RECORD
RUBBER MAY 99
.018 x 14"
4160 TURNS
NO BACKOFF
NO "O" RINGS

SPAR
.030 X .025

STAB 7" CHORD 1.25"

.025 x .025

FLAT CENTER SECTION — 1/8 POLYHEDERAL WING - AND TAIL

CAT IV RECORD SEPT 1/01
LAKEHURST NJ
15:06
1st PLACE USIC 2001 12:37
WEIGHT .431 grm
COVERING - POLYMICRO (WRINKLED)

.025 x .020

Wing tip strait up

1/16 INCIDENCE

.030 ROUND

MOTORSTIK 4.95"

FUSE 9.9"

3° DOWNTHRUST 2° LEFT

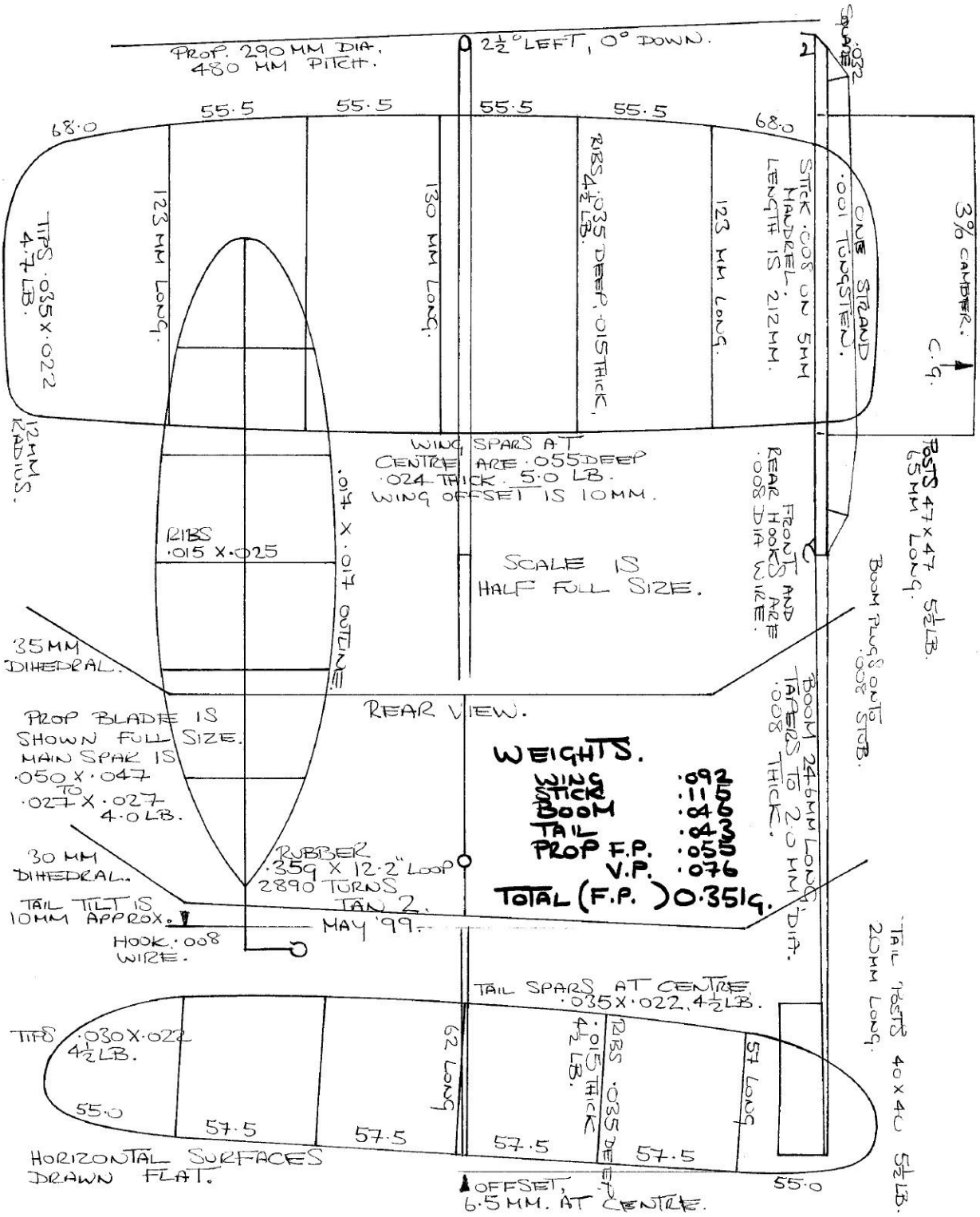
PROP 7"

.012 SHEET

Rudders strait up

.020

2° UP



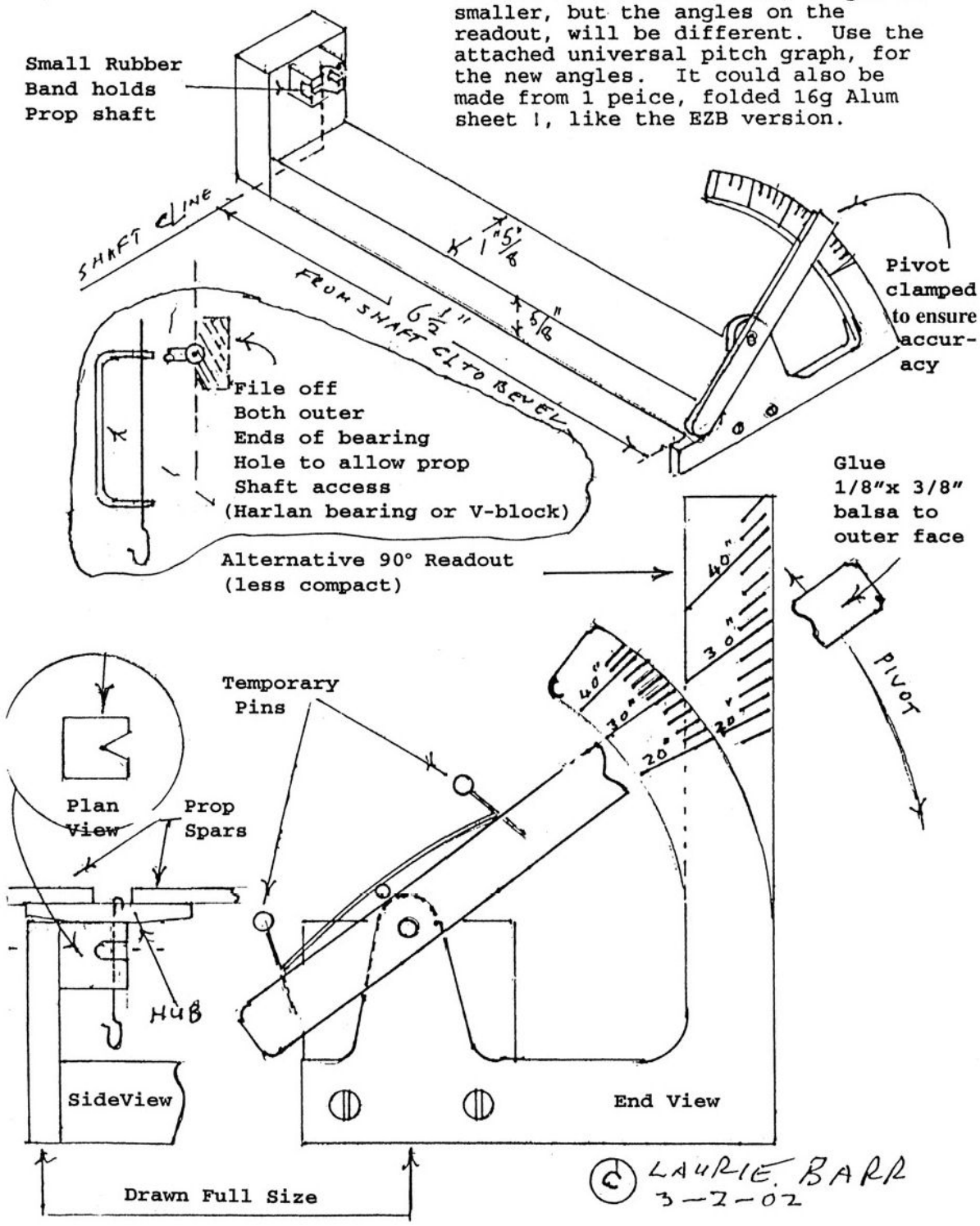
35 CM MODEL BY BOB BAILEY. 32·03 + 33·19. 1ST PLACE AT THE 'CARGO LIFTER OPEN INTERNATIONAL. 13–14 OCT. 01. UNOFFICIAL 36·23.

DRAWN BY NICK AIKMAN.

Note: This plan was accidentally left out of Issue 105, and is included here with our apologies. Whoops! Carl sent it to me and I forgot to insert it into the print job. Tim

My original design was all Acrylic, but it could be made from Hard Balsa and Ply. The Pivot Pitch Arm, was riveted so it had a "stiff" action. I made the distance from hub centre to the pivot arm, 6 1/2" inches, for that is where most of the blade area will occour, on a typical F1D prop.

You can make this checker, larger or smaller, but the angles on the readout, will be different. Use the attached universal pitch graph, for the new angles. It could also be made from 1 peice, folded 16g Alum sheet !, like the EZB version.



The Super Sleuth

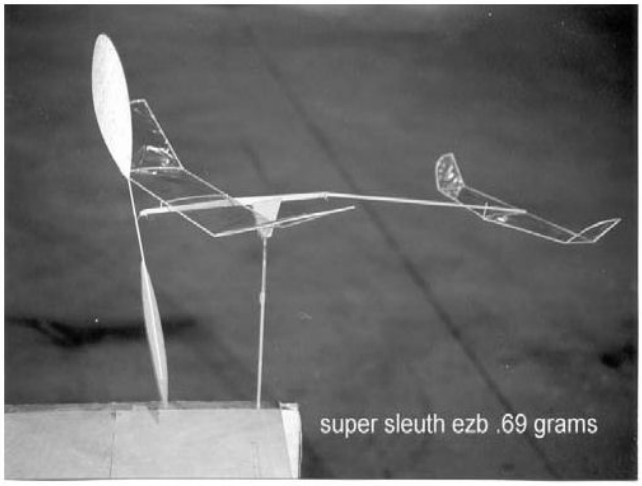
(Designed and constructed in 1997)

The dictionary describes a Sleuth as a casual detective. This is something most of us become when we decide to venture further into any of the categories this fine hobby has to offer. My past experiences with ezb had the usual progression of building other peoples models with some success but the frustration with trimming the high torque phase that all of us experience. I read all the news letters that I could get a hold of and then the article in January 1988 "Model Aviation" the "Serendipity" ezb was full of information on things that were never published with other designs in the past. This was a big boost to my progression. Other disciplines of the hobby were also helping to develop my thinking on good performance. For many years I followed R/C high tech glider development. These planes must be extremely efficient as their duration mostly depends on drag reduction. Things such as wing plan form are studied at length. The flying surfaces of this ezb are influenced by those theories in hopes of better flight performance.

In 1994 I was asked to C.D. our Canadian FAI team trials for Wakefield for the up coming world championships. This gave me the opportunity to talk with some of the top F1B flyers in the world. One of the topics we discussed was controlling the power burst phase of their impressive non variable incidence tail models. The thrust line passing through the C.G. was controlling the power burst. Reading of model aerodynamic books gave further insight to the importance of the position for the C.G.. We must consider not only the longitudinal and lateral planes for it's position but also it's vertical position. When we can get the thrust line to pass through this vertical position it helps greatly to tame the tiger! The dropped tailboom helps to lower the mass associated with the tailboom and the stabilizer which in turn helps to lower the vertical position of the C.G. Another location of some mass is the wing and posts. Why put the wing high up on posts? This only raises the vertical position of the C.G.. I have built many outdoor rubber models that had their wing position close to the fuselage and experienced no ill effects. The thrust line passes through the C.G. on this model. Did it work? The plane flew right off the board with very little trimming, just a small amount of sanding between the wing posts to adjust the washin. No sanding was done to the rear or front of the motor stick for down thrust or reduced incidence. For the 23:46 flight in our 80-foot ceiling, the plane was launched with .18 inch/ ounce torque but I have launched as high as .25 inch/ounce without ill effect.

I have seen other inventive people using different configurations to achieve the same result but this layout seemed better and much simpler to construct. I am now testing a Ltd. Penny Plane of similar layout and it flies well with only minor trim adjustments also.

Barrie Taylor

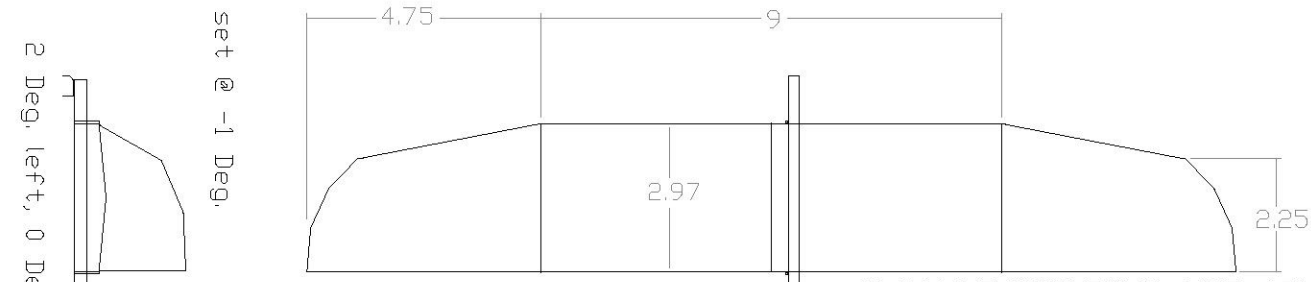


Super Sleuth EZB

Cat. III (80 feet) Time: 23:46

Designed and Drawn by: Barrie Taylor

All dimensions: Inches

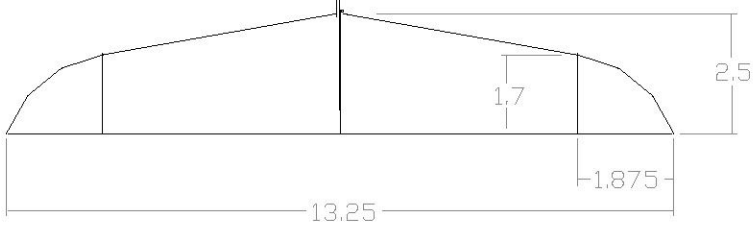


Wing span flat: 18.5
Main spars: 6lb .031x.04-.031x.065-.031x.04
Tip spars: 4lb .031x.04-.031x.03 L.E. is one piece wet formed.
Ribs: 4% arc 4lb .019x.03
Wing tubes: mounted on spar, condenser paper .05 ID x.12 offset .25 right of center.
Main panel flat with tips raised to 18 projected span.
Stab span flat: 13.25
Spars: 4lb .022x.03-.022x.045-.022x.03
Center rib: 2% arc 4lb .019x.025, outer ribs .019sq.
Stab tips raised 45 Deg.
Stab post: 6lb .045 Dia. with condenser paper tube mounted on tail boom.

Finished weights
Prop: .150
Wing: .116
Stab: .059
Fuselage with all posts: .365
Total: .690 grams

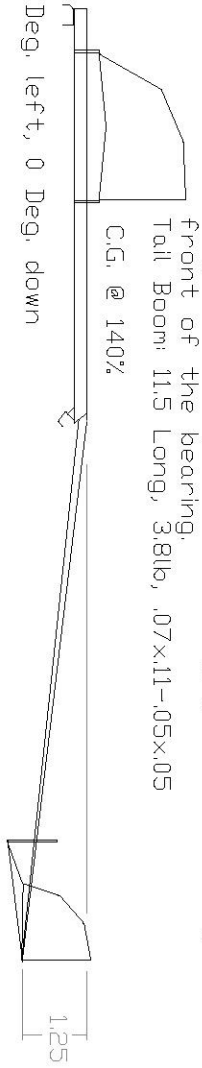
Rubber: Tan II, .045x13.5

Glue: Duco
Covering adhesive: 3M super77

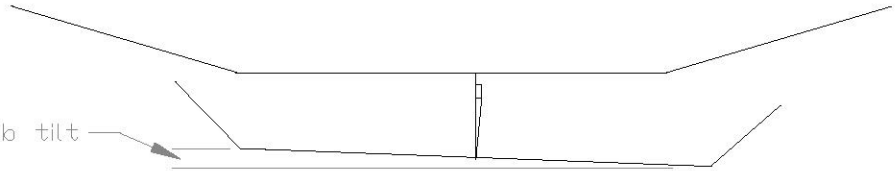


Wing set @ -1 Deg.

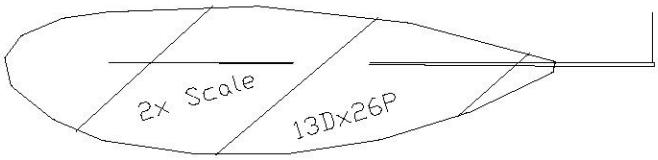
2 Deg. left, 0 Deg. down



Motor Stick: 9 Long, 4.5lb, .07x.15-.12x.26-.09x.17, .013 wire hook with .02 gusset, Harlan bearing with .032 hard spacer.
Wing Posts: 6lb, .05 Dia.x.5 long, glued to fuselage 1 inch from front of the bearing.
Tail Boom: 11.5 Long, 3.8lb, .07x.11-.05x.05



Prop: 13D x 26P
Blades: .006 4.5lb C grain @ 30 Deg. relative to the prop spar. Formed on a 5 Dia can @ 17 Deg.
Prop spar: 11 long 6lb .065 Dia-.03 Dia.
Shaft: .013 Dia with reverse S hook.



'SWEEP' F1L: CONSTRUCTION NOTES.

John Tipper.

This F1L was built just for the 'Cargo lifter' meeting. I used the best, stiffest wood that I could find. I have been using diagonal ribs for F1L wings and tailplanes for a long time; all the extra work is worthwhile as it gives good, rigid flying surfaces. It also has the added benefit of reducing the risk of folding a tailplane if you accidentally catch it during steering.

The thrust bearing is a shortened 'Harlan', set to give about 1.5 degrees of down-
Thrust and 3 degrees left side thrust. The extra side-thrust is needed to get up high in the unlimited ceiling at the German hanger. The wing is set up flat, with no warps at rest. The tailplane has about 1/16th washin and this is fine-tuned by twisting the rear of the boom in the tissue tube. Once set, it can be locked with a spot of glue. The rear tail post needs a small tissue wrap; the front tail post is inserted into the boom. The tip of the boom is raised ½ an inch and also offset ½ an inch to give left turn.

Covering Procedure.

Because I aimed to keep weight to a minimum and also wanted a nice, smooth covering, I decided to use Y2K film. First, I crumpled the film up quite tightly and then smoothed it out again on a large sheet of black mounting card. For this, I used a very soft blusher brush. The film was attached to a balsa frame using 'Spraymount' (the blue can variety). Generally when doing this, I try to get the covering quite tight and then I waft the whole frame up and down quite vigorously, without tearing the film. This helps to stretch out the wrinkles, leaving a uniformly smooth sheet of film with just enough slackness for covering. I leave the frame for a week or two, to reduce the static. I use the same 'Spraymount' as an adhesive and covering the wing requires two light passes, the tailplane only needs one. The components are then dropped upside down onto the film and cut out with a 15watt soldering iron. I make sure that the film is completely stuck to the outline, particularly at the dihedral ribs.

To set the dihedral on the wing and tail, I cut half way through the underside of the spars and crack up the wing tips and 'fins'on the tailplane. The joints are well glued and a tiny rectangle of balsa sheet is cemented across the dihedral break at front and back to add strength. The slack film at the joint is taken up by running a brush loaded with a very thin mixture of 1part 'Duco' cement and 10 parts acetone.

The original, full sized plan has been reduced to fit into INAV and must be enlarged again to build from. Raising the tips until the span is very fractionally less than 18 inches sets the dihedral angle on the wing.

PISTACHIO PLANS PORTFOLIO
by Dave VTO Linstrum MIAMA Dedicated to Doc Martin who promoted this event

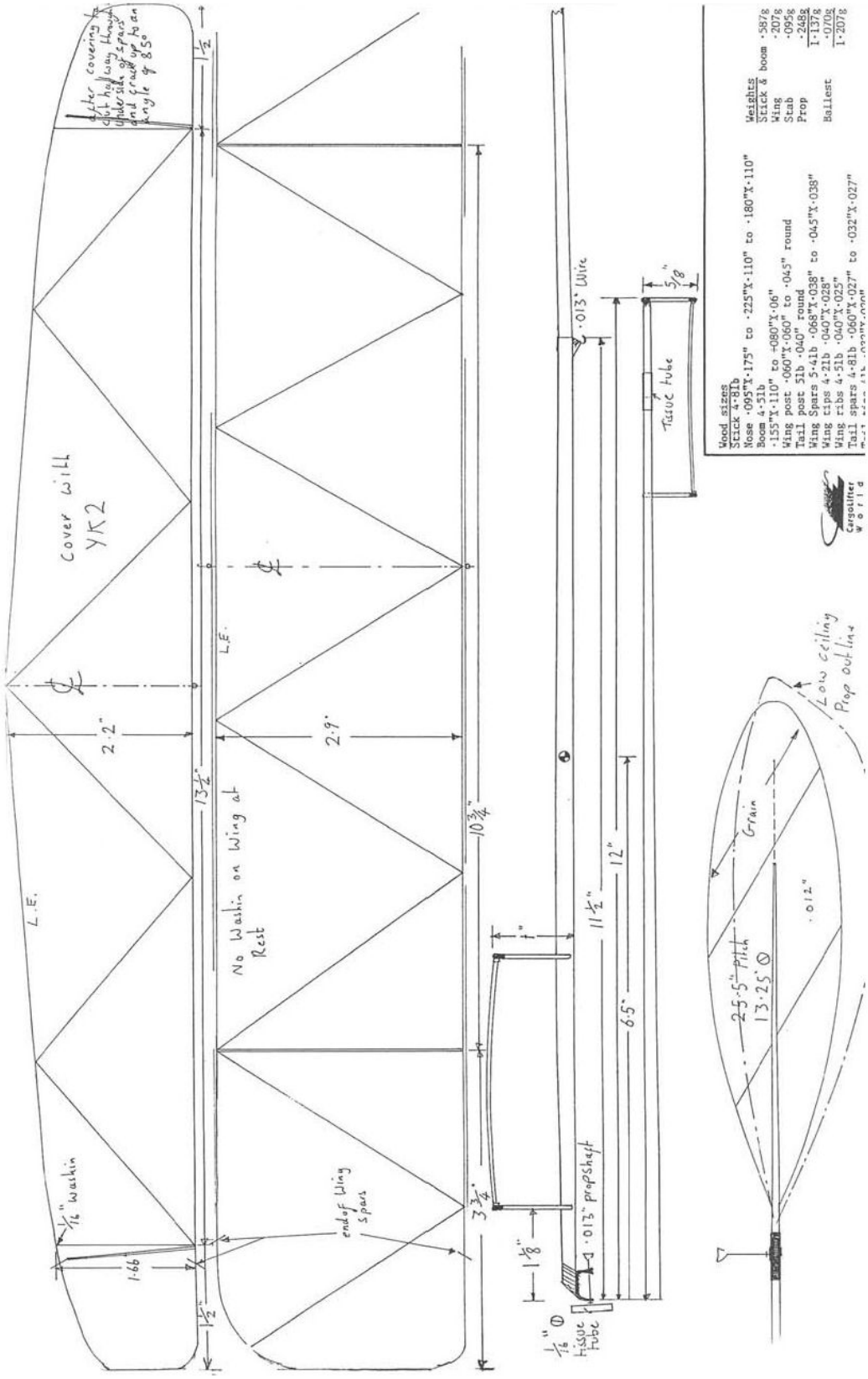
Pistachio Scale should have great appeal to Indoor Duration flyers since the models MUST be built VERY light to fly well- and scale judging is by the very simple Walt Mooney ranking system. Models are lined up for judging and ranked Best to Worst. Scale Does can earn Quality of Documentation look which can affect B to W. Score is the sum of B to W place in field and flight time (best of 5) in seconds.

The MIAMA Pistachio Rules allow replicas with either max 6 inch OAL or max 8 inch projected wingspan~ This allows a broad choice of subjects-an example is the Goldwing canard (a favorite of Doc's and now in AMA Museum Muncie) which * 6 inch OAL has a whopping 12 % inch span- thus the split plan as it won't fit on INAV page. Single cover OK. Models are hand launched so wheels do not need to rotate.

GOLDWING based on reduction of a Peanut by noted indoor flyer Dave Aronstein 1921 DORNIER KOMET/KAWASAKI reduction MAN AMA Scale by Doc Martin PILATUS PORTER by Dave VTO Linstrum has 8~8 inch span and very simple lines YAK 12R by Dave VTO Linstrum, has 9 % inch span- all silver Russian utility A/C (*note due to space restrictions we have only include 2 plans in this issue, plans are elsewhere in this issue)

There are many Pistachio Plans available by mail order from Bill Hannan. He has the Mooney Bag of Pistachios- Walt's Peanuts reduced to Pistachios from MB plans. He also has several good booklets including the Peanuts & Pistachios series with full size plans. SASE to Runway Box 210 Magalia CA 95954 USA for detail info.

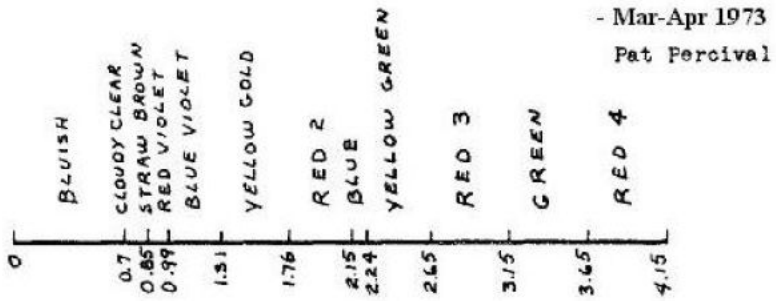
HAVE FUN WITH YOUR PISTACHIOS! WARNING - THEY ARE ADDICTIVE


Cover with YK2
L.E.
2.2"
2.9"
13½"
No Washin on Wing at Rest
1½"
1·66"
1/16" Washin
end of Wing spars
3¾"
10¾"
·013" prop shaft
1⅛"
1/8" ⌀ Hiwire tube
·013" Wire
5/8"
Tailwire tube
11½"
12"
6·5"
Wood sizes
Stick 4·8lb
Nose ·095"X·175" to ·225"X·110" to ·180"X·110"
Boom 4·5lb
·155"X·110" to +080"X·06"
Wing post ·060"X·060" to ·045" round
Tail post 5lb ·040" round
Wing Spars 5·4lb ·068"X·038" to ·045"X·038"
Wing tips 4·2lb ·040"X·028"
Wing ribs 4·5lb ·040"X·025"
Tail spars 4·8lb ·060"X·027" to ·032"X·027"
Weights
Stick & boom ·587g
Wing ·207g
Stab ·095g
Prop ·248g
1·137g
Ballast ·070g
1·207g
Cargolifter World
Low ceiling Prop outline
Grain
·012"
25·5" pitch
13·25"⌀

MICROFILM THICKNESS

In the Nov. '63 INAV Bill Bigge explained how he managed to measure the thickness of microfilm, then presented the scale of color vs. thickness shown below. The units shown are arbitrary, but can be translated thus: 1.0 on the scale is approximately 8 microinches (.000008"). In other words, red violet (the very first true color in the range) is about 8 microinches thick and the blue is twice as thick. Some builders call the straw brown color gold, which is half as thick as Bill's designation yellow gold. Incidentally, it is risky to use film thinner than straw brown, since the cloudy clear region covers about a 4:1 range of thickness, all of which is quite likely to be very brittle. Because of the wide range of thickness, it is impossible to determine the properties of clear film and straw brown is already borderline.

- Mar-Apr 1973
Pat Percival



LAURIE BARR'S BORON JIG FOR MOTORSTICKS AND TAILBOOMS

Cut the motorstick to the length required, and slide back over the form rod. Mark the position required for the boron around the circumference of the motorstick (see method below). Cut boron 1" longer than the M/S. Remove a fine hypodermic needly from a syringe and fill with Duco and acetone of clear dope consistency. Pass boron through mixture in the needle and hang up to dry.

Find some 0.040 to 0.060 rubber and tie a single know tight around boron near ends and cyano in place. Cut rubber 4" long and make a loop and cyano. Place form rod with M/S on the 2 wedges and allow to roll down slope, up to the two stops marked "X".

Stretch the rubber bands and stick modeling pins into the 4" uprights at each end. Slide this up/down until the boron is resting on top of the motorstick. If needs be, wrap bands around the rear of the 4" uprights. Rotate the motorstick until the boron sits over the mark made before, where you want the Boron to be.

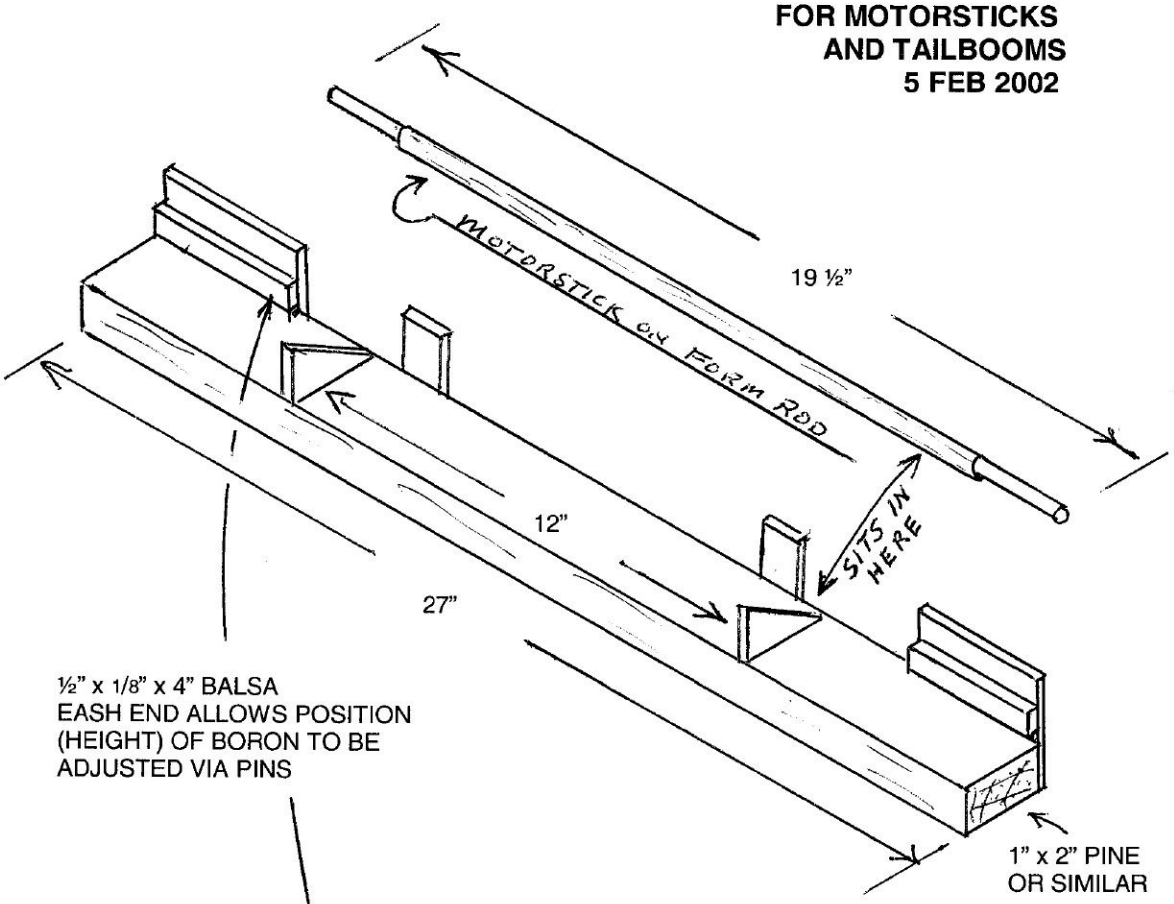
Using a medium-sized brush, apply acetone, starting from the right end (for right-handers!) and wet approx. 2" at a time, and press the boron down hard, using the metal end of the brush holding the hairs.

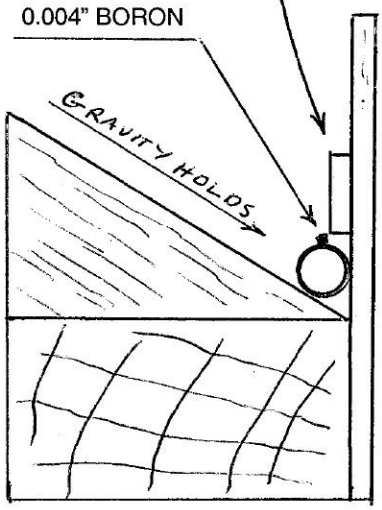
Remove the rubber, and rotate the M/S to the next position. When all 4 are done, remove from jig and snap off the over-length ends of boron. Do this over a white sheet of paper to allow you to see any shards. Apply stick tape to any shards, fold and dispose. Re-stich the loose ends of boron.

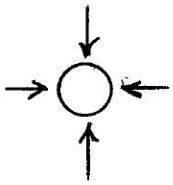
Allow 10 minutes ? to set, and slide the M/S off the rod, and lightly holding each end, bow the middle away from you. Any boron not attached will show as a kink. Re-glue as required.

This jig can be made in minutes. The boron will be dead straight, under modest tension, no boron will be loose, and it is done for the least weight.

LAURIE BARR'S BORON JIG
FOR MOTORSTICKS
AND TAILBOOMS
5 FEB 2002







PRE-MARK EXACT LOCATION OF 0.004" BORON. WRAP A THIN STRIP OF A 'POST-IT' NOTE AROUND THE CIRCUMFERENCE, STICKY SIDE DOWN. CUT, FOLD IN TWO, THEN FOLD AGAIN IN FOUR. LINE UP THESE MARKS WHERE YOU WANT THE BORON AND 'DOT' MARK LOCATION ON THE MOTORSTICK.

NON BERNOULLIAN AERODYNAMICS FOR INDOOR MODELS

Vernon D. Neff
vdneff@aol.com

I am quite new at indoor flying but very much fascinated by this hobby/science. I have been particularly intrigued by the often heard comments about the breakdown of the Bernoulli principle at very low flying speeds where we still make models fly for long times under low power. As we all know these conditions are estimated in terms of the Reynolds number (Re) which provides a measure for good (streamlined) flow over and under a flying surface. At very low flight speed the flow may become almost completely detached from the surface and wander into some never never land without producing much lift. The extent of this flow problem can be rather dramatically illustrated by considering a simple example of an actual indoor model which, for simplicity, we choose to be a (1.2 g) EZB designed with a flat (non cambered) wing. A further reasonable assumption is that the EZB flies at a speed of about 1 meter/second and that all of the lift is produced by the wing. Under these conditions the Reynolds number (Re) for tangential flow over and under the surface of the wing is about 5000 (in SI units). We need to write down the standard Bernoulli equations for lift and drag which are valid when both lift and drag are produced entirely by the Bernoulli effect. As is well known these equations are:

$$L = 1/2\rho A v^2 C_l \qquad (1)$$

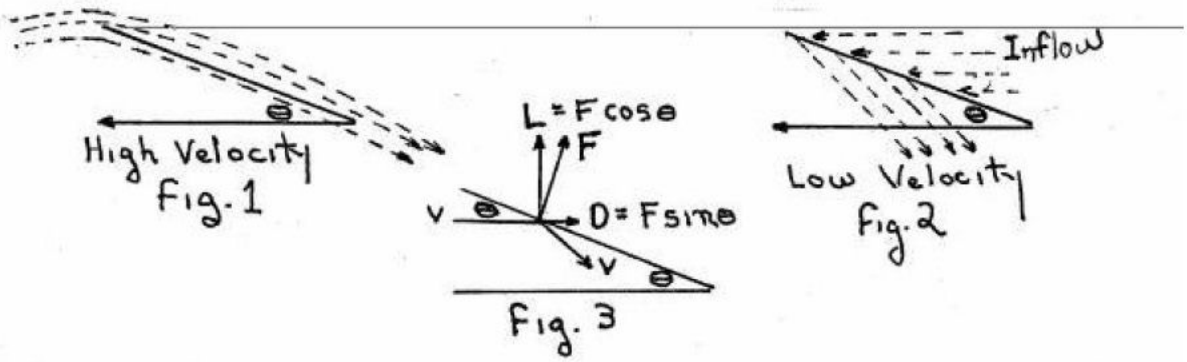
$$D = 1/2\rho A v^2 C_d \qquad (2)$$

where ρ is the density of air, A is the total surface area of the wing, and v is the velocity with which the air flows tangentially over and under the wing. The lift and drag coefficients, C_l and C_d , are determined experimentally from actual measurements of lift and drag in the wind tunnel. Such experiments have been performed for a flat wing by F.W. Schmitz and the wing profile is called the Gottingen flat plate (1). They have been reported for two Re of 168,000 and 42,000 respectively. The flat wing profile is quite peculiar in that the lift coefficient increases linearly up to an angle of attack of about 5° and then drops of dramatically at higher angles. At 5° ,C_l also decreases by a factor of about 1.2 as we go from Re 168,000 to 42,000. From equation (1) we can calculate the lift coefficient required to fly our EZB at a speed of 1 meter/second by equating to the weight (mg) of the airplane. This is standard procedure and is, indeed, the way in which C_l is calculated from experimental data. If we now calculate the C_l required to fly theB at 1 meter/second we obtain a value of 0.529. Now if we compare to the data for the flat plate at Re 168,000 we find that, at 5°, the value for C_l is about 0.5 and everything seems hunky dory. But wait a minute. Our EZB is flying at an effective Re of about 5000, not 168,000. If we assume that the Re continues to decrease at the rate of 1.2 described above, the lift coefficient would be about one tenth of its reported value at 168,000. "Something is quite rotten in the State of Denmark". The Bernoulli effect only supplies about 10 % of the required lift and the airplane would not fly at all at this speed. Yet our EZB's do fly surprisingly well. The real question is what kind of magic flies our planes at such low Reynolds numbers? It is most certainly not the pure Bernoulli effect. As we know, the real answer to this question is locked in the secret of the subject of the aerodynamics of very slow flight. This subject is beyond any kind of exact theoretical treatment available at this time. We can, however, replace the bad concept of Bernoullian air (BA) with another which we will call "Non-Bernoullian Air" (NBA).

NBA can be defined as air in which lift and drag on a moving object are produced entirely by the net momentum transfer (i.e. impact force) of air molecules moving in a certain direction near the surface of the object. The concept is illustrated in terms of a simple model for NBA as shown in

figures (1), (2) and (3). The object chosen is a flat plate moving very slowly in air with velocity v. For comparison the Bernoullian airflow is illustrated for the same object moving rapidly in air (figure 1).

The flow conditions in figure (2) are assumed to be quite different from those shown in figure (1). On the lower surface in figure (2) there is a net downflow (downwash) of air over the entire surface. The flow is assumed to proceed outward at angle θ which is also the angle of attack as shown. The situation is very different on the upper surface. As the plate moves through the air a partial vacuum is created behind it. Air must flow in toward the surface in order to maintain the static pressure.



We have attempted to illustrate the forces acting on the wing in NBA as shown in figure (3). In order to calculate the force on the lower surface we imagine a stationary flat plate with air molecules moving toward it with net flow velocity v. Note that v is the velocity of flow not the true random thermal velocity which is required to produce the static pressure of 15 lbs./sq.in. If a given molecule strikes the plate with a perfectly elastic collision, it leaves the plate in the direction shown and produces an impact force = $2mv\sin\theta$ where m is the molecular mass. Here θ is the angle between the plane of the plate and the direction of motion, i.e. the angle of attack. The total force on the plate is equal to the force per molecule times the total number of molecular collisions per unit time. This collision number is a standard expression in the molecular theory of gasses and is given by $Z = NAv\sin\theta$ where N is the number of molecules per unit volume, A is the total surface area of the plate and v is the flow velocity. The total force is then given by $F = 2mNAv^2\sin^2\theta$. The force on the upper surface is not as easily determined. Here we must imagine that the plate moves and creates a partial vacuum as mentioned previously. The decrease in pressure on the upper surface tends to increase the total force F. For NBA we make a completely empirical assumption. We assume that the reduction in pressure on the upper surface is equal to the increase on the lower surface so the total force is $4mNAv^2\sin^2\theta$ as illustrated in figure (3). This force is then resolved into lift $L = F\cos\theta$ and drag $D = F\sin\theta$. Actually the empirical assumption made above can be somewhat justified by including the average thermal velocities of air molecules but a discussion along these lines is to long and involved to be included here.

It is clear that the model for NBA presented above is an abstraction and complete oversimplification of what actually happens in real air. Within the framework of the model, however, no fundamental scientific principles have been violated. On the other hand streamlined Bernoullian flow is also an abstraction and BA also does not describe what really happens. In essence the model for NBA is a simple attempt to describe lift and drag in terms of "pushing on air" at very slow flight speed. As mentioned previously I am quite inexperienced in the world of indoor flight. It would be extremely presumptuous of me to assume that anything said here would not be known to you in some way based on your own knowledge and experience. All I propose to do is to present a different point of view which may be useful in helping to understand the difficult problem of very slow flight.

2. Lift and Drag on a Flat Plate in NBA

As we know the lifting surfaces (i.e. wing, stabilizer, fin and rudder) of an indoor endurance model somewhat resemble those of a flat plate. The plate we imagine is infinitely thin so that it has no resistance (drag) at zero angle of attack. The resulting equations for L and D in NBA are:

$$L = 4mNAv^2(\sin^2\theta\cos\theta) = 4\rho Av^2(\sin^2\theta\cos\theta) \qquad (3)$$

$$D = 4mNAv^2(\sin^3\theta) = 4\rho Av^2(\sin^3\theta) \qquad (4)$$

where we have substituted $\rho = mN$ which is equal to the air density. It is most interesting to find that these equations have the same form as the Bernoulli equations (1) and (2) for streamlined flow. For purposes of comparison we can make both equations exactly the same by defining the lift and drag coefficients in NBA as follows:

$$C_l = 8\sin^2\theta\cos\theta \qquad (5)$$

$$C_d = 8\sin^3\theta \qquad (6)$$

One can play many interesting games by comparing equations (1) and (2) for BA with equations (3) and (4) for NBA. In making such comparisons one must remember that we are, in effect, comparing apples with oranges. We are comparing the conditions for perfectly streamlined (tangential) Bernoullian flow (Apples) with those described above for NBA (oranges). Now we must be very careful by what is meant when we compare the two. This we have done for the Gottingen flat plate in figure (4) The experimental wind tunnel data for the flat plate were obtained at Re 168,000 . If the EZB is "flying" at this

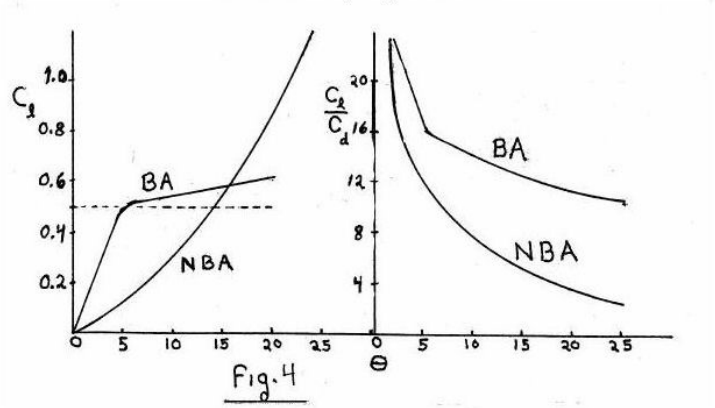


Fig. 4

Re, the air passing tangentially over the wing would be traveling at about 32 meters/second or 67 mph. None of us would even begin to think of subjecting our favorite model to this malicious airflow in order to achieve the correct amount of Bernoullian lift. The C_l curves for both BA and NBA are identified in the figure. The doted line represents the C_l of about 0.5 required to fly the EZB at 1 meter/s. As can be seen from the figure this amount of lift is not achieved in NBA unless the models flies at a whopping 15° angle of attack. Now remember that the theory for NBA is an abstraction and we cannot attribute much credence to the absolute values of these calculated numbers. On the other hand we can draw some interesting conclusions. In order to fly at a high angle of attack in NBA we have to deal with increased drag. This requires increased power. That is, our indoor endurance models fly at very low speed at the cost of increased power as compared to what would be required if we had perfectly streamlined tangential flow over the wing. Now I do not know what the actual angle of attack of our bench model is when it flies to your satisfaction. It does appear to me that these models are sort of hanging at relatively high angles. One often hears that the best solution to efficient flight is to fly close to the "stall" angle. However the stall angle in BA and NBA are very different things

indeed. In BA the angle of stall is conventionally defined as the angle of attack at which the C_l reaches a maximum and starts to decrease at higher angles. The very reason for this definition is that the airflow ceases to be Bernoullian and begins to become turbulent thus producing less lift. In pure NBA the C_l reaches a maximum value at an amazing 57°. At this angle however, as we shall see, the wing is also producing a huge amount of drag which amounts to more thrust than would be required to raise the airplane straight up.

What then is the major point of this discussion? The major point is that , at very low flight speed, there is little meaning in speaking about stall in the conventional sense of commonly accepted aerodynamic theory. The angle of "stall" simply means the angle of attack at which the largely non Bernoullian air produces enough lift to maintain level flight. This view tends to focus us on the importance of the angle of attack required for our real model in real air. Here we have neglected an important factor in the above discussion. In my humble opinion the endurance model behaves more like an object possessing two wings with different surfaces areas. Of course there is nothing new about the assumption that the stab also produces lift but this consideration dramatically changes the value of θ required to produce level flight.

It is also interesting to compare the effect of drag in NBA vs BA. Here we find another essential difference; namely that NBA produces more drag than BA at a given angle of attack. This is best compared in terms of L/D which is a kind of measure of the wing efficiency. The L/D ratio is shown on the right hand side of figure (4). For BA this has been estimated from the experimental data on the Gottingen flat plate. Note that L/D is independent of the velocity of flow over the wing so we can use the experimental values reported. For NBA the ratio is simply $L/D = (\tan\theta)^{-1}$ as is easily determined from equations (3) and (4). We see that, at higher angles of attack, the wing in NBA, is considerably less efficient than in BA. That is, the wing in NBA produces more drag.
This is another reminder that although our airplanes fly quite well in NBA, they require relatively more power to do it.

Finally there are several gross differences between NBA and BA which should be mentioned. First of all we note that in NBA there is no vortex drag. The effects of drag are produced entirely by what we would call profile drag in BA. As far as lift and drag are concerned, features such as tip stall, aspect ratio, and wing shape, which are quite important in BA, are seemingly irrelevant in NBA. On the other hand these features may still be important in determining other factors such as flight stability. Also we note that in NBA the center of pressure is at the center of the (flat) wing not at about 1/3 of chord as it is in BA. This result alone may lead to interesting discussion, and controversy, about the location of the C.G. in the indoor endurance model.

The concept of "pushing on air" can also be applied to the cambered wing and to the very slow propeller. Space is limited, however, and such considerations are postponed subsequent to establishing the level of interest in this admittedly oversimplified approach to the problem of slow flight.

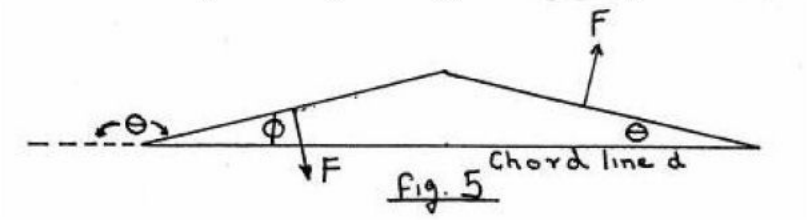
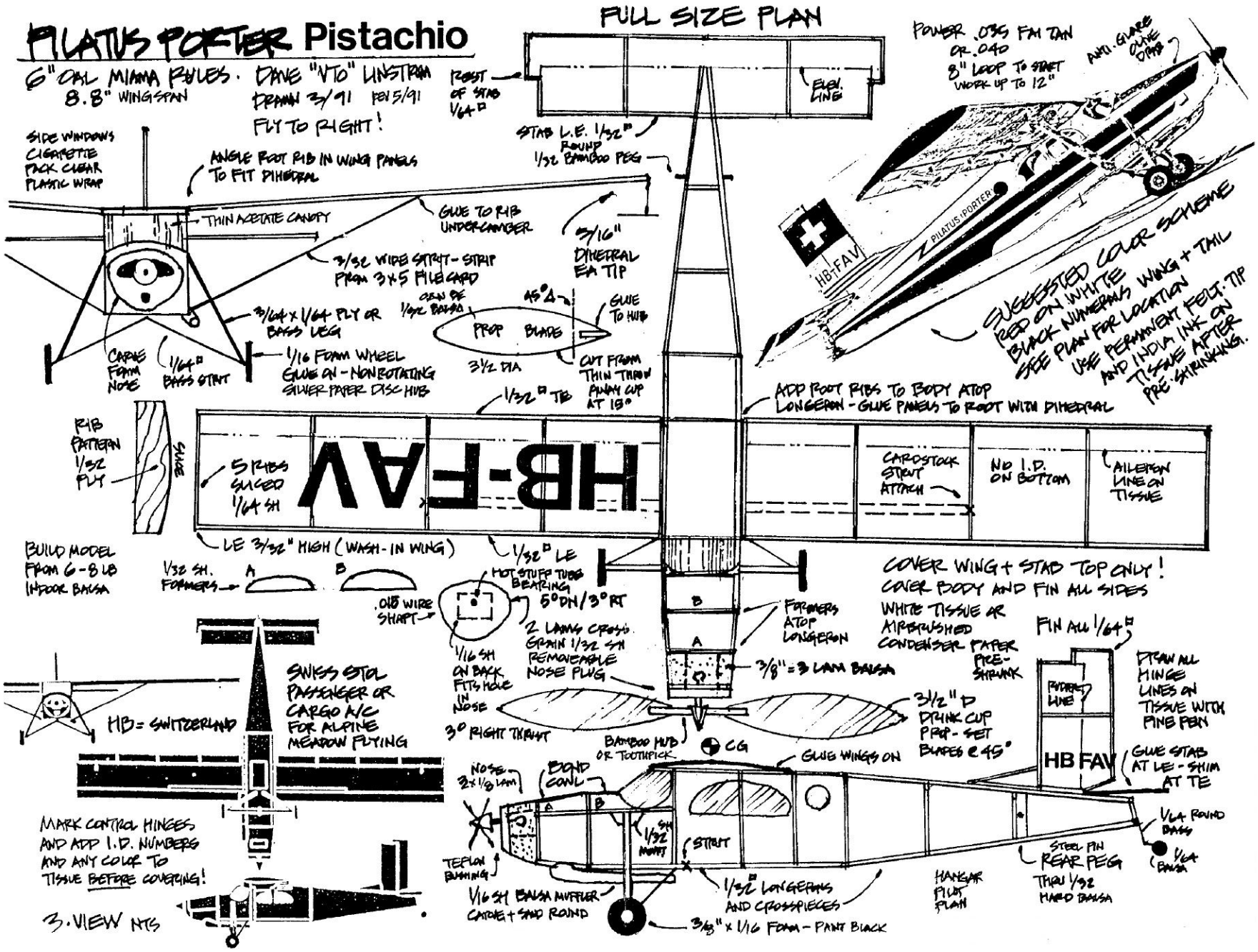
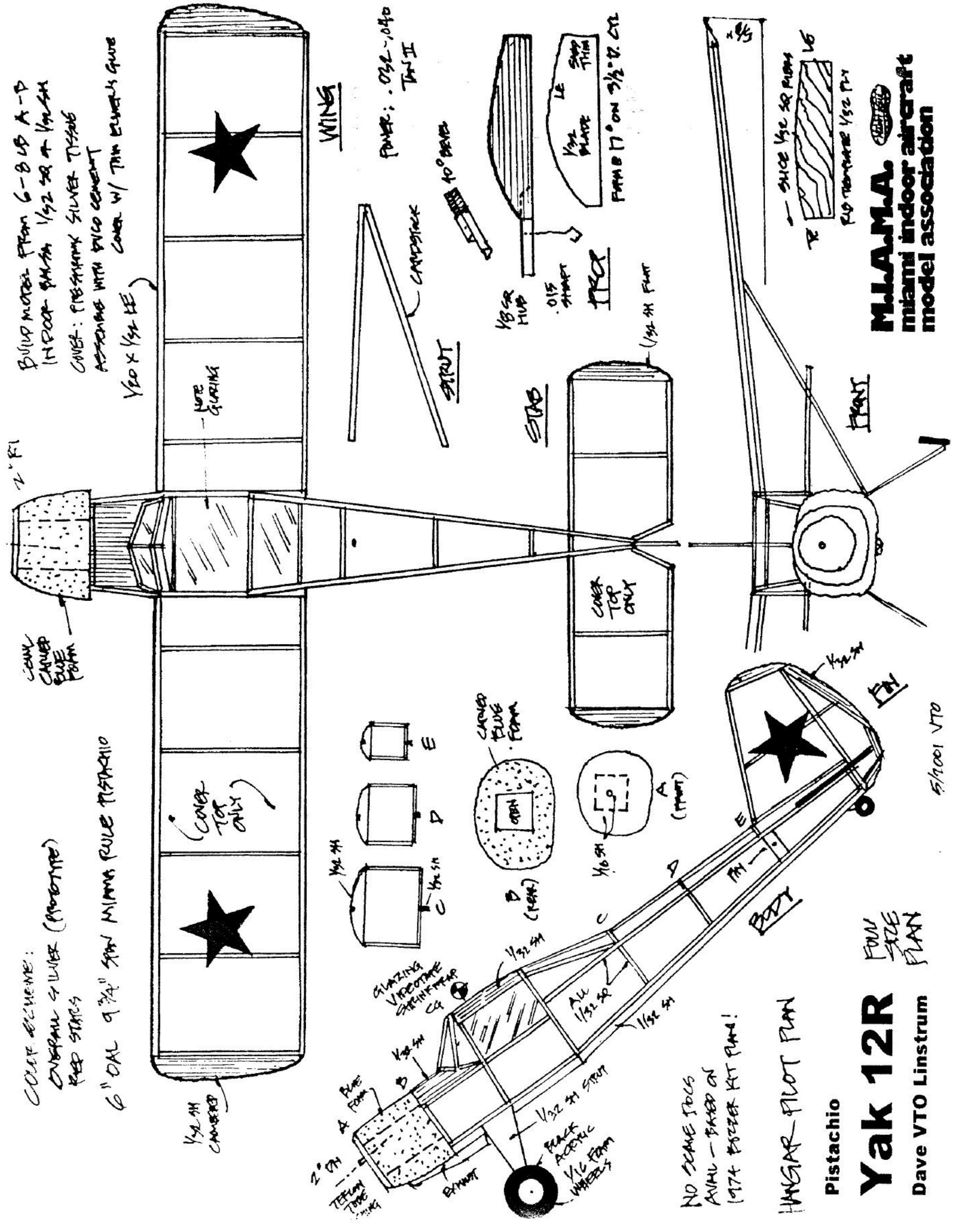


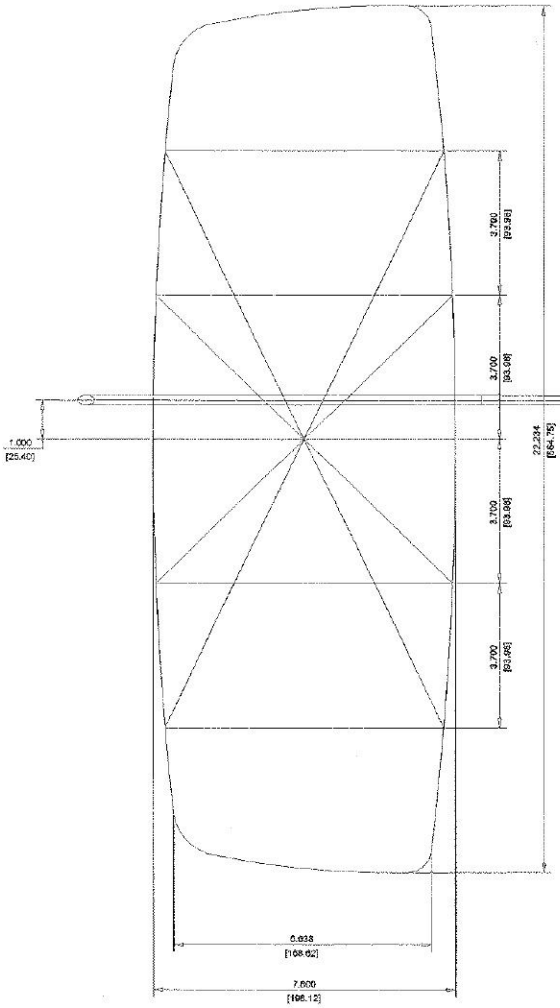
Fig. 5

Reference (1). Model Aircraft Aerodynamics, Martin Simons, 1999,4th Ed, Nexus Special Interests Ltd. The data for the Gottingen Flat Plate were taken from this excellent book. The text is based on the standard aerodynamic theory of flight and nothing said here should, in any way, be attributed to the author of this book.


PILATUS PORTER Pistachio
6" OAL MIAMA RULES · DAVE "VTO" LINSTROM
8.8" WINGSPAN DRAWN 3/91 REV 5/91
FLY TO RIGHT!
FULL SIZE PLAN
POWER .035 FAI TAN OR .040
8" LOOP TO START WORK UP TO 12"
ANTI-GLARE CAMO PAINT
SIDE WINDOWS CIGARETTE PACK CLEAR PLASTIC WRAP
ANGLE ROOT RIB IN WING PANELS TO FIT DIHEDRAL
THIN ACETATE CANOPY
GLUE TO RIB UNDERCAMBER
3/16" DIHEDRAL EA TIP
3/32 WIRE STRUT - STRIP FROM 3x5 FILE CARD
3/64 x 1/64 PLY OR BASSA LEG
CAN BE 1/32 BASSA
45°Δ
GLUE TO HUB
PROP BLADES
3½ DIA
CUT FROM THIN THROW AWAY CUP AT 15°
CABLE FROM NOSE
1/64" BASSA STRUT
1/16 FOAM WHEEL GLUE ON - NON ROTATING SILVER PAPER DISC HUB
ROOT OF STAB 1/64"
STAB L.E. 1/32" ROUND BAMBOO PEG
ELEV. LINE
1/32" TE
ADD ROOT RIBS TO BODY ATOP LONGERON - GLUE PANELS TO ROOT WITH DIHEDRAL
RIB PATTERN 1/32 PLY
SLICE
5 RIBS SLICED 1/64 SH
HB-FAV
CARDSTOCK STRUT ATTACH
NO I.D. ON BOTTOM
AILERON LINE ON TISSUE
LE 3/32" HIGH (WASH-IN WING)
1/32" LE
BUILD MODEL FROM 6-8 LB INDOOR BASSA
1/32 SH. FORMERS
A
B
.018 WIRE SHAFT
HOT STUFF TUBE BEARING 5°DN/3°RT
2 LAMS CROSS GRAIN 1/32 SH REMOVEABLE NOSE PLUG
1/16 SH ON BACK FITS HOLE IN NOSE
3° RIGHT THRUST
FORMERS ATOP LONGERON
3/8" = 3 LAM BASSA
COVER WING + STAB TOP ONLY!
COVER BODY AND FIN ALL SIDES
WHITE TISSUE OR AIRBRUSHED CONDENSER PAPER PRE-SHRUNK
FIN ALL 1/64"
DRAW ALL HINGE LINES ON TISSUE WITH PINE PEN
3½" D DRINK CUP PROP - SET BLADES @ 45°
BAMBOO HUB OR TOOTHPICK
CG
GLUE WINGS ON
GLUE STAB AT LE - SHIM AT TE
HB FAV
FUSELAGE LINE
SWISS STOL PASSENGER OR CARGO A/C FOR ALPINE MEADOW FLYING
HB = SWITZERLAND
MARK CONTROL HINGES AND ADD I.D. NUMBERS AND ANY COLOR TO TISSUE BEFORE COVERING!
3-VIEW NTS
NOSE 3x1/8 LAM
BOND CONE
A
B
1/32 SH MOUNT
STRUT
TEFLON BUSHING
1/16 SH BASSA MUFFLER CATCH + SAND ROUND
1/32" LONGERONS AND CROSSPIECES
3/8" x 1/16 FOAM - PAINT BLACK
HANGAR PILOT PLAN
STEEL PIN REAR PEG THRU 1/32 HARD BASSA
1/64 ROUND BASSA
1/64 BASSA
SUGGESTED COLOR SCHEME
RED ON WHITE
BLACK NUMERALS WING + TAIL
SEE PLAN FOR LOCATION
USE PERMANENT FELT TIP AND INDIA INK ON TISSUE AFTER PRE-SHRINKING.
PILATUS PORTER
HB-FAV



COLOR SCHEME:
OVERALL SILVER (PROTOTYPE)
RED STARS
6" OAL 9 3/4" SPAN MIAMA RULE PISTACHIO
BUILD MODEL FROM 6-8 LB A-B INDOOR BALSA 1/32 SQ or 1/64 SH
COVER: PRESHRUNK SILVER TISSUE
ASSEMBLE WITH DUCO CEMENT
COVER W/ THIN ELMER'S GLUE
1/20 x 1/32 LE
COWL CARVED BLUE FOAM
2° R1
1/32 SH CAMBERED
COVER TOP ONLY
NOTE GLAZING
WING
STRUT
CARDSTOCK
POWER: .032-.040 TAN II
40° BEVEL
1/8 SQ HUB
.015 SHAFT
PROP
1/32 BLADE
LE
SAND THIN
FORM @ 17° ON 3 1/2" D. CYL
STAB
COVER TOP ONLY
1/32 SH FLAT
FRONT
SLICE 1/32 SQ RIBS
TE
LE
RIB TEMPLATE 1/32 PLY
1/32 SH
C
D
E
B (REAR)
CARVED BLUE FOAM
OPEN
1/16 SH
A (FRONT)
2° SH
TEFLON TUBE
A
BLUE FOAM
B
1/32 SH
GLAZING VIDEOTAPE SPRING TEAR
CG
EXHAUST
BLACK ACRYLIC
1/16 FOAM WHEELS
1/32 SH STRUT
ALL 1/32 SQ
1/32 SH
FIN
BODY
1/32 SH
NO SCALE DOCS AVAIL — BASED ON 1974 BOZZER KIT PLAN!
HANGAR PILOT PLAN
Pistachio
Yak 12R
FULL SIZE PLAN
Dave VTO Linstrum
5/2001 VTO
M.I.A.M.A.
miami indoor aircraft model association



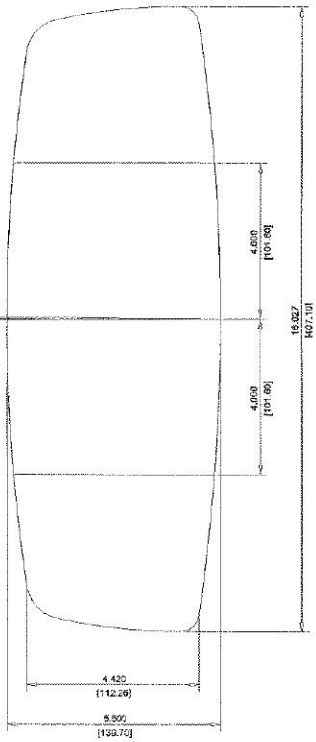
ALL SURFACES COVERED WITH Y2K-2 POLYCARBONATE FILM
NON WRINKLED EXCEPT ON THE PROP

3/8" STAB TILT FOR LEFT TURN

WING POLYHERAL IS 3/8 ON EACH OF THE MAIN PANELS
TIPS TO GIVE 55 CM SPAN.

SET THRUST LINE 2 DEG LEFT, 0 DEG DOWN

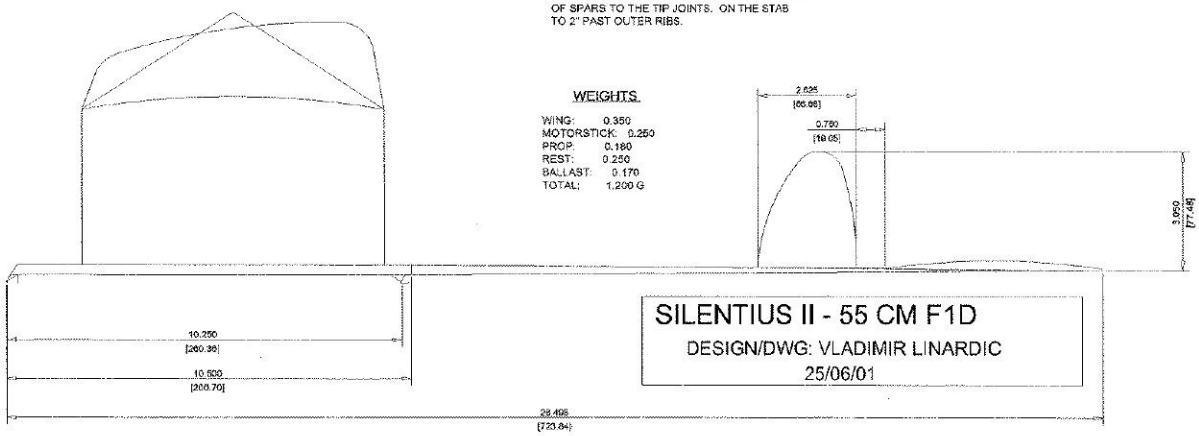
PROP 17 1/2" DIAMETER 30" LOW PITCH
17 1/2" DIAMETER 30" PITCH FLARING PROP FOR
SLANIC WITH SPAR AT 70% OF BLADE CHORD



MATERIALS AND DIMENSIONS

MOTORSTICK: TUBE 0.013" THICK 4.2 LB 1/4"I.D.
4 BORON EQUALLY SPACED
WEBS 0.013 THICK 4.2 LB X .75 LG.
FRONT CAP 0.013 THICK 4.2 LB
BEARING MODIFIED HARLAN F1D SIZE
REAR HOOK 0.013 DIA RICHMOND STYLE
TISSUE TUBES PLUGGED @ BOTTOM
BRACING 2 X 0.001 DIA TUNGSTEN
TAILBOOM: TUBE 0.009 4.0 LB THICK
FORMED ON A RAY HARLAN FORM
4 BORON EQUALLY SPACED
PLUG JOINT 3/4" AHEAD OF STAB L.E.
FIN: OUTLINE 0.030 X 0.050 4.6 LB
2 DEGREES TURN BUILT IN DURING ASSY.
STAB: SPARS 0.030 X .045 > 0.030 SQ. 6.0 LB
RIBS 0.030 X 0.040 5.0 LB
WING: SPARS 0.034 X 0.045 NO TAPER
TIPS 0.030 X 0.045 NO TAPER
POSTS 0.063 X 0.034 > 0.045 X 0.034
6.5 LB 2 X BORON ON SIDES
CABANE 0.030 X 0.050 > 0.030 SQ 6.0 LB
RIBS 3 BANNANA STYLE COMRESSION RIBS
0.030 WIDE 0.030 DEEP AT ENDS AND 0.090
IN THE CENTER.
STANDARD RIBS 0.030 X 0.040 5.0 LB
BRACING 0.0007 KARMA WIRE AS PER DRAWING.
PROP: HUB 0.095 X 0.095 X 1.25 LG. 6.8 LB
SPARS 0.065 X 0.060 6.1 LB
HINGES MONOKOTE APPLIED WITH BALSALOC
HUB BEARINGS TEFLON WASHERS
SHAFT 0.013 DIA WIRE
YOKE 0.008 DIA WIRE
SPRING 0.009 DIA WIRE, 0.070 OD X 8 TRN
ADJUSTMENT SCREWS #00-90
ADJ SCREW HOLDER 0.025 X 0.060 BASSWOOD
TC ARMS 0.005 DIA WIRE
BLADE OUTLINES 0.025 SQ 6.0 LB
RIBS FORMED 0.026 SQUARE 5.0 LB

NOTE: 2 X BORON (TOP & BOTTOM) OF SPARS ON WING THE BORON IS APPLIED TO FULL LENGTH OF SPARS TO THE TIP JOINTS. ON THE STAB TO 2" PAST OUTER RIBS.



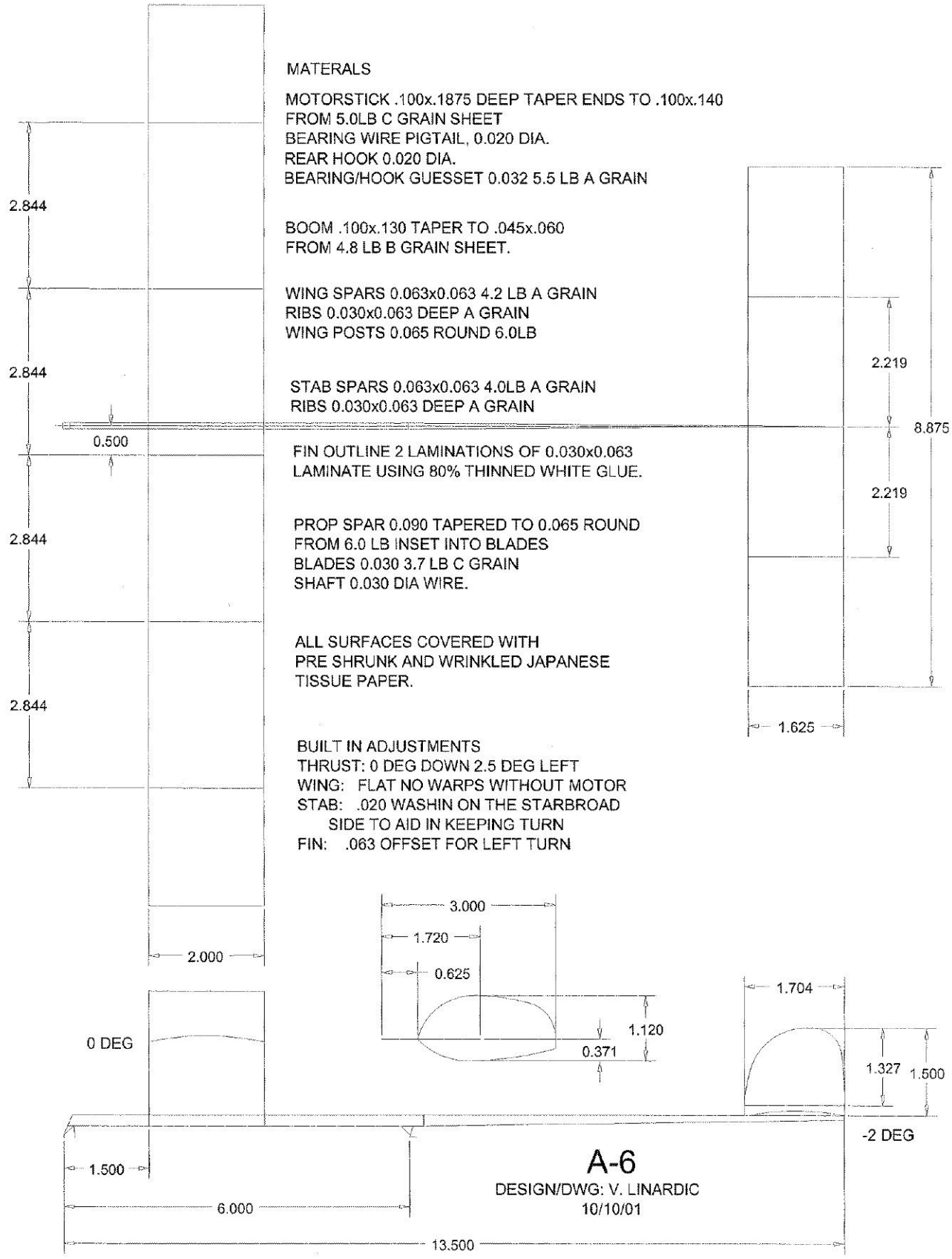
WEIGHTS

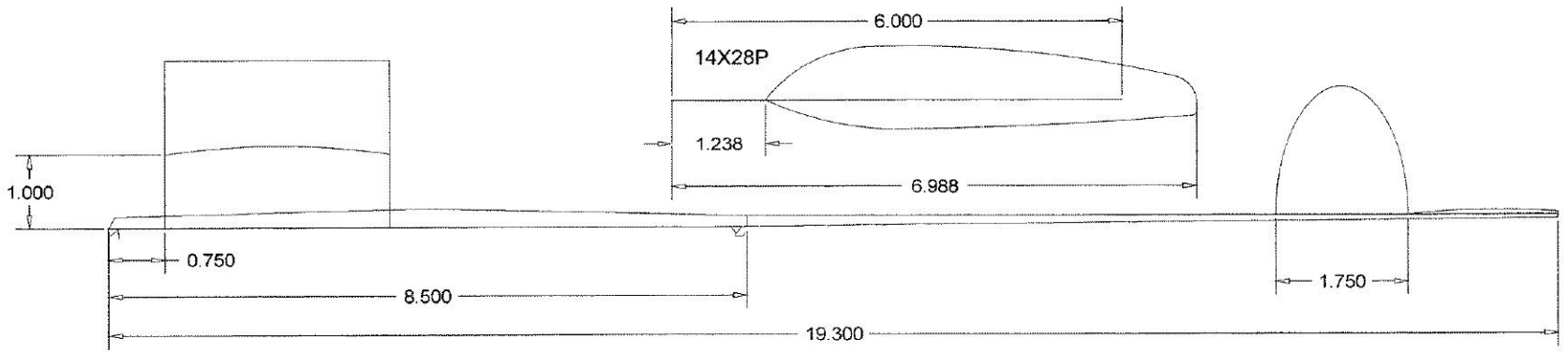
WING:	0.350
MOTORSTICK:	0.250
PROP:	0.180
REST:	0.250
BALLAST:	0.170
TOTAL:	1.200 G

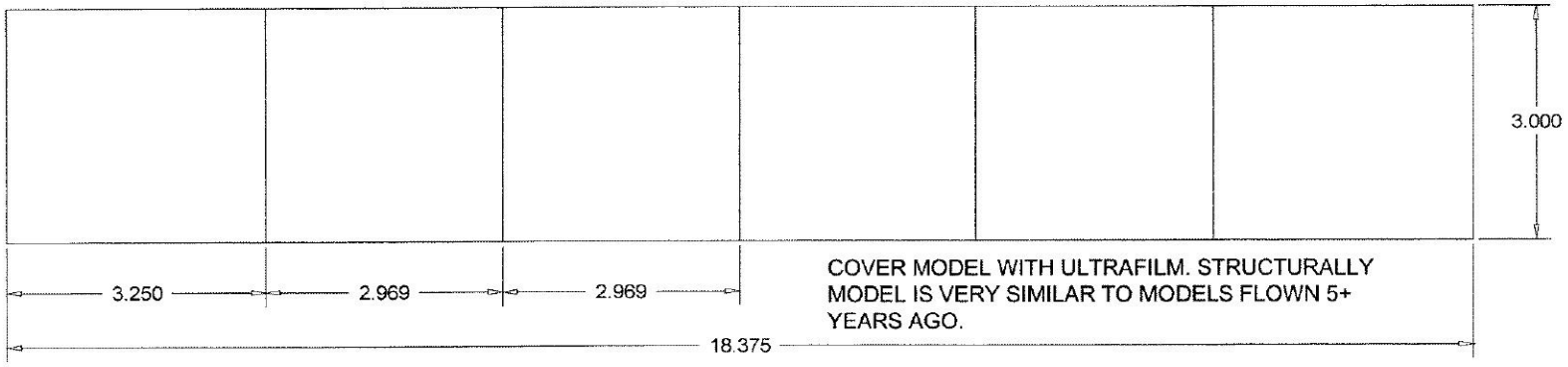
SILENTIUS II - 55 CM F1D

DESIGN/DWG: VLADIMIR LINARDIC

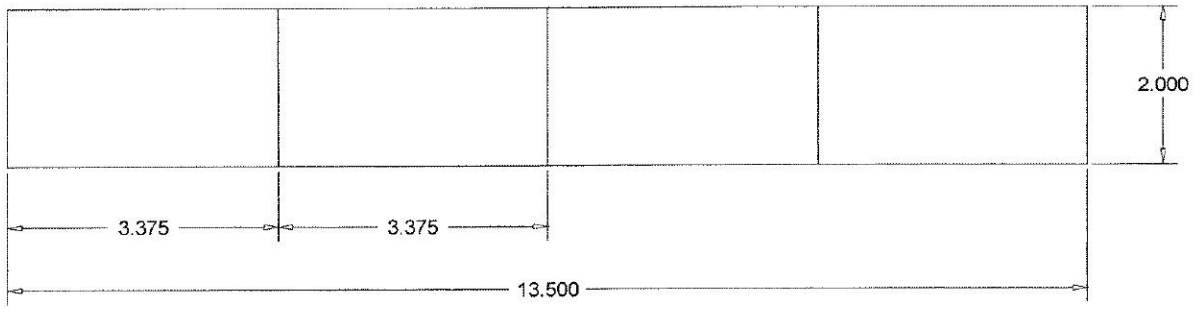
25/06/01


MATERALS
MOTORSTICK .100x.1875 DEEP TAPER ENDS TO .100x.140
FROM 5.0LB C GRAIN SHEET
BEARING WIRE PIGTAIL, 0.020 DIA.
REAR HOOK 0.020 DIA.
BEARING/HOOK GUESSET 0.032 5.5 LB A GRAIN
BOOM .100x.130 TAPER TO .045x.060
FROM 4.8 LB B GRAIN SHEET.
WING SPARS 0.063x0.063 4.2 LB A GRAIN
RIBS 0.030x0.063 DEEP A GRAIN
WING POSTS 0.065 ROUND 6.0LB
STAB SPARS 0.063x0.063 4.0LB A GRAIN
RIBS 0.030x0.063 DEEP A GRAIN
FIN OUTLINE 2 LAMINATIONS OF 0.030x0.063
LAMINATE USING 80% THINNED WHITE GLUE.
PROP SPAR 0.090 TAPERED TO 0.065 ROUND
FROM 6.0 LB INSET INTO BLADES
BLADES 0.030 3.7 LB C GRAIN
SHAFT 0.030 DIA WIRE.
ALL SURFACES COVERED WITH
PRE SHRUNK AND WRINKLED JAPANESE
TISSUE PAPER.
BUILT IN ADJUSTMENTS
THRUST: 0 DEG DOWN 2.5 DEG LEFT
WING: FLAT NO WARPS WITHOUT MOTOR
STAB: .020 WASHIN ON THE STARBROAD
SIDE TO AID IN KEEPING TURN
FIN: .063 OFFSET FOR LEFT TURN
2.844
2.844
2.844
2.844
0.500
2.219
2.219
8.875
1.625
2.000
3.000
1.720
0.625
1.120
0.371
1.704
1.327
1.500
0 DEG
-2 DEG
1.500
6.000
13.500
A-6
DESIGN/DWG: V. LINARDIC
10/10/01





COVER MODEL WITH ULTRAFILM. STRUCTURALLY MODEL IS VERY SIMILAR TO MODELS FLOWN 5+ YEARS AGO.



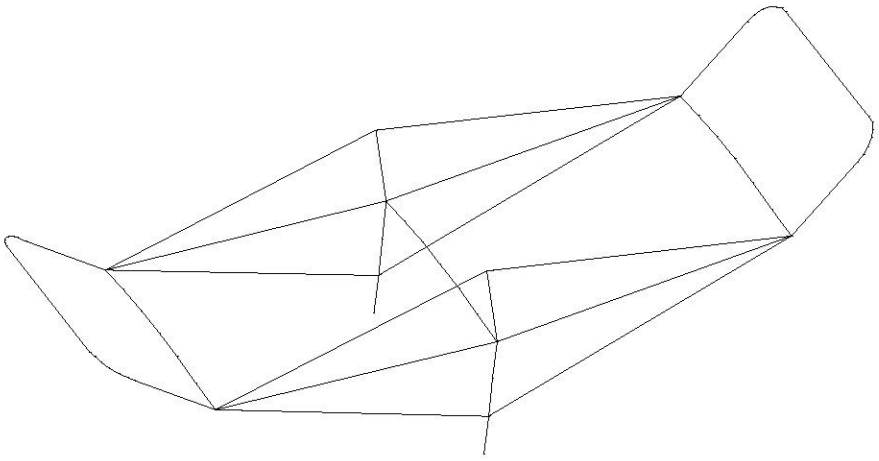
WEIGHTS
WING 0.39
PROP 0.22
REST 0.49
BALLAST 0.10
TOTAL 1.20 GRAMS

CAT IV RECORD 21:48

F1L EASY-B MODEL
DESIGN/DWG. V. LINARDIC
15/05/01

"Hybrid" F1D wing design

by Tim Goldstein
timg@IndoorDuration.com



This design came about because I wanted to try an unbraced wing and did not have time to build one for the team trial. Thinking what I could do it dawned on me that I could get the function of an unbraced with this scheme and just apply it to a current braced wing. Into the bracing jig the wing went and off with the existing wire and cabane. Added the 2 little posts and on with new wire. Took about 15 minutes and I was ready to try the unbraced concept. At the team trials I was using the traditional braced wing. Was having terrible problems at launch with barrel rolls and power stalls. My F1D looked like an overgrown ministick. After fighting the plane for 2 days with everything I could think of and all the suggestions I could solicit, I finally switched to the hybrid wing. Launched at the same torque that was giving me some interesting aerobatics and a climb to 120 feet. This time it climbed out like an F1B and immediately planted itself in the girders at 185 feet in just under 6 minutes. Was lucky to get it down with a balloon. Launched at a lower torque and continued to fly. Been using the design ever since and now am using the 3 rib design shown instead of the original 5 rib.

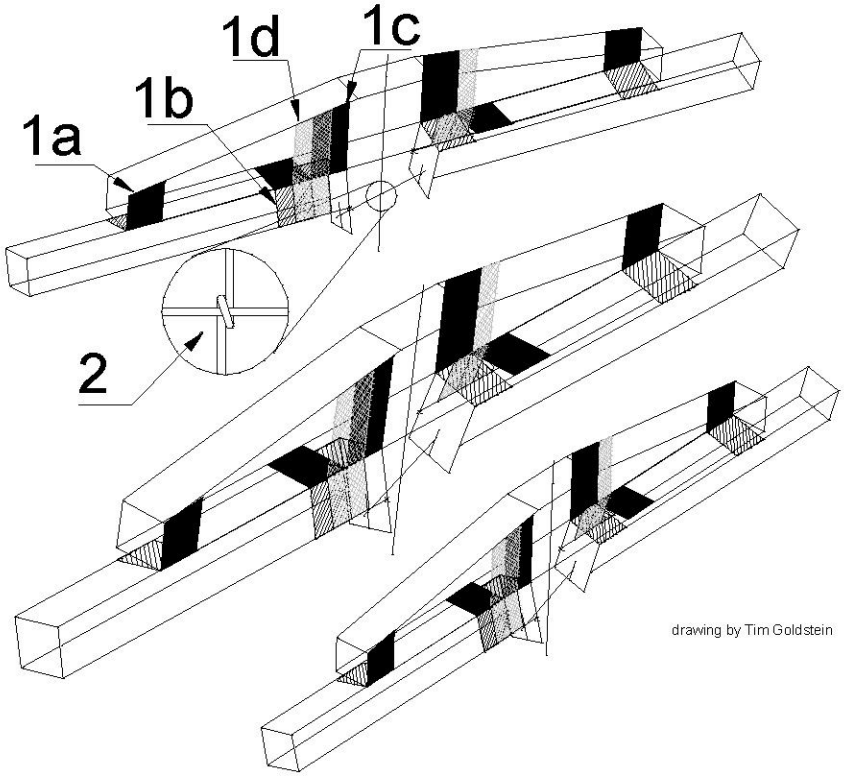
The advantages as I see it is consistent spar stiffness in varying humidity and much lower weight than a true unbraced design. While it is pretty easy to bring a F1D55 in under weight this gives me even more leeway so I can play with CG by moving the ballast and start work on modifying my model to pack smaller with a dual plug-in tail and not worry about going over weight.

VP Prop Hinge System

By John Kagan

1) Polyspan "L" hinges, double glue w/Ambroid
   - 1a & 1b counter prop torque
   - 1c counters spring torque
   - 1d prevents separation
2) Actuator arm attachment, solder

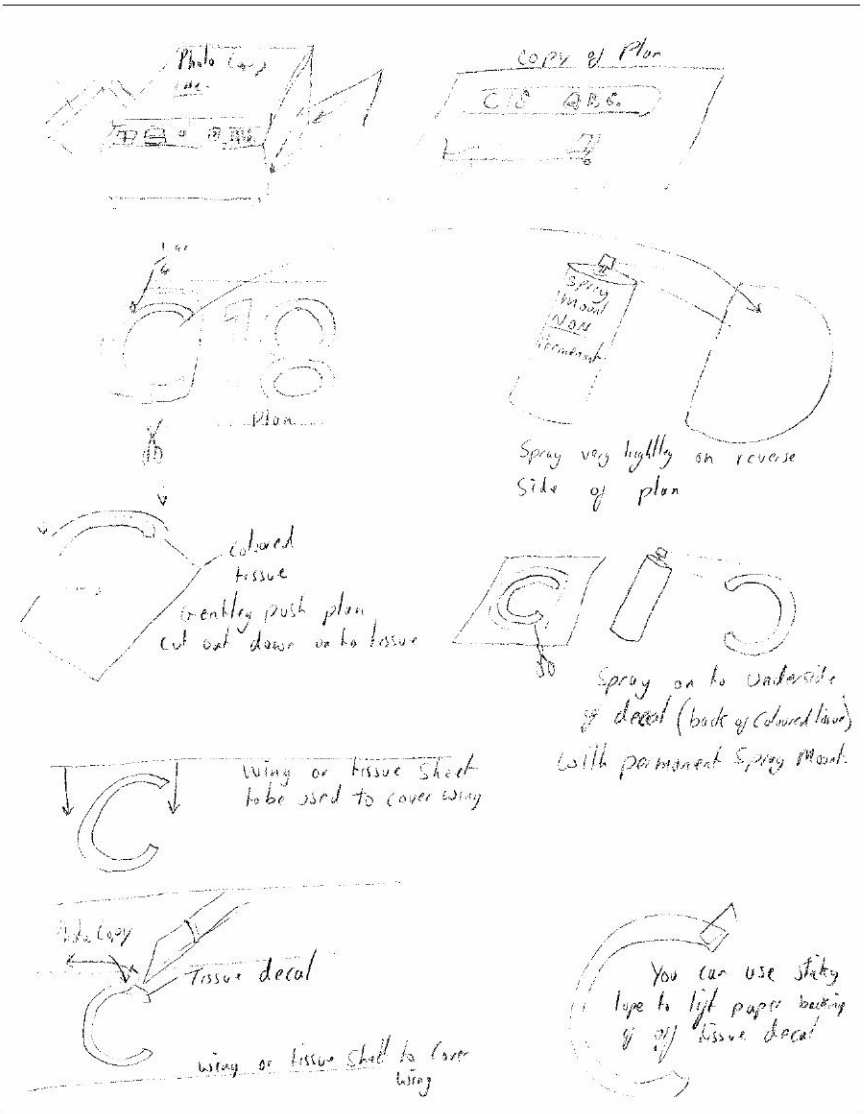
Reference Steve Brown's VP article INAV 89



Making tissue decals for P-Nuts & No cal and any other scale models.

By John Tipper

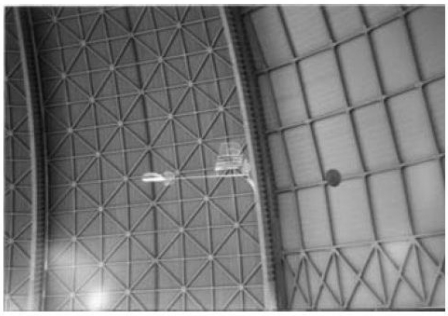
- First of all photo copy the plan 1 or 2 copies is enough.
- Next select the first marking you wish to reproduce, start of with a simple letter or number on the wing.
- Roughly cut out the letter from the plan leaving a 1/4" boarder around the template.
- Using a can of non permanent spray mount, give the under side of the template a very light spray, this just needs to be enough to stick the template to a piece of coloured jap tissue, lightly press template on to tissue.
- Next carefully cut out the decal with a sharp knife or good pair of scissors.
- For the next stage use a permanent spray mount to give a good spray on to what is the underside of the tissue decal , at this stage the paper backing must still be in place, this helps to keep the decal in good shape and flat.
- Lay the decal down on to its place on the model, once in place, gently press down and allow tissue to bond to wing tissue.
- When set use a fine point of a scalpel to gently peel the paper backing of off the wing leaving the tissue decal in place.
- For best results lay decals on to flat tissue then cover model when decorations are finished.



German Indoor Championships, Cargo Lifter Hanger, October 13-14, 2001

Aerial View of the Base

Closeup in Summer



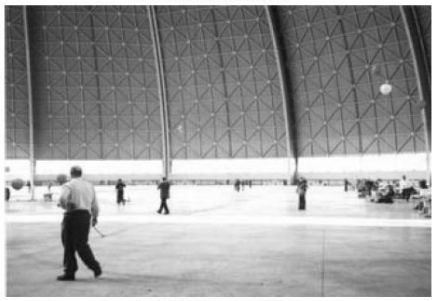
An F1D Floats By

Peter Keller

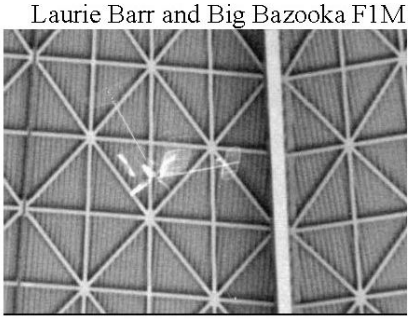
Nick Aikman

Laurie Barr and Big Bazooka F1M

The Lineup of Tables



And Still More Room



Midair's Were Rare, but Happened

Ron Green was top British Flier

Mikita Kaplan came from the Czech Republic

Mikita's Daughter Klara got 25.09 in F1D and a 17.36 in F1L

Another whoops. Carl had these ready for 105 and I forgot to print them. Sorry, Tim

MINI STICK, how it all began.

by Thomas Vallee (USA)
From Indoor News June 1994

It may be of interest to note that the Mini Stick (Living Room Stick:) event was originated by Pete Staehling and myself as a special fun event for an "indoor bull session"' of the Goddard Indoor Flyers. At these sessions we would do planning for the groups upcoming flying season and discuss indoor matters in general. We would also drink a good deal of good beer and consume generous amounts of home made baked beans or 3 alarm chili. Thus, a beer party was the inspiration for Mini Stick.

This is how the first Mini Stick contest came to be held in my living rrom. We had six contestants and the winning time was about 3'30. Since then Mini Stick has come a long way. The original rules were almost identical to present rules except that there was no weight limit. We determined the proper weight limit by weighing all the models. The .015 ounce (.43 gram) minimum weight is heavier than models built by our indoor experts but slightly lighter than the models built by our beginners. It seems to have been a good choice.

After the first few contests we saw possibilities of Mini Stick as an ideal entry level event which could be fun for expert and beginner alike. We began to promote Mini Stick outside our own group with great success. One thing we liked about the event was that it filled a special need not met by other events. It could be flown seriously in small rooms not suitable for other large indoor models. Mini Stick was a partial solution to the flying site problem. Our motto was "IF YOU HAVE A LIVING ROOM, WITH MINI STICK YOU HAVE A FLYING SITE". This was the inspiration for Mini Stick's alternate name, Living Room Stick (LRS).

I realized just how far Mini Stick has come since those first days, when I saw about sixty of these little ships filling the air in the Mass Launch* competition at the US Indoor Championships (* we have both standard duration and mass launch competitions at the USIC). Developing Mini Stick has been a lot of fun for me. It has been particularly pleasing to see so many people, having so much fun with our little brainchild, particularly the beginners

Hope you find this history of the origins of Mini Stick to be of interest.

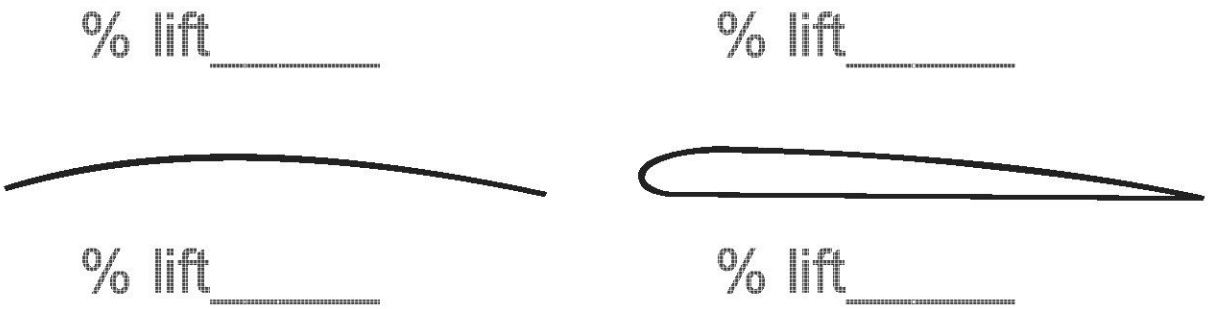
A point to ponder

Lew Gitlow of Indoor Model Supply (www.IndoorModelSupply.com) wrote us a letter and gave us a proposition that just happened to fit in nicely with the article in this issue by Vernon Neff. What Lew asked was the following:

1. On the wings used for out slow speed indoor flying models (single covered arc), what percentage of the lift is from the airfoils top surface vs the bottom surface?
2. On a typical outdoor model with a double covered Clark Y section what percentage of the lift is from the airfoils top surface vs the bottom surface?

Lew's proposal was that if we asked the question of our readership and get a response that he would look over the tally of the results and give use some commentary and experimental test results as for publication in a future INAV.

So, lets get your input on this and put Lew to work writing something for the next INAV. Send your thoughts on this to Carl. His address and e-mail is in the front of this issue.



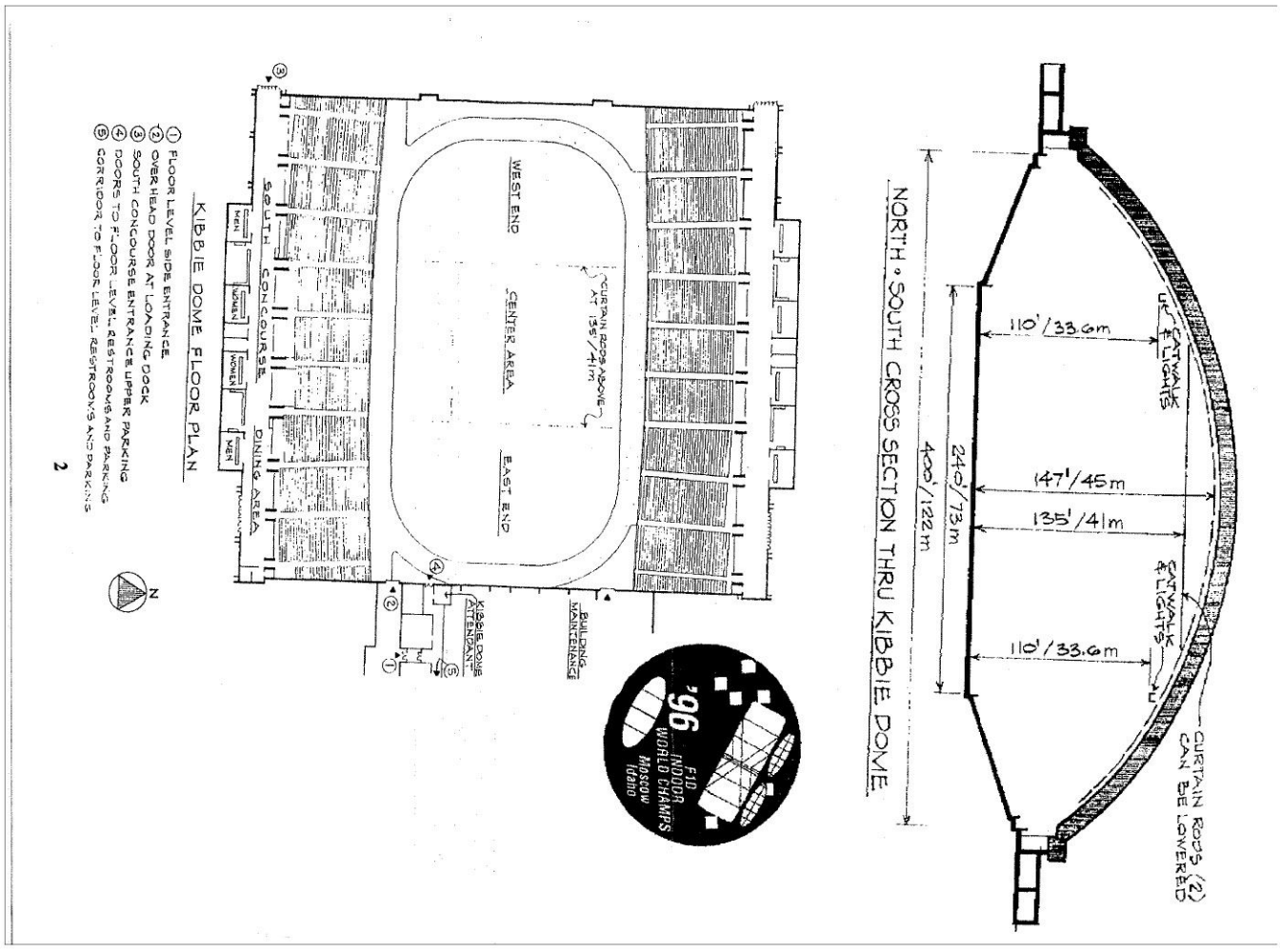
Kibbie Dome 2002 July 27 - 30

A 4 day event that is really multiple contests in one. All AMA classes, FAI classes, the Wally Miller EZB contest (1.2 gm), and an FAC contest. This is a world class 145' ceiling site with a layout that allows multiple classes to be flown at the same time. Light weight slow flying speed classes are flown in one end of the building and heavier faster flying classes are flown in the other. The middle area serves as a buffer between the two. This tremendous layout allows you to fly all classes of models any time during the entire event without the rush and concern of per class time slots (gliders excepted as they are limited to 1 hour each morning). This fun format allows for very relaxed flying and great camaraderie. There are no trophies, but instead in a great Kibbie Dome tradition contestants and supporting indoor vendors bring indoor oriented products, tools, supplies, and gadgets to put into a prize pool. At the closing award ceremony top placing contestants are allowed to pick their prize form the pool.

Special room rates are available at the University Inn in Moscow, ID. This is a Best Western hotel that is very nice with a full range of amenities. This hotel is within sight of the dome and is the "official" hotel for the event. The reservation phone is 800 325-8765 and the group discount is listed under AMA Modelers. Room rate is $52.50/night and all rooms have a little refrigerator and there is a grocery store next door. Hotel website is http://www.uinnmoscow.com

Come on out and learn why this contest continues to increase in participation every year. Registration is on site with no pre-registration required for the contest.

Contest CD:
Andrew Tagliafico
10039 SW Quail Post Rd
Portland OR 97219



Site drawing shamelessly borrowed from Indoor News May 1996

INDOOR

NEWS and VIEWS

ISSUE # 107

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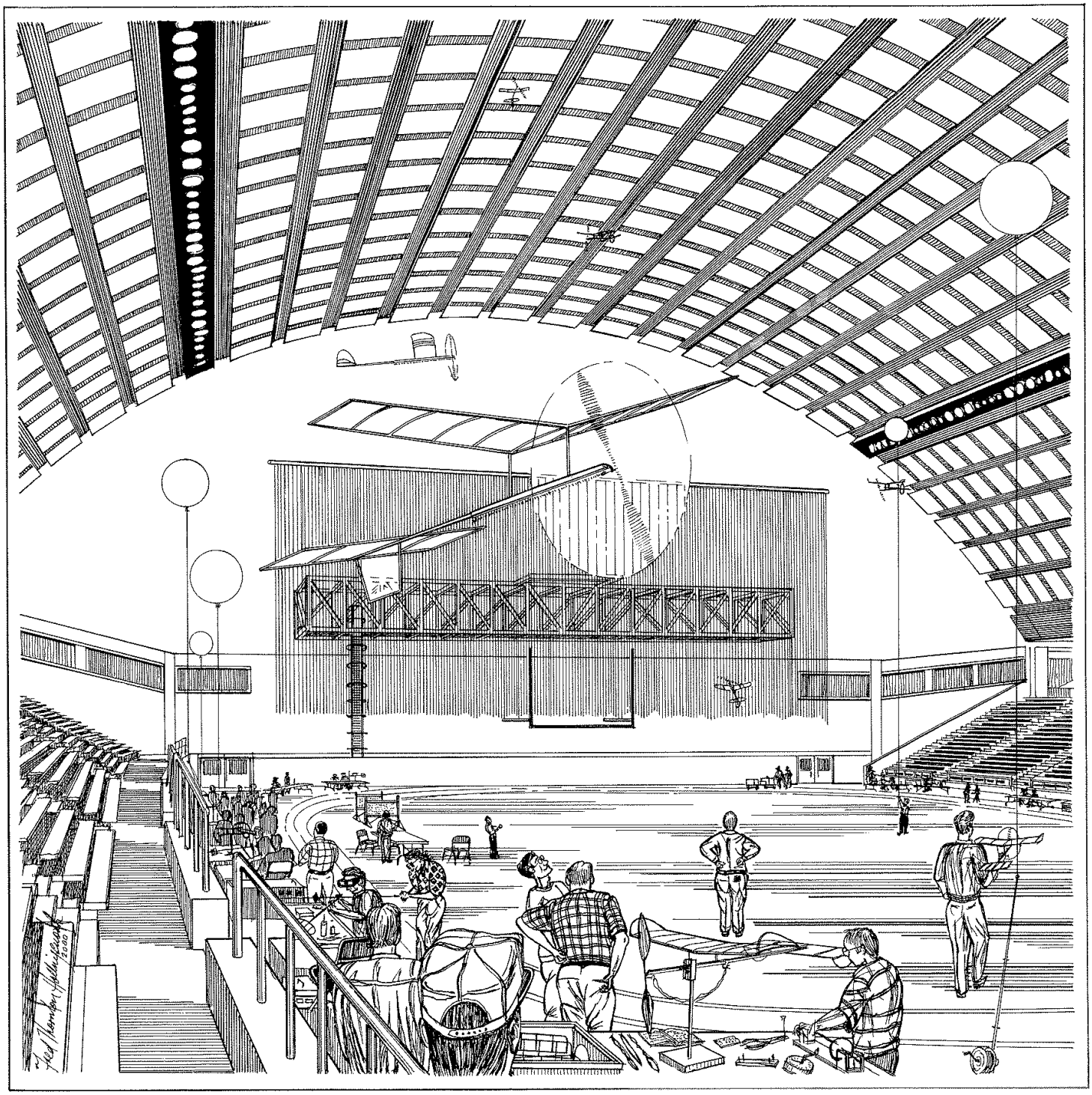

June 2002

From The Editor's Desk

Most of this issue is taken up by a single model design – the Hobby Shopper EZB by Larry Coslick. The first 12 pages is simply a reprint of the original article in Issue #90, one of the most re-quested reprints in our history. In the second 10 pages or so, Larry describes his on-going work in making the re-named Micro-B an even lighter, stronger, and more versatile model. The design tran-scends categories. It has been built with equal success by novice Juniors as well as World Champions. Parker Parrish, one of our most promising Juniors, likes to tell of how his first Hobby Shopper was heavy and didn't fly well, so he built nine more. Imagine that.

We also feature a new S.O design by Cezar Banks, of the La Mesa, CA, crowd. His wing design is taking the West coast by storm. The rest of the issue concerns USIC 2002 results. It was GREAT. I was there. With the help of Abram Van Dover, CD, we are happy to publish the results in the same month they happened, another INAV first, thanks to the new digital age.

Let us know what you think. - Carl Bakay

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*NOTE: New rates went into effect April 1, 2002

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Sample ad copy should be sent to Tim Goldstein at the above address for publishing details.

Cover art by Fred Hollingsworth, with permission of Wally Miller. Mr. Miller originated the EZB.

Membership Desk:

First up some of you may have not noticed the subscriptions increase that was announced in the last issue. If you sent in your dues after April 1 and paid the old amount your subscription renewal was prorated at the new rate so your new expiration is less that a full year from what it was. Hopefully everyone can understand.

I was at Lakehurst over the Memorial day weekend and Carl was at USIC. It never ceases to amaze me that pretty much anytime Carl or I attend an event we get new subscribers. Even more amazing is that when we start handing out back issues and talking INAV up we find that many indoor fliers have never heard of the publication. We need your help with this. INAV is a publication that depends upon its readers to supply it with quality content and to spread the word that we exist. You have all been doing a great job on helping Carl and I with the content. But, it seems that we have not been doing so good a job on telling other fliers that INAV is a must have if you are into indoor. I know that a couple of years ago we were all embarrassed to be recommending INAV because you never knew if there would be a next issue. Well those days are over. Carl and I have a solid year of track record to prove that INAV is alive and well. You can now feel confident telling others that INAV is the source for indoor info and a must have if you want to get serious in the sport. Expanding INAV's subscription base helps us all. Please join use in promoting it. You can now sign up or renew on the web using PayPal. 1 year subscription buttons are on the INAV page at www.IndoorDuration.com Cost is slightly more to cover the PayPal fees, but many people are finding the continence worth it.

I will be at Kibbie Dome at the end of July and hope that you will all come down and say hello. You'll find me at the far end in the light weight section.

Tim

PPP Film (Penny Plane Plastic)
1025 Cedar St
Catawissa MO 63015
.7 micron film that is economical and easy to apply.
12" x 50' rolls
$25.00 per roll
Price includes shipping

Y2K Films
4514 Meadow Ln
Red Bud IL 62278
Y2K (.5 micron) or Y2K2 (.3 micron)
12" x 25' rolls
$33.00 per roll Domestic
$35.00 per roll Foreign
Price includes shipping

Rules Cycle
Bud Tenny Chairman, Indoor Contest Board

If any of you have an issue with the Indoor rules (actually, all AMA competition rules), this is the year to offer proposals.

The deadline for submission is (postmark) Oct. 1, 2002. The proper form is available via your Dist. VP or AMA HQ. Try the VP first, he can request several forms if he doesn't have them. If several guys from one District each request one, that multiplies the load on the HQ staff.

For any new events, I WILL require a clear statement of intent. For modification of existing rules, it is helpful if you describe exactly what you are trying to accomplish. This will help you draft the proposal and it will help me as I review the proposal.

ATTEMPTS AT RECONDITIONING 1970'S PIRELLI RUBBER
By Carl Bakay

Unless you have been flying rubber models on Mars, you are aware that the rubber situation is tight, some would say critical. Since last year, there has not been enough good Tan II to go around, and a manufactured lot is sold out before everyone gets a shot at buying some. Quality is not a problem – myself and others have tested August 2001 and March 2002 batches, and they have been some of the best ever. Quantity is the problem.

We now have about ten people from all over the globe pursuing the quest for what has become known as The Holy Grail, only in this century our quest is electronic, via e-mail. One of the avenues to be explored is checking your club inventories for older rubber that might be reconditioned, or even used 'as is' for catapult, sport, or practice flying. Not much has been done on this – can older rubber be reconditioned to restore any of its old performance. Stan Chilton has told us that some aging is good, and a fresh box of rubber seems to perform better after a year or two. But after that, it is all downhill.

> Here's what Fred Pearce had to say in his 1979 article in Model Aviation, titled "All You Need to Know About Rubber".
> *Rubber is a polymer. Aging results in the continuation of uncompleted vulcanization reactions usually resulting in chain-lengthening and increased crosslinking between chains. These processes lead to toughening of the rubber. Aging of rubber beyond optimum condition results in chain scission (decomposition), resulting in shorter chains combined with increasing crosslinking of an excessive nature. The product becomes increasingly brittle. Brittle rubber tears at knots and slight imperfections. It is also inclined to explode…*

If we recondition old rubber, what would be some target properties to look for? In the same article and others, Fred reported 780 to 830% elongation from his fresh 1970's Pirelli, as well as energies from 3200 to 3750 ft-lbs/lb. So this is about what we can expect for 100% restored rubber. So the word went out.

Mark Bennett of Sacramento was kind enough to send me a full pound box of 6 mm Pirelli from somewhere (or somewhen?) in the 1970's. This is just under out current ¼" strip, measuring 0.236 to 0.238" wide. When stretch tested it had an elongation of 650% before it snapped, and an average energy of 3000 ft-lbs/lb. I thought the best things to try as restoratives were the lubes already in use, Son-of-a-Gun , Formula 2001, a glycerin/soap 50/50 mixture, as well as two skin lotions guaranteed to make your dried old skin look younger and feel softer. These were Vaseline Intensive Care Dry Skin Lotion, and St. Ives Collagen Elastin Lotion. About 15 grams of Mark's Pirelli were weighed and soaked in each of these for a month in sealed margarine containers, and shaken once every few days to keep an even coating. Then they were rinsed thoroughly in warm tap water, air-dried overnight, and weighed again. The weight increase gives some crude measure of penetration into the matrix.

I then cut the strips in half to 0.120", formed them into 7" loops, and pull tested them to the point where there was about 50% breakage. The results are calculated on from four to six samples each, tabulated roughly in the order of improvement.

Treatment	Weight Gain	Elongation	Energy @ 70° F
None, Dry	0.0%	650%	2990 ft-lbs/lb
Water	5.9%	671	2830
Son-of-a-Gun	8.2	678	2860
2001	8.0	671	2900
glycerine/soap	8.3	678	3230
Vaseline Lotion	6.6	689	3140
St. Ives Lotion	9.6	691	3280

Elongation is repeatable to ± 1 inch, or ± 15%, and the energy content I estimate to be good to ± 100 ft-lbs/lb. The conclusion would have to be that some small improvement is possible, but that the original stretchiness is lost forever due to chain damage and advanced crosslinking.

Balsa for Indoor Models by Joe Maxwell back in print!

A classic returns. New printing with better quality pictures. A Study of the characteristics and cutting of the special wood we use for building our ultra-light aircraft . 48 pages. GBP 9.00 in the UK, 17.00 Euro in notes for Europe, GBP 10.00 in notes(US$15.00 in bills) elsewhere.
Send bills (not a check): Joe Maxwell, 11 Windsor Place, Stirling FK8 2HY, Scotland
jnmaxwell@maxwellj.fsnet.co.uk chapter listing available at www.IndoorDuration.com

Indoor Duration Flying Continues at Cardington.

From Laurie Barr.

I am delighted to inform you that after surmounting many hurdles, we have the use once again of Hanger No 1. Although the roof is somewhat 'perforated', there is much more room to fly in and because we have 'bought' flying time, and are repairing some broken windows! We are sought after guests and not prisoners. However, the front end of the shed houses some small airships and there is an invisible line across the floor that we MUST not cross. This would risk losing the chance to reinstate our presence in our 'ancestral home'.

The entry fee remains as £10.00 per person and this will also include spectators. This year, we will also charge £1.00 per contest entry to generate a bit more income. Access is by the A600 South of Bedford. Drive between the hangers and turn left. Along the rear end of the hanger are 2 doors, both of which will be locked after 10.45/11.00 a.m. The doors will open again at approximately 6.00p.m. This procedure is to ensure stable air and to stop anyone (including non B.M.F.A. people) not on the list from trespassing.

The following list shows all the dates as scheduled. This is subject to airship operational demands, in which case we shall give way if there is a conflict of interests. Best of all, is that the big main doors, WILL BE SHUT!!! and I expect the whole experience of flying here, will be relaxed and enjoyable.

Requirements for entry. All are mandatory.

You must be a current B.M.F.A. member, and you will be expected to show your card if requested.

There is so much space, that all kinds of scale and fun flyers are welcome, so long as you are on my list! (But no R/C or engine powered flight)

No one, except our safety personnel, is allowed to climb any staircases, for any reason. Small children who cannot be controlled are not recommended at this site.

This is a hard hat area, and although there are a few hats available, you are urged to buy your own 'Bob The Builder' type hat which you can get at builders yards, or B&Q etc, for under £5.

You must send a post card to Laurie Barr, giving all the dates you will attend, well before your arrival. Also state your full address, E-Mail address, B.M.F.A. number and phone number, in case we are given short notice to cancel any date. An s.a.e. would also be very helpful.

Schedule.

May 19th. F1L & No-Cal
May 26th F1M & LPP **Note:** This new date replaces the meeting scheduled for the 1st/2nd of June. This is to June 16th F1D & Mini-stick avoid clashing with the reinstated outdoor Nationals.
June 30th F1L & No-Cal
July 13th F1D first Euro trials.
July 14th F1D second Euro trials
July 28th F1M & LPP also reserve date for Euro trials
Aug. 11th F1L & No-Cal
Aug 24th Practise/ LPP & No-Cal & Catapult Glider.
Aug 25th F1L & F1M **Indoor Nationals**, over 2 days
Aug 26th F1D & Mini-Stick. **2nd day Indoor Nationals**
Sept 8th F1L & No-Cal
Sept 22nd General reserve date.

This information is for all previous members, but we also want more BMFA members to attend, and we are advertising all dates, but there is an upper limit to the numbers allowed at any meeting. We would also be very happy to welcome flyers from abroad.
Send your dates ASAP to- Laurie Barr FSMAE, Herries Cottage, Winter Hill Road, Pinkneys Green,
Maidenhead, Berks, SL6 6PJ. Tel 01628 487544. E-Mail. lgbarr@tiscali.co.uk

28. 04. 02.

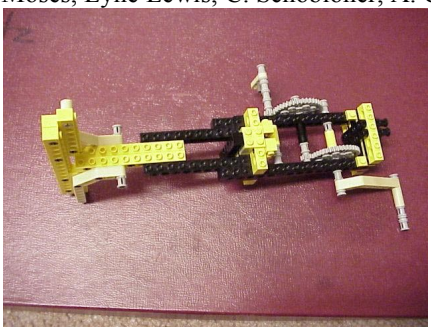
SCIENCE OLYMPIAD PHOTO ALBUM

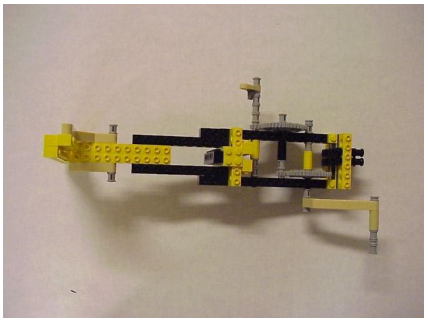
Thurgood Marshall Middle School Team, La Mesa, CA
1st Row: Nicole Webster, Alex Nelson, K. Sami, K. Adler, K. Shah 2nd Row: Brian Finley, Cezar Banks, John Hutchinson, G.Del Castillo, John Oldenkamp

Roger Willis, Councilman Brian Maienschein, Senior 2nd place Winner/Mentor John Hutchison

Cloudbuster Mentors of Michigan and Ontario
L to R: P. Bruning, D. Ola, G. Carter, D. Carter, G. Lewis, J. Lemke, F. Tellier, J. Moses, Lyne Lewis, C. Schobloher, A. Chizmadia, F. Wunsche

Bill Lehn helps youth in Dayton, OH. Shown here in their church gym flying site in mid-December





Two views of an SO winder Made from Lego Technics by Andrew Hardin of Fort Collins, CO

USIC OPEN SCI-OLY EVENT

Bill Gowen, event CD

2 gram Rubber Limit, 8 gram plane, wheels.			**Unlimited Event, No rubber limit**		
Contestant	**Best Flight**	**Place**	Wayne Johnson	7:37	1
Neal Henderson	5:40	1	Bill Gowen	7:08	2
Wayne Johnson	5:22	2	Bill Carney	4:43	3
Bill Gowen	5:18	3			
Dan Benner	4:43	4			
Terry Trisler	3:16	5			
Carl Bakay	3:07	6			
Bill Carney	3:06	7			
Steven Dard	2:48	8			

Some comments regarding the article " Non Bernullian Aerodynamics for Indoor Models" by V. D. Neff

by Reuven Shenkar (ISR)

Altough flying F1D for about 7 years, I am sure not considering myself an expert in regard to issues like model building. However,being an aeronautical engineer, I am allways willing to discuss technical issues like aerodynamics, stability and performance. After reading the artical by V. D. Neff in INAV #106, I decided to write down some words regarding that article in particular,and the subject of Low Reynolds Number Aerodynamics in general. The comments and criticism maybe a little harsh, so it is stressed hereby that I am absolutely not trying to offend or discourage anyone,the contrary.

1. First, I don`t like the term "Bernoullian Aerodynamics" . Bernoulli`s equation is not some kind of "magic" . It is derived, after some assumptions, from the basic laws of fluid mechnics, which are :

- conservation of mass
- conservation of momentum (Newton`s II law)
- conservation of energy

it follows, that Bernoulli`s equation is valid along a streamline in an inviscid incompressible fluid [1]. Of course,The essence of Low Reynolds Aerodynamics is the effect of viscosity, but Bernoulli`s equation is NOT to be blamed for .

2. Re number is not a measure of the "flow over and under a flying surface". It is a measure of the ratio of inertial forces to viscous forces.

3. Re number is nondimentional. ASo it does not matter what units are used.

4. The equation L=1/2*rho*v^2*A*cl and D=1/2*rho*v^2*A*Cd are reffered in the text as "Bernoulli`s equations".This is not so. These are definitions. Their purpose is to make the coefficients nondimentional. For example, When dealing with compressible flow, the coefficients are written as L=1/2*gamma*p*M^2*A*Cl etc., where gamma is spcific heat ratio, and M is Mach umber. This is exactly the same. However, 1/2*gamma*p*M^2 is NOT the dynamics pressure in this case. it is used for the sake of clarity, because otherwise it would be very confusing.

5. The velocity v, in regard to these definitions, is taken as the velocity of the free stream, not the velocity "...tangentially over and under the wing...".

6. The statement " ...If we assume that the Re continues to decrease at the rate of 1.2...The lift coefficient would be about one tenth. " is completly unjustified. It is true that peak Cl decreases,
but not to that extent.

7. Here we get to some interesting point. This concept of "Non Bernoullian Air" was first suggested by....the great Isac Newton himself [2], while trying to deal with other problem. It is often regarded as the " squared-sine law". Because of the square sine ,the outcoming numbers are extremely small.Historians say that for this reason, there was a belief which lasted to the beginning of the 20th century, that human flight is not possible.
Fortunately, this law proved to be wrong ,at least for "normal" aerodynamics. In hypersonic aerodynamics, because the gas is so rarefied, the so called "Newtonian theory" works quite well.

8. Another early attempt is due to Kirchoff [3], who described a type of flow where the flowfield behind the wing is completely detached. The calculation of the flowfield ,by means of conformal transformation,
is very laborious. This also failed to describe the physics of the flight correctly.

9. "..The airflow ceases to be Bernoullian and begins to become turbulent
thus producing less lift...". First, the word "turbulent" is out of context. "turbulent" and "Bernoullian" are not opposits. turbulent flow does not produce less lift.The contrary. It is often favorable to us.

10. The discussion of L/D ,which is a (mostly) 3-D characteristic of the wing, in the context of 2-D flow is wrong and confusing.

11. "...In NBA there is no vortex drag. The effects of drag are produced entirely by what we would call profile drag in BA. As far as lift and drag are concerned,features such as wing stall,aspect ratio,and wing shape...are seemingly irrelevant..." Wrong. Vortex drag is a 3-D concept. No 2-D airfoil theory can say a thing about 3-D effects .

Attached is an interesting photo I found a year ago during some cleanup of my hard drive. I think it is an F1M by Jonas Romblad (sp?). In close scrutiny, one can see clearly that in the lower half of the endplates, there is a bulge pointing outwards, while on the upper half it is opposite. This is ,no doubt,a tip vortex. If this is not vortex drag, then I don`tknow what is.

12. "...The concept of "pushing on air" can also be applied to the cambered wing...". This is the total,immediate failure of the Newtonian theory. It can`t explain why a cambered wing at ZERO AOA exerts lift. And it does, even at Re=2000! [4]

The subject of low Re aerodynamics is indeed very complicated. The problem is ,of course, the viscosity, which in that case can`t be ignored. Consequently, the assumptions of the classical aerodynamics theory are less valid. for example, the concept of the boundary layer.

Generally speaking, boudary layer theory is a mathematical term. it is a way to get an approximate solution to a problem, where the exact solution is difficult or unobtainable. If one identifies that the problem contains some small parameter, which is the one that "cause trouble", it is often possible to break the problem into two different ones: one in a small region that is dominated by the small parameter, and the other in the rest of the region, where the effect of the small parameter is negligible. In the aerodynamic theory, 1/Re is the small parameter. It is obvious, that as Re decreases , the assumption of the boundary layer is less justified.

Now things should be somewhat clearer. Because the situation is much more complicated, the classical analytic theory of airfoil sections does not describe the flowfield correctly, let alone the simplified Newtonian theory!

One thing is true."...This subject is beyond any kind of exact theoretical treatment available at this time...".
Well, almost true. There is a growing interest in low Re aerodynamics recently, due to the issue of MAV development. Because of the vast difficulties, the analysis is being done by means of Computational Fluid Dynamics, which is a fast-growing discipline of applied aerodynamics.There is a brand-new book, first of its` kind [4],

that includes some of the first ever reports regarding low Re aerodynamics. It contains some results that are of value for the indoor comunity. The major challenge of CFD is the establishment of the credability of the results. Particularly in our case. So there is a lot of work to be done. Right now no one has any insight about what is going on in the vicinity of low Re. In order to do some serious research,the following steps should be followed:

1. prepare a large set of (virtual) airfoil sections,with all kinds
of variations of camber in different points of the cord .
2. Run CFD computations , and conduct wind tunnel tests , possibly
with all available means of visualisation, like
smoke, tufts, oil patterns, PIV, etc. This alone is almost impossible,
because the forces are extremley small.
3. compare CFD resulte with wind tunnel results. Improve turbulence model/numerical method/etc. until there is a strong correlation .
4. When satisfied with the CFD procedure, Now start to alter properties of a virtual airfoil in the CFD software, and see what does what.After a long long time , this should give you the expected insight.
5. Do the same as (4), with some finite set of control points, in order to get an "influence matrix" .
6. engage an optimization program, that takes the influence matrix and gives an optimized airfoil.

I hope that this makes some things a bit clearer. Again, I do not mean to discourage anyone from trying to do some individual work.As you see, it can stimulate some interesting discussion.

References:
[1] K. Karamcheti,"Principles of Ideal-Fluid Aerodynamics",Krieger ,1980, p. 221.
[2] I. Newton,"Philosophia Naturalis Principia Mathematica", 3rd ed.,London ,1727 (English translation and commentary, California University Press,1999).
[3] H. Lamb,"Hydrodynamics", 1932, Also available reprinted by Dover Publication.
[4] T. J. Mueller,"Fixed and Flapping Wing Aerodynamics for Micro Air Vehicle Applications", AIAA press,2002.

A Reply by Vernon Neff

Mr. Shenker is an aeronautical engineer apparently interested in low Reynolds number aerodynamics. I am not an aeronautical engineer and I now regret having stuck my nose in matters where it does not belong. I am, however, an average person who does not like being told that he is wrong which Mr. Shenker says a couple of times in his critique. After all, in an absolute sense, Newtons equations of motion are wrong.

Mr. Shenker (S.) points out that the first attempt to explain lift, on the basis of momentum transfer at the surface alone, was due to Newton.. This was quite a surprise to me but I would be quite pleased to refer to the lift produced by ignoring the flow conditions as Newtonian. Perhaps I did not make it clear that this is an extreme position. The other is the lift produced by perfectly streamlined flow, i.e. the Bernoulli effect.

In the interest of clarity I wish to explain precisely what I meant by referring to the Bernoulli equation or perhaps, more properly, the Bernoulli principle. We consider an incompressible fluid under conditions of perfect streamline flow. As pointed out by (S.), the Bernoulli (or Euler) equation is based on the conservation of mass, momentum, and energy. In physics this equation is an example of what we call an equation of continuity. In terms of fluid flow it simply relates the pressure in the fluid to the velocity along the streamline in the sense that $P + 1/2\rho v^2 = C$ where P is the fluid pressure along the streamline, v is the velocity, ρ is the fluid density and C is a constant. The significant point is that as the flow velocity increases, the pressure decreases, and that the decrease in pressure depends on the square of v. (S.). has correctly pointed out that the empirical equations I introduced for lift and drag are not the “Bernoulli” equations but they do invoke the Bernoulli effect through the dependence on the density and the square of the velocity. The main point of my article was the fact (surprising to me) that one can derive equations which have the same form by simply considering the molecular dynamics at the surface and by essentially ignoring the effects of fluid flow. Once again I emphasize that this is an extreme and oversimplified point of view which is apparently well known to engineers. I definitely do not agree that flight is impossible if we consider Newtonian lift alone. The simple equations I produced do require a high angle of attack but they can be modified in a number of ways by including the effects of molecular collisions (i.e. viscosity) near the surface. In fact, by going down completely to the molecular level and including the molecular thermal energy (velocity) I can produce a theory which gives too much lift. This heretical theory also predicts that lift and drag should increase as v rather than the square of v. Of course such conjecture is meaningless in the absence of good experiments which are sadly lacking in the realm of very low Re. I am gratified to learn that the engineers are now engaged in studying this problem.

I would like to defend myself on a few other points of contention. First of all I do not believe that Bernoulli’s equation is “some form of magic”. I believe that it is exactly what I described above. I have been accused of using a 2-D theory to describe 3-D effects. On the contrary I said that the Newtonian concept does not include such things as vortex drag. I did not say that vortex drag is unimportant for understanding real flight at low Re. I do not know what is important. Again the point of the article was simply to discuss lift and drag from the opposite end of the Bernoullian spectrum where we simply ignore the complex features of fluid flow. Surely no one believes that such an approach can explain all (or perhaps any) aspects of slow flight. By the way, the Bernoulli equation is itself two dimensional. The history of the development of aerodynamics, since the time of Prandtl and Tietjens, is one of going beyond the simple principle of Bernoulli as stated above. Mr. Shenker is well aware of this fact and I am somewhat surprised that the engineers seldom mention such things as circulation and the bound vortex when they defend the principle of Bernoulli to the lay public.

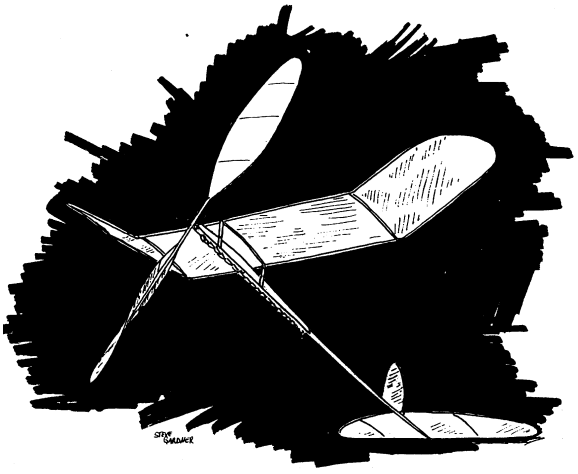
At the end of the article I mentioned the cambered wing, and the very slow propeller, as candidates for consideration in the Newtonian theory. I did not consider these subjects in detail and probably will not in anticipation of stirring up further controversy in which I do not care to participate. Now Mr. Shenker asserts that “the total immediate failure of the Newtonian theory” is that it cannot explain why a cambered wing, at zero angle of attack, produces lift. Now I will not say that he is wrong because I do not like that absolute term. I will say that I definitely disagree. Newtonian lift can be produced but this depends heavily on the shape of the airfoil, and the inclusion of certain effects due to molecular collisions near the surface. Since there are an infinite number of choices for shape this is hardly the place to pursue the matter further. As a final point of consideration it is my opinion that no very slow indoor endurance model actually flies at absolute zero angle of attack.

Finally I wish to acknowledge some corrections which are minor but still important. Mr. Shenker correctly points out that the Reynolds number is dimensionless which it most certainly is. My calculations were carried out in SI units but the final result is, of course, independent of units. He does not like the way I described the Reynolds number and I don’t either. First of all I should have called it the average Reynolds number because the true Re varies across the surface of the wing. For the purpose of the discussion I simply meant to convey that the average Re is proportional to the wing velocity. I also regret using the term turbulent in the context where it was questioned by (S.).

Currently I do not plan to indulge in any more “theories”. I am still fascinated by our hobby and am engaged in designing modest experiments to measure lift and drag. These experiments will involve a wing moving at the end of an eight foot slowly rotating shaft. I would be happy to report any meaningful results in future issues of INAV. Mr. Shenker has also outlined a very elaborate experimental program. It appears to me to be something that should be undertaken at a place like NASA. I believe that it is beyond the resources of the average modeler.

Hobby Shop EZB

by Larry Coslick
Illustrated by Steve Gardner



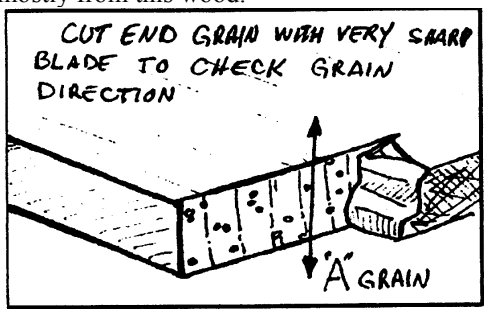
Originally published in INAV #90

This building and trim article is intended to help the new modeler eliminate some of the frustrations when starting out in this fascinating hobby. It is a detailed description of my methods for constructing an EZB. The prototype was built entirely from hobby shop wood, and was quite strong at .61 gram. Following these directions this EZB should come out weighing less than .75 grams using only wood available at your local hobby shop. At this weight the model could fly from 22 to 25 minutes in a high ceiling Site. For a new EZB flyer this is a very good performance.

BALSA SELECTION

The most important part of building a competitive EZB is the selection of the proper wood for each part. The wood is available at any hobby shop with a fair selection of balsa sheet. Special indoor wood is not needed. The wood used for the prop blades may be a possible exception.

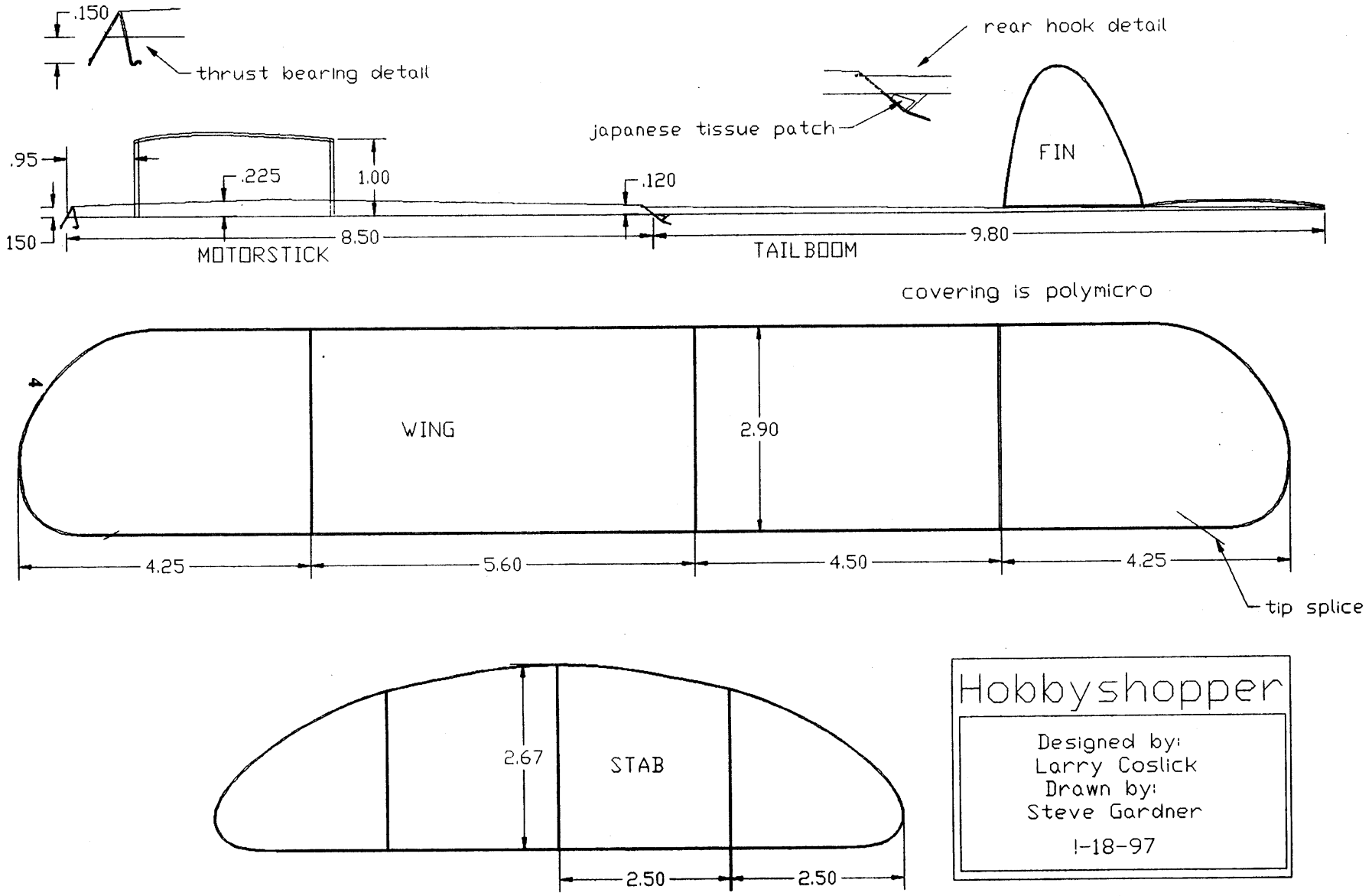
The first consideration when choosing wood is weight. The density, or weight, of balsa is measured in pounds per cubic foot. We say a certain piece of wood is "six-pound wood", and on some plans it may be marked "6# wood". Each component of an EZB is made from a certain weight wood. The very lightest wood is about 3.5 to 4 pounds per cubic foot. Wood with a weight of about 5 to 6 pounds per cubic foot is much easier to find at an average hobby shop, so this EZB is made mostly from this wood.



Take a postage scale to the hobby shop and check each piece before you buy it. To check the density of a piece of wood first weight the piece to find its weight in grams. Then find its volume by multiplying its thickness by its width, and then multiplying that number by its length, in inches. We are mixing units here, but grams (metric) are easier to use for weight, while inches (English) are still what everyone used for small measurements.

To use these together we take the weight in grams and divide by the volume in inches, then take that number and multiply by 3.81 to get pounds per cubic foot. A piece of 1/16 X 3 X 36 wood in the 5 pound range will weigh about 8.9 grams and a six pound piece about 10.6 grams. By figuring out what the wood will weight in a certain size sheet you can use a postal scale right at the balsa wood rack in the hobby shop to choose wood. You should buy "A" grain wood for EZBs. (see drawing)

Because the density of balsa wood can vary a great deal in any given sheet of wood the next step is to hold the sheet in front of a swing arm lamp with at least a 40 watt bulb. Turn off all the other room lights so that you can see the light coming through the balsa better. The wood will have a brown color that is lighter where the wood is the lightest in weight. The wood that you want is the lighter streaks or sections of wood that the most light is coming through. Mark these areas with small dots from a felt tipped pen while holding the wood up to the light. When you look at the wood when you turn the room lights back on you will probably notice that the wood you have marked is very light in color, almost white, and that it shows almost no grain at all. The areas marked are not usually very wide, yet you will not need much for several sets of wing spars, or ribs etc. When you cut these very small areas out leave a half an inch or so of darker, heavier wood to serve as a handle for the good wood. This will make cutting spars and other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thrust bearing detail
rear hook detail
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MOTORSTICK
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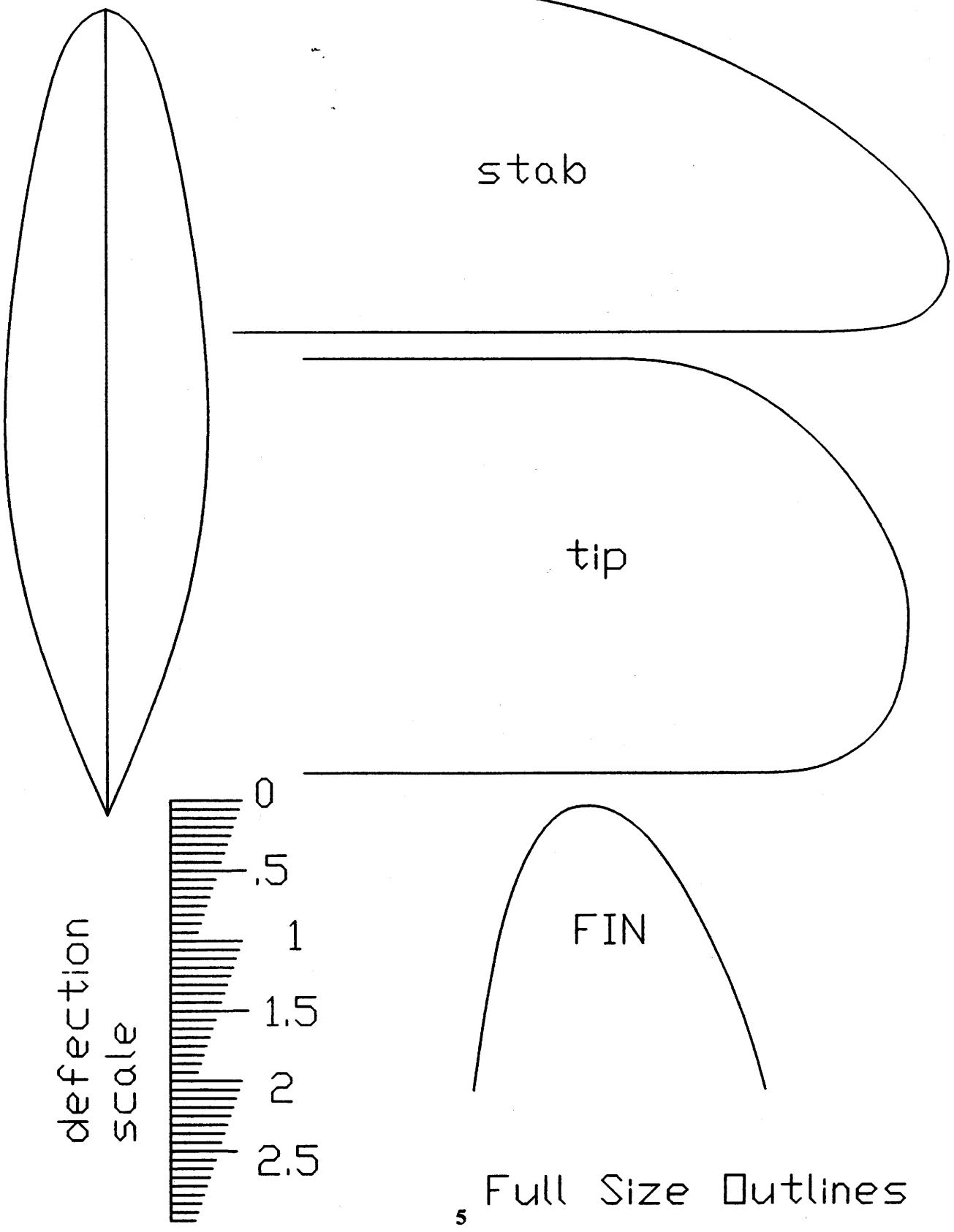
TAILBOOM
covering is polymicro
WING
2.90
4.25
5.60
4.50
4.25
tip splice
2.67
STAB
2.50
2.50
Hobbyshopper
Designed by:
Larry Coslick
Drawn by:
Steve Gardner
1-18-97

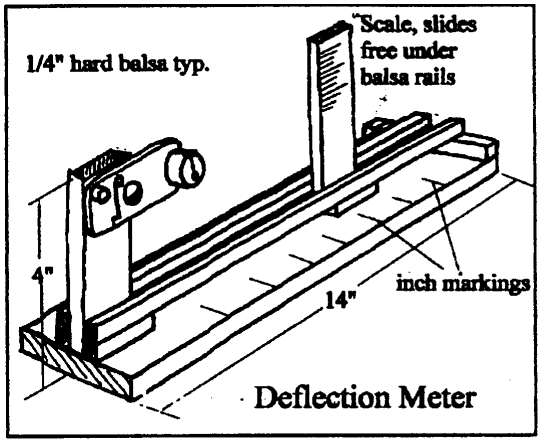
HOBBY SHOP EZB

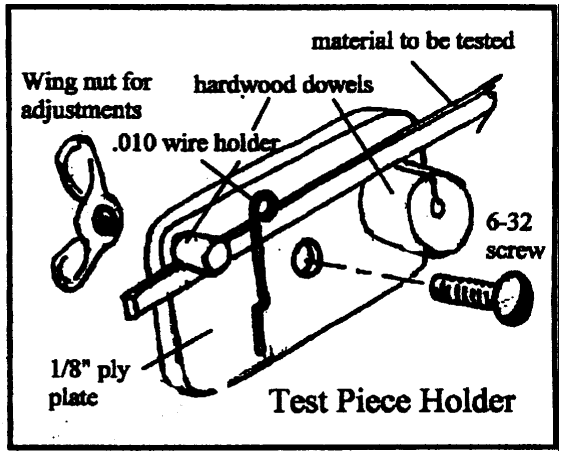


5 Full Size Outlines

parts from this wood much easier. This method of picking out the wood will work even with 1/4 inch wood which you might use for motor stick wood. Cut the good wood out of the sheet and recalculate the density of the good piece. It might be as light and stiff as the special indoor wood and it has straight, smooth grain.

The next most important thing to check about balsa wood is its stiffness. Cut a test spar from each of the good pieces of wood and test them on the deflection meter. (see drawing) Use colored marker pens to grade the wood for stiffness so that you can tell which piece made the stiffest spars. If you do not mark them you will get them mixed up and have to test them again. You may be surprised at the difference in stiffness between one spar and the next, cut right beside the first. Simply selecting the stiffest wood from a given section will really improve the model.





SANDING

The sanding blocks are cut from pine, .75" X 1.5" X 5". Slightly round the long edges with sandpaper. Cut the sandpaper so it wraps up around both sides. Use 220 wet or dry paper for the fast cut and finish with 360 grit. To sand the wood for the prop blades, or any other wood that you need to be a certain thickness, the ends of the sanding block are spaced up to the height of the wood thickness. To do this shim stock is glued to the ends of the block. It can be made from metal, plastic or masking tape. It takes some experimenting to find the correct amount of shim for each application.

Glass makes a good surface on which to sand. I use a piece of double strength glass 10" X 24" which is mounted on several layers of foam board, painted flat black, (no lacquer). The glass was then taped to the foam board with duct tape to safety and protect the edges.

Sanding prop wood - It can be sanded to around .020" by carefully sanding with a back and forth motion. Once the wood is this thin you must start to sand in one direction only, away from the end that you are holding down on the glass Make sure to stroke the sanding block past the end of the sheet and to lift the sanding block completely off the glass before making another stroke. Start with 1/32" C grain balsa and take it down to. 008". This will take about 45 minutes, so be patient.

MOTOR STICK

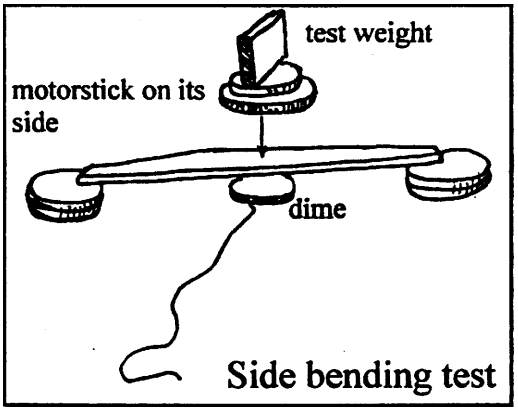
MOTOR STICK.	8.5"	4.5# AB GRAIN	.185 GR.

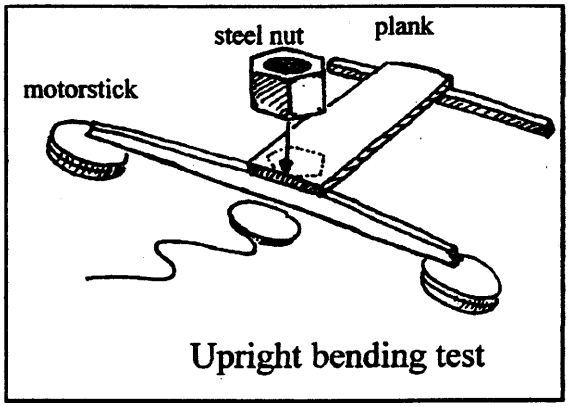
Selecting good Motor stick wood is perhaps the hardest part of building an EZB. The wood must be light and springy. Punky wood will take a set, and the models flight characteristics will change making the model's flight unpredictable. Do not accept a motor stick that won't spring back after bending it noticeably to the right and in a downward plane viewed from the front. When selecting motor stick wood cut them from 3/32" or 1/8" stock, preferably 3/32". For this project I found a piece of 3/32" AB grain. The sheet had several 1/2" wide sections of white wood sandwiched in-between wide bands of dark wood. I drew the outline of the motor stick right on the sheet and out it out with a new razor blade and straight edge. The sides were left straight. With no sanding this motor stick weighed .185 grams, and was just right for this model, I cut 10 sticks and found lighter ones, but felt that this weight stick was one that most modelers could find. If you are able to find a stick that is lighter and stiffer, use it.

Stiffness test for the motor stick- Coins are used to make the weights and spacers for this project because they are fairly consistent and available to everyone. Using new pennies, CA 2 pennies together. Make up several sets. Find a spot on the face of 2 sets that is .12" thick, and mark that spot with a magic marker. Take a dime and quarter and CA them together to make one of the test weights. Cut a piece of balsa 1/8" X 1/2" X 1" long and CA that to the dime as a handle. This is one of the weights used to measure motor stick bend. It weighed 7.9 gram Find a dime that is .051" high and CA a piece of thread to one edge. This will be used as a test spacer so don't get

any glue or thread on the faces of the coin. The last weight to be used is a 5/8" coarse thread nut (hardware, auto parts store) that weighs 31.89 gram. The support for the nut is called the plank. Make it out of a piece of 1/8" X 1/2" X 4" balsa. On one end of the plank glue a 1/8" square x 3" long foot.

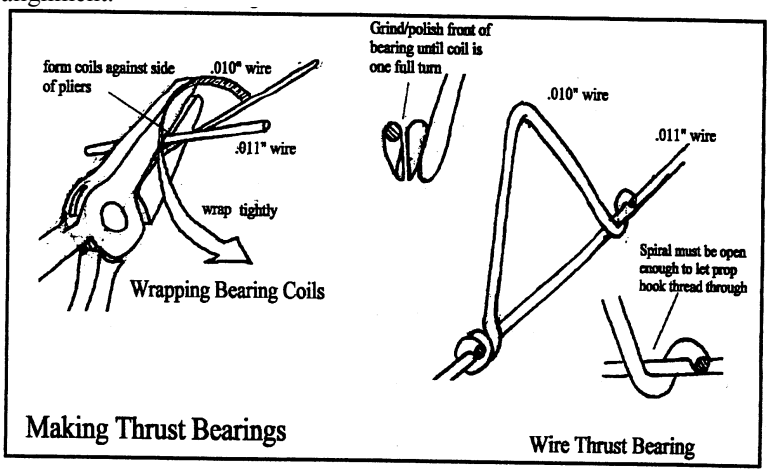
TESTING-Use any flat, hard surface to make this test. Place the motor stick flat on its right side across two sets of pennies with each end of the motor stick resting exactly on the center of one of the penny sets. Turn the penny sets to where the .12" thick area is under the end of the motor stick Use a ruler to find the center of the stick and place the spacer dime under the center of the stick. Place the test weight made from the nickel and quarter above the dime on top of the motor stick. The motor stick is a good one if it doesn't bend far enough to touch the spacer dime. If it is too close to see clearly, then gently tug on the thread to see if the spacer dime rubs the stick. Place the motor stick upright and place the plank end on top of the motor stick. Place the nut on top of the plank with the outside edge of the weight lining up with the outside of the motor stick. Again, the motor stick should not touch the dime. See drawing:

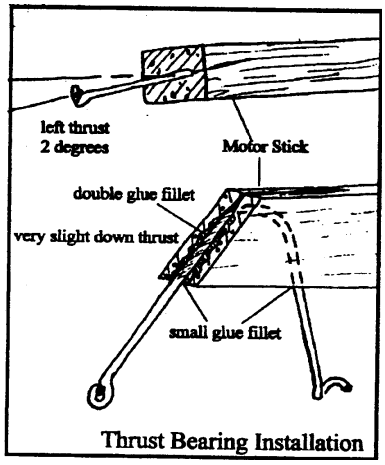




Wire Bearing and Rear Hook

The wire bearing, called a "thrust bearing", is made from .010 music wire. To make the bearing the wire is tightly wrapped around a piece of forming wire that is .001" larger than the bearing wire, or about .011". All the "music wire" mentioned in these instructions can be purchased very inexpensively at the local music store in the form of Guitar strings. A very good pair of needle nose pliers are a very nice thing to have when making thrust bearings, if you are going to fly indoor, get some! See the illustration on bending the bearing. Note that the bearing supports the prop shaft at two points. There is the front of the bearing, and there is the "pig tail", so called because that is its shape. After the bearing is formed, it will usually require some adjustment. The pig tail might be out of align with the from of the bearing, or vice-versa. Insert the forming wire in either the pig tail or front of the bearing and bend to realign. The bearing must swing free on the prop shaft. This will not happen until the front of the bearing and the pig tail are in near perfect alignment.





Before mounting the thrust beating to the motor stick, make sure that the prop can be threaded through the bearing. If the bearing front end is not ground down far enough, or if the pig tail is not properly formed, the prop shaft will not thread onto the bearing Make sure that the front of the bearing is ground down to match the drawing. if the Problem is with the pig tail, you might be better off by just making a new beating Once the bearing is made and you have it aligned you can use it to help get the prop shaft square with the prop spars. Temporarily mount the bearing to a l/8” sq. piece of balsa, like a false motor stick. Do not mount the bearing on the real motor stick for this step, the pressure of getting the prop shaft straight might weaken the glue joint. At this time I have the prop shaft mounted to the prop spar. No blades. Put the shaft through the bearing and hook up a thin loop of rubber. Put in some hand winds and

check to see if the spar is running true. If there is any wobble in the prop spars as they turn, make note of which spar is most forward, and then, grasping the prop spar where the wire shaft is bent and glued to the spar, bend the shaft until the prop spars turns straight. Go easy and make very small corrections.

Remove the thrust bearing from its temporary mount and clean off any glue. Cut a 1/4" deep slot in the front of the motor stick. Angle the slot to provide 2 degree left thrust. Place a piece of .010” wire 3" long through the bearing to check the thrust line. Slide the bearing into the slot. The reference wire should be .150" below the bottom of the motor stick. Do not place glue in the slot. The front of the bearing should intersect the lower right angle of the motor stick. (see drawing) Take a new razor blade and cut the front of the motor stick to match the front angle of the bearing. Recheck for 1 degree down and 2 degree left thrust. The front of the bearing must be flush with the motor stick. Apply two thin coats of glue, to the wire and wood. Build up a small glue gusset where the pig tail and the front of the bearing meets the wood. No extra glue is needed.

Cut a 1/64" slot at the rear of the motor stick. The motor stick and boom are joined by a scarf joint. Cut apiece of .009” wire 5/8" long and bend over one end 1/16" long. The 1/16" hook will be imbedded in the wood but the wire will be flush with the rear of the motor stick Tack glue the wire in place. Cut an angle on the tail boom to match the motor stick pre-glue both surfaces using Ambroid glue. Attach the boom and make sure the bottom of the boom is even with the bottom of the motor stick. Cut a gusset so that the end of the gusset is .125" below the motor stick The gusset is glued to the boom. Place a strip of Japanese tissue over the gusset and wire. You can angle the wire again where it breaks away from the gusset. Cut the wire to a usable length (see plans)

Boom

Boom	9.80"	6#	.04 gram

I cannot stress enough the importance of a good EZB tail boom It needs to be fairly stiff and light. When they are not stiff enough the model will usually flounder under high launch torque.

To get a tapered boom start with a sheet of good clear grained 6# wood 11" x 1" x .062” (1/16” sheet), and sand it down to a taper from .062” at one end to .028" at the other, using a 220 grit sanding block. Once the sheet is tapered in one direction the boom can be cut to a taper in the other direction using a Harlan stripper or a good eye and a straight edge. This taper is from .075" to .028".

The boom is used on the model with the .075" side vertical so that the boom is stiffest in the vertical plane. If you build and use the deflection meter the boom is tested in the same position. Insert the large end of the boom into the hold down and adjust the pivot and the scale until the end of the boom is at the 0 mark With a .270 gram weight trimmed from a paper clip hung on the very end of the boom, there should be less than 1-1/8" deflection. A deflection of around 3/4" is a good boom.

Stab

STAB CONSTRUCTION

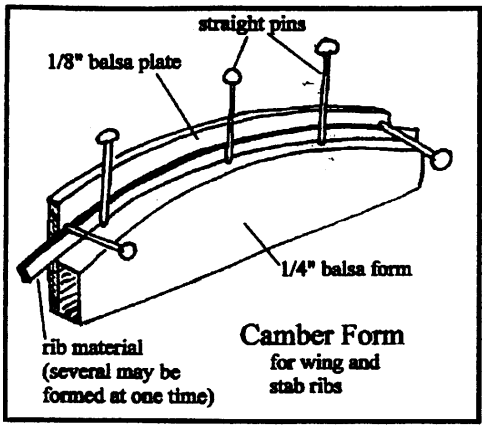
PROJECTED WEIGHT		.05 GR.
OUTLINE	.025" X 0.27" X 24"	5.0 #
RIBS	.017" X .027"	5.0#

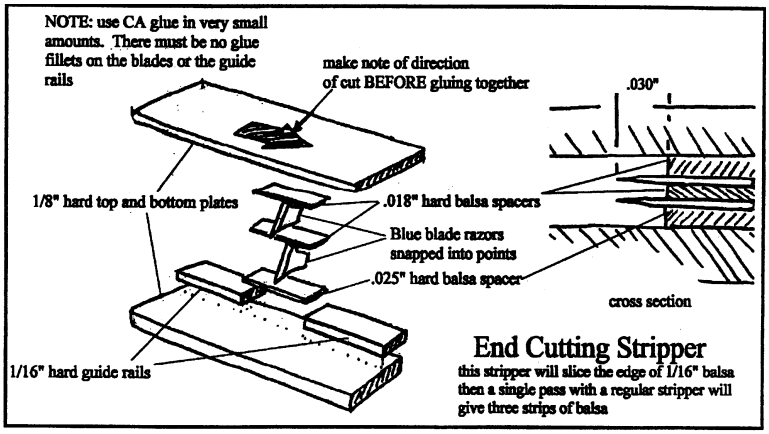
Make the template from .032 sheet balsa and coat edge with CA. Cut vee notches at the rib locations so that the ribs will clear the template.

FIN	.025" X .025"	5.0 #

Select from either 1/32" or 1/16" stock for stab wood. Use A grain with a density of 4.0# to 5.0#, and cut the sheets 24" long A 24" outline will wrap all the way around the stab template, but if you have trouble finding a good piece of wood this long you can cut the spars and splice to get the correct length When wrapping the thin outline around the template it's easy to put a twist in the wood. To keep this from happening mark thin black lines ever 4"or 5" along the edge of the sheet you will cut the span from. These lines act as a reference when pulling the wood around the template. To get the wood strip to wrap around the template without kinking you must hold a bit of tension while pulling the spar around the curve of the template. You can either sand the wood to .025" thickness or use Steve Gardner's stripper (see drawing). His stripper cuts the stab and fin outline at the same time from 1/16” sheet. If you sand 1/32” down to .025" it is best to use a Harlan stripper (see tools list) if you have one. The dry outline should not weigh more than .025 gram. A light one will weigh .015 gram. Do not cut the outline dimension any thicker, because it is over-built with the wood sizes shown.

The ribs are stripped .027" high out of A grain and then stacked on a form. See illustration for stab wood stripper and rib form.





WING

Projected Weight.				.15 to .16 gr.
LE	.030" X .067" X 10.5"	5.5#		.028 gr.
LE	.Deflection	5/16" with .340 gr., paper clip at 5"		
trailing edge.	.027" X .067" X 16.5"	5.5#		.031 gr.
trailing edge	Deflection	I 1/16" with .20 gr. clip at 8"		
Tips	.025" X .058"	.025" X .035" 4#	(2)	.022 gr.
Ribs	.020 X .055 X 3"	4.5#	(3)	.010 gr.
Posts------	.035 X .062 X 1.25"	6#	(2)	.009 gr.
Paper tubes--3 wraps of Condenser Paper, or light Japanese tissue			(2)	.003 gr.

The leading and training edge spars are cut from selected sheets of A grain stock as described in the wood selection article. Use a Jim Jones or Harlan stripper to cut the spars to shape. Test each spar for weight and stiffness using the deflection gauge. Select the L/E and trailing edge spar that comes closest to the spec sheet. The front spar is the most important component of the wing. It must be stiffer then the rear spar for the wing to resist unwanted flexing. To save weight the wing tips can be cut from very light wood. If you can find 3.5# use it.

Leading edge spar - This spar is 10.5" long and is not tapered except for the last 3/4" on each end. Hand sand or cut this taper from .067" to .058".

Trailing edge spar - This spar is 16.5" long and the last 4" of the top of each end tapers from .067" to .035". Scribe a line to show the taper and sand or cut along the line. Mark the top of this spar with a felt marker to prevent turning the spar up side down.

Tips - The tip wood needs to be sanded from 1/32" stock to around .025", not less than .022". Use 4# wood or less. Use a Harlan stripper, if you have one, or a straight edge to taper the 8" tips from .058" to .035".

Template - Mat board of the kind used to mount pictures or photos makes very good template material. It is available at all art stores and most picture framers. Balsa sheet 1/16" thick is also good. Make sure that allow for the width of the spars and another .050" when you make the template to stay under the 3" chord limit for EZBs. Apply CA glue around the entire template edge and sand smooth when dry. This will prevent the template from swelling when you use water to make the bend in the tips. Pin the template to your building board with poster pins. These are 3/8" long pins with plastic heads. Push the pin all the way down to the heads so that they are not in the way of construction.

Construction - The first step is to soak the tip wood in water to allow them to be bent around the template. Gene Joshu suggested a good way to soak the tip and stab outlines. Lay the wood on a Formica counter, top or table and use a watercolor paintbrush to run a bead of water along both sides of the wood. Let the water soak for about a minute, then place the tip with the .035" end at the rear splice marked on the plans. Trap this end of the tip in place with a balsa block and a pin and wrap the wood around the template while holding a very light tension. The other end of the tip will extend past the front splice. This will be trimmed off later when it will be matched to the leading edge spar. Once the tips are dry (about an hour) lay the rear spar in place with the top side marking up, and cut the scarf joints in the spar and the tip. Pre-glue and attach each tip to the rear spar. Place the leading edge on the template. The wood will extend beyond the rib. Make a scarf joint 1/8" beyond the rib and attach both tips to the leading edge spar. Be careful when making the last joint, its easy to cut either the tip or the spar too short.

Ribs - Sand a small sheet of 4.5# A grain balsa to .020". Strip 5 straight ribs .020" X .055" X 3.25", two of these are spares. Soak the ribs and then stack them on the rib form to dry. (See illustration) The ribs are placed with the front end against the leading edge spar, then they are carefully trimmed to length at the trailing edge spar. Check to be certain that the rib is not too long, forcing the spar apart or adding bend to the rib. Pre-glue the ends of the rib and the spot on the spars where the rib will be glued. Wait about ten seconds and place glue on one end of the rib and attach it to the spar in the proper place, then glue the other end of the rib to the spar. Make sure that the rib is vertical before this glue dries. After the ribs are placed its best to leave the wing on the template for one day. Make sure that the center rib is installed perpendicular to the wing spars to properly locate the wing posts. The wing post jig centers each post on the rib location. This jig is illustrated in the final assembly section.

Covering - This subject is not covered in this issue. I did a covering article which appeared in INAV issue 65,66,67 Jan93. If you need a copy, send a self addressed stamped envelope to INAV.

Placing Dihedral - After the wing is covered turn the wing over on a clean flat surface. Take a sharp double edged blade and cut scarf joints on the tip side next to each rib. Don't cut all the way through the spars. Lift the center section of the wing 2" above the table and break each joint where the cut was made. The tips will touch the table. Now support the center section with balsa blocks. Place a small amount of thinned carpenters glue in each joint. After 2 minutes re-glue the joint. Carefully turn the wing over and block up each tip 1.7". Make sure the wing is not over 18" long from tip to tip. Place a small weight on top of the spar at each tip rib. After about one hour lift the wing and inspect each dihedral break. If there is a gap, close it with a sliver of balsa.

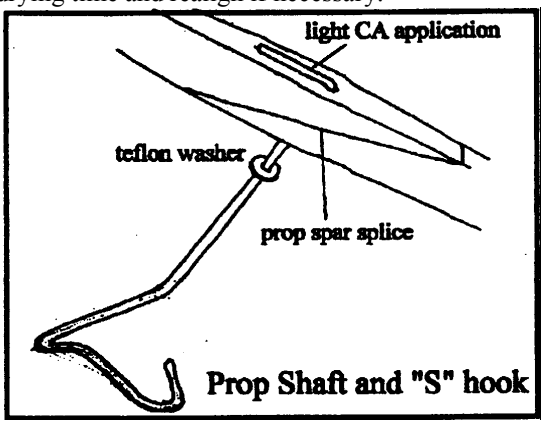
Wing Posts - Strip the posts 1/32" X 1/16" X 1" , 6# wood. Wing post installation is described in the final assembly section.

Paper tubes - Cut another piece of 1/32" X 1/16" balsa to use as a form for the tubes. Cut the tissue or condenser paper .into 3/8"X1" pieces. Apply a bit of ambroid glue to one end of the form and place the tissue so that it is ready to wrap. The tissue should extend off the end of the form by about a 1/16" so that you will have an end to grab when you pull the tube off of the form. The glue will help you start the wrapping by holding the end of the tissue. After the first turn, when the tissue is starting its second layer, put a fairly large blob of glue on the tissue right at the form Now as you continue to wrap the tissue around the form this glue will spread out and coat each wrap in the whole length of the tube. Once you have three or four turns wrapped around the form immediately grasp the end of the tube extruding past the end of the form with your finger and pull the tube off the form. Set aside to dry an hour, then place back on the form and recoat the outside of the tube. Once the glue is on the tube pull the tube off again and let dry completely. Do not put the tubes on the wing posts too soon, or they will stick. A good idea from Steve Gardner.

Prop

Projected Weight .170 gr.
Prop Spar-------12.5" X .047" X .075"---.025" X .025"---5.5# .035 gr.
Prop Spar-------B grain-----Deflection 3/8" each side with a .20 gr. paper clip
Prop Spar Wire---.010 music wire + spar .044 gr.
Prop Blades---------5.0 sq. in each blade----------4.0# .008" (2) ---------.120 gr.
Prop 14" X 25" Pitch

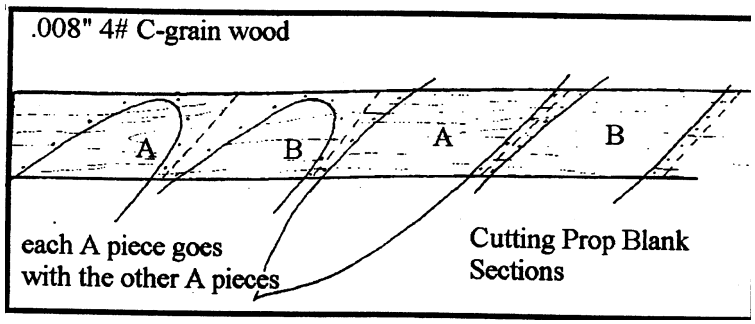
Prop Spar - The spar is double tapered from 1/16” B grain, 5.5#. Look for clear uniform grain and cut several 1" X 7". Sand a taper from 050" to .025" using a 220 grit sanding block. The spars are double tapered by cutting the second taper into them when they are cut from the sheet. Use a Harlan stripper or a straight edge to make this cut. Make several spar sets from each sheet. Test each spar for deflection as you did the boom. Both prop spare should match each other closely in deflection. Record the deflection of each set of spars. Pick the lightest stiffest set of spars to use for the prop. When your final selection is made, cut a long scarf joint on the big end of each spar. (see drawing) Pre-glue the ends of the spars and join the two with ambroid. Pick up the spar after several minutes of drying time and realign if necessary.

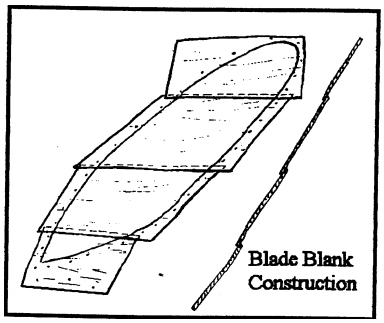


Prop Shaft - I have used several styles of prop hooks and the S hook works best for me. It centers the 0 ring and does not creep up the hook. Sharpen one end of .009” wire and punch a hole through the narrow portion of the spar.(see drawing) Hone the end of the .010" prop shaft and push it through this hole in the spar. Leave just enough wire to accept 1 thrust washer and clear the end of the bearing by 1/16". Place needle nose pliers at the front of the prop spar and push the prop spar back towards the hook. Bend a 90 degree angle in the wire. Leave .2" of wire to glue to the prop spar. CA the wire to the spar using a straight pin to apply the glue. It just takes a small amount of CA so do not overdo it.. Check the spar on the dummy motor stick for trueness. The .2" of wire on top of the prop spar allows for easy handling when truing up the prop spar.

Blades - If at all possible, order .008” C grain from Indoor Model Supply. It's difficult to find good C grain at a hobby shop. If you want to use hobby shop wood for the prop you must choose the lightest piece of C grain 1/32" balsa that you can find. You can't use 5# wood and expect the prop to weigh .17 grams. The EZB will fly OK with a heavier prop, but the performance will fall off quickly with every bit of extra weight.

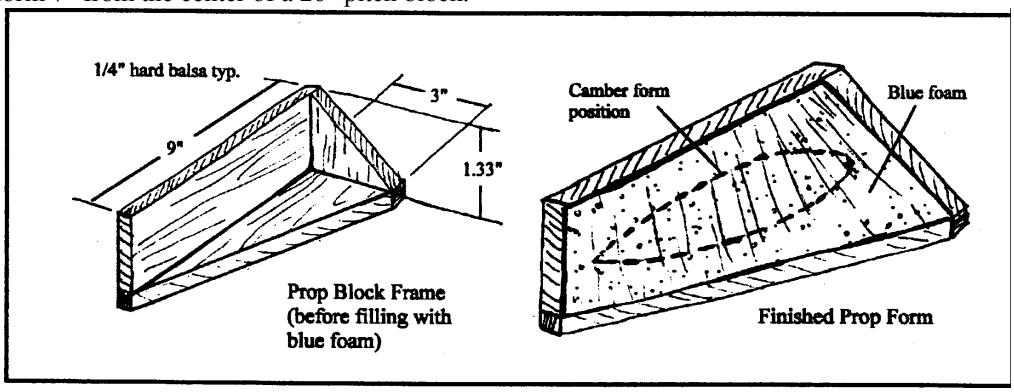
Blade Construction - The blades are assembled on a 4"x10" piece of the green cutting mat from the fabric or stationery department of Wal Mart. My prop blade template is cut from thin aluminum flashing material (available at any hardware store). Diagonal lines are drawn on the template to indicate the overlap. Place the lip of the template over one end of the balsa sheet. Outline the tip with a series of dots 1/8" away from the template. Move the template tip down the sheet and outline the tip again. Do each section two at a time. The reason for placing the two sections together is so the grain will match as closely as possible. After the pieces are cut out the first tip (A) goes with the first center section (A) and so forth. The sections are glued together so that the diagonal joints face the hub and toward the front of the spar. The tip will overlap the center section, and on down the line. Each overlap is about .025". Use very thin ambroid and lay a thin line of glue along each face to be glued. When dry, lay the tip over the center section .025". Hold the two sections together on the mat and run a small brush loaded with acetone across half the joint. After 10 seconds, slightly rotate the two sections so they won't stick to the mat. Now do the other half. Do not use any more glue or acetone. Repeat this on the remaining sections.





Place the glued prop blades in a heavy book and press overnight The next day, lay the blades, stacked on top of each other, on the green mat. Make sure that the diagonal lines match up. Lay the metal prop template over the wood. Use a new razor blade and cut both sides of the template. As you come toward the tip make small straight cuts instead of trying to get the blade to follow the sharp curve of the tip. Work around the tip and rotate the mat as you go. If the cuts are small enough you will have a perfect curve and no sanding be needed. Weigh and record the weight of both blades. Draw a spar line on the back side of each blade where the spar will be placed. This can easily be done by stacking the blades together and pricking the wood with a straight pin. Place a straight edge along the two small holes, and draw the line with a very thin tipped marker. Do not use a sharp pencil or an ink pen as this will damage the thin balsa.

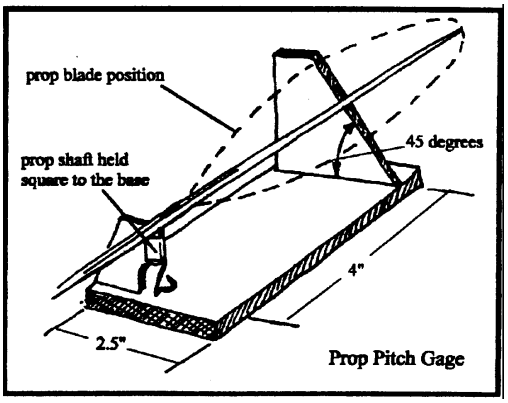
The thin blades need camber to help retain their shape. To get camber into the prop blades a camber form is made from 3/32” soft balsa. The camber form is made by taking the prop blade template and cutting it 1/8" larger than the template. From the hub to about 2/3rds the length of the form the thickness is 3/32”. Taper the last 1/3rd to .045" at the tip. Sand an airfoil into the form leaving the leading and trailing edges .020" thick. From about one inch from the hub up to the hub the camber fades to nothing. The edges will get thicker than the .020" from the one inch point to the hub, where they will he 3/32" thick. Hold the form at different angles to the light and check for depressions or flat spots and use sandpaper to adjust as necessary. Soak the form in cool water for 30 minutes and then place the tip of the form 7" from the center of a 26" pitch block.



Wrap with an Ace bandage to hold the form to the block and allow to dry. After the form has dried soak the blades in cool water for about 15 minutes. Float one blade over the other while they are still in the water and line up one edge. Remove from the water and stack the wet blades on the camber form, and again place the tip end of the form 7" from the end of the pitch block. Use the prop template to cut a cap from 1/32" balsa to protect the blades from the Ace bandage. Run water over cap for a few seconds, and place

over the blades on the camber form. Wrap the pitch block, form, blades, and cap with the Ace bandage. Let the blades air dry for two days. To separate the blades once they are dry, place a single edge razor blade between the two blades and run the blunt edge of the razor blade carefully around perimeter of the prop blades.

Prop Assembly - Take the prop spar and place it on the pitch gauge. Make a prop stop from scrap balsa and tape it to the top of the gauge at the 7" mark. Move a swing arm lamp directly behind the gauge next to the base. When the blade is placed close to the spar the light will show the exact position of the spar through the blade. Do not use Ambroid or other cellulose cements. The pitch will change as the glue cures because cellulose glues shrink too much. Use carpenters glue. The 45 deg. protractor at 4" will give a pitch of 25". Have a blade ready and place a small amount of glue at the hub, the center, and the tip of the prop spar. Immediately move the blade to the spar and attach the hub first, then attach the tip. The tip should be next to the stop. Reach behind the blade and press the blade to the center section of the spar. Check to see if the spar is on the reference line drawn on the blade. Adjust now if necessary. After 10 minutes, remove the spar and place two dots of glue between the hub and center of the blade. Two more between the center and the tip.

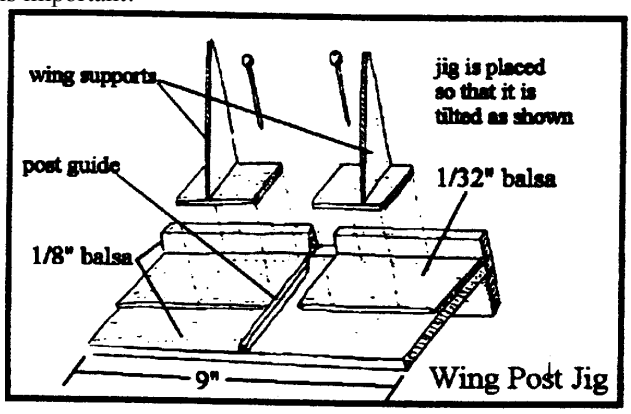


Place the spar back on the gauge and make sure that both edges of the blade touch the protractor at the 4" mark. If one of the edges is higher than the other, the spar can be tweaked, gently twisted to get the blade to touch front and back. Wet the spar by the hub and tweak it past the desired pitch After a few adjustments it should hold the position. Attach the other blade the same way. The prop is now complete.

Final Assembly

Fin- The motor stick and boom should be attached and straight in line with each other. Glue the fin to the left side of the boom, 1/16" in front of the stab. The stab is installed later.

Wing Posts - Before the wing posts are installed cut a step at the top of each post. Cut the step 1/32" deep and the depth of the wing spar. Bevel all four faces at the other end of the wing posts. Place the paper tubes on the posts and make sure that they fit snugly. This is important!



Wing Assembly Jig - The wing assembly jig is used to correctly position the wing posts while they are glued to the wing spars. The post guide holds the wing post square to the spars while the wing supports hold the wing square to the face of the jig. (see drawing)
After the glue has set on the wing posts and paper tubes, install the wing on the motor stick. Place 1/32" positive incidence in the wing. One final adjustment needs to be made to the wing Loosen the glue joint at the rear-wing post where it meets the rear spar with acetone. Put. downward pressure on top of the right rear spar several inches from the center rib. You want 3/32" wash in (rear spar down) on the right wing panel.

This will slightly wash out in the left panel. Place the model in a stooge and support the wing until the glue has set. This model will not fly properly unless this adjustment is made.

Stab - Glue the stab to the boom with thinned carpenters glue. The stab is glued onto the boom with the left tip about 3/8" high. This is called "stab tilt" and is used to make the model turn to the left. The stab should be flat , or with a slight amount of wash in on the left panel. Warps can easily be removed during assembly by placing downward pressure on top of the L/E spar by the center rib while supporting the boom with your thumb. This adjustment is done on whichever side of the stab that needs it. Hold or support the stab until the glue sets.

Set up & Trim

Final check- Before the model makes its first flight you need to make sure all the components fit together properly. Make certain that the wing posts fit snugly in the paper tubes. The side walls of the paper tubes must be stiff. If they are not the models flight pattern

will be erratic. To fix loose or weak tubes use a bit of ambroid on the outside of the tubes. If this doesn't tighten the tubes enough then use a very small amount of glue to coat the inside of the tubes. Check the thrust bearing for 2 degree of left thrust as per plans. The wing must be washed in on the outboard panel, with 1/32" positive wing incidence. Make sure that the wing is less than 18" in span and the chord is slightly less than 3" wide. Re-check the prop for 25" of pitch The stab should be 3/8" higher on the left side. Finally, the motor stick and tail boom should be straight in line with each other.

I am going to assume that you have no experience in trimming an indoor free flight model. Duration models fly to the left in a nose high flight attitude. We help the model turn left by tilting the stab so that it is higher on the left side. The prop thrust bearing is offset about 2 degrees to the left. Offsetting the rudder is not very effective and so it is not used on this model. Stab tilt and thrust offset are more effective. Next, the model must fly nose high, just under the stall, for maximum duration. This slows the model and also slows the rotation of the prop. Negative incidence in the stab is what causes the model to fly nose high. A really good tail boom will naturally flex to give the needed negative incidence. Here is an easy way to test the stiffness of your models tail boom. Hold the assembled model by the front of the motor stick. The prop does not have to be on the model. Lift the model vertically about 3" and then push it back to its original position. Repeat this procedure several times. This will load the stab and boom. A fairly stiff boom will flex up and down about 2 inches and a floppy boom will flex 5 to 6 inches. Now rotate the model gently on its roll axes from side to side. The wing and stab will follow each other on a stiffer boom. On a floppy boom the stab will twist one way while the wing twists another. In my opinion the tail boom is one of the most important components of an EZB. Its importance doesn't usually show up until the motor is really torqued up. My design has the wing mounted very close to the front of the motor stick. This makes for a longer tail moment arm and moves the center of gravity behind the trailing edge of the wing. This makes the stab carry a larger portion of the load. This is evident by the upward flex induced in the stab during flight. When the stab is loaded, the boom also bends upwards. The more power that is loaded into a motor the greater the boom will bend. If the model has a floppy boom it will stall or flounder around until the torque drops off. When the motor stick and boom match, the model will perform smoothly throughout the entire usable torque range.

First flight - Set the model up with 1/32" positive wing incidence. Tie up a loop of robber .033" X 10". Wind in 300 turns and place the motor on your model. Go to the center of the floor. Hold the model about eye level, with the nose of the model slightly elevated. Release the prop and gently push the model forward. The model should circle left in a 20' to 25' circle. If it stalls, move the front wing post down slightly. If it dives, relaunch and make sure you launch with the nose raised, if it still dives make sure that you still have 1/32" incidence in the wing and check to see if the model has too much down thrust in the bearing. Increase the wing incidence another 1/32", but no more than 1/16" over all. If the model needs more than this you should tweak the tail boom to help get the nose up. This should correct any diving.

With 300 turns in the motor a .6 gram model should maintain level flight. A slightly heavier model (.75 g) will probably not maintain its height, but it should come close. When the model flies without stalling, check the circle. If the circle is greater than 25', twist the tail boom so that you have more stab tilt. Do the opposite if you need a wider circle. Hopefully your model will be flying with a nose high attitude.. If not, an adjustment has to be made to the tail boom. If you had more experience I would suggest sanding the boom slightly so that it would flair. Lets do it an easier way for now. Starting about 3” behind the rear hook, bend the boom upward about 1 degree. 1 degree puts about 1" negative incidence in the stab. Wet the area where the bend is to be with saliva and be careful. Don't apply too much pressure as the boom may break. Rewind the motor and check for the 25' circle and a nose high attitude. If the model is doing both, start adding turns in the motor in multiples of 100. Do this until the model starts bumping the ceiling.

You could continue adding turns, but there is a possibility of damaging your model. Depending on your flying site, you now have two choices. Experiment with different rubber sizes and launch torque, to get the most out of your model, or start flying on quarter motors.

If done properly, quarter motor flying under a low (25') ceiling can accurately predict the time your model with do in a high ceiling A 22' to 26' site is a perfect place to get ready for contests with ceiling heights of around 120'. If you decide to use quarter motors measure the distance from the rear hook to the back of the prop hook. Make a dummy motor 3/4 the length of your measurement from .015” wire. Wrap thread 1.5" on each side of center and apply a light coat of CA. This give a place to add ballast and to hold on to when the motor is torqued up. The prototype performed well on a 3" loop of .033" tan II. To get the motor off the hook on the winder without loosing turns an "O" ring is used. This is a very small plastic ring through which the motor is threaded before it is tied. These things are made from thin slices (.025" to .030") of the plastic stick found on the cheapest Q-tip copies. Use one 0 ring on the front end of the 3" loop.

You need a reliable way of balancing the quarter motor and dummy motor. The dummy motor must weigh three times that of the rubber. This is important. You can use a scale or build a quarter motor balance beam. See plans for my balance beam. Each time there is a change to the weight of the motor, you need to add or remove weight from the center of the dummy motor. Non-drying clay sold at toy and art supply stores is good for adding weight to the dummy motor. When flying on quarter motors the model and the prop need to be released at the same time. The torque drops off quickly on a quarter motor once the prop stars to turn. You can't tell if the model will handle the torque that is loaded on the model if turns are allowed to spin off before the launch. If your model stalls on a quarter motor it will certainly stall on a full motor.

I'll give you an idea of what the prototype looked like when loaded with .13 inches oz. of torque.. Hold the wound model in front of you, and sight down the motor stick to get the proper view. The wing was fiat with no warps in either wing panel. The motor stick and boom were bent downward in a slight arc. The stab had lost some of its tilt but was still high on the left side. This torque was more than enough to get to the 116 foot ceiling at Johnson City.

One last bit of information on motor sticks. If your model stalls at a high launch torque and you think the boom is OK the problem could be with the motor stick. It might be too strong. The model will fly great on low to moderate torque, but stalls when released at the desired launch torque. Try this. If the model stalls at .12 inches oz, wind to .15 inch oz. and relaunch. If it climbs 4 to 5 feet higher then stalls, the motor stick is probably too stiff. To make certain wind and launch at .18. If the model climbs to around 20 feet before stalling the motor stick is definitely too strong. Take a sanding block and sand the bottom of the motorstick from the rear post tube to one inch in front of the rear hook. Be careful and only make a few strokes with the paper and make another flight. Its extremely easy to remove too much wood and ruin the motor stick. Relaunch at .12 in oz of torque to check if you have removed enough wood. When the stalling at this torque goes away stop sanding the motor stick.

Good Luck !! Larry Coslick

West Baden Fun Fly Exhibition

Fly in perhaps the best Cat III (30 meters) in the world.
West Baden Springs motel in West Baden, Indiana is the place.
August 3 & 4 2002 is the date.

Tentative Schedule for the Contest

Friday Aug 2nd	Setup	Noon – 4 pm. A.C. may be on.
Saturday Aug 3rd	Setup and Fly	8 am – 4 pm A.C. off
	Scale Exhibition	11am – 4 pm
Sunday Aug 4th	Fly	8 am – 5 pm A.C. off

The disk will be shrouded in plastic. J, S, O will be flown as separate classes. No entry fee. No judged events. No prizes. Just the joy of flying free in the historic West Baden Atrium.

Entry & Housing information – Andrea Hill (Historic Indiana) (No entry fee) (800)-450-4534

Contacts: Dave R. Thomson, CD, 5432 Haft Rd., Cincinnati, OH 45247, (513)-574-8322
Walt van Gorder, Ast. CD 5669 Victoryview Lane, Cincinnati, OH 45233, (513)-922-3351

Must register to fly. Copy this page, fill out, and return to Dave or Walt by July 7, 2002. Thanks!!

Events 201, 202, 203, 204, 205, 206, 207, 208, 209, 210
211, 212, 214, 216, 217, 218, 219, 220, 221.

Please circle events you'll fly. No judged events.

I may / will (circle one) attend. ----------
Sign

Print Name

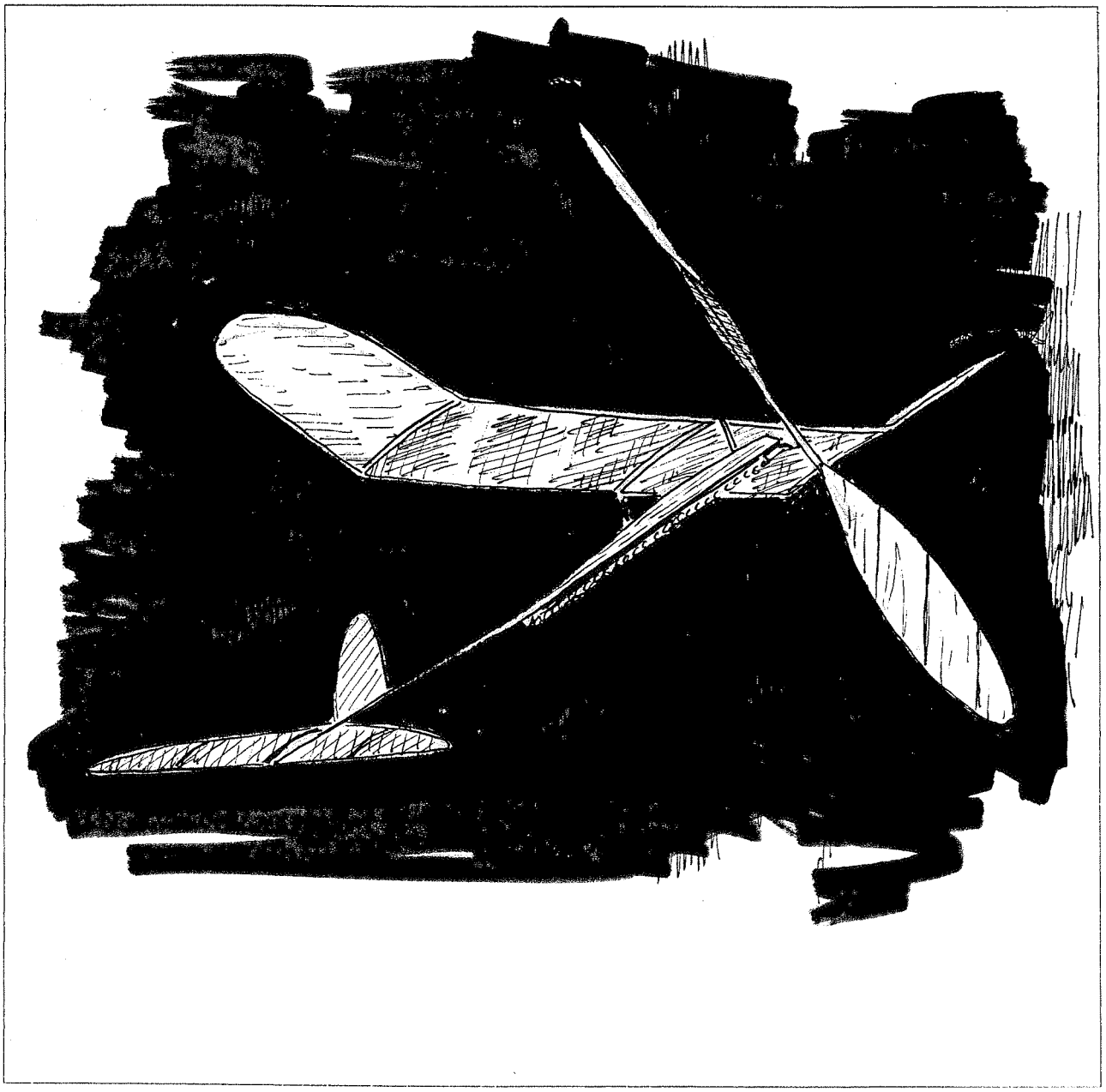
MICRO-B EZB CLASS

BY LARRY COSLICK

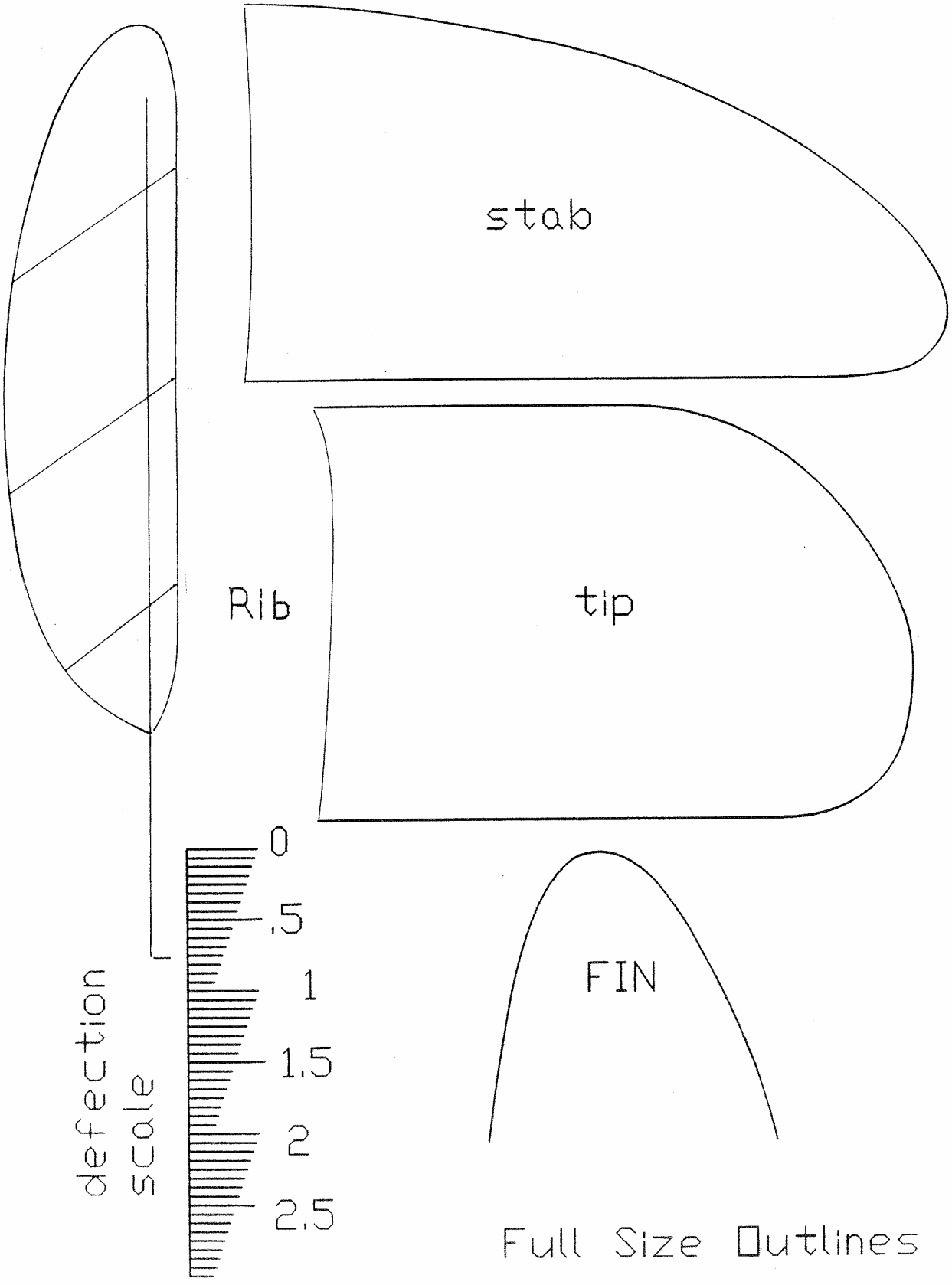
RAWINGS BY STEVE GARDNER

There are a lot of indoor modelers that don't go to Johnson City or fly for records in sites such as Akron or Lakehurst. If you fly an EZB for fun or competition in sites up to 60 feet that have dirty ceilings, you might want to build this micro light EZB. This model uses a 7" motor stick and by carefully selecting light stiff wood it can be built under 0.4 grams. The models light wing loading allows it to post no touch flights up to 17 minutes, in a 35 foot ceiling and over 24 minutes in a 60 foot site. With a good flairing prop and the right rubber combination, the prop RPM's are in the low 60's. It's like flying a miniature FID

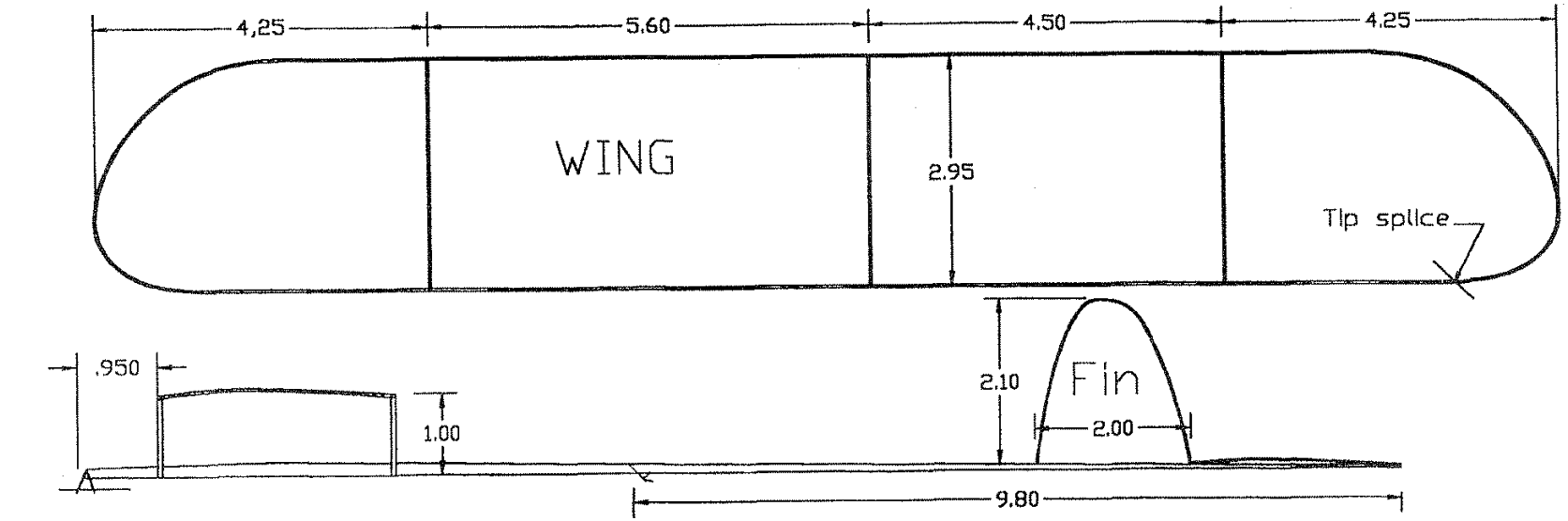
.

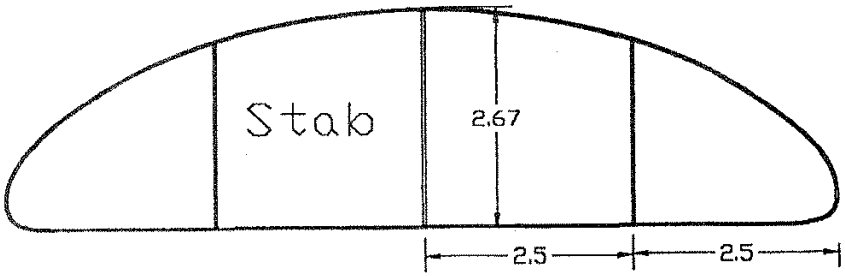


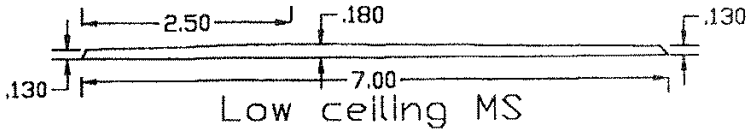
Akron Light & Micro-B



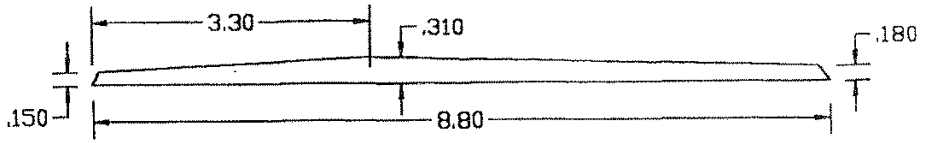
You may need to enlarge or reduce this to get the proper full size outlines. For reference the deflection scale is in inches.
Editor



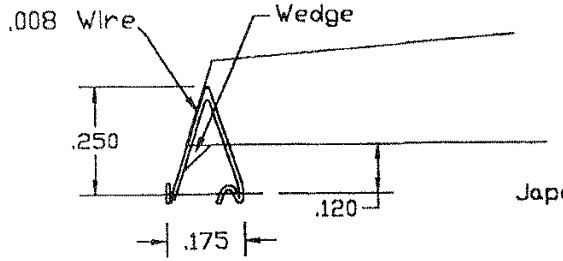




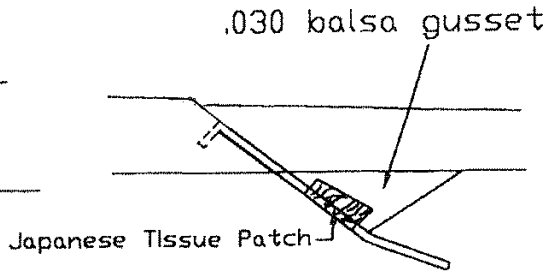
Low ceiling MS



high ceiling MS



Bearing Detail



Rear Hook Detail

MICRO-B

Designed by Larry Coslick
Drawn by Steve Gardner

3-11-02

Wood sizes and Dimension Micro-B and Akron Light

	MicroB	Akron Light
SIZE	.095 x .130 to .095 x .180 to .095 x .130 x 7"	.101 x .150 to .101 x .310 to .101 x .180 x 8.8"
DENSITY	3.9#	4.3#
WEIGHT	.102 gram	.187 gram
SIZE	.055 x .070 to .025 x .025 x 9.8"	.075 x .090 to .030 x .035 x 10"
WEIGHT	.032 gram	.038 gram
DEFLECTION	.075 With a .27 gm weight at the end of the boom	5/8 with a .27. gm weight at the end of the boom
SIZE	.025 x .067 x 10.5" Only taper last 1" each end	.025 x .070 x 10.5" Only taper last 1" of each end to.06
DENSITY	4.8 # Unreal stiff	4.8# Unreal Stiff
WEIGHT	.025 gram before cutting to final length	.028 gram before cutting to final length
DEFLECTION	7/16" with a .34 gram weight at 5"	5/16" with a .34 gram weight at 5"
SIZE	.025 x .061 x l6.5"	.025 x .065 x 16.5"
DENSITY	4.8#	4.8#
WEIGHT	.032 gram before taper and cutting to final length	.036 gram before taper and cutting to final length
DEFLECTION	7/8" with a.2 gram weight at 8"	3/4" with a.2 gram weight at 8"
SIZE	.025 x .060 to .025 x .035 x 8.5"	.025 x .060 to .025 x .035 x 8"
DENSITY	3.4#	3.6#
WEIGHT	.018 gram for 2 No deflection test on tips	.021 gram for 2 No deflection test on tips
SIZE	.018 X .055	.018 X .055
DENSITY	4.5#	4.5#
WEIGHT	.01 gram for 3	.01 gram for 3
SIZE	.032 x .058 x 1"	.032 x .058 x 1"
DENSITY	8 to 9#	8 to 9#
WEIGHT	01 gram	.01 gram
SIZE	.023 x .027 x 18"	.023 x .027 x 18"
DENSITY	4# Unreal Stiff	4# Unreal Stiff
WEIGHT	.020 gram for 2	.025gram for 2
SIZE	.008 X .030"	.008 X .030"
DENSITY	4.5#	4.5#
WEIGHT	Under.003 gram for 3	Under .003 gram for 3
SIZE	Same as stab spar	Same as stab spar
SIZE	.006 C Grain See plan	.006 C Grain Same outline as Micro-B
DENSITY	3.8# .006 x 1.2 x 18" Sheet weight .13 gm	4.3# .006 x 18 x 1.2 Sheet Weight .15 gm
WEIGHT	.06 gram for 2	.075 gram for 2
SIZE	.035 x .058 to .025 x .030 x 6.2" 2 Double tapered spars	.040 x .060 to .025 x .025 x 6.2 " 2 Double tapered spars
DENSITY	4.6#	5#
WEIGHT	.02 gram finished weight cut to 12.25"	.03 gram
DEFLECTION	.4" at 4.5" with a .2 gram weight	1/4" at 4.5" with a.2 gam weight
SIZE	.008"	.009"
WEIGHT	.005 gram	.007 gram

Weight of Component Parts

	MicroB	Akron Light
WING DRY	.080 GRAM	.090 GRAM
WING COVERED WITH Y2-K2 AND DIHEDRAL	0.100	0.110
WING COMPLETE WITH POSTS	0.110	0.120
STAB DRY	0.013	0.018
STAB COVERED	0.02	0.026
FIN DRY	0.003	0.003
FIN COVERED	0.005	0.005
MOTOR STICK 7"	0.102	0.187
M/S WITH THRUST BEARING AND REAR HOOK	0.113	0.204
M/S WITH BOOM 10"	0.146	0.243
M/S WITH WEDGE AND TISSUE	0.149	0.246
M/S WITH CONDENCER PAPER TUBES	0.153	0.251
M/S COMPLETE WITH STAB AND FIN	0.180	0.285
PROP SPAR CUT AND GLUED 12"	0.020	0.030
PROP SPAR WITH .008 M/W SHAFT	0.026	0.040
PROP SPAR WITH BLADES ATTACHED	0.092	0.120
WING AND POSTS	.110 GRAM	.120 GRAM
FUSELAGE AND TAIL ASSEMBLY	0.180	0.285
PROP 13.25X25P	0.092	0.120
TOTAL	0.382	0.525

Y2-K2 Film weighs approximately .00033 gm/sq in and Super77 spray weighs about .004gm on an EZB wing depending how it is applied

Motor stick side deflection was made with the penny test using the new 7.9 gm load weight.
7" Micro-B M/S passed the test by clearing the dime.
8.8" Akron Light M/S cleared the base by .020".

Motor stick torsion test was made using a 11.34" balance beam.
Micro-B M/S used a 0.4 gm weight to simulate .08 in/oz launch torque. Deflection was .6"
Akron Light M/S used a 0.5 gm weight to simulate .1 in/oz launch torque. Deflection was .55"

MICRO-B AND AKRON LIGHT WOOD SOURCES

I used balsa from three sources to build both models. Wood for the prop, tail boom, ribs and wing tips came from Indoor Model Supply. Wing and stab wood was ordered from Tim Goldstein and the motor stick and wing post wood came from Sig Mfg. I will only cover the items in this article that I consider helpful in building the Micro B. INAV has back issues of the Hobby shopper article that covers everything that is needed to build the Micro B and Akron light EZB. Issue 90 is also available on the INAV Archive CD. All you have to do is to substitute the wood sizes to build both models.

For the new EZB flier, don't be to concerned about building a model under .7 or .8 grams. It's much more important to build a model where all the component parts work together in unison than to build it light. After some time and experience the two will come together and the magic will begin.

MICRO-B WOOD SELECTION

If you decide to build the Micro-B or Akron Light, wood selection is much more important now. There are going to be differences in the weight and stiffness of wing spars in any sheet of balsa. Indoor wood is no exception. Even though these variations may be slight, they can make a difference in the weight and stiffness of the model. Because of these differences, it's best to use the wood sizes and densities on my plan only as a guide. The wood weights for individual parts are included in this article, but it might be necessary to adjust the wood densities and sizes of your wood to match the required weight and stiffness of individual model parts. An example of these variations occurred while cutting spars for the stab. Two spars were stripped from a .023" sheet and weighed. From past experiences I knew that they should weigh about .02 gram but they weighed .025 gram for the pair. The sheet was turned over and two more spars were stripped form the other side. The second set weighed .02 gram and met my projected weight for the stab spars. A 20% savings over the first set. Sometimes it's necessary to cut spars or booms from four or five different sheets of wood to come up with just the right one.

I have built several of these 7" M/S EZB's under .4 gram using Indoor Model Supply wood with the lightest being .37 gram. That model was covered with the heavier poly-micro film.

I wanted to try Tim Goldstein's wood, which he calls Tru-Weight Indoor Balsa. He weights each sheet to determine it's density and makes a stiffness test on most sheets. I calculated the density on the sheets that were ordered and they were right on the money. I couldn't test the sheets for stiffness the way that he does but the cut spars exceeded my requirements for stiffness using my deflection jig. I really like the way that he grades his wood. It takes a lot of the guess work out of ordering balsa. Tim has a web site WWW.F1D.BIZ. The site lists the sheets that he has cut with its thickness, grain, density, width, length and stiffness on sheets over .019". It also tells of the wood is saw cut or Ground.

WING SPARS

I ordered 2 sheets of A grain wing spar wood (3.9# .025) & (4.8# .025) unreal stiff. A wing was built from each sheet but the spars were cut about .003" shorter in height for the 4.8# wing. Both wings were usable, but the 4.8# wing was stiffer and weighed the same as the 3.9#wing. In the past few years I have found out that it's a good idea to have 2 wings for each EZB. Even though they appear to be set up the same, one will work better.

T/E WING SPAR

Taper the ends of the spar to .035". First, place a mark on one side of the spar to indicate the top. Put the spar on a flat surface and trap it between 2 wider strips of balsa, then tape it to the surface. Use a straight edge as a guide & cut the 3" taper to .035". If the spar is not trapped, it will wander & you could possibly ruin the spar.

WING POSTS

Do not use soft wood for wing posts. I used 9# wood for both models. A strip .032 X .058 X 8" deflected .7" with a .2 gram weight. The difference between 6 & 9 # wood was about .003 gram for the pair.

STAB RIBS
I use 4.5# .008 C grain ribs on all of my new EZB's stabs. Reverse the airfoil so that the high point of the rib is closer to the T/E. The model will recover better if it tail slides. It's difficult to keep these thin ribs straight. So don't get frustrated if they are a little crooked.
MOTOR STICK – MICRO-B 7"

It takes 3.9# wood to get a M/S to weight close to .1 gram. Make sure to bend the cut M/S off to one side to see if it will spring back to it's original shape. If it doesn't, don't use it. I cut 6 M/S's from three different sheets and they were tested for the side bending test

with the new 7.9 gram weight. All but 1 of the M/S's passed the test without moving the dime. The torsional twist test was made with a .4 gram weight to represent .08 in. oz. Of winding torque and regestered a .6" deflection. This is a new test and I do know that a .6" reading is good on an 8.5" M/S.

TAIL BOOM 9.8''

The boom that I used for the prototype might be a little stiff for the model weight. A boom that deflects 1" would be good for ceilings up to 50 feet, because the launch torque will be much lower.

THRUST BEARING .008" MUSIC WIRE

Make the T/B .250" high and .175" from the front to the rear of the pigtail. Insert the bearing in the M/S so that the prop shaft is no more than .12" below the bottom of the M/S. See hobby shopper article for bearing installation.

PROP SHAFT .008" MUSIC WIRE

Make the hook small because there is very little clearance under the M/S.

REAR HOOK

I call this a cheater hook because it adds .1" to the length of the M/S. Use .007 wire and make it as shown on the plan.

PROP SPAR DOUBLE TAPERED

For this model cut the spar at the hub higher than the width for a better flair. The finished spar should not weigh any more than .02 gram and .025 gram with the .008 M/W hook.

PROP BLADES

To build a prop that weights under .1 gram you will need a sheet of .006" C grain that weights .13 gram or under. Don't cut down on the blade area to make the prop lighter. It needs the area and flair to keep the light model out of the ceiling. The finished prop is 13.25" X 25P. The Hobby Shopper article goes into great detail on EZB prop construction. It's a good idea to build 2 or 3 props for the model. Make one with the spar mounted .1" from the blade T/E and the other .2" away. The third could be built with the blade mounted right at the T/E. If the spar should be too stiff or too soft the blades can be removed and replaced on another spar without any weight gain. Soak the whole prop in slightly warm water for at least 30 minutes. Rotate the spar gently while the prop is in the water and if the glue is soft enough the blades will fall off the spar. If not, re-soak for a while longer. Take a soft tooth brush and gently go over each spot that looks white until all of the glue is removed. Don't rub hard or the balsa will tear. Rinse will and re-pitch the blades. With some care, you can use the same blades over and over again. The cover picture shows a EZB with a symmetrical blade prop. Don't use this type prop blade in low ceilings. The pitch has to be set too high to control the launch torque and the high pitch won't utilize the cruse torque as well as a flairing prop.

SET UP AND TRIM

Follow the procedures in the Hobby Shopper Article, except for rubber sizes and torque readings. Always make a low power first flight to check the models circle and nose high flight attitude.

RUBBER AND TORQUE RANGES

Depending on ceiling heights and air quality you can expect to use loops from 6.5" to 8" in length and .025 to.030" wide. The shorter loops use the wider cross sections to keep the torque up in low sites. In a 60 foot site a loop .025" X 8" would be better. You will have to do a lot of test flying to come up with the right prop rubber combinations. Torque ranges will be around .04 to .05 in ceilings to 50 feet and .07 for higher ceilings.

DEFLECTION JIG FROM HOBBY SHOPPER ARTICLE

If you plan on building the jig, use the full size deflection scale that is included in this article. The distance between the two dowels of the test piece holder was not shown on the drawing of the deflection gauge. That distance is 1.6" from the left side of the first dowel, to the 0 mark on the larger dowel. Also, it's best to place a music wire stand off along the L/E of the deflection scale support. It keeps the spar from flexing away from the scale face.

NO TOUCH CONTEST

The Micro B was originally designed for no touch flying, so it's perfect for this kind of contest. The contest is flown in rounds with a minimum and maximum flight time for each round. If the model touches the ceiling during any round it's out of the cOntest. Depending on the flying skills of the group, the first round could be set at 7 minutes with a maximum of 9 minutes. The next round might be 9 minutes and so on. The more experienced fliers could be handicapped with a higher flight time per round. This type of flying really improves your skills in selecting the correct rubber size, prop pitch and torque requirements for each flight. This kind of event can be used with any type of indoor model.

GOOD LUCK

Larry Coslick

Revision of the Hobby Shopper EZB Motor Stick Test

There were several articles in the INAV issue 105 directed toward my testing procedure for EZB motor sticks. After reading the articles, I decided to re-test my M/S's using the same procedure as described in the Hobby Shopper article, ISSUE 90

After the M/S's were re-tested, it was obvious that there was a flaw in the way that the original test was made. The Hobby Shopper M/S test was designed just for that article and for the M/S's that were cut for the prototype. The problem was that I didn't compare the penny test with my side-bending jig. My jig uses a mechanism that is not available to the public so I had to come up with an easier way to test the M/S's. I happened to select a stiff piece of balsa for the prototype and didn't realize it by using the new test. I would have detected the wood's stiffness by using my jig had a comparison test been made. After the article was completed the penny test was put away and never given a thought until issue 105.

My side-bending jig uses a spring-loaded center post that drives a pointer along a numbered scale from 0 to 30. Readings in the range of 10 to 20 indicate a usable M/S. 10 being the stiffest. These numbers have no numerical value and are only used to compare one stick against another. I was able to measure the deflection and came up with a weight that would compare with my jig's readings. The new weight uses a dime, quarter combination with a balsa handle and weighs 7.9 gram.

I re-tested 10 M/S's using the penny test with the new weight and concluded that any M/S that clears the base will work.

The 10 M/S's that were tested range in length from 8.5" to 9" and weigh .16 to .19 gram.

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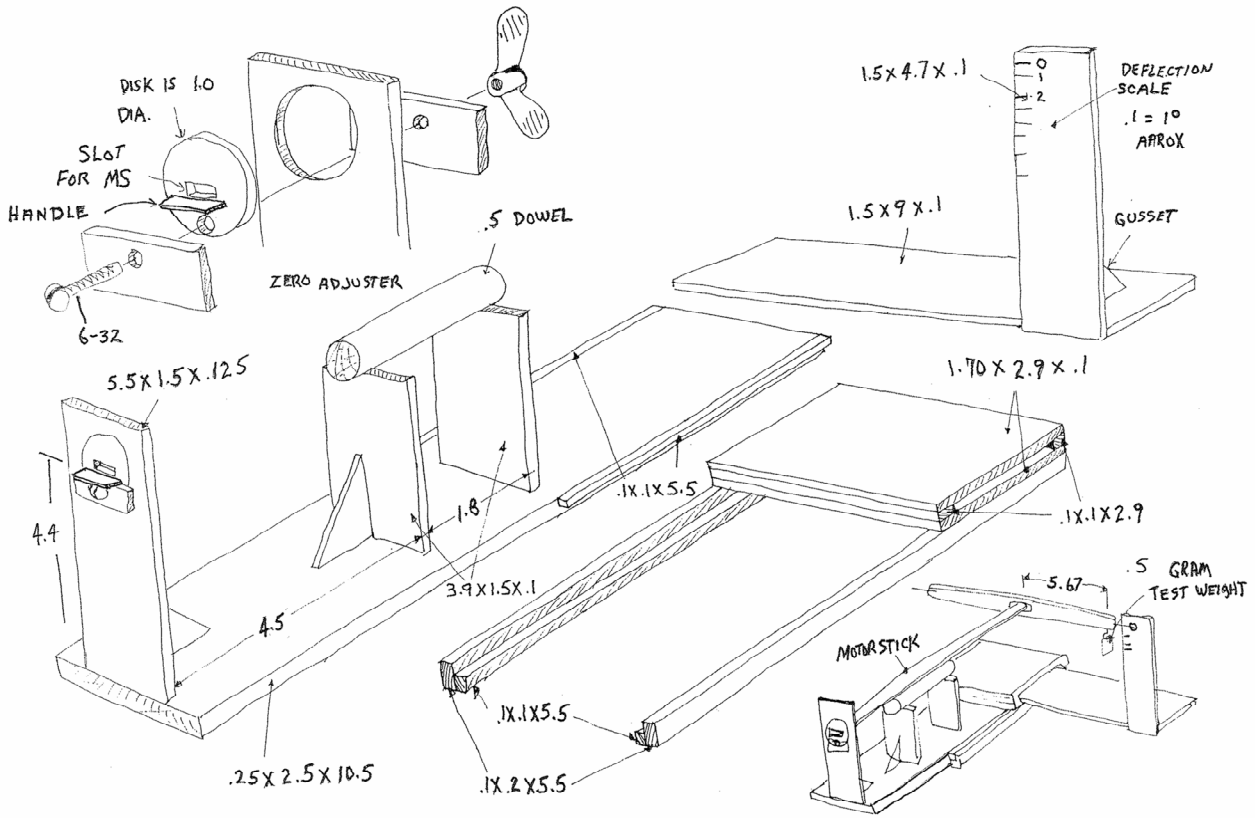
TORSIONAL TWIST JIG
By Larry Coslick

I got the idea for this jig from Jerry Nolan in 1993 and finally built it this year. The jig consists of a support that holds the M/S and a balance beam that's attached to the hook end of the M/S. A .5 gram weight is placed on one end of the beam to simulate the twist of a motor wound to 1 inch oz. of torque. .1" of deflection equals about 1 degree of twist. Be sure to balance the beam for a more accurate reading. This jig is designed to make the test before any hardware is attached to the M/S. The base that is shown on the drawing will measure M/S's from 7" to 9" in length. The deflection scale can be pinned to the base but the one that is shown is easy to build and is very handy. Since I use 3/32" balsa for my M/S's, the rectangular slots in the front support and the balance beam are cut slightly smaller than 3/32" to insure a tight fit. If the M/S is too loose a balsa wedge can be used to tighten it up. Most of the time the balance beam won't line up with the 0 mark on the deflection scale. Steve Gardner came up with a way to rotate the M/S and align the beam to O. When the M/S is removed from the jig, the ends will be marred from the tight fit. Dip each end in water for a few seconds and the wood will swell to its original shape.

I tested the same M/S's that were re-tested using the 7.9 gram weight for the penny side bending test. The test were made on M/S's 8.5" to 9" in length and I got tortional twist reading from .55" to .9". Some 8.5" sticks deflected .9". Since this is a new jig, I haven't had a chance to test what the upper limits will be. I did test one of the M/S's that I used at Johnson City and that one deflected .6". The side bending test has some importance but I believe that this jig will give a better indication of how that M/S will perform.

Balance beam weights for jig

Weight in grams	In. Oz. of Tq.
.4	.08
.5	.10
.6	.12
.7	.14



MOTOR STICK TORSION TEST JIG

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

As I mentioned before there have been very few entries, several of them being flown in ceilings higher than Category 1 (8metres or 26.25 ft.). Because of the difficulties with finding reliable fudge factors I decided not to use a fudge factor, but report all times within the ceiling category that they were flown. The final results (31 March 02) are as follows;

F1L	**F1M**
Category 1 Vlad Linardic, Toronto 12:24 Harley Ellis, Toronto 12:21 Ken Mark, Toronto 11:11 Category 2 Akihiro Danjo, Kawaski, Japan 19:19 Category 4 Bill Gowen, Tropicana Dome, Florida 16:56	Category 1 Fabio Manieri, Rome, Italy 14:23 Vlad Linardic, Toronto 13:06 Category 2 Akihiro Danjo, Kawasaki, Japan 16:53 Category 4 Bill Gowen, Tropicana Dome, Florida 16:08
FAC Peanut	**FAC No-Cal**
Category 1 Mike Thomas, Toronto Lacey M10 1:54 Chris Brownhill, Toronto Lacey M10 1:34 Stu Weckerly, Dearborn, MI Stout 2AT 1:13 Gert Brendal, Enschede, Holland Renard RSV 18-100 1:07 Bill Henderson, Toronto Davis TX-1 1:02 Bob Fisher, Toronto Piper Vagabond 0:35 Category 2 Akihiro Danjo, Yokohama, Japan Andreason 1:12	Category 1 Mike Thomas, Toronto Hosler Fury 4:49 Vlad Linardic, Toronto Cassutt Racer 3:25 Category 2 Akihiro Danjo, Yokohama, Japan Lacey M10 5:06 Category 4 Fred Rash, Johnson City White Monoplane 4:09

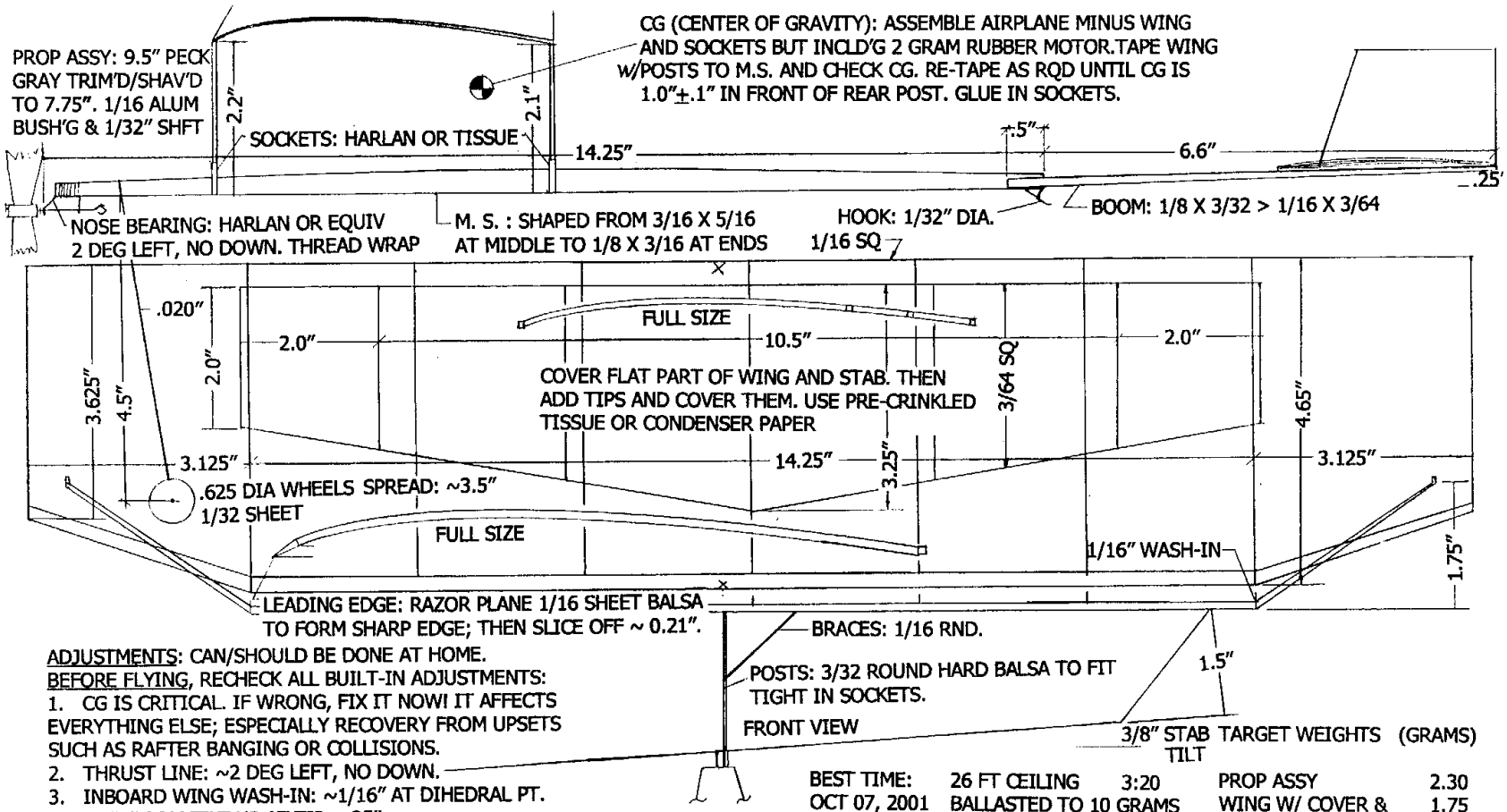
Congratulations to Akihiro Danjo who produced the highest times regardless of ceiling category in F1M, F1L and No-Cal. They were all flown under a category 2 ceiling. Congratulations also to Mike Thomas
who produced an amazing category 1 time of 1:54 in FAC Peanut, which was also the top time regardless of ceiling category. W. Henderson

---

Cargo Lifter Contest Dates

Dear friends,
CargoLifter just gave the consent to two Indoor Contests dates: June 1rst and 2nd for German Trials F1D with comps in other classes on demand and
September 14th and 15th for the German Open Nationals in all FAI Classes. The German Open will be announced in the FAI calender as one of the new types of contests
approved by the CIAM Plenary Meeting this year.

Gerhard Woebbeking
Holstenstrasse 108
22767 Hamburg/ Germany
Tel.+49-40-3898310 woebbeking@t-online.de



ADJUSTMENTS: CAN/SHOULD BE DONE AT HOME.
BEFORE FLYING, RECHECK ALL BUILT-IN ADJUSTMENTS:

1. CG IS CRITICAL. IF WRONG, FIX IT NOW! IT AFFECTS EVERYTHING ELSE; ESPECIALLY RECOVERY FROM UPSETS SUCH AS RAFTER BANGING OR COLLISIONS.
2. THRUST LINE: ~2 DEG LEFT, NO DOWN.
3. INBOARD WING WASH-IN: ~1/16" AT DIHEDRAL PT.
4. TAIL BOOM TILT UP AT TIP:~.25"
5. TAIL TILT: IN-BOARD SIDE ~ 3/8" HIGHER

TRIMMING/FLYING

USING A WINDER, PUT IN ABOUT 600 TURNS AND BACK OFF 200. HAND LAUNCH AT SHOULDER HEIGHT AND OBSERVE. YOUR GOAL IS A SMOOTH, SLOW "CRUISE" FLIGHT SPEED AND A LEFT CIRCLE OF ABOUT 25 FEET DIA. TWEAK (COERCE) BOOM UP OR DOWN AS NEEDED TO ACHIEVE SLOWEST SPEED W/O "MUSHING". FINE TUNE BY ADJUSTING POSTS IN SOCKET. CRUISE CIRCLE SIZE CAN USUALLY BE ADJUSTED BY TWEAKING THE BOOM SIDEWAYS AND/OR CHANGING STAB TILT. IF THAT DOESN'T DO IT, LEFT THRUST AND/OR WING WASH-IN MAY ALSO NEED TO BE CHANGED. FINALLY, DON'T PROCEED TO FULL OR NEAR FULL WINDS FLYING UNTIL "CRUISE" TRIMMING IS RIGHT.

BEST TIME: 26 FT CEILING 3:20
OCT 07, 2001 BALLASTED TO 10 GRAMS
COMPARATIVE TESTING (NOT EXHAUSTIVE) SEEMS TO GIVE THIS WING A 10-15 SECOND ADVANTAGE OVER STD SQUARE/RECT'GULAR LEADING EDGE WINGS. WING CONFIG ALSO RETRO-FITTED ONTO OTHER S.O. DESIGNS WITH SIMILAR IMPROVED RESULTS.

TARGET WEIGHTS (GRAMS)

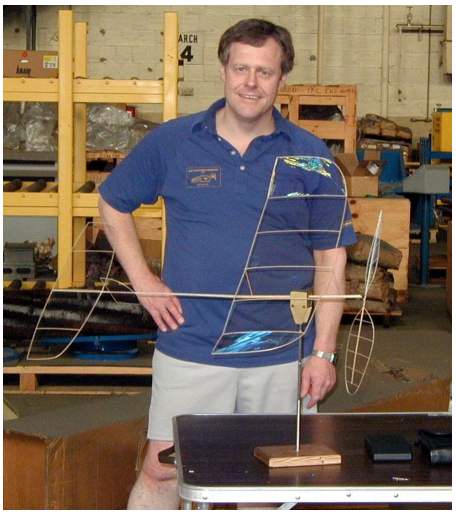
PROP ASSY	2.30
WING W/ COVER & POSTS	1.75
FUSE/BOOM/TAIL/L.G.	3.95
TOTAL: 2002 "C"RULES	8.00

FOR "B" RULES: REMOVE L.G. ADD BALLAST AND/OR BUILD HEAVIER TO WEIGH 10.0 GMS

"Leading Edge"

SO by Cezar Banks

SCALE 1" = 2"



Richard Doig

1955-2002

It is with deep regret that I pass along the news that indoor modeling lost a good friend and supporter, Richard Doig, on Wednesday, May 29, 2002. Richard is survived by his wife, Melody, and son, Christopher, age eight.

I was fortunate enough to meet Richard in 1971 when he showed up at Lasky Recreation, a gymnasium in Detroit where the Detroit Balsa Bugs would meet every Friday, to fly models and exchange ideas. Richard flew Control Line Stunt and Carrier, however, became intrigued with indoor models. Studying from the likes of Bob Bienenstein, Ron Plotzke, Dick Kowalski and Ed Stoll, learning to fly indoor competitively went fairly quickly.

The first Nationals Richard and I flew indoor was in 1971. This was at the armory in Chicago. We watched our "heroes", and flyers like Jim Richmond, Bucky Servaites, and mentors Ron and Ed make getting to the ceiling and doing a lot of time look easy. These modelers gave us our goals and, by the 1972 Nationals, we seemed to be getting the hang of flying indoor.

I remember the all night microfilm pouring sessions, trips to the hobby shop and test flying at the Michigan State Fair Coliseum like they were yesterday. Since Richard was a little older than me and had a car, I came to rely upon him both as a close friend and an enjoyable means of getting to contests.

Richard continued to develop his building and flying skills and is noted for designing a feasible and lightweight variable diameter pitch propeller. His dedication to the sport propelled him to membership on two F1D Indoor Teams, competing in Poland in 1992 and Moscow, Idaho in 1996. The United States Team placed first in 1996.

I will always remember Richard's passion for indoor and curiosity as to how models could be made better. I recall with a sense of peace and loss the good times we had together. I will miss him. Indoor modeling will miss him. Please keep Richard, Melody and Christopher in your thoughts.

Bill Shailor

The family has requested that any donations be made to the NFFS to be used for indoor modeling

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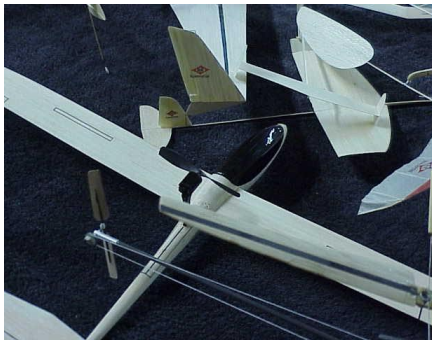
76th National Aeromodeling Championships
Johnson City, TN • Muncie, IN • USA

Gary Hodson winds a Peanut

The Gliders of Jim Lewis

Kurt Krempitz

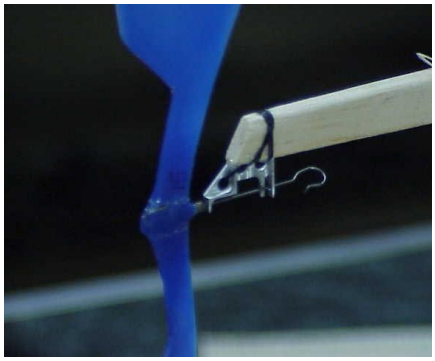
Lee Surtees



A Romash Model Bash

World War I Scale

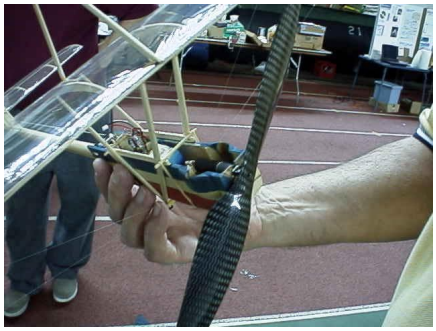
The Science Olympiad Invitational



How to Get a 9 ½" Prop to 2 Grams

Cessna Bird Dog?

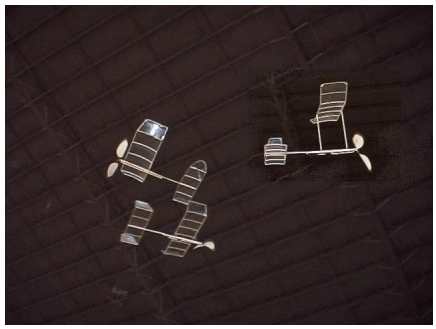
Bob Wilder & Indoor Electric RC



Front of His Duration Record Holder

Jim Richmond

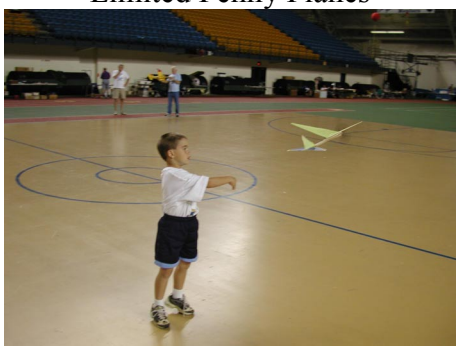
Lacey M10 Floats By



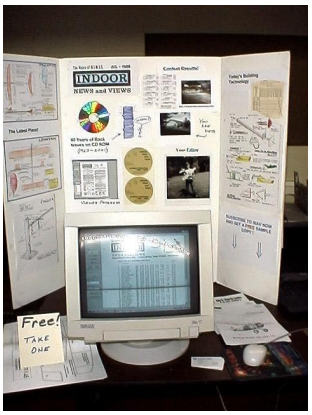
Limited Penny Planes

Fred Tellier

Rich Miller's Zlin Cropduster

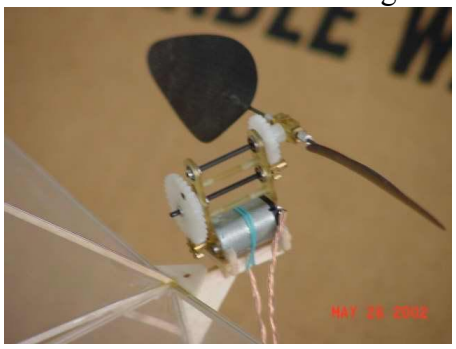


There's No Better Feeling



The INAV Booth Manned by Carl

Ray Harlan and Electric FF Duration



Closeup of Ray's Front End

Jack McGillvery

Event USIC Dime Scale 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	Miller, Richard	179518	Bat Monoplane	435
2	Blair, John	29698	Leopard Moth	276.5
3	Diebolt, John	5286	Bat Monoplane	275.5
	Miller, Jim	89382	Martin MO-1	NS
	Bard, Steve	110773	Stahlwerk	NS
	Barker, John	2095		NS
	Meece, Cameron	pending	Corbin	NS
	O'Dell, Bill	408354	Great Lakes Trainer	NS
	McGillivray, Jack	MAAC 1025L	Arado	NS

Event USIC F1L 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	FLT #5	FLT #6	SCORE
1	Kagan, John	469254	19:45	20:13	20:04	20:23			40:27:00
2	Loucka, Larry	1210	17:10	17:42	16:46	18:43	19:41	18:09	39:24:00
3	Cohen, Alan	738608	15:08	17:07	17:52	18:33	18:45		37:18:00
4	Romash, Rob	130061	16:27	18:10	16:40	18:16			36:26:00
5	Kehr, Joe	549294	16:05	15:34	12:07	17:25	18:30	17:52	36:22:00
6	Gowen, Bill	615737	5:10	15:01	16:37	17:27	16:25		34:04:00
7	Cawthorne, John	1650	15:14	15:39					30:53:00
8	Singer, Len	209081	13:25	14:49	15:06				29:55:00
9	Diebolt, John	5286	13:45	15:17	3:32	3:38			28:32:00
10	Combs, Jerry	5471	13:41	6:06	10:34	14:28	9:00	9:23	28:09:00
11	Linardic, Vladimir	MACC38165L	10:13	7:11	13:14	14:14			27:28:00
12	Momot, Tukasz**	?	11:46	15:17	11:25	11:46			27:03:00
13	Barker, John	2095	11:10	12:07	12:07	13:10			25:17:00
14	Jones, Raymond	MAAC 13157	9:13	13:36	0:50				22:49
15	Carney, Bill	833252	8:09	11:22	6:29	7:08	10:32		21:54
16	Wrzos, Chet	20454	11:53	7:45					19:38
17	Olshefsky, Peter	614476	7:20	11:38	2:17				18:58
18	Clem, Jim	L55	12:30						12:30

Final score equals sum of two best flights

Event USIC F1M 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flt #1	Flt #2	Flt #3	Flt #4	Flt #5	Flt #6	Score
1	Diebolt, John	5286	13:17	13:58	15:07	17:08	16:41		33:48:00
2	Gowen, Bill	615737	13:45	5:40	15:32	15:13	16:07	15:41	31:48:00
3	Tellier, Fred	MAAC 9125	15:28	3:07	5:47	15:42			31:10:00
4	Linardic, Vladimir	MAAC38165L	10:45	19:16					30:01:00
5	Olshefsky, Peter	614476	12:30	12:18	10:31	12:10			24:48:00
6	Kehr, Joe	549294	10:16	10:50	13:10	10:50	13:10		24:00:00
7	Rigotti, David**	599400	8:50	12:08	11:02	10:20	8:52	11:32	23:40
8	Barker, John	2095	8:56	9:11	10:24	10:15	11:11	11:08	21:35
9	Hartman, Phil	8667	6:28	7:13	7:35	11:32	10:00		21:32
10	Trisler, Terry	625159	9:54	8:09					18:09
11	Jones, Raymond	13157	7:20	10:38	10:09	7:20	10:38		17:58
12	Landrum, Billie	52674	7:27	8:45					16:02
13	Rash, Fred	63458	11:08						11:08

Score is the sum of flier's two best flights

Event USIC FAC Scale 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	Anderson, Wayne	587497	Blenhan & Voss	148.5
2	McGillivray, Jack	MAAC 1025L	SE-5A	142.5
3	Miller, Jim	89382	Martin MO-1	141.5
4	Lee, Jim	MAAC 5436M	N/A	130.5
5	Linstrum, Dave	485	Stout 2 -AT	129.5
6	Blair, John	29698	Spad 13	126
7	Miller, Richard	179518	Currie Wot	124
8	O'Dell, Bill	408354	Cessna O-1E	77
	MacEntee, Rich	102085	Waco SRE	0

Event USIC Golden Age Scale 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Score
1	McGillivray, Jack	MAAC 1025L	188
2	Lee, Jim	MAAC 5436M	159
3	Miller, Jim	89382	103
4	Blair, John	29698	95.5
	Anderson, Wayne	587497	0
	Linstrum, Dave	485	0
	Top three places determined by fly off		

Event USIC High Wing Monoplane 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	McGillivray, Jack	MAAC 1025L	Found	140
2	Miller, Jim	89382	Lacey	132
3	MacEntee, Rich	102085	Lacey	130.75
4	Lee, Jim	MAAC 5436M	Lacey	127
5	Gilbert, Sidney	1803	Nesmith Cougar	113
6	Blair, John	29698	Cougar	107

Event USIC Modern Civil Production 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	McGillivray, Jack	MAAC1025L	Piper Cub	395
2	Lee, Jim	MAAC 5436M	Taylorcraft	144
3	MacEntee, Rich	102085	Turbo Beaver	134
	Landrum, Billie	52674		
	Miller, Jim	89382		
	Anderson, Wayne	587497		

Event USIC Ministick Mass Launch 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.
1	Loucka, Larry	1210

Event USIC No Cal 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flight1	Flight2	Flight3	Flght4	Flight5	Score
1	Loucka, Larry	1210	6:43	7:35	8:00	8:07		8:07
2	Linardic, Vladimir	MAAC38165L	7:01	7:46	6:37			7:46
3	Diebolt, John	5286	4:30	5:43	6:10	5:43	3:35	6:10
4	Warmann, Bob	187	3:31	0:08	5:33	5:13	6:08	6:08
5	Harlan, Ray	131	5:11	0:09				5:11
6	Trisler, Terry	625159	4:13	4:17	4:18	5:03	4:58	5:03
7	Rash, Fred	63458	3:57	4:05	4:23	4:24	3:54	4:24
8	Benner, Dan	259516	3:43	3:44	4:04	3:52	4:05	4:05
9	Leifer, Louis	MAAC 2418L	3:16	3:24	4:00			4:00
10	Nuszer, Joe	29036	3:00	3:55				3:55
11	Von Bueren, Karl	51477	2:47	1:17	2:55	3:35	3:05	3:35
12	Gilbert, Sidney	1803	1:52					1:52

Event USIC P24 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	
1	Diebolt, John	5286	Winner
	Bakay, Carl	478659	
	Benner, Dan	259516	
	Kehr, Joe	549294	
	Romash, Robert	130061	
	Trisler, Terry	625159	
	Johnson, Tem	16707	
	Clem, Jim	L55	
	Mac Entee, Rich	102085	

Event USIC Pioneer 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	Lavender, Tim	269765	Drzewieki	133
2	Miller, Jim	89382	Bleriot VII	128.5
3	Schutzel, Emil	508384		127.5

Event USIC Pistachio 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	SCORE
1	Schutzel, Emil	508384	I 4 Bis	3
2	Ripley, Ed	484619	Denny Kitfox	6
3	Linstrum, Dave	485	Platatus Porter	6
4	Ripley, Ed	484619	Goldwing	7
5	Olfson, Doug	480646	Goldwing	11
6	Ripley, Ed	484619	Wee Bee	11
7	Gilbert, Sidney	1803	Fike	12
	Places with tie scores determined by Static Scores			

Event USIC Round the Pole 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flight1	Flight2	Flight3	Flight4	Flight5	Flight6	Flight7	Flight8	Flight9	Score
1	Rigotti, David **	599400	3.43	3.52	3.35	3.45	3.12					3.12
2	Boone, Jack	107857	4.53	4.24	4.15	3.91	3.84	3.64	3.64	3.19	3.27	3.19
3	Italiano, Tony	2386	3.63	3.67	3.41	3.22	3.25	3.33				3.22

Event USIC Race to the Roof 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flight1	Flight2	Flight3	Flight4	Flight5	Flight6	Flight7	Flight8	Flight9	Score
1	Benner, Dan	259516	7.4									7.4
2	Kagan, John	469254	10.1	10.6	11	8.2						8.2
3	Roash, Robert	130061	12.8	16.1	14.7	14.3	9.1					9.1
4	Bard, Steven	110773	35.3	29.3								29.3
5	Rash, Fred	63458	48.5	48.6								48.5
	Lindstrum, Dave	485										
	Diebolt, John	5286										
	Carney, Bill	83252										
	Chalker, Matthew	683977										
	McGillivray, Jack	MAAC1025L										

Event USIC Straight line Speed 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flight1	Flight2	Flight3	Flight4	Flight5	Flight6	Flight7	Flight8	Flight9	Score
1	Lewis.Jim		1.78									1.78
2	Diebolt, John	5286	3.2	2.51								2.51
3	Carney, Bill		6.1									6.1

Event USIC Unlimited Rubber Speed 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Score
	Diebolt, John	5286	
	Boone, Jack	107857	
	Italiano, Tony	2386	
	Lewis, Jim	119	

Event USIC WWII Mass Launch 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name
1	McGillivray, Jack	MAAC L1025	P-51 Mustang

Event USIC WWI Mass Launch 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name
1	McGillivray, Jack	MAAC 1025L	Junkers CL1
	Miller, Jim	89382	Fokker, DVII
	Loucka, Larry	1210	DH 6
	Blair, John	29698	Fokker DVII
	** Equals Senior Class. *** Equals Junior Class		

Event 201 HL Stick 2002 Nationals Johnson City, TN.

Place	Contstant Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	Flt #5	Score
1	Richmond, James	4936	41:24					41:24
2	Chilton, Stan	L30	24:28	31:15				34:28
3	Schaffer, Doug **	680152	30:07	26:40				30:07
4	Linardic, Vladimir	714084	27:58					27:58
5	Grant, Jim	159477	10:09	23:58	19:10	22:54		23:58
6	Gowen, Bill	615737	21:59	21:51	20:03	23:16		23:16
7	Chalker, Matthew **	683977	07:16	19:24	19:57			19:51
8	Clem, Jim	L55	12:58					12:57

Event 202 Intermediate Stick 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flt #1	Flt #2	Flt #3	Flt #4	Flt #5	Score
1	Linardic, Vladimir	MAAC381650	31:31	14:36	37:58			37:58
2	Kagan, John	469254	14:29	36:47	37:49			37:49
3	Tellier, Fred	MAAC9125	29:09	08:04	35:01	34:07		35:01
4	Chilton, Stan	L30	26:18					26:18
5	Rezac, Lauren	641807	10:08	19:39	10:03	26:13	24:38	26:13
6	Olschefsky, Peter	MAAC864	25:07	24:23				25:07
7	Barker, John	2095	17:56	07:54	23:41			23:41
8	Rigotti, David **	599400	21:57	08:15	23:02			23:02
9	Grant, James B.	159477	11:23	04:25	ATT	09:42	22:17	22:17
10	Kerr, Joe D.	549294	10:06	12:53	16:26	18:46	18:40	18:46
11	Richmond, James W.	4936	07:35					37:58
12	Schaffer, Doug **	680152	05:31					05:31

Event 203 F1D 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	FLT #5	FLT #6	SCORE
1	Richmond, James	4936	27:46:00	30:33:00	31:43:00	33:04:00			64:49:00
2	Kagan, John	469254	31:34:00	29:45:00	32:38:00	31:55:00			64:33:00
3	Tellier, Fred	645957	28:12:00	28:57:00	30:14:00	27:59:00	30:50:00	29:47:00	61:04:00
4	Schaefer, Doug **	680152	27:47:00	30:07:00	28:58:00				59:05:00
5	Saks, Ben **	663661	25:06:00	27:47:00	29:17:00	29:24:00			58:41:00
6	Momot, Tomasz	675398	8:23	23:21	27:23:00	28:12:00	22:06	28:08:00	56:20:00
7	Johnson, Brian **	643961	24:38:00	27:59:00	26:11:00	26:40:00	28:17:00		56:16:00
8	Linardic, Vladamir	MAAC38165L	17:18	27:37:00	25:42:00	7:21	10:19		53:19:00
9	Rezac, Lauren	641807	23:55	8:49	25:12:00	25:41:00	24:31:00	24:06:00	50:52:00
10	Rigotti, David M **	599400	23:51	21:17	24:23:00	24:13:00			48:38:00
11	Leppard, Larry	93740	20:49	22:15	23:14				45:29:00
12	Combs, Jerry	5471	19:54	8:38	19:36	20:54			40:48:00
13	Raymond-Jones, D C	63358	19:52	15:27	15:28	19:09	20:45		40:38:00
14	Ripley, Ed	484619	2:24	19:53	18:17	19:15	19:43	15:10	39:36:00
15	Barker, John	2095	15:36	18:55	19:52	10:24			38:27:00
16	Clem, Jim	L55	12:58	16:31	19:00				35:31:00
17	Kehr, Joe	549294	7:52	17:35	17:36	15:56			35:11:00
18	Olshefsky, Peter	614476	15:15	14:22	17:21	15:48			34:58:00
19	Cailliau, Lawrence	79985	28:14:00						28:14:00
20	Bard, Steve	110773	13:02	13:17					26:19:00

Event 204 Cabin ROG 2002 Nationals Johnson City, TN.

Place	Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	FLT #5	Score
1	Loucka, Larry	1210	24:47:00					24:47:00
2	Linardic, Vladimir	MAAC38165L	7:45	13:59	9:21			13:59

Event 205 Manhattan 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flt #1	Flt #2	FLT #3	FLT #4	FLT #5	Score
1	Schutzel, Emil	508384	9:37	13:35				13:35
2	Van Gorder, Walt	19912	11:59	12:04	13:26			13:26
3	Grant, Jim	159477	11:52	10:34	12:02	10:34	13:15	13:15
4	Loucka, Larry	1210	9:56	10:35	12:24			12:24
5	Linardic, Vladimir	714084	4:44	8:32	11:47			11:47
6	Tellier, Fred	645957	7:47	9:33	8:20	7:12		9:33
7	Kehr, Joe	549294	6:51	6:59				6:59
8	Oleson, Doug	490646	2:09	1:39	2:14			2:14

Event 207 Pennyplane 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	FLT #5	SCORE
1	Kagan, John	469254	18:00	18:24	16:41	17:07	16:58	18:24
2	Olshefsky, Peter	MAAC864	9:22	10:41	10:32	16:08	15:19	16:08
3	Clem, Jim	L-55	14:30	15:48				15:48
4	Teller, Fred	645957	13:18	8:18	15:31	13:41		15:31
5	Cawthorne, J.	1650	14:55	13:00	13:44			14:55
6	Richmond, Jim	4936	14:00	13:15	14:39			14:39
7	Wisniewski, Gordon	716	14:16	13:51	13:07	10:15	11:37	14:16
8	Hartman, Phillip	8667	4:55	13:33	13:48	14:04	13:08	14:04
9	Raymond-Jones, DC	63358	12:30	13:28	10:12	13:27	12:25	13:28
10	Nuszer, Joe	29036	12:36	13:14	12:38	12:13	12:17	13:14
11	Gowen, Wm	615737	11:58	11:51	13:06			13:06
12	Rigotti, David M **	599400	12:01	12:46	12:43	12:55		12:55
13	Grant, Jim	159477	3:20	12:19				12:19
14	Kehr, Joe	549294	9:05	9:57	10:15	4:31	11:50	11:50
15	Von Bueren, Karl	51477	9:01	9:43	11:09	11:13	6:51	11:13
16	Johnson, Tem	167007	9:04	9:55	10:23	11:03	10:56	11:03
17	Rigotti, David	66859	10:38	10:07	10:48			10:48
18	Carney, Bill	83252	2:50	10:40				10:40
19	Rash, Fred	63458	10:10	10:39				10:39

Event 206 Easy B 2002 Nationals Johnson City, TN.												
Place	**Contestant Name**	**AMA NO.**	**FLT #1**	**FLT #2**	**FLT #3**	**FLT #4**	**FLT #5**	**SCORE**				
1	Cailliau, Lawrence	79985	11:14	27:38:00				27:38:00				
2	Linardic, Vladimir	714084	24:04:00	24:00:00	26:00:00			26:00:00				
3	Richmond, Jim	4936	15:34	10:54	24:17:00	24:03:00		24:17:00				
4	Tellier, Fred	645957	22:35	23:58	21:54	24:01:00		24:01:00				
5	Van Gorder, Walter	19912	22:55	9:09	23:58	8:05		23:58				
6	Kagan, John	469254	22:34	22:27	23:53			23:53				
7	Gardner, Steve	6193	17:02	22:00	20:04	23:18	20:41	23:18				
8	Tomaz, Momot	675398	23:00					23:00				
9	Romash, Robert	130061	19:07	19:47	20:26	22:38		22:38				
10	Schaefer, Doug **	680152	21:25	20:34				21:25				
11	Olshefsky, Peter	614476	16:42	11:24	11:09	11:55	21:00	21:00				
12	Leppard, Bill	93740	19:09	21:41				20:41				
13	Clem, Jim	L-55	17:11	20:28	8:40			20:28				
14	Diebolt, John	97263	4:48	6:26	18:19	18:50	19:36	19:36				
15	Rezac, Lauren	641807	17:32	16:22	19:31	19:29	15:50	19:31				
16	Chalker, Mathew **	683977	17:18	19:15				19:15				
17	Harlan, Ray	131	18:51	17:19	10:49	12:45		18:51				
18	Nuszer, Joe	29036	18:20	17:42				18:20				
19	Combs, Jerry	5471	9:42	12:17	17:58	7:04		17:58				
20	Gowen, William	615737	11:40	4:31	17:45			17:45				
21	Raymond-Jones, D C	63358	17:41	16:39	16:56	15:52	16:44	17:41				
22	Singer, Len	209081	16:36	17:18				17:18				
23	Morrow, Chris	546510	3:45	16:56	17:00	14:09	16:22	17:00				
24	Von Bueren, Karl	0:00	6:18	12:14	15:54	17:00		17:00				
25	Cawthorne,John	1650	15:26					15:26				
26	Italiano, Tony	2386	11:20	3:05	14:59	14:51	14:51	14:59				
27	Carney, Bill	83252	9:04	12:31	14:13	14:59	1:52	14:59				
28	Grant, James	159477	12:18	14:22	5:02	6:52		14:22				
29	Lemel, A.L.	5028	1:38	11:21	11:40	12:31	10:02	12:31				
30	Wrzos, Chester	20454	11:28	11:58				11:58				
31	Van Dover, Abram	894	10:40	11:22				11:22				
32	Miller, Roger)	52009	7:03					7:03				
Event 208 Limited Pennyplane 2002 Nationals Johnson City, TN.												
Place	**Contestant Name**	**AMA NO.**	**Flt #1**	**Flt #2**	**Flt #3**	**Flt #4**	**Flt #5**	**Score**				
1	Cawthorne, John	1650	12:30	14:58	8:14	13:44	15:14	15:14				
2	Van Gorder, Walter	19912	12:53	14:06	5:44	5:15		14:06				
3	Tellier, Fred	645957	13:35	13:48	10:14	13:40	13:11	13:48				
4	Johnson, Brian **	643961	11:50	13:06	12:12			13:46				
5	Hartman, Phil	8667	4:36	13:26	13:10	13:45	3:20	13:45				
6	Johnson, Wayne	643960	12:40	11:39	13:40			13:40				
7	Warmann, Robert	187	12:31	13:27	4:26	7:10	12:51	13:27				
8	Clem, Jim	L-55	11:35	11:45	13:20	5:17		13:20				
9	Grant, James	159477	10:00	13:11	10:24	2:28		13:11				
10	Leppard, Bill	93740	12:27	13:03				13:03				
11	Benner, Dan	259516	11:03	10:35	13:02	11:42	12:02	13:02				
12	Rigotti, David M **	599400	13:01					13:01				
13	Gowen, William	615737	12:40					12:40				
14	Diebolt, John	5286	4:39	9:51	12:19	11:37		12:19				
15	Rigotti, David	66859	9:03	10:46	11:40	12:16	11:46	12:16				
16	Barker, John	2095	9:30	10:47	12:14	10:48	9:06	12:14				
17	Olshefsky, Pete	614476	10:51	12:08				12:08				
18	Wisniewski, Gordon	716	8:51	9:56	11:52	12:07	11:22	12:07				
19	Kehr, Joe	549294	11:51	9:26	11:35	11:43	12:06	12:06				
20	Gardner, Steve	6193	10:30	3:58	9:34	5:11	11:53	11:53				
21	Trisler, Terry	625159	9:51	10:34	11:19	2:17	11:50	11:50				
22	Nuszer, Joe	29036	12:07	11:42	11:30	11:40	11:09	11:42				
23	Boone, Jack	107857	10:02	11:21	9:07	11:08	11:39	11:39				
24	Von Bueren, Karl	51477	11:39	10:02	8:23	11:02		11:39				
25	Raynond-Jones, D C	63358	9:16	11:17				11:17				
26	Singer, Len	209081	9:01	10:56	11:17			11:17				
27	Carney, Bill	83252	10:52	4:26	10:12	2:46	11:13	11:13				
28	Johnson, T E	16707	7:36	9:23	10:20	10:44	10:46	10:46				
29	Italiano, Tony	2386	7:43	9:51	8:30	6:54	3:29	9:51				
30	Combs, Jerry	5471	7:59	9:46	7:56			9:46				
31	Wrzos, Chester	20454	7:49	9:42				9:42				
32	Sullivan, Ed	69585	7:52	8:54	9:37	3:40	6:59	9:37				
33	Landrum, Billie	52674	8:27					8:27				
34	Ripley, Will	pending	4:41	3:59	5:06	6:47	8:18	8:18				
35	Kagan, John	469854	7:24	8:01				8:01				
36	O'Dell, Bill	408354	7:24	8:01				8:01				
37	Van Dover, Abram	894	5:52	7:03	6:18			7:03				
38	Campbell, Dan	346641	3:39	5:31	5:55	2:51	4:54	5:55				
Event 209 Helicopter 2002 Nationals Johnson City, TN.												
Place	**Name**	**AMA NO.**	**FLT #1**	**FLT #2**	**FLT #3**	**FLT #4**	**FLT #5**	**SCORE**				
1	Diebolt, John	5286	6:56	7:04	6:39			7:04				
2	Loucka, Larry	1210	5:44	6:16	7:00			7:00				
3	Linardic, Vladimir	MAAC38165L	6:58					6:58				
4	Richmond, Jim	4936	4:05	4:36				4:36				
5	Ripley, Ed	484619	1:42					1:42				

Event 210 Ornithopter 2002 Nationals Johnson City, TN.

Place	Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	FLT #5	SCORE
1	Ripley, Ed	484619	14:46	4:29	2:44	15:16		15:16
2	Harlan, Ray	131	13:46	12:18	15:09			15:09
3	Diebolt, John	5286	8:21					8:21

Event 211 Autogiro 2002 Nationals Johnson City, TN.

Place	Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	FLT #5	SCORE
1	Linardic, Vladimir	MAAC38165L	11:44					11:44
2	Rash, Fred	63458	2:30	7:15	8:25	8:39		8:39
3	Ripley, Ed	484619	7:28	5:35				5:35
4	Diebolt, John	5286	1:13	7:11	7:09	7:23		7:23

Event 212 H L Glider 2002 Nationals Johnson City, TN.

PLACE	Contestant Name	AMA NO	Flt #1	Flt #2	Flt #3	Flt #4	Flt #5	Flt #6	Flt #7	Flt #8	Flt #9	Score
1	Buxton,Jim	75154	79.5	81.3	80							161.3
2	Lewis, Jim	119	33.3	23.5	68.4	64.5	24	67.4	44.1	66.8	26.2	135.8
3	Boehm, Bernard	92567	58.1	63.5	67.2	66.6	65.2					133.8
4	Surtees, Len	35852	51.6	56	60	64	28.9	61.8	55.8	58.9	56.7	125.8
5	Romash, Robert	130061	60.3	60.2	62.1							122.4

Event 213 Kit Plan Scale 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	MacEntree, Richard	235021		300
2	Campbell, Glen			291
3	Grant, Jim	159477		282
	Lee, Jim	680246		267
	Blair, John	29698		188
	Meece, Cameron			144

Event 215 Bostonian 2002 Nationals - Johnson City, Tennessee

Place	Contestant Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	FLT #5	CHARISMA	SCORE
1	Miller, Richard	179518	290	325	300			1.12	700
2	Schutzel, Emil	508384	256	270	262	296		1.2	679.2
3	Diebolt, John	5286	254	173	260	301	266	1.18	669.06
4	Gardner, Steve	6193	211	124	189	174	302	1.19	610.47
5	Kagan, John	469254	240	263				1.1	553.3
6	Harlan, Ray	131	232	265	174			1.09	546.73
7	Benner, Dan	259516	225	145	218	185	187	1.15	509.45
8	Cawthorne, John	1650	186	202	101	181	164	1.16	450.08
9	Barker, John	2095	170	188	188	185	202	1.14	444.6
10	Wieczorek, Leonard	10105	109	168	103	147	159	1.11	362.97
11	Bard, Steven	110773	92	101				1.17	225.81
12	Von Bueren, Karl	51477	112	76				1.17	219.96
13	Carney, Bill	83252	48	19				1.03	69.01
14	Miller, Roger	52009	59					1.08	63.72

Event 218 Standard Cat. Glider 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flt 1	Flt #2	Flt #3	Flt #4	Flt #5	Flt #6	Flt #7	Flt #8	Flt #9	Score
1	Von Bueren, Karl	51477	81.2	79.2	84.8	79.7	78.4	86.4	80	80.6	78	171.7
2	Buxton, Jim	75154	79.3	82.2	79.8	81.9						164.1
3	Schlarb, W.L.	14425	77.2	78.4	80.6	78.1	80.4	77.2				161
4	Schlarb, Ralph M	322352	79.5	78.4	63.2	79.9	77.5	75.4	80.9	74.5	73.4	160.8
5	Romash, Robert	130061	78.4	74.6	74.3	74.7	75.8	79.1				157.5
6	Krempetz, Kurt	69866	73	74	76.3	76.7	54.1	74.2	75.6	33.9	80.4	157.1
7	Cawthorne, John	1650	70	64	71	75.5	73	73.8	74.3	77.2	71.4	152.7
8	Johnson, T.E.	16707	69.8	70.1	73.1	77.4	74.2	68.2	66	72	66.6	151.6
9	Krempetz, Kenny	11951	70	71	72.3	16						143.3
10	Jessup, Artie	10269	55.8	58	67.9	71.9	71.2	70.3	62.1	69.2		143.1
11	Miller, Richard J.	179518	62.6	48.8	63.2	73.9	57.4	62.3	67.1	28.2	68.4	142.3
12	Lewis, Jim	119	66.7	50.3	66.5							133.2
13	Olshefsky, Peter	MAC864	59	55	54	54.5	45.1	54	51.3	48	47.1	114
14	Warmann, Robert	187	8.1	8.1	11.1	53.9	11.9	51.6	8.9	28.9	5.2	105.5

Event 219 Unlimited Cat. Glider 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flt #1	Flt #2	Flt #3	Flt #4	Flt #5	Flt #6	Flt #7	Flt #8	Flt #9	Score
1	Krempetz, Kurt	69866	89	85	84.5	90.3	91.2	90.6	93			184.2
2	Lewis, Jim	119	77.9	65.8	82.2	79.3	80	83.8	82.7	88.1	88.6	176.7
3	Krempetz, Kenneth	11951	83	68.6	70.5	86.5	87.4	76.8	75	77.2	76	173.9
4	Schlarb, W.L.	14425	84.8	83.6	9							168.4
5	Von Bueren, Karl	51477	82.6	81.2	79.3	80.3	84.9	82.3				167.5
6	Buxton, Jim	75154	79.8	80.2	81.2							161.4
7	Boehm, Bernard	92567	77.1	78.4	75							155.5
8	Cawthorne, John	1650	70.1	74.1	72.6	73.9	70.9	68.3	63.3	81.4	69.9	155.5
9	Romash, Robert	130061	78.5	76.5	73.5	76.7	75.8	76.5				155.2
10	Warmann, Robert	187	48.1	61.1	72	57.3	68.5	73.2	74.1	62.5	75.4	149.5
11	Johnson, T.E.	16707	67.9	67.2	65.6	55.4	68.2	67.1	73.8	72.7	72.3	146.5
12	Jessup, Artie	10269	71	62	0.8	60	64.5	63.6	57.8	67.6	67	138.7

Event 505 Peanut Scale 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	Miller, Jim	89382	N/A	210
2	Lee, Jim	680246	N/A	189
3	Bard, Steven	110773	N/A	157
4	Hodson, Gary	669378	N/A	143.5
5	Romash, Robert	130061	N/A	135
6	Blevin, Doyle	523646	N/A	105
	Linardic, Vladimir	MAAC38164L	N/A	DNF
	Grant, Jim	159477	N/A	DNF

Event 220 Ministick 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flt #1	Flt #2	Flt #3	Flt #4	Flt #5	Score
1	Romash, Rob	130061	11:33	11:34	12:45	12:47		12:47
2	Chilton, Stan	L-30	10:18	11:50	10:45	12:38		12:38
3	Van Gorder, Walt	19912	11:10	12:14	11:35			12:14
4	Lunardic, Vladimir	MAAC38156L	11:59					11:59
5	Hodson, Gary	669378	8:54	11:05	10:48	11:41	11:52	11:52
6	Warmann, Robert	187	9:48	11:44	3:00			11:44
7	Diebolt, John	5286	9:37	8:43	11:35			11:35
8	Loucka, Larry	1210	11:09	11:19				11:19
9	Schutzel, Emil	508384	9:55	11:17	11:12	8:53	10:23	11:17
10	Singer, Len	209081	9:47	10:30				10:30
11	Rigotti, David **	599400	7:06	9:15	10:18			10:18
12	Leppard, William	93740	10:00					10:00
13	Tellier, Fred	645957	5:46	9:42				9:42
14	Richmond, James	4936	8:17	9:16	9:41	9:18		9:41
15	Harlan, Raymond	131	9:10	9:15				9:15
16	Rash, Fred	63458	8:58	8:09	9:06	9:13		9:13
17	Von Bueren, Karl	51477	6:28	8:51	7:46	6:22	6:22	8:51
18	Clem, Jim	L 55	8:50	7:54				8:50
19	Cawthorne, John	1650	7:27	6:10	8:45	7:41		8:45
20	Olshefsky, Pete	614476	8:20	7:10	6:17			8:20
21	Raymond Jones, D.C.	63358	7:20	8:12	7:56			8:12
22	Chalker, Matthew	683977	7:49					7:49
23	Combs, Jerry	5471	7:02	7:48	5:41	6:31		7:48
24	Kehr, Joe	549294	7:42	4:04				7:42
25	Bard, Steven	110773	7:02					7:02

Event 507 AMA Rubber Scale 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	Blair, John	29698	Bristol Brownie	199
2	Miller, James	89382	Lacey	197
3	Lee, Jim	680246	Lacey	189
4	Grant, Jim	159477		183
	Ripley, Ed	484619		DNF

Event USIC A 6 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	FLT #1	FLT #2	FLT #3	FLT #4	FLT #5	SCORE
1	Schutzel, Emil	508384	08:08	06:51	09:32			09:32
2	Chilton, Stan	L30	08:12	08:13	09:09	09:08	09:31	09:31
3	Hodson, Gary	669378	08:09	07:55	09:04	08:40	02:03	09:04
4	Tellier, Fred	MAAC 9125	06:57	06:19	06:05	04:27	08:02	08:02
5	Johnson, Tem	16707	07:03	06:43	07:46	03:33		07:46
6	Singer, Len	209081	06:37	06:54	07:28			07:28
7	Warmann, bob	187	05:59	06:21	05:41	07:06		07:06
8	Leppard, Bill	93740	05:47	06:06				06:06
9	Sullivan, Ed	69585	04:44	04:52	04:29	05:54	05:19	05:54
10	Combs, Jerry	5471	02:47	04:04	04:02	04:24	04:30	04:30
11	Bard,Steven		03:21	03:31	03:10			03:11
12	Ripley, Will***	pending	01:48	01:39	02:09	01:50		02:09

Event USIC Bostonian Mass Launch 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.
1	Diebolt, John	5286

Event USIC 35 CM 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Flt #1	Flt #2	Flt #3	Flt #4	Flt #5	Best Flt
1	Loucka, Larry	1210	14:48	19:38	22:51	26:36:00		26:36:00
2	Saks, Ben	663661	21:02	2:13	3:18			21:02
3	Romash, Robert	130061	16:08	18:26	17:40	18:50		18:50
4	Chalker, Matthew **	683977	12:12	12:25	16:15	17:47	17:27	17:48
5	Olshefsky, Peter	614476	14:59	14:25	10:44	17:41		17:41
6	Jones, Raynond	MAAC13157	13:27	12:40	17:01			17:01
7	Grant, Jim	159477	5:00	14:59	8:28	16:39	16:28	16:39
8	Cohen, Alan	738608	14:15	15:53				15:53
9	Linardic, V.larimir	MAAC381650	2:34					2:34

Event USIC Coconut Scale 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Score
1	MacEntee, Rich	102085	4
2	Miller, Richard	179518	5
3	Miller, Roger	52009	9
4	Linstrum, Dave	485	9
5	Anderson, Wayne	587497	10
6	Petty, Rachel***	680176	10
7	Falconberry, Joe***	pending	13
	Landrum, Billie	52674	N/S
	Static score determines place on ties		

Event USIC Coconut Mass Launch 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	Richard Miller	179518	Ziln	

Event USIC FAC Peanut 2002 Nationals Johnson City, TN.

Place	Contestant Name	AMA NO.	Aircraft Name	Score
1	Buxton, Jim	75145	Miss Ashley	142.25
2	Miller, Jim	89382	Fokker DVII	140.25
3	MacEntee, Richard	102085	Waro SRE	129.5
4	Hodson, Gary	669378		128
5	Miller, Roger	52009	Hosleer Fury	123.5
6	Linstrum, Dave	485	Polish PW-II	87

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INDOOR
NEWS and VIEWS
ISSUE # 108

The Prime Osborn Center, Jacksonville, FL

September, 2002

From The Editor's Desk

As I write this, we still don't know how much will go in this issue, but July and August are busy contest months. The UK Team Trials at Cardington Air Dock were held July 13-14, Kibbie Dome was July 27-30, and then there's the new site-on-the-block, the Prime Osborn Convention Center in Jacksonville with their trials and Fun Fly July 28, almost in my neck of the swamp. The Canadian Indoor Nats and West Baden Fly Me to the Moon Part II happened August 2-4. Nick Aikman was at Cardington, Tim went to Kibbie and myself to West Baden, so we have that much covered.

Many wonderful things are in the works at INAV. Thanks to Laurie Barr, John O'Donnell and John Taylor, we have collected all the issues of the discontinued Norwind News, and will be offering them with several other out-of-print indoor newsletters in a second archive CD. You may remember that the great articles on stiffness testing came from there, and more is featured this month. We start an indoor scale column called Scale Matters by veteran writer Dave Haught, whose models also appear on the Kibbie photo page, and a new series by yours truly on Great Indoor Sites. And still more: Tim's latest masterwerke is a book called The Best Of Indoor News and Views, now in draft form and soon to be offered for sale. Keep checking www.indoorduration.com for updates. - Carl Bakay

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Can't get enough of Indoor News And Views? Then get the INAV Archive CD. This CD includes over 250 complete issues of INAV along with a custom viewer program that allows you to print all the issues, articles, and plans. Order your Archive CD today by sending US$45.00 plus shipping (USA US$3.00 all others US$5.00) to Tim Goldstein at the above address. Proceeds from the Archive CD go to support Junior indoor flying.

Indoor News and Views is an open forum presenting ideas, opinions, model designs and techniques for the indoor community. Unless specifically stated, INAV does not offer any opinion as to the merit of published work, nor does it endorse any products or services advertised herein.

Sample ad copy should be sent to Tim Goldstein at the above address for publishing details.

Cover art by Bill Carney.

Publishers Desk

Thanks to everyone's help INAV is continuing to grow and expand. With this issue we are breaking the 350 subscriber mark. Now that INAV is back on a reliable schedule we are seeing a number of past subscribers joining us again. We are also getting a number of new subscribers joining by using the convenience of online sign-up via PayPal. This service is hosted at www.IndoorDuration.com and can also be used by current subscribers to renew. There is an additional charge when subscribing/renewing this way to offset the fees we pay for the service. The additional cost is about the same as that for an envelope, check, and stamp and it is sure hard to beat the convenience especially for our non-USA subscribers.

We are looking for ways to increase INAV's circulation. The web has certainly shown that people are interested in learning more about indoor if they are exposed. Now we just need to figure out how to expose them. As a test we are placing a classified ad in Model Aviation hoping to attract some modelers that my have read the indoor column, but did not know where to find more information. Anyone that has some ideas how we can help INAV expand please feel free to contact me.

As is normal we are always interested in articles, plans, and contest listing for future issues. We are currently in need of drawing for the cover. Anyone that wants to help on either a one time basis or an on going basis can contact either myself or Carl.

Tim

NFFS Sympo Call for articles.

2003 Sympo Papers Needed

The National Free Flight Society Symposium 2003 needs your help. We are looking for technical papers on the science of Indoor flight as well as for articles on Indoor design, construction, and flying. If you have a possible topic and are interested in sharing your knowledge with modelers around the world, please contact 2003 Sympo Editor Louis Joyner.

Louis' e-mail address is joyner28@comcast.net. A short (25 to 50 word) outline of the proposed paper is all that's needed at this time. Please include this in the body of the e-mail, not as an attachment. The mailing address is: 6 Saturday Rd., Mt. Pleasant, SC 29464.

Lee Hines will be the chairman of Models of the Year committee. His e-mail is sweepettelee@earthlink.net.

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THE REST OF THE STORY

An Editorial by Indoorsman Joe Kehr
Tulsa, OK

John Kagan's great article in INAV (Issue # 103) covers the techniques and the reasons for steering. Reading his article and following the guidelines will produce excellent results. (Watching John steer is a lot like seeing Tiger Woods putt). However, on the other hand, knowing the rules and the definition of inappropriate steering should be an event official's major concern. Steering according to the rule book should be required reading for our Indoor Event Director's. It's time to address the issue.

Watching the experts steer their models to more favorable environs will give you a quick idea of the problem. The advantage lies with the contestant that takes the time to develop these skills (even I have been able to do a limited but successful number of flight adjustments). The problem is the growing number of departures from the intent of the rule(s). The intent of the rule(s) is to take your model out of harms way. In the AMA Competition Regulations, 2002 - 2004, page 26 under the heading "FAI Steering Rule", paragraph a. "Steering must only be used to avert collision with the structure of the building, it's contents, or other models. Movements of the model must be primarily in the horizontal plane". This is a pretty precise description of the intent. At the USIC 2002 1 witnessed many of the contestants involved in steering for improved locations when I believe their models were in no imminent danger of any of the above. The timekeepers responsibility is to observe and warn of any potential infractions. (Friendly timekeepers rarely take that responsibility seriously). In the Akron Airdock you could justify steering almost anytime because of the floor clutter but you probably know what the limits should be.

Many indoor modelers appear not to have bothered to read or perhaps have ignored the rules. Then there are the problems of evolution where Event Directors have allowed contestants to do whatever they choose as long as they don't interfere with other contestants models. This has led to some very loose definitions of the rules and steering that only puts the model in a favorable position when there was no eminent danger as listed in the rules. It is predictable that a number of top modelers will drag their steering gear with them as they follow the drift and as soon as it "appears" their model may fly to an undesirable location ... up goes the balloon.

Having sailed boats for a number of years I'm aware that any object moving through a fluid will displace a considerable amount of that fluid. This is in the form of a bow wave. A balloon is an object moving through a fluid called air. Any horizontal or vertical movement (up or down or sideways) will displace air and set up a wave action that will disturb any object in or near it's path. (Throw a rock into a smooth surfaced pond and witness the effect). I watched one such incident at USIC 2002 where a balloon dragging contestant was advised that he was close to a model that was descending close by and his response was "yeah I see it". The balloon's "bow wave" rippled the model in question. (Sometimes a second or two can win or loose an event).

I believe the indoor modeler should want to do what is right and that every contestant should be given the same chance. Therefore, every participant should expect and support the Event Director as they define and enforce the intent of the steering rule. He (the Director) should be ready to set aside the intimidating aurora of the top modeler and. enforce the rude on an equal basis for all that are flying. Which brings up another point. Balloons should be tethered in such a way or in a place where their presence will not interfere with any model's flight pattern. In Johnson City the balloons should be kept under the overhang of the seating around the circumference of the floor. This would provide a clear flying space for any model entering the area. Some attempt was made to clear the air space of balloons this year but the Director's words were largely ignored.

Ignoring the rules that govern our competition and the people that must enforce them will only lead to winning by deception which authors the question - Is winning by manipulation worthy of the prize? Enforcing the rules is not the most pleasant task that the Event Director must face ... but face it he must. And that is THE REST OF THE STORY.

Editor's Note:
There were two real hazards to duration flying at Johnson City: one came from putting up or winding in a balloon too rapidly in crowded airspace, the other from a few modelers who left the balloon up at the end of a hundred foot line, "just in case" it was needed. Mr. Kehr's plea is only for simple consideration of others at a contest.

‘A Tale of Two Sites’.
The French Open International Contests, held at Orleans and Bordeaux. June 22n^{d}/23rd and June 29th and 30th.

The contests at Orleans and Bordeaux are annual events and the highlights of the French indoor duration calendar. The national championships alternate between each venue and this year Orleans hosted this event. Both competitions take place over two days and the classes flown are identical,

35 Centimetres, F1L, F1M, and F1D. The 35 Centimetre class has separate categories for juniors and cadets because the small size of these models is seen as a good way to get younger flyers to start to compete and engage with more advanced building techniques.

Having decided to make the trip several months earlier, Geoffrey Lefever and I left Norwich at about 5.00 AM on Friday the 28th and headed South to catch the Dover/Calais ferry. Our enthusiasm for the trip was slightly dented by the car radio commentary describing the England football teams’ ignominious exit from the World Cup, but our spirits soon picked up as we entered France and Geoffrey drove on around Paris and down to Orleans. We arrived at our hotel in time to meet Bob Bailey for Dinner.

The following morning, we were first to arrive at the sports hall in the middle of historic Orleans. The hall is a good size and has a ceiling height of 45 feet. However, cunningly positioned boxes, each armed with a fearsome array of lights hang downwards at regular intervals and restrict the usable height considerably. Luckily, these lights can be lowered between rounds on payment of a small penalty fee, allowing the retrieval of trapped models. The early morning was given over to trimming on both days before short rounds of about an hour and a half followed for each class. F1D was given ‘top billing’, with longer rounds of two hours in late afternoon. This format also applied to the Bordeaux contest but such short rounds made flying in up to four separate events something of a scramble. Previous experience of the sites was a great help in trimming and selecting correct rubber sizes. Throughout our trip there was a heatwave and the constant temperatures and humidity made competing at both events something of an obstacle course for some.

The only other flyer from abroad at Orleans this year was the experienced Swiss flyer Peter Keller and so this was not a truly international event. Attendance was generally lower than in previous years although with such a low ceiling, it is possible that some French flyers waited until the following weekend where Bordeaux offered a higher site.

In 35 Centimetres, Bob, Geoffrey and I all had VP equipped models. After wrecking one model trying to retrieve it from the ceiling, Bob eventually won by managing to get his prop tuned in to the site/conditions. I managed second by adopting the ungentlemanly tactic of slowly climbing up to the roof and clattering around on the ceiling for several minutes. I got away with this twice but on the final day, a big tail-slide off the lights lost a lot of altitude and time on my last flight.

Peter Keller won F1D and F1M and I believe he had to get above the lights to record winning times, although he had well built VP props for both classes. Bob Bailey claimed another victory in F1L but British success in F1D was limited by the fact that we were all trying out new layouts.

The next day, we headed South in convoy with Bob and spent several days exploring France, stopping at Perigeux, Limoges and other towns and villages. Bob repaired a damaged F1D tailplane and we visited the ruins of Oradour sur Glane, the site of a Second World War Nazi atrocity, where the entire village population was rounded up and shot or burned to death, as the village was gutted. The entire area has been left exactly as it was on that day.

Arriving in Bordeaux, we met up with the other British flyers. John Tipper, Bryan Stichbury and Mike Green had travelled to Bordeaux independently and completed the UK contingent. Other flyers from abroad were Fabio Manieri from Rome and The Spanish competitors Daniel Medina and Manuel Diaz. French participation was greater than in Orleans and the site is the national velodrome, a modern building with a wooden beamed ceiling structure that is surmounted by a square pyramid, peaking at just over 100 feet. This site is far more benign than Orleans, with a bigger floor area. The structure of the pyramid tends to centre models as they climb and circle high up and hang-ups are rare.

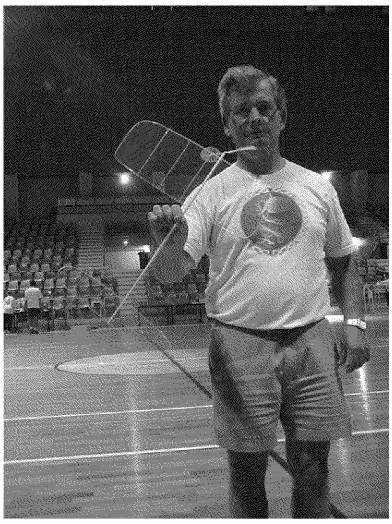
In 35 Centimetres, john Tipper flew his latest, very light (0.37gram) tandem, but a mid-air and then a high altitude steering mishap caused repairable breakage before John compounded this further by more extensive damage caused during balloon retrieval from an unlucky hang-up in the pyramid. On the second day I managed to extend the hall record to 28.31, before Bob Bailey extended it further to win with 30.19 with a back up of 27.57.

Bob Bailey also won F1L and F1D although the winning times in both classes were slightly lower than last year. Geoffrey Lefever won F1M using a venerable fixed pitch model that bounced around in the roof for two late flights on the second day, thus relegating Mike Green to second place.

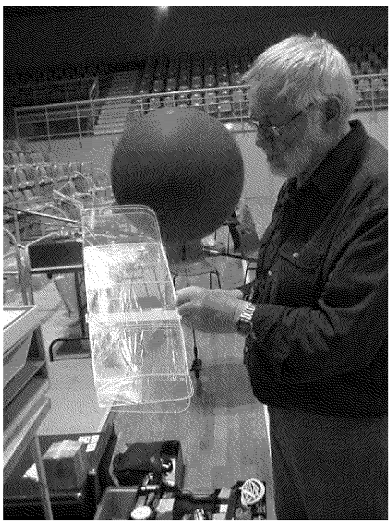
As in Orleans, the competition ended with a short, informal get-together and prize-giving, with a presentation of awards to juniors, cadets and seniors and a chance to meet the French flyers in a more relaxed atmosphere.

On behalf of all the British flyers, I would like to thank our most amiable French hosts and particularly the competition organisers, Jacques Delcroix in Orleans and Jean Pierre Darrouzes in Bordeaux. I certainly enjoyed both contests and would happily make a return trip. The Bordeaux velodrome in particular is an excellent site for indoor duration flying and it is a shame that there weren't more competitors from other countries.

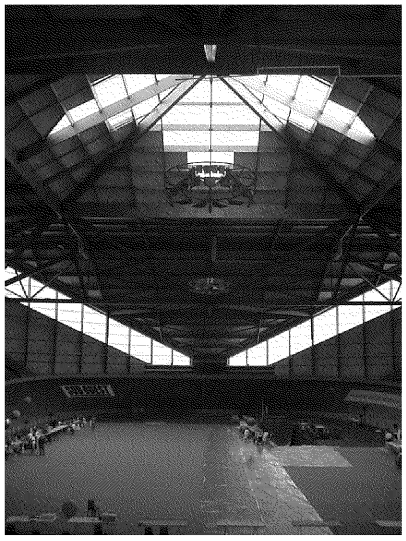
Nick Aikman.



Bob Bailey 35 cm



Geoffrey Lefever



Bordeaux Velodrome

Orleans Sports Hall

Bordeaux Velodrome Contest Results 2002

F1D (55cm 1.2g)

PRENOM NOM	58:02
BOB BAILEY	56:09
JOHN TIPPER	54:15

F1M BEGINNER

PRENOM NOM	35:15
GEOFFREY LEFEVER	32:36
MIKE GREEN	32:34

F1L (EZB) (1.2g)

PRENOM NOM	44:06
BOB BAILEY	39:24
GEOFFREY LEFEVER	37:36

MICRO 35 SENIOR

PRENOM NOM	58:16
BOB BAILEY	53:31
NICK AIKMAN	45:39

MICRO 35 JUNIORS ET CADETS

PRENOM NOM	17:40
ANTHONY DENAUD	16:34
EMILIE FORTAGE	8:45

There were approximately 15 AMA and 2 FAI Cat. III records set 8/3 & 4/2002 at West Baden, Ind..

Senior LTD PennyPlane	13:30 Brian Johnson
Open LTD PennyPlane	14:46 Walt Van Gorder
Open LTD PennyPlane	13:35 Wayne Johnson
Open Ministick	12:34 Walt Van Gorder
Senior Ministick	8:15 Doug Schaefer
Junior Ministick	7:46 Josh Mersal
Senior HL Stick	31:49 (F1D55, 0.59 gram rubber) Doug Schaefer
Open HL Stick & FAI	47:? Jim Richmond
Open ROG Cabin	time? Larry Loucka
Senior Easy Bee	21:49 Doug Schaefer
Senior F1D	30:25 Doug Schaefer
Open F1D & FAI	33:47 Jim Richmond

I believe there were a couple Glider records set too by someone with large group from California. That is what we could remember. A single flight was not allowed to count for two records. The Senior Pennyplane might have been broken with Brian's Limited flight and Senior F1D record placed higher at HLS level.

-Sandy M. Schaeffer

INAV Tests Tan Sport Rubber From FAI Model Supply

John Clapp was kind enough to send three different widths of his Tan Sport Rubber, dated May 2002. This product is aimed at SAM, scale and sport flyers who don't require the performance of Tan II competition rubber strip. We have finished testing and found it to as good as many batches of Tan II in the past.

All samples were stripped to 1/8 inch and made up in 7 inch loops. We broke five or six loops before starting, so all these tests were done to about 95% of the breaking point.

Elongation of all samples was 71 inches max, or 10.1 x when fresh, and 75 inches or 10.7% when retested the following day. Calculated energies by the Gibbs method are adjusted to 70 degrees Fahrenheit.

Size	Thickness	Energy, fresh	Energy, re-run	Hysteresis loss
1/4"	0.039"	4100 ft-lbs/lb	4380	25%
3/16"	0.038"	4040	4390	26%
1/8"	0.038"	4040	4420	26%

Contact John at FAI Model Supply for prices and availability.
www.faimodelsupply.com

Carl Bakay

"2 Days in the Hangar – 2002"

Reported by: H. Bruce McCrory

This was my second trip to Everett, Washington's Big Boeing Hangar. I was prepared, with two new planes that would work well in a unique and exciting environment, the assembly building for the World's largest planes. Two would be plenty to fill 11 hours on Saturday and another seven on Sunday. There would be time to fly, between dodging AMA Darts and getting others back into business. I had extra rubber for anxious fliers, all my construction equipment, and extra wood for emergency field repairs.

Saturday came early, and so too, big plumps of white. Snow in the Puget Sound is a rare thrill on the weekend. An inch will paralyze traffic and shut down everything, turning a work day into a holiday. This was not a welcome greeting for a very popular and superbly managed event that had already been postponed by tragedy. But the excitement of hundreds of youngsters beaming the way I had only two years earlier when I launched my first free flight plane was too impelling to cancel for a sloshy forty-mile trip. The main roads were nearly bone dry.

The planes were there, 767's and a new 777 sharing "our" flying space. The crowd was lighter than 2001 but certainly no less eager to fly. Many familiar fliers from Oxbow had parked their tables and gear at the edge of about the biggest open room in the World. A thousand fliers would be dwarfed by the space. I missed several faces of Northwest flying legends I had grown to rely on for guidance. There were many people that I guessed were Everett fliers. We exchanged cards and shared information. And, we flew planes. There was no lack of assistance for young fliers.

A mother of two fliers brought me HER plane, for repair. A beautiful Limited Penny Plane she had built during one of the building seminars. She confided that building one was a lot harder than coaching. If she could start over, she would have six years of experience, instead of a few months.

I spent most of Saturday testing several wing and stabilizer combinations with my new A6 motor stick. I've learned to use tissue sockets and plugins where they count, at prop hub, the wing, boom and trailing edge of the stab. A series of standard dimension connections expands the possibilities of improving flight exponentially. I make a lot of mistakes, flying time is limited and the enjoyment of experimental design bears a price tag with failure written on it. Rule number 1: Use a lot of plugin sockets. They are indispensible for replacing sections and for adjustments.

The day raced by. It was 3pm and I hadn't posted a single flight. A few of us took a break and hiked over to the cafeteria for lunch. Wright Stuff and Science Olympiad fliers were into a round of competitions with no losers. I remembered to cover my box of planes. Several Darts had already tried to land in it. A group of workers was quizzing a student and adult from the second floor mezzanine separating our section from another, just as large. My next flight would be for real.

I wound and backed off to the standard .11 inch ounces of torque for my 720 milligrams of .039" strip of Tan II. Jo Higgins would be the time keeper. "Do you want a short time or a long time?" That's Mrs Higgins. "Long, of course!" I launched south, into the air drift. Planes in their foam cradles will weathercock if able. I knew all my A6 flight characteristics. They struggle to 50' and spin in tight 15' circles as minutes pass. In the Hangar they drift south, in the return air current, toward the United Emirites 777. Gordon Dona, from Minnesota, had just retreived his nocal from the cargo bay. Charlie Higgins intercepted me before I got the table to record flight data.

"Bruce, I can't see your plane. I think it's at the roof and the colors blend." What!!? There, in dim shadows, a natural grey Esaki moth was bouncing off the ceiling at 110 feet, among 20-foot girders and conduit, above the lights and vents. Then it dissapeared. We stopped the clock at 1:42. At their table, Jo quipped "I promised you a long flight. But not like this."

My report to Keith Varnau included column number and section. The crane crew would pick up the A6 later. But Sunday night was after the contest and I had a plane that would take a smaller section motor, and more turns, which meant more duration, and…. And…I needed it to win!

The image of one of his hundreds of kids out on the floor loomed in my mind. Keith's expression reflected my own realization. "Write it down. Here's some paper. Don't worry. We'll get it." I was embarrassed. By the time I reached my table I was laughing. He'd seen it before. The excited panic. Many, many times.

Mine was to be the only plane in two days to get stuck in the girders. There was even an award for that. He got to keep it for a momento and teaching aide for his construction classes. A6-5B could never win a bigger prize. The next one will be an improvement. They always are, for beginners.

Hangar Days is for young people and not so young children. But no way around the matter, I feel young while I fly there and know I will close my table at the end of the event having drunk from the Fountain of Youth and learned more from the experience.

Good flying. hbm

Ranking Contest F1D

1st. and 2nd. June 2002 CargoLifter Hangar Brand – Briesen

A total of 9 F1D pilots used the opportunity to train in the best indoor flying hall, and to qualify for the national F1D-team 2003. Six German "ranking contest" participants were joined by one F1D-novice (Uwe Bundesen) and 2 Hungarians. Additionally, there were 3 participants who only flew F1L, F1M and F1M-L **(Einlagewettbewerb).** Thomas Weimer (freeflight reporter Brandenburg) and the indoor reporter of the freeflight committee, Gerhard Wöbbeking, were contest directors. Access to the CargoLifter hangar on Saturday as well as on Sunday was from 8 a.m. to 8 p.m.

Because of the difficult economical situation of the Cargolifter AG, it took some time before the proposed dates could be confirmed. At the moment the firm has reduced the production activity, but the hall manager will keep his area of responsibility. He confirmed explicitly the dates of 14th and 15th September 2002 for the German Open Nationals. Because indoor fliers never misused the company's trust in them, the CargoLifter Teams abandoned protection with barriers of installations and airships, or by having colleagues guard the scene during the weekend.

This time, the space at the West entrance (probably the best place for us to fly) was reduced because of a balloon secured with ropes – a danger for high flying models. But no F1D got stuck or was damaged. The hall space that remained was nevertheless much bigger than in any other airship hangar in the world.

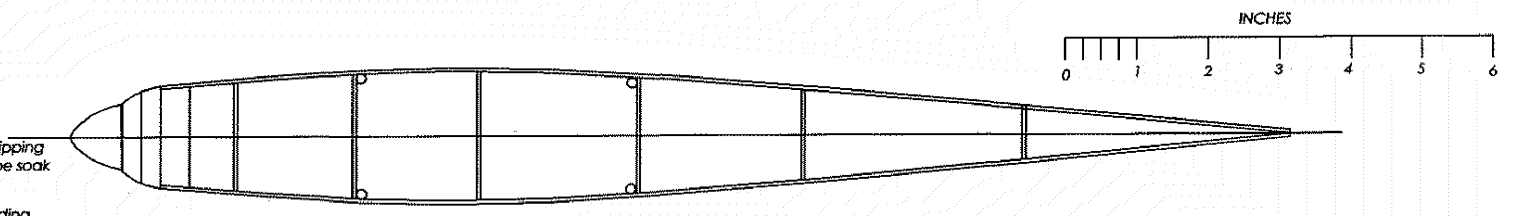
Again, good weather outside provided a good indoor climate. Temperatures inside and out were approximately the same. An unpleasant draft in the morning probably originated from the nocturnal cold, at the Northern side of the hangar however a gusty wind blew. Both days, small drafts remained - they correlated with the prevailing outdoor wind direction during the day (the hall is not totally enclosed). Evenings, models could almost be released from the tables around the steel construction of the west entrance, because it's heat radiation pushed the models in to the hall. Remarkable was the spectacular flight of Dezso Orsovai's F1D model around a small freight balloon high around, encircling it without ever touching it.

Performances were first-class. Peter Kuttler **consolidated** his world record, by flying another 20 seconds longer (35 minutes and 56 seconds). Karl Schönfelder flew with 33 minutes and 41 seconds the second best flight time, but he had to be satisfied with 3rd. place behind Lutz Schramm in the classification. Lutz Schramm's F1D remained in the air for more then 33 minutes during 3 of its flights and the best 2 flights count for the ranking. These three fliers will form the national German 2003 team for this year's World Championships in Romania. Marian Krause, their team manager, became 4th. best German. Both Hungarian fliers outflew their national records considerably. Both Hungarian fliers flew much longer than their current national record. Uwe Bundesen's start in F1D was successful with a best flight of 29 minutes and 9 seconds.

Editor's Note: Many thanks to Gert Brendel of the Netherlands for translating this from German. Several words in boldface do not have an English equivalent. The title, Rangliste translates to Ranking Contest, similar to time trials to establish team standings in America. Einlagewettbewerb is made up of two words, 'payment' and 'contest', and is most likely where one pays on the spot to participate. Enough people can thus fly an event even if it wasn't arranged. By consolidated is meant that Peter already had the record, but now bettered it.

The reference to the reduction of the Cargolifter company is worth commenting on. The hangar and the single construction crane balloon were built on an abandoned Russian fighter base entirely on speculation. It was hoped that advanced orders for Cargolifter blimps would pay for continued growth and expansion to other countries like the U.S.A. This has not happened, and the company's future is in doubt. Gert has also provided us with more details on this. Read on.

1. Model is covered with Japanese tissue
2. Balsa is 6# to 8# wood unless noted
3. Prop blades are cut from large drinking cup
4. Spinner is turned from balsa on .065 mandril
5. Landing gear wire is .015
6. All up weight is 16-24 grams
7. Model is designed to use 1/8" rubber without stripping
8. One coat nitrate dope on fuse tissue to stop tube soak
9. Circle to the right using thrustline adjustments
10. Prop pitch 11" for heavy model, 13" for light
11. Wing may be double or single covered depending on the airframe weight. Keep it light.



model is designed to allow motor changes without CG shift ruining trim.

Noseblock is light balsa with aluminum tube bushing Note down thrust and recessed thrust washer

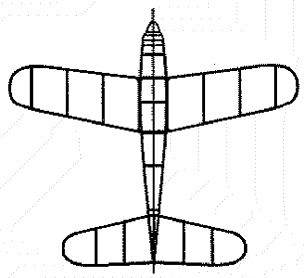
Paper tubes used to mount wing Make tubes with 6+ layers of tissue for strength

Longerons made from .06x.06 hard balsa

Stab slot uncovered to allow pitch adjustment

Fin outline is laminated from three .02X.07 balsa strips

TOP VIEW



Use reverse "S" hook

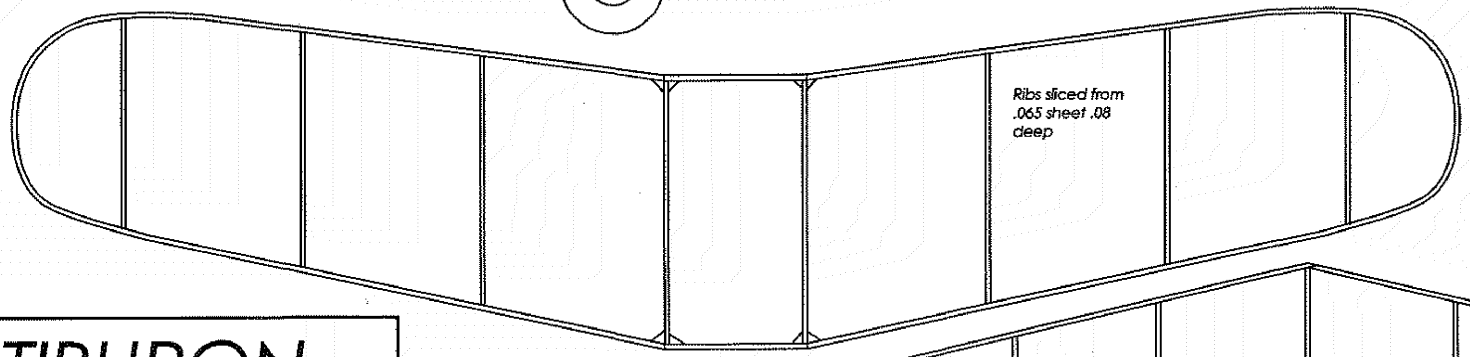
Aluminum tubing .063 OD

Wheels turned from blue foam using a motortool

Wing sweeps forward!

Dihedral is 1.5 inch each tip

Wing leading and trailing edge .08X.10 firm balsa

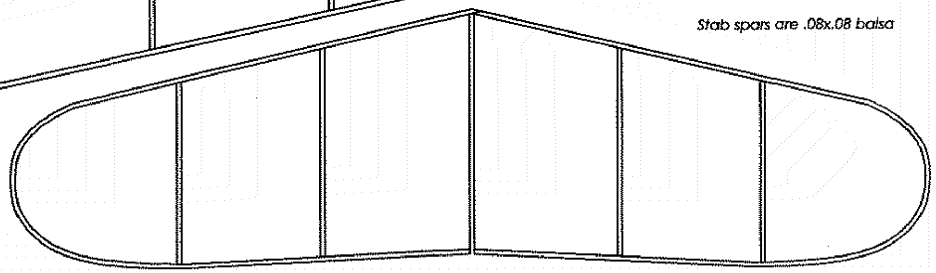


3/32" Wash-in under right wingtip

Ribs sliced from .065 sheet .08 deep

Stab ribs sliced from .065 sheet balsa .08 deep
Stab sweeps back!

Stab spars are .08x.08 balsa



TIBURON

Indoor sport model

Designed and drawn by Steve Gardner

model is a good scale training model teaching prop, wheel, and laminated outline making as well as trimming unusual configurations.

Balsa Testing revisited
by John Taylor, originally printed in the February 1995 Norwind News

In the April 1994 Newsletter I described a method for testing balsa to established quality in terms of stiffness/weight. At that time I suggested that standard 36"x 3" sheets should be cut into four 18"x 1-1/2" in order to localize any variations in density and stiffness. I have subsequently realized that variations that can exist within sheets of this size are still sufficient to invalidate the results. I have therefore completely revised my testing methods using much smaller specimens.

Having experimented with various sizes l have standardised on a nominal size of 12"x .125"x .062". I usually cut nine test pieces from a standard sheet; three from each edge and three from the centre line.
The rig I use is shown in the sketch. The dimensions are not critical unless you choose to use the formulae I use to establish "Stiffness Criterion". You should aim at deflections of 15-20mm. and you will need loads of 1, 2, 4 & 8gm. to cover the most flexible soft wood and the most rigid hard wood. If you use an excessive load on very flexible wood you may find that the specimen becomes torsionally unstable and buckles with a twisting motion. This is more likely if you make the rig longer than shown in the sketch.
Stiffness Criterion

In my previous note the output from the test was "Young's Modulus" E. This was plotted on a graph against density in pounds per cubic foot and an average line drawn. Wood was selected on the basis that its 'E' was above the line. I realized that balsa defined by this average line had 'E' proportional to $(\text{density})^2$. This means that a simple formula can be developed which calculates a "Stiffness Criterion" without plotting a graph.

\The formula is as follows:
"Stiffness Criterion" = $(16 \times b \times W)/(d \times w^2 \times y)$
where:- b = width of specimen in inches
d = depth of specimen in inches
W = load in grams
w = weight of specimen in grams
y = deflection in millimetres
Please excuse the mixed units??

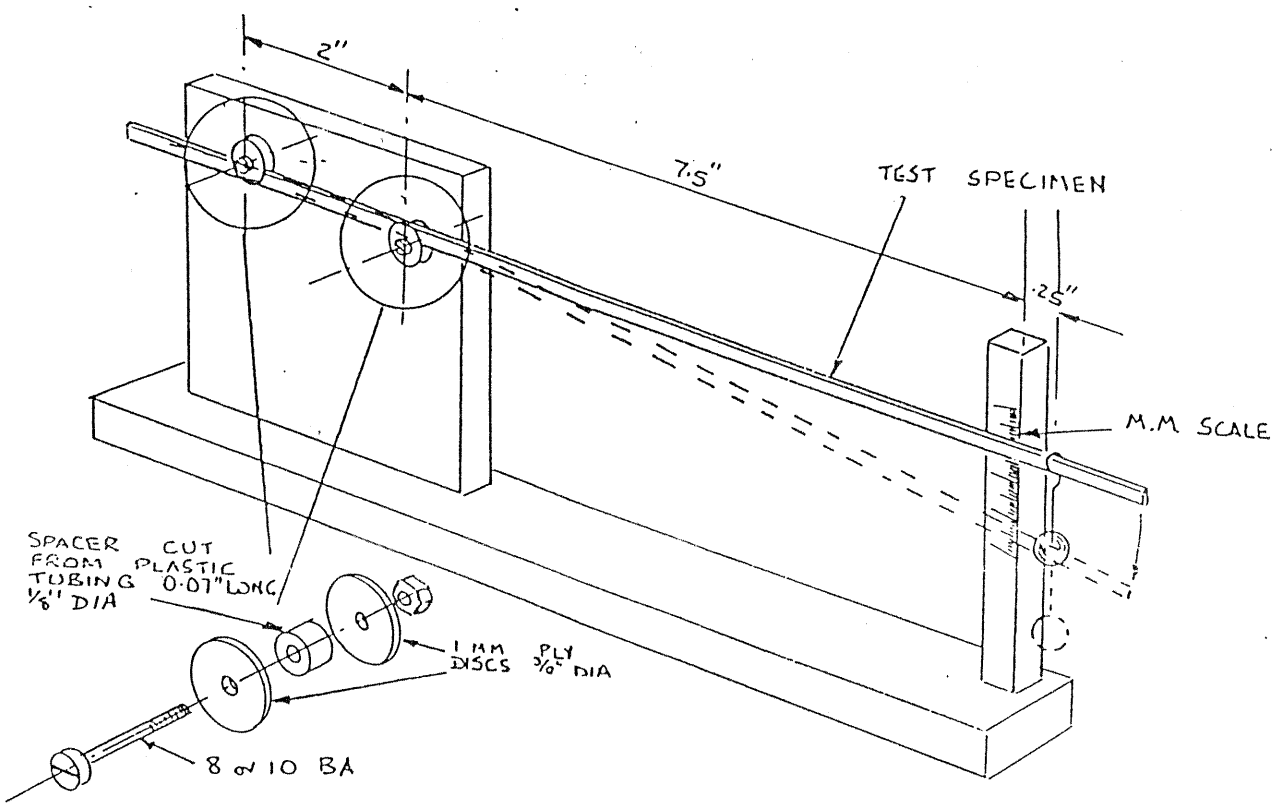
The number 16 is merely a constant chosen so that reasonable good quality wood gives a criterion of 100. The worst wood I have tested produced 48 and the best produced 123. Note this formula only applies for 12" long specimens tested on a rig with the dimensions shown.

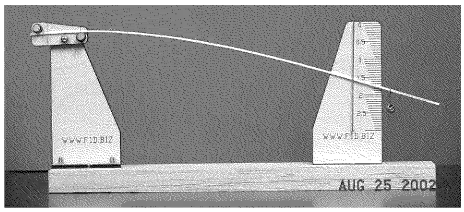
We can also see that:- Density = $(0.317 \times w)/(d \times b)$ lbs / cub ft.

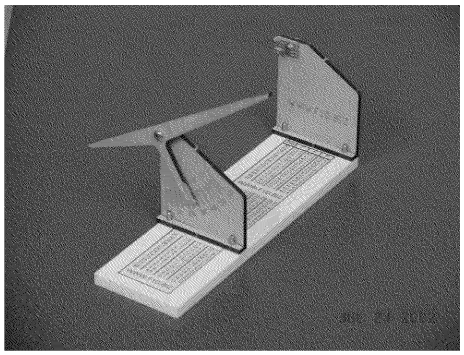
Again for 12" long specimens with b and d measured with a micrometer.
example:- Specimen dimensions:- Length 12"
Width 0.062"
depth 0.125"
Specimen weight 0.14gm.
Applied load 4gm.
Deflection 16mm.
"Stiffness Criterion" = $(16 \times 0.062 \times 4)/(0.125 \times 0.14^2 \times 16) = 101$
Density = $(0.317 \times 0.14)/(0.062 \times .125) = 5.7$ lb/cub ft.
Other Specimen Sizes:
Specimens down to .062"sq. could be tested on the rig as drawn, however, it would be necessary to place a spacer under the support boss remote from the loaded and to ensure that the reading does not go off the scale.

Furthermore, replacing the 0.07" long support spacers by others 0.26" long it would be feasible to test a typical motor stick say, 12"x 0.25"x 0.125" in lateral bending. A load of around 16gm. would be required. It would not be possible to test for longitudinal bending since the deflections would be too small over such a short length.

Designing for minimum weight
Consider two nominal motor sticks each 12"x 0.25"x 0.125"
Stick 'A' 4 lb/cub ft. "Stiffness criterion" 100
Stick 'B' 6 lb/cub ft. "Stiffness Criterion" 120
Stick 'A' weight = 0.394gm., Deflection under 16gm. load = 33mm.
Stick 'B' weight = 0.591gm., Deflection under 16gm, load = 12mm,
If we now 'reduce stick 'B' from 0.25"x 0.125" to 0.204"x 0.102", stick 'B' now weighs 0.394gm. - ie. equal to stick 'A', however, the deflection of the slimmed stick under a 16gm. load is now 27.5mm. - ie. stiffer than stick 'A' at the same weight.
This shows that it is more important to choose wood with a high "Stiffness criterion rather than minimum density.







Brand New Products from www.F1D.biz

We are not just Tru-Weight Indoor Balsa any more!

- Balsa Deflection meter kit US$15.00
- Propeller Pitch Gauge kit US$30.00
  Both tools are laser cut and CNC machined
  Kit assembly takes about 5 minutes after applying a clear finish of your choice.
- Selling the Harlan Bambino Science Olympiad plane kit and the Harlan Spring Scale. Many other new items available.
- Full listing and online ordering at www.F1D.biz
- Catalog available by sending a #10 SASE to:

Tim Goldstein
13096 W. Cross Dr.
Littleton, CO 80127

Product Reviews
By Marty Sasaki

www.F1D.biz Prop Pitch Guage.

My prop pitch guage consisted of some pieces of balsa (too heavy to use for models) held together with a bit of glue and tape. I used a Harlan prop bearing to hold the prop. It made threading the prop onto the guage a pain and I would often use the guage before bending the hook.

The jig was a pain to use, was extremely fragile, and non-portable, but it worked. I couldn't see spending money for something that I could easily make and I was too lazy to make a good guage. Besides, I really didn't like the design of the one inexpensive guage that I knew about.

Tim Goldstein at www.F1D.biz changed that.

Tim has an inexpensive prop pitch guage "kit". Calling it a kit is a little silly though. Assembly consists of finishing the laser cut plywood (a little sanding and applying a clear finish, entirely optional), and screwing the prop shaft holder to one of the plywood uprights and screwing the pointer/indicator to it's upright. The chart that maps the angle of the indicator to the prop pitch is applied to the plastic base.

Ignoring the time it took for the finish to dry, everything was ready to go in 5 minutes. The only tricky thing about this is having a 1/16 inch hex head wrench to tighten the screws.

The plastic base has holes drilled in it which match pins on the uprights. It's a friction fit which makes disassembly and assembly easy. There are three sets of holes so you can set the distance between the prop holder and the indicator at two, four, and six inches.

The guage works really well. The prop shaft holder is quick and easy to use and holds the prop well. The angle of the indicator is easy to set and easy to read. Once you have the angle you look at the chart

for the pitch.

A pitch guage is a tool which is easy to forget about, but being able to set the prop pitch is an important part of maximizing performance of duration models. Tim's pitch guage is a quality tool. Highly recommended.

Ray Harlan's Double Spring Scale

I like simple things that work. This inexpensive spring scale works very well.

First the basics. You hang the item you want to weigh on the end of a wire. The other end of the wire is anchored. The wire bends and you read off the weight from a printed scale. Ray's spring scale is

actually two scales, one goes from 0 to 10 grams and the other goes from 0 to 1 gram.

The problem with most scales of this type is their accuracy. Calibrating this type of scale is usually pretty painful. You start with a set of calibrating weights, hang them in various combinations

on the wire and mark how far the wire bends down.

It's not possible to have a pre-printed scale because the amount the wire bends is very sensitive to it's diameter. Very small changes in diameter will result in noticeable changes in how much the wire will

bend.

Ray has a very clever method to calibrate the scale. The scale comes with two calibration weights, one for each side of the scale, and a set of printed labels. At first glance the labels all look the same, but they are each sligthtly different.

To calibrate you carefully mark the zero point, then you put on the appropriate weight and place a mark there. You then find the label which exactly matches the two marks you have made and you attach this label to the scale.

The scale works very well and could be used for making penny planes or science olympiad models. I use it to make up rubber motors for F1M and F1D (I use the "official" scale to verify the weight before flying).

MAKING CURVED PARTS THE EASY WAY
By "Indoorsman" Joe Kehr (The Joker)

One of the more frustrating building requirements of indoor modeling is making curved wing tips, sabilizers and rudders. When returning to modeling some five or six years ago, I read several articles coving the subject. At that time there seemed to be a lack of information available on curved construction techniques, and what I could find was not very explicit in content. After struggling with suggested carboard templates, tape, pins and a burned up microwave, I decided there must be a better way. This article is about my solution. (It woks for me.)

Some of most esthetically beautiful film covered models and the majority of scale models have curved wing tips, stabilizers and rudders. Technically I'm told curved tips have something to do with aerodynamics that fool the model into reacting as though it has larger flying surfaces than it does. Of course you know that a curved wing tip is stronger (and lighter –ed) than a square one (unless your name is Bernard Hunt.) Well, I found out the hard way that cardboard templates get wet, warped and mushy, tape gets sticky and messy when exposed to heat, pins crease the wood causing a curve to become a hexagon, and a microwave will set a balsa template on fire. (All the rationale you can muster will fail to convince your wife or mumzie that you are <u>not</u> stupid.) There is a better way. I have developed a method that is almost poainless and even fun when you find out how easy it can really be to make curved outlines.

First; I study the plans and map out all of the curved parts and figure in overkill, so that when the wood (being curved) relaxes after you remove it from the form will come back to the plan shape. This is really guess work because of various wood densities and cellular differences. Second; I cut a $^{3}/_{8}$ or ¼" rectangular plywood base about 1 inch larger than the curved outline requires. Third; I use $^{1}/_{8}$, $^{3}/_{16}$ or ¼" balsa sheet to cut the calculated overkill curve size required for the part being formed. It is important to eliminate any sharp creases along the edge, as this will tend to break the surface of the spar being formed. They can't be salvaged and should be tossed. I use my disc/belt sander to get as smooth, 90 degree edge. This is the surface on which you form your curved parts.

Once shaped, the sheet balsa form is glued to the plywood base. Only use cellulose glue or one that will not soften on contact with water. (CA will work) Now we are coming to the most important part…WEDGES. You cut two wedge shapes as in Figure 1, that's two for each end of the curve. One is glued to the base in a position that will tighten on the spar when pulled. This is marked as A-1. Mark its wedge as A-2. Repeat on the other end and label as B-1. Mark the wedge as B-2. Glue B-1 to the base so that B-2 tightens against the pull of the spar being baked. Now you are ready to test your skill.

I generally let the wood soak overnight in a solution of water treated with a softener such as granular diswasher soap. I keep this mixture in a plastic milk carton that's handy in the workshop. My soak tank is nothing more than two 1" x 1" x 30" pieces of wood glued together with a 1" x 2" x 2" spacer at each end. Using aluminum foil I form a tank inside the slot. When you've finished your project, the water is easily diposed of. Dumping it on the floor is not cool.

Now, take the soaked spars from your clever tank – insert them in the slot formed by A-1. Move the wedge, A-2 into place and gently tighten. (It is a good idea to make your form longer than you need because the wedge will sometimes flatten the end.) Mark the spars (ala Larry Coslick) so that you don't inadvertently twist it as you pull it into shape. This also helps to keep track of which surface you want on the outside, top or bottom. Which brings up another, rather important, sometimes controversial subject which could lead to fist fights and brawling.

Generally speaking, I pull my spars around the form. This is easily done by turning the plywood base with one hand and applying a gentle pull with the other. If you hesitate, cough or giggle, you'll probably induce

a break point in the spar and it won't be useable. Some indoorsmen push the spar around the form and thus eliminate any pulling problems.

Set the wedge B-2 to hold your spars in place while they are baking in the oven, not your microwave. Check and make sure the spar has not crawled up on the form. If it has, relax the tension slightly and use a ¼" x 1/16" x 1" stick to urge them in place. (fingernails are only used to scratch your head.) Set the oven temperature for 215° and bake for 15 to 20 minutes.

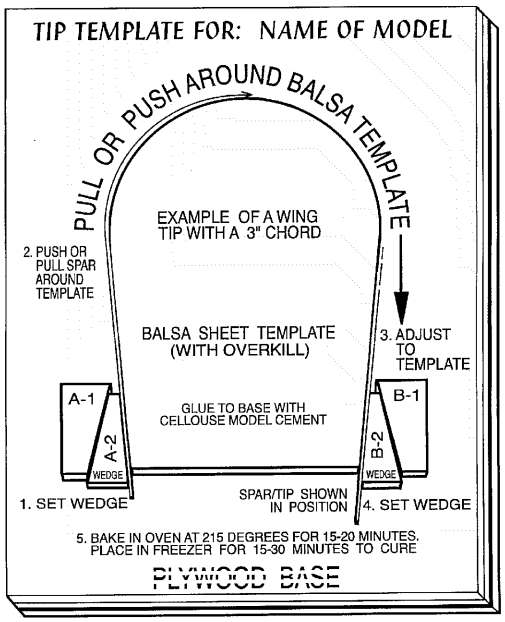


FIG 1. MAKING CURVED PARTS THE EASY WAY

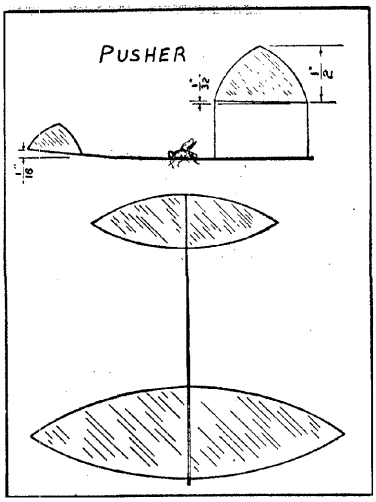
It is a good idea to make two spars at a time so you'll have a matched set from the same piece of balsa. Pay attention to your marks on the wood so you'll get the grain and size the same. Don't use a pen with water soluble ink. Bad!

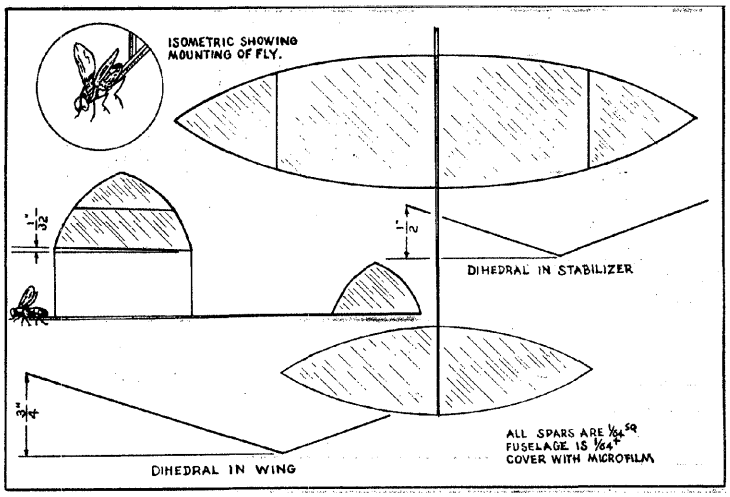
After baking I place the whole shebang in the freezer to cool and cure. In 20 or 30 minutes they'll come out the same as if dumped overnight on your workbench, Gently remove the wedges. If you find them sticking to the spar(s) carefully move them up and down and they'll separate. Making several sets at a time will cover future breakage, and since you're having so much fun, you'll have a big time doing it (I have hundreds.) When you cut your wood to a specific size, they look a little larger after being soaked and baked, because they are. Don't fret, they swell a little. Trim to plan size and you're in business. Use a pen to label the form, and be sure to include the wedges when you file it away. Now go find your wife or mumzie and show them how smart you are with all your perfectly formed wings, stabs and rudders.

Hey! Is something burning?

Fly Powered Models from an early INAV

At least twice in past history (so I'm told), M.A.N. has had articles on microfilm models which were powered by flies. Apparently any kind of fly is satisfactory, as long as it is an active specimen. The drawings shown here have been reproduced from the August 1940 M.A.N., and the article was "Models On The Fly" by William B. Schwab and Joe Elgin. Model construction is conventional and the author suggests that test glides be made with an inactive fly or a 1/8" cube of balsa as weight. The flies are glued in place, but it probably would be a good idea to limit the amount of glue. I have noted that some modern thinners and solvents are effective insecticides when in contact with the varmint and glue might be too. Thanks to Edgar Seay for the loan of the magazine.





Greetings all.

I can't help but add some personal comments to recent stuff about changes to the F1D rules. When contemplating a return to duration flying after a 14-year lapse, I was initially very skeptical about the rule changes which I thought would de-stroy the class completely. I went to Cardington, saw the first UK models built to the new specs and decided to have a go anyway. After 2 years of building and flying to the new rules I have changed my mind for a variety of reasons.

The changes have revitalized the class, certainly in the UK and also from recent observations, in some other parts of Europe. Indoor duration modellers and others from different areas of our sport are not so daunted by the prospect of at least having a go at F1D. the class is seen as being more accessible.

These models are easier to build and handle than 65 cm aeroplanes. Wood selection is not so critical for most parts and the advent of Y2K2 and the availability of boron make covering/assembly/handling/repairing and flying far, far easier. I don't understand why some find it difficult to use Y2K2 - it is so much more durable than microfilm and doesn't need such lengthy and arcane strategies to produce good sheets - you just unroll it, stick it to the covering frame and get on with it. On Saturday, I hung an unbraced F1D across a girder, right at the top of the shed and eventually managed to balloon it down. The retrieval and subsequent aerobatics would have shredded an old braced, microfilm covered model but with 2 drops of cyano and a small patch, the model was ready to fly again half an hour later. Only the flexibility of the flying surfaces and toughness of the covering made this possible. Bracing microfilm models was often cited as one of the most difficult of skills and one that put many people off.

The limit of 0.6 grams of rubber has taken out some of the guesswork regarding rubber sizes. Everyone has the same amount of rubber and it is hardly arduous to process motors, you just hang them on a scale or stick them in a pan! This has changed the way we use a motor and the energy it contains. We now wind harder and back off less, attempting to get everything we can from a piece of rubber. VP props or other similar devicesare necessary for most sites, but they were before anyway and the use of these devices has become commonplace in recent years, not just in F1D, but in other classes too. VP props and smaller models allow meaningful competitions in low ceiling halls.

The rubber limit has also reduced the flight times and this must surely be a sensible thing. The availability of really high sites is diminishing, both in the USA and elsewhere. As I understand it (and please correct me if I'm wrong,) the only truly high American venue that is used regularly is Lakehurst. Yes, in the UK we do still have Cardington and the salt mine is still in use in Eastern Europe. The German 'Cargo lifter' hanger will host a meeting in September and hopefully the Eurochamps in 2003, but as the company is in financial trouble, this may be in doubt. If the rubber weight restriction were removed, the times would soon be back where they were a few years ago and in high sites, models would spend much longer at high altitude and therefore be in danger of hanging up. High altitude steering

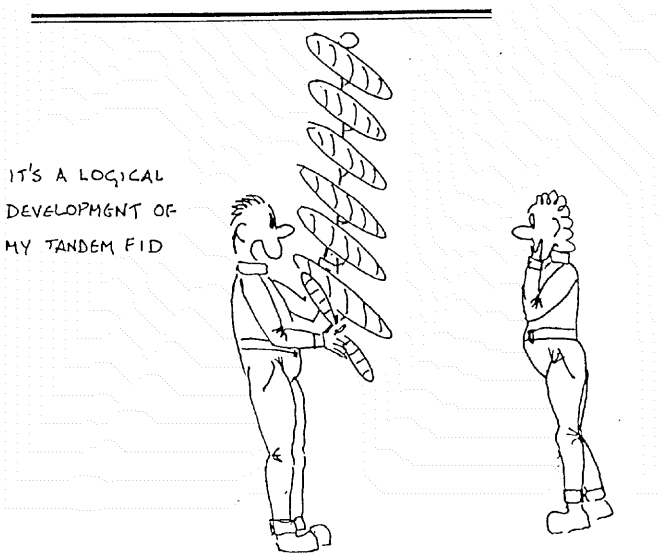
ability would become more important, but there would be little opportunity to practice it. Even with only 0.6 grams of rubber, it probably won't be too many years before 40 minutes is reached.

I believe that the new rules should be seen in totality as a challenge, not a hindrance. Changing the rules has meant that new strategies and techniques are necessary for top performance. In the UK (and I'm sure, elsewhere,) a lot of innovative thought and experimentation is taking place to make the most of the opportunities that the rule changes have given.

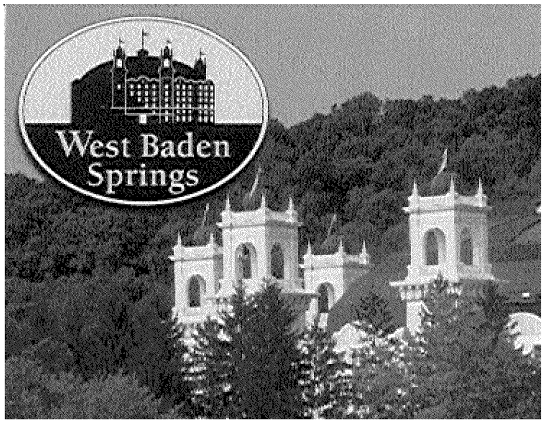
I seem to have written a book. Oh well, I'll wait for the attempts to shoot

everything I've said down in flames.

Nick Aikman



(reprinted from Norwind News)



GREAT INDOOR SITES

PART I

West Baden Springs, Indiana

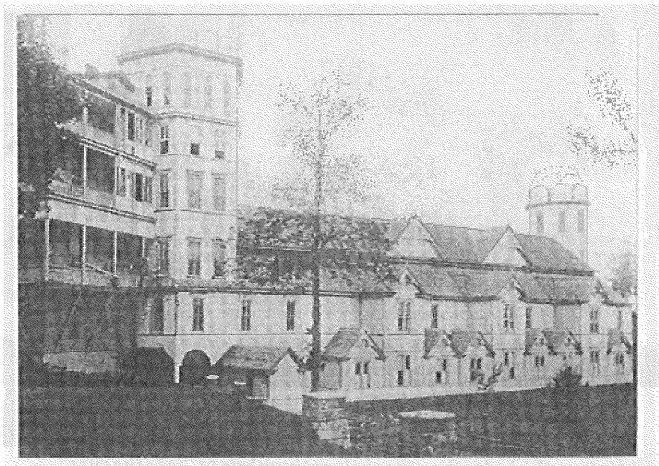
By Carl Bakay

This is the first in a series of articles that will relate the history of the best indoor flying sites in the world. We start off with a tale of Orange County, Indiana. The weekend of August 3-4 was my first ever foray into this remote resort area of southern Indiana. It came about largely from a comment by Walt Van Gorder, who told me, "Come and fly, or don't fly, but don't miss the experience." He was right. It was quite a weekend. You see, going to the resort town of West Baden Springs is really a two-for-the-price-of-one deal. Only one mile south is the impressive French Lick Hotel, spa and resort, and the two are connected in history as well as geography.

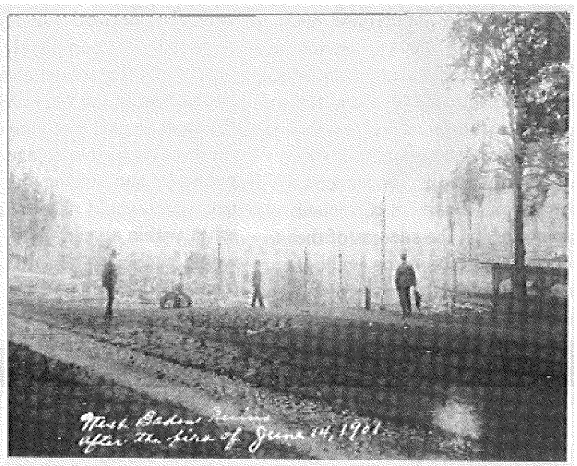
For thousands of years before the pioneers came, herds of buffalo made a yearly migration from the western plains to the falls of Ohio. The salt deposits from the evaporating mineral springs made south Indiana a natural stopping point for these animals, and another treat was wallowing in the cool, muddy marshes that dotted the area. Indians followed the buffalo, then French trappers came for the furs, and were the first to write of the area's existence, hence the name "French Lick". This natural trail made by the buffalo was a perfect route for the wagon trains to follow on their trek west, and today it is paved Route 150 called the Buffalo Trace.

One of the early settlers in Orange County, Indiana was Dr. William Bowles. He saw economic potential in the area, bought a number of acres for $1.25 each, and built the French Lick House in 1845. In 1846 we declared war on Mexico, and Dr. Bowles was quick to join up, leasing the hotel to a certain John Lane during his absence. Returning from the war, William and John had words, and a rivalry sprang up that would define the area for generations to come. John Lane moved a mile down the creek, where there were also springs, and established his own Mile Lick Inn in 1852. Feeling that this name didn't have the right ring to it, he changed it to West Baden, after the already famous springs in Weisbaden, Germany. As the rest of the century progressed, William and John kept trying to outdo each other in hotel size and attractions, and to lure more tourists to "take the waters" during the spring and summer "watering season". Indiana winters were bitter, and the hotels were not heated.

The ownership of the property passed through the hands of a number of partners in the late 1800's, and a Col. Lee Sinclair emerged as the sole stockholder. Under Col. Sinclair's guidance, the hotel flourished with the addition of an opera house, gymnasium, casino, swimming pool, and a bottling works to sell the spring water across the land. He called it Sprudel Water, again taking the German name for spring. Attendance really grew with the extension of a railroad to the valley in 1887, bringing up to 14 trains a day the year round. Then in June of 1901, a fire started at 1 am in the kitchen of the West Baden Springs hotel, and quickly spread throughout the all-wood structure, burning the resort to the ground within an hour. There were no injuries or loss of life, but the hotel was a total loss.



The orginal hotel after Sinclair began improvements



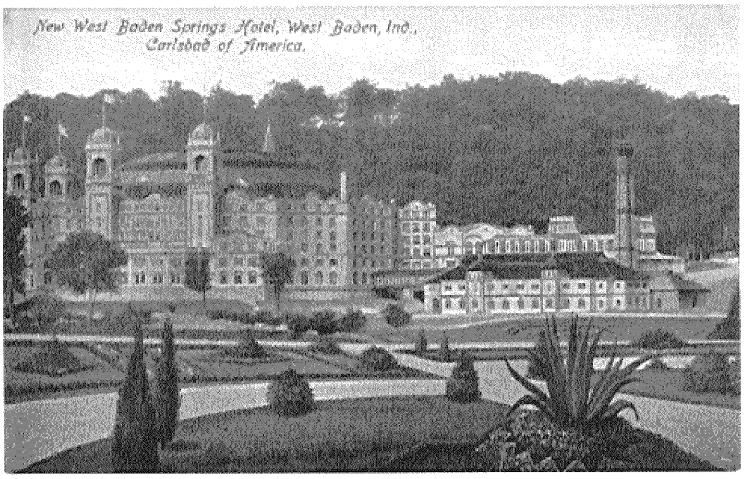
Only ashes remain after the great 1901 fire

The French Lick Springs Hotel at this time was owned by a Thomas J. Taggert, who seized upon the Colonel's misfortune to announce a major expansion at *his* resort. But rather than give up and retire at the age of seventy, Mr. Sinclair released to the press his intention to construct a new, larger, and completely fireproof hotel. Not only that, but it was to be completed within a year of the date of the fire. You see, these two gentlemen were as fierce rivals as William Bowles and John Lane a half century earlier, and if the Colonel could pull this off, it would be the architectural coup of the century.

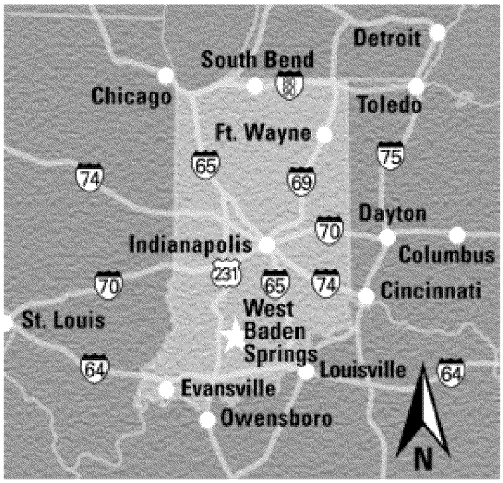
There was nothing impossible about his plans for an all-brick, six storey hotel, but Sinclair also envisioned a 200 foot domed atrium in the center, unsupported by pillars. A steady stream of architects told the old man what a visionary he was and how pleased they were to meet with him, but that his demands were ridiculous - such a structure could not be built. Then he found a young, unproven architect from West Virginia who agreed to the challenge. This young fellow was named Harrison Albright, and he wisely subcontracted a bridge engineer to design a 200-foot steel span, which for a bridge builder is a piece of cake. The finished dome would consist of six bridges arranged in a circle. To allow for the extreme temperature changes of the Indiana seasons, which could be fifty degrees a day, the trusses would not be fastened to columns, but sit on a series of rollers to allow movement.

The building was completed in a little over 270 days. It was an octahedron with six floors of inside rooms facing the perfect circle of the atrium in the center. It had 708 guest rooms (compared to Taggert's measly 610 rooms at French Lick), each of which had its own bath, hot and cold running water, steam heat and Edison electric lights. The finished hotel opened to the public on September 1, 1902. It was called "the Eighth Wonder of the World" and the guest list read like a Who's Who of the rich and famous. The prosperous times lasted all through the Roaring Twenties, up until the day of the stock market crash of 1929. The day after that, with family fortunes wiped out overnight, the hotel stood empty. To save it from decay, it was sold to the Jesuits in 1934 for one dollar for use as a seminary. They stayed for 30 years, until the cost of maintaining the building, plus falling enrollment forced them to close the seminary in 1964.

Fortunately for the modeling community, the next tenant was the Northwood Institute, a private college based in Midland, Michigan. They offered degrees in business, hotel management, and the culinary arts, among other things. The first indoor meet was held in the atrium in 1976, thanks to Buckey Servaites, the main contact with the Institute, and Doc Martin who did all the paperwork and publicity. West Baden proved to be an excellent Cat. III flying site, just about four to six inches shy of Category IV. Not only was the flying a great success, but the culinary arts students provided an evening gourmet banquet in the dining hall, and even insisted on taking leftovers to determined flyers still in the atrium.



A Hand-Colored Postcard Shows the Resort in It's Heyday



Off the Beaten Path, But Centrally Located

Our luck held in keeping this site for eight years. They proved to be glory days for the indoor hobby, recovering from previous years at the Lake Charles Civic Center in Lousiana. The atrium saw the likes of Jim Richmond and Bob Randolph, Erv Rodemsky, Stan Chilton, Wally Miller, Roy White, and on and on. They will tell you it was, and still is, some of "the best air" you will ever find. The lavish banquet turned out to be a one time deal, but there was still a lot the area had to offer. The steam train still ran for visitors on a ten-mile track, French Lick still offered a host of spa amenities and a world-class restaurant. Then there were antique markets in Paoli, and German beer festivals in nearby Jasper. Just walking around the grounds and taking pictures would involve a half day at the least.

But the Northwood Institute, like the Jesuits before them, could not afford the staggering cost of upkeep, and closed their doors at the end of 1983. This turned out to be good for the Nationals in the long run, because after one year each in Detroit, Niagara Falls, and Lake Charles, the organizers secured the wonderful East Tennessee State Mini Dome in Johnson City in 1987, where we still fly the Nationals today. However, it was a sad time for the West Baden resort, which would sit vacant for ten years of neglect. Conditions became so bad that a hundred foot section of the outer wall collapsed in a pile of rubble from freezing water and a weak foundation. Structural analysis of the cement slab found sections that were hastily poured on poorly compacted soil, with compressive strengths less than 1500 psi. One engineer commented, "You wouldn't pour a sidewalk today with less than 3000 psi."

In 1996 the Historic Landmarks Foundation bought the building for $250,000, and with additional financial backing from preservationists William and Gayle Cook, began the long process of restoration. Photos in this issue and #104 attest to their success. While the inner atrium and outer walls were still cluttered with scaffolding and artisans, and the grounds covered with volunteers replanting the gardens, Walt Van Gorder met with William and Gayle, and son Carl, and proceeded to do a flying demonstration in the crowded atrium. He later met with Tina Conners and her assistant, Andrea Hill of the Foundation to see about securing the site again. The deal was struck, and on August 11 to 12, 2001, we were invited to put on an AMA sanctioned Fly Me To The Moon. Dave Thomson was the CD. It was a grand homecoming, especially for veterans like Walt and others who began indoor in the 1970's, and perfected their craft over the years in that magical space.

We were invited back for August 3 to 4 this year, and I was fortunate enough to be there. About 25 contestants set 14 records or more, and even yours truly broke ten minutes in F1L for the first time. Maybe you remember the day you did the same thing. As far as we know, there will be a meet next year. I hope there will be many more.

UPCOMING CONTEST CALENDAR

Fifth Annual Empier State Indoor Championship, Sept 21-22, 2002. Contest site is the Ralph C. Wilson Jr. Fieldhouse, near Orchard Park, New York. Co-sponsored by WNYFFS and FAC.
Saturday: F1D, EZB, LPP, FAC Dime Scale, No-Cal Scale, combined Thompson Greve Race.
Sunday: Int. Stick, MiniStick, Open PP, Cat Glider, Electric Endurance, FAC Scale, Peanut, Golden Age, Power scale, WWII Combat, Modern Civil Production Mass Launch.
CD: Vern Thomas, 970 Clarkson-Parma Town Line Road, Hilton, NY 14468. (585) 392-5164 or e-mail vthomas@rochester.rr.com.

Wichita BEAMS 3rd Annual Free-Flight Championship Wichita, KS
October 19, 2002 Awards will be given for first and second place.
EZB; Limited Pennyplane; F1D;5gm ROG; OT Wakefield No-Cal; FAC No-Cal Scale, 7gm Bostonian; Peanut Scale
CD: Lauren Rezac
lauren.j.rezac@boeing.com
(316)526-5304

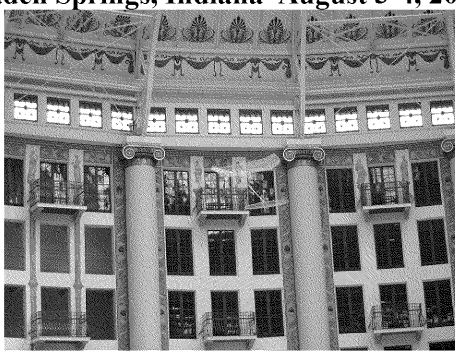
International Contest Calendar

Thanks to Gert Brendel, Indoor Flight International

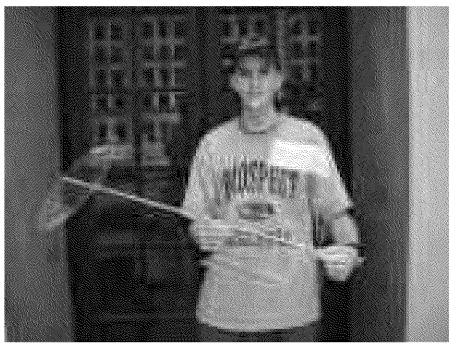
What & When	Where	Info
Coppa Citta dio Anzio 10-11.08.2002	Italy	F1D Contact P.Vittori at 0039/06558 4817
Cardington Indoor Contest 11.8.2002	Cardington, UK	F1L & No-Cal
Flemalle International Contest 22-25.8.2002	Flemalle, Belgium	F1M, F1D, F1L (ezb), Micro 35, Saint Formula (+3gr), Bostonian (Juniors), F4D, F4E, F4F and Pistachio. Contact: Bernard Delhalle, email: Bernarddelhalle@skynet.be
BMFA Indoor Duration Nats 24-26.8.2002	Cardington, UK	Program: Friday 24th: Practise/ LPP & No-Cal & Catapult Glider Saturday 25th: F1L & F1M Sunday 26th: F1D & Mini-Stick
Interscale 2002 6-8.9.2002	Prostejov, Cz. Republic	Open Indoor Scale F/F. Contact: Ing. Tonda Alfery, email: alfery@cbox.cz
Cardington Indoor Contest 8.9.2002	Cardington, UK	F1L & No-Cal
German Open Championships 14-15.9.2002	CargoLifter, Brand, Germany	German Open Nationals in all FAI Classes. Contact Gerhard Woebbeking at woebbeking@t-online.de for more details
Cardington Indoor Contest 22.9.2002	Cardington, UK	General reserve date
Indoor World Championships F1D 7-12.10.2002	Romania	Indoor World Championships F1D, Seniors and Junior. Contact: Zanciu Mihail, Str. Parcul Tineretului camera 210, Bucuresti, Sector 4, Romania, tel: +40 1 330 40 40 ext 224, fax: +40 1 330 40 40 ext 224, email: frm@radiotel.ro
Butterfly Meeting 2.11.2002	J.Massinkhal Nijmegen, The Netherlands	F1M
Baden-Württembergische Saalflug-Meisterschaft 10.11.2002	Schorndorf-Schornbach, Germany	F1M contest, F1M-x, Ministick Contact Roland Braun, tel. 07181/23650, or Bernhard Schwendel at BeSchwende@aol.com

Fly Me To The Moon
West Baden Springs, Indiana August 3-4, 2002

West Baden from the Front Lawn on a Very Hot Weekend

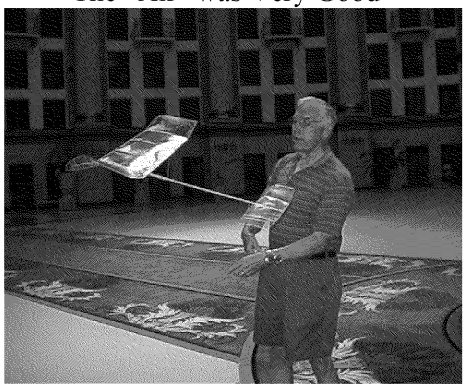


Can You See, The F1D? The "Air" was Very Good

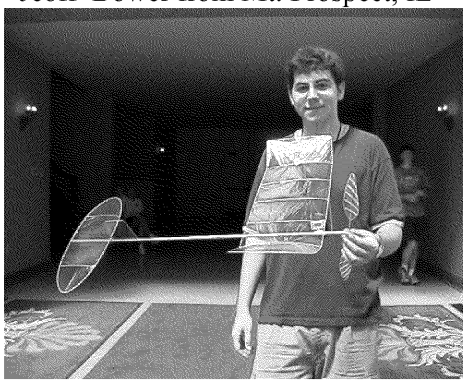


Aeronautical Engineering Student Jeoff Bower from Mt. Prospect, IL

Penny Plane was the Popular Event

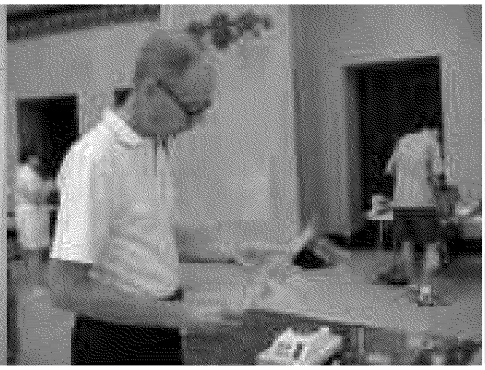


Jim Richmond Launches for a Record



Ben Saks Looks Happy with His F1D

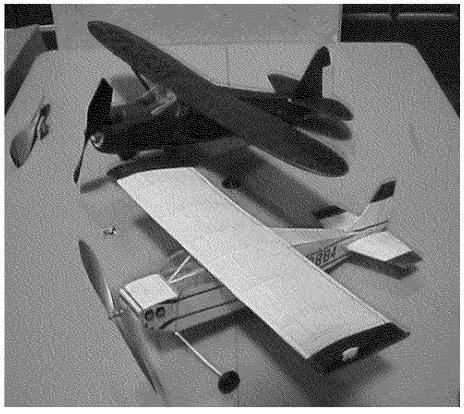
A Partial List of Records Set



Walt Van Gorder

I Stayed in an Ideal Bed & Breakfast

The Fountains and Grounds Have Been Restored by Volunteers



Scale was in Evidence on Saturday

KIBBIE DOME ANNUAL
MOSCOW, IDAHO JULY 27-30, 2002
Report by John Lenderman

We arrived at Moscow the day before the competition began, and upon entering the dome, we found workers trying to take down the plastic sheets covering the scoreboard in the center of the dome. The sheets hung down more than halfway to the floor, and would present a hazard to any model in that area. The scoreboard was supposed to be higher up towards the roof and our organizer and contest director, Andrew Tagliafico, was working diligently to have it done properly. It was later in the afternoon that it was finally corrected, but the plastic sheets still hung down ninety feet from the floor. I observed several models that hit the plastic near the ceiling, and they just slid down to the bottom of the sheet and fell off, sometimes recovering, and continuing to fly, but losing considerable time off the flight. The two nets across the top of the building appeared to be higher this year, but still managed to snag quite a few of the models. Fortunately the net was able to be lowered occasionally, and the models retrieved mostly intact.

The outer roof of the dome had been recovered in the past year, and this apparently alleviated the jet stream which had plagued us in the past. We had gusty winds outside for several days, and this resulted in some wandering flights, but nothing like the jet stream that took you from one end of the building to the other during the flight. Conditions during the flying times were varied, with some dead spots, and then a period of buoyant air that lasted several hours.

Visiting this year for the first time was a group of flyers from Kansas: Gary Hodson , Emil Schutzel, and Tem Johnson, They were the busiest guys I had ever seen, and all during the competition they were testing, cutting rubber, stretching rubber motors, and occasionally doing some repairs. This dedication really paid off, as Gary set a site record in the A-6 event of 10:07, which I believe is the first over 10 minute flight in that event. This group was quite friendly, and willingly shared any information that was asked of them. Stan Chilton, of Wichita, Kansas, also set a site record in the Mini-stick event. His flight of 13:14 was a scary one, with the model being very close to the ceiling a good part of the flight, and drifted a bit to the side. Stan showed us his winder, which had an enclosed attachment of electronics and a nine volt battery, that registered the turns on a reader next to his torque meter. Quite ingenious.

There were several new modelers at the dome, and all were impressed with the site. John Lovins, of Denver, came with his father, who is not a modeler, but came to support John, and appeared to enjoy himself. It was heartening to see the turnout of F1D flyers. There were eleven entries, and all flew very well. Among them were two who were new to the event, and had their models doing well. Chris Borland, who built his F1D in three days, and Bruce McCrory, were new flyers in that event, and I observed them making good flights. Jake Palmer, who was a National Record holder in Limited Pennyplane, had a beautiful model that had great potential, but was not in the top three places.

There was a good turnout of F1L models, and most of the flyers had figured out the secrets to make them fly well. During the meet, the management of the dome had someone up on the top to try and find some of the models which had gone over the tiles and stayed there over the years. There were around fifteen models which were recovered. Some of them in good shape, and others which were damaged. Andrew Tagliafico got his back intact, and began flying it again this year. It was his new design Mini-stick. Wouldn't you know it--he put it right back over the tiles during the last day of flying. We noticed that both Limited Pennyplane and regular Pennyplane entries were down this year. Perhaps one of the reasons was the Dona family not attending, due to the recent passing of Doc Dona., the father and grandfather of that clan.

It was good to see Jim Richmond there, and as usual, he went about his business quietly, putting up two excellent flights, one of which was over 30 minutes. He truly reflects the mark of a champion, with his attention to details, and calling on his past experiences. It was also nice to see Earl Hoffman

and his daughter; Earl had some very good flights, and he shows no signs of slowing down. There was some talk during the flying days, and some suggestions about having this competition for five days instead of four, or having an additional day for a fun fly. Andrew said he would take that into consideration, and perhaps discuss this during the next year. Darryl Stevens brought his two young daughters to the meet, and they behaved quite well. They said they would like to come back again next year. Wally Miller flew into Spokane with his model box, and told of the inspections he went through at the airports. He carries seven or eight models in his box, and it is red in color. At both inspection points, they made him take the lid off the box, and were amazed at what was inside. He had sent his tools ahead to Ed Berray, so they wouldn't have :to go through inspection.

During the competition there were quite a few spectators that wandered in, and you could see from the expression on their faces that it was something they hadn't seen before. Some asked quite a few questions, and the modelers answered them patiently. There was some talk about a possible indoor symposium at the meeting next year at the dome. We 'll have to wait and see what happens. Chris Borland began using the Caesar Banks wing on his Science Olympiad model, and increased his flight times by quite a bit. He stated that wing takes less rubber, and floats quite well. He proved that this year, because he turned in a fantastic flight of 6:25, coming down dead stick from about 20 feet. Chris also used that wing section on his Limited Penny, and EZB models, and experienced improved times in both classes.

The A-6 event has seen a few new developments that help improve flight times. One of the problems that vexed the flyers was the rubber bunching around either the prop shaft or the rear hook. The Kansas group tried rutting small portions of soda straws or shrink tubing on the motor at those critical spots and it seemed to help with that pesky problem. They collect straws from the fast food places, and try them out for size. The dome was open to 8 P.M. each night, and quite a few opted to stay and fly until that time.

The Flying Aces group were there, and did quite a bit of flying. Dave Haught, who is the leader of that group, had a four motored B-17, which was beautifully detailed in such a way that it had the appearance of being real. F1D had eleven entries, and Jim Richmond won with two flights of 25:59 and 31:54. It was real nice to see how well all these competitors flew. They work very well as a group, helping each other, and discussing problems. As mentioned previously, Mini stick was won by Stan Chilton, with an exceptional flight of 13:14. This is the first over 13 minutes in the dome. Andrew Tagliafico was second with a very nice 12:35 on his new design. A-6 was dominated by the Kansas group, including Stan Chilton. However, Gary Hodson put up a great flight of 10:07, after working for 3 days on rubber and prop combinations. Stan tried very hard, and came up a bit short with his 9:46. Emil Schutzel also had an excellent flight of 9:44. All these models had really good flight patterns and were quite stable.

Limited Pennyplane found the Thrush again showing good flight characteristics, for a decent time of 15:32. Wally Miller flow a Thrush also, and put up his best ever time of 14:21. Wally really works hard at improving his models, and does a great job of building, with no flaws. Chris Borland, using the Banks wing, had his best ever time of 14:11. He is not afraid to try new ideas. Andrew Tagliafico Flew early, and set the pace in EZB with a graceful flight of 26:15. In second, with a 26:01, was John Lenderman, with a flight that was almost into the east wall several times, but worked its way out. Wally Miller, flying his .5 gram model, was third with 24:55. The F1L, or 1.2 EZB was won by Wally Miller, the originator of the event, with two great flights of 22:02.5 and 22:15, for a total of 44:17.5. In second was John Lenderman with 42:59, and third was Jerry Powell, last years winner, with 41:17. The Intermediate stick event was dominated by Stan Chilton, with an outstanding flight of 37:01. Jake Palmer, flying again after taking time for college and finding work, is back again, and flying well. He was second with a good 30:29, and Earl Hoffman was third with 24:10.

AMA stick was won by Herb Robbins, with a beautiful flight of 41:47, and again Earl Hoffman flew to second place with a 24:10. P-24 had only four entries, and Ed Berray won with a nice flight of 6:04. Tem Johnson was: in second place with a 4:23. A-R.O.G. was a battle between Andrew Tagliafico and Ed Berray, with Andrew topping Ed with a 17:27 to Ed's 16:48. Both models were beautifully constructed, and flew very well. In the regular Pennyplane event, John Lenderman flew his Thrush plus 10 for a very nice, steady flight of 17:07. Second was Jon Sayre, flying a pretty biplane for 13:25.

In Bostonian, Emil Schutzel flew steadily for two days, and improved his times on each flight, ending up with a pretty 5:13.4. 1 would guess that Emil flew at least 18 or more flights in practice. The format of this competition encourages that, so if you like to fly lots of flights with no restrictions, come to Kibbie Dome next year! Jerry Powell had a good 3:59.6 with his Yrekan for second place. Science Olympiad was won by Chris Borland with an outstanding flight of 6:25, using the Banks wing. Std. Catapult was a battle between Ed Betray and Tem Johnson, with Tem winning by a little more than 2 seconds. Hand Launch glider was won by Jon Sayre with a 155.02 total of two flights. Unlimited catapult was won by Tem Johnson, after the flight time calculator, (me) added the scores incorrectly. Ed Berray was again second. Jon Sayre easily won the Ornithopter event with a graceful flight of 8:20 and Emil Schutzel won the Manhattan event with a very high time of 11:06. His model does very well.

Here are the complete results.

* Site Record

F1D (2 Flights)

1. Jim Richmond 57:53
2. Herb Bobbins 54:52
3. Tim Goldstein 53:36

MINI-STICK

1, Stan Chilton 13:14*
2. Andrew Tagliafico 12:35
3. Wally Miller 12:17

A-6

1. Gary Hodson 10:07*
2. Stan Chilton 9:46
3. Emil Schutzel 9:44

LIMITED PENNYPLANE

1, John Lenderman 15:32
2. Wally Miller 14:11
3. Chris Borland 14:11

EZB

1. Andrew Tagliafico 26:15
2. John Lenderman 26:01
3. Wally Miller 24:55

F1L 1.2 EZB (2 flights)

1. Wally Miller 44:17.5
2. John Lenderman 42:59
3. Jerry Powell 41:17

INTERMEDIATE STICK

1. Stan Chilton 37:01
2. J ake Palmer 30:29
3. Earl Hof fman 24:10

AMA STICK

1. Herb Robbins 41:47
2. Earl Hoffman 24:10

P-24

1. Ed Betray 6:04
2. Tem Johnson 4;23
3. Dave Haught 4:11

A R.O.G

1. Andrew Tagliafico 17:27
2. Ed Berray 16:48
3. John Lenderman 11:47

PENNYPLANE

1. John Lenderman 17:07
2. Jon Sayre 13:25
3. Ten Johnson 10:43

BOSTONIAN

1. Evil Schutzel 5:13.4 *
2. Jerry Powell 3:59.6
3. Dave Haught 1:45.9

SCIENCE OLYMPIAD

1. Chris Borland 6:25*
2. John Lenderman 4:35
3. Ed Betray 3:36

STD CATAPULT GLIDER (2 FLTS)

1. Tem Johnson 2:23.05
2. Ed Betray 2:21.31
3. Herb Bobbins 2:06

HAND LAUNCH GLIDER (2 FLTS)

1. Jon Sayre 155.02
2. Ed Betray 78.89
3. Gene Stubbs 68.47

UNLIMITED CATAPULT (2 FLTS)

Tem Johnson 2:30.17
2. Ed Berray 2:22.04

ORNITHOPTER

1. Jon Sayre 8;20
2. Herb Bobbins 2:58

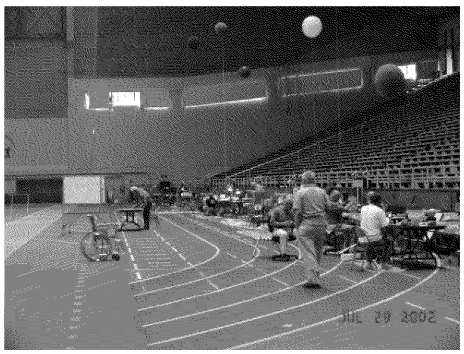
MANHATTAN

1. Emit Schutzel 11:06

There was also a F1D team selection regional held during the 4 days at Kibbie Dome. Results are:

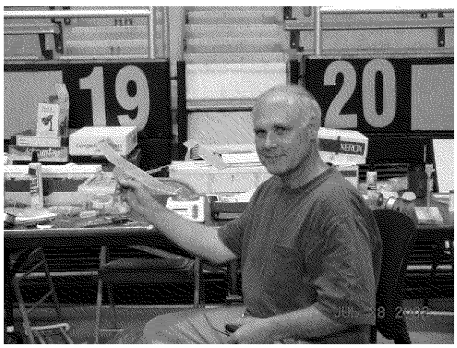
1. Tim Goldstein
2. Jake Palmer
3. Lew Gitlow

KIBBIE DOME ANNUAL, JULY 27-30, 2002, MOSCOW, IDAHO

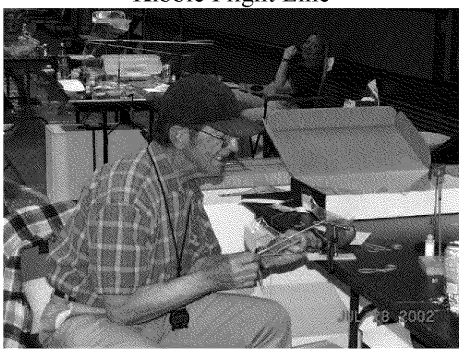


Kibbie Flight Line

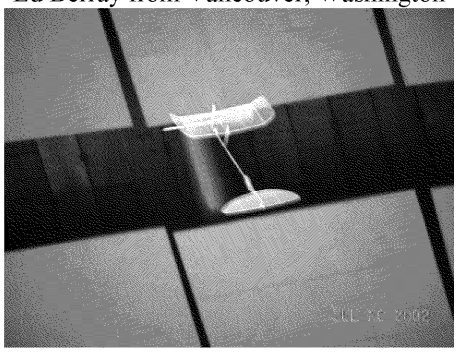
Ed Berray from Vancouver, Washington



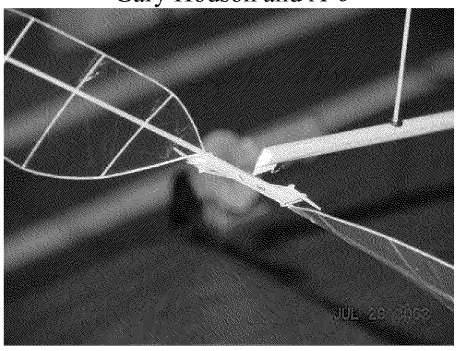
Gary Hodson and A-6



Lew Gitlow

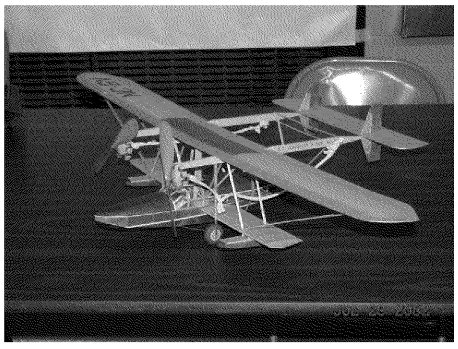


Tim Goldstein's 55 cm F1D

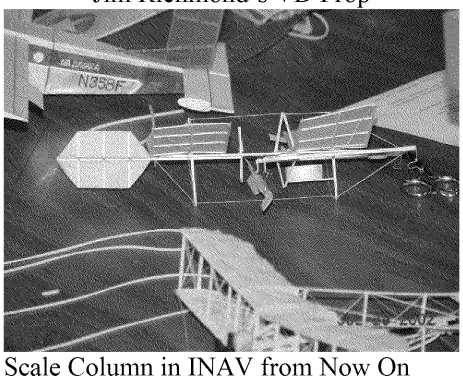


Jim Richmond's VD Prop

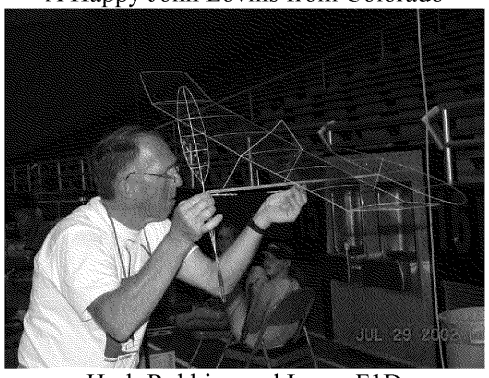
A Happy John Lovins from Colorado



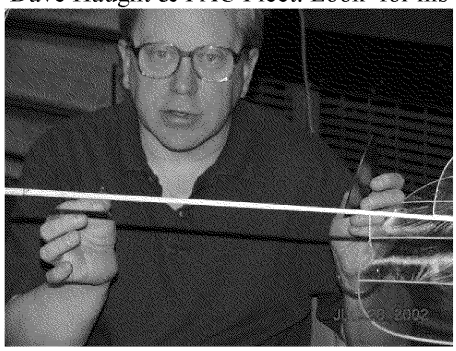
Dave Haught & FAC Fleet. Look for his



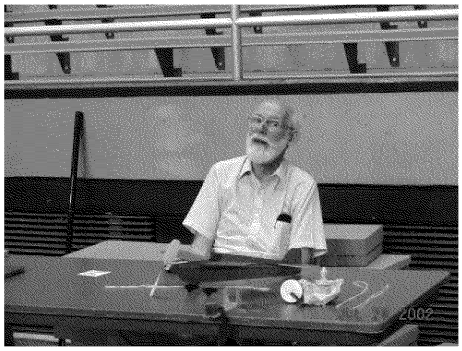
Scale Column in INAV from Now On



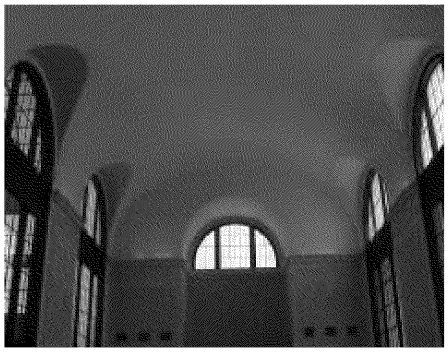
Herb Robbins and Large F1D



Nice Motorstick, Steve!

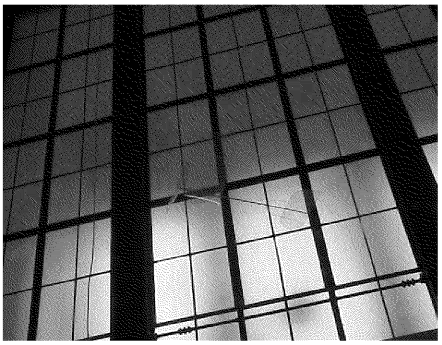


Al Yuhasz Looks At All That Air!

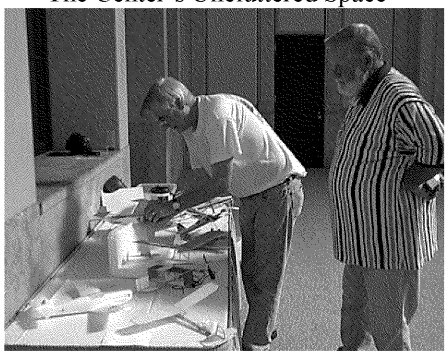


The Center's Uncluttered Space

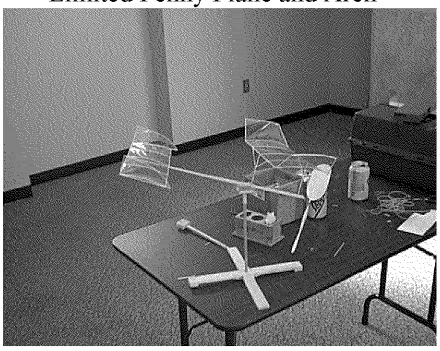
Limited Penny Plane and Arch



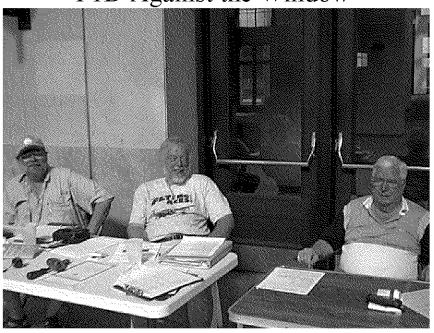
F1D Against the Window



Flight Line – Dave Reed and Bill Hedge



Bill Carney's Limited Penny

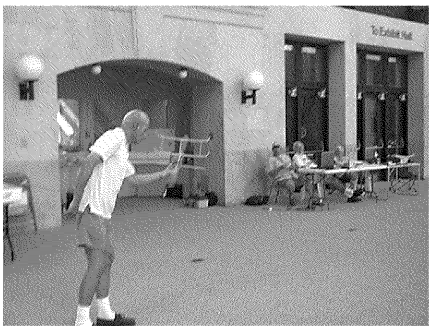


Norm Blitch PC Support, Phil Thibodeau CD, Jim Cassidey Field Marshall

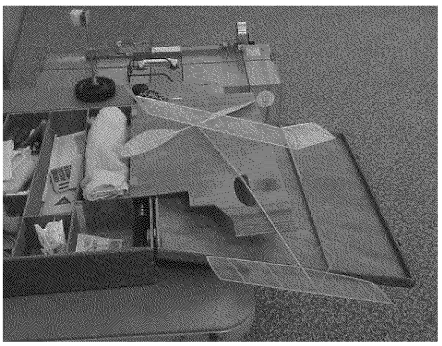
Above and Left: Dick Obarski and his record setting Legal Eagle

Flight Line: Newt Bollinger, Dick Obarski, unidentified, Joe Nuszer, Scott Prince seated on Floor

Bill Carney Congratulates Dick Obarski



Joe Nuszer and Open PennyPlane



Joe Nuszer's EZB

F1d Motor Stick Construction – An Update
By Steve Brown, with input from Bernard Hunt and John Kagan

The Editor asked me to update my F1d Motor Stick Construction article to reflect current practice for 55cm / 1.2gm models. There is very limited experience with the new rules so the optimum designs and construction methods have yet to be fully established.

The 0.6g motors are short and fairly tightly stretched between the hooks. Ideally, the models are flown with little or no back off and run down to a deadstick condition to use all the energy from the limited motor. This means a very large range of input power and this makes trimming more difficult as compared to the old 65cm models. There is a tendency to stall / mush on the climb or alternatively to be underelevated on the letdown. The turning pattern is also problematical with a tendency to crab to the right or even roll. Because of these trimming problems some fliers (particularly British) prefer sticks which bow and twist much more than for 65cm models.

Stick diameter – in 65cm days most sticks were rolled on .250 diameter rods. These days there seem to be two schools of thought. Some fliers are still using .250 i.d. sticks because they provide increased durability. Others use smaller diameter sticks (typically .220 i.d.). The idea is to have a stick that will bend controllably under load, as well as twist enough to induce a large amount of wing wash at launch.

Boron – whether you use a large or small diameter, you can reduce the number of boron filaments. Three boron filaments on a stiff stick may, in fact, not allow enough bending under load. Two .003 or .004 boron located at 4 and 8 o'clock, or 3 filaments located 180 degrees apart, will work on short sticks (10"). Three boron filaments are enough for any stick. The boron should extend the full length of the tube and any stick extension. Boron on top of the stick seems to dramatically reduce stick bending.

Bracing – Short (10") sticks with 3 or 4 boron may be flyable without any bracing wire or post. This may be scary at first, but my experience is that if there is going to be a problem it is more likely to be that the stick doesn't bend enough under load. At the most, a short post (1-1.25") and a single .001 tungsten wire is enough. It is common for these designs to be adjusted so that the stick bracing wire is slack when no motor is present.

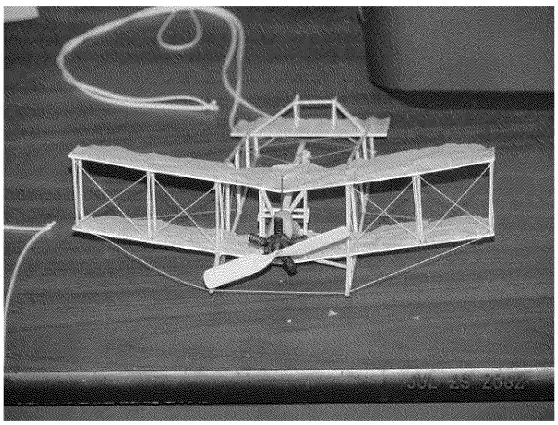
For beginning flyers I'd recommend a 1.25" post and single wire for any design, until you get some "feel" for stick strength. For anyone who is weary of the stick bracing post being accidentally broken off, try basswood about .040 X .040. The weight penalty over balsa is negligible (.005gm or less) and the strength is much greater.

Wood selection – Immediately after the rule change there was discussion of how much easier it would be to find appropriate wood due to the increase in the minimum model weight. This is true, but my experience is that sticks made of .014 or .015 wood are often too stiff.

.012-.013 balsa of about 4.0 - 4.3 lbs is about right. I you are building an "English" stick you may wish to experiment with thinner in your search for flexibility. For .012 - .013 balsa, a weight of .27 - .31 grams (for a 1.125 X 18 sheet) seems right. Contact me at stbrown@hotmail.com if your have any questions or comments.

Scale Matters! By Dave Haught

DHaught042@aol.com



Most kids growing up get to play on jungle gyms and swing sets, take a spin on the merry go round, muster up the courage to ride the breath taking trip down a ten foot slide. I was not so underprivileged. My slide was the wing root of a TBM fire tanker, my tree house was a ball turret of a B-17, and my clubhouse office was in the cockpit of a B-25. I grew up with a father who loves airplanes, who spent winters converting World War Two bombers into fire tankers and summers flying to exotic forests to keep them flying.

Airplanes and model airplanes have always been a part of my life. For my sixth birthday I received a drawing table complete with t-square, triangles and with what my parents thought was a life time supply of tracing paper. By seven I was tracing three-views and carving solid models, by eight I was learning to fly the control line stunt pattern. Of all my fondest model memories I will never forget my first scratch designed and built rubber scale model. It was a Curtiss Robin, 16" wing span, covered with 000 silkspan, no dope, and no windows. I wound it up, and let it roll. It hurtled itself into the sky in wonderful spiral, right into the top of our apple tree! I was hooked. I still have the plans tucked away in my archives.

Forty some years later I am still building models, but in the last few years I have narrowed my focus to indoor scale. For me the attraction to this corner of our hobby is a strange mixture of history, real people's efforts, dreams, and designs that are mystically blended, explored, and recreated in each model I build. I spend hours researching an aircraft that has caught my attention, its designer, the times, the details of its design. Then I select a particular ship and start the plans sequence. That involves finding or recreating a decent set of four views, cross sections, a stack of research photos, and a lot of coffee. Only when I am in my drawing mode I do I start to contemplate the practicality of the model. Some would pick an event, then study the performance parameters required to be successful in competition, then they select the most promising aircraft for their efforts, design the model and build it. Most times they are quite successful. I have never had such a practical approach.

That is why you will see me winding four motors for a B-17 or an Avro Lancaster or something so strange and fragile you would never guess it could fly. My passion is the art of designing a scale airframe light and strong enough to sustain flight. I try to shoot for the glorious two minute flight, but I often settle for a minute. To me joy is in getting any design to fly. If it flies, then I proceed to massage it until I have its max flight.

Indoor scale modeling is an art. Some have an instant gift, others of us have to work at our craft. Designing, building, finishing, trimming, detailing, and presenting are some of the topics I hope to explore with you in this series of articles. Many of the ideas and techniques I have researched - stolen- over the years will be common knowledge, some may be new to you. That is another one of the great aspects of this hobby we have, sharing. Let me hear any input from you along the way, these hallowed pages of Indoor News and Views have mentored many of us over the centuries, and by contributing a bit here and there you can help us spread the enthusiasm for this wonderful hobby or obsession-as my wife calls it.

A first foray into the scale mist is best done with the proverbial "good" kit. In the past twenty years-yes it has been even longer-the free flight scale kits have been more numerous and much better than the previous twenty year's products. Peck Polymer offers a wonderful line of kits that can be built right from the kit wood and plan with good success. I remember watching spell bound as a bright

yellow Bob Hoover P-51 peanut model did and R.O.G. and put in a magnificent 90 second flight indoors at Taft.

After watching a television special on the Red Tail Squadrons of WWII, I was inspired to build one. There lurking on my shelves was a Peck kit. I took it down and gave it good going over, the wood was pretty good, a few parts would be traded out for lighter balsa, a few stringers added to the nose top to preserve a more scale contour, but yes it would do the job. The model came out at 6 grams, a bit heavier than I would have liked, I did add a foam pilot and a few more details than I should have. Bottom line was it was mostly built right out of the kit. It will fly a very predictable 85 seconds. There are many such kits out there that are adequate for a first try or two. Stay away from the models that require a top and bottom keels with mostly solid formers-these are semi-deadly! I say semi because there are a few exceptions out there. One gentleman in our local club, John Robison, has had remarkable success with them, more on his unique approach later. These kits tend to be very heavy and have discouraged many aces from becoming hopelessly hooked on this hobby.

Another line of scale kits I have not mentioned yet are the indoor scale kits put out by many of our fine suppliers of indoor items. I have had mixed success recommending them to new modelers since they often lack the skills required to build these exquisite kits. A peanut is not a peanut is not a peanut. The 1/16" square lumber used in an outdoor peanut will be the demise of the peanut built for indoor flight. Not only wood sizes and weights are different for indoor, but the type of construction for the lighter materials requires better fits at joints, even different types of joints. Then there is the logarithmic spiral of weight caused by enough glue to join the lumber together. With the indoor kits out there you will easily use a 10th the cement and half the structure you would on a typical peanut scale model. While this sounds petty, I built a Micro X Porter from the kit and the same model using outdoor size contest grade balsa. The kit came in at 4.5 grams while its outdoor twin came in at 15.2 grams. Both flew great in their appropriate environments, however both met their demise in each other's airspace. I flew the indoor model outdoors to demonstrate how much better a lighter model flew outdoors, and it flew out of sight in a thermal! The outdoor model flew very well indoors, quite a bit faster than its twin, climbing fast, it sifted itself through the girders and made a spectacular crash.

All of this brings us to a point, I think. Ah yes, one needs to be a bit practical with the first indoor scale model or two if you want success. If you have some experience with indoor duration, go the indoor kit route. If you are making the transition from outdoor to indoor, you might pick up where you are most comfortable and try making the model as light as you can. In both cases keeping the model as simple as possible will pay big dividends. Select something with few struts, wings, and fragile looking appendages at first. The more complex the more perplex!

I'll end this first installment with an idea that might be new. I have struggled with a source of tubing for nose blocks on my peanut and pistachio sized models. The neat Peck Polymer thrust buttons have a hole too big for the size wire I use for the prop shafts, plus they do add some weight. I have been cutting them down a bit in length and diameter. The smallest size of aluminum tubing has a sloppy 1/32" diameter hole through it-way too big as well. As I was looking around for a source of smaller tubing the glue syringe I use caught my eye. I buy disposable plastic syringes at the local farm supply store that have replaceable needles. The needles come in a wide range of sizes all with handy diameters. At around a dollar each they are a good buy. The steel they are made of is soft and can be cut with a fine file of utility knife. Give them a little roughing up with 400 sandpaper and they can be pressed into your nose blocks, a touch of cement and you have a great bearing. I have experienced a lot of variation in a model's perfomance due to a sloppy prop bearing. I have even successfully bushed a worn nose bearing with the steel tube and given new life to an old model. Give it a try!

Well enough for this episode. Next issue a few insights into common problem areas in scale model construction with a few new ideas and some thoughts on props. Remember its not just a hobby! Now back to my B-24 . . .

The UK Team Trials for the 2003 European F1D Championships.
Held at Cardington, 13th and 14th of July.
By Nick Aikman

This was rather a low-key event considering the importance of the European Championships. Perhaps this was due to the fact that although the championships are scheduled to take place at the magnificent 'Cargo Lifter' hanger near Berlin, they have been put in doubt by financial difficulties within the company. Also, although there are now around twenty F1D flyers in the UK, only eight or so compete in major events. Top flyer John Tipper was unable to attend, and UK team member Derek Richards could only fly on the second day. The field was therefore reduced to six and a half.

This was the first major F1D competition in this hanger for some years. Holes in the roof meant that recent rain left the atmosphere slightly damp and although the weather was fine, the times were not as high as had been expected. The air never really became dry and the biggest holes have the nasty habit of giving a 'Venturi' effect that rapidly sucks models upwards, either into the suspended mesh netting that is draped below each bay of the roof, or more unluckily, above the nets and into the girders. For these reasons, well set up VP props were vital to control altitude and keep models well below the netting and those with most knowledge and use of them topped the list.

Bob Bailey had the best of the luck, his longest flight drifted rapidly sideways at high altitude and then hit the end wall, sliding down a long way before Bob was able to successfully catch it with a balloon and steer it to safety. The VP prop then gave a very slow letdown for his longest flight of 32.02. Conversely, Ron Green had the worst luck of the weekend as several breaking motors and uncharacteristic steering mishaps did damage to his models. His best flight of around 32 minutes was not official. I managed to hang right at the top of the shed at the end of the first day, when the up-draught from the biggest hole sucked my model twenty feet upwards in less than two minutes. After a circle or two above the nets, the model roosted on a catwalk but was successfully retrieved with a balloon

So, a contest with few surprises and Derek Richards managed second place even though he missed half the contest. Now the chosen team will wait to see if the contest actually takes place. Most of us plan to attend the open international event at the 'Cargo Lifter' hanger this September, so maybe we'll find out more then.

Results.

1.	**Bob Bailey.**	**32.02 + 31.31**	**Total.**	**63.33**
2.	**Derek Richards.**	**31.37 + 30.39**	**"**	**62.16**
3.	**Bernie Hunt.**	**31.40 + 30.27**	**"**	**62.07**
4.	**Ron Green.**	**28.26 + 27.16**	**"**	**55.42**
5.	**Geoffrey Lefever.**	**25.53 + 27.22**	**"**	**53.15**
6.	**Nick Aikman.**	**25.24 + 27.18**	**"**	**52.42**
7.	**Laurie Barr.**	**22.14 + 24.06**	**"**	**46.20**

Wart

By Gary Hodson

Tem Johnson, Emil Schutzel & I made the long trek (1770 miles) from Kansas City to the Kibbie Dome in Moscow, ID. Along the way, we picked up Al Yuhasz in Denver. Al & Tem were roommates in college, 50 years ago. They both were members of the Perdue University Aeromodeller's Club, but after college they lost contact with each other. Al recently returned to Free Flight after a long absence from the hobby. He contacted the AMA to see if by chance Tem was also a member. The AMA forwarded Al's letter to Tem & they began to renew old acquaintances. This trip was the first time they had seen each other since college.

If you have never flown in one of the large indoor sites like the Kibbie Dome in Moscow, ID, or the Mini Dome in Johnson City, etc., you owe it to yourself to attend one of the these events. You do not have to fly competitively to enjoy the thrill of flying in a site where you do not have to worry too much about hitting the walls & ceilings. The thrill is comparable to the first time you flew a rubber powered airplane successfully. There is lots of room for everyone to fly no matter how serious you are & you will get lots of suggestions & ideas from the other fliers.

The Kibbie Dome Contest Directors, **Andrew Tagliafico (duration) & Dave Haught (FAC scale)** did a great job & deserve our thanks for making this event so successful. The contest format is designed to maximize the amount of flying time available. Four days of non-stop flying from 8:00 AM to 8:00 PM. Hand launched & catapult gliders get the floor from 8:00 AM to 9:30 AM all four days. The rest of the time is open flying. In other words, there are no fixed time slots during which you must post your official flights.

Last year the **Heart of America Free Flight Association** (Kansas City area) selected the A6 to be its "official event" for the annual club championship. As a result, we all have been focused (some would say obsessed) on improving our A6 times. We fly a lot of ¼ motor flights & share information on what works & does not work. Our times have risen rapidly from eight minutes to over nine minutes & now, to over ten minutes in a little over two years. Tem won the HAFFA club championship, Emil was first at the USIC this year & I was first (& broke ten minutes) at the Kibbie Dome this year. Competition can be fun & it improves the breed!

Wart

Best time: 10 minutes, 7 Seconds
Date: 7/28/02
Location: Kibbie Dome, Moscow, ID
The plans contain most of the details you need to build a competitive A6.
Following are a few details of the construction not shown on the plans:

Thrust bearing: I order thrust bearings from **MicroX (part #TBR-1)** unbent (flat). This allows me to bend them to suit my requirements. I want a relatively large stand off (7/32") between the prop shaft & motor stick in an effort to prevent the knots that form as the motor unwinds from snagging on the motor stick. The rear hook is also 7/32" from the motor hook for the same reason.

Motor Stick: The large stand off mentioned above results in a lot of bending force so the motor stick needs to be very stiff. I test my motor sticks for bending as described by **Larry Coslick** in his EZB articles in **INAV**.

Motor: The 10 Min., 07 Sec. flight was made on an 18" loop of **March 2002 Tan II** rubber that weighed 0.91 grams. I did not get involved in rubber powered free flight in time to own any of the legendary 5/99 rubber. I know **John Clapp of FAI Model Supply** has been working very hard to get us the very best possible rubber & it appears that his efforts are paying off.

Wing Ribs: You could eliminate some of the wing ribs to save weight, but they help me maintain the airfoil shape when I cover with wrinkled condenser paper.

Covering: The flight surfaces are covered with wrinkled condenser paper to minimize warping as the paper shrinks over time. The condenser paper is wadded up into a tight ball, flattened out & ironed between two sheets of newspaper. It is attached to the flight surfaces with rubber cement diluted approximately 50% with naphtha. The rubber cement is brushed onto the frame. If necessary, the cement can be reactivated with naphtha until the paper is positioned to your satisfaction.

Wood Selection: I find the stiffness rating of **Tim Goldstein's Tru-Weight Indoor Balsa** to be particularly helpful in selecting wood for specific applications. Light, stiff wood for the 1/16" wing & stab spars keeps the surfaces warp free & allows more weight to built in to the motor stick where it is required for stiffness. Also, a stiff, light tail boom is essential. Light weight prop blades are important, but their stiffness can be lower. In order to build down to the 1.2 gram minimum weight, it is important to have a reliable source of excellent wood.

Correction notice on Micro-B article in 107

The gremlins just would not leave us alone on this one. In the chart of wood sizes and dimensions on page 24 there was an error. The titles in the left most column of the chart starting with T/E WING SPAR and through PROP SPAR were transposed down one line. So, the dimension given under size in the line above is the proper dimension for the item named below.

Sorry for any confusion and thanks to Larry Coslick for pointing this out.

USA Jr Team Change

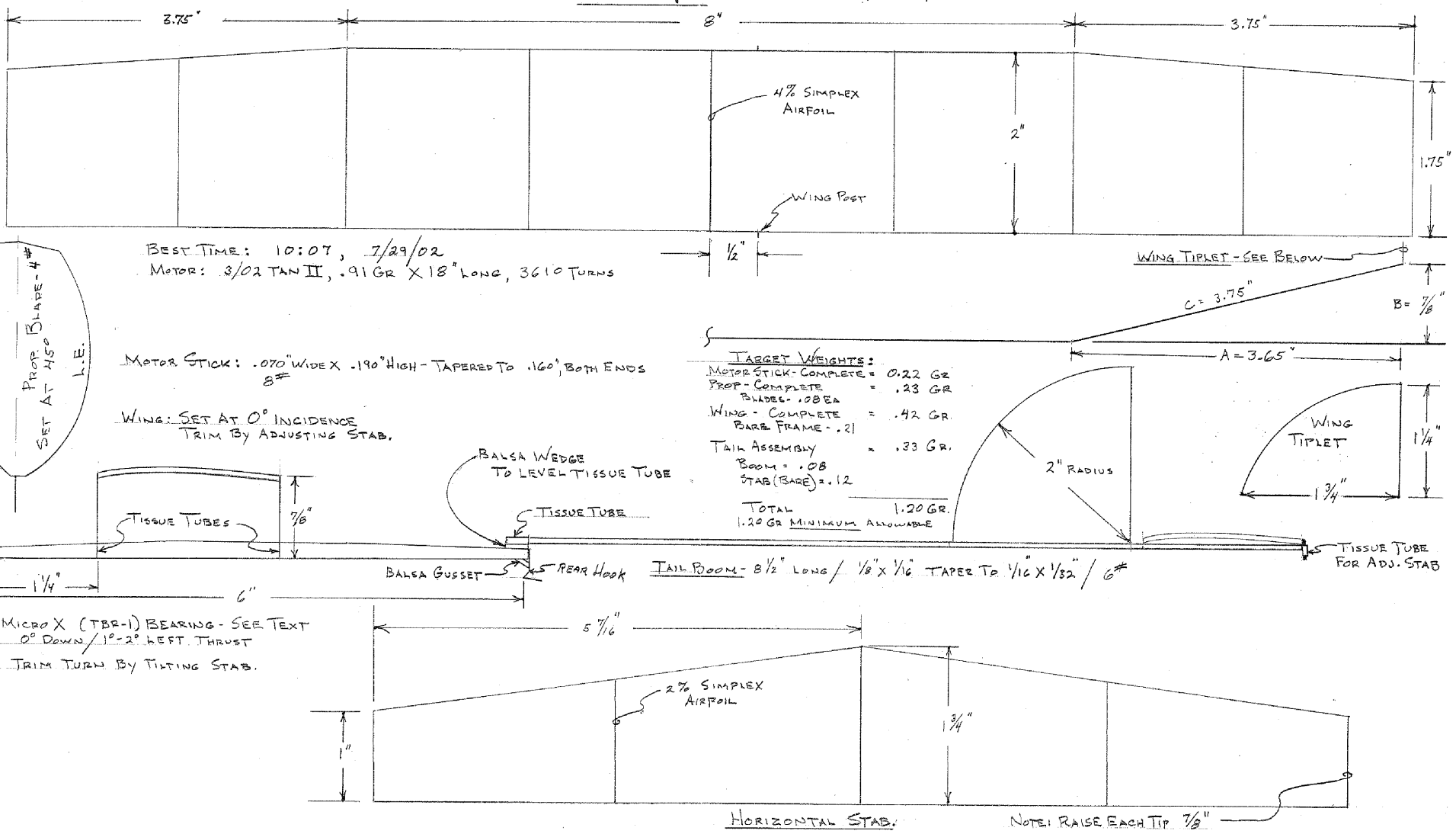
After much consideration Parker Parish decided that his commitments would not allow him to fill his berth on the Jr. World Championship team. Team Manager Ray Harlan then contacted Matt "my plane flew out of the hanger" Chalker who was 4th in the team trials to fill the spot. After a little fast talking to his dad Matt accepted the opportunity to represent the USA at the Champs.

Here is a little of what Matt had to say about it on the Indoor list on Yahoogroups:

"First, I'm excited to be able to go, but I wish Parker could be going, since he was the one who earned his right to be on the team. I have a lot of work to do to be able to go, since the only half-way suitable components that I have are 2 wings, which leaves a lot to be built. The largest thing that I could use everyone's help with is rubber. The only rubber I have is 3/02 and only about a half of a pound at that."

"WART"

A-6 By Gary Hodson



Best Time: 10:07, 7/29/02
Motor: 3/02 Tan II, .91 Gr x 18" Long, 3610 Turns

Motor Stick: .070" Wide x .190" High - Tapered To .160", Both Ends 8#

Wing: Set At 0° Incidence
Trim By Adjusting Stab.

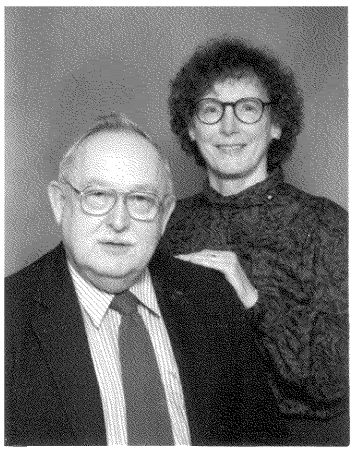
Micro X (TBR-1) Bearing - See Text
0° Down / 1°-2° Left Thrust
Trim Turn By Tilting Stab.

Target Weights:

Motor Stick - Complete	= 0.22 Gr
Prop - Complete	= .23 Gr
Blades - .08 Ea	
Wing - Complete	= .42 Gr.
Bare Frame - .21	
Tail Assembly	= .33 Gr.
Boom = .08	
Stab (Bare) = .12	
Total	1.20 Gr.
1.20 Gr Minimum Allowable	

Horizontal Stab.

Note: Raise Each Tip 7/8"



Bud and Jody Tenny

LOOKING BACK

by Bud Tenny

Many modelers who should know, have said that we would not have indoor modeling as it is today, perhaps not at all, if it weren't for Ralph 'Bud' Tenny. Certainly, there would be no Indoor News and Views. With Tim as an interviewer, here is how it started, in his own words.

In 1960, The Navy-sponsored NATS was held at Dallas NAS in Grand Prairie and Indoor was flown in the Will Rogers Coliseum in Ft. Worth. The following March the Cliff Model Club (Kit Bays, Don Chancey, and Jerry Murphy now chairman of FFCB) were some who kept flying. The club members had indoor models left over from the NATS and held a contest in the Drill Hall at Dallas NAS.

At the time I was working with several young boys at UC. I told them "This is something all model builders should see." At age 17 I was very active in stunt and combat and my sponsor took me to Kansas City Memorial Auditorium where indoor was flown; he told me the same thing. Just to be in the swing of things I lightened a JETCO ROG and covered it with very crude microfilm. I came home hooked.

Very shortly, I circulated about 50 copies of Issue #1 of INAV; in an editorial comment I suggested that regular indoor events could be held year-round "by scheduling meets at times that would not conflict with outdoor FF" (which I also was flying. Jerry Murphy replied "If you scheduled meets for the men's room at the Statler-Hilton, summer events would still conflict with FF schedules."

I went ahead anyway, and Jim Clem and I and a few others began monthly meetings at a city recreation center in North Dallas and other similar sites.

The very first few issues of INAV were typed on bond paper using orange carbon paper facing the back of the sheet. This gave me a dense image that would easily reproduce on a blueline machine. At first, these were bootlegged in a machine at work. When that privilege went away, I did one or two at a commercial printer. When I got a computer and printer I shifted to that format, printing oversize pages that were photo-reduced to 8.5 x 11 size. That may have been the October or November issue in 1961.

>So far we haven't asked about NIMAS.

I don't remember which of the 10 or 12 co-founders suggested the concept of NIMAS, but it was an idea whose time was ripe.

>Was it essentially the first AMA Special Interest Group?

NIMAS was founded long before SIG's were heard of. It was never formally named and became a de facto special interest group. But like many organizations, everyone was happy to have special services, but no one was wiling to help, so the only real NIMAS benefit was INAV.

>I think you took it back over at some point to rescue it.

Not true. As I remember, when it got too much for me, one guy offered to take over and lasted for two issues. At that point, Rich and Melody took over. I have lost track of who followed them.

>I also know you have written the Model Aviation column for how many years?

For as long as MA has been in existence. I think I had a couple of columns in whatever magazine AMA teamed with (Air Trails?). Then AMA decided to do it in-house as they do now.

>I also know you are on the contest board and have been involved with quite a bit of the behind the scene effort to make indoor what we have today.

In the mid-'60s I was chairman of the FFCB until Cliff Weirick forced me into a ruling I knew was contrary to AMA tradition. I told him I would do it if he took the heat when the s--t hit the fan. It did, he didn't and I resigned from the FFCB. When the ICB was formed I was chairman, and pretty well hand-picked the members from the other AMA Districts. Except for an early resignation (Dist. 11, Taglifico took his place) and later Charlie Sotich resigned in that District, the ICB has remained stable in membership until Doc Martin and Rich Doig died. I still have no replacement for Doig.

> I would love to have the details on what you have done and how long you have done it.

When F1D participation began, I served as Team Manager in 1966 (Debrecen, Hungary) and the first WCh held in Cardington. I managed both those Team Selection programs. I also managed the third Team Selection; until then, the team members chose the chairman. That time, the AMA Rep to CIAM made the choice. That removed any chance of my going at AMA expense and I was never able to afford to attend overseas WCh events. Since then, my AMA activity has been limited to IVAV, ICB and Dist. VIII administrative tasks.

>How about hearing a little bit about what you have done career wise, family related, and other hobbies and interests?

After we married, Jody typed the labels for each issue until I was able to get them onto self-adhesive labels, which I typed the master images for. Later, I was able to computerize the operation, as did Doig and all following editors.

At the time we married I was a Senior Instrumentation Tech at Texas Instruments and that continued until I retired from TI after 16 years when I was eligible. Since then, I did various test instrument design jobs until I had to retire to finish recovering from cancer. After that, I did various things such as telephone computer support. I don't remember what else until I can get Jody to help me. I continued to fly indoor until all the good sites evaporated. Since then, I have been associated with the Dallas Personal Robotics Group (mostly elder statesman and advisor, since I've never completed my own robot).

We are both very active at the First Methodist Church in Richardson; both of us have served on the Administrative Board and Jody was very active in the women's group. We met when she started the Parents Without Partners and I attended (my first wife moved out unannounced taking our infant son. I never saw him again until he looked me up after he was grown.)

But, in Texas parlance, 'I married a family'. I helped her raised three young children. Kevin is now nearly 50, Kristi was 44, and Kerry is 18 months younger. We are very regular in Church and Sunday School, and Kevin drives in from Farmersville (25 miles) to attend church with us. Kristi and her husband were active in their church, but Kerry, a very well-known mathematician, remains an agnostic, struggling with some theological questions.

Now in retirement, Bud continues to write the Indoor Column for Model Aviation magazine. He tells us he is looking for high quality photos, articles and other material relating to Indoor. Write to him at P.O. Box 545, Richardson, TX 75083.

INDOOR
NEWS and VIEWS
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The World Championships, Slanic, Romania
November, 2002

Photo by Edmund Liem

From The Editor's Desk

First, let me express regret at the passing of my friend Jim Clem. A friend to so many, he would always stop what he was doing to talk to me and others about any aspect of the hobby. Of the testimonials we had to choose from, I selected that of Bud Tenny's, perhaps his longest and closest friend, to include in this issue. Godspeed, Jim.

Since our last issue we have had two major contests, at the Cargolifter site in Germany and the salt mine in Romania. The great news is that once again our Junior flyers are putting on an amazing show with Doug Schaefer in particular in second place among Open contestants. Our friend Mikita Kaplan of the Czech Republic also handled himself very well at CargoLifter by placing second in FIL. Mikita's daughters are both Junior fliers, with Klara placing in F1L and Gabriela grabbing a fourth in Mini Stick. The family trio tutors an indoor youth group in their hometown of Brno where they have the use of a sportsplatz, or athletic hall with a really clean ceiling. They start out with Butterfly RTF's and work their way up to more competitive models. We can learn from this. It reminds me of a father I knew in Ohio who complained with me that there was no scout troop in our town, so we started one. The Dayton, Ohio area is the birthplace of the Wright brothers and of aviation in our country, and it is also a hotbed of Sci Oly activity. This is exactly how many of our Juniors got their start. - Carl Bakay

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Indoor News and Views is an open forum presenting ideas, opinions, model designs and techniques for the indoor community. Unless specifically stated, INAV does not offer any opinion as to the merit of published work, nor does it endorse any products or services advertised herein.

Ad copy and classifieds should be sent to Tim Goldstein at the above address for publishing.

Publishers Desk

Major news in the free flight world with the announcement that Tan II is no more. Below is the official release from John Clapp owner of FAI model supply of the situation. The good news is that Tan Sport is available and showing great promise. See INAV 108 for Carl's test of this new product.

Received an interesting idea from fellow Denver flier John Lovins regarding the rubber situation. His thought is we might be able to get some decent rubber by being friendly with some competition outdoor fliers. The idea is many outdoor fliers discard their motors after a few uses with some broken strands. Much of the rubber in the motor is still in good shape. They may be willing to give/sell the old motors. Might be a good way to get your hands on some of the fine vintage rubber that is no longer available. You may even find a flier who is interested in learning some more about indoor.

Tim

Tan II Rubber Update

Gentlemen,

The following is the very latest update on the status of Tan II rubber. This message is not second-hand or hearsay information, but comes directly from the man himself, John Clapp of FAI Model Supply. I received it Saturday morning following a request to John that he issue a statement to clear the air.

Bob Clemens

THE BAD NEWS

The rumors are true, no more TAN II rubber will be produced!

A critical ingredient is no longer being produced due to the change in golf ball technology. A special version of this additive was crucial to produce TAN II.

CURRENT STATUS

We are all out of factory cut 1/8" Tan II when the current orders are filled. A few 1 pound boxes are available. We are re-cutting 1/4" into 1/8" with our power stripper for those who would like it. We obviously do have 1/4" available as well as a few 10 pound (or 1 pound) boxes of 3/16". We expect all of this remaining Tan II rubber will be gone in the next few days.

We will keep enough 1/4", 3/16", and 3/32 in small boxes to support Science Olympiad for this school year. Many of you may know that this event is a fertile breading ground for Junior F1D fliers and other young aspiring modelers. If some of you don't already know, the USA Junior Team blew away the competition in the Jr. World Champs! Please do not try to take advantage of this small S/O stock pile.

THE FUTURE

There will be no shortage of TAN SPORT! We have asked the factory to see what could be done to make what we would call TAN SUPER SPORT, and they have held meetings this week to see what possibilities exist. This new rubber, if feasible, would have greater energy storage than Sport, but some what less than the average value for TAN II.

We know that this situation, while not totally unexpected, presents a world wide problem. Please be reassured that it is not being taken lightly!

We thank you all for your past and future support!

John
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JIM CLEM -- MODELER AND FRIEND

I first met Jim in the early 1950s -- possibly while I was still in the USAF. He was a dedicated and successful CL Speed flier, and I was flying Stunt and Combat. I later learned that he was taught about Indoor by Carl Goldberg. I remember seeing a photo of Carl and Jim in an old yearbook or other model airplane publication.

As a celebrity of sorts, Jim was sort of an idol of mine long before we became friends. At the time I was flying Precision Acrobatics and Combat. Jim tutored me in the finer points of timing control-line models and many other things about different phases of modeling.

When I first arranged an indoor flying session at the Drill Hall on Dallas Naval Air Station, he came and flew a model that had a carved balsa prop. I learned that the prop was older than most of the fliers who came out to the session!

After Jim and Fran moved to Plano, I often visited him at home, perhaps once a week. I shared with him copies of the many club newsletters that I receive. He always had something new to show me; his inventive mind apparently kept working day and night and he built hardware or props or whatever was needed to prove or disprove all these ideas.

His special interest was prop efficiency and he build special test fixtures while pursuing the concept of better props. His home in Plano had a recreation room upstairs that was an excellent place to test fly Ministick models and compare different props. For other tests, his living room had high ceilings; there he set up a round-the-pole device so he could "fly" a Limited Pennyplane on a tether and learn the level flight torque for different prop/rubber combinations and get some idea of potential duration of different prop/rubber setups.

Jim's physical condition was never good and he was always in pain. Even so, I can seldom remember him without a smile. It just got wider when someone came to visit. With Fran's help (he didn't "do" computers), Jim maintained fairly active e-mail contact with many friends. He also did a lot of long distance calling to other fliers and friends. He gave advice and sought advice; all of us miss this remarkable man.

Bud Tenny

Jim was one of the most likeable persons I have known. We could get frustrated with each other, disagree, discuss and argue, but he was never disagreeable. Oh yes, he would disagree, but I soon learned that Jim was searching for the best possible solution to every problem and to his credit, he never stopped looking.

Knowing this man was an inspiration. While he was small in stature, he had the heart of a giant. When we traveled as a team to the United States Indoor Championships, I often chided him about his talking to everyone which took away from his competing. He persisted and never hesitated to drop anything he was doing to visit with an "old timer", friend or with a youngster that was casually interested in models. He had a great following.

Jim tried to figure out everything in advance. He had charts and graphs on every phase of indoor modeling which he kept in his notebooks and bags. He could tell you how many winds every rubber motor would take before breaking. He made notes on every flight, fiddled with his gadgets and was always frustrated with me because I didn't always follow his lead. On the long trips home from the Nationals I would complain about not doing better and he would say, with his little smile, "you build airplanes as good or better than the big boys... why don't you just fly them like I tell you".

Jim told me all about his love of flying, his Cessna 170, his experiences as a Formula V race car driver and his records flying U-Control speed. He told me about his flight instrument business and the struggles he encountered along the way. It was easy to sense his great love for his wife, Fran, and his love for his boys, Mike and Jim and his grandchildren.. We talked about spiritual matters and it was apparent that Jim believed. He lived his life as a good Christian should with a love for his fellow man and a love and respect for God.

Our loss brings sorrow but our knowledge of his presence with God brings the assurance that all things are easier for Jim. I envision Jim with his twinkling eye and scrubby beard siting at the foot of God making his notes and relishing every moment of it. I can see him push his chin up with his fist and ask the Lord "now tell me again how the bumble bee flies, I've always wanted to know". I am a better man for having known him.

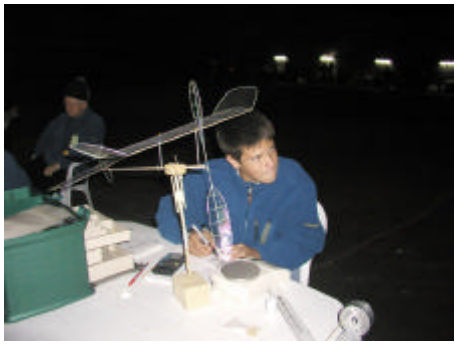
Your Friend, Joe Kehr

World Championships, Slanic, Romania, October 7-12, 2002

Photos taken by Sandy Schaefer

The Boys Boxes Arrive Safely

Matt Chalker Gets Ready



Top Junior Doug Schaefer

Derek Richards

Marius Conu CD

The Romanian Junior Team

The opening Ceremonies Give Some

Idea of the Size of the Mines

Hungary's Andras Ree

Ron Green is a Top British Flier

Edward Liem and Dieter Siebenman

Colin Raymond Jones

John Kagan

Peter Kuttler

The Spanish Team

2002 F1d World Champs Commentary
By: Mark Schaefer, Doug Schaefer, Jim Richmond, Steve Brown and John Kagan

The last day of contest rounds 5 and 6 held some of most exciting flights I have ever witnessed. John Kagan bringing it togather with solid 32.55 in last round to propel himself into third place. Mangalea Corneliu (Romania) putting up a 33:30 after all prior rounds stalled out on launch or went into a wall. Larry Caillau's 30:06 and 31:25 last day that locked USA adult team into first (done with a braced wing by the way). A strong showing by German Lutz Schramm with 31:48.

Over course of six rounds there were few flyers that consistently put up near or all thirty minutes flights. Amoraritei Dan (Romania) with four 30 plus, a 29:48 and opening round 28:33. Robin Baily (England) with three 30 plus ,29:53 and 29:15. Aurel Popa with three 30 plus, 29:39 and 28:31. Doug Schaefer with five 30 plus and a 26:14. Of 84 flights by adults only 22 were over 30 minutes.

Of Junior flyers I was impressed with very friendly and fine aero modeler Somesan Horatiu (Romania). He put up three good 27 minute and a 26 minute flights for third place. Another is

Olexandr Kovalyov (Ukraine) the defending Jr. World champion with 28:48. A very young Tamas Sukosd (Hungry) with 27:10 and 27:57 in fourth place. The even better news was the number of good 20 minute range flights by Polish and Lithuanian teams.

What many of you do not know is what happened the last day in junior contest. It starts on day 2 in round 4. Doug accepted a 32:40 that had been prop washed several times and finally collided with a Spanish plane at forty foot. Falling about 15 foot. In Round 5 of last day Doug collided with a

plane way up at somewhere around 170 foot falling a long ways. He decided to accept the 32:50. Then Ben Saks in round 5 came down with a 33:10, putting himself into first place with a plane he had pieced together from prior days crashes. If you recall both had 33:04's the first round. Needless to say

lunch was a very quiet affair. Doug had been launching with a (9 1/8 inch loop before pre winding) and 1650 winds into motor and backing off to 4.3 to 4.5 inch/oz. placing his plane 20 to 10 foot under catwalks that are ten foot under the ceiling. After lunch Doug mentioned something about not backing off. The exact wording I fail to want to remember. He launched final sixth round at 1750 wind and 5 inch/oz with a very slight 20 wind backoff with motor weighting 0.59 grams with o rings.

One other plane lanched earlier and four other planes few seconds later. One of these other planes were Romanian's that always go for ceiling plus some of the better adults. At three minutes into flight we lost sight of Doug's plane. With all these plane right around catwalk height. What came next was

two plane colliding just under catwalks. Another hitting wall twice then hanging up for five seconds on light fixture on catwalk. The fourth plane drifting completely out of area. We went from not knowing what had happened to our plane for sure to hearing several Romanian's yelling back and forth "Amercana, Americana" etc.. At ten minutes into flight we knew the only plane was ours from shining spot light from a different angle which disclosed a distinctive color to his Y2K2.

In hind sight Doug's plane was below two that collided and later above one that hit wall. For whatever reason Doug's was only plane that made the climb then made a second slower climb to peak. All other models during contest that I saw only made first initial fast climb then came down. At over 18 minutes it started to first started to come down. At a set place of around 100 foot where he like to take a RPM readings it read 38 and final time of 36:12. The action was not over as Ben set out for last flight. Ben broke a motor putting it on the plane. After repairing fuselage he had good flight that collided with another plane. A second flight did climb to perhaps ten foot of catwalk landing with very good 32:09, Giving Ben three flights out of six over 32 minutes.....Impressive!

Speaking strickly of motor loop length or cross-section size- Most everyone used small cross section motors under .049 with monster number of winds as Steve Brown mentioned. This accounted for number flights not climbing high enough and perhaps little cruise time. In round three Doug had his only under thirty minute flight with similar lower cross-section motor. Although there was another problem at same time with the model. The key point that we noticed with low cross-section rubber was the plane tended to drift a lot more. An extreme example was Matt's prop/winds. For whatever reason the drift was noticed. It just worked out to have the stab's incidence higher (a far back CG too).

Working on loading up prop more for lower RPM's (and for thicker cross-section rubber) thus going at problem of climb and flight time not from a number of winds stand point but rather a lower prop RPM.

Mark Schaefer

Our big problem at the mine was finding the right combination of prop, rubber, and plane adjustment to handle the full wind torque required to get these little planes to the top of the 220 ft. high cold cavern. We had to find the answer in a couple of days of practice, but none of us were confident that we were ready at the start of competition.

I had brought a selection of 11 props and ended up using the least likely one of the bunch , a modified 35 year old 18.6" dia. positive flair job with narrow blades. My first round attempt was not adjusted for enough turn and it headed straight for the opposite wall. I caught it on the balloon line, but the prop locked on and that ended that.

Round 2 had a better turn adjustment, and it made a huge 1st turn which tightened up as it climbed almost to the top. When they get above the lights located under the 210 ft. catwalks, you can see the shadow of the plane on the ceiling. This flight was about 215 ft. high and perfectly centered in the 35 ft. space between the catwalks. That flight landed at 35:29 which turned out to be my second longest one.

For round 3, I tried a different plane and prop. This one stalled out after a climb of about 60 ft., did some "aerobatics" as it fell, and then recovered to complete the flight. The bad start limited the altitude to about 170 ft. and the duration was 31:33. As it turned out this was enough along with round 2 to win, but I didn't want to risk getting "bumped off" (as has happened before) so I continued to try to improve.

The round 4 flight started a little off center and bounced off of the tapered wall under the catwalk a few times, breaking the tip of one prop blade and losing some altitude. This flight ended at 28:51. I did some testing of a different plane using a variable diameter prop and was seriously considering it for round 5 but then I broke the prop and went back to the original one. This was probably fortunate, for the round 5 flight was picture perfect, staying centered between the catwalks and cruising well to use up almost all of the 1900 turns packed into that tiny .59 gram motor. Seeing that I was well ahead with a 36:15 flight, I chose not to fly in the 6th round. In my 4 prior trips to the Romanian salt mine I had never managed to win, although I was always in 2nd or 3rd place.

So I regard this win to be of particular importance, having been done in a very difficult site.

The Romanians have been very fine hosts and I would enjoy returning here again sometime. But now the German Cargolifter site is in my dreams.

Jim Richmond

In a related note, the Romanians debated moving Somesan Horatiu (who did quite well, by the way) from the Junior competition to the Senior team before the competition started.

It appears to be acceptable, then, to have a Junior age competitor on a Senior team. It just means that you will have one less Senior age flyer, since you are still limited to three competitors. I didn't see any VP's, although Jim tried a VDi in practice. Jim used a flaring prop in the contest. The others (including mine) were symmetrical, as I remember. Much to my surprise however, once people started getting their models all the way to the roof in good fashion it became apparent that a VP could actually help use up the remaining turns. There were several flyers doing big times that got all the way up and landed with turns.

John Kagan

Basically there were two trends: models built after the English style with tip-fin stabs, and models resembling the 65cm designs. Of these, Richmond's looks English but isn't built in the English manner. Popa and the two top US juniors flew models resembling 65cm's. Most wings are unbraced with flat center sections. When bracing is used it is often the front-to-front style like Tim Goldstein's model. Length is 30-34". Almost everyone uses a full boom under the stab. Most sticks are about 10" with a straight stub and then an 18" boom. Richmond & I used 12" sticks with wire spacers to locate the motor and 18"booms.

Few models were braced except for some of the Eastern European models. Most props are symmetrical. Richmond flew a positive flare prop. No VP's were in the top group and I don't know whether any were flown.

Subjectively, it appeared to me that the number of hangups, etc. was less this year but that was due to the fact that so many of the models just didn't make it to the ceiling. I didn't see the enormous amount of wreckage that was typical with 65cm's. People that lost airplanes will probably disagree!

The great majority of flights weren't very good and didn't get all the way up. Of those that did I'd estimate the rate of hangups was about the same. Generally if the airplanes were centered well you

were OK, as in previous years. If you were off after launch you had the usual trouble. To do the max time you had to be at or near the catwalk. Anything less and the flight was wasted. You didn't see the "great time at 150'" phenomenon you might see in a typical hanger.

The flight profile on the airplanes is interesting: a very rapid climb of 5-8 minutes, typically 5-ish, followed by a very short "cruise" and a long, slow descent. It's almost as if there is no cruise in the strict sense. With my airplanes I found it actually easier to get the model in a centered location due to the nearly vertical climb. After launch there is no sweeping turn as we are used to seeing. Ron Green's models were the most interesting to watch: they had the wings on short posts (maybe 1.5") over a 10" stick. Then a very long boom with 10" of droop and the stab under the boom. They went up completely vertically and almost "bunted" over. Very odd to see. Just about all the models I say used fixed pitch props of 18-18.5" diameter. Anything else didn't appear to work. Richmond had a smaller VD prop that worked during practice but it failed during the contest and he never flew an official with it.

Steve Brown

First off I would like to thank all of the many people that made my trip to Romania so successful. This includes Walt Van Gorder, John Kagan, Fred Tellier, Steve Brown, Larry Calliou, Tim Goldstein, Bruce McCory, Lew Gitlow, Ray Harlan, Jim Richmond, Valdamir Linardic, and many others. These people and others helped me slowly struggle through my first planes to where I am now.

Romania was a very interesting country that is very different from the US or Canada. When I arrived, I waited with my parents at the airport. We exchanged our money and became millionaires. Then we left the airport, and we found our way on to the very busy streets of Bucharest. When we arrived at the Hotel Slanic, we found our rooms, and we got settled in. The food and accommodations were very different from the United States. The food we ate tasted very good, and the fruit was about the sweetest that I have ever tasted. The showers had no shower curtains, and the room was barely big enough for Rob to fly his airplanes in. But Ben and I survived it, for we shared a room.

The first day in the Salt Mine we were on the third level down where the spa is located. The spa consists of beds lined up so that the people can sleep down there and breath the healthy air. The air was very turbulent with all the tourists walking about, but Kagan and I went around a corner and found some decent air. The drift where we started at was getting bad enough to where we could not even fly quarter motors. Matt broke one of his wings on the first day trying to steer his plane out of the spa area.

The next day we got into the flying site, and finally everyone got in some good flights. I only flew about 5:40 at the beginning, but by the end Ben and I were flying about 7:35. Kagan was flying about 7:50. The last practice day down in the mine everyone was flying about the same amount of time on quarter motors, but I put up a full motor and got a 31:48. Steve got a 33:08 on his full motor that day. After I got the 31:48 I put away my third best plane and got out my best plane and flew it on two quarter motors .It flew about 7:30 on a pre-wind. Although I had a problem because the plane appeared to be on the edge of stall, and I did not have enough time to put up an full motor flight. So the next morning I went down to the mine extra early and found that my plane would launch out at full torque on a quarter motor and a half motor. The quarter motor flew an astounding 8:20, so for the first round I backed off about twenty winds. This produced a 33:04, and it tied me for first with Ben. The second round I got a 30:48 and was in the lead.

The next day was very rough for Ben, but I discovered what went wrong with my second and third round flights. Ben's flights went horribly wrong with both of them running into the wall. I discovered after a 26:31 in the third round that my tube for my front wing post was loose. I fixed this before the fourth round and straightened out the prop. I put up my plane and got a 32:40 with a mid air with one of the Spanish team's planes, and it cost me about twenty feet or about two minutes. I decided to accept this time because it increased my time by two minutes.

The final day I entered in second overall. My first flight stalled out, but I recovered it in under a minute and saved my flight. I do not know why it stalled out, but it might have been from all of the people out in the launch area launching. So I relaunched my plane, and I had another mid air with a 32:51. I probably should have reflown that flight, but I was running low on motors. Also I still had a large lead over Ben, but that round Ben over took me with a 33:10 flight. So

all lunch I was very nervous because I had only one motor left that I felt was suitable, and it would be its third wind. It also had a little fray in it that would make it even more interesting, so when I had time I went and borrowed a couple of motors from someone incase I broke that motor. When it came time to fly, I wound up my motor slowly to point five three inch ounces. Then I launched out at full torque and I took twelve minutes to get within what Ben said was half a meter. When I got to the ceiling, there were six plane up there. One plane that circled inside my own circle hit the wall twice and got hung up on a light. Two other planes had a mid air that centered them well out of my circle. I stayed on the ceiling until about eighteen minutes. By about nine minutes all the planes disappeared and left my plane alone on the ceiling. I came down with twelve winds surprisingly keeping its nose up until about thirty-six minutes dead on. I guess that the retriming I did before the fourth round really helped, and the third wind proved to be the best. I had about one of the only motors that survived three flights over the contest. Possibly the only way my motor survived was I only wound to about point five three inch ounces with its max at about point six five. With this flight I retook first in the juniors and second overall.

After I flew my flight in the last round I went and helped Matt with his aircraft. I found him a motor that had enough winds for twenty-six minutes, and Matt got a 25:38. All week Steve, John, Ben and I helped Matt to weaken his plane enough to where it would fly. I believe that John and Steve really enjoyed the juniors in their room. Every night we went and cut rubber and Matt sanded on his planes in John and Steve's room. Matt kept up with this and went from about ten minutes to over twenty five minutes, which really impressed me. Matt finally finished a respectable sixth with a one point six gram plane. I think that all three of us juniors had a very good time.

Once again I would like to thank everyone that made my trip possible. Also especially to my dad to which I owe a lot of thanks for his support and criticism.

Doug Schaefer

THE MINES OF MORIA OR

THE 2002 WORLD F1D CHAMPIONSHIPS. SLANIC. ROMANIA FROM A UK PERSPECTIVE.

The fellowship of Bob Bailey, Ron green, Derek Richards (the team) plus manager John Tipper, timekeeper Bryan Stichbury and I met at Heathrow before flying into Bucharest to be greeted by our amiable Romanian guide and his wife. After picking up 2 hire cars, we travelled in convoy through the rain soaked, dilapidated city to our ‘barracks’ for the night. Next morning we left and our guide chaperoned us out of Bucharest and up into the foothills of the Carpathians to Slanic. On arriving at the hotel we had time to unload all the modelling gear, discover that the tap water was a strange brown colour, meet several members of the endless army of stray dogs and greet several of our fellow competitors and others associated with the ‘Champs.

Practice day. Tuesday 8th.
For Ron, Bryan and I, this was our first look at the infamous mine. I certainly found it exhilarating to step out of the lift doors for the first time and finally stand in this weird, wonderful and legendary indoor space. The atmosphere, smell and low light levels are unique and it was certainly a bit of a shock after being in the ‘CargoLifter’ hanger only 3 weeks earlier.

Test flying for the Brits’ was largely uneventful, no one broke anything major and the team concentrated on half motor test flights. John Tipper decided that I was chief tea maker (we brought our own electric kettle!) but I managed to avoid this duty for most of the week.

Wednesday 9th.
Ron led the way in round 1and after a prodigious wind, his much admired and scrutinised model took off like an F1C. Going vertical for 2 or 3 minutes, it hit the roof 7 minutes into the flight, before bumping around on the ceiling, drifting over a catwalk and settling on it at 11:12. Ron’s ‘Droopy boom’ models were certainly the most extreme and innovative being flown (see the ‘CargoLifter’ report for details) and after this flight, the model was safely retrieved from the roof.

Derek was plagued by ill fortune on day 1 with handling damage and motor stick breakages. Bob Bailey had better luck, putting together 2 fairly conservative flights that got very high without misshap. Bob’s models seem to climb on lower torque levels than Ron’s or Derek’s.

Throughout the meeting, there was much less steering than I had anticipated, relatively few models got caught by the walls and the new rubber limit meant that here at least, there was a very short cruise phase for most flights.

Maestro Jim Richmond showed excellent judgement with his second flight, which reached catwalk level and just brushed the structure once, before a very slow let down ended at 35:29.

Thursday 10th.
This was Ron's best day as he managed 2 flights of 29 minutes that were his best of the meeting. Derek's misfortunes continued but Bob made progress with his 2 best flights of 30:45 and 31:40. Elsewhere, many flyers with 'old rules' experience were finding it hard to get long flights or decent climbs with such small pieces of rubber. Ukrainian flyer Oleh Korniychiuk was the only one flying with VP props, his latest versions use what I believe are tiny carbon mouldings for the hub and torque arm. In round 3, Oleh posted his best flight of 32:21.

Friday 11th.
So, on to the final day and as is usual, many flyers recorded their top times and changed many individual and team positions. Ron Green's run of bad luck continued with more damage that left him without a score in round 5. In the final round, by the time the model was finally processed, his time was running out and the model was released with seconds to spare, on less than full turns. Derek Richards fared much better and recorded his top times of 29:17 and then 30:33. Both these flights were nerve-racking in different ways. The first involved a mid-air at the top of the mine, which ended with the aeroplanes untangling safely. The second flight got to the catwalk and then played tag with one of the big lights just underneath it, before the model rested on the light and then tail-slid off a few seconds later before the heat could blow the motor. Bob Bailey's luck soured in round 5 as his best model was damaged before launch and the second string aeroplane developed climb pattern problems which also occurred in round 6.

Elsewhere, unofficial world record holder Corneliu Mangalea finally got a respectable time in round 6 after a series of misfortunes in earlier rounds. Strong flights from John Kagan and Larry Cailliau improved their individual standings and consolidated the USA team score. Larry was one of the few seniors still using conventional wing bracing and he never totally conquered the problems associated with braced wings for this class. In round 5, Jim Richmond again showed his mastery of the site and of the new rules with the high time of the meeting – 36:15. This gave him both the individual championship for the 7th time and the trophy for the longest single flight. American Junior Doug Schaeffer rounded off an excellent series of flights with 36:12. Aurel Popa who took the second place individual medal had mentioned that the best previous time in the mine of just over 36 minutes had been set in the summer, when the conditions were much less humid. And so the top times here are all the more remarkable.

General comments.
I believe that many flyers were using May '99 rubber. In contrast, the UK flyers all flew on March '02. The part of the batch of May '99 that arrived in the UK was deemed unusable as it seems to have deteriorated since being made. Maybe others using a different part of the batch got a more durable product. There are also problems with March '02. It seems to be wildly inconsistent not only from box to box, but also within very short lengths. I understand that it was a trial batch and this inconsistency may be a result of poor mixing or some other unknown factor. Both Ron and Derek had trouble getting the turns they expected at some point in the contest.

Virtually all of the UK misfortunes came from motor stick breakage at or near the front or rear hooks. It is probable that the dank conditions together with very high launch torque levels were just too much for sticks rolled from very light wood. Ron Green was particularly unlucky as he twice suffered fully wound motors exploding after removal of the protective blast plate, just after launch.

The UK contingent won the unofficial 'jolliest team of the meeting' award. Our traditional stiff upper lips were left behind in the UK or passed on to others and despite many problems, the team eventually won the bronze medal, behind the Romanians who took silver and the USA with gold. I was particularly impressed with the American junior flyers who not only built very good models and flew them exceptionally well, but who were also gregarious, knowledgeable and happy to learn and talk about all aspects of the experience.

The mine is undoubtedly a very tough place to fly in. As a helper I was aware that many competitors did not enjoy the experience and attended out of a sense of duty. The gloom and cold plus the fact that decent sanitation is a concept rather than a reality do not make for an ideal environment. Processing of models was described by one jury member as "catastrophic", and it was impossible to carry this out accurately in what was a very draughty area. The close confines of the preparation area were far from ideal and several model breakages occurred as contestants left or entered a densely populated part of the mine. Nevertheless, it should be remembered that if Slanic was not available, along with the great efforts of all those involved with organising and running the competition, there may not have been a world championships at all.

Nick Aikman. 25.10.02.

PLACE		Round:	1	2	3	4	5	6	Score
Senior Results									
1	JAMES RICHMOND	USA	01'10"	35'29"	31'33"	28'51"	36'15"	0	71
2	POPA AUREL	ROM	29'39"	33'03"	31'50"	32'09"	09'58"	28'31	65'12"
3	JOHN KAGEN, 2000 WORLD CHAMPION	USA	27'01"	27'09"	23'34"	31'10"	31'15"	32'55"	64'10"
4	AMORARITEI DAN	ROM	28'33"	30'07"	30'09"	30'02"	29'48"	33'24	63'33"
5	ROBIN BAILEY	GBR	30'43"	29'53"	30'45"	31'40"	00'54"	29'15"	62'25"
6	LAWRENCE CAILLIAU	USA	17'00	30'22"	22'51"	00'05"	30'06"	31'25"	61'57"
7	LUTZ SCHRAMM	GER	28'41"	0	29'17"	30'09"	31'48"	01'36"	61'57"
8	OLEG KORNIYCHIUK	UKR	30'34"	24'40"	31'21"	29'54"	01'03"	22'06"	61'55
9	PETER KUTTLER	GER	31'11"	0	28'21"	29'24"	25'19"	29'49"	61'00"
10	STEPHEN BROWN	USA	31'23"	25'54"	29'28"	24'59"	26'55	23'13"	60'51"
11	FRED TELLIER	CAN	29'08"	22'09"	30'05"	29'45"	29'52"	20'33"	59'57"
12	DERECK RICHARDS	GBR	23'44"	26'00"	0	24'59"	29'17"	30'33"	59'50
13	RONALD GREEN	GBR	11'12"	28'14"	29'06"	29'07"	0	23'33" '	58'13
14	ANDRAS REE	HUN	19'19"	23'10"	22'49"	25'17"	27'32"	29'46"	57'18"
15	ZOLTAN SUKOSD	HUN	27'17"	26'24"	02'05"	26'16"	28'31"	26'06"	55'48"
16	JAN DIHM	POL	25'56"	26'34"	27'39"	27'34"	28'05"	25'22"	55'44"
17	DANIEL MEDINA MANGAS	ESP	22'27"	27'06"	25'46"	28'12"	22'27"	19'10"	55'18"
18	EDMUND LIEM	CAN	16'00"	22'47"	23'23"	22'46"	26'33"	28'17"	54'40"
19	DESZO ORSOVAI	HUN	27'10"	25'33"	24'07"	24'37"	27'08"	22'35"	54'18"
20	EDWARD CIAPALA	POL	23'47"	21'02"	24'50"	20'03"	05'01"	27'47"	52'37
21	MANGALEA CORNELIU	ROM	01'36"	04'31"	01'15"	19'02"	09'45"	33'30"	52'32"
22	KARL SCHONFELDER	GER	0	18'24"	18'27"	15'36"	27'26"	24'48"	52'14"
23	MANUEL DIAZ GARCIA	ESP	22'43"	19'45"	24'43"	24'41"	21'17"	24'24"	49'24"
24	DIETER SIEBENMANN	SUI	22'41"	26'19"	16'02"	21'54"	00'47"	16'19"	49'00"
25	SERGY MOSOLOV	UKR	19'56"	22'36"	24'26"	24'22"	24'14"	24'22"	48'48"
26	ENOMOTO HIDEYO	JPN	22'30"	22'16"	21'29"	22'36"	20'55"	22'13"	45'06"
27	JERZY MARKIEWICZ	POL	19'59"	22'24"	17'49"	15'01"	16'45"	06'38"	42'23"
28	LUIS FONT BELLOT	ESP	17'18"	20'32"	19'33"	15'42"	14'30"	17'12"	40'05"
29	RAYMOND JONES COLIN	CAN	15'43"	14'40"	11'16"	18'45"	15'38"	19'28"	38'13"
30	RIMAS STEPONENAS	LAT	11'08"	18'22"	19'20"	06'26"	00'23"	04'46"	37'42"
31	VITALIJUS SALOGUBOVAS	LAT	18'02"	12'34"	0	18'52"	18'34"	16'59"	37'26"
Junior Results									
1	DOUG SCHAEFFER	USA	33'04"	30'54"	26'14"	32'40"	32'51"	36'12"	69'16"
2	BENJAMIN SAKS	USA	33'04"	24'50"	13'00"	14'53"	33'10"	32'09"	66'14"
3	SOMESAN HORATIU	ROM	27'26"	26'56"	21'00"	27'53"	27'00"	20'00"	55'19"
4	TAMAS SUKOSD	HUN	27'10"	22'35"	18'35"	0'	0'45"	27'57"	55'07"
5	OLEXADR KOVALYOV	UKR	23'07"	28'48"	23'02"	08'20"	17'30"	24'27"	53'15"
6	MATHEW CHALKER	USA	18'54"	16'49"	19'55"	24'34"	21'10"	25'58"	50'32"
7	PUKOWIEC MICHAIL	POL	13'48"	15'20"	20'02"	24'00"	24'56"	16'46"	48'56"
8	POP IONUT	ROM	22'11"	14'33"	23'06"	20'00"	22'50"	21'56"	45'56"
9	MARIUSZ ROGOWSKI	POL	17'31"	16'20"	17'42"	21'33"	20'42"	0'16"	42'15"
10	IGNAS VALICONIS	LAT	20'19"	20'11"	14'27"	18'05"	21'10"	02'20"	41'29"
11	LUKAS IVANUSKAS	LAT	06'56"	0	17'56"	16'56"	19'58"	20'50"	40'48"
12	MARTYNAS MARKULAS	LAT	18'21"	18'52"	19'18"	18'05"	18'07"	19'20"	38'38"
13	IVAN MIHNEA	ROM	04'55"	01'39"	17'39"	17'37"	18'37"	19'33"	38'10"
14	JAKUB FILEK	POL	14'31"	14'49"	16'16"	19'31"	0'48"	16'20"	35'51"

Scale Matters

By Dave Haught
DHaught042@aol.com

A gaggle of No-Cals. Notice the range of sizes a 16" wingspan rule will generate in this event.

Greetings! Once again I have been asked to fill these hallowed halls with some words for the scale builders out there. I know you are out there, my email box has been full of wonderful stories and experiences many of you have shared. Thanks! Feel free to contribute your bits of wisdom or experience for us all to learn from. This month I have a lot of things brewing.

No-Cal Corner?

Hey they are scale too! I believe this is the greatest event for scale modeling in a long time. It allows a novice to build a model that looks like a particular real airplane and have it fly decently without a lot of time and effort. In fact our indoor group started with No-Cals.

Peanuts were heavy and would fly up into the rafters and come down in parts, bigger models would only come down in bigger parts. Until the gang got used to building light and turning tight, No-Cals ruled the air! We picked a different vintage for each month and everyone built at least one model for the event, then after an hour of trimming we would do mass launches and wow! I will never forget my Fokker Triplane getting straffed by a Bristol Scout! His prop made hay out of my top wing, boy did it come down fast! In those days flights of a minute under a 20 foot ceiling were rare, our models weighed in at 10-15 grams and we were still using plastic props. WWI, WWII, Racers, Golden Age, even a Spirit of St. Louis event was held, all to great amounts of fun and good experience. I've enclosed a nose bearing design we have developed, it works well with rolled tubes or square motor sticks.

During a rather intense evening of flying I discovered my 6 gram Bearcat was starting to have schizophrenia. One flight it would fly like it was on rails, the next like it was possessed. The model's trim was correct (I keep an index card on each model with its warps, turns, torque, flight turns and times recorded), nothing that I could see seemed out of place, next flight-even weirder! What gives? I had another guy launch it while I video taped it's flight. In slow motion playback I noticed the wings were flexing ever so slightly at the wing root under power. On closer examination with magnifying glasses, there they were, tiny stress cracks in the wing ribs-all of them! I had used indoor "C" grain .020 balsa for the ribs, tying to keep the model's weight down. A touch of thin cement stiffened them up, got me through the night, but got me thinking.

The next NoCal session was for Racers, so I built a Mr. Smoothie, 5 grams, very clean and true. Flies great, now after four years of hard competition, still a good 6 minute model. Wing still flat and true, this time I had used very, very light .090 thick balsa for the wing ribs, sliced to 1/32" in rib depth, with the idea that the thicker (wider) ribs added to the rigidity of the wing rib to leading edge joint. Seems to work very well.

Wireless yet?

In the email bag this week was a great idea from John Pakiz: "I make very light tail wheel leaf springs out of office stationary for Peanut scales. There are few things worse than bare wire for the tail wheel. They're easy to make and once painted with silver acrylic, look very convincing. You can do the same thing for a larger outdoor model using bond paper and go even larger using manila folder stock." Thanks John! Gluing several layers together over a form will insure the finished unit will retain the right shape and will be springy too! I tried this on the landing gear of a Pistachio without using any wire and it works great! By the way folded, bent and twisted paper can be used to make

all kinds of scale details. Air scoops are neatly replicated with formed paper and a bit of creative folding and cutting yielded a complete cockpit for my Peck P-51 Mustang! It looked so cool I had to carve a foam pilot to sit in it! Building heavies.

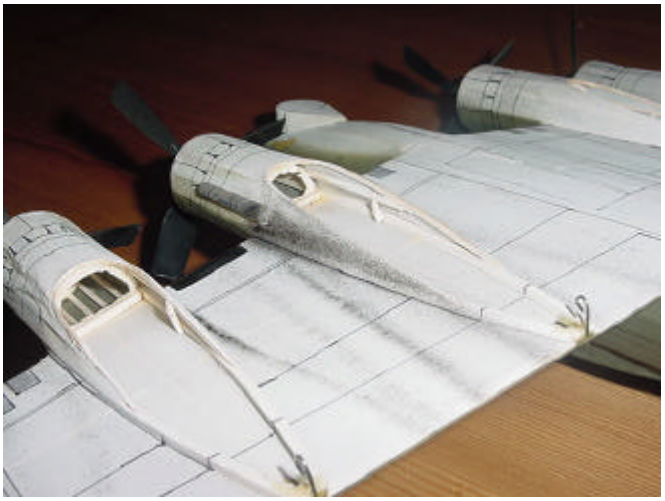
Not an area of interest in the indoor arena? By heavies I mean my ongoing heavy bomber series. A few years ago I became obsessed with the thought of a Lancaster bomber rumbling overhead in our gym, just clearing the girders in big flat turns, then making its final approach and turning in to land at my feet. All four props just finishing a run down as I wander over to pick it up.

Two weekends later I was winding my first "heavy" in the dream gym. I had built a 1/48 scale Lancaster to make use of available decals and the cool three blade plastic props that were available from England. The Lanc came in at 52 grams with four rubber motors, the props were most of the total weight.

First flights were scary, lots of encouragement and advice helped get it through low powered glides. A slight right turn had been built in and all looked safe, so more winds, more torque. My sons each took a wall of the gym as well as other modelers to be ready of it decided to suddenly fly straight into a wall. I cast all fear aside, figuring its better to make a complete fool of yourself all at once instead of prolonging the laughter over several disastrous attempts.

The Lanc left my hands in a flat smooth toss, just two feet from the floor. It climbed with a wonderful strong, safe right power pattern, made a full circuit of the gym, then the motors faded out, the moment of truth, would it turn left? Would it stall and fall off on a wing? Nope, it kept on rock steady, turning sweetly to the right, making its final turn and wheel on landing right in front of all of us. No one said a word, we had all been holding our breath! As it sat there on the floor the last of the turns spinning the props, I knew I was hooked!

The "heavies" three. All 1/48 scale models, stick and tissue at its insanity level, but still very cheap therapy!



The bottom of the nacelles on the B-17 are open to allow access to the motors and to let them roam free as they unwind.

The next winter I began a pair of B-17's, same scale, but with an effort to reduce the overall weight. Both came in lighter, one at 42 grams, the second at 43 grams, again the plastic props ate up a lot of the weight. The only reason I still use them is they are super rugged and I can adjust the prop pitch, besides they look so cool!

A few things I learned from the duration guys really helped with the lightening of the B-17's. First off I really built three models. Duration builders take meticulous care to weigh every stick of wood in building their models. I was not so diligent, but figured if I built three of every part I could eliminate the heavy one. It also is interesting how after building the first part you see several ways to do it better and lighter the next time. Now I know why they build the same model over and over, perfecting their skill and their design. It worked for the B-17's. Each part was a bit lighter and often stronger than its predecessor.

Another skill I used from the duration builders was to build a lot of jigs for alignment into the model, then later removing them. The fuselage on a B-17 is circular in cross section through the centerline, each former was simply a balsa circle (the cockpit top fairing is a trapezoid added for the required sections), I cut them from the lightest 1/16" sheet I could find, drilled a 1/4" diameter hole through them all on center and slid them onto a straight strip of 1/4" hard balsa. A tiny amount of Duco cement held them in place until all the stringers were glued on. Then a drop of acetone on each junction with the spine, a slight twist of the stick, and viola! Out slides the stick, leaving a light but strong fuselage. Not my original idea, but it sure worked well! I then attached a piece of razor blade to the same 1/4" square strip and used it as a long handled knife, starting at the nose, I cut away much of the remaining formers.

The engine nacelles soaked up a lot of thought and experimenting. The Lanc was way overbuilt in this area. One thing that I learned the hard way was that each of the motors of a light four engine model require a lot less out put power than a single engine model's motor. That means the motors will be less powerful and require less nacelle structure to contain the forces. I discovered this with a P-38 model I flew once outdoors. I had put motors in each boom equivalent to what a singe engine model would require, wound them up and the model streaked into the ground after a very impressive torque roll. Way too mucha powera! For the B-17's I designed a very simple and light nacelle module that was built free of the wing and added after the wing was covered.

I use differential down and right thrust as per Dennis O Norman's fine articles on building and flying twins from an old FM article. To do this and make it adjustable took some time, but the system shown for the No-Cals has been very successful here. The 1/32" sheet aluminum tab is the secret. Make sure it is a tight fit over the Peck thrust buttons by slightly crimping the aluminum with pliers. I normally cut all but 3/32" of the rear of the bearing off to save weight. The rear motor hook is a duration design, I use a small O ring on the motors which is easy to slip on the rear hook after winding.

The B-17's have proven to be a bit trickier to trim, they tend to climb off nicely, then fall off on one wing or the other. I have added a bit more dihedral to them and hope to have better results to report. I am quite happy with their weight and their ruggedness. They have had many high speed encounters with tables and chair legs, all in a day's flying for a Fortress!

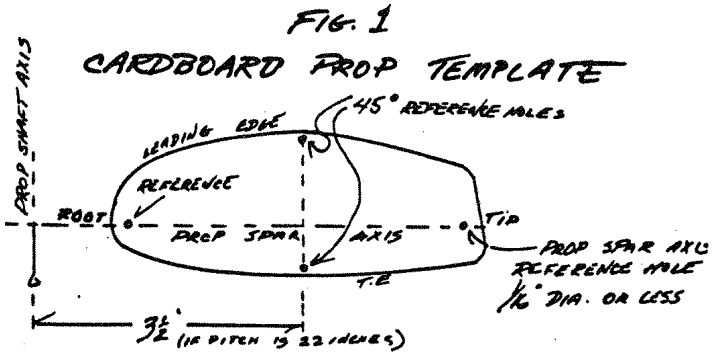
Currently on the building board are numbers four and five in the ‘heavies" series, 1/48 scale B-24's. The higher wing location and simpler fuselage construction should lend a bit more stability and more weight savings. More later . . .

Till next time, keep it light! Dave

PENNYPLANE PROPS

By Jack O’Leary
Published in Minneapolis Modeler July/August 2001

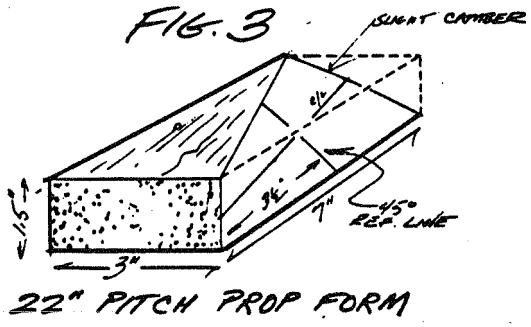
Novice pennyplane props are governed by rule which limits their diameter to 12 inches. The chord of the prop is usually a generous 1.5 to 2 Inches. Pitch ranges from 20 to 26 inches. Generally the prop axis is positioned from .55 to .7 chord to increase flare In the power burst resulting in a less vigorous climb to cruise altitude.
Let's make a pennyplane prop. Carefully select 1/32", Cgrain stock, about 5 to 7 lb. per cu. ft. Cut the prop blades to shape using a cardboard template which has 1/16 dia. reference holes to mark the prop spar axis and the 45 degree pitch angle reference line. If you determine that you want a 22 inch pitch prop these 45 degree reference holes will be 3.5 inches from the prop shaft axis. See Fig. 1.



Stack the blades and sand perimeter to get identical blades shape, then lay flat and sand to get a bade root thickness about .030" tapering to approx. .010" at the tip. Now reposition the

cardboard template over the blades and using a fine felt tip pen or very soft pencil, mark through the template to establish your prop axis and 45 degree angle reference points on the backside. Now connect the points with a light line.

Okay, still with me? Now we select an appropriate prop pitch forming fixture, i.e., a pre-carved block of your selected pitch. I'll stick with 22" for the purposes of this article, here are the dimensions, Fig. 3. Or if you choose, you can get excellent results with a can or jug formed prop about which much has been published (Linstrum, Meuser et all) or a J. Jones fiberglass prop form (my preference) which are available in many pitches.



Jim Jones has an excellent article in the August 80, M.A.N. which provides all the necessary Info. on carving helical pitch prop forming blocks.

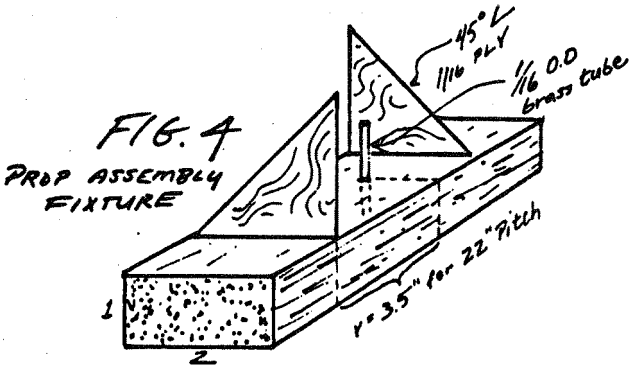
Prepare your pitch forming block by giving it about four coats of dope, and tracing the prop axis, the 45 degree reference lines and the prop outline in the correct position. I go a step further and contact cement (3M Sprayment, now under a new name, 3M Craft Mount) Glad Wrap material on top of the doped surface.

Now soak your blades in hot water for 10 to 15 minutes and lay up on the form by strapping with dressmaker's elastic tape or some old 1/4" gum band. Protect the top of the blades with blotter material which you have cut slightly oversize to the prop blade template. I generally make two props at a time, so I lay up four blades on the pitch forming block. If you're making EZB props put an intervening layer of jap tissue between the blades which will facilitate separating them after the blades are oven cured.

With water, respray the blades which are strapped to the pitch forming block and place in a 180 degree-200 degree F. oven for an hour. For the energy conscious, I've found that an electric fry pan works equally as well if you raise the "stuff" on a trivet. Let the blades cool down completely before unstrapping, and separating the blades from one another.

Select some tough, springy 8-10 lb., 3/32 sq. stock for the prop spar. Sand to a round cross section which tapers from .08" root to approx. .02" diameter at the tips. Bob Mouser had a neat method of achieving a tapered round spar which he reported in his "No Noncents" pennyplane article about three years ago in "Model Aviation". Match the two prop spars for flax, weight and size. The prop spar should extend to 1/2 to 2/3's along the prop spat axis. Attach the prop blades to each of the prop spars with the glue of your choice. With pennyplane, because of the liberal weight rule, glue choice is not particularly important. In EZB, however, because minimum weight is crucial, I'd stick to Micro X products or acetone thinned Ambroid.

Construct a prop assembly fixture as per Fig. 4.

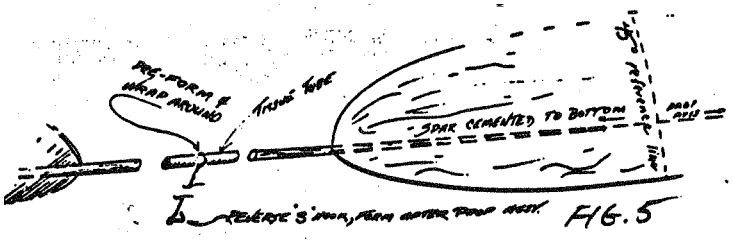


Make a number of jap tissue hubs by selecting the correct size music wire (generally 3/32" dia. for pennyplane). After polishing so no burrs remain on the cut end, rub the music wire with wax paper or silicone treated release paper (which works better). Cut strips of Jap tissue approximately 3/4" wide by 1-1/4" long. Moisten the short end of the tissue and wrap around (once) the music wire. Carefully apply thinned cement to the tissue and roll the music wire between your fingers, applying more cement as needed. Take care not to get cement on the music wire which will make it difficult, if not impossible, to remove from the tube. Let the tube set up on the music wire for 30 seconds or so and push the tube off the end of the music wire. Let dry completely before cutting to length (about .75") 2 hours to overnight. You'll find that you'll goof the first five tubes but by the end of the evening you'll be making them like a pro.

Pre-shape the music wire prop shaft so the wrap around portion matches the O.D. of the paper hub. Do not form the

rubber hook at this time.

We are now ready to assemble and complete the prop. Take the two prop blades with spars attached. Trim the prop spar at the root so that they will join at the center. Position the prop shaft over the tissue tube but do not glue at this time. Insert prop shaft into tube in fixture. Push (should be a moderately tight fit) both prop spars into the tissue tube hub and twist the blades so that the 45 degree L reference lines coincide exactly with the 45 degree L plywood reference plates on the fixture. Now, tack glue the blades at the 45 degree L plates and carefully hot stuff the prop shaft and prop spars to the paper hub. Cut away the tack glue areas and free prop from the fixture. Now form the reverse "S" rubber hook and your prop is complete. See figure 5.

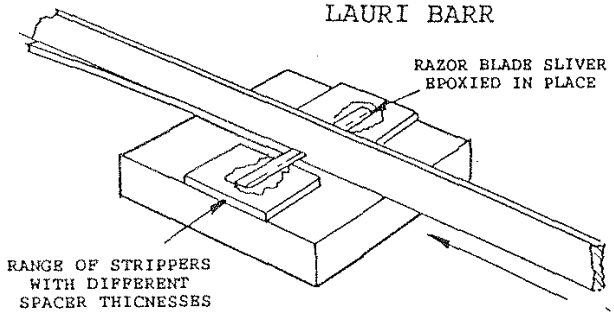


I hope this article encourages fellow club members to get into pennyplane. Our participation has stagnated to where only three of us are flying P plane at the indoor meets. Making indoor props is relatively simple after you've tooled up to do the job. Took me a week to write this damn article but I can knock out a half dozen P. plane props In an evening with ease.

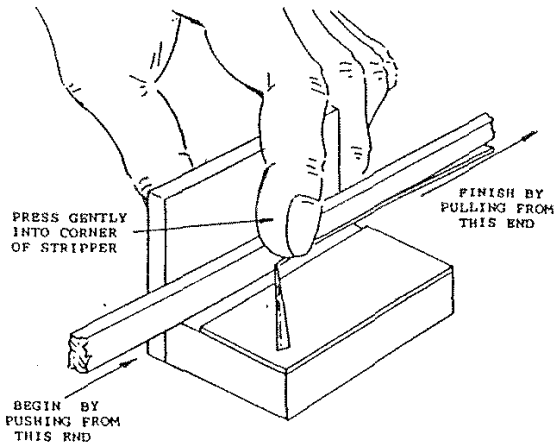
BALSA STRIPPER from Norwind News

Many of our readers will be familiar with the type of mini-stripper used by Laurie Barr referred to in the article on Laminated Wing Ribs. This device is illustrated in figure (a). Although this type of stripper works quite well it has been found that the balsa strip which passes under the blade is compressed due to the wedge shape of the cutting edge. Quite apart from the increase in density which accrues it seems likely that this compression is responsible for the distortion encountered by Bob Bailey when slicing ribs.

FIGURE (a) MINI-STRIPPER USED BY LAURI BARR



Bernie Hunt has devised a stripper which goes a long way towards eliminating this problem. Bernie's stripper is shown in figure (b). In this case the sliver of razor blade is taken to a fine point and the downstream edge has any burrs carefully removed with a fine grinding wheel. An important feature of this device is the 'spiking' of the blade point into the cutting guide thus providing stability for the very fine cutting tip. The thinnest razor blades available should be used and modern stainless blades have been found to be satisfactory. These can be cut using a fine grinding wheel as supplied with 'Dremel' and 'Mini Craft' drills



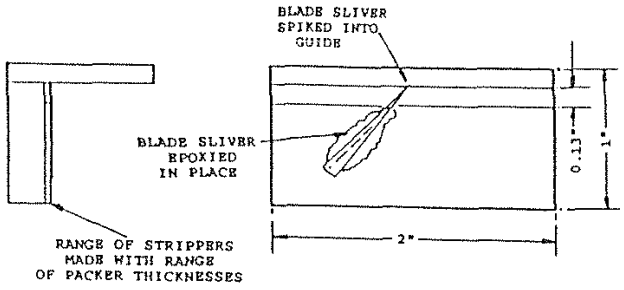


FIGURE (b) HUNT MINI-STRIPPER

FOAM CORE MODEL BOXES
By Indoorsman Joe Kehr (The Joker)

Wherever I go to compete, a lot of people stop by to discuss, not my models, but the boxes they're transported in. I'm better known for my boxes than the airplanes. It's not always been that way. Early on after a few disasters from toting these fragile creations in cardboard boxes, I decided it was time to solve the destruction derby problem. Probably more models were damaged or destroyed in transportation and storage than there were in flying them. This is an article on my solution to a very common problem.

Foam core board is a material that was developed for use in the art/craft world and is widely used by display and sign makers. I became aware of the product about 15 years ago in my business "Kehr Graphics". It is absolutely great for making free standing signs because it is stiff, strong. and durable. (See Fig. 1). Without getting into a product discussion analyzing it's properties, measuring flexibilty, inherent strength and exact method of manufacture let me put that to bed by saying "it makes great boxes".

There are some things you need to remember: foam core board warps when laying around and it needs to be kept flat in a dry place. Don't get water on it or it'll swell up like a poisoned pup and become useless. (Of course cardboard will do the same thing, only worse! Don't use model glue (acetone base) on it and CA is absolutely "verbotton". Just cheap old "Elmer's (white) Glue All" which is multi-purpose for paper, wood, cloth, pottery (and model boxes). (It says most of that right on the label). You get it at the same place you get your foam board. I use the 1 pint size. That's 16 fl. oz for all you technical guys.

There are a number of colors available but I use basic white. This is an advantage since you accumulate a lot of scraps and those can be used in other parts of your box, besides it's cheaper (a whole lot cheaper). The cost: A 30" X 40" sheet is usually about $4.99 at Hobby Lobby. If you watch for their sales you can pick it up for about $3.99. They also have it in the 20" X 30" size, but it's a little costlier per square foot. If you don't have a Hobby Lobby in your vicinity try an arts and craft store. When you buy be sure to check it for warps. Clerks have a knack for leaning it in a 15 degree off vertical position. And oh by the way, warps can be fixed by wiping the concave surface with a damp, almost dry rag. Quickly lay it flat with several heavy objects and use it as soon as possible before it remembers where it's been.

The tools needed for the best results will be: A good heavy straight edge - mine is stainless steel 48" long.. A yard stick is OK but it has a tendency to slip under your grip or your knife blade will cut into it. Plenty of No. 11 Xacto blades or equivalent and good blade holder, a 45 degree triangle or carpenters square. The only tricky part of building foam core boxes is making straight cuts at 90 degree angles. Don't try to make a cut with one swipe. Run your blade several times in the cut, it's easy that way. Oh yeah, the foam eats up blades so have several and change them often. The rule of thumb for cutting is to measure twice and cut once! If you're off 1/ 16th or 3/32nds you'll know it. Someone will say "what's wrong with your cockeyed box"?.

I start with a sketch. You'll need to figure out how you will cradle your model inside the box and what the dimensions should be. Now an important point: I hear a lot of horror stories about models being torn up or broken in shipment. The tendency is to strap the model down so it can't move. WRONG! I cradle my models and give them room to move. Don't strap them down! If you drop or bump your box the shock of energy generated by the sudden jolt will break spars. That's called energy transfer. A good friend went through this several years ago when he strapped his models in specially rigged suit cases and carried them on an airliner to the USIC in Johnson City. He had to spend a lot of time repairing the damage. When the case or box stops - the model wants to keep going. Most indoor models are flexible enough to take jostling and if they are not tied down they're less likely to break. It's a gutsy choice but well worth your consideration.

It's assumed the majority of you are better than average indoorsmen and will understand how to build a box. If not, read the following carefully. The basic box will be built around the X, Y, Z, dimensions (see Fig 2.). The sides and ends will be glued to the top surface of the bottom. Allow 3/ 16ths of an inch for the thickness of the foam board. The sides (YZ) overlap the ends (XZ) and allow the 3/ 16ths inch, (3/8ths total), to compensate for the thickness of the sides. Remember the base (XY) is your foundation on which you literally build the rest of the box.

I start by running a bead of the Elmer's along the bottom of one of the sides. Run your finger along the edge to spread it on the surface. The foam will suck up quite a bit of glue. Join the side to the bottom. You can sit there and hold it or use straight pins to keep it in place until the glue takes a set. Make sure the edges meet along the outside. Fit both ends in place running glue on one side edge and the bottom. You can hold or pin them in place. Finally, add the

other side, running glue on the exposed edge of the end pieces and along the bottom of the side. The glue will hold in about a half hour or less. For the hinge I use black duct tape (Home Depot or Lowe's). It seems to hold better than the silver. Draw a line about 3/4ths of an inch from the edge of the hinge side of the top. Cut the duct tape to match the length of the top and press it in place along the line. This will leave about a 1-1/4th inch flap of tape hanging over. Set the top/lid on the open box and push the tape down starting from the center and working out. I run an extra bead of glue along the inside seams and smooth it out with my finger to form a strong seal.

Now you have a beautiful box. Hey, wasn't that fun? When you've gone this far you probably lost your intimidation of foam core board. Heck, go ahead and build another one. Now! Get control of your euphoria and begin to add the cradles/bulkheads/shelves to the inside. Here's where you can get original. The scraps become useful to build those cradles, bulkheads and shelves. I carry my F-ID's with the tails attached - only one to a box and cradled in bulkheads to prevent moving around. My mini stick box carries four fully assembled mini's. That way I don't loose the adjustments after they're tested. There are two on the bottom, two on a removable shelf and there's also a take out tray to carry extra props and cut rubber. I find a lot of nooks and crannies develop where I can store rubber and extra props. If the box is deep enough the tray will carry all the other junk we need to fly. A word of CAUTION! Don't put any heavy objects in the model part of the box (like car keys, cell phones, sandwiches, rubber lube or pliers). They will become missiles when the box is dropped. BAD! You might want to develop a latch although I don't use them. Be sure to tuck them under your chin when outside.

Foam core board is light, easy to carry and less susceptible to drop damage. It does not absorb moisture like cardboard (eliminating warps caused by dampness). It's a swell place for all those neat stickers issued by AMA, the USIC, NFFS and Steve Gardner. I make a standard set of labels for the boxes in the computer which list the contents, that it's fragile and that it is a super gee whiz penny plane that uses about 2 feet of 1.25 Tan II, or whatever. Stick 'em on with spray adhesive that's too globby to use for covering. Rules for the class are attached to the box for quick reference. The boxes stack inside the car like boxwood (box-wood - get it)? I look forward to building foam core boxes because it's a design challenge. I sit around all the time and say "man look at all those neat boxes". So far I haven't suffered any damage to my planes, including 5 trips to the USIC and one to the Akron Airdock. These might even survive a trip to the salt mines! Hey! Did you say someone has foam core board on sale?

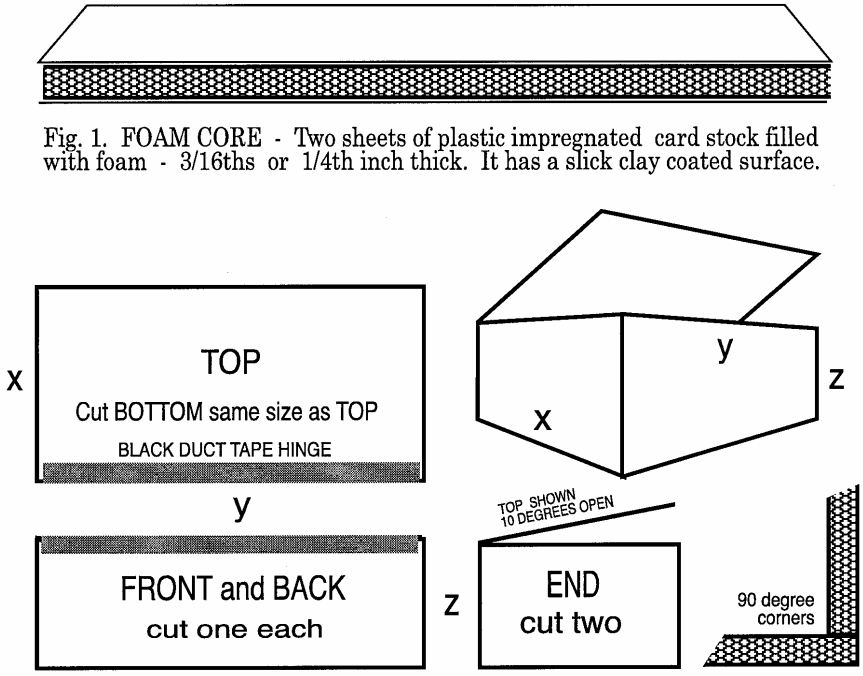


Fig. 1. FOAM CORE - Two sheets of plastic impregnated card stock filled with foam - 3/16ths or 1/4th inch thick. It has a slick clay coated surface.

Fig. 2. Shown are the X, Y, Z dimensions of a typical box. They are: Top and bottom - X/Y, front and back - Y/Z, ends - X/Z. Be sure to make 90 degree corners and vertical cuts on the board.

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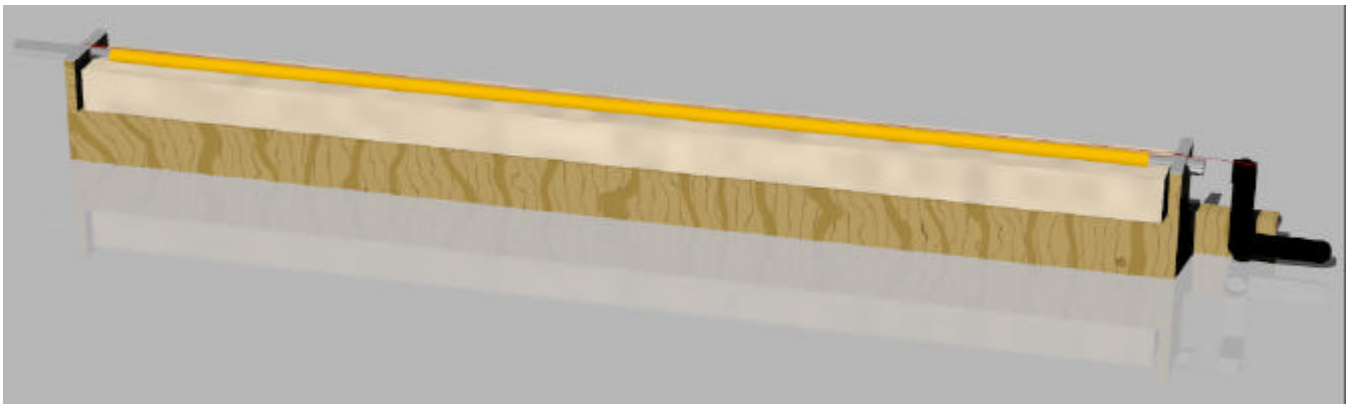
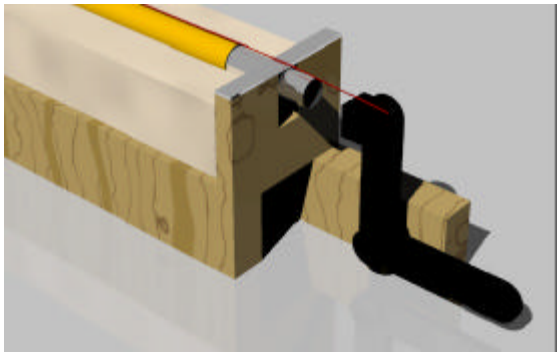


Jig for the application of boron to motor sticks
Written & drawn by Tim Goldstein

When I first started in F1D my motor sticks all looked like they were built by the crooked man in the crooked house. The first year I was at Kibbie Dome Nick Leonard Sr noticed this and gave me a back of a napkin sketch of the jig he used to make his motorstick straight while putting his boron on and assuring that the boron was tensioned evenly. Following is my interpretation of his jig. I have been using it since and it sure does give you arrow straight motor sticks with boron that looks perfect.

There are no critical dimensions on the jig so it is shown without units. Mine is constructed out of supplies I had on hand. I used some spruce for the bottom rails (, balsa sheet for the base plate and uprights, brass shim stock for the retainer plates on the uprights, silicone R/C receiver foam for the pressure pad, and a R/C aileron bell crank. The uprights are made tall enough so that when you put your mandrel through them the foam pad is pressing up enough to push the motor stick tight against the mandrel, but not hard enough to bow the mandrel. The retainer plates need to be thin enough that the boron lays snugly against the top of the motor stick.

To use the jig you slide your mandrel with the seamed motor tube on it into the jig. The foam pad will press the motor tube snuggly against the mandrel so that it is dead straight. You then glue the boron to the retainer plate at the end opposite the bell crank and to the block attached to the bell crank. Once that glue has dried you put the weight of your choice on the horizontal arm of the crank (I use about 80 gm). This tensions the boron and pulls it straight. Now use your favorite method to firmly attach the boron to the stick. Once that sets you snap the excess boron at the ends of the motor stick then slide the mandrel forward so the end towards the bell crank comes free. Now lift it up slightly to take the pressure of the foam off the motor tube and rotate the tube into position for the next strand. Now repeat the above until all strands are attached.



Besides straightening your motor stick this method also applies the boron with the exact same amount of tension on each strand so the stick stays straight.

This is a response to the article run in INAV 108

Having just finished Mr. Kehr's editorial on steering in the latest INAV I feel compelled to comment.

I agree completely that Contest Directors need to enforce steering rules correctly (as well as communicate site specific information, such as boundaries across which steering is allowed, and definitions of objects away from which models may be steered). Putting everyone "on the same page" might help alleviate some problems and misunderstandings. I expect that the majority of steering concerns are due to either the steerer or steering critic not being aware of the relevant rules and interpretations. I doubt many are the result of malicious intent. I didn't see the questionable steers to which Mr. Kehr alluded (and I hope it wasn't any of mine that were considered inappropriate). But I would guess that any differences of opinion stem from site-specific interpretations that have been communicated in the past, but not recently. As a solution, I propose a clarification with the following site-specific steering rules interpretation that could be included in the information package (these could possibly be modified for other sites):
****

Proposal for USIC Steering Rules Interpretations
BOUNDARIES
Steering is allowed once the model crosses the following boundaries:
- The edge of the red running track on the long sides
- The inside edge of the tennis courts

Discussion / Rationale: In a dome, the wall / ceiling boundary is not clearly defined. At some point the top of the dome changes from a ceiling, from which we are not allowed to steer, to a wall, from which we definitely want to steer. There is a precedent from previous USICs for choosing the edge of the tennis courts as that delineation.

Steering a model that drifts over the seats ranges from not desirable to impossible. Running up and down the steps is great exercise, but not so great for getting a model safely back into the main flying area. The running track is a reasonable boundary.

ALLOWED OBJECTS
Steering is allowed when a model is within three circles (measuring time, not distance) of colliding with one of the following:- The speakers or speaker cables- The yellow rope running from the wall to the black bag at the top of the dome.

Discussion / Rationale: There is precedent for designating "contents" such as the yellow rope as something from which model can be steered: at the 1996 WC at Moscow, ID competitors were allowed to steer from the curtain rods dividing the upper airspace.

Obviously, "three circles away" is a big judgment call. The rules state the decision to steer is the competitor's.

DISALLOWED OBJECT
Steering is not allowed from objects including, but not limited to:
- The arch beams
- The center vent
- The cross beams next to the vent
- The black bag near the top of the site

Discussion / Rationale: The arch beams, cross beams, and vent are part of the ceiling. The black bag poses little threat, and is close to the main flying space, encouraging too much steering near the majority of other models.

DISQUALIFYING OFFENCES
The competitor shall be disqualified from the event he / she is currently flying if:
- His / her balloon or line makes physical contact with another competitors airplane during an attempted steer. the competitor shall be disqualified from an event of the CD's choice if:
- His / her balloon or line makes physical contact with another competitors airplane while the balloon is being carried.
Discussion / Rationale: This departure from the AMA steering rules is intended to persuade people to try harder to avoid other people's planes.

ETIQUETTE
The following are considered extremely poor etiquette:
- Disturbing the air through which another competitor's model will fly with a balloon, your body, or in any other fashion.
- Standing around with / leaving your balloon within the boundaries listed above.
****

On the other hand, I contest a few of the points asserted in Mr. Kehr's editorial.

The rules do not state that it is "the timekeepers responsibility . to warn of any potential infractions" related to deciding when to steer. They specify that the timekeeper warn the competitor if his / her model's altitude change is approaching the limit, or if he / she is likely to endanger other models.

The call at the most recent USIC to stuff balloons under the balcony is, in my opinion, a well-intentioned solution in search of a problem. Previous requests to move balloons out of the center flying space made sense, but this request involved significant hassle for nominal gain. If a model is low enough and far over the seats and competitor tables to be in risk of hitting a balloon parked along the side, then it is significantly past due for a steer. At the very least,

balloons, people, tables, and chairs can be evacuated if a flight is landing in a populated area. It appeared, by their actions, that many other people concurred.

Mr. Kehr states, "It is predictable that a number of top modelers will drag their steering gear with them as the follow the drift and as soon as it "appears" their model may fly to an undesirable location.up goes the balloon.". I would suggest that ALL modelers put up a balloon when it appears that their model may fly into an undesirable location, as outlined in the rules and interpretations.

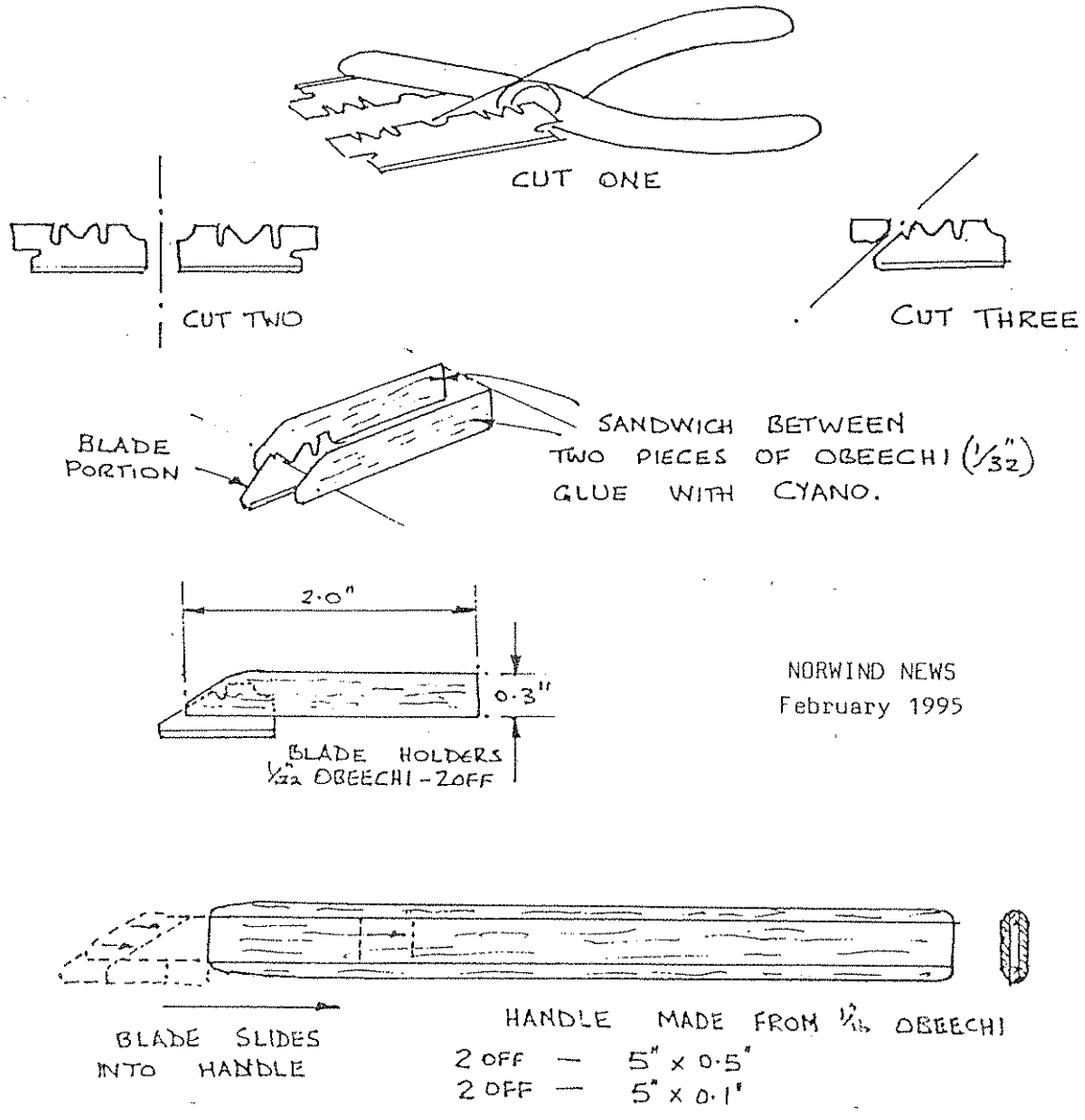
Overall, I agree with the message:
- Everyone, including Contest Directors, should know the steering rules and interpretations.
- People should be considerate when walking, steering, and parking their equipment. With the addition of:
- We should denote rule interpretations for everyone to read.
- Let's be judicious about the rules we impose on ourselves.

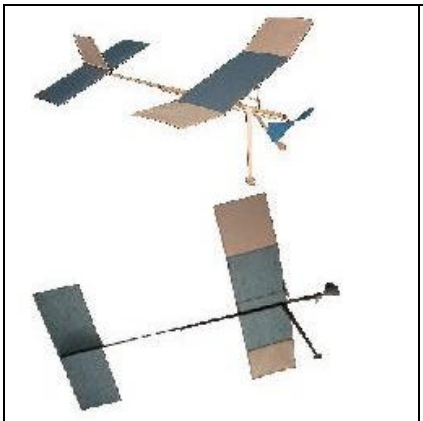
John Kagan

A Modelling Knife

by John Taylor as printed in Norwind News.

While everyone else is searching out old fashioned Carbon Steel razor blades, John has utilised current high quality Stainless Steel blades for his knife. Although Stainless Steel blades won't 'Snap' like their Carbon counterparts, they can be cut quite easily. John uses the manufactured corners giving four edges per blade. John's sketches (not full size) show you just how it's done.





Kit Review - Ray Harlan's "Bambino" (a Sci. Oly. design)
by Kermit Walker, Lodi, California

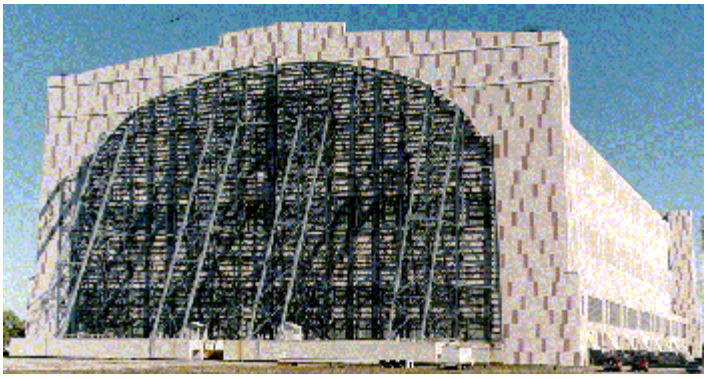
This will be a brief review of Ray Harlan's "Bambino" Science Olympiad (SO) 2-model kit. I am by no means an expert indoor duration modeler, but I have been flying indoor models such as peanut scale as the like for several years now, and have recently built a couple of indoor duration type models. I have also been building and flying other types of model airplanes continuously for most of my life (over 50 years) and that includes nearly 15 years of outdoor free flight competition from the late 1950's into the mid-1970's.

The kit - Upon opening the kit box (a nice sturdy tube), I was pleased to find enough first-class materials to build 2 Bambinos. Included were 2 plan sheets, 2 sheets of different-colored, high quality Japanese tissue, a number of pieces of strip balsa, separate sheets of laser-cut wing and stabilizer ribs, 2 molded plastic propellors, a bag of small parts (including laser-cut wheels), and one set of comprehensive instructions, with one sheet of addendums. Also included was about 12' each of 4 different widths of what appeared to be recent Tan II rubber strip - the multiple sizes and generous lengths being a nice plus not often found in kits, at least in my experience. The strip wood was color-coded for use as referenced in the instructions and in general, the materials appeared to be appropriate for their intended use and of good quality.

Building the model - I built one of models from the kit and then passed on the remaining materials and the instructions to a friend who has recently been bitten hard by the indoor bug for him to build the other. I followed the provided instructions pretty much to the letter, and the model went together very well, with a minimum of effort or head scratching. I even used the method specified to attach the tissue using Super 77 spray contact cement - something I had never done with tissue and was somewhat dubious about - and it worked quite well. The only slightly negative comments I might have involved getting to the specified component weights for an 8 gram model and the required modifying of the propellor (prop). The instructions have very good specifications all along as to what weights each component, even the raw materials for that matter, need to be for either an 8 gram model or a 10 gram model, and I had some problems getting the strip wood light enough for an 8 gram model without sanding it down too much. Then there is the prop! I am given to understand by people who should know that the process called out in the instructions to modify the prop by scraping and finally sanding it to reduce its weight from something like 4.5 to 5 grams to something like 2 to 3 grams is the standard practice for SO models. However, I found the process both tedious and not the easiest task I've ever done - I fact, I got tired and frustrated early on and gave up at about 3.3 grams. I would estimate my total building time (I didn't know at the time that I'd be writing this review) to be something around 8 to 10 hours over 2 days, but I consider myself a pretty slow builder and I'm sure others could cut that time considerably. I also followed the specified procedure to calculate and locate the balance point of the model before gluing on the wing strut tubes to the fuselage stick, and although the process seemed kind of lengthy, it did result in the model being balanced in exactly the correct place without any balance weight required - a very good thing! My model finished up at 9.5 grams, without rubber, and I'm sure that with some more work in further lightening the prop, and perhaps some lightening of the motor stick, I could have gotten the weight down close to the 8 gram minimum.

Flying the model - The instructions have the builder build-in a number of pre-flight adjustments (left thrust, left stabilizer tilt, left rudder offset, left wing warp, etc.) and the model is designed with an asymmetrical wing (left wing longer). The instructions also contain detailed trimming or adjusting instructions. As it turns out, my model needed exactly zero adjustments not only just to fly, but to fly about as well as I think it can! The first couple of flights went so well, that the model was soon testing the limits of the 22' high ceiling in the gym building that we fly in locally. My best 2 flights out of the 8 or so I made that evening were 2:01 and 2:05 - times I consider quite good for a brand new model at 9.5 grams under a 22' ceiling.

Summary - I was quite pleased with my first experience in building an SO model and, more to the point of this review, was quite satisfied with the overall experience in building this specific kit. I would not hesitate to recommend the kit to anyone wishing to build an SO model. I think this recommendation would apply especially to newer indoor modelers, as the instructions are both well written and detailed enough so that even the most novice indoor duration modeler should have a minimum of difficulty in achieving success with this kit. Good stuff, Ray!



GREAT INDOOR SITES

PART 2

N.A.S. Lakehurst, New Jersey

By Carl Bakay

Without question, Lakehurst Naval Air Station is the most famous airship base in the United States. The focus of Lighter Than Air flight (LTA), it was the main Navy base for rigid dirigibles and non rigid blimps in this country. It was home base for the Shenandoah, Los Angeles, Akron, and Macon. These were rigid ships so big that they launched and recovered biplanes from their own hangars in the bottom. It was the first international airport, start and terminus for the epochal around-the-world flight of the Graf Zeppelin in 1929, and the site of the terrible loss of the Hindenburg in 1937. The list of firsts and lasts is far too long to mention here, but the in between makes for quite a story.

A Naval aviator once said that a love affair with an airship is a lot like a love affair with a kangaroo – "You're gonna need a lotta room." That was certainly the case in the Pine Barrens of south central New Jersey. Fertile cranberry bogs dotted the north central part of our state (I was born and raised in Trenton, on the East coast), but nobody but the Army knew what to do with all the pine forests in the southern part. In 1915, with the Great War in Europe growing ever greater, Eddystone Ammunition Company bought a large tract of land to the east of Fort Dix Miliary Reservation, and between the little towns of Lakehurst village and Ridgeway, New Jersey. They produced and tested artillery shells for the Imperial Russian Government. Near the end of the war, it was taken over by the Army as a training camp for the new Chemical Warfare Service, called Camp Kendrick, but the Army had no use for it after the war, and offered the land for sale.

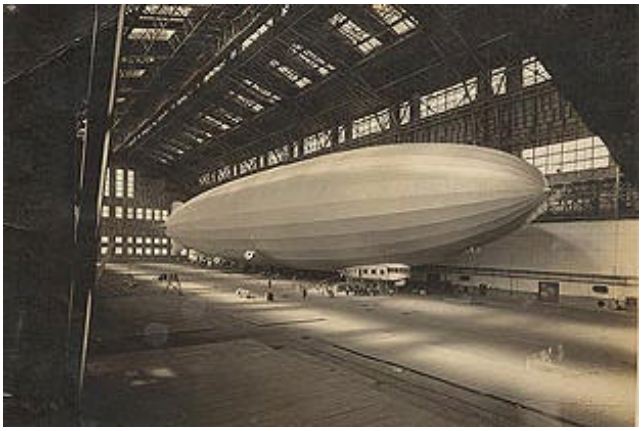
It did not stay vacant for long. In 1919 the Navy purchased the tract and named it Naval Air Station, Lakehurst, and Franklin D. Roosevelt authorized money for the construction of a hangar. Just north from Trenton and across the river in Pennsylvania were the great foundries of Bethlehem Steel Company, and it was they who delivered and erected the first of ten steel trusses on May 17, 1920. The design for the building was similar to those found in Great Britain during this period, basically a collection of arched bridge sections fastened atop steel towers for elevation. Hangar No. 1 was completed in the summer of 1921, and the station itself commissioned in June of the same year.

The place was huge, with outer dimensions of 350 feet by 966 feet, with the top of the roof reaching 224 feet. Subtract the giant doors, the side shops, service bays and offices, and there was still a clear floor of 262 by 804 feet, room for about three and a half West Baden resorts on the inside, towers and all. Later on, during Word War II, down the road were built Hangars 2 and 3 in 1942, and Hangars 5 and 6 in 1943. These last two were just as large as No. 1. Each is 1088 by 297 feet at the base, and 187 feet high, all made of wood.

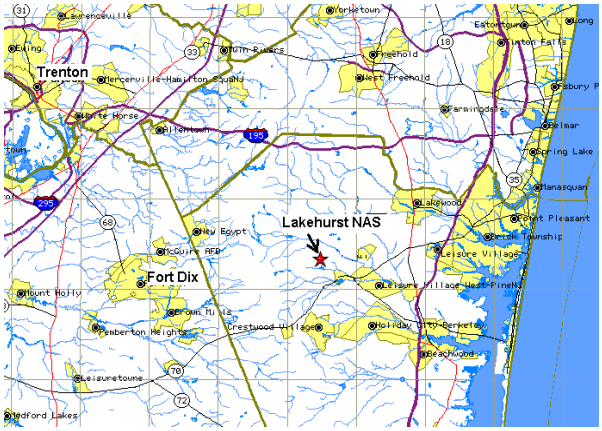
Airship fleet operations began in earnest with the delivery of the USS Shenandoah, which dominated the Lakehurst scene from 1923 until 1925. The twenties were great years for the airship, and the Navy envisioned dozens of them for fleet escort and antisubmarine duty. The Shenandoah was busy traveling on "handshake tours" all around the country, and spirits ran high. Then, in 1925 it ended when she was destroyed in a storm over Ohio. It was an omen of things to come. Flights continued with the German-built Los Angeles starting in 1925, the USS Macon, and the USS Akron from 1931 to 1933, when the Akron, too,

was lost off Barnegat Lighthouse in New Jersey with a heavy loss of life. Then the Hindenburg caught fire while mooring at the tall mast, and burned to the ground in seconds with its hydrogen gas.

This period marked the beginning of the end of airships, both military and commercial, in this country, but just the opposite happened for winged flight. In 1927 Charles Lindberg galvanized the world with his solo transatlantic flight of 33 hours in a stripped down, overloaded Ryan mailplane. Public interest in commercial aviation skyrocketed, and youthful interest in model aviation did the same. "You can build a model that looks and flies just like the big ships!" was the rallying cry in magazines for boys. There were perhaps 20 kit manufacturers before 1927, and over 2000 the following year. The Aviation Model League of America (AMLA) was born in 1927 in the pages of The American Boy magazine, and national indoor and outdoor contests were sponsored by them every summer, starting in 1928. In 1931 Model Aviation magazine was born, and indoor modeling was really on its way.



USS Los Angeles Moored in Hangar No. 1



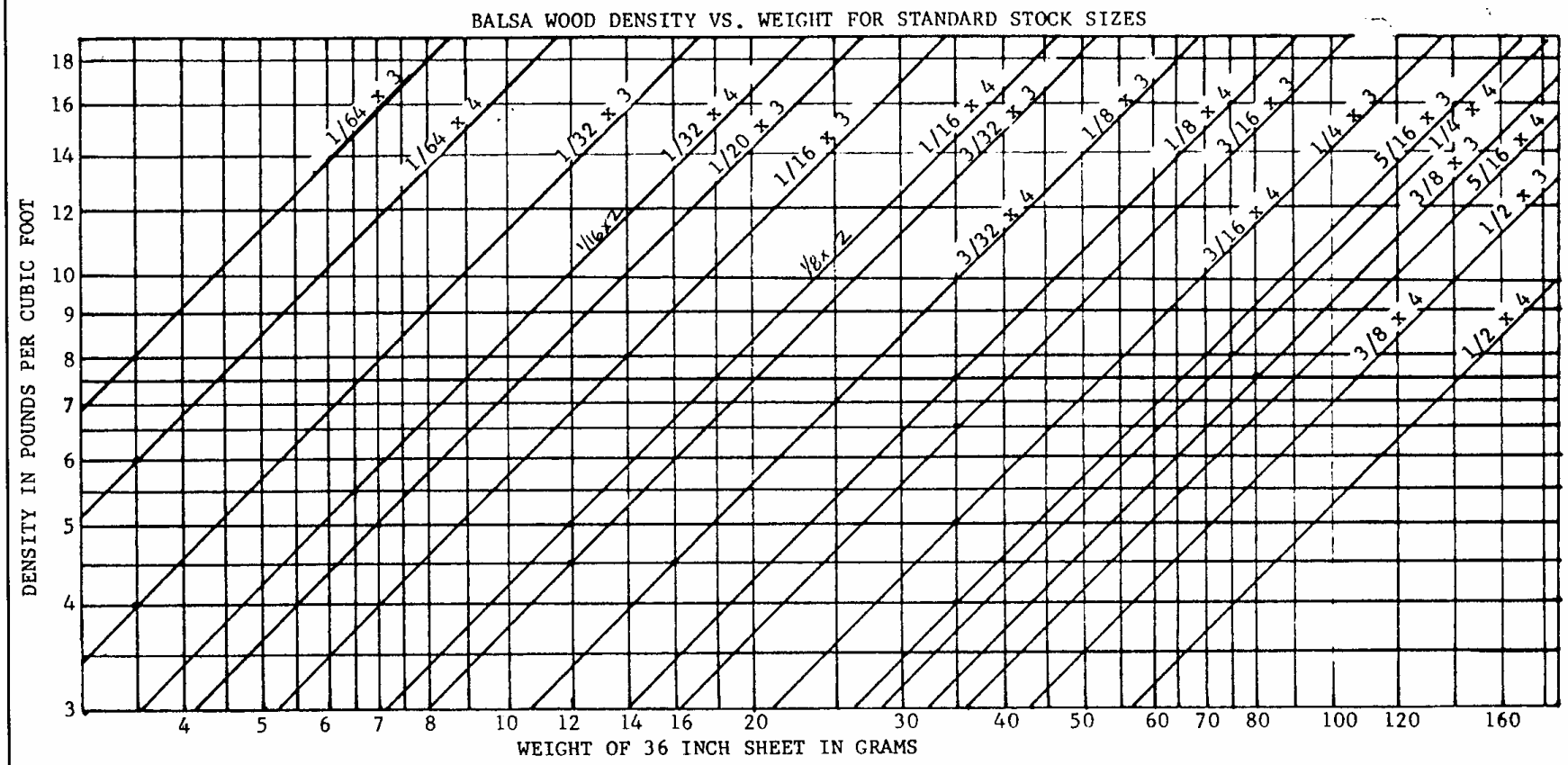
Located in South Central New Jersey

Let me quote from the East Coast Indoor Modelers Site (ECIM):

I*n 1926, not long after construction of Hangar No.1, a group of modelers were given permission from Commander Charles Rosendahl (the father of airship development in the U.S.) to utilize the Navy facility for Ultra - Light Models. Through the remaining portion of the year and the next couple, Indoor Modeling was able to develop in this unlimited space. In 1931 the first major Free Flight Contest was held in Hangar No.1 hosted by the Lakehurst modeling group. This event marks the formal origin of what we now call the East Coast Indoor Modelers (ECIM).*
Today ECIM works in conjunction with several organizations to perpetuate this superb facility. Being one of the oldest modeling groups in the world, we are proud to continue our tradition here at our original home. Many of our present members you may meet have been flying here for over 50 years!
Recently, ECIM has added Indoor RC Slowflyers to the membership and activities which are present in the Hangar.
The president of ECIM is Rob Romash. Contact him at cgrain1@yahoo.com to join the club.
Several World Championships were held in Hangar 5, while Hangar 1 has been used by the East Coast Indoor Modelers from 1931 until today for hosting national record trials and weekend flying.

Here are some links for more info:

http://www.lakehurstnj.org/visitgde.html	Visitor's Guide, some pix.
http://www.nlhs.com/	Navy Lakehurst Historical Society
www.geocities.com/CapeCanaveral/1022/lakehurs.html	Lakehurst NAS Site



Note: For 2" wide stock, weigh and multiply by 2. Then use 4" wide data

EQUIVALENT SIZES

1/64 x 3	1/64 x 4	1/32 x 3	1/32 x 4	1/16 x 3	1/16 x 4	3/32 x 3	3/32 x 4	1/8 x 1
1/8 x 3/8	1/4 SQ	1/8 x 1/4 (3)	1/4 x 1/2	1/8 x 1/2 (3)	1/4 x 1	3/16 SQ (8)	3/8 x 1	1/2 x 1
3/16 x 1/4		3/16 x 1/2		1/4 x 3/4	1/2 SQ	3/8 x 3/4	1/2 x 3/4	
1/8 SQ (3)		1/4 x 3/8		3/8 x 1/2		3/8 SQ (2)		

GOLD NUGGETS

A FEATHER by John Pakiz, Omaha, NE

This is a pigeon flight feather I found in the front yard. I like to look at nature, as no one is smarter than God. The feather has an airfoil, and is reflexed at the T.E. Notice the shape and think of this as a wing. Our study of aerodynamics says a wing should approximate an ellipse for best lift distribution over the span.

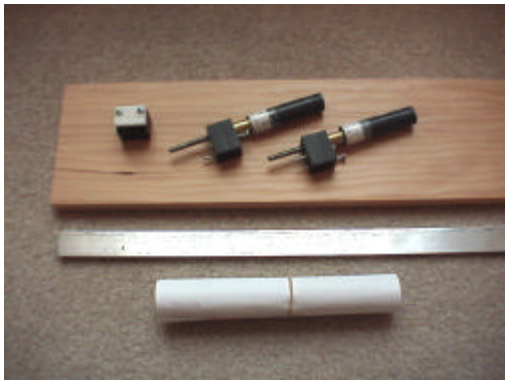
Notice where the quill is – way up front by the leading edge. The airfoil high point line runs along the quill line. Years ago I saw a sheet that compared the wing cross section of various birds. I noticed the buzzard wing airfoil high point line was close to the L.E. I thought, "Hm, buzzards are great soaring birds so why not replicate this on my models?" I called such sections the John Pakiz Buzzard Special.

Years afterward I learned that airfoils with the high point close to the leading edge are advantageous because if the boundary layer separates (separation bubble), then the airflow has a chance to reattach to the wing before it gets to the trailing edge. This in effect increases the coefficient of lift and decreases drag. My small sport rubber models with buzzard's wings climb like rockets and the wings don't stall.

Now look at the feather again and think of it as a propeller. See how it tapers toward the tip with the thickest chord near the hub. I can attest from experience that props like this are more efficient than ones with a constant chord. Since the tip spins faster than the hub, you can have a shorter chord at the tip, still have a good Reynold's Number value and less vortex drag.

A propeller is simply a rotating wing, so once again think of the ellipse shape.These are simply thoughts.

Brand New Product www.F1D.biz
The Tim Goldstein Balsa Stripper - by Carl Bakay



Indoor News and Views has published plans for micrometer type balsa strippers from time to time, but here is an ARU (Almost Ready to Use) version that you can assemble in ten minutes.

You supply a board 4"-6" x 5/8" x 24"-26", but everything else you'll need comes in the kit, as shown in the photograph. Two micrometers made from 20 tpi high-quality threaded rod, are the main items, already graduated for 50 thousandths of an inch per revolution, and set in pre-drilled delrin blocks. Also included are an aluminum bar straightedge, cutting block and instructions. Tim provides a template for drilling the mounting screw holes, but I found it was simpler just to position the micrometer blocks 24" apart, insert the screws, and whack their little heads with a hammer for drill hole positions. Screw in the four screws, and you are done. Making straight or tapered strips anywhere from 0.010" to 0.100" was smooth and easy. Buy one, you'll like it. They are $45.00.

*www.F1d.biz tells us this item will be available to ship in early December.

Deutscher Aero Club e.V. - Sportfachgruppe Modellflug

Offene Deutsche Saalflugmeisterschaften 14.-15. September 2002 - Cargo Lifter Werft Brand - Briesen

F1D

Name	Vorname	Nation	Junior	1	2	3	4	5	6	1. Wert	2. Wert	Gesamt	Platz
Mangalea	Corneliu	ROM		36:42	37:10	**39:06**	40:38	00:00	00:00	40:38	39:06	79:44	1
Schramm	Lutz	GER		35:21	35:44	38:31	41:02	37:18	00:00	41:02	38:31	79:33	2
Krause	Marian	GER		35:23	31:23	31:40	39:15	00:00	00:00	39:15	35:23	74:38	3
Popa	Aurel	ROM		35:49	36:37	37:09	35:28	00:00	00:00	37:09	36:37	73:46	4
Kuttler	Peter	GER		31:49	34:58	37:23	00:00	00:00	00:00	37:23	34:58	72:21	5
Aikman	Nick	GBR		33:27	33:58	36:32	34:01	00:00	00:00	36:32	34:01	70:33	6
Green	Ron	GBR		36:02	33:39	31:54	00:00	00:00	00:00	36:02	33:39	69:41	7
Siebenmann	Dieter	SUI		35:42	32:12	00:00	00:00	00:00	00:00	35:42	32:12	67:54	8
Tipper	John	GBR		30:29	34:48	32:53	00:00	00:00	00:00	34:48	32:53	67:41	9
Lotz	Philipp	GER	J	26:16	27:59	27:38	30:56	34:28	00:00	34:28	30:56	65:24	10
Merkt	Thomas	GER		31:18	32:20	32:27	29:24	30:18	00:00	32:27	32:20	64:47	11
Bailey	Bob	GBR		32:11	32:03	00:00	00:00	00:00	00:00	32:11	32:03	64:14	12
Bundesen	Uwe	GER		28:44	32:04	28:48	31:24	31:21	00:00	32:04	31:24	63:28	13
Schönfelder	Karl	GER		30:31	31:29	31:23	26:56	28:00	24:54	31:29	31:23	62:52	14
Hunt	Bernhard	GBR		31:29	00:00	00:00	30:33	00:32	00:00	31:29	30:33	62:02	15
Botos	Istvan	HUN		30:27	31:30	00:00	00:00	00:00	00:00	31:30	30:27	61:57	16
Orsovai	Dezsö	HUN		30:52	29:07	30:39	30:48	00:00	00:00	30:52	30:48	61:40	17
Lotz	Rainer	GER		15:17	15:43	17:35	23:15	31:50	29:49	31:50	29:49	61:39	18
Dihm	Jan	POL		26:05	26:27	00:00	25:52	29:26	31:30	31:30	29:26	60:56	19
Sukosd	Zoltan	HUN		26:26	00:00	00:00	29:36	30:49	00:00	30:49	29:36	60:25	20
Ciapala	Edward	POL		30:07	28:27	28:25	24:10	25:45	00:00	30:07	28:27	58:34	21
Nimptsch	Werner	GER		25:11	22:22	24:20	24:52	28:12	27:23	28:12	27:23	55:35	22
Simon	Gyula	HUN		24:49	26:00	25:52	24:31	24:27	24:15	26:00	25:52	51:52	23
Ree	Andras	HUN		29:50	21:35	00:00	00:00	00:00	00:00	29:50	21:35	51:25	24
Filek	Jakub	POL	J	23:47	25:37	25:29	20:51	22:03	21:22	25:37	25:29	51:06	25
Markiewicz	Jerzy	POL		22:02	19:48	00:00	23:16	23:40	23:59	23:59	23:40	47:39	26
Vins	Karol	SVK		18:26	15:32	16:46	00:00	00:00	00:00	18:26	16:46	35:12	27
Kaplan Jun.	Mikita	CZE		24:56	00:00	00:00	00:00	00:00	00:00	24:56	00:00	24:56	28
Kaplanova	Klara	CZE	J	18:17	00:00	00:00	00:00	00:00	00:00	18:17	00:00	18:17	29
Barr	Laurie	GBR		18:11	00:00	00:00	00:00	00:00	00:00	18:11	00:00	18:11	30
Vogler	Kurt	GER		04:28	06:28	05:08	04:44	07:15	05:48	07:15	06:28	13:43	31
Lefever	Geoffrey	GBR		00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	32

F1M

Name	Vorname	Nation	Junior	1	2	3	4	5	6	1. Wert	2. Wert	Gesamt	Platz
Hunt	Bernhard	GBR		20:04	20:33	00:00	20:42	21:58	00:00	21:58	20:42	42:40	1
Nimptsch	Werner	GER		15:55	19:47	17:52	17:57	18:38	00:00	19:47	18:38	38:25	2
Barr	Laurie	GBR		12:08	18:11	17:43	00:00	00:00	00:00	18:11	17:43	35:54	3
Lotz	Rainer	GER		10:20	16:20	18:58	00:00	00:00	00:00	18:58	16:20	35:18	4
Wächter	Bruno	GER		12:16	17:20	16:44	14:32	16:58	16:36	17:20	16:58	34:18	5
Bundesen	Uwe	GER		18:05	15:38	14:59	00:00	00:00	00:00	18:05	15:38	33:43	6
Offterdinger	Harald	GER		14:17	12:09	0:00	14:28	15:10	16:55	16:55	15:10	32:05	7
Feger	Jens	GER	J	15:06	14:59	13:48	00:00	00:00	00:00	15:06	14:59	30:05	8
Hasselmann	Johannes	GER	J	04:36	11:23	11:11	14:04	13:41	14:52	14:52	14:04	28:56	9
Viezens	Ekkerhard	GER		07:31	05:19	09:21	05:12	08:02	07:31	09:21	08:02	17:23	10

F1L

Name	Vorname	Nation	Junior	1	2	3	4	5	6	1. Wert	2. Wert	Gesamt	Platz
Barr	Laurie	GBR		25:21	27:45	28:16	00:00	00:00	00:00	28:16	27:45	56:01	1
Kaplan Jun.	Mikita	CZE		19:26	23:51	25:37	27:01	27:58	00:00	27:58	27:01	54:59	2
Lefever	Geoffrey	GBR		24:27	26:30	26:37	26:41	26:22	26:40	26:41	26:40	53:21	3
Wilson	Roy	GBR		24:46	01:57	26:01	25:27	00:00	00:00	26:01	25:27	51:28	4
Lotz	Rainer	GER		23:05	24:12	25:08	25:27	20:12	00:00	25:27	25:08	50:35	6
Bundesen	Uwe	GER		23:19	25:25	22:22	25:45	00:00	00:00	25:45	25:25	51:10	5
Tipper	John	GBR		18:41	25:19	23:03	23:18	23:06	00:00	25:19	23:18	48:37	7
Feifer	Ladislav	CZE		21:25	20:24	21:08	23:08	00:00	00:00	23:08	21:25	44:33	8
Orsovai	Dezso	HUN		20:20	22:01	00:00	00:00	00:00	00:00	22:01	20:20	42:21	9
King	Clive	GBR		16:57	21:14	20:54	00:00	00:00	00:00	21:14	20:54	42:08	10
Nimptsch	Werner	GER		19:50	18:52	00:00	00:00	00:00	00:00	19:50	18:52	38:42	11
Najman	Milan	CZE		16:07	16:52	17:33	18:48	17:46	18:52	18:52	18:48	37:40	12
Vins	Karol	SVK		18:28	18:07	16:37	12:31	16:55	00:00	18:28	18:07	36:35	13
Kaplanova	Klara	CZE	J	14:37	13:00	11:59	16:05	17:15	00:00	17:15	16:05	33:20	14
Kaplanova	Gabriela	CZE	J	14:23	17:10	15:22	00:00	00:00	00:00	17:10	15:22	32:32	15
Strnad	Leo	CZE	J	13:29	16:39	00:00	00:00	00:00	00:00	16:39	13:29	30:08	16
Viezens	Ekkerhard	GER		11:01	12:57	11:31	08:45	10:51	11:57	12:57	11:57	24:54	17
Kaplan Sen.	Mikita	CZE		18:01	00:00	00:00	00:00	00:00	00:00	18:01	00:00	18:01	18

F1M-L *Beginner* *Limitiert*

Name	Vorname	Nation	Junior	1	2	3	4	5	6	1. Wert	2. Wert	Gesamt	Platz
Lotz	Philipp	GER	J	05:58	14:36	14:44	00:00	00:00	00:00	14:44	14:36	29:20	1
Wächter	Bruno	GER		12:43	12:30	11:59	09:57	14:22	14:25	14:25	14:22	28:47	2
Offterdinger	Harald	GER		14:17	13:17	00:00	00:00	00:00	00:00	14:17	13:17	27:34	3
Hasselmann	Johannes	GER	J	10:10	12:09	13:29	00:00	00:00	00:00	13:29	12:09	25:38	4
Feger	Jens	GER	J	11:28	10:56	00:00	00:00	00:00	00:00	11:28	10:56	22:24	5
Viezens	Ekkerhard	GER		07:44	06:02	08:41	08:51	08:01	09:13	09:13	08:51	18:04	6
Leopold	Edgard	GER		04:40	04:37	04:39	05:26	05:14	08:52	08:52	05:26	14:18	7

F1D-P1 (35 cm)

Name	Vorname	Nation	Junior	1	2	3	4	5	6	1. Wert	2. Wert	Gesamt	Platz
Tipper	John	GBR		34:26	36:30	30:09	00:00	00:00	00:00	36:30	34:26	70:56	1
Lotz	Rainer	GER		24:43	18:07	24:19	00:00	00:00	00:00	24:43	24:19	49:02	2
Ciapala	Edward	POL		22:08	23:19	24:45	00:00	00:00	00:00	24:45	23:19	48:04	3
Nimptsch	Werner	GER		17:56	24:40	22:33	00:00	00:00	00:00	24:40	22:33	47:13	4
Strattner	Werner	GER		19:43	19:21	20:33	19:10	20:07	20:36	20:36	20:33	41:09	5

Mini Stick

Name	Vorname	Nation	Junior	1	2	3	4	5	6	1. Wert	2. Wert	Gesamt	Platz
Barr	Laurie	GBR		11:46	12:50	13:26	00:00	00:00	00:00	13:26	12:50	26:16	1
Wilson	Roy	GBR		12:31	11:53	12:19	00:00	00:00	00:00	12:31	12:19	24:50	2
Najman	Milan	CZE		10:29	05:36	09:42	09:29	09:52	00:00	10:29	09:52	20:21	3
Kaplanova	Gabriela	CZE	J	07:50	08:51	07:31	07:55	00:00	00:00	08:51	07:55	16:46	4
Kaplan Sen.	Mikita	CZE		08:24	07:27	07:54	00:00	00:00	00:00	08:24	07:54	16:18	5
Lotz	Rainer	GER		00:00	00:00	00:00	07:18	08:19	00:00	08:19	07:18	15:37	6
Strnad	Leo	CZE	J	05:28	05:50	05:36	06:03	06:44	00:00	06:44	06:03	12:47	7

BRIESAN – BRAND: GERMANY: SEPTEMBER 13th AND 14th.

For the second year running a British raiding party travelled to Germany by air, sea and land to compete in the Open International held at the greatest indoor flying arena in the World. This time, we were nine in number – Bob Bailey, Laurie Barr, Ron Green, Bernie Hunt, Clive King, Geoffrey Lefever, John Tipper, Roy Wilson and I. Laurie, Bernie and John brought their wives along as well. Although we were aware of financial difficulties within the company, we were relieved to find that there is a chance that the 'CargoLifter' operation will start up again. Geoffrey, Ron and I arrived on site on Thursday afternoon to find the visitors centre and tour facilities still in operation although much of the workforce has been laid off until a more stable financial situation can be found. A small airship was flying overhead that was originally built at Cardington. I took this to be a good omen.

Most of us arrived on Thursday, knowing that it would be possible to fly on Friday afternoon and so with Friday morning to kill, Ron Green was persuaded to set up his winding rig in a hotel room and he then gave an impromptu master class in the subtle art of rubber motor winding. Between us, we had several boxes and samples of March 2002 rubber and Ron tested these with the aid of figures obtained from a Bernie Hunt programme that is designed to show what turns and torque can be extracted from a loop of rubber from two different intensities of winding. This information was displayed on a small programmable calculator that most of us had with us. After the session, those of us with tested rubber all had big smiles, knowing that we all had some very potent latex. For the contest, all the UK flyers used March 2002 rubber with the exception of John Tipper who flew with May 1999 and he was plagued by the breakage problems usually associated with this batch.

Entering the hanger on Friday afternoon we met the German F1D team and immediately saw the titanic, black shroud of the CL 75 balloon. This 'Gothic' wreckage was salvaged from a freak accident during a thunderstorm that destroyed the balloon. The sad remains were laid out like a vast circular carpet over a third of the available floor area. The remaining floor-space was still huge.

On Saturday morning, after a cordial welcome and briefing from Gerhard, flying began in earnest at 10.00AM. The hanger was available from 8.00AM to 8.00 PM on both days and many flyers made the most of this opportunity. The contest ran until 5.00 PM on Sunday to allow for prize-giving and other formalities. The classes flown this year were F1D, F1L, 35CM with plastic covering, Mini Stick, No Cal, F1M and a limited type of F1M with restrictions on some dimensions, materials and constructional methods. There were fewer flyers this year and less juniors but nevertheless, modellers from 8 countries were present and with the World Champs only a few weeks away, many national F1D team members were taking the opportunity to practice under a high ceiling.

The conditions outside varied during the weekend from bright and sunny to windy and wet. This seemed to have little effect on the air inside. The only real problem was the low level drift and turbulence that appeared every morning. This also occurred last year and for the first few hours on Saturday and Sunday many models held on run down stands exhibited windmilling propellers. Unfortunately, there was no balloon gas this year and so most of the UK flyers flew cautiously until around 2.00PM when the air quickly became calm. Because of the draught, on the second day the entire UK contingent de-camped to a calmer area in the middle of the hanger, on the edge of the burst balloon and we were then able to launch directly from our workstations.

Of the various classes flown, No Cal, Mini Stick, F1M/F1M limited and 35 CM all attracted relatively few applicants. As can be seen from the results, this did not stop some excellent performances, with Laurie Barr featuring prominently at or near the top of several lists. Also prominent were the excellent junior flyers Philipp Lotz, who beat his father in F1D with a high time of 34:28 and who also had 2 other flights over 30 minutes. The sisters Klara and Gabriela Kaplinova also collected several prizes.

35 Centimetres.

Bob Bailey and I intended to enter 35 CM, but flying F1D took precedence for us both. John Tipper won the class, with two exceptional flights of 34:26 and 36:30, which were posted early on Saturday afternoon. 36:30 is a new official world best ever for this class, extending Bob Bailey's unofficial record from last year by a few seconds. Had Bob entered, the contest would probably have been closer. As it was, the 2-flight total was over 20 minutes ahead of the rest of the field. John flew his latest version of his tandem design with a new wing and tail built 40 milligrams heavier than normal to enable a higher climb. During these flights he lost track of the model on several occasions against the cream coloured hanger background and this problem affected many flyers during the weekend.

F1M.

Bernie Hunt easily won F1M, using the same model that had previously set a new world high time of 22:50 for this class at Cardington. Using a conventional fixed pitch prop the model made high times of 21:58 and 20:42. The aeroplane features similar wing and tail planforms to Bernie's 'Big Square' F1D and Bernie concentrated on F1M this year, beating several other top F1M flyers from the UK and Germany. As with last year, these were the only 2 countries with F1M entrants.

F1L.

Laurie took this class, after a strong competition. Geoffrey Lefever tried everything possible to raise his times to over 26 minutes and although he got as high as Laurie, to within 20 feet of the roof, he was finally pushed down to third place by Mikita

Kaplan who made two better flights late in the final day. There was less UK domination at the top of the results than last year and 18 flyers entered, from 5 different nations.

F1D.

As with last year, the fiercest competition was in F1D, although there were ten fewer entrants. Earlier in the year, Peter Kuttler had set a new Cat' 4 world record at the site with a flight over 37 minutes and early on Saturday morning, I suggested to Gerhard Woebbeking that a flight of 40 minutes might be made during the weekend. Little did I know how prophetic this comment was! I'm sure that by the time this is printed, the shockwaves from the times achieved will have died down somewhat. Nevertheless, the times are remarkable and could probably only have been achieved at this site. This year, the internal air become much more buoyant, at ground level on both competition days, the temperature was in the mid 70's and this was about 10 degrees hotter than last year. At altitude, it may have been hotter. There was minimal drift and the conditions were unaffected by any of the changeable weather outside. Many of the longest flights in F1D and other classes came in the late afternoon or early evening and as expected, most flyers set their high times on the second day after much fine tuning and matching of props to rubber.

Some flyers took this opportunity to test new models in advance of the World Championships and this certainly applied to Ron Green and Bob Bailey who were more concerned with trimming than in going all out to win. The Germans and Romanians certainly seemed to be battling it out for pole position. As there was no round system, flyers could choose exactly when to fly and only a few made all 6 official flights.

Technically, there was much of interest and a lot of it came from the British camp. At last years meeting, Dieter Siebenmann flew a model with a drooping tail boom and a wing set at a high incidence in relation to the thrust line. This sparked off much developmental thinking and work over the winter, most of which was carried out by Bernie Hunt and Ron Green. As a result of this, at Cardington this spring, the first of the 'Droopyboomers' appeared. The aerodynamic concept involved gives the opportunity for 9 or 10 inches of vertical seperation between the wing and tailplane and this allows the tail to function more effectively in less disturbed air. Setting the wing at a positive incidence of around 7 degrees to the thrustline has been shown (on Bernie's whirling arm rig) to be beneficial because the propeller is undoubtedly more efficient when it rotates horizontally. The downward pointing front end allows this to happen through a greater part of the flight. The main gain with these changes is in the letdown phase of the flight.

Other details of the 'Droopyboomers' include changes to clean up and refine the airframe to reduce drag. Some models use wing and tail posts made from high modulus carbon fibre, allowing the cross section to be reduced to miniscule proportions. The wing dihedral has been lessened to around an inch and a quarter to reduce the surface area and thus skin friction. Boron/balsa main spars are now 'de rigueur' and Ron Green currently makes them less deep than normal with more than adequate strength, adding boron fibres let into the top and bottom in 4 thou' channels.

Ron also started the practice of hooking up with the aid of a 'blast plate' – a long rectangle of thin balsa or plywood that fits exactly underneath the whole length of the stick and is held in place with 'hooks' of foam rubber or thin wire. With such tight motors, wound to the limit and with little back off, these simple protective devices should stop most of the carnage that we all had last year with motors breaking on models. Most of us now use these and they also give a good psychological boost when trying to get the motor loaded.

Elsewhere, Peter Kuttler and others also used boron on wing spars. Peter was flying models with elliptical wing outlines and a narrow chord of 180 mm, designed to climb well in the salt mine. He also used prop outlines that ended with rearward facing 'hooked' tips that were similar in shape to the wing/tail tips used by American rubber flyer George Perryman. Several modellers, including the Romanians were flying with a similar wing bracing system to that depicted by Tim Goldstein in INAV 106 and the Romanian models were also microfilm covered – often with plenty of patching from flying in the roof of the mine.

The best Romanian and German flights exhibited fairly tight, spiral climb patterns and there was no consensus on propeller pitch or diameter. Aurel Popa was apparently using a 440mm by 710mm prop while others went up to 460mm by 900mm. I flew with a 19" by 32", Steve Brown outlined propeller and delighted myself and amazed everyone else by ending with a high time of 36: 32 (a new UK record) and 3 other flights over 30 minutes. This extended my personal best by 8 minutes after languishing in the 28 minute doldrums for many months. The UK unbraced models certainly had the highest initial climb angle; going almost vertically just after launch with prodigious wing wash-in. Our longest flights reached an estimated height of 240 feet, but the longest flights of the meeting got another 20 or 30 feet higher than this and the top F1L models went even further to within 20 feet of the roof.

Cornelieu Mangalea raised the official F1D world record to 39:06. by using 2 timekeepers for the flight, which was bettered on 3 other occasions – once by Mangalea again and also by Krause and Schramm from Germany, who eventually set an amazing unofficial record of 41:02. It is unlikely that these times will be bettered for some time of posted anywhere other than at this site. Once again, this exceptional site provided a venue for spectacular performances and once again, I thank and congratulate Gerhard Woebbeking for enabling the meeting to take place in such a smooth but informal manner.

Nick Aikman. 16.10.02.

INDOOR ELECTRIC FF EVENT # 221
By Bob Wilder

With a lot of encouragement from my good friends, Bud Tenny and Jim Clem, I embarked upon the idea of putting together an electric powered indoor free flight model. I had a little experience earlier with electric powered r/c race cars and electric r/c model planes. I later noted an event in the AMA rule book that caught my attention. It was the equivalent of an endurance indoor model that was electric powered and steered by r/c. This was event #627. I thought I had done something great when my first model flew indoors for over ten minutes. I later set a record in event #627 with a flight of over 4 hours. My first love has always been free flight models so I set out to build a light weight indoor electric powered free flight model.

I started with a model similar to a P-24 model powered by two 50 mah NiCad batteries. It was apparent that this type of indoor free flight model had possibilities. The AMA agreed, and event #221 was born!

Currently the rules for event #221 are simple. The model is to be powered with two 50 mah NiCad batteries and the model should not weigh more than one ounce. Harnessing and applying the energy in the most efficient way of these two small batteries is as important as utilizing all of the energy in your rubber motor. Just like all high performing rubber models that require a low wing loading and maximizing the rubber and prop combination, the electric model, likewise, would require that you match the motor, gearbox, and prop for the most efficient combination.

While it is not absolutely necessary, I thought it would save time in the long run to build a thrust stand in order to obtain the most efficient combination. My test stand consists of a variable DC power supply, allowing me to accurately measure the voltage and current supply. Then I built a stand to secure the motor, gearbox, and prop. The thrust was then measured on an accurate digital gram scale.

Currently, there are many small DC motors on the market that could be tried for your first model. One of the more popular motors is the Mabuchi M-20 series, which weighs 3.5 grams. These motors should be available from Kenway Motors, advertised in most model magazines. Secondly, you will need a set of good light weight gears. I experimented with about ten different gear ratios from 4.2:1 to 16.0:1. I found that there was a good selection of small light plastic gears available at my local hobby shop. They are sold as repair gears used to repair servos.

Once you have your motor and gearbox, next you need a good prop. I built my own from balsa using the old standard 15 degree bottle form technique. I have made many different shapes, diameter and pitch props. The bottom line here is to obtain enough thrust to fly your model, which is about 25% or 35% of the weight of your model. Strive to obtain that much thrust at a minimum current draw.

A good model might have about 200 to 300 square inches of wing area and weigh 18 to 22 grams. Keep in mind that the total battery weight is seven grams. Add to that a motor, gearbox, and prop and the weight begins to add up. These models still fly very slowly and gracefully.

I saw Ray Harlan fly his electric model at the Johnson City Nationals this year for a record flight of over 30 minutes. For this event, you will not need a Wilder winder. You will only need a battery charger.

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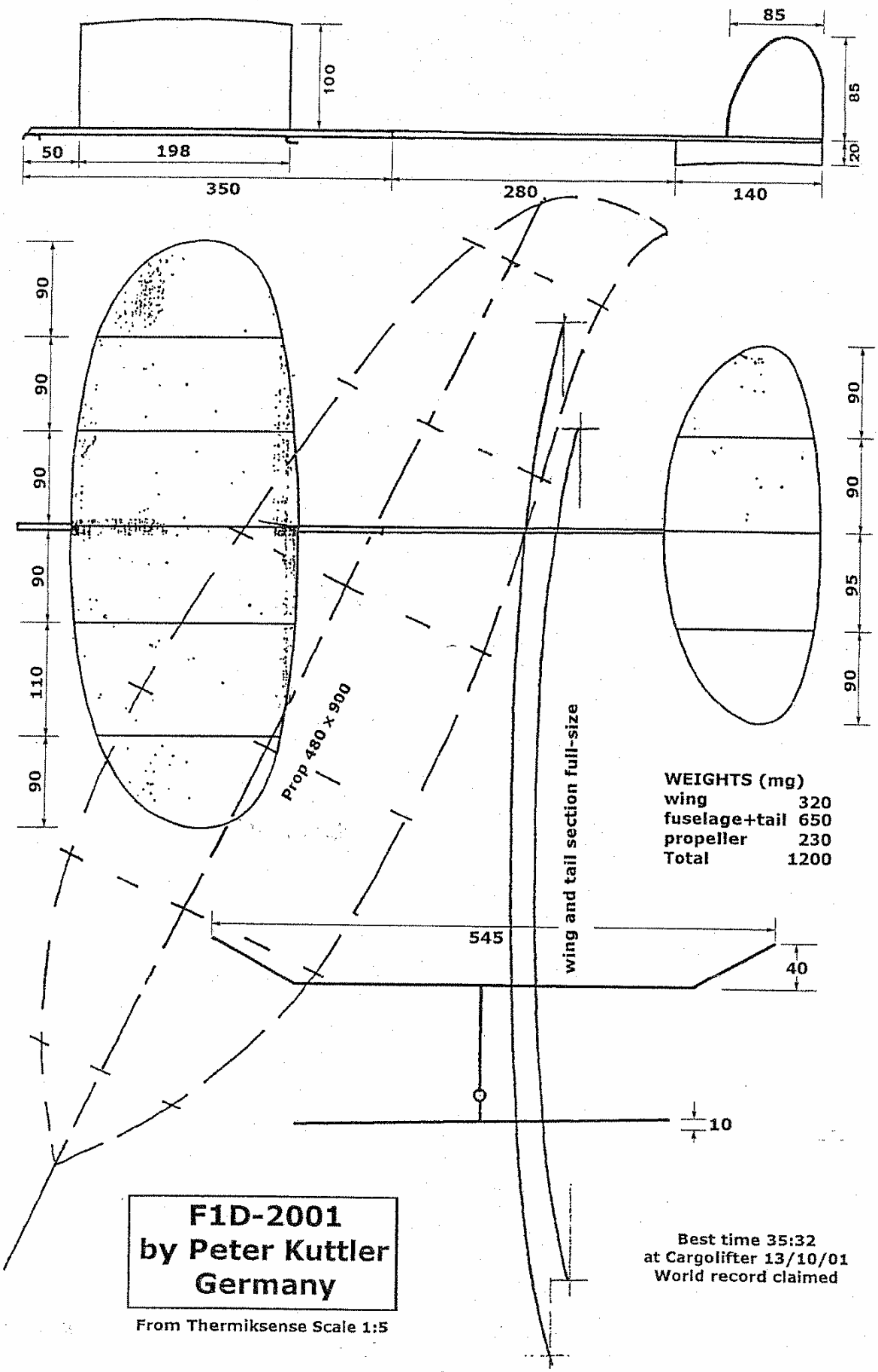
85
100
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198
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90
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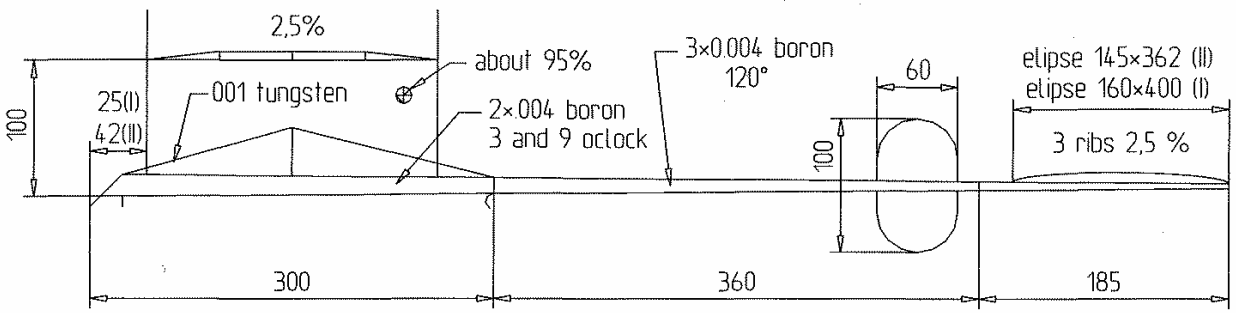
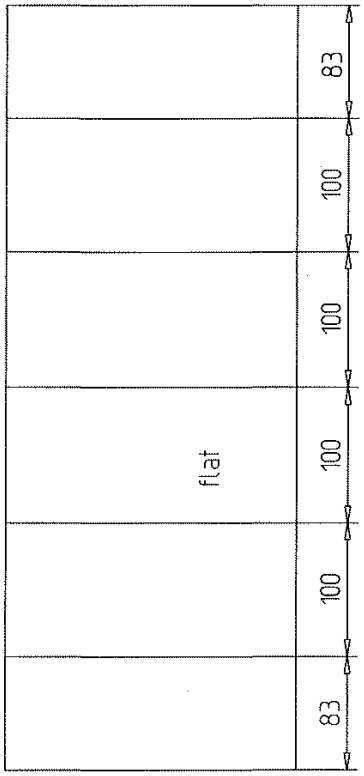
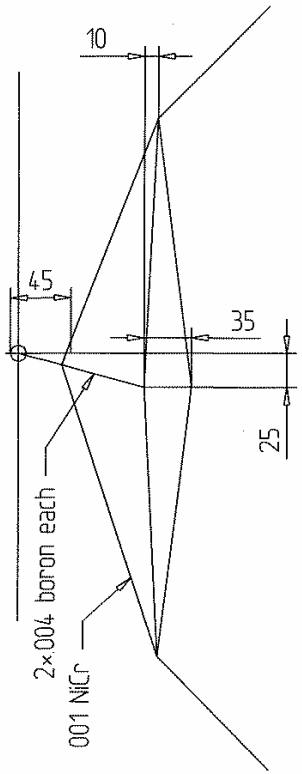
90
90
95
90
Prop 480 x 900
wing and tail section full-size
WEIGHTS (mg)
wing 320
fuselage+tail 650
propeller 230
Total 1200
545
40
10
F1D-2001
by Peter Kuttler
Germany
From Thermiksense Scale 1:5
Best time 35:32
at Cargolifter 13/10/01
World record claimed





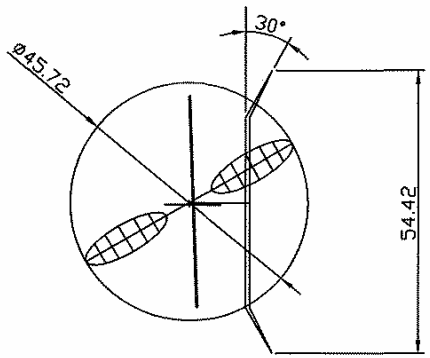


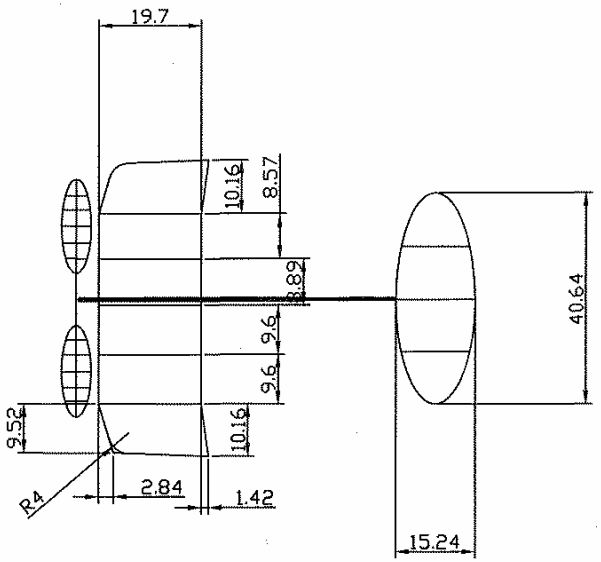
Weights

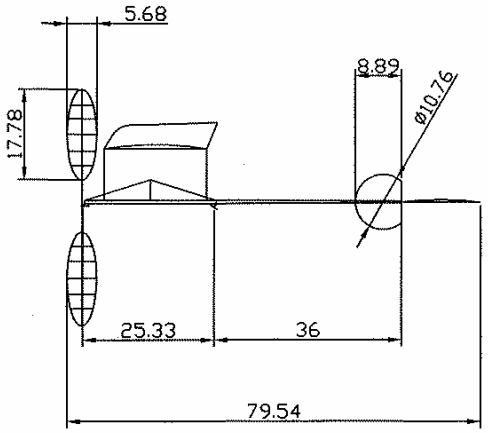
stick	-260mg	
1/2boom	-160mg	
1/2 boom+stab	-160mg	
wing	-350mg	
prop.	-180mg	
rubber	-1,22g/m May '99	1980 turns
covers	- microfilm	
Prop. ϕ440	-710 pitch	
Best times	37'09" Cargo Lifter	
in 2002	35'20" Slanic	

Aurel Popa F 1 D
2002

Brian Johnson's
Jr Record F1D







All dimensions in centimeters
Record flight September 2, 2002
Akron Air Dock
.051 inch X .59 gram 5/99 Tan II
1850 turns - time 35min. 27 sec.

Construction Notes

Wing
- Spars 5.7lb .033x.070tapered to .040
  .004 boron top and bottom
- 3 Center Ribs .035x.050 4% Simplex
- Compression Ribs .028x.030 4% Simplex
- Tips .025x.035
- Frame Weight .25 gram
- Covering Y2K2 - covered weight .30 gram
- Posts .035x.058 - boron 4 sides - .04 gram

Stab - 6x16inch ellipse
- Outline .025x.064@center-.040@tips
- Ribs .035x.050 3% simplex
- Frame Weight .09 gram
- Covering Y2K2 - covered weight .11 gram

Motorstick
- 5.4 lb .013 C grain
- .004 boron @12,3,6,9 o'clock
- Foam webbing
- Weight .31 gram with bracing wire

Tail boom
- 5.4 lb .008 C grain
- .004 boron top and bottom
- Weight with fin - .19 gram

Prop
- Steve Brown VP hub
- 18 diameterx 30 (low) pitch
- Weight - .26 gram

Labor Day Record Flight

by Brian Johnson

For the 3 days of flying at the Akron Airdock (August 31-September 2), I only put up 3 official flights, all of which were over 30 minutes. The first day I was only test flying the plane with half-motors. These tests were disappointing as the highest one was only about 15 or 16 minutes with a VP, and most of them were hanging around 14 minutes. The second day I switched to a large flaring prop and continued doing half-motors, with about the same results as the VP. The plane had a nice take off with the half-motor, so I thought "What the heck, I'll just put up a full motor for the hell of it." I cut some .051 May '99 and put 1650 turns on it (I can't say how much torque because the torque meter I was using is not calibrated to any unit). It was near the end of the day so there was very little drift, but the plane's takeoff was awful. It stalled several times and acted like it wanted to roll over, but it finally pulled out and went into a decent climb. I don't know why it had a bad takeoff on the full motor but not the half-motor. Anyway, the plane only climbed to about 160 ft (20 ft below ceiling) due to the poor takeoff when I had intended for it to get all the way up there. I was pretty disappointed, but as it came down, I realized it would break 30 minutes, which was a good time for only getting up 160 ft and using a fixed-pitch prop. The official time was 31:04 and the plane came down with 140 winds.

The third day I switched back to my VP and continued doing half motors for most of the day. The air in the hanger has a nasty drift all day except for the last few hours, so unless you are good at steering (which I am not) you have to wait until the end of the day for an official flight. My best half motors were still under 15 minutes and staying pretty low despite having very high torque on the motor. My VP had a low pitch of 30, a high pitch of about 34, and maximum tension on the spring, so I guess there was a thermal barrier in the building that the plane couldn't break through on a half-motor. At the end of the day I wound a piece of .053 May '99 that I won in a competition at USIC. I could only get a little over 1500 winds on it. The takeoff was very tame, and the plane bumped the ceiling once. It was at 20 minutes at the ceiling (which baffled a few of my fellow flyers) but it only had 1500 winds on it and it dead-sticked at about 40 ft. The official time was 32:20.

I knew the plane could stay up for several minutes longer in the space of that 40 ft so I downsized the rubber to .051 and put over 1800 winds on it, with the same torque. This flight stayed 5 or 10 ft below the ceiling. It didn't stay as high for as long as the previous flight, but it came down nice and slow. It looked like there were over 100 winds left when it landed, and the official time was 35:27.

These were 3 good days of flying for me, and now I don't have to worry about qualifying in a regional to go to team selection for 2003.

Labor Day Report

By Mark Schaefer

The weather at Akron was excellent first day with low humidity, 80F high and some drifting. Second day was off a bit. Last day turned out better late in day of all three days.

Brian was concentrating on F1D all three days. Second to last flight of day three he ran out of rubber with 31:28 flight. I suggested more rubber. The big flight could not have been timed better. The air was leaving building as it got dark. Yet, temperature and humidity remained near floor. To boot a storm was coming in during late period of flight. This was only time during three days there was no drift at all. Looks like he is only 5 seconds off FAI world record set at cargo lifter.

Van Gorder had high 17 minute penny plane flight late on last day. We talked about waiting later (at very same time Brian set record). Walt broke the only motor he had with enough winds to set the record while winding.

Jim Richmond had 59 minute HLS flight that literally got attention of everyone in air dock. On second attempt the plane hung up on last cat walk near ceiling. The guard stopped Kagan from getting Richmond's plane.

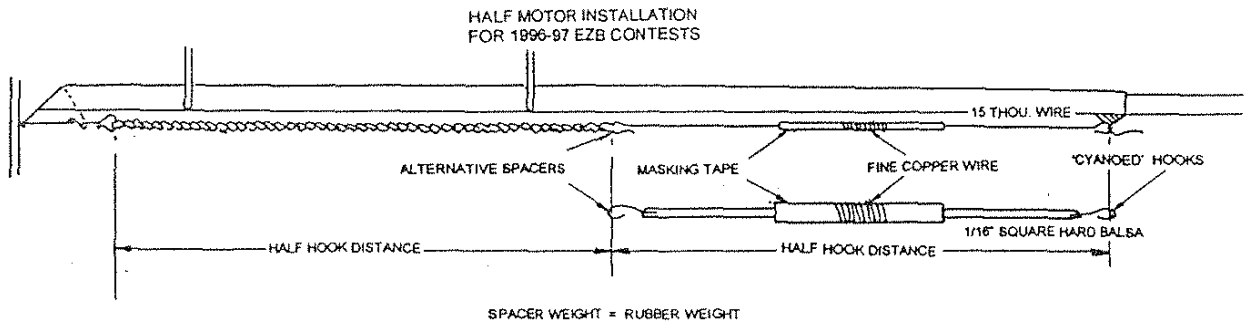
Doug set three new cat 4 records in three different model classes during the three days. Total of six new records set but only one turned in for each class.

Easy B - 26:26 - old record was 22:56 by Don Slusarczyk on 9/3/90

MiniStick - 12:35- Old record was 12:32 by Rob Eberle on 5/27/96

Immediate Stick - 35:10 Old record 28:53 by Don Slusarczyk on 6/8/90

Partial Motor Test Flying
Adapted from an article in Norwind News by John Taylor

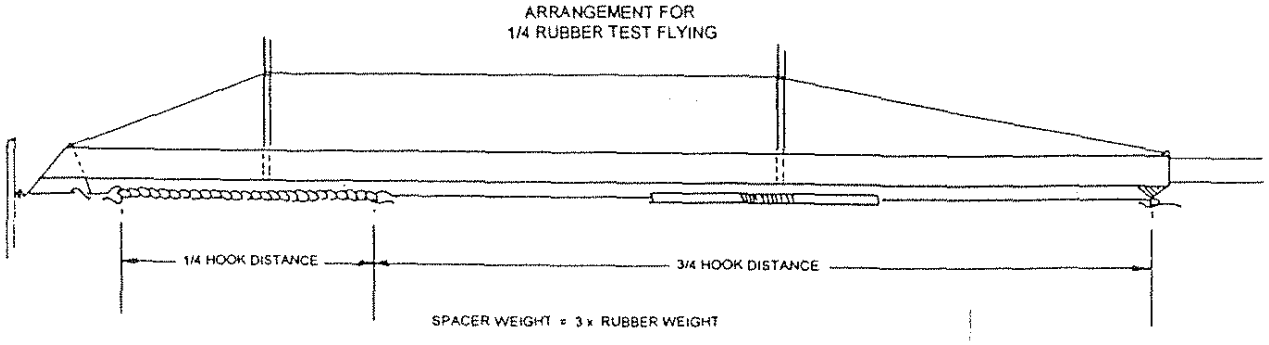


"Partial Motor" test flying is a well established technique which aims at speeding up and simplifying the test of indoor models. It allow you to test and trim a plane in far less time. Partial motors allow you fly your plane in a low ceiling site while trimming it for a high ceiling contest. At a high ceiling site it is useful to check trim, determine climb altitude, and test rubber while getting ready for a full motor flight.

The technique is identical to that illustrated above for half motor flying. The normal motor is replaced by a half length, half weight motor together with a ballasted spacer which is equal in weight to the half motor and has a length equal to half the distance between the hooks. However, it may be desirable to change the proportions of rubber weight to spacer weight in order to limit the duration still further. For instance with a F1D model with a maximum duration in excess of 40 minutes one may choose to use a 1/4 motor and a 3/4 ballasted spacer as shown below. In this arrangement the spacer takes up 75% of the distance between the hooks and weighs 75% of the total weight of the spacer and the motor.

In theory these proportions can be anything you choose but in practice they would be matched to the performance of the model under test. In a situation with no ceiling limitations, (such as Cardington), the set-up shown would produce a duration of 25% of that provided by the corresponding full motor without a ballasted spacer. However every phase of the flight, (climb, cruise and descent), would be faithfully reproduced. This means that the reaction of the model to full torque and the ability to sustain flight on the last few turns can be assessed without waiting an unnecessarily long time before the next trimming adjustment can be made.

The figure shows two methods of spacer construction. The first is just a simple length of wire with a hook at each end and the second is a length of hard balsa with a hook "cyanoed" to each end. In either case the centre is wrapped with masking tape to bring the spacer up to the required weight. Your Editor has found that the simplest method to achieve the correct weight is to wrap the tape until the spacer is a few milligrams light and then adjust the final weight by wrapping fine copper wire around the centre of the tape. It is important to ensure that the C of G of the spacer is at it's geometric centre otherwise the C of G of the whole model will be affected.



The British Indoor Duration Nationals, at Cardington, Bedfordshire. 2002.
by Laurie Barr

Once again, the venerable old hangers at Cardington were available for our use, this year being held in the No 1 shed.

We spent a lot of time and money to repair the windows (60), some as high as 80 ft from the gound! Because wind is horisontal and not vertical, most of the time, flying conditions have been excellent, but not when the wind is from the North. To repair the roof will cost over £1,000.00 million pounds, so we hope we get lucky with rain and wind. For our big week-end, we got Northerly winds!!!

The wind strength on Saturday was low, the the direction, just off North, and conditions were fairly good. Sunday's air was poor, with a lot of drift toward the larger holes in the roof, and there was much heroic steering to tow the models away from the vortex at the north end of the shed, but also some "missed" chances, and the resulting breakage or loss.

Monday was a bit better, but no Sun and a bit gloomy, but most of our best F1D fliers, were busy just trimming for the upcoming trip to the Cargolifter hanger in Germany, followed 2 weeks later, at the World Indoor F1D champs in the Romanian salt mine.

I now have 58 people who are registered to attend Cardington, but the attendence was only moderate, but we were pleased to see the two lads who made the trip across the water from Belfast, Northern Ireland, and also fliers from Scotland, and Northumbria.

We also flew for the Dave Yates Memorial Trophy, giving 6 points for a win, down to 1 point for 6th place.

Limited Pennyplane

Tom Chambers	13.08	6 pts
Laurie Barr	12.37	5
Bert Spurr	10.39	4
Peter Watt	9.59	3
Urlan Wannop	9.13	2

E.Z.B F.1.L
(Holmberg Silver Trophy)

Bob Bailey	23.20	6
Goeff Jones	21.18	5
Laurie Barr	20.04	4
John Tipper	18.26	3
Goeff Lefever	18.02	2
Urlan Wannop	14.31	1
Bert Spurr	12.16	
Rod 0'Neil	11.08	

No-Cal Profile Scale

Laurie Barr	5.54	6
Clive King	2.44	5

F.1.M (Beginners F1D)

Bernard Hunt	22.01	6
Mike Green	15.08	5
Laurie Barr	12.15	4
Bert Spurr	10.52	3
Tom Chambers	10.00	2

F.1.D
(Houlberg Gold Trophy)

John Tipper	27.04	6

Catapult Glider.
(Cardington Cup.)

Mick Page	74 sec	6
Mark Benns	70	5
Kevin Tatlow	50	4
Laurie Barr	14	3

Hand Launched Glider.
(Sweepette Trophy)

Mark Benns	47 sec	6

Living Room Stick

Laurie Barr	11.34	6
Bert Spurr	4.39	5
Urlan Wannop	4.18	4

The Overall National Champion is Laurie Barr, with 28 points.

So ended a tough 3 days, and we look forward to better weather on our last 2 meetings in 2002, and hope we have a future at Cardington, in 2003.

Rubber Measurement By Weight

by Wally Miller from INAV issue 83, 1995

Most indoor modelers spend a great deal of time and effort selecting the proper wood, weighing every piece, keeping records and building as light as they dare. Then, at the flying site, quite often an eyeball evaluation of the power requirement is made and from a container that has the desired size marked on it, you remove a length of rubber. Well, I can almost guarantee that, if certified mechanically, the size will be in error.

A while back, I was stripping rubber for an upcoming contest. (I use both Harlan & Oppegard strippers.) After a pass on a 20' length, a check of the profile revealed that I had once again created a trapezoid, not extreme, but enough to raise my pressure a few points. Now I know this rubber is perfectly usable, but what size is it? After thinking about it considerably, I produced a formula for finding the average size of any profile configuration. With a slight deviation, it will enable the calculation of the weight of any known size to length.

The inconsistency of the rubber we use dictates that a "Base" must be established from a sample of the proposed length to be stripped. This is the key to our formula. Start by inspecting approx. 22' of rubber with a 10X scope. If all looks good, cut it off 21' long, then remove some exact amount from each end. 6" seems right. Their combined lengths are the "L" of our formula. Weigh each piece and total it for "WT". Next, measure for "W" This is best done with a dial vernier caliper, set it to .253 (for 1/4 Stk) and let the jaws hang over the edge of your bench. Now, check all four ends of the sample, adjust the setting until the rubber just hangs on its own. With the above information, just follow the instructions on the left side of the chart and you will soon have a "Base" to suit your needs.

Now - Sizing rubber.

From a strip, cut off a length as if to make up a motor

Measure and record its length. Weigh it to a 4-place decimal. Follow the "Unknown Size" instructions on the right side of the chart.

Cut the remainder of the 20' strip into usable lengths. Weigh, calculate and store it in marked containers.

While researching this project, 2 dozen 20' lengths were stripped. Each usable length within a strip was recorded for weight and size variation. From six to seven motors per strip, the average variation in weight was .0015 and .002 for size. Considering that both stock and cut size were simultaneously averaged, the results seem quite remarkable. Other batches may be different. Only time will tell.

In conjunction, and of equal importance, it was found that by reversing our formula, we are able to calculate the weight of any given size to length. This has been produced in a chart form as a "Visual Scale" or field use, and should prove to be a valuable tool for maximizing various flying conditions.

One final note: in Lew Gitlow's new book, on page 73, is a chart for the optimum motor weight as a percentage of the model weight. Combine the two charts and perhaps your watch will tick a little longer.

INDOOR TRIM

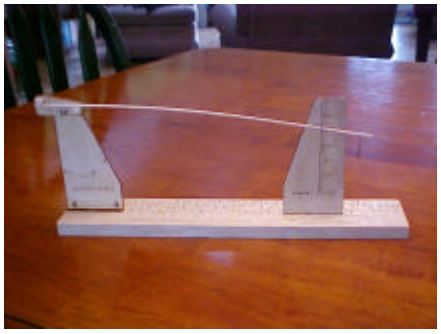
Author unknown, likely Bud Tenny from INAV August 1961

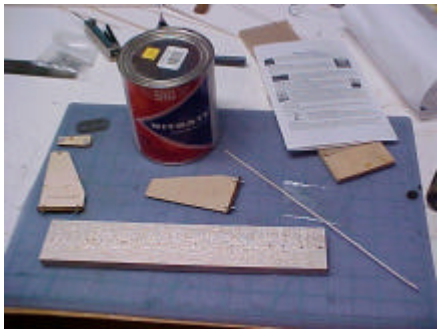
For some time now, most of our airplanes have been flying with the C.G. behind the 50 point. This wasn't intentional, our new props were lighter than the early ones and-we didn't retrim the ships.

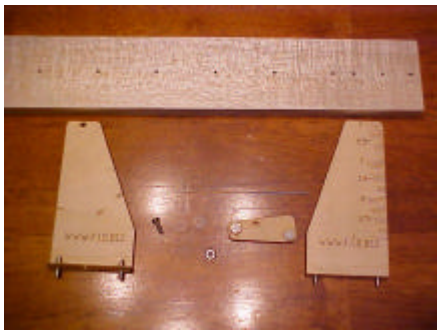
When the Nats Paper Stick and our A ROG came along, they were balanced ahead of the 50% point Test flights pointed out a surprising (to us) fact -- flying on the verge of a stall isn't the best trim. By lowering incidence in small steps, we improved the climb and gained about 20% during the cruise. The new C.G, point is also less critical.

Product Review of the new Deflection Gauge from WWW.F1D.Biz

By Jerry Combs







Has this ever happened to you? You get the bug to build a new and lighter model. You order your wood and soon it arrives. Immediately to the workshop you go as you ignore the plaintive cry from your significant other....you know she said something about the kids not remembering what you look like or something equally ridiculous....and you happily begin stripping spars and cutting ribs, weighing each to make sure that they are lighter than any you have ever used before. Soon the wood is formed and glued into a magnificent structure that is much lighter than your normal efforts. You painstakingly cover the wing using less glue than ever to attach the Mylar, dihedral is added as are the wing posts. The hours pass and in the wee hours of the morning you have completed your new wonder model. Ah success, the model is much lighter than the last one you built. Quietly you wind a few turns on a motor and sneak into the living room for a quick test flight. Horrors! What has happened? The wing has bowed upwards so far that you know it will never take a fully wound motor. All that time wasted, all the materials wasted. How are you going to explain to your significant other that you need to buy more wood and more covering material? How could this have been prevented?

Chin up, my friend, there is now available a product from F1D.Biz that can help prevent this disaster. Tim Goldstein has designed and produced a deflection gauge that is a must for anyone who wants to improve the consistency of their models. Most, if not all, of the master builders use deflection gauges of some type to measure their spars so that when they build a model they know that the spars are strong enough. No two spars cut from the same sheet of balsa will have exactly the same stiffness and spars cut from different sheets are even more of a mystery. With a deflection gauge you pick the best of the spars that you have cut and can use them more wisely.

The deflection gauge that Tim is selling comes nicely packaged in a poly bag and is complete with all necessary hardware. All that has to be done is apply a finish to the laser cut pieces and install two wires and one screw. The application of a finish could be skipped but why not go ahead and do it so that your deflection gauge will last your entire lifetime. The pieces are very nicely laser engraved and all of the hard work of alignment is pre-done for you. The deflection gauge is designed so that it can be dissasembled for easy storage. I used 2 coats of nitrate dope to finish mine but almost any quality wood finish could be used. Do be careful to not get the finish into the positioning holes on the base, if you do it is not hard to clean out the holes but why not do it right to begin with.

Using this deflection gauge makes one appreciate just how well thought out the design is. There is a light wire keeper to keep the spar in the correct position and the spar holder is adjustable for zeroing before measuring the deflection. The hard balsa base is big enough to keep everything stable as you measure your spars, my homemade unit was always falling over on me ruining potential good spars. If you get the impression that I am most favorably impressed with this product, you are correct.