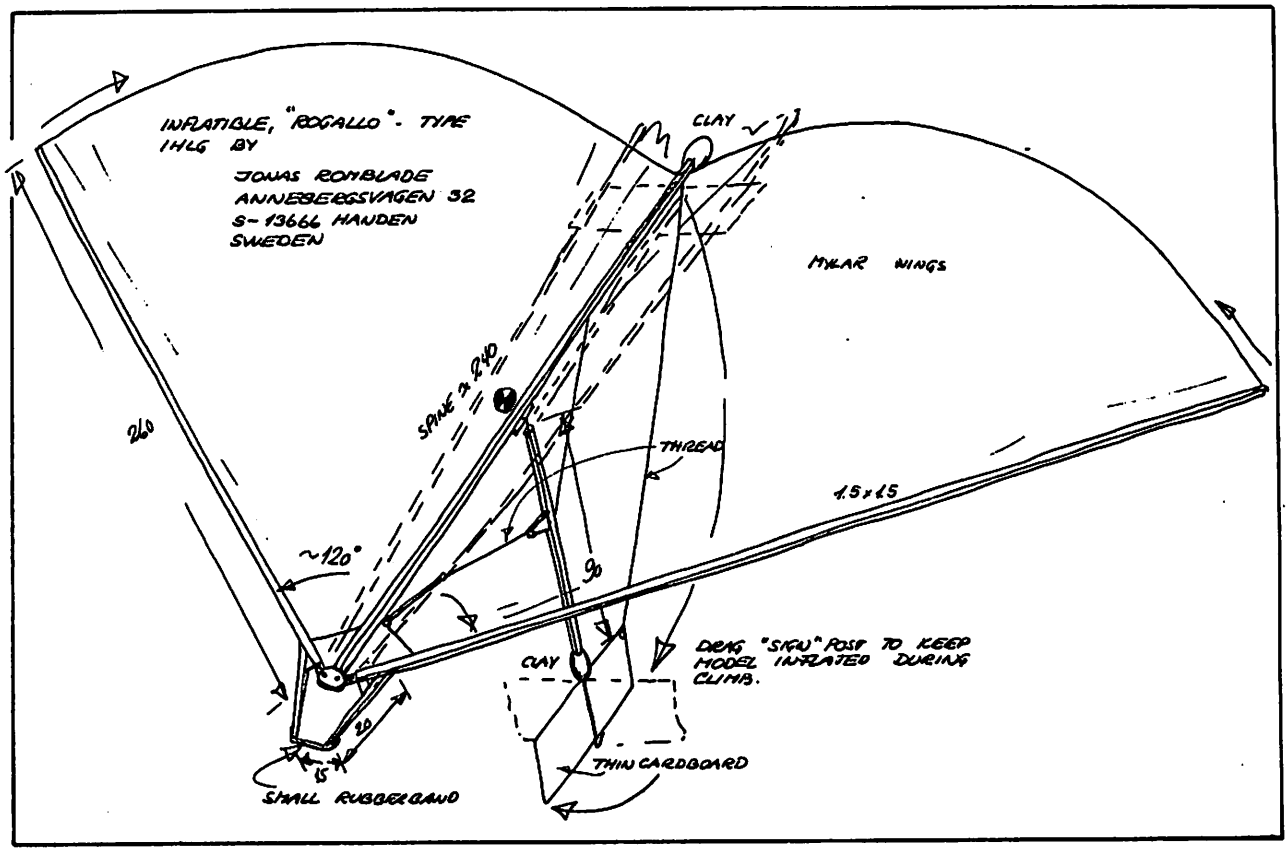


INDOOR NEWS 1·88

Dear FRIEND,

Yes, this is INDOOR NEWS 1/88 and we are writing October now!!!

I am VERY SORRY about this situation but lack of material and my personal busy flying Wakefield, F1B, is the complete background for this record of delay....

Seemingly many indoor freaks have been low on indoor activities and not many - about 15 (!) - have complained about the delay of IN. I COULD have sent out the reasons for the delay on postcards but this would have cost too much money.

I'm happy to be back and give you some indoor information but I would have liked to bring you many more technical views from the World Champs at Johnson City. This was not to be and I will hope that participants there will catch up on this.

I have decided NOT to make any double or treble issue but will try to have 2/88 out in December and 3/88 in February hoping to have catched up with 1/89 in April/May. Please, do support me, thanks!

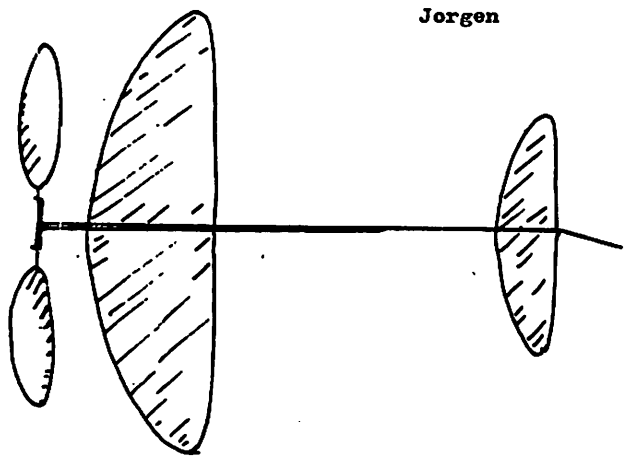
1989 should see the European Indoor Champs in the salt mines in Romania as they had offered this to the FAI last year but perhaps another venue would be possible.

There is for the time being no offer to host the 1990 W/Ch but there are possibilities in Poland and Czechoslovakia .... France???

The rubber situation. The excellent rubber from Champion Model Products was sold out quickly ... I hope you got some of it. Recently CMP has got PANDA rubber from China which has very high energy but will have some tendency to break in the bigger sizes in Wakefield motors. Seemingly it is useful for indoor ..... without the breaking tendency. CMP is also having a US firm which tries to produce rubber to our modelling specifications. Good luck, George!

Wake up, fellows ..... I am awake again ....

Jorgen

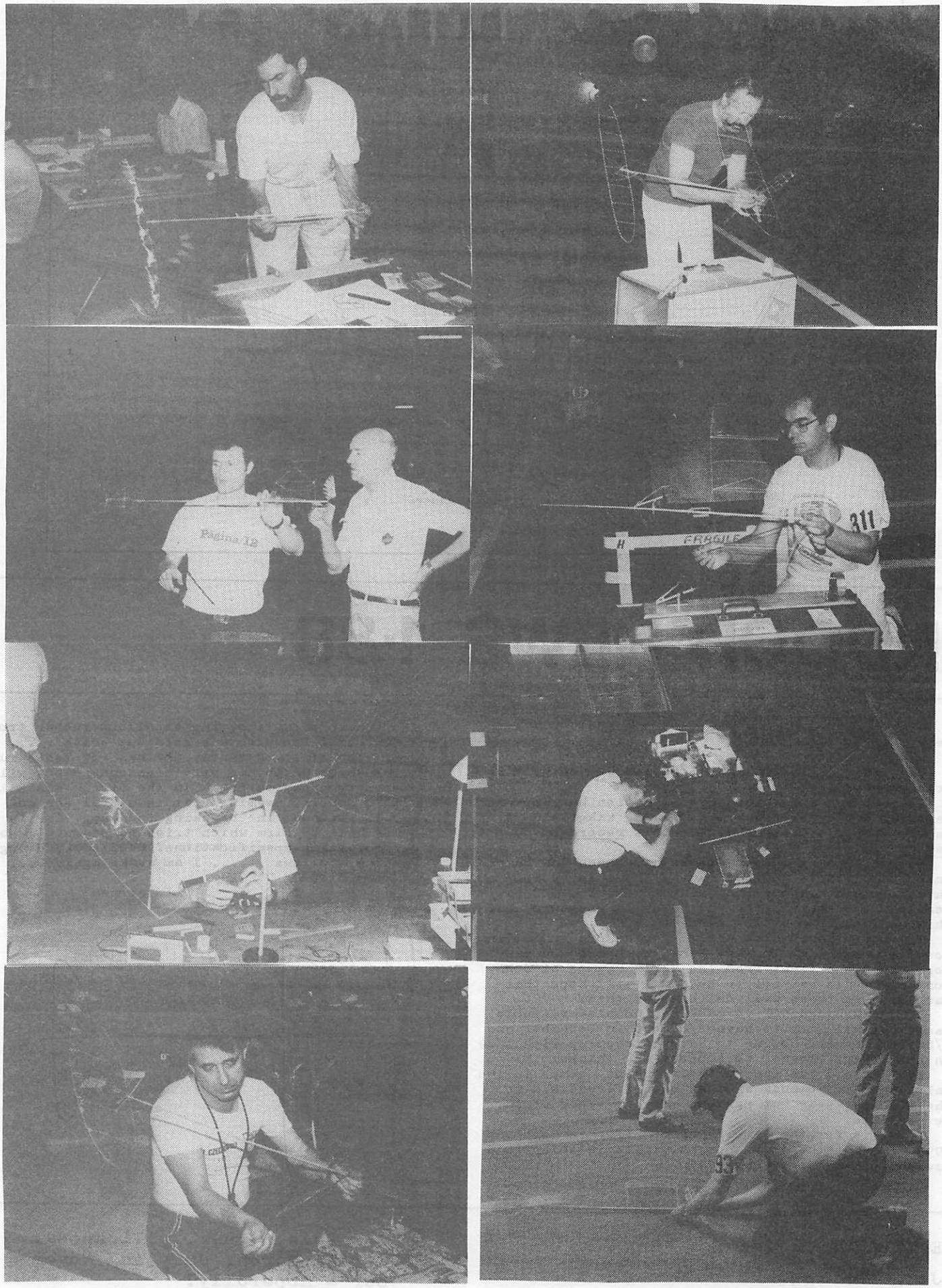


EDITOR ETC ....

Jorgen Korsgaard
Ahornweg 5
D-2397 Ellund-Handewitt
W. Germany

Phone: 04608-6899

3 issues a year, will appear around March, July and November - hopefully!
Scandinavia 45,- Dkr
Europe 50 Dkr/14 DM
Airmailed elsewhere 9 US $



Pictures from Johnson City, June, 1988.

BY THEDO ANDRÉ

1988 F1D WORLD CHAMPIONSHIPS, JOHNSON CITY, TN., U.S.A.

BY BILL HENDERSON, CON.

Teams from thirteen countries assembled in the 35 metre high Mini-dome of the East Tennessee State University at the end of May to compete for individual and team honours in the 1988 Indoor World Championships. The three day contest was organized to have practice flying in the mornings and two official flights in the afternoons- no defined rounds. After the official opening ceremonies at 1pm. on the first day, Canada's Mike Thomas had the very first model in the air to put a 37:17 flight on the scoreboard. Another five models had followed him and soon all were circling in the centre of the 34.9 metre ceiling. Although there were two touches, miraculously there were no collisions, but it was obvious that air traffic control would have to be instituted even though each nation was only allowed one model in the air at one time. Since there were very few collisions for the rest of the contest it was obviously a good decision. Steering was strictly controlled and was only permitted outside the 30 yard lines and the sidelines to bring the model back into the central area, or inside the central area only if a collision was imminent. Most flights on Day 1 were in the 34 to 35 minute range, but Jack McGillivray (Canada) put up two flights of 40:14 and 37:28 to take a commanding lead over Jiri Kalina (Czechoslovakia), 35:04 and 35:01, and Dezso Orsovai (Hungary), 34:44 and 35:17.

Because of late collisions Cezar Banks (USA) and Ron Higgs (Canada) were allowed to take their second flights at the beginning of Day 2 with Banks achieving a 38:50. This set the tone for the day and he produced the day's high time of 44:59 in flight 3. Other fliers produced similar high times so that at the end of Day 2 the standings were as follows;

1st. Cezar Banks	Flight 2, 38:50	Flight 3, 44:59
2nd. Jack McGillivray	Flight 1, 40:15	Flight 3, 38:45
3rd. Jim Richmond	Flight 1, 35:20	Flight 4, 41:57
4th. Thedo Andre	Flight 2, 37:22	Flight 3, 38:20

Once again there were last minute collisions together with air traffic control delays that resulted in Jack McGillivray (Canada), Reg Parham (UK), and Andras Ree (Hungary) being permitted reflys at the beginning of Day 3. Tension was building and everybody pulled out the stops to reach the 40 minute standard set by the leaders. Cezar Banks trying to beat the high time of he meet, set by himself, blew up several models and could not get any more successful flights. Several 36 and 37 minute flights appeared on the board, but Jim Richmond demonstrated his complete mastery of F1D by putting up two flights of 44:09 and 39:44. Sylvester Kujawa (Poland) produced 37:10 and 35:53 to hold onto 5th. place and Rene Butty (Switzerland) put in two more very consistent 36 minute flights to hold onto 6th. place. Jiri Kalina (Czechoslovakia), Laslo Ree (Hungary), Peter Keller (Switzerland), Pentti Nore (Finland) and Dieter Siebermann (Switzerland) all put in over 36 minute flights to maintain or improve their standings.

Two dramatic position changes occurred when Mike Thomas (Canada) put in flights of 35:22 and 37:43 to move from 16th. to 7th. place and Steve Brown (USA) got it all together with flights of 34:54 and 33:43 to move from 29th. to 11th. place. Now it was obvious that there was a battle for the first four places in the team event. The USA had moved from 3rd. to 1st. place with Steve Brown's flights, dropping Canada to second place and the consistent flying of the Swiss team pulled them up from 4th. to 3rd. place to drop the Polish team to 4th. place from 2nd.. Canada was behind the USA on team total with Ron Higgs still to fly. He produced a very good 35:35, but Canada was still 1:45 short of the US team total in spite of the mid-field prayers to the duration gods.

Several countries flew with only two team members notably, Holland, United Kingdom, and Japan and two countries, Czechoslovakia and Argentina only had one representative flying. For Eduardo Molfino of Argentina it was his first World Championships and he produced two personal best flights on Day 1. At the banquet and awards ceremony, besides the usual individual and team awards, a special award was given to Laszlo Ree, who at 19 was the youngest competitor in the championships.

Thus ended a very exciting and well organized World Championships in a new indoor space that was rated very highly by many competitors for its lack of drift and total predictability at all times of the day.

The World Championships were followed immediately by a two-day open international F1D event based on three formal rounds each day, but with no air traffic control. Many of the competitors from the World Championships stayed on to compete and many entries came from the USA taking the opportunity to fly against the best in the world. In the end only one 40 minute flight was achieved (by Jim Richmond), but a very high level of flying was maintained. The final results reflect the International nature of the contest:

1st. J. Richmond (USA)	40:07 and 39:44
2nd. C. Banks (USA)	39:51 and 39:10
3rd. S. Kujawa (Poland)	37:38 and 38:35
4th. A.Ree (Hungary)	37:10 and 37:52
5th. D.Orsovai (Hungary)	34:55 and 39:19

JOHNSON CITY PRESS, Sunday, May 29, 1988

By Teresa Church

Press Staff Writer

The steps of waltzers at a grand ball couldn't be more gracefully executed than those of participants in an unusual international event under way Saturday.

They slowly, skillfully moved across the turf inside East Tennessee State University's Memorial Center, never glancing away from the delicate beauties at their fingertips.

The objects of their concentration are their creations — from hours of patience, reading and trial and error. And many of them have traveled from far off lands, such as Argentina, Finland, France, Hungary, England, Poland and Japan, to show the fruits of their labor.

They came here for the 1988 International Indoor Model Aircraft Championships.

Gilbert Graunke traveled 800 miles from his home in Brookfield, Wis., just to help with the event, what he calls a once-in-a-lifetime opportunity. And he's here because he enjoys his hobby.

"It's the same reason golfers go all over the world to do their thing and tennis players travel all over the world to play," Granuke said.

"It's the challenge. And, secondly, it's because you like it. It's something you like to do."

"The name of the game here is duration," Granuke said softly, glancing up as the 24-inch-long models floated through the air ever so slowly and elegantly above his head.

Last year at ETSU, Granuke said he witnessed the longest flight he has seen since he began flying models in 1930. The flight lasted more than 40 minutes.

The winners' circle will include flyers with the highest duration totals, but even the most experienced is put to the test by the aircraft that fly without any controls.

The feather-light craft, weighing little more than a $1 bill, are constructed from very light wood and microfilm that reflects yellows, reds, greens and golds. The flyer himself is the crafter.

To participate, a plane's wing span must be about 26.5 inches and the entire craft can't weight more than one gram. There is no limit on the length. "They all look similar, but they are very different," he said.

Balsa wood from trees grown in Equador and rubber bands are shaved to the specific width the flyer wants. He knows the width and length of the rubber motors determine the number of turns the rubber bands can be twisted without breaking them.

It's very tedious work, similar to that of a watchmaker, says former watchmaker and four-time world free flight champion James Richmond of Carmel, Ind.

"It's very scientific and technical," he said, explaining that weights and measures in the 1,000th are very important in building and flying the craft.

To launch, flyers hold their planes underneath, with the tips of their fingers, and the craft simply float away, spurred on by rubber bands or "motors" tightly wound at the propellers.

"It's a very precise science," Granuke said. "There is a strategy involved here."

During practice and competition, movement in the Mini-dome is restricted to slow steps to prevent stirring the air and causing unpredicted drafts.

This is important because paths the planes will take already have been determined through practice runs, and the flyers have made necessary adjustments to the wings and tails so the craft will follow them. "It takes a number of years to develop the skills," Granuke said.

Enormous and colorful balloons, attached to hollow plastic strips and fishing line, fill the air. These are used by timers on the ground to guide or "steer" the small craft when it nears the rafters or speakers at the top of the building.

Flyers want to avoid that situation: The amount of time the fish line is in contact with the plane is deducted from the flight time by those carrying steering balloons.

It is a very scientific, individualized sport. Flyers sit at tables with scales, devices for shaving and twisting the rubber motors, lamps, glues and numerous other items. Many have concocted materials and gadgets themselves.

Though he has been flying models since his childhood, Richmond insists it is a hobby for him, like it is for the other men participating in this event. And all the competitors are men.

"You wouldn't think so because they are so delicate and artful, but it's very scientific," Richmond, an engineer, said.

He and Granuke have built model planes for many years, but neither have actually piloted a life-size aircraft nor do they intend to.

"Most of us like to fly with both our feet on the ground," Richmond explained.

The weeklong event is sponsored by the Academy of Model Aeronautics, the National Free Flight Society and the National Indoor Model Airplane Society. Practice flights will be held from 7 a.m. to 2 p.m., when competition will begin. Competition will end at 8 p.m. each day.

1988 F1D WORLD CHAMPIONSHIPS

INDIVIDUAL RESULTS

			Flt.1	Flt.2	Flt.3	Flt.4	Flt.5	Flt.6	Score	Placing after flt 1	2	3	4	5
1	J Richmond	W/C	35.20	10.50	33.50	41.57+	44.09*	39.44	86.06	3	20	12	3	1
2	C Banks	US	16.52	38.50+	44.59*	31.35	6.34	0.00	83.49	25	15	1	1	2
3	J McGillivray	CAN	40.14*	37.38	38.45+	29.04	28.44	34.28	78.59	1	1	2	2	3
4	T Andre	NL	17.18	37.22+	38.20*	9.20	33.02	10.54	75.42	24	17	3	4	4
5	S Kujawa	PL	11.57	34.01	35.09	37.58*	37.10+	35.53	75.08	28	21	12	5	5
6	R Butty	CH	2.07	36.04	35.50	36.41+	36.51*	36.13	73.32	33	26	4	6	6
7	M Thomas	CAN	34.17	32.48	28.50	30.51	35.22+	37.43*	73.05	7	8	16	16	16
8	J Kalina	CS	35.04	35.01	13.39	35.18+	37.35*	34.46	72.53	4	2	5	8	7
9	L Ree	H	33.23	32.18	36.32*	34.39	35.18	36.09+	72.41	11	9	8	7	11
10	P Keller	CH	34.04	34.17	35.41	33.36	36.44*	35.54+	72.38	8	5	7	10	8
11	S Brown	US	7.21	12.28	37.22*	15.41	34.54+	33.43	72.16	31	33	28	29	9
12	P Nore	FN	8.14	34.42	30.17	1.13	36.24*	35.46+	72.10	30	23	18	18	12
13	W Ciapala	PL	24.52	33.21	36.11*	8.42	35.40+	8.27	71.51	21	13	9	11	10
14	R Higgs	CAN	36.10*	32.10	33.18	30.33	32.56	35.35+	71.45	2	6	10	12	17
15	L Englund	FN	34.50	2.21	5.09	10.42	35.38*	35.16+	70.54	5	27	32	33	14
16	O Velunsek	YU	32.36	34.36+	32.50	32.02	35.55*	9.58	70.31	14	7	15	15	13
17	D Siebenmann	CH	16.10	10.19	22.51	33.19	33.22+	36.39*	70.01	26	31	31	28	23
17	R Orsovai	H	34.44+	35.17*	34.07	32.11	15.44	33.43	70.01	6	3	6	9	15
19	B Romak	US	33.44+	10.51	35.40*	7.02	27.31	30.21	69.24	10	22	11	13	18
20	I Zagar	YU	33.49+	35.15*	1.48	27.52	33.25	11.11	69.04	9	4	14	14	19
21	L Barr	GB	30.08	34.27*	29.53	29.20	33.17	34.13+	68.40	18	10	20	20	21
22	R Parham	GB	31.44	24.51	33.56+	26.25	33.59*	33.45	67.55	15	14	17	17	20
23	A Ree	H	13.56	14.03	8.42	33.21+	33.59*	10.59	67.20	27	30	33	32	22
24	E Miem	NL	30.46	33.27*	15.15	28.14	5.44	32.49+	66.16	17	11	21	21	26
25	R Czechowski	PL	32.50*	22.48	31.49+	28.46	22.16	5.57	64.39	13	16	19	19	24
26	M Mastnak	YU	27.11	11.21	32.36*	7.47	31.45+	24.58	64.21	19	25	24	26	25
27	B Trachez	F	31.25	31.30+	32.18*	6.15	30.10	14.27	63.48	16	12	22	22	27
28	S Nonaka	J	20.47	26.39	31.16+	28.52	32.26*	29.47	63.42	23	19	25	25	28
29	R Champion	F	32.53*	6.48	29.18+	9.53	20.09	5.27	62.11	12	24	23	23	29
30	H Enomoto	J	9.00	25.19	30.10+	31.14*	28.36	20.05	61.24	29	29	26	24	30
31	G Cognet	F	26.52	8.42	26.29	30.21*	28.54+	11.07	59.15	20	28	27	27	31
32	H Erofejeff	FN	5.07	18.26	21.06	29.36*	28.24+	7.05	58.24	32	32	30	30	32
33	E Molfino	ARG	23.31+	25.56*	19.56	5.58	9.27	0.00	49.27	22	18	29	31	33
No.of scoring flights:			8	9	14	8	18	9						

Note: * denotes competitor's highest score, + the next highest.

FROM FREE FLIGHT NEWS - WITH THANKS

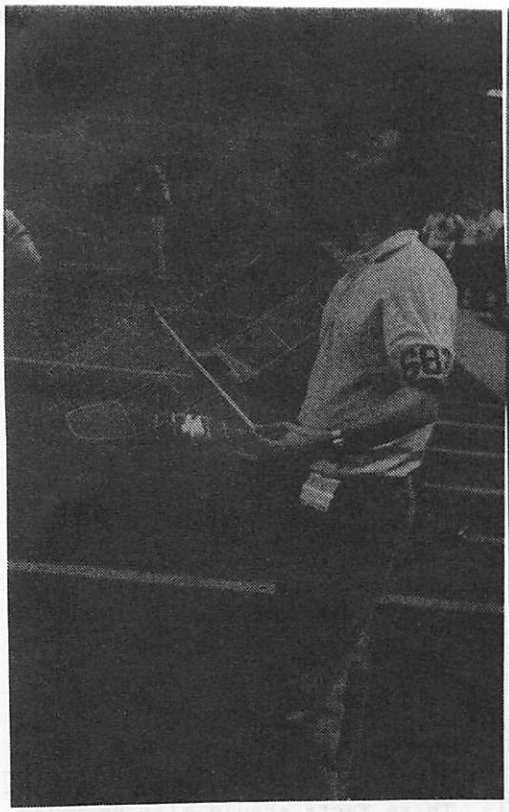
TEAM RESULTS

				Placing after flt 1	2	3	4	5
1	U.S.A.	US	225.29	6	7	3	3	1
2	Canada	CAN	223.49	1	1	1	1	2
3	Switzerland	CH	216.11	7	6	5	4	3
4	Poland	PL	211.38	5	4	2	2	5
5	Hungary	H	210.02	4	3	7	6	4
6	Yugoslavia	YU	203.56	2	2	4	5	6
7	Finland	FN	201.28	8	8	8	8	7
8	France	F	185.14	3	5	6	7	8
9	Netherlands (2)	NL	141.58					
10	Great Britain (2)	GB	136.35					
11	Japan (2)	J	125.06					
12	Czechoslovakia (1)	CS	72.53					
13	Argnetina (1)	ARG	49.27					

LONGEST SINGLE FLIGHT: C Banks USA 44.59

A tremendous Championships. The new site, the Mini Dome at East Tennessee State University lived up to all the reports. It was very airtight and conditions were extremely stable and consistent with little drift. The maximum 35m / 116 ft height was usable at the centre and variable props were a great help in reaching maximum performance under this ceiling. The Canadians, with their variable pitch props, started devastatingly by holding top team and individual places at the end of the first day. Cezar Banks swept to the top with a flight of his conventional model clocking just 1 second under the three-quarters of an hour. Jim Richmond came back to retain his title with two great flights on his variable diameter prop.

A flight over 40 min was needed to place and 70+ totals were in the majority. The organisation was superb. Full report next month (plus possible corrections of results typed under jet-lag!). IK



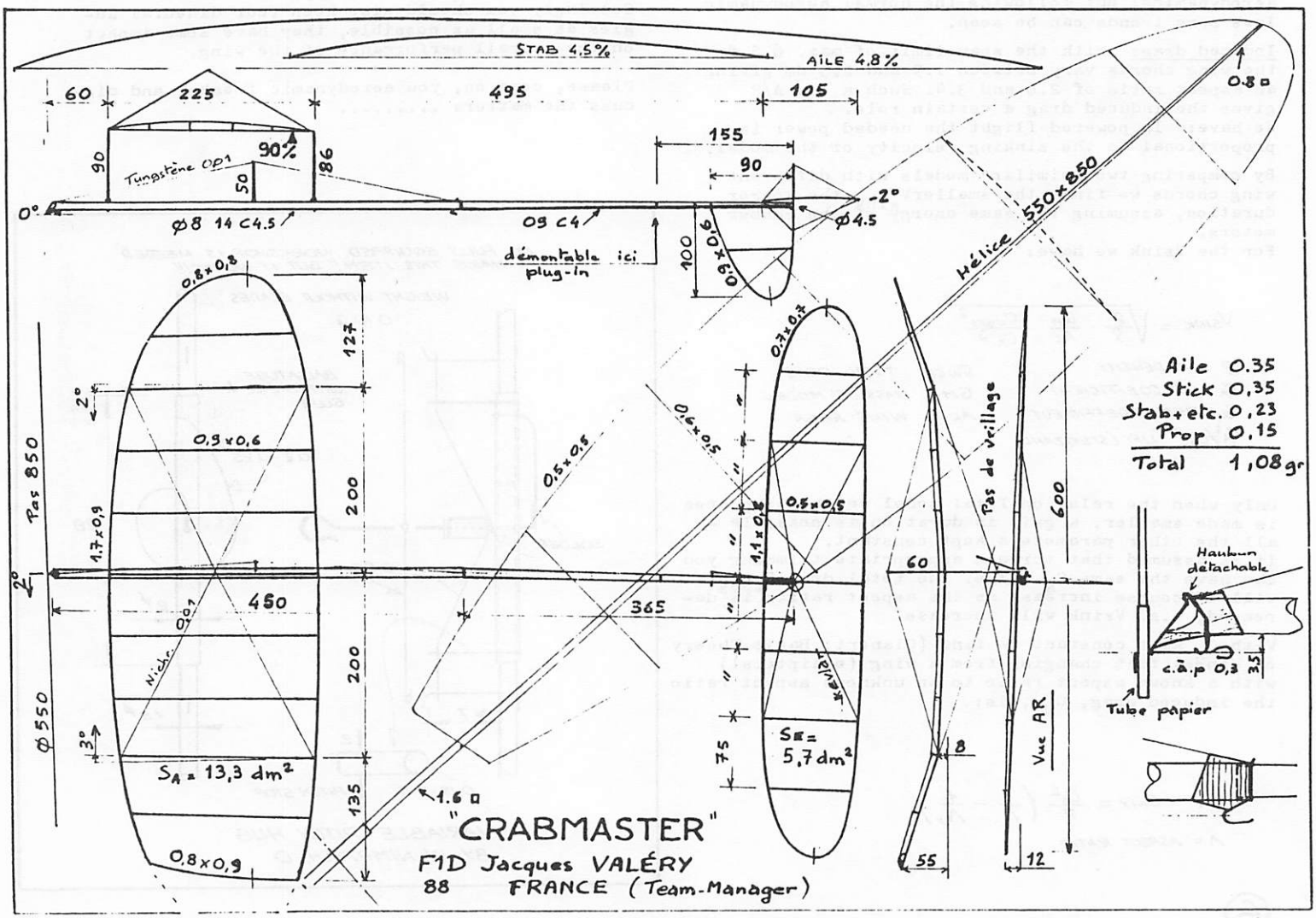
Rene Butty, CH



McGillvray, CDN



Lew Gitlow at the F1D International



KEVLAR

The Du-Pont name for polyaramidfibres which are used in the aircraft industry, car tyres, drivebelts etc. You can get in form of rovings, e.g. unidirectional bundle of fibres, several hundreds, and you can Kevlar cloth for covering outdoormodels.
Indoor flyers pull out the single fibres at good light/dark background withoutany kinks or knots.
The quality I have has a filament diameter of about 12μ = 0.0005" and is not called KEVLAR but TWARON from the firm ENKA.
These fibres are good for bracing, about twice the pulling strength of nichrome and weighing 20% of the wire. Breaking elongation is as low as 2%. You can theoretically lift 20 grams with one of the fibres.
Example: By a multibraced stabilizer you can save about 2 mg by using the fibres instead of nichrome.
Adhesive: Thinned nitrocellulose cement is suitable for sticking the filaments to the airframes.
Aramidfibres are vulnerable when exposed to ultraviolet radiation and in heavy radiation the strength will sink below 50%. But UV-radiation is scarce for indoor flying, as a matter of fact outdoor flyers are are recognised on their sunburnedness....!
When bracing I use pieces of fabrique-tape - 300 mg to hang on the ends of the filaments, fold the tape and catch the loose end. This works.

Yours Bernd-O Miehe; D

F1D - Optimising of wing chords, tip shapes etc....

Some thoughts by Bernd-O Miehe.

In Indoor News 1/87 there were the questions of the best wing chords and of the geometrical lay-out of wing tips....
I am not a learned man in aerodynamics, but I know one who also flies F3A gliders and we have discussed the matters.
First of all, a comprehensive computer simulation is so far not possible due to the lack of sufficient data suited for F1D models - VERY,very low-speed aerodynamics! But following the normal aerodynamic laws some trends can be seen.

Induced drag: With the span limit of max. 6.5 dm the wing chords vary between 1.9 and 2.5 dm giving an aspect ratio of 2.6 and 3.4. Such a low A/R gives the induced drag a certain role.
We have: In powered flight the needed power is proportional to the sinking velocity of the model.

By comparing two "similar" models with different wing chords we find: the smaller V_{sink} the longer duration, assuming the same energy of the rubber motors.
For the Vsink we have:

$$V_{SINK} = \sqrt{\frac{2}{\rho} \cdot \frac{G_M}{A_F} \cdot \frac{C_{W\,GES}^{\,2}}{C_A^{\,3}}}$$

ρ AIR DENSITY — $C_{W\,GES}$ TOTAL DRAG
C_A LIFTCOEFFICIENT — G_M MASS OF MODEL
C_W DRAG COEFFICIENT — A_F WING AREA
C_A^3/C_W^2 LIFT (STEIGZAHL)

Only when the relation Total model weight/wing area is made smaller, a gain in duration is possible - all the other parameters kept constant.
It is assumed that through appropriate trimming you can have the same C_A value. The total drag $C_{W\,ges}$ will of course increase as the aspect ration is dereased, e.g. Vsink will increase.

With C_A kept constant we find (Glanert: Basic Theory of Wings) that changing from a wing (elliptical) with a known aspect ratio to an unknown aspect ratio the induced drag, C_{Wi}, is:

$$C_{wi} - C_{wix} = \frac{C_A^2}{\pi}\left(\frac{1}{\Lambda} - \frac{1}{\Lambda_x}\right)$$

Λ = ASPECT RATIO

The amount of induced drag increases with decreasing aspect ratio near to proportional to $1/\Lambda$.
The total drag of the model consists of parasitic drag (fuselage, bracing etc.), profile drag (wing section) and induced drag. The induced drag plays the most important role from these three.
Improvement in duration by decreasing the wing loading is possible but only the square root of this.

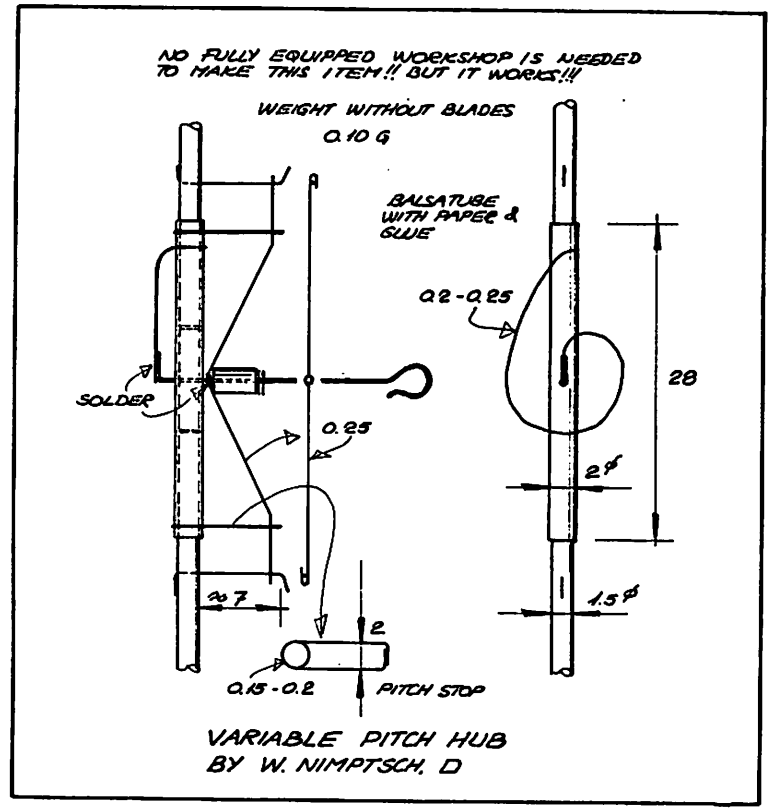
By combining these two factors - drag and wing loading - you can have a mathematical maximum of "optimum duration as a function of the wing chord".
For a detailed calibration you would need exact lift and drag information of the whole model which is not available today.
But until then - try and try will give the only appropriate answers.....

One thing is clear: Increasing the wing chord is only beneficial when you keep the weight the same or less. Also take into account that bigger wings at the same weight are weaker structurally and thus will be more prone to deformation through the forces of air acting on the wing.

Literature and data of measurements in the extreme low Renolds Number area are very scarce - who knows any?? - I only know Max Hacklinger's papers covering F1D (old rules) and F.W. Schmitz's "Aerodynamik des Flugmodells".
Schmitz has experimented with wings of aspect ratio 5 at a Reynolds No of 20.000 and especially with the Go 417a wing section (cambered plate) which resembles the sections we use in indoor models. He found that the values C_A and C_W are near to constant for Re≥ 20.000 - 150.000, and that high lift (Steigzahl) possible is. These facts should also be valid at Re= 10.000 or less, especially when you think of nicely squared spars on your models.

Wing tip shapes: As the span of the wing is fixed there are not many possibilities for shaping your wing tips as every square cm gives lift. Still you might ask if it is best to decrease or increase camber going from root to tip.
Seemingly you should also keep your dihedral angles as small as possible, they have some impact on the overall performance of the wing.

Please, come on, you aerodynamic freaks, and discuss the matters .....



VARIABLE PITCH HUB
BY W. NIMPTSCH, D

The Voice of N.I.M.A.S. APR·1964

INDOOR NEWS and VIEWS

$2/ YEAR NIMAS DUES $1/ YR ADDITIONAL

..... STILL VALID?!

MICROFILM TECHNIQUES

Introduction

Although the entire science/sport/art of indoor model flying is largely an art that we all practice, the whole business of formulating, pouring and using microfilm is the least subject to rigid definition and analysis. To put it another way, formulas and techniques which work for one person may work poorly or not at all for someone else; in fact, what worked last week may not work today but will work perfectly sometime later on - next week, perhaps. This was brought home strongly to me after the article on taut film. Some people reported that the formula based on Duco cement wouldn't work. I rechecked and got the same results; mixed some more and sent it to them to try. Sometimes they could get good results and sometimes not. Once I was working with a young fellow who could successfully pour only one of four commercial types of film on hand - and that particular brand was one I had been warned about by a very experienced flier - he said it was almost impossible to get film from that mix!

For similar almost incomprehensible reasons, methods of covering and handling are excellent or unworkable, depending on who is trying to do it. So, film formulas which are given later on will be extensively tested, but no guarrantee is attached. The other techniques will be presented in good faith also - one or more fliers have had good luck with them.

Part I - Basic Materials

It is possible to make microfilm out of a variety of different materials, and most of the likely candidates have been tried at one time or another. In fact, it is theoretically possible to make microfilm from any type of material that has available a solvent system such as will be described later on. There are several good films on the market, and it hardly seems worthwhile for most of us to develop more formulas. Since model builders are incurable do-it-yourself types, the information presented in this series should help the dedicated experimenter to make his own film or change a commercial mix to suit his own needs or desires.

The most common base for microfilm is nitrocellulose, in whatever form might be handy. Many formulas printed in the past are based on nitrate dope, which is probably one cause of more trouble than any other single item of film formulation. Each brand of commercial dope starts as nitrocellulose, but each company has different ideas on what to put in it. There are often eight or nine ingredients in dope, most of them unnecessary or harmful to good microfilm. For best results, one should start with pure nitrocellulose and add only those ingredients necessary for the film characteristics we want.

Before we go further, a word of warning is necessary. Another name for nitrocellulose is guncotton - the same basic material is used to make gunpowder. Dry nitrocellulose is extremely flammable and burns rapidly; if it is confined it will generate gas pressure rapidly with explosive violence. Nitrocellulose does not require any outside source of oxygen - it furnishes its own. Most suppliers have a choice of several damping media, and these may also cause problems. For example, du Pont has the options of butyl alcohol, denatured alcohol (ethyl alcohol), isopropyl alcohol and water. For our purposes, the alcohol-wet materials are best, but these are volatile and inflammable. Also, nitrocellulose in any undissolved form deteriorates at storage temperatures above 90° F., resulting in unpredictable and probable unusable properties in the final film. The best and safest way to avoid safety and storage problems is to dissolve the nitrocellulose as soon as you get it. The problem is then one of storing a liquid like dope - much safer. Remember, never store undissolved nitrocellulose - it can be extremely hazardous, and there is no reason not to dissolve it!

Next comes the proper choice of viscosity of the nitrocellulose. The Questions and Answers column in this issue briefly discusses an industrial method of viscosity measurement; here we will consider what the viscosity rating tells us about the final product. Popular usage of this term (viscosity) as applied to nitrocellulose expresses the average molecular chain length of nitrocellulose; ultimately it is an indirect indication of the tensile strength of the final film. The viscosity rating also expresses indirectly the amount of solvent which must be used to produce a mix of pouring consistency. For example, a low viscosity material will produce pouring consistency with 1/5 or 1/6 as much solvent, but the film strength will be only 70% as much as the higher viscosity material. On the other hand, the very high ratio of solvent to solids in a high viscosity material makes it almost impossible to pour enough film on the water to form even gold film; it takes a determined effort to get blue film for props.

For more specific examples, du Pont HC-17 material is rated at 1/4 second viscosity and approximately 9,500 lb. per sq. in. tensile strength; HB-14 is 1/2 sec. and has about 11,500 lb./sq. in. tensile strength; HA-5 comes in at 5 sec. and 12,800 lb./sq. in. The ultimate tensile strength for nitrocellulose film is about 13,000 lb./sq. in., so there is no need to go higher than 5 sec. material for strength reasons. It takes about twice as much solvent per given quantity of 60 sec. material as it does for 5 sec. material, so the ease of handling and pouring will be in similar ratio.

For those who object to having the danger of an explosive material around the house, there is another way to get pure nitrocellulose. Chemical supply houses such as Sargent and W. H. Curtin sell collodian, which is a nitrocellulose solution in alcohol and ether. Collodian is made from high viscosity nitrocellulose, and makes an excellent base for microfilm - after you get rid of the alcohol and ether - both solvents are unusable in film mixes. So, if you start with collodian (be sure to get plain collodian and not flexible collodian which is already plasticized with castor oil and camphor), you need a polyvinyl container with an open top such as a toy sand bucket. Get someplace with good ventilation and no open fire or flames - ether and alcohol is very inflammable and toxic. Pour in about three ounces of collodian and tilt the bucket until the entire inside surface is coated with liquid. Repeat the coating operation every few minutes until the remaining liquid will no longer flow - then set it aside until all solvent is gone. This coating will shrink and pull loose from the bucket - cut it up and dissolve it in the proper solvents. Part II will deal with solvents, and how to blend solvents for specific action during pouring and curing. I am deeply indebted to the Houston du Pont office and Mr. F. S. Horner for making the du Pont brochure A-6908 available to me; much of the above information came from this valuable source.

MICROFILM TECHNIQUES

Part II - Solvent Systems

Successful microfilm formulation is almost completely dependent upon having the proper choice of solvents, but the solvents make absolutely no difference in properties of the film after it is cured out or aged. The reason for this is that the solvents will all be evaporated when the film has aged.

The amount and kind of solvent must be chosen with three things in mind: First, the solids (nitrocellulose or another basic material) and the plasticizers and other modifiers must be completely dissolved and thoroughly blended together to give material of uniform characteristics. Second, a solvent (or solvent system) is used to change the viscosity (viscosity used here in the normal sense rather than as discussed in Part I in relation to rating of nitrocellulose) to give easier pouring; in this case a blend of solvents is chosen which does not change the pouring and drying characteristics of the solution. Finally, the handling characteristics of the solution can be tailored as desired by adding certain solvents to the mix. To some extent, each person will have a favorite way of pouring which will dictate some changes in the solvent system; in general, microfilm must pour smoothly, spread well and dry reasonably wrinkle-free in a fairly short time.

Solvents are classified according to their speed of evaporation - fast, medium and slow. The Chemicals Division of Union Carbide has a chart (F-7465M) entitled "Solvent Selector" which also lists the various solvents by a numerical system - the higher the number the faster the rate of evaporation. Normal Butyl Acetate is assigned the number 100, and the other solvents are rated in

comparison to this. On the same scale, Acetone's rate is 1160, Methyl Ethyl Keytone 570 and Amyl Acetate 42. These four solvents are adequate for home brews, and are the easiest to buy. Acetone and Amyl Acetate are usually available from drug stores, but Methyl Ethyl Keytone and Butyl Acetate may have to be purchased from a paint manufacturer.

The first choice of solvent which must be made is the one to dissolve the nitrocellulose or other base. Generally this choice should be the fastest solvent you plan to use, although a pretty good case can be made to use a blend such as 50% Acetone and 50% Butyl Acetate. In any case, you should keep careful record of the solvents used because they will affect the final mix as will be shown later.

The second solvent choice you must make in brewing a pot of microfilm is the blend (and it must be a blend) of fast, medium and slow thinners or solvents which give the handling characteristics you desire. Fast solvents such as Acetone (1160) and Methyl Ethyl Keytone (570) create a solution which pours and spreads readily, but a mix with only fast thinner will dry too fast, wrinkle, blush and generally be unsatisfactory. So, a medium speed solvent such as Butyl Acetate (100) is added to let the film dry slower on the water. If you add just enough to stop the blush, the film will still spread well but the color is likely to be very uneven. More B/A will help smooth out the color, but you must guard against too much. Excess medium (and slow) solvents prevent the film from spreading and slows up the curing on the water. As a result, a sheet of film may continue to shrink after it is picked up, and then break on the hoop before the water dries off.

The final blend of solvents (and the final film mix) will depend upon the viscosity rating of the nitrocellulose and the amount and kind of plasticizer used. Most likely the final formula will contain about 75% fast solvent, 20% medium and 5% slow (not counting plasticizer). Note that if you start with the nitrocellulose already in solution (and you must not store undissolved N/C because of the danger of explosion as outlined in Part I), you must keep track of the solvents in the nitrocellulose. For example, assume the N/C was dissolved with a 50/50 blend of Acetone and Butyl Acetate. A close accounting of solvent amounts can be made if the N/C is assumed to add no volume to the mix; this is nearly true for normal microfilm mixes since the N/C makes the solvents thicker than before. Now, let's analyze the following formula for solvent content:

Ingredient	Amount	% Solvent
Nitrocellulose	20 cc	0 (actually contains 10 cc Acetone and 10 cc B/A)
Acetone	30 cc(+ 10)	40/53 or 75.5%
Butyl Acetate	0 cc(+ 10)	10/53 or 18.8%
Amyl Acetate	3 cc	3/53 or 5.7%
	53 cc	

One final important matter has not been mentioned about the formula above; the ratio of N/C to solvent in the 20 cc of dissolved N/C. If we consider the two extremes, the problem will be well illustrated. First, if a minimum of solvent is used (one disadvantage is that to completely dissolve the N/C may take 24 to 36 hours even though the container is agitated often) the resulting mix will still be too thick to pour easily and your results will likely be quite uneven and inconsistent. To thin the solution without upsetting the very vital solvent balance, you must add the solvents in the 75.5/18.8/5.7 ratio shown above. If you were in a hurry and used quite a bit of solvent to dissolve the N/C, the result may be a mix so thin that you just can't pour smoothly colored, uniform sheets. The only solution is to add N/C and plasticizer until the solution is thick enough to use. Plasticizer is omitted in the formula above, but is necessary for the final formula; the amount needed is determined by the amount of solid N/C present in the mix and this will be discussed in Part III.

To summarize, a successful microfilm batch will contain fast, medium and slow solvents in approximately 75/20/5 ratio. Various solvent blends can be used to dissolve the nitrocellulose, but the most versatile mix uses 100% fast solvent, and no more solvent than it takes to completely dissolve the N/C. It is entirely feasible to use the 75/20/5 blend (or whatever you decide is best), but you should take care to make a thick mix and add more of the solvent blend as you make new batches. To tailor a mix for different results, separate a small portion of the batch and keep careful records on what you add and what results are obtained. Poor spreading usually is

(cont. p. 4)

cured by adding some fast solvent. Uneven color may be caused by improper balance of medium and slow solvents, but it may be caused by improper pouring techniques as discussed in Part IV. Too much medium and slow solvent may prevent proper drying on the water; when you pick it up the sheet may continue to shrink until it breaks. If shrink breakage is a problem, add more fast thinner and wait longer before picking the film off the water.

Some solvents can be classified as very slow, and can sometimes be used to help create more uniform color in the heavier films such as blue (used for props). Two such solvents are Butyl Cellusolve and 2-ethyl hexyl acetate; the evaporation speeds are 6 and 3 respectively. These very slow solvents should be used sparingly; you have to be mighty finicky about color before it is worthwhile to use very slow solvents.

I wish to thank Mr. James R. Leusch of Union Carbide Corporation for making the "Solvent Selector" brochure available to me; it has proved to be very helpful as a reference source.

MICROFILM TECHNIQUES

Part III - Plasticizers And Modifiers

The techniques outlined in parts I and II would make it possible to pour a sheet of nitrocellulose film and probably pick it up. This sheet of film would be brittle and would shrink for some time - not exactly what we need for indoor models! To improve the handling and ageing of the film, one or more materials will be added to the mix. These materials are chosen for the characteristics which they will impart to the final material, and sometimes two or more plasticizers will be combined to achieve the best results. No more plasticizer than is necessary should be used, however, since all these materials decrease the strength of the film to some extent.

Plasticizers are either solvents for nitrocellulose or non-solvents; the non-solvent types usually act as a mechanical lubricant and are most likely to migrate to the surface of the film. When this happens, the film is no longer properly flexible and is also subject to damage from ultraviolet light. Besides, this stuff on the film collects dust, dirt and other models that happen to touch yours! Typical non-solvent plasticizers are castor oil, soybean oil, linseed oil and eucalyptus oil.

The solvent type plasticizers commonly used in microfilm are dibutyl phthalate, dioctyl phthalate and tricresyl phosphate. This class of plasticizer is more efficient in nitrocellulose and thus less is needed to achieve the desired results; since they are essentially a solvent with a low evaporation rate, they tend to create a stable film that ages well.

Monsanto Chemical Co. is one of the largest manufacturers of plasticizers, and some of their literature has contributed greatly to this part of the series. One of their charts lists characteristics of film and sheeting and suggests plasticizers to enhance those properties as follows: (applies to nitrocellulose only)

TENSILE STRENGTH	Dicyclohexyl phthalate (DCHP), Diphenyl phthalate (DPP) and Tricresyl phosphate (TCP)
HARDNESS	TCP, DCHP AND DPP
ABRASION RESISTANCE	DPP and DCHP
FLAME RESISTANCE	TCP
TEAR STRENGTH	Dibutyl Phthalate (DIP)
HEAT STABILITY	Dioctyl Phthalate (DOP) and DIP
WATER RESISTANCE	DOP and TCP
LIGHT STABILITY	DOP and DIP

On the spec sheet for DCHP, the rather interesting observation is made that nitrocellulose films plasticized with DCHP "feel dry and separate easily"- an obvious good characteristic for microfilm. From the chart above, DCHP is said to promote tensile strength, hardness and abrasion resistance. Aha! The Perfect Plasticizer! So, try it!

The "ideal microfilm" should, no matter what other things it will do, be strong and separate easily if it folds over when you break something or when two models get together. The most obvious thing which causes microfilm to cling together is a "tacky" or "sticky" surface; but very thin, perfectly dry films will also cling or stick together because of what appears to be static electricity on the surface. A third property of microfilm sometimes causes trouble - film that is very smooth will overlap and stick simply because it is so smooth. This is like the Johansson blocks used as measurement standards in machine shops - they are so smooth and flat that two mating surfaces will exclude the air between them and a sort of vacuum holds them together. Film that is very smooth and highly reflective usually has this problem.

So, I tried DCHP. Blue film was noticably less sticky than films using other plasticizers, but gold film from the same batch was unusually troubled by static. An attempt to get the best of two worlds was made by using DCHP and TCP together; the resulting film seemed to be more static free and less sticky, but further tests need to be made here.

Some people build models with stressed-film construction and this calls for special film for best results. It must be stable, before and after heat shrinking, and it must be easily heat-shrunk to produce the stressed skin which adds to the overall strength of the model. To date, the best plasticizer for this type of film is benzyl butyl phthalate (BBP). The only apparent fault of BBP is that film using it as plasticizer is tacky like other phthalate-plasticized film; the static effect seems to be relatively minor. Perhaps BBP and DCHP can be used together to good effect??

Non-tautening butyrate dope (see "New Materials" on page 1) is a material which seems to hold unusual promise as an additive for microfilm. To date, film using NTB shows unusual freedom from stickiness as a blue film and very good resistance to static effects as a silver or gold film. Various samples have shown it to be possible to produce either stable film or film which will slack off after a time, depending upon the amount of NTB used. I have not had time to try heat-shrinking this type of film, except to verify that it can be heat-shrunk. My reservations concerning this material are based upon the poor record of butyrates with regard to delayed action shrinking, and upon the fact that NTB can be thinned with the proper blend of solvents and poured into a sheet of film. The resulting film is weak, spongy and sticky - not terribly reassuring!

Another approach to preventing film from sticking together was pioneered by Curtis Janke - the "roughener" concept. The idea is to use a material which comes out of solution before the rest of the mix hardens on the water; this produces minute irregularities on the surface which prevent the surfaces from getting into good contact and thus helps prevent sticking together. It may be that NTB works this way, except that NTB is soluble in all the solvents used in the microfilm. Cellulose Acetate, in a very dilute acetone solution, is added in very small quantities to the microfilm solution. Curtis warns that this makes the solution cloudy, and it should be added to small quantities of film solution at one time to avoid the possibility of ruining the whole bottle of solution. I have verified that dilute C/A added to film using BBP did indeed reduce the tendency to stick; but I also added extra acetone to the mix and this may have caused the uneven color I observed in the film.

The problem of choosing the proper plasticizer, and of finding out how much to use, is the most time consuming part of brewing your own film. The proper solvent blend can be determined in a matter of hours, if you use a systematic approach. The bare minimum of time needed to establish the proper amount of plasticizer is three weeks for a known plasticizer; an unknown plasticizer may develop undesirable symptoms months later. As an example, Dick Kowalski formulates his film (for stressed film) so it has the maximum plasticizer that does not go slack on the model. The test is to see that the film does not go slack on the pouring hoop after two or three weeks. My own tests for plasticizer amounts and effectiveness are simple and easy to implement. To check for film stability, 3" diameter hoops (like rudders) are built from .024" sq. balsa and covered with various colors of film. The amount of warp (if any) after three weeks gives some idea of the amount of shrink. A quick check of the heat-shrink ability is made by shrinking gold film on such a frame; the sample is left to age again to see if the film will continue to shrink, remain stable or slack off. A better test would be to subject the samples to 140° F. and 90% humidity to test for "worst case" storage of the finished model.

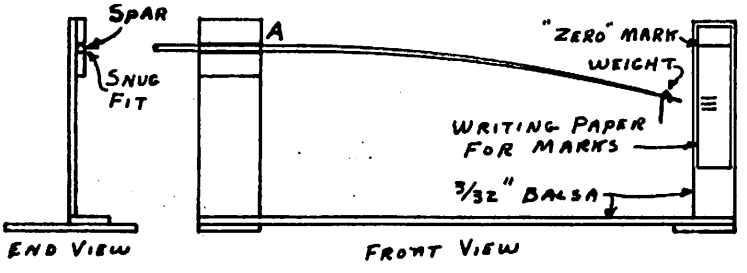
Tests for sticky film are hard to devise; I finally settled on tearing loose a corner of the film and letting it fold over on itself. If it can then be separated with tweezers, it is repeatedly folded over and separated. A very dry film will take four or five folding cycles before failing. Film which has a high degree of static will quickly fold over after you cut it loose; it will probably separate partially and leave several tiny folds that won't pull out. A better test for film would be to make a small wing (a 3" x 6" ellipse for example), cover it, and then fold it up so the film laps over. If it can be straightened out again, the film is good.

HINTS AND KINKS

A Building Hint

Reggie Batterson took to heart Bob Champine's suggestion for checking prop spars and designed this jig to aid in the check. The stand itself is simple and the dimensions are not critical, except for the snug fit at the spar hub.

In operation, the partially finished spar is checked for deflection with a weight (Bob and Reggie use a .009 oz. weight), then the spar is rotated to make sure the flex is the same in all directions. Finally, the spar is reversed and the deflection of the second end of the spar is sanded until the deflection in all planes equals that of the first end. A word of caution - the slot at "A" must be horizontal for best results, and the spar must not "rock" at all.



QUESTIONS AND ANSWERS

30. How do you find the density of unmarked balsa wood?

The density of wood is usually expressed in terms of pounds per cubic foot, and even marked pieces may vary slightly from the marked value. This is because the wood is usually cut into standard sized blocklets which are weighed and the resulting density read from a chart which has been prepared for that size of block. Since balsa density often varies quite a bit from one side of a block to the other, individual sheets from the same block may vary as much as 20% in density.

To grade an individual sheet of blasa, it must be weighed and the physical dimensions of the sheet measured so the volume can be computed. A particular piece of 3/32" balsa measured 2.125" x 18" x .105", which makes 4 cubic inches. The weight checked out at .159 oz as weighed on the beam scale featured in the March INAV. Incidentally, this scale's versatility was extended by putting hooks on the unknown beam at 2" and 3" and making a .1 oz. weight.

Since we now have the volume of wood and the weight, it is a simple matter to figure the weight per cubic inch:

$$\frac{.159\ oz.}{4\ IN.^3} \times \frac{.25}{.25} = \frac{.0398\ oz.}{IN.^3}$$

Note that the second expression in the equation is chosen so that the denominator becomes unity and so the numerator is numerically equal to oz./cubic inch. Now, multiply this number by 108 cubic inches/oz. to get 4.3 lbs./cubic ft. The number 108 is derived by expressing the number 1 pound/cubic ft. as 16 oz./1728 cubic in. and inverting the expression to get 108 cubic in./oz. This divides out all the units and gives a dimensionless number 4.3, which represents pounds/sq.in. This procedure takes but a few minutes for each sheet of wood, but is almost essential if you hope to build the lightest models practical for your site and flying conditions.

REPRINTED WITH KIND PERMISSION FROM THE AM EDITOR.

Lifting Microfilm

Bernard Aslett removes the mystery from producing good microfilm

THE ADVENT of microfilm covered EZB's has, by most opinions, produced a vastly improved model. The extreme low weight of this covering material (in even thick sheets) allows a commensurately heavier wooden structure, which now handles the aerodynamic loads so much more efficiently.

Stimulated by the Northern Area Indoor *circuit* and also the 'Flyrod' contests, many modellers are being encouraged to build EZB's and it is only natural in pursuit of greater performance, that they look to microfilm covering.

This article emphasises the *lifting* of microfilm, as it may be said, "anybody can pour it". In explanation, successful lifting requires technique and without it, strong men have been known to be reduced to tears plus an excursion into Anglo-Saxon phraseology. Having made this fundamental distinction it will be later admitted that good pouring techniques, undoubtedly contribute to success. Before discussing technique it would be appropriate to look at what equipment is required.

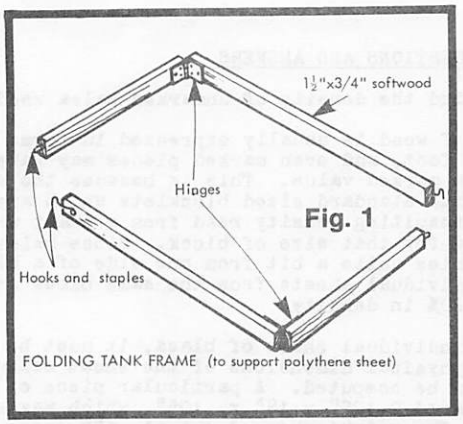


Fig. 1
FOLDING TANK FRAME (to support polythene sheet)

Tank

This can be quite unsophisticated. A wooden outline 1¾ ins. x ¾ ins. set on edge and forming a rectangle, with a fairly thick (.008 ins.) polythene sheet laid inside is quite satisfactory. Setting it on a table top avoids the need for a separate base. The size of the tank should be as large as can be conveniently accommodated to allow for a future need for large sheets of microfilm, but 50 ins. x 28 ins. will cope with sheets up to 40 ins. x 12 ins. Storage convenience can be gained by hingeing two opposite corners, whilst fixing of those remaining can be made with a "hook and eye", or similar, (fig 1). The polythene should be stored in a roll to avoid folds which in time would cause cracks and leakage — at this point it might be helpful to reflect that 4½ gall of water, to provide a depth of approx. 1in. is required in the suggested 50 ins. x 28 ins. tank and this will weigh 45lbs! Sudden tank failure would be the cause of instant unpopularity! Clear sellotape to each side of the polythene sheet is effective in repairing small leaks...



Fig. 2

Pouring Vessel

Requirements — anything to produce a thin steady stream. Several favour the Ron Green approach, using an aluminium 35 mm cassette case. A hole of .108 ins. dia. is made towards the bottom, allowing a one handed technique (fig 2). Some film solutions may require a larger hole, to avoid producing too thin a film. American Erv Rodemsky, the 1980 World Champion, favours a plastic bottle with a spout of two, telescoping brass tubes (fig 3). The length of the smaller dia. tube is altered to control the thickness of the film.

Frames

Having created your 'film', this has to be removed (lifted) from the surface of the water. This is done using a *frame*, these are chosen to suit the size of the wing, stab, etc., to be covered, but 20 ins. x 10 ins. should adequately cover one EZB and not be too large to begin with. Frame cross section of ⅜ ins. x ⅜ ins. balsa is suitable and should be constructed to form a flat rectangle that sits easily on the water.

Film Solution

Desirable properties, dryness and stability. There are several quite good solutions commercially available (see *Aeromodeller* ads) although the perfect film is somewhat like a pot of gold at the end of the rainbow. Straight *Humbrol* clear dope has produced surprising success for some, although it is not consistent from can to can. It would not be appropriate to close this subject without due tribute to Erv Rodemsky, who has been quite tireless and uniquely knowledgable in the search for a perfect solution. It is probable that no one else has applied himself so consistently, and for so long to this particular task.

Technique

Preparation: The water temperature should be consistent with the last successful pouring temperature...70° - 75°F will suit most solutions. If pouring on consecutive evenings, re-check the water temperature. Dust and small fragments of old film can be effectively removed by drawing a sheet of absorbent (news)paper across the surface. The surface ripples should then be allowed to settle.

Pouring: For consistency of film colour across any one sheet (and thickness — see table), a smooth/steady pass of the pouring vessel is made down the *length* of the tank, at a height of approx. 2ins. If you are new to this technique (or out of practice!), dummy passes, holding a stop watch, will allow you to check if your speed of pass is consistent (1.5 sec. for the 50 ins. tank has been found suitable).

The film should now be examined for suitable colour (and admired). It now

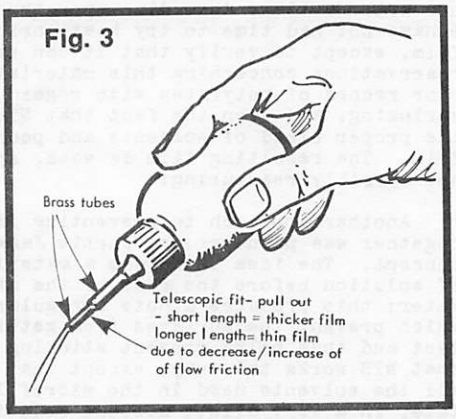


Fig. 3

requires time to allow rapid boiling solvents to evaporate — 8 mins. is suggested. This is unlikely to be time wasted. Apart from improved success rate, the frame surface to be laid on the film can be prepared with an adhesive — Cowgum, Uhu-stick and Scotch Spray Mount have all been used successfully. The sheet of film can again be admired whilst selecting the area of best colour to be taken — it is important to note (and exclude) weak spots from the frame coverage. The prepared frame is now lowered so that it is approx. ½in. above the film and one edge is then allowed to make

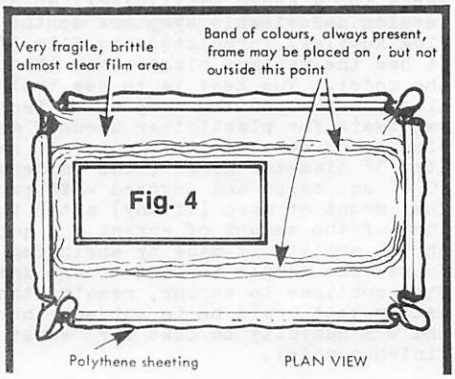
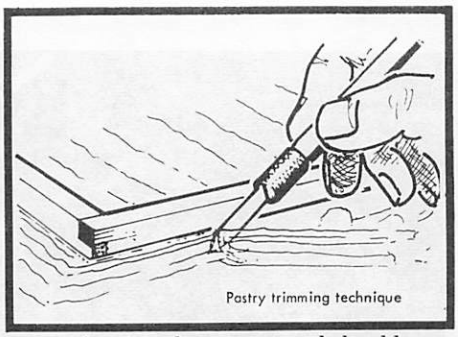


Fig. 4

contact. Without delay, the frame is released to drop lightly onto the film — it is then lightly touched on top, both along edges and ends, to ensure good adhesion. Fig. 4 illustrates the position at this stage.

The frame is now pushed in turn to the sides/ends of the tank to gather up the surplus film. This incidentally indicates the dryness/stickiness of the film, in that *dry* film tends to resist this gathering up procedure. Some will now flop this "excess" over the top of the frame prior to lifting, others tear the excess away. More preferable (to preserve the adhesion of the desired film) is an upwards "pastry trimming" action using a long bladed knife (fig. 5).

Lifting: The critical stage has now been reached, and great emphasis needs to be placed on smoothness and care. Fig. 6 illustrates the technique. It should be noted that the frame plus film displaces water such that the bottom edge may be ⅛in. below the surface. Drawing this frame across the tank will create a "bow wave" and turbulence, which is thought to greatly contribute to breakage. If the leading edge is raised up just to the water level, a smooth and steady movement in the direction of the dotted path, will lift the film (allowing air underneath) and avoiding much of the problems described. The frame is now held over the tank for ½ - 1 min. for drainage. For the first 10 min. or so the film is at its most fragile, and most breakages ("popping") occur in this period. It should now be moved to a temporary storage, propped upright at a shallow angle and allowed to dry out completely. Moving with the plane of the film parallel to the direction of movement at all times, avoids air pressure forces on the film. Temporary storage should be near, but out of influence of movements due to the lifting procedure. After 24 hrs. the film is by



Pastry trimming technique

comparison much stronger and should now be moved carefully to permanent storage (e.g. draughtfree loft).

The frames can be suspended employing a Bulldog clip and panel pin, ideally waiting for the film to indicate maturity by slackening. It would appear though, that use often occurs due to need, rather than any other factor. Carefully record the date of pouring, film solution and colour, frame number and eventually airframe for which it was used. These details can be invaluable, in light of a films good/bad performance.

No discourse on microfilm could ignore, not only the beauty of the colour range, but its significance in respect of thickness and hence weight. Many subjective opinions have been given to describe a particular colour, e.g. Apple green rose!! A shortened table is given showing an interpretation of the most important range of colours.

The physical thickness of microfilm is somewhat academic, and is usually related quite simply to its particular colour in the recognised order. It is intriguing to examine the few serious attempts that have been made to give an accurate assessment. The colours are produced by a well recognised physical process called Interference and are a natural property of any thin film. In the Nov 1963 INAV Bill Bigge gave information which has been extrapolated below:-

Red Violet approx. .000008 in. = 0.2 micron = 2000A°

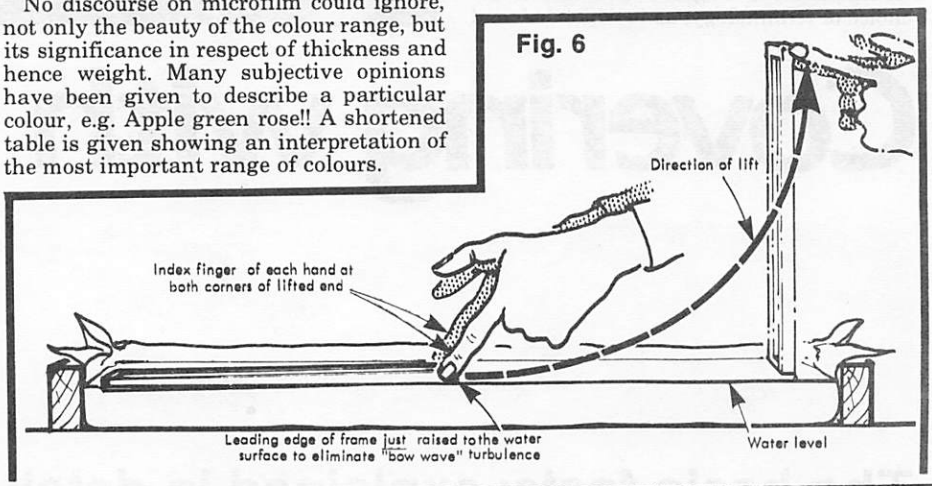
Blue Violet approx. .000010 in. = 0.25 micron = 2500A°

Table I

Colour	Comments
Clear/Cloudy	Brittle, unuseable
Silver	for very light coverings — fragile
Gold (brownish tinge)	for light coverings
Reddish Violet	commonly called Mauve -★
Blueish Violet	commonly called Blue -★
Gun Metal (greyish)	rather transient colour
Light Green	rather transient colour
Bright Yellow	Not to be confused with Gold
Red/Green	Thick and durable for EZB

★ Range most frequently used for F1D

Fig. 6





FORMAT: 8½" x 11" size
16 pages plus card cover
Sketches, cartoons and
52 photographs. $5

INSPIRATION FOR BUILDERS OF SMALL-SCALE FLYING MODELS

Peanuts & Pistachios ▪ VOLUME NUMBER THREE

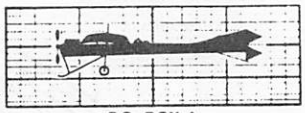
COMPILED BY BILL HANNAN

HIGHLIGHTS OF THIS BOOKLET:

- Abstracts from letters by readers in many parts of the world.
- Peanuts & Pistachios Pointers. (Construction hints and tips)
- The Proxy Postal Proposition. (International contest via mail)
- Peanuts & Pistachios Packing. (Mailing models with minimal risk)
- The Peanut Gallery. (Peanut photographs from near and far away)
- The Pistachio Presentation. (Itty-bitty flyers on display)
- Peanuts & Pistachios Producers. (a few builders & their models)
- Pistachio Peregrinations. (World-wide wanderings of a Mosquito)
- Plans for a Peanut Farman F.450 and a Piper Cub "oldtimer"
- Pistachio plans for a 1911 Caudron & Nutty Spoked Wheels
- Wedell-Williams Racers 3-view drawings and wisps of whimsy

+ Postage to Europe by surface mail $1.25
by air mail: $2.75

PUBLISHED BY
W.C. HANNAN, GRAPHICS



P.O. BOX A
ESCONDIDO, CA 92025 USA

NEW! Peanuts & Pistachios III

FUN!



FUN!

You asked for more, so here's the third in the series! Truly international in coverage, this concise booklet features drawings & photographs from such countries as Australia, Belgium, Canada, Czechoslovakia, England, France, Germany, Greece, Japan and the United States.

Here is a showcase of the finest in tiny scale models, to inspire you to greater achievements of your own!

RUNWAY ALSO OFFERS a diverse selection of other items, including Peanut Scale plans, aviation publications, a Pitcairn Autogiro display model kit and more....

F1D contest at the "Z-HALL", CSSR

1.	Leopold Walek	66:23
2.	Vaclav Walek	66:18
3.	Karel Brandejs	63:51
4.	Lutz Schramm, DDR	60:47
5.	Jaraslaw Jirasky	60:32
6.	Vaclav Zanka	53:10
7.	Karl Schonfelder, DDR	52:09
8.	Jindrich Fadrny	46:15

DDR is East Germany. JULY '88

IT HAS BEEN suggested that an accompanying article to that dealing with pouring/lifting microfilm (*Aeromodeller* Jan 85) might be of interest.

The reader may remember that they were left admiring their new sheet of film having recently lifted it from the water-bath. It would then be stored in a safe place until mature - this state being indicated by the film slackening on the lifting frame and taking a long or short time depending on the solution used. Of course, many models are covered with film that hasn't slackened. Other priorities may rule, for example, it might be in all other respects a very nice sheet of film - but if slackening hasn't occurred then there is always a risk that it may be shrinking...and that it will eventually mean a distorted flying surface.

But let us return to the stage where that new airframe sits on the building board awaiting completion.

There would seem to be two basic covering methods which we might choose; they might be termed the *mid-air* and the *controlled* techniques. No disguise is made in the choice of terminology, as to which is found preferable. However, many indoor modellers use *mid-air* techniques successfully, so just one will be described, the wing.



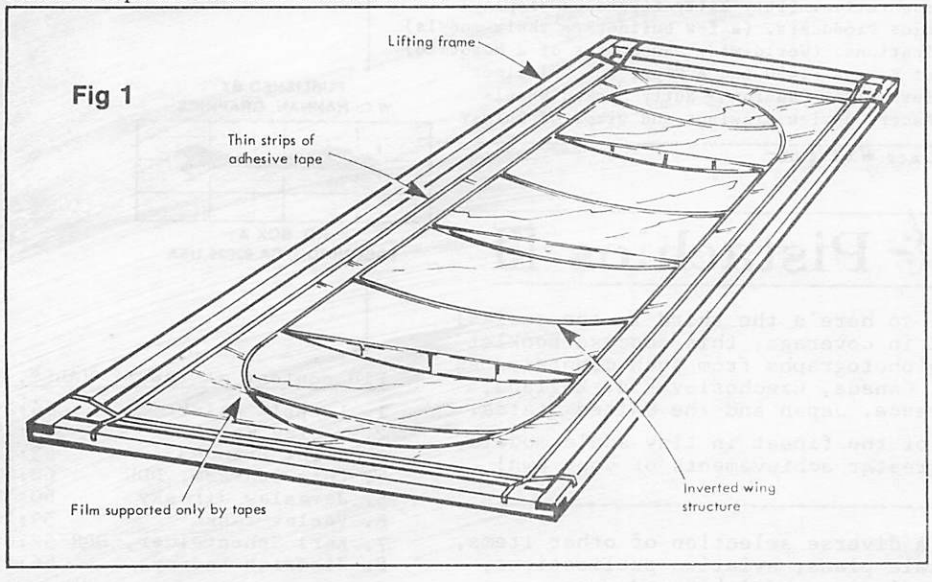
Although this article is aimed at the F1D model EZBs such as this by Graham Davitt all use the same techniques.

Covering with MICROFILM

The basic facts: explained in detail by Bernard Aslett.

Wings

Usually, the film on the (original) lifting frame, is made even more slack in the following manner. Narrow strips of adhesive tape are attached to the film *and* frame, approximately 6mm inside the frame sides and ends. The film is then separated from the frame using a brush and acetone or preferably heat (eg soldering iron of 10 Watt rating - any greater and you might need the Fire Service!). The ends of the adhesive tapes which now totally supports the film can be adjusted on the lifting frame to produce the degree of slackness in the film, that is desired.



The wing in its flat, unbraced state, is now carefully placed *upside down* onto this slackened film. The weight of the structure causing a (hopefully) uniform tension of film across the chord and along the span (fig. 1). With care, adjustments may be made. Attachment is made with a wet, soft brush applied to the outside of the frame, with considerable ease.

A word on brushes. Microfilm will only tolerate the passage of the very softest bristle/hair and it is worth the expense of a pure sable long-haired brush.

The airframe may now be removed from the excess film using acetone or heat.

Surprisingly microfilm is really quite strong when under tension and will resist efforts to alter the alignment of the covered structure, if doing so places the film *in* tension. It is for this reason alone that a more controlled technique is preferred...

In principle this *controlled* technique requires first the setting of the structure in correct alignment *prior* to covering. The wing/stab would be placed on a flat *wooden* board (details later) - laminates are too fond of attaching themselves to the film. For the propeller, it might be said that, it should *never* be covered on anything other than the 'pitch jig' on which it was constructed.

To return to the wing. The intention now is to take the film to the wing rather than the reverse as described in the *mid-air* technique. The board should have an outline

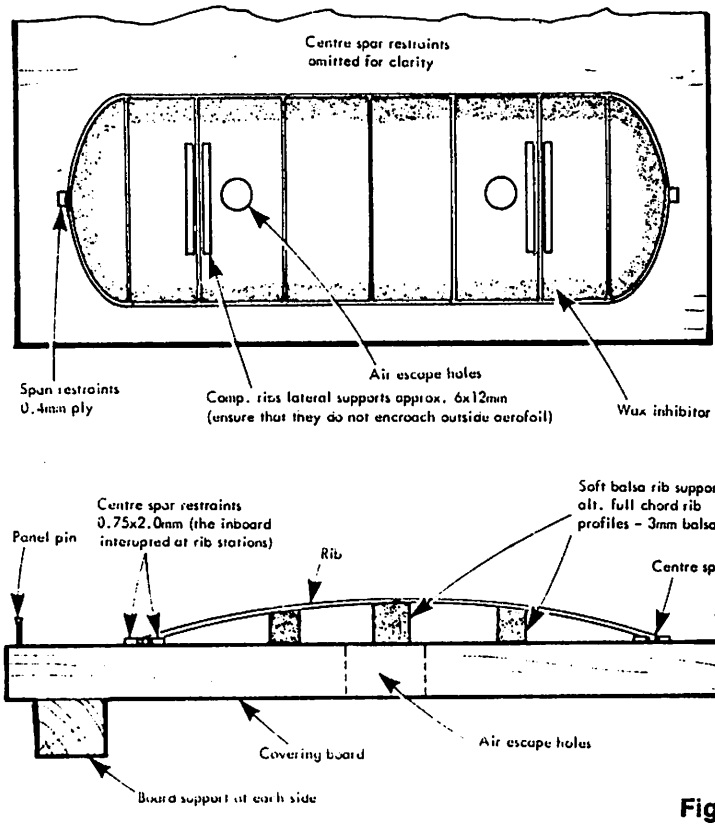


Fig 2

drawn on it *including* rib stations in order to preserve the desired wing shape. It has been found helpful to control the centre spars with thin strips of balsa, (0.75 × 2mm in section) previously fixed to the covering board. Two or three holes should be made right through the board, *inside* the wing outline, to allow escape of air which would otherwise be trapped under the film, causing a distortion due to ballooning of the film.

It is also necessary to preserve the rib *profile*. This can be done by blocks of soft balsa strategically positioned, or alternatively full profile ribs fixed to the board at each rib station. Compression ribs usually only require lateral support.

One shortcoming of this *controlled* method is that more water will be used than with the *mid-air* technique. It is very important that this water application should be controlled. This is done by generously impregnating the board *inside* of the airframe with a wax candle, being careful not to stray outside of the outline. The wing can now be set to the board, but as yet left dry (fig. 2).

We now turn to the subject of the covering frame. It has already been stated that the lifting frame is necessarily robust. A much lighter frame is now needed, constructed as shown in figure 3.

The transferring of the film is initiated, by first separating the film from the frame *just inside the ends*. The covering frame is then gently lowered on to the lifting frame. We now note that the covering frame size is required to be a little in excess of the lifting frame length but slightly less in width - a point only briefly referred to in the previous article.

The sable brush is then liberally wetted and carefully run along the *outside* of the 3 × 6mm members (fig. 3). The film is now attached to the covering frame and can be separated from the lifting frame using heat/acetone. It will be noted that the extra length of the 3 × 6mm members now prevents the covering frame from falling through the lifting frame as the film is parted.

We now return to the covering board. It is desirable to control the position of the covering frame in relation to the wing. This can be done successfully by six small panel pins set into the board; three each side in a spanwise direction - the covering frame to just sit inside them, leaving an equal amount of excess film each side of the covered wing.

It will be noted at this point that the *arc* of the rib aerofoil is naturally in excess of the flat chord and for a typical F1D wing by about 5mm. If a strip of 5mm wood is set inside *one* row of panel pins, the covering frame will be constricted across the chord by this amount when it is finally lowered on to the wing. With care and small adjustments, the film can be set on the wing at an optimum tension without distortion occurring.

Having everything prepared it just remains to wet the wing outline and also ribs at centre and polyhedral stations. The outline requiring quite copious application as the board will soak up much, and scrupulous care is needed to ensure that not a drop of water gains access to the inside of the wing outline.

The covering frame is brought without delay to the board and one side is gently positioned inside one row of panel pins and on the board surface. Having established that the spanwise location will cover *both* tips, gently lower the second side of the frame constricting the width at the 'goal posts' to just slide inside of the slip of 5mm wood (fig. 4). Efficient attachment to outline *and* ribs can be gained by gently blowing on the top surface of the film, to make contact where this does not occur naturally.

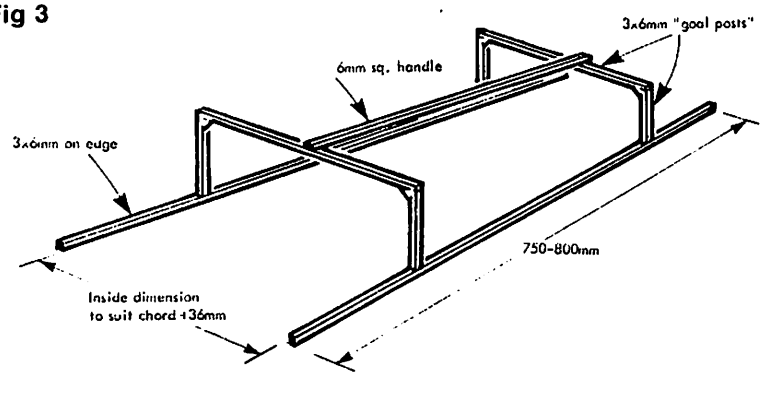
Heat can be taken around the wing to remove excess film and surprisingly close to the saturated outline without fear of damage. The covering frame, panel pins and 5mm strip can now be removed.

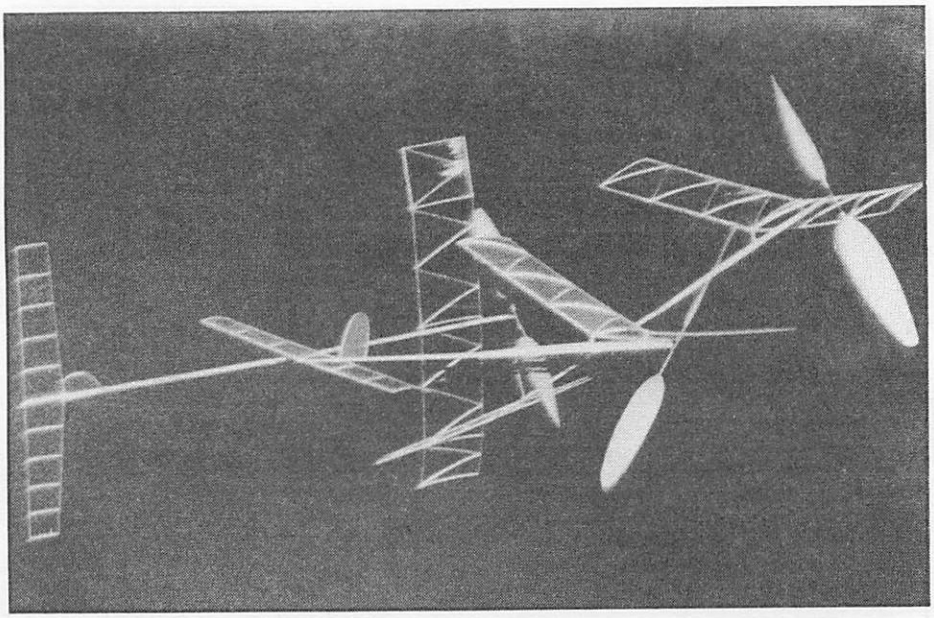
Undesirable wrinkles should be eliminated at this point to prevent the film sagging to the surface of the board - which tends to occur at the tips, where the arc of the aerofoil is least. This is achieved by a wet (not saturated) sable brush, held at an angle of about 30° to the film surface, being carefully drawn along the wrinkle. It is worth experimenting with this technique a little, in order to find the direction that best preserves the film to aerofoil section.

This is a point when it is worth noting that there is a considerable range of opinion in the 'Indoor World' as to how slack or tight, is desirable for best performance. From the best of knowledge available, aerodynamics such as lift/drag ratios, boundary layer thickness and aerofoil sections are speculative and unproven in the circumstances in which we fly. Thus immaculate covering without a wrinkle, might even be at a *disadvantage* to one somewhat more slack. However, that a properly tightened film contributes significantly to structural rigidity and in turn strength, is unlikely to be denied.

The airframe with taughtened film is now left to dry out completley (preferably 24 hrs), prior to very carefully easing the structure

Fig 3





This spectacular three model collision was seen at the second SAMS indoor event at Watford - surprisingly little damage occurred...certainly no need for the full treatment described in this article...

away from the constraints built into the board. Bracing can now take place which of course, is another subject. The attentive follower might at this point wish to know, that the remaining (unattached) ribs are attached to the film *after* bracing.

Propellers

Much described already, applies to the propeller, with the advantage of dealing with a smaller structure. However, the twist that occurs along the blade presents a new consideration. It is necessary to present a covering frame to the structure that is able to match this twist.

A rectangular frame of light balsa (6-8lb/cu ft) is constructed that will comfortably cover the blade shape chosen, but *not* to exceed the dimensions of the pitch block - explanation later. The cross section should be approximately 3 × 1mm. This frame is laid on an area of the lifting frame and attached with the sable brush and water. A thin strip of adhesive tape is placed right across the lifting frame, close to the covering frame to protect the rest of the film whilst separating the smaller from the larger.

With the section (3 × 1mm) chosen, it will be found that it will easily accept not only the blade twist but other curves and contours as well. This twisting actually induces some wrinkling, but this can be removed later, as described for the wing.

In order to prevent the film attaching to the pitch block - *inside* of the blade outline - tissue of a matching blade shape but about 2mm smaller all round can be placed *under* the blade prior to covering. A slightly hairy tissue eg *Modelspan* has been found most suitable.

The ribs and blade outline are now carefully wetted, again avoiding any moisture on the inside of the outline. This should also serve to attach the blade by capilliary attraction, to the block's contours. The covering frame is now twisted between the fingers of both hands and carefully presented to the wet blade (fig. 5).

It is useful at this point to have a third hand to lightly pin down the frame to the pitch block, thus the frame cannot reasonably exceed the block dimensions. Blowing should ensure good attachment. Separate the frame in the prescribed manner. It may be helpful at this point to describe how to deal with a part of the structure outline that was not quite wet enough for the film to adhere. A small hole (or series of) can be burnt in the offending area encroaching to within approximately 1mm of the outline. Through this hole/s a wet brush can introduce water to the outline, and blowing should produce the attachment previously resisted.

With the removal of the covering frame, the blade should be left to dry out thoroughly...before moving on to the opposite blade. In order to preserve the accuracy of the blade, it may need judicious use of pins to gently hold it to the block during this drying period.

A final thought on propellers - use of a thicker, more durable film than that for elsewhere, is usually a wise selection.

Although this (necessarily) pedantic description is directed towards F1D structures, the principles involved can quite easily be adapted to an EZB airframes - and indeed these ideas can in true aeromodelling traditions, very healthily be modified to suit one's own approach. It is always a great help if one can have the assistance/advice of someone already experienced in indoor procedures, to deal with the unexpected. Thankfully aeromodelling seems to attract and encourage such generosity and one of the most warming experiences of international competition is the recognition that these exchanges are not in any way restricted to National boundaries.

Fig 4

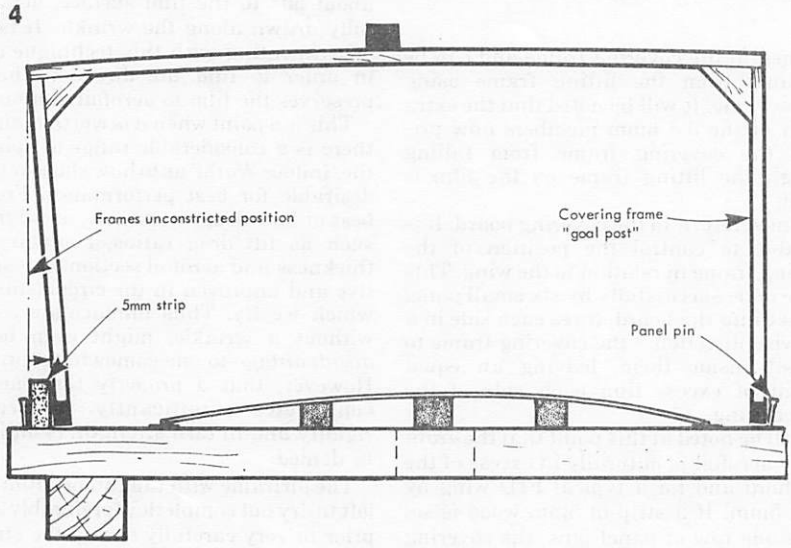
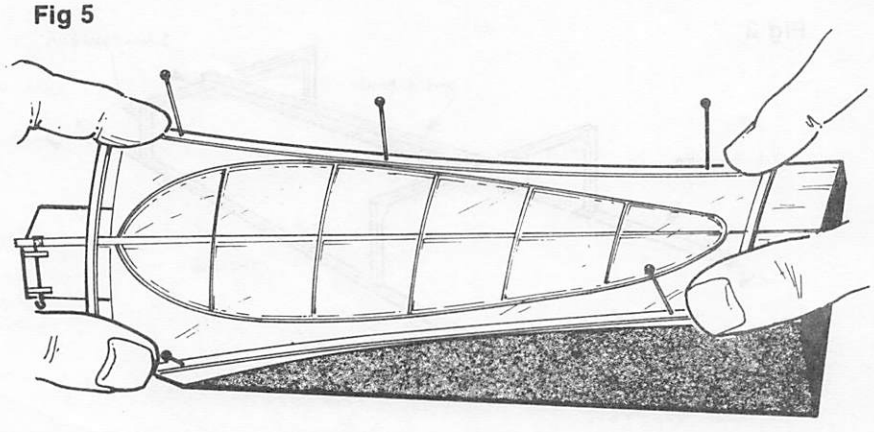


Fig 5



U.S. INDOOR CHAMPIONSHIPS, JOHNSON CITY, TN., JUNE 1988

BY BILL HENDERSON

On June 2nd., Indoor week at Johnson City continued with the annual U.S Indoor Championships allowing all of us who had been timekeepers or officials at the F1D World Champs and Open International to do some competitive flying with many other flyers from all over North America and some from Europe who had stayed on after the F1D events. The next three days of intensive flying started out with three very popular events all flown together; EZB Open (75 entries), EZB International (26 entries), Intermediate Stick (33 entries). At one point in the morning Jim Richmond took a count of all the models in the air at that moment and reached 25 before he could not be sure of double counting. It was an amazing sight, like a horde of locusts, and suprisingly few collisions occurred. The results were as follows;

International EZB

1st. G.Nolin	20:01
2nd. W.VanGorder	18:07
3rd. J.Barker	17:56
4th. G.Underwood	17:07

all from the USA. Top Canadian was W.Henderson in 12th. place with 13:30.

EZB Open

1st. E.Hoffman	21:21
2nd. C.Marcos	20:02
3rd. G.Nolin	20:01
4th. G.Wisniewski	19:25

Top Canadians were J.Marett (15th.) with 15:55, K.Groves (17th.) with 15:39 and it was nice to see L.Leiffer putting in a 12:02 flight. Top Canadian juniors were J.Paddle (4th.) with 4:55 and R.Smith (5th.) with 4:31.

Intermediate Stick

1st. E.Hoffman	29:03
2nd. R.Ganser	25:41
3rd. J.Richmond	25:33
4th. L.Louka	24:28

Top Canadians were Ron Higgs (7th.) 23:18 and Jack McGillivray (9th.) with 22:25.

Peanut Scale and AMA Scale were flown together in the afternoon and brought out the usual wide selection of models from antique Voisons and Bleriots to modern Fikes and Laceys. In Peanut the final results were;

			Flight score	Scale score
1st.	J.McGillivray (Canada)	Isaccs Fury	118	118
2nd.	L.Garber (USA)	Hydro Voison	87.5	120
3rd.	W.Henderson (Canada)	Bleriot 7	101	101

and in AMA Scale;

1st.	J.McGillivray (Canada)	Isaccs Fury	91	91
2nd.	K.Groves (Canada)	Dream Fike	91	88
3rd.	J.Blair (USA)	Cessna	89	88

While the official scale events were being flown Doc Martin was running his MIAMA Grand Prix, only this year it was for Pistachio Scale instead of Peanut Scale as in previous years. The idea was to popularize this 8" maximum wing span class. The turnout was not large, but several very nice models flew in this event with suprising durations of over one minute for such small models.

The evening was devoted to hand-launched glider and catapult glider, the latter proving to be the most popular of the two events. The winning times were very comparable with catapult glider having a slight edge.

Hand-launched Glider (25 entries)

1st. B.Boehm	66.2	66.1
2nd. P.Shailor	62.0	63.0
3rd. T.Andre(Holland)	53.4	57.8

Top Canadian was Ron Higgs at 7th. place with 56.3 and 46.4 seconds.

Catapult Glider (37entries)

1st. R.Warman	75.0	73.4
2nd. C.Marcos	66.6	68.4
3rd. K.Fulmer	61.4	64.0

Day 2 of the USIC opened with five hours of duration and speed circuit flying in Manhattan Cabin, Bostonian, Open speed and Peanut speed. For those flying all four events it was a hectic morning, but the results speak for themselves;

Manhattan Cabin (28 entries)

1st. R.Harlan	10:51
2nd. R.Ganser	10.08
3rd. C.Marcos	9:31
4th. W.VanGorder	9:24

Top Canadians were W.Henderson in 8th. place with 8:53 and K.Groves in 9th. place with 8:50.

Bostonian (41 entries) scored on two best flights X charisma factor.

1st. R.Miller	427.28
2nd. R.MacEntee	425.25
3rd. J.McGillivray (Canada)	421.08
4th. J.Marett (Canada)	417.76

Open Speed (16 entries)

1st. C.Marcos	13.7 mph
2nd. W.Henderson-(Canada)	12.1
3rd. J.Shepherd	6.7

Peanut Speed (6 entries)

1st. J.Blair	8.9 mph.
2nd. J.Konefes	4.6
3rd. S.Fink	4.2

The afternoon was devoted to Ornithopter, Helicopter, Autogyro, and No-Cal (Profile) Scale. The ornithopter event produced record breaking times as it has each year;

1st. J.Krush	12:26
2nd. R.White	10:23
3rd. D.Slusarczyk	8:40

Helicopter was won by Jim Richmond with a 5 minute plus flight using the classic twin rotor rubber helicopter design that has become the standard for this event. Autogyro had just afew entries but the top two put in respectable times;

1st. R.Ganser	9:56
2nd. L.Louka	8:21

No-Cal Scale is a fun event that attracted over 30 entries and was flown with a series of mass-launch heats leading to a mass- launch final with the last model down being the winner. The final was very tightly fought with a few seconds between the three finalists who were;

1st. C.Slusarczyk

2nd. J.Marett (Canada)

3rd. R.Miller

The day finished with a banquet which included a couple of very funny, local storytellers. They were almost upstaged when the floor was thrown open to anyone from the banquet and Chuck Slusarczyk responded with some real stories of his early days as an ultralight flyer. He is a natural storyteller and had us almost rolling in the aisles with his humour.

The last day opened to two more very popular events; Pennyplane and Novice Pennyplane. Due to the number of entries expected the senior and junior classes competed separately instead of combined as in most other events. The final results were as follows;

Pennyplane (Open class-39 entries)

1st. L.Garber	14:08
2nd. W.VanGorder	14:05
3rd. G.Wisniewski	13:47

with Canadians, John Marett in 5th. place (13:27) and Ken Groves in 9th. place (11:57).

Junior class

1st. R.Smith (Canada)	8:06
2nd. M.Richmond	7:32
3rd. J.Paddle (Canada)	3:19

Novice Pennyplane (Open class-69 entries)

1st. C.Slusarczyk	12:46
2nd. R.Miller	12:32
3rd. J.Clem	12:31
4th. D.Obarski	12:30
5th. K.Groves (Canada)	12:16

Junior class

1st. R.Smith (Canada)	9:06
2nd. M.Richmond	6:41
3rd. J.Plassman	4:58
4th. J.Paddle (Canada)	3:48

The day finished with traditional AMA duration events; Hand-launched Stick, ROG Stick and a special event, Oldtimer sponsored by the AJI group. Once again Canadians did very well;

Hand-launched Stick

1st. J.Richmond	44:47
2nd. J.McGillivray (Canada)	39:06
3rd. L.Louka	38:13

ROG Stick

1st. J.Richmond	15:22
2nd. J.Nuszer	12:20
3rd. R.Ganser	11:40

and in 5th. place, Canadian J.Marett with 6:00.

The Old-timer event produced some impressive times comparable to those possible with Intermediate Stick;

1st. L.Louka	23:50
2nd. C.Marcus	21:27
3rd. J.Krush	20:45

After five days of intensive competition the time had come to decide the USIC Grand Champion based on seven eligable events chosen by the contestant before he flew any of them. Using 100 points for first place, a maximum score of 700 points was possible. In the end the first place winner had five first places to his credit.

1st. J.Richmond	664.8 points
2nd. J.McGillivray (Canada)	604.3
3rd. R.Ganser	568.2
4th. L.Garber	561.5
5th. K.Groves (Canada)	499.0(Ken was last year's champion)

J.Marett of Canada took 7th. place.

This was a fantastic week of competition, renewed friendships and general camaraderie that will sustain us indoor flyers until next year. Now that Canada officially flies to the AMA rules in indoor events all the top Canadian times are new records (except where they do not exceed previously established records); a great start for our new indoor committee.

DM-INDOOR 1988.

F1D:

1. Jørgen Korsgaard	26:07	+ 26:23	= 52:30
2. Werner Nimptsch, D	23:32	+ 27:16	= 50:48
3. Hugo Ernst	18:48	+ 17:35	= 36:23
4. Frank Dahlin	17:48	+ 18:34	= 36:22 (!)
5. Hans Rasmussen	7:02	+ 13:38	= 20:40

35 cm Mikrofilm:

1. Werner Nimptsch, D	14:13	+ 13:17	= 27:30
2. Hugo Ernst	10:36	+ 10:48	= 21:24

EZB:

1. Hans Rasmussen	11:26	+ 11:24	= 22:50
2. Jørgen Korsgaard	11:09	+ 10:21	= 21:30
3. Hugo Ernst	9:36	+ 10:49	= 20:25
4. Frank Petersen	8:41	+ 8:37	= 17:18
5. Danny Nielsen	6:31	+ 8:10	= 14:41
6. Jens Peter Larsen	5:14	+ 4:52	= 10:06
7. Poul Rasmussen	6:06	+ 4:52	= 10:58
8. Martin B. Hansen	3:33	+ 3:13	= 6:46

F1D-Beginner:

1. Werner Nimptsch	10:47	+ 11:18	= 22:05
2. Sønke Boldt	7:43	+ 7:45	= 15:28
3. Jørgen Olesen	5:09	+ 5:06	= 10:15
4. Jens Wium-Andersen	4:40	+ 4:26	= 9:06
5. Karsten Mortensen	3:56	+ 3:34	= 7:30
6. Dennis Rasmussen	3:54	+ 3:02	= 6:56
7. Rene Kvist Sørensen			1:05

DANISH CHAMPS

Chuckglider:

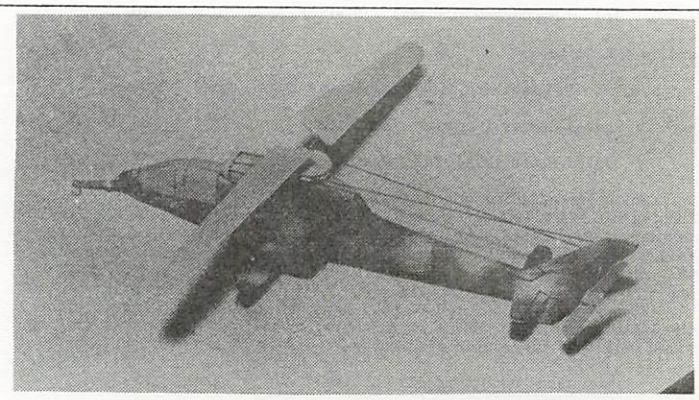
1. Jørgen Korsgaard	59 sek
2. Sønke Boldt	56
3. Danny Nielsen	55
4. Mikael Ernst	52
5. Hans Rasmussen	49
6. Hugo Ernst	48
7. Jens Wium-Andersen	47
8. Dennis Rasmussen	46
9. Anders Korsgaard	46
10. Jørgen Olesen	46
11. Jens Peter Larsen	44
12. Karsten Mortensen	31
13. Frank Petersen	31
14. -	

P-15:

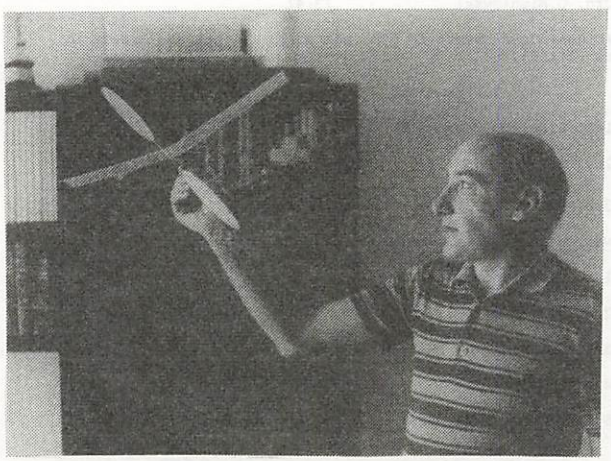
1. Mikael Ernst	249 sek
2. Rene Kvist Sørensen	213
3. Anders Korsgaard	210
4. Henrik Nielsen	209
5. Jesper Thorlund Jensen	192
6. Dennis Rasmussen	191
7. Jens Wium-Andersen	187
8. Jørgen Olesen	177
9. Martin B. Hansen	172
10. Sønke Boldt	159

Peanut:

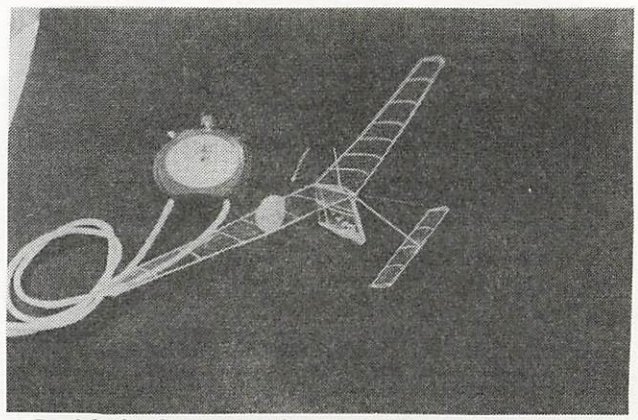
	skalapoints	flyvetid	
1. Heinz Neumann, D Skyrider	27	54 + 53 = 107	
2. Martin B. Hansen Skyrider	25	57 + 45 = 102	+ 76 sek
3. Hans Rasmussen Evans Volksplane	24	46 + 56 = 103	+ 59 sek
4. Danny Nielsen Piper J3	27	29 + 33 = 62	
5. Jørgen Korsgaard Bede-4	27	31 + 30 = 61	
6. Danny Nielsen Ganagobie	27	30 + 30 = 60	
6. Jørgen Korsgaard Farman Moustique	19	37 + 39 = 76	
7. Jens Peter Larsen Peitenpol	31	12 + 19 = 31	
8. Kim Kvist Sørensen Nesmith Cougar	27	24 + 25 = 49	
9. Sønke Boldt Lacey M-10	27	17 + 22 = 39	
10. Jesper Thorlund Jensen Piper J3	19	28 + 27 = 55	
11. Frank Petersen Pike E	17	15 + 14 = 29	



Yes, it flies, motorstick protuding at the nose



Eduard Grippo, Argentina with his EZB



Jonas Romblads Gossamer Condor with 33 cm span, it flies 1:15 regularly. Bracing is Kevlar

Les Shaw Helps Design Project Fly



Les Shaw of Test Operations, Technical Services and Support, has been working with about 200 freshman aerospace engineering students at the University of Colorado, Boulder, Colo., on an indoor model airplane design project.

Indoor model airplanes are generally less than 24 inches in wingspan and extremely light. Some of them are gliders and are literally thrown into the air while others are driven by a rubber band powered propeller. It is not uncommon for an 18-inch wingspan model to weigh less than two grams and to be capable of flying over 10 minutes under a 40-foot ceiling.

Les and fellow club members established design parameters that would allow the students enough freedom to be creative, while at the same time being restrictive enough that the students would have a good chance of designing something that would really fly.

They also attended the student lab sessions to advise them on their designs and to provide construction hints. Early in the project, it became apparent that a contest would help to properly judge the flying abilities of the designs.

At that point, Les approached Ball Aerospace, and asked if the company would be willing to sponsor the activity by providing a modest amount of prize money and certificates for the participants. Ball's management felt that the encouragement of budding aerospace professionals was certainly in the long-term interest of the company, and agreed to sponsor the contest.

Thanks to Ball, the financial success of the contest was assured, and things began to move quickly. The lab sessions were completed, and the students test-flew their designs on the Friday night prior to the Saturday contest. Les was obviously impressed with the students' efforts. "There were canards (with and without rudders), biplanes, twin-engined airplanes and 'conventional monoplanes,' all flying quite well. Virtually every possible combination of aircraft plan-form, aspect ratio and power source arrangement was attempted. Our best flyer was a high-wing monoplane that flew for two minutes, nine seconds.

Les sees several benefits from the contest. "Today's young people don't BUILD things anymore. Tomorrow's engineers need to develop an appreciation for the role of the technician/craftsman. In addition, the lesson that designs don't always do what pages of calculations say that they should do is an important one that should be learned early in any engineer's career."

Les went on to describe another benefit of the program. "The building and flying of stick-and-tissue models is becoming nearly a lost art. If you attend a freeflight contest, one of the things you will notice about it is the age of the competitors — most of them are in their 50s. I hope we're nurturing a new generation of modelers, and that we showed them that it's possible to derive a great deal of pleasure from seeing your own designs fly, without spending hundreds of dollars on radio control gear.

Les is hopeful that the program can continue. "There is a real need to give engineering students a relevant project in that grim first year of coursework. We were repeatedly told by upperclassmen and grad students who attended the contest that they wished they had been given the opportunity to actually design something during their first years of college. Most of them seemed to feel that a project of this nature provides a needed focus for their coursework."

"We're proud of what we've accomplished here," Les continued. "At a single bound, we've gone from a small indoor modeling club to the administrators of what may be the largest modeling program in the United States. We're hopeful that our program will become an example for other club/educator/business partnerships. We're particularly pleased that EVERYONE benefited from this project: Our club received the use of a really superior flying site, the students received a relevant design project (and had a lot of fun, to boot), and Ball received the kind of exposure to the faculty, students, and general public that advertising simply can't deliver. All companies say that they're interested in education, but very few actually demonstrate the depth of their commitment."

Les and the rest of the club will be flying on several more occasions during the spring. He invites anyone interested in this hobby to join them. "It is very satisfying to see an airplane which you built circling under the rafters for minutes on end."

Senior editor Andresen, Drafting Chief Wennerstrom, and Executive Production Coordinator Fruciano, have been wrestling with final drafts of NFFS SYMPO 88. A wider range of contributions, from many more countries and some 'blockbuster' material make SYMPO 88 unique. Available July 30, 1988.

SYMPO

SYMPO '88 TABLE OF CONTENTS

	Hardy G. Brodersen Hermann Andresen	*A Word from the Exec.* *Introduction*
AERODYNAMICS AND STABILITY	Andrew B. Bauer	*Some Effects of Design and Trim on FIC Glide Recovery*
	Hans Gremmer	*Slotted Wingtips on Soaring Birds and Models*
	Jean Wantzenriether	*Your F1B Stabilizer: Lift Slope Implications*
	William F. Waterman	*Computation of Low-Speed Airfoil Lift and Drag Characteristics*
STRUCTURE	Stan Wennerstrom	*Stress Analysis of an FIC Folder*
	Matt Gewain	*Using Composite Materials*
POWERPLANTS	Klaus J. Hammerschmidt	*The Cylinder of the CO2 Motor*
	Douglas Joyce	*Computer Program for the Rossi MK II*
	Li Renda	*Measurement of Stored Energy of Rubber Strips and Analysis of M-N Curves of various Rubber*
DESIGN	Thomas Koster	*RC - Timers*
	Rich Rohrke	*A Progressive Tilting V1T*
	Li Renda	*Influence of Moment of Inertia on F1B Performance*
	Ed Lidgard	*A small Hub Folding Propeller*
	Joe Maxwell	*Wakefield Propellers, The State of the Art*
	Robert Piserchio	*Variable Pitch Front End for Wakefields*
	Mark Young	*A Reversible Helicopter*
	Anselmo Zeri	*From the "Rara Avis" Nest*
CONSTRUCTION	Randy Archer	*Aluminum Skin Wings*
	Heiko Rapp-Wurm	*Composite Wakefield Wings*
	Louis Joyner	*F1B Propeller Construction*
	Van Wallene	*Making Carbon Fiber Spar Caps*
	Giorgio Venuti	*FIC Motor Models, Balancing and Building*
FLYING and STRATEGY	James Richmond	*The Inside Story*
	Charles Sotich	*Ed Konefes' Sheet Aluminum Winding Stooge*
	Robert White	*What to do after the Dope Dries*
	Yaodong Zhou	*How to find the Thermal by using the Streamer*
	Tony Italiano:	**NFFS HALL OF FAME**
		Frank Cummings *Walter Erbach* *Tom Hutchinson* *Joe Weathers* *Bob White*
	Jon Zeisloft:	**MODELS OF THE YEAR**
		Rol Anderson Atlas MK III A/B Large Gas *Terry Thorkildsen Astro Star 1/2A Small Gas* *John Lenderman Le Nomade Large Rubber* *Phil Hartman Square Eagle P-30 Small Rubber* *Jim Leuken Shockwave HLG* *Walt Van Gorder Manhattan Pieces Indoor* *Victor Tchop VT-38 F1A* *Robert White RW-22 F1B* *Eugene Verbitsky EV-43 F1C* *Robert Wilder Accessories Special*

ORDER FROM:

NFFS Publications
4858 Moorpark Ave.
San Jose, CA 95129

Dear Jørgen,

I'm writing this letter in English so that you needn't bother about a translation if you want to publish parts of it in your Indoor News.
We had our 3rd Indoor Competition at Offenburg 3 days ago and I am sendin· you the results in this letter.
At the moment I am the only adult indoor flyer here and that meant that most of the preparations for the contest had to be made by myself. Fortunatelny the weather conditions last Sunday were not good for gliding (one of the reasons why I chose such an early time of the year) and some of my friends from the local gliding club turned up and helped me with preparing the site etc. Albert Riedlinger who is in charge of indoor flying here in the south-west of Germany was very helpful,too. This meant that I myself had enough time to do some flying of my own and help our youngcompetitors with their TH-O models.

The TH-O is a very simple construction by Günter Maibaum. It is easy to build, flies well and reliably and can do more than 4 minutes in a 7 m hall if it doesn't weigh much more than 2 grams. Usually I build the prop blades for the boys and help them with the final assembly of tailboom , stick and stabilizer. As you can see from the list we had 12 participants in this class. It is rather a question whether any of them will go on with indoor modelling but it was great fun for all and maybe one or two of them are the champions of the future.
The conditions in our hall proved not to be as good as in the years before. We couldn't keep the heating running and the temperature was about 18° Centigrade. However,there was no change of weather in the hall throughout the day and performances did not change very much either. Our hall is very tight , does not have any windows so that there is almost no draft. We had put plastic sheets round most of the big obstacles on the ceiling so that there were no hang-ups and with a little bit of steering everybody could fly rather consistently.

In FID - X as we now call the class in Germany (I find FID-Beginner is not a suitable word) I flew my Si Halus design from 1984 with a bigger stabilizer and a prop of 400 mm diameter and 550 mm pitch. I used Champion rubber - the one you gave me - and did quite well. Some days before I had flown a personal record with 11:20 using the same rubber. I hope to get some more of this good stuff but have heard rumours that it won't be sold any more.

There is something else that might be interesting: I built an EZB recently because there will be a contest in this class in Knittlingen on March 20th. It is actually the first EZB I ever built. I chose a very normal design according to the rules : 1,2 g minimum weight, length 50 cm, stick 25 cm, stabilizer not more than 50% of the wing. I was very amazed when it did 13:5C on its third flight with a back off of about 200 turns. As far as I know this is not bad for a 7 m (21 foot) hall and it might be the result of a new way of treating the polyester that I use for covering.
I cut the film to the size I need but before putting it on the wing I squeeze it into a little ball and then flatten it out again. Covering seems to be easier after this treatment, there are less big folds but thousands of little ones. I imagine that the rough surface produces many small eddies but prevents the development of bigger ones thus reducing the drag. I remember that in one of the earlier editions of Indoor News a Danish (?) modeller wrote about an EZB which performed better with condenser paper covering which probably can be explained by the same theory.

It might be rewarding to make test flights with indoors gliders using the same fuselage and stabilizer but wings with differently treated covering material and if I find the time I'll do some research and let you know.

Well , that's all. I'm looking forward to the the next edition of Indoor News !

Yours





3. Offenburger Faalflugwettbewerb, Ergebnisse:

FID-X (FID-Beginner)

Erwachsene:	1.	2.	3.	4.	5.	6.	Gesamt
1. Bundesen, Uwe	8:22	9:59	9:00	10:29	10:30	9:32	20:59
2. Ondraczek, Günther	9:00	-	9:21	10:07	10:30	9:26	20:37
3. Schlosser, Benno	9:52	9:48	9:20	9:43	10:00	9:38	19:52
4. Keller, Peter	9:20	10:03	7:43	9:22	5:30	9:41	19:44
5. Pham, Duy-Thanh	8:19	8:25	8:35	8:47	9:33	9:03	18:36
Jugendliche:							
1. Ruppert, Roger	9:46	9:12	9:02	9:09	8:46	9:11	18:58
2. Tschallener,Alex	7:12	7:07	7:56	7:56	7:23	9:33	17:29
3. Merkt, Thomas	7:13	-	6:50	-	7:26	⊥	14:39
4. Reichert, Simon	5:08	6:45	5:09	6:32	5:50	5:28	13:18
5. König, Peter	5:22	6:12	4:12	-	5:50	6:11	12:23
6. Durke, Jürgen	5:40	5:15	5:13	3:59	3:43	5:56	11:36
7. Keßler, Dominik	3:11	2:21	-	-	2:54	3:06	6:16

TH-O (Nur Jugendliche)

1. Bundesen, Endru	-	-	4:16	4:46	4:28	4:11	9:14
2. Eisleben, Falk	3:49	3:27	4:04	4:14	3:44	4:24	8:38
3. Schrimpf, Florian	3:26	3:40	3:24	3:58	3:07	4:00	7:58
4. Keßler, Dominik	3:26	3:27	3:16	3:32	3:41	4:02	7:43
5.Krans, Martin	2 :59	2:42	3:23	3:44	3:18	1:15	7:07
6. Doll, Andreas	3:30	3:30	3:23	3:10	3:30	2:58	7:00
7. Durke, Jürgen	2:48	3:01	3:28	3:32	2:53	2:27	6:58
8. Csiko, Sandor	2:19	-	3:20	3:16	3:03	3:05	6:36
9. Klingbeil, Ralf	2:43	-	3:00	2:33	1:36	2:53	5:53
1o. Hummel, Matthias	2:15	-	2:33	1:46	1:09	1:28	4:38
11. Reichert, Simon	2:00	1:55	1:50	-	-	-	3:59
12. Hummel, Tobias	-	-	-	2:16	-	-	2:16

TH

Erwachsene:							
1. Bundesen, Uwe	1o:14	10:24	-	-	-	-	20:38
2. Ondraczek, Günther	8:05	8:50	7:55	-	-	-	16:55
3. Gerlach, Wolfgang		-	4:59	4:22	6:40	6:28	13.08
4. Reutlinger, Egon	3:19	-	4:52	-	5:08	5:23	10:31
Jungendliche:							
1. Mc Keverne, Michael	8:09	-	7:07	8:1 3	-	-	16:22
2. Merkt, Thomas	-	-	4:20	4:07	5:1 6	-	9:36

"FLEMALLE 1989" se déroulera les 25, 26 & 27 Août 1989.

F 1 D - MICRO FILM

PL	NOM	PAYS	VOLS						TOTAUX
						3 COMP.			
1	NIMPSCH Werner	RFA	1260	1224	1486	1490			2976
2	KLINK A.	RFA	906	820	1156	1356	1439		2795
3	VANHAEREN J.P.	BELG	301		500	277			801

F 1 D "BEGINNER"

PL	NOM	PAYS	VOLS						TOTAUX
						10 COMP.			
1	NIMPSCH Werner	RFA	591	620	585	606	661		1281
2	SCHLOSSER Benno	RFA	529	609	387	585	604	520	1213
3	LUXENBORGER J.	RFA	545	397	494	556	575		1131

F 1 D "BEGINNER" JUNIOR

PL	NOM	PAYS	VOLS					TOTAUX
1	MERKT Thomas	RFA	382	353	438	457	516	973

E.Z.B. "JUNIOR"

PL	NOM	PAYS	VOLS						TOTAUX
1	PROOST Erik	Belg	460	513	549	492	500		1062
2	HANRIOT Christophe	F	345	390	319	390	470	284	860

MICRO 35

PL	NOM	PAYS	VOLS						TOTAUX
						6 COMP.			
1	NIMPSCH Werner	RFA	767	752		883			1650
2	KLINK A.	RFA	143	175	142	529	554	625	1179
3	DELCROIX Jacques	FR	174	533	494	505	430	576	1109

E.Z.B.

PL	NOM	PAYS	VOLS						TOTAUX
						8 COMP.			
1	SCHLOSSER Benno	RFA	703	720					1423
2	WEIL Jurgen	RFA	673	670	522	590			1343
3	PROOST Joseph	BELG	480	568	527	551	538	320	1119

CACAHUETES DUREE - SENIOR PEANUTS 34 COMP.

PL	NOM	PAYS	TYPE APPAREIL	STAT.	VOLS				
1	DELCROIX Jacques	FR	LACEY M10	416,5	99	110	107	112	102
2	WEIL Jurgen	RFA	CLOUDBUSTER	456,5	87	80	90	97	89
3	ALFERY Antonin	CZ	Heinkel He.70G	496,5	61	86	86	68	72
4	KOUTNY Lubomir	CS	KALININ K-5	381,5	90	93	96	88	106
5	DELCROIX Jacques	FR	TREMPIK	424,0	90	83	88	83	79
6	ALFERY Antonin	CZ	Farman F.450	470,0	80	63	78	60	77
7	WEIL Jurgen	RFA	SKY RIDER	469,5	71	68	71	66	65
8	GLOCKNER Siegfrie	RFA	VOLKSPLANE	336,0	94	91	42	62	91
9	FRAIKIN Henri	Belg	POTTIER 100 TS	320,0	75	94	94	92	93
10	DELCROIX Jacques	FR	POTTIER 180	361,0	61	89	83	76	84

SAINTE FORMULE (+de2gr) SENIOR

PL	NOM	PAYS	VOLS					
						10 COMP.		
1	FRAIKIN Henri	Belg	245	251	256	239	241	
2	KOUTNY Lubomir	CS	237	222	233	250	175	
3	SCHLOSSER Benno	RFA	189	219	243	235	175	

PISTACHIO 16 COMP.

PL	NOM	PAYS	TYPE APPAREIL	STAT.	VOLS				
1	WEIL Jurgen	RFA	CLOUDBUSTER	460,0	47	55	58	57	59
2	ALFERY Antonin	CZ	Spitfire FR Mk.XI	468,5	53	21	52	56	51
3	ALFERY Antonin	CZ	DRZEWIECKI	421,5	58	40	47	43	49
4	DELCROIX Jacques	FR	POTTIER 100 TS	434,5	48	48	28	31	40
5	ALFERY Antonin	CZ	Waterman Gosling	428,5	39	43	30		
6	HANNAN Bill	USA	SR 7B	501,5	12	10	13	17	15
7	KOUTNY Lubomir	CS	GUILLEBAUD TANDEM	302,0	48	25	48	41	43
8	SABEL Benno	RFA	WINDHAM 1909	281,0	12	44	19	40	44
9	UCHIDA Shoichi	JAP	LACEY M 10	282,5	44	39	43	35	
10	ORSINI Pascal	F	FARMAN MOUSTIQUE	470,5					

Flemalle 1988

Vom 26.-28.08.1988 wurde zum 12.Male in der Sporthalle von Flemalle (Belgien) um die Pokale in 8 Saalflugklassen gekämpft.
Die doch schon lange Tradition dieser Veranstaltung kann ihren Grund nicht in der für Saalflug nur bedingt geeigneten Halle haben. Es dürfte das "Drumherum" sein, daß jedes Jahr immer wieder die Saalflieger aus den angrenzenden Ländern in den Vorort von Lüttich lockt.
Der Innenraum der Halle gleicht eher einem Getreidespeicher. Nach oben immer enger werdend, bildet in 1o Meter Höhe eine nur wenige Meter breite verglaste Dachgaube den Abschluß. Nach unten hängende Lampen und div. Streben ergeben einen knapp 8 Meter hohen Raum ohne Hinder-nisse.
Die Unterbringung brachte keine Probleme. Ein Teil der Teilnehmer zeltete direkt neben der Halle, während andere in den schon bei der Anmeldung vorbestellten Hotelunterkünften übernachteten.
An den ersten beiden Tagen wurden die bei uns bekannten Saalflugklassen geflogen.
Nach einer kurzen Eingewöhnungszeit in die Besonderheiten der Halle ging das ganz gut, und ein Blick in die Ergebnislisten zeigt, daß die deutschen Teilnehmer sehr erfolgreich waren. In den Klassen F1D Mikrofilm und Mikro 35 (P1) gab es Doppelsiege, während in E.Z.B. und F1D Beginner jeweils die drei 1. aus Deutschland kamen. Meine mit 24:5o Min. in der Mikrofilmklasse erreichte Zeit bedeutete neuen Hallenrekord.

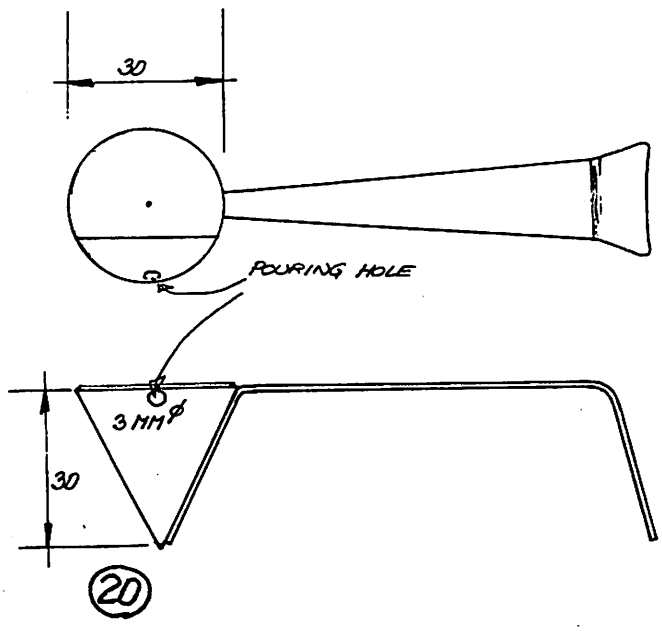
LEARN GERMAN, PLEASE!

Am Samstagabend gab es in der neben der Sporthalle gelegenen Cafeteria für diese Klassen die Siegerehrung, in der Frau van Hauwaert ihren ganzen Charme zeigte. Es gab eine sehr herzliche Ansprache und später für die Sieger Pokale und ein Küßchen.
Der Samstagnachmittag und der Sonntag sah dann die Teilnehmer in den bei uns offiziell kaum bekannten Klassen wie Sainte Formule, Cacahuetes und Pistachio am Start. Hier konnten unsere Teilnehmer nur gute Plätze belegen.
Wunderschön anzusehen waren die zwecks Bewertung der Bauausführung auf Tischen aufgebauten Modelle. Eigentlich waren sie zum Fliegenlassen viel zu schade. Daß sie das auch können zeigten sie später mit Flügen bis an die 4:oo Min.
Den Wettbewerb in diesen Klassen konnte ich nicht bis zum Ende verfolgen, da ich nach der Siegerehrung am Samstag die Heimfahrt antrat.
Sollte es im Jahr 1989 nicht wieder eine Terminüberschneidung wie in den letzten Jahren geben, dann wird mich der 13. Wettbewerb in Flemalle sicher wieder als Teilnehmer sehen.

WERNER NIMPTSCH

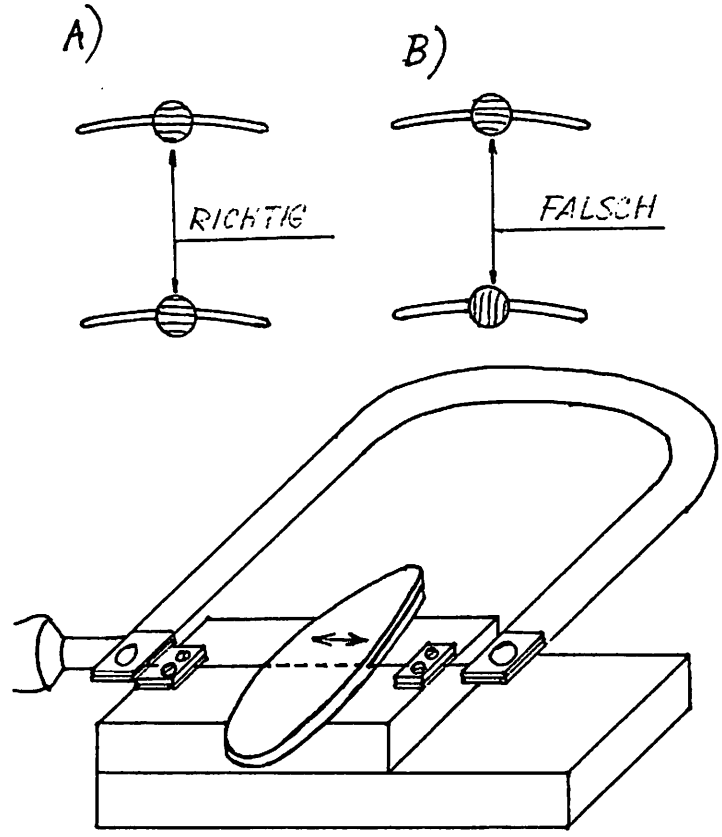
W. Nimptsch

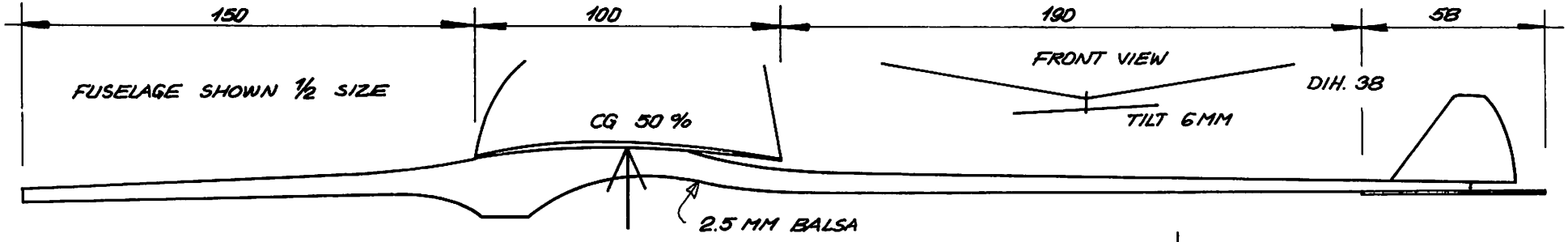
Bruno Waechter sent the nice microfilm pouring "spoon" ... not only the drawing but also a real one! It certainly works. Adjust size of hole to your own film solution - 2-3 mm.



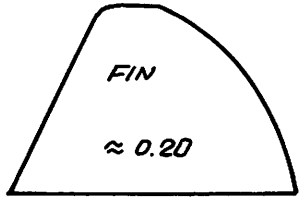
Uniform prop blades ..... By Bruno Waechter:

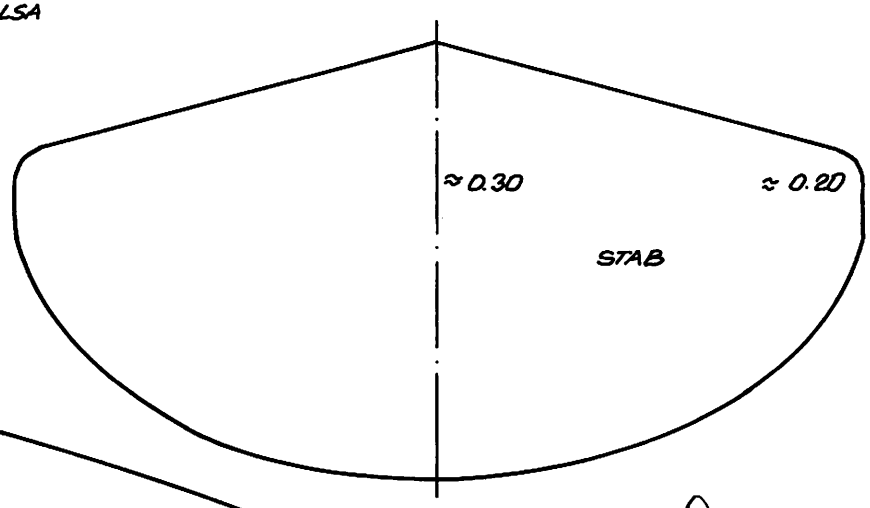
Cut your blades from 2.5-3 mm C-grain balsa as shown on the sketch. Now there is a lot of sanding but it is well worth it.
Also note that the annular rings have the same orientation in your prop spars.

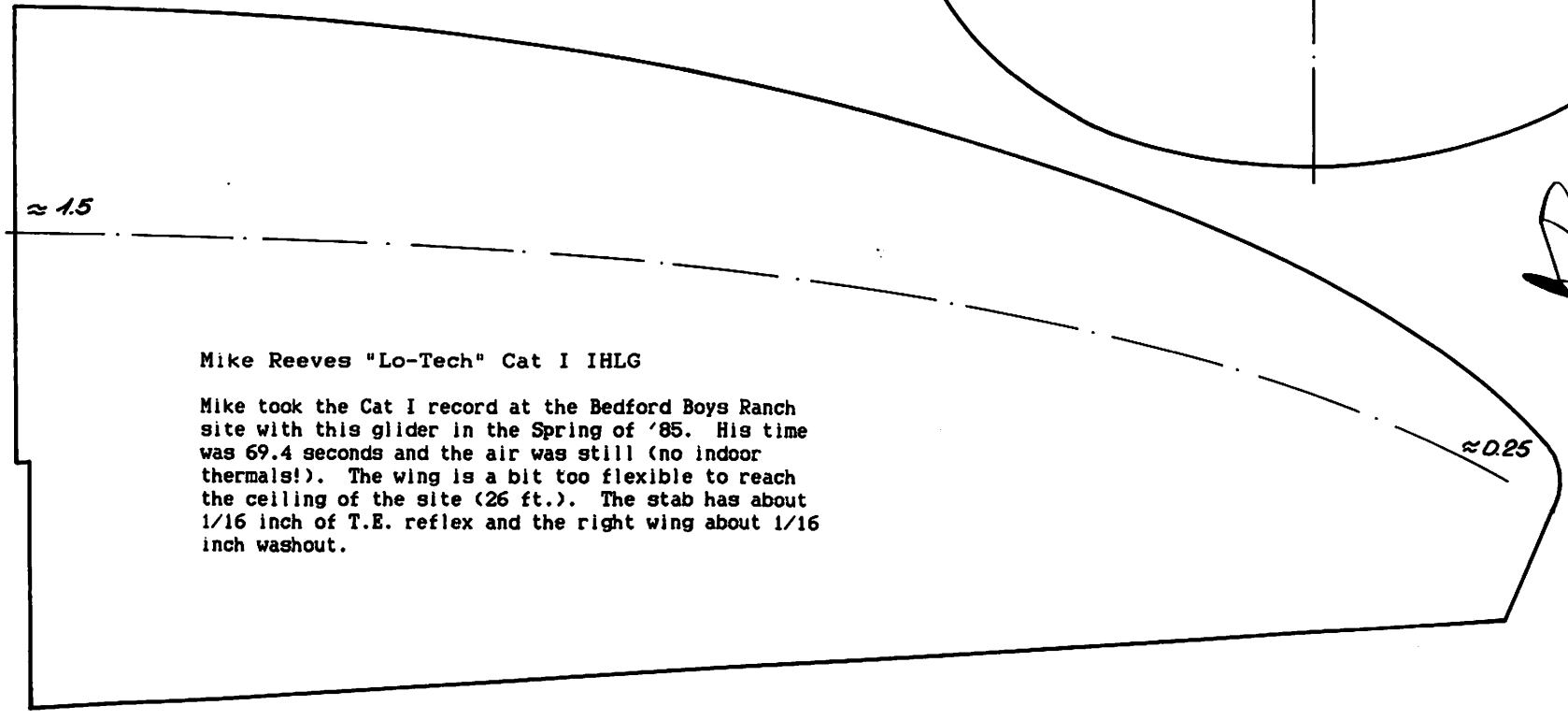


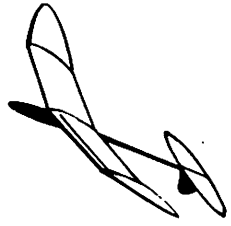


WEIGHT: ≈ 4 GRAMS





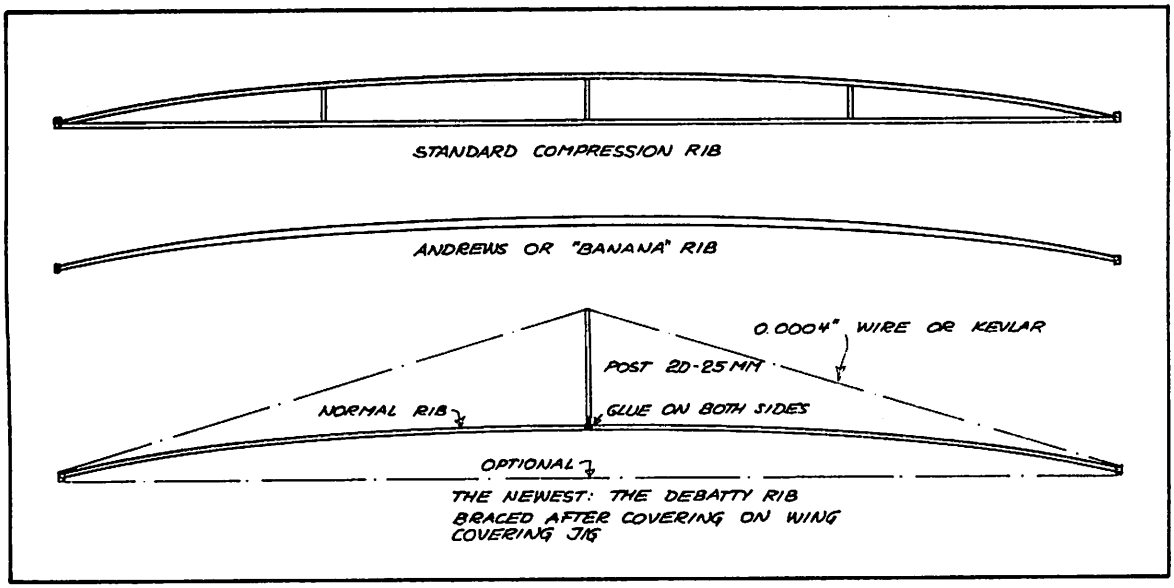






Mike Reeves "Lo-Tech" Cat I IHLG

Mike took the Cat I record at the Bedford Boys Ranch site with this glider in the Spring of '85. His time was 69.4 seconds and the air was still (no indoor thermals!). The wing is a bit too flexible to reach the ceiling of the site (26 ft.). The stab has about 1/16 inch of T.E. reflex and the right wing about 1/16 inch washout.



VIA BOYD FELSTEAD

Results from an Indoor contest in Helsinki Exhib.Center
Feb.20th,1988:

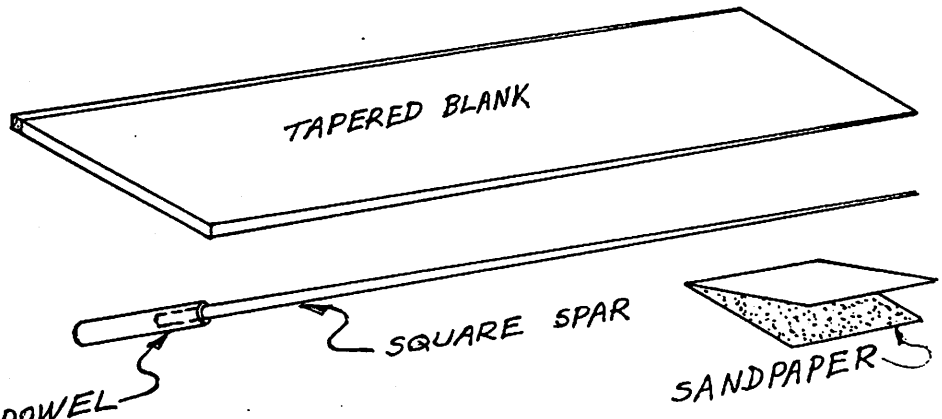
FID (65cm) 6 Ent.		Microf 35 cm 1 Ent		Penny-Plane 6 Ent.		Peanuts 11 Ent.	
1. L. Englund	50'42"	1. L. Englund	24'39"	1. T. Tynkkynen	18'46"	1. T.Tynkkynen	170
2.H. Erofejeff	47'17"			2. T. Linkosalo	16'26"	2. R. Posa	119
3.H.Raulio	45'49"			3. T. Sihvonen	15'30"	3. M. Grotenfelt	114

Dear Jorgen,

I certainly wish to continue my subscription to your newsletter. It supplies the most complete information about indoor activities. How you were able to start and maintain such an impressive news pool is beyond my comprehension. I will do my best to send whatever ideas I have. I notice that Boyd Felstead sent in the trapezoidal cabane idea.

I have a fabricating suggestion which occurred to me while I was reading Jerry Nolin's instructive article in "Model Aviation" which described his "Easy B". In showing his method for making tapered propeller spars, he obviously was trying to help builders who have a scarcity of tools by showing a method of rounding and tapering which used special guiding and sanding blocks. I tried his system to see how it would work and as he implies, quite a bit of care and a delicate touch get the job done.

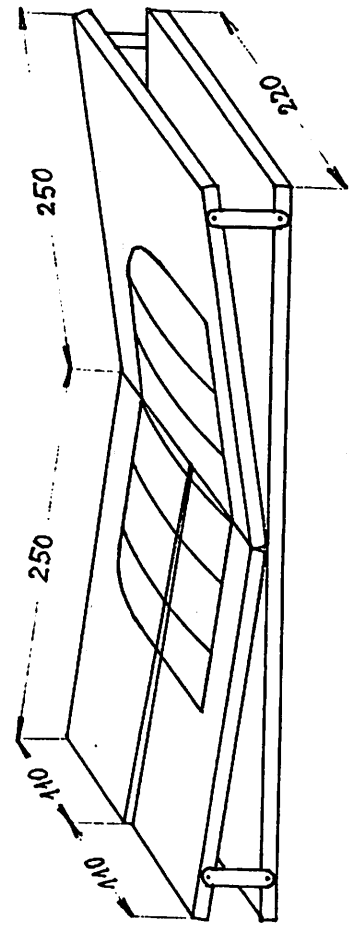
My own method is easier, but requires the use of either a motor mounted chuck (rotary vice) or a drill press. On the former, the finishing strokes are horizontal, on the latter, vertical. I start with a tapered sheet of 5-6 lb/ft³ wood, quarter grain preferred. I taper my own sheets by very careful, systematic sanding and have been able to control taper thickness dimensions to ±.001" (±.025 mm). Make the sheet 20% longer than the desired ½ spar length and taper it from slightly larger than the spar hub to slightly smaller than the spar tip. Using a steel straight edge and single edge razor blade, strip 2 spars so that their cross sections are square. Drill carefully centered suitably sized hole 5mm deep in the end of a piece of .6mm dia dowel, and cement the large end of the spar in the hole. Mount the dowel in the chuck and using a piece of folded sandpaper, very carefully sand the square to a round. A very accurate round taper will result. Then measure with a micrometer caliper to find the desired hub diameter and make a diagonal cut for a scarf splice with the other spar half. Cut tip off at desired spar length.



The spindle speed for sanding should be 1000 - 1500 RPM. Any faster will cause the thin spar to whip and perhaps break off.

Yours truly,

Jim Grant



Universal jig for EZB, TH, Pennyplanes and F1D-X
By Bruno Waechter. (D)

Maestro Jim Richmond:

Dear Jorgen,

Good to hear from you and good to hear that IN is still alive and kicking.

Yes, I did use the Nagoya set-up at Johnson City. The ceiling height was similar and that proved to be the best arrangement, although I was not at all certain about it when the competition began.

You see, I figured out it would take a pair of 42 min flights to win (which proved to be right!), but I had never done over 40 min at a site of this height and was unsure about the benefit of a variable prop here.

A new Cardington-style plane had been made which was really light, requiring balast to make one gram. I elected to use it the first day, but saw that I would have to do battle with the girders to exceed 40 min using an ordinary prop.

McGillivray showed us the way, using a variable pitch prop on his first flight which cleared 40 min. On day two I switched to the Nagoya set-up, but still wasn't sure of it after 3rd round flight of only 33:50. Adjusting for an earlier shift got the time up to 41:57 in the 4th round and I was feeling pretty good until Cezar uncorked his 44:59. An incredible achievement in this site.

Next day I managed a ceiling scroping 44:09 to pull into the lead, but Cezar only needed 41:08 to come back. Fortunately for me his tricky prop mechanism didn't repeat with another great performance.

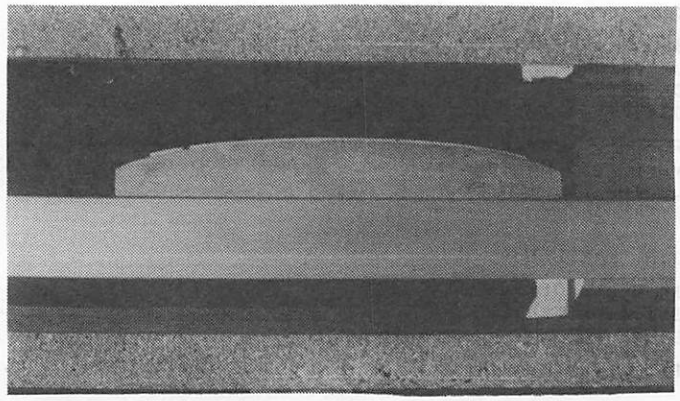
During the FID Open International held the following two days, I elected to use only a standard prop on the light Cardington-type plane to see how it could compare in performance with the VD prop plane at this ceiling height. I regard the two app. 40 min flights as optimum and believe a good side by side comparison was made, showing that variable props are superior at this altitude and perhaps up to 125 or 130 ft.

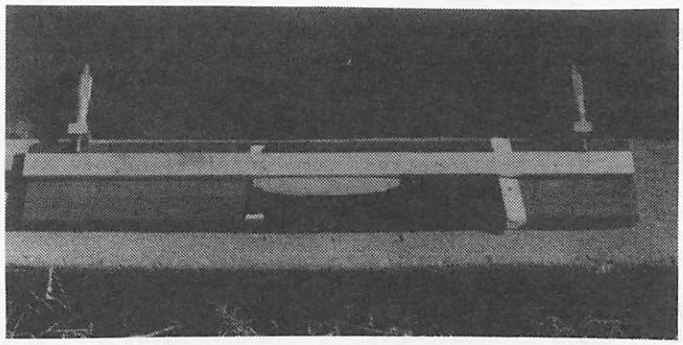
New designs?? Not yet, but maybe it is time to start thinking about the next generation. What do you think???

Equal rib thickness....

By Manny Radoff ... through Richard Ganslen?

Quite a number o people possess the Ray Harlan balsastripper which can be used for cutting ribs of equal thickness/dimensions when using a aluminum bar as guide for the rib template.
To save the redwood base use a piece of glass when cutting the ribs
See the photos.





MISTRZOSTWA POLSKI F1D '88 19-21.05
CHAMPIONSHIPS of POLAND F1D '88 WROCŁAW hala lotnicza

Juniors	aeroclub			
1. KRZYSZTOF MIELNICKI	bydgoski	27:25	28:46	56:11
2. MAREK NAWROCKI	śląski	29:36	23:59	53:35
3. RAFAŁ SKRUTERA	bydgoski	23:35	20:18	43:53
4. ANDRZEJ MAKOWSKI	— " —	19:08	22:19	41:27
5. PIOTR BLASZEWICZ	— " —	16:20	21:20	37:40
6. ROBERT WOLDAŃSKI	poznański	17:31	19:31	37:02

Seniors				
1. SYLWESTER KUJAWA	poznański	32:39	33:50	66:29
2. EDWARD CZAPLA	śląski	30:58	30:02	61:00
3. WŁODZIMIERZ PAWLIK	bydgoski	26:43	32:10	58:53
4. MAREK ANIOŁA	poznański	29:33	29:16	58:49
5. MAREK GRZĄBKA	— " —	28:03	26:36	54:39
6. PAWEŁ FRĄCKIEWICZ	wrocławski	27:00	24:20	51:20
7. ZBIGNIEW SZYMAŃSKI	— " —	21:40	26:45	48:25
8. JAN DĘHM	krakowski	25:35	22:01	47:36
9. RYSZARD CZECHOWSKI	— " —	23:07	22:56	46:03
10. JAROSŁAW SIERKO	bydgoski	25:41	17:22	43:03
11. RYSZARD MAJEWSKI	— " —	22:17	17:50	40:07
12. RAFAŁ COLTA	— " —	18:36	18:50	37:26

MISTRZOSTWA KRAJÓW DEMOKRACJI LUDOWEJ F1D
CHAMPIONSHIPS COUNTRY PEOPLE'S DEMOCRACY FAI 1988
WROCŁAW • POLAND 19+21.05.

1. AUREL ROBA	ROM.	35:04	36:34	70:45
2. SYLWESTER KUJAWA	POL. I	32:39	33:50	66:29
3. NECU BERMAN	ROM.	31:40	34:47	66:27
4. EDWARD CZAPLA	POL. I	30:58	30:02	61:00
5. WALERY DWINSKICH	USR.	29:00	29:09	58:09
6. ALEKSANDR ROMASZEW	USR.	26:43	28:49	55:32
7. CORNELIU MANGALEA	ROM.	29:22	25:23	54:45
8. LEOPOLD WALEK	TCH.	24:40	29:20	54:00
9. MAREK NAWROCKI	POL. II	29:36	23:59	53:35
10. KAREL BRANDEJS	TCH.	29:05	22:15	51:20
11. ZBIGNIEW SZYMAŃSKI	POL. II	21:40	26:45	48:25
12. JAN DĘHM	POL. II	25:35	22:01	47:36
13. RYSZARD CZECHOWSKI	POL. I	23:07	22:56	46:07
14. JAROSLAV JIRASKO	TCH.	25:00	19:26	44:26
15. JOSEF ZGORELSKI	USR.	19:41	23:34	43:15

TEAM RESULTS :				
1. ROMANIA	70:45	66:27	54:45	191:57
2. POLAND I	66:29	61:00	46:07	173:36
3. USSR	58:09	55:32	43:15	156:56
4. CSSR	54:00	51:20	44:26	149:46
5. POLAND II	53:35	48:25	47:36	149:36

FOR INDOOR NEWS: ENGLISH BY JERZY KUREK, MODEL CLUB BOLE, WROCŁAW, POLAND 1988

PEANUT SCALE. YOUNG.

			EXECUTION			TOTAL
1. JERZY KUREK	MDK WROCŁAW	BELLANCA	60	04.3	04.4	68.7
2. DARIUSZ NAŚLADEK	CECHY KĄCIK WW	BOŻENA	40	06.0	08.0	54.0

2 COMPETITORS

PEANUT SCALE. JUNIORS & SENIORS.

1. SYLWESTER KUJAWA	POZNAŃ	SOLAR CHALLENGER	98	88	87	273
2. SYLWESTER KUJAWA	"	CANARD	70	82	85	237
3. MIROSŁAW STACHOWSKI	CECHY KĄCIK WW	WEGA 1	45	73	93	210
4. JAN CHMAN	OLD BOY WW	PIPER CUB	80	63	60	203
5. JAN GŁOWACKI	POZNAŃ	CANARD	65	45	67	177
6. JERZY MAGNUSZEWSKI	"	PIPER CUB	55	51	60	166
7. SYLWESTER KUJAWA	"	CLARGET 1903	100	37	23	160
8. JAN GŁOWACKI	"	PIPER CUB	75	25	0	100
9. PIOTR RACHOCKI	OLD BOY WW	ZIPPY SPORT	96	0	0	96
10. MIROSŁAW STACHOWSKI	CECHY KĄCIK WW	GABRIEL	90	0	0	90
11. ZBIGNIEW WIDOWICKOWSKI	AWR OŚRODEK	WATERMAN GOBLIN	85	0	0	85

11 COMPETETORS

WAKE. RETRO 1:2. OPEN.

1. STANISŁAW ZURAD	—	ZS 52	—	02:10	02:05	04:15
2. STANISŁAW ZURAD	—	ZS 53	—	02:04.5	01:46	03:50.5
3. PAWEŁ FRĄCKIEWICZ	OLD BOY WW	FELLON	—	01:43	00:46	02:28

CO_2. FLYING SCALE. OPEN.

1. LECH KOWALSKI	MIELEC	MESSENGER	—	00:32	00:31.5	01:03.5

F1D. 150. OPEN.

1. KRZYSZTOF SUCHAR	OLD BOY WW	02:42	02:26	05:08	

SHIG. YOUNG.

1. JERZY KUREK	MDK WROCŁAW	34.2	39.3	73.5	
2. TOMASZ NOWAK	KOZLE	32.2	35.4	67.6	
3. TOMASZ ZYGADŁO	MDK WROCŁAW	31.0	19.8	50.8	
4. PIOTR ZYGADŁO	SP15 WROCŁAW	23.3	20.3	43.6	
5. ROBERT MOKROWIECKI	SP15 WROCŁAW	21.3	20.5	41.8	

23 COMPETETORS

SHIG. JUNIORS & SENIORS.

1. DARIUSZ STEFAŁSKI	OLD BOY WW	47.0	52.0	99.0
2. JAROSŁAW MAKUCH	OLD BOY WW	48.0	43.2	91.2
3. KRZYSZTOF GĘSTEROWICZ	OLD BOY WW	43.0	44.0	87.0
4. JACEK SIERPOWICZ	OLD BOY WW	42.3	41.0	83.3
5. WOJCIECH KRAJNER	AWR OŚRODEK	42.6	18.0	60.6

10 COMPETETORS

F1D. 450. YOUNG.

1. JERZY KUREK	MDK WROCŁAW	06:36	06:36	13:12
2. PIOTR NALEWAJKO	CECHY KĄCIK WW	04:41	04:50	09:31
3. BOLESŁAW ZAGÓRSKI	CECHY KĄCIK WW	01:17.3	02:51	04:08.3

6 COMPETETORS

F1D. 450. JUNIORS & SENIORS.

1. RYSZARD CZECHOWSKI	KRAKÓW	10:09	09:03	19:12
2. JAN DĘHM	WADOWICE	07:05	07:01	14:06
3. MAREK DRZEWIECKI	CZĘSTOCHOWA	06:16	07:15	13:31

7 COMPETETORS

ERB. YOUNG.

1. JERZY KUREK	MDK WROCŁAW	07:12	06:12	13:24

1 COMPETITOR

ERB. JUNIORS & SENIORS.

1. JAN DĘHM	WADOWICE	11:31	12:04	23:35
2. PAWEŁ FRĄCKIEWICZ	OLD BOY WW	10:20	10:16	20:36
3. RYSZARD CZECHOWSKI	KRAKÓW	08:30	09:45	18:15

5 COMPETETORS

Do you have a need for some modelling materials, try these:

THE MODEL BOX

12 Cook Street
Rowayton
CT 06853
USA

Composites, glues,covering materials etc.

Champion Model Products

880 Carmen Court
La Verne
CA 91750
USA

Rubber, rubber, jap. tissue etc. Has a lot of very good Chinese rubber - Panda Rubber - especially useful for indoor.

J.H. MAXWELL

14 Upper Craigs
Stirling FK8 2DG
Scotland

Prop jigs and form blocks, balsa for EZB props etc.

Mace Model Aircraft Co.

359 South 119th East Avenue
Tulsa
Oklahoma 74128
USA

Plans, kits and supplies. Some interesting new kits for newcomers

JIM JONES

36631 Ledgestone Drive
Mt. Clemens
MI 48043
USA

Adjustable balsa stripper, torquemeters, Boron etc.

MICRO-X-PRODUCTS INC

Box 1063
Lorain
Ohio 44055
USA

Has everything for the indoor modeller .....

PECKS-POLYMERS

P.O. Box 2498
La Mesa
CA. 92041

Everything for the scale modeller and other supps.

RAY HARLAN

15 Happy Hollow RD
Wayland
Mass. 01778
USA

Sells Micrometer balsa stripper, rubber stripper, indoor beam scales, pigtail thrust bearings etc. Tailboom forms, thin mylar.

SMALL PARTS INC.

P.O. Box 381736
Miami 33238
USA.

Teflon tubings, teflon sheets, stainless steel wire,

INDOOR MODEL SUPPLY

1887 West Haven, N.W.
Salem
Oregon 97304
USA

Everything for the indoor enthusiast

FAI Model Supply

P.O. Box 3957
Torrance
CA. 90510
USA

Rubber kits, outdoor equipment, and rubber, rubber

Leif Englund, Finland

After participating in the W/Ch in Johnson City Leif now thinks the time is ready for changing the F1D rules. He would like to see a ban on variable propellers as they are very difficult to make and fly with. He is also tempted to suggest no weight limits on the model and the rubber, but then reducing wing span to say 50 cm.

What do you think?

Questions: (by Manny Radoff)

1. Would it be just as good to use the .0005 or .0015 tungsten wire on top of my hollow motor stick instead of boron as the top is under tension and not compression??

2. Does the height of the wing posts affect flying characteristics of our F1D's?

3. What is the best way to get most turns into a rubber motor?

4. What ingredients make the best rubber lube?

5. What ingredients should be part of a microfilm solution to stop it from flaming up when trimming with a hot wire?

6. What is yout best microfilm solution?

7. What is the reason for using arc or elliptical airfoils instead of the McBride or Simplex?

8. What is better for wing spars? larger sizes of lower density or smaller sizes of higher density balsa?

WANTED

DRAWINGS F1D
F1D-Beginner, F1D-X
Pennyplanes
EZB
Peanuts
Chuckgliders
Beginner models

Pencil dwgs/sketches will be OK as the editor will do the inking .... remember as many details, dimensions, wood sizes/densities as possible .... THANKS

BUILDING AND INSTRUCTION articles/sketches

RUBBER TESTS

TESTS on new materials/unusual materials

PICTURES sharp and contrasting (you will get them back again)

COMPETITION reports/results

Events for the calender

Model THEORY

AERODYNAMICS

STRUCTURE ANALYSIS

LETTERS/IDEAS/CRITICS

By CONTRIBUTING YOU will help our beautiful common sport and hobby.....!