Indoor News



Issue 42 May 1997

DIARY

28 May- 1 June Johnson City USA	**United States Indoor Championships,** All classes. Contact: 5432 Haft Rd., Cincinnati, OH 45247, U.S.A..
21-22 June St Denis en Val France	**15th Orleans Indoor**, F1D, F1D Beginner, F1L. Contact: J. Delcroix, 41 Allee du Coudray, 45160 Olivet, France, tel +33 23863 4957.
7-10 Aug Strépy- Bracquegnies Belgium	**Indoor International,** All classes. Contact: J.M. Melice, rue Bernier 36, 4200 Maurage, Belgium, tel +32 6467 5742.
14-15 Aug Nagoya Japan	**Nagoya Nuts '97,** Peanut, Pistachio. Proxy entries are welcome. Contact: Kazuhiro Suzuki, 4-94 Kashihara-Cho Kasugai, Aichi 486, Japan.
29-31 Aug Maastricht Netherlands	**Interscale 1997,** F4D, F4E, F4F, Pistachio. Contact: H.F.J. van Leeuwen, Papsouwselaan 180, 2624EE Delft, The Netherlands, tel/fax +31 15 2610972.
30 Sept- 5 Oct Slanic Romania	**European F1D Indoor Championships 1997**. Contact: Federatia Romana de Modelism, Str Vasile Conta no. 2, sector 2, 70139 Bucharest, Romania, tel +40 1211 0160, fax +40 1210 0161.
6-7 Oct Slanic Romania	**Euroindoor F1D.** Contact: see above

POSTAL/PROXY EVENTS

14-15 Aug Nagoya Japan	**Nagoya Nuts '97,** Peanut, Pistachio. Proxy entries are welcome. Contact: see diary.
7-10 Aug Belgium	**Indoor International,** Pistachio Proxy, Contact: see above.

1998 Indoor World Championships

The 1998 Indoor World Championships will be held in Nagoya in Japan during October. The site is the same one used for the 1984 World Championships.

1st Indoor International

Last year it was announced that the yearly Indoor International competition of Liège-Flémalle (Belgium) would become a two year event. Another club has stepped into the void and will organise a competition to the same four-day format in another place: Salle Omnisports, Rue des Canadiens, 83, 7110 Strépy-Bracquegnies, Belgium. The size of the hall is 50 x 30 m, height 9 m.

There will be competitions in the following categories: F1D-Microfilm, F1D-Beginner, F1L(EZB), Micro 35, Sainte Formule, Pistachio (proxy entries allowed), F4F Peanut, F4D Scale Rubber, F4E Scale CO_2/Electric. Information contact: see Diary. Program:

Thursday:	09.00 - 10.00	Training
	10.30 - 12.45	F1L, Micro 35
	13.00 - 14.45	F1D Beginner
	15.00 - 16.30	F1D
	17.00 - 18.30	Ste Formule
Friday:	09.00 - 10.45	F1D-Beginner
	11.00 - 12.20	Ste Formule
	12.30 - 14.45	F1L, Micro 35
	15.00 - 16.15	F1D Beginner
	16.30 - 18.30	F1D
Saturday:	09.00 - 10.50	Ste Formule
	11.00 - 12.30	F1D
	13.00 - 16.20	F4F, Pistachio
	16.30 - 18.00	F1L, Micro 35
Sunday:	09.00 - 10.00	Training
	10.00 - 16.00	F4E, F4D, F4F, Pistachio
	16.00 - 18.00	RC Indoor
	18.00 - 19.00	Fun Fly
	19.00	Results

COLOPHON

Indoor News is published at least four times a year and covers all types of indoor models, from peanuts to microfilm. Texts can be sent in Dutch, English, German and French. Please type your texts on 12,5 cm width. Texts can be sent on floppy disk (3½ or 5¼) in any text format. I can make drawings, if you are no draftsman.

Payment of subscriptions is preferred per eight issues. When paying by Eurocheque, International Postal Money Order or with bank notes no additional bank fees are required. Please add NLG 6,50 for bank fees when paying by Eurogiro or NLG 20,00 with foreign checks. The Eurogiro account number is 4406860.

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Contests in Cardington (GBR)

The provisional program of indoor meetings to be held at Cardington is as follows:

April 13	Limited Penny Plane and Index
April 27	EZB and Index
May 4	Living Room Stick and Index
May 18	EZB and Index
June 15	Limited Penny Plane and Index
June 29	EZB and Index
July 13	Nocal (profile scale) and Index
July 27	Limited Penny Plane and Index
Aug 11	EZB and Index
Aug 23	Nats - Practice Day
Aug 24	Nats - EZB and Limited Penny Plane Index (over 2 days)
Aug 25	Nats - F1D and LRS (1st Team Trials)
Sept 7	F1D and Index (2nd Team Trials)
Sept 21	EZB and Index (reserve day for Team Trials)

There will be BMFA plaques/certificates for nominated and Index events and trophies for Nats events. EZB events will be run to 1.2g F1L rules. All EZB and Limited Penny Plane events (except Nats) will be handicapped with a simple time penalty based on the flyer's previous best time (like golf!).

For those that are new to Cardington, it is situated on the A600 about 3 miles south of Bedford (drive in through the gate next to the field, go between the hangars and turn left to reach the vehicle entrance to No.1 Hangar). We close the big door at 11am so if you want to park in the Hangar get there before then.

No.1 Hangar is huge (1000 feet long, 300 feet wide and 150 feet high (300 x 90 x 50 m)) so there is plenty of room for everyone to fly and fun fliers are most welcome. Do remember to ring Laurie Barr (tel 01628 487544) on the Fri or Sat before a meeting to confirm the meeting is on (on rare occasions we have to cancel because of operations in the Hanger). As well as the above program, fun flyers are welcome if care is taken, but no power models please!

Indoor Records

From Ian Kaynes' report of the CIAM Plenary Meeting: The UK proposed new indoor record categories for EZB (F1L) and indoor HLG. The F1L proposal was accepted unanimously, but there were problems with assimilating the IHLG rules into FAI standards. Rather than place it under records only, it was considered better to define the class in new provisional rules which could then be referenced in the record section. The supplied class definition was in conflict with some basic FAI definitions and will be refined by the FFSC for resubmission next year.

Note from T.A.: this proposal raises the question why the F1D Beginner class is neglected. This also is an FAI recognised class, for many more years than F1L. I hope there will be reactions from the readers to this subject. Several rules-related subjects have been raised in past issues of Indoor News (records, F1D rules), but there were hardly any comments from the readers. Do indoor fliers really care about the rules to which they fly or do they prefer to be surprised by CIAM decisions? It would be so much better if we could publicly discuss rules proposals before they are accepted by the CIAM.

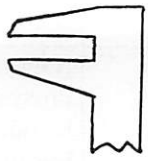
Once again Ruesch International

Just at the time I announced that U.S. readers could pay their subscriptions cheaply through Ruesch International they discontinued their account with my bank, the ING Bank. This means that there is no cheap way anymore to pay your subscription by cheque. I am sorry for this situation, but I can't help it. So when you pay by cheque (other than Eurocheque) please add $10.00 for bank fees.

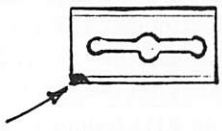
Tip

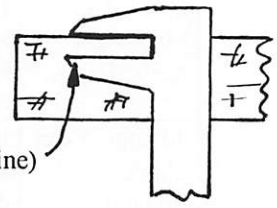
From Mark Forster, AUS: You can use a razor blade and a felt tip marker to accurately indicate the thickness of a spar on the wood to be cut. The method works as follows:

1. Set thickness for spar

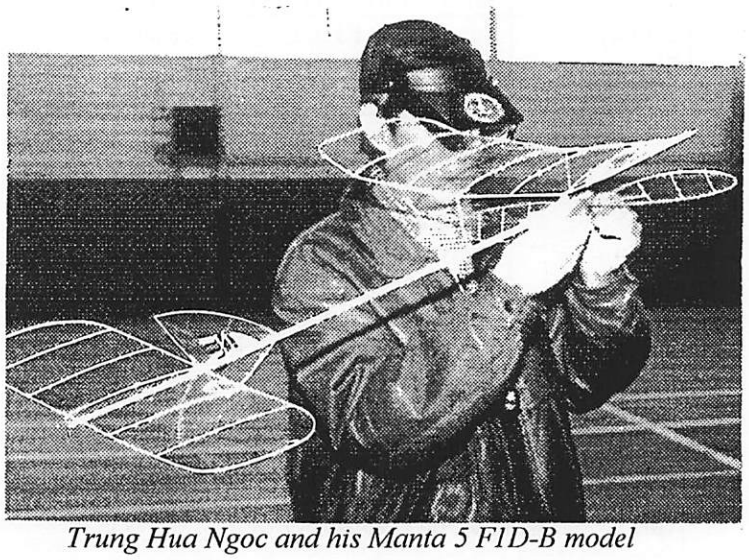


2. Mark razor with felt tip pen

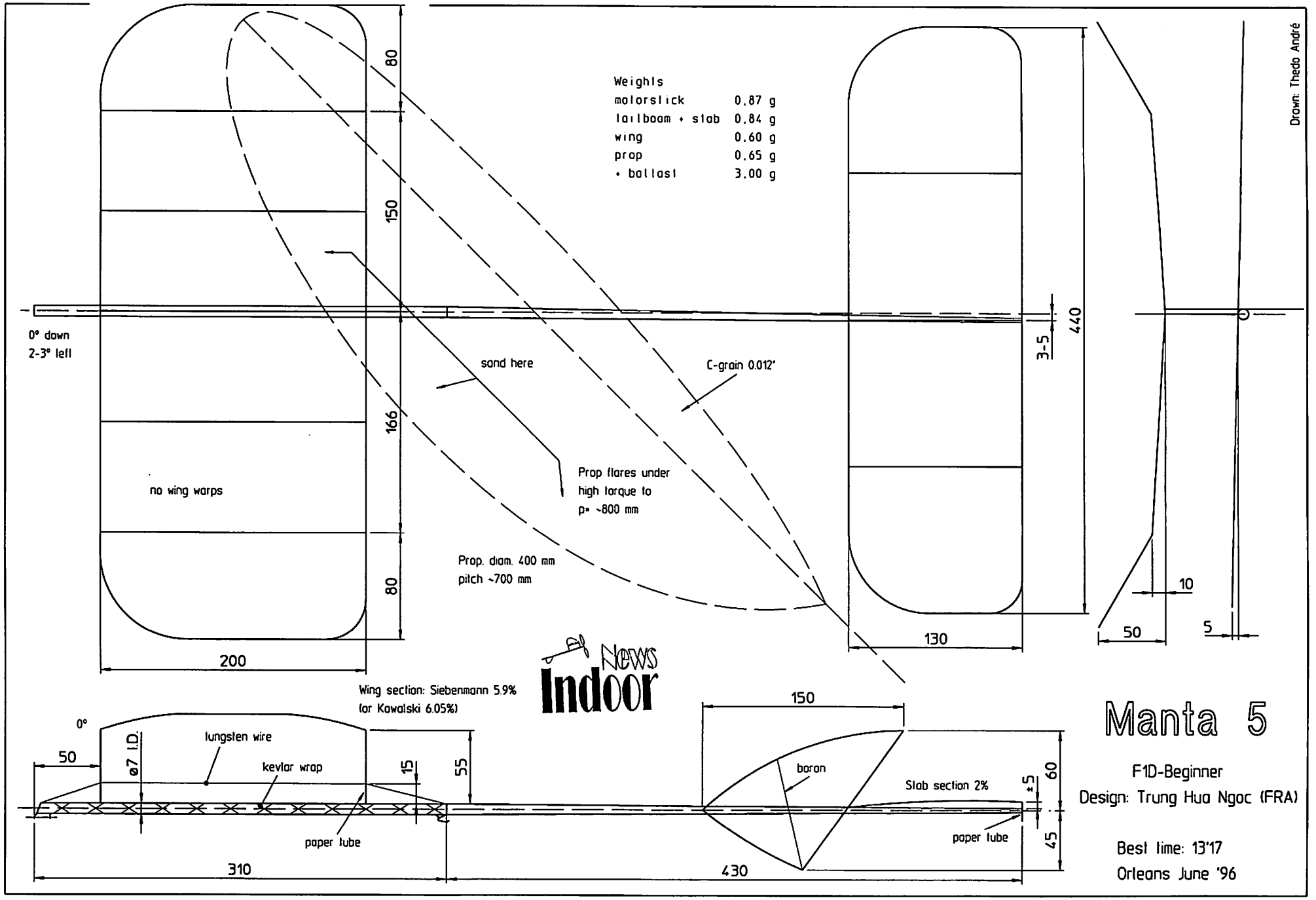




3. Using razor mark here (leaves fine line)



Trung Hua Ngoc and his Manta 5 F1D-B model


Weights
motorstick 0.87 g
tailboom + stab 0.84 g
wing 0.60 g
prop 0.65 g
+ ballast 3.00 g
80
150
166
80
200
0° down
2-3° left
sand here
C-grain 0.012"
Prop flares under
high torque to
p= ~800 mm
no wing warps
Prop. diam. 400 mm
pitch ~700 mm
3-5
440
130
10
50
5
Drawn: Thedo André
Wing section: Siebenmann 5.9%
(or Kowalski 6.05%)
News
Indoor
0°
50
ø7 I.D.
tungsten wire
kevlar wrap
15
55
paper tube
310
150
boron
Slab section 2%
±5
60
45
paper tube
430
Manta 5
F1D-Beginner
Design: Trung Hua Ngoc (FRA)
Best time: 13'17
Orleans June '96

Flight pattern of duration models

by David Lentink (NED)

A question that has bothered me for some time is the following: why have rubber powered indoor models to climb to as much height as possible in order to achieve the longest duration of flight? I haven't seen this question raised before, which is a bit strange because, when you think about it, climbing is inefficient when you are after a long flight duration. Consider the following reasoning:

- suppose you let your model climb, result: potential energy is converted into height, in itself a form of potential energy;
- after cruising the model starts to descend and regains it's potential energy, but because of the laws of physics this cannot happen at a 100% rate of efficiency. Thus the climb has cost an extra amount of energy (actually no energy was lost, but was converted into heat).

This (maybe too simple) reasoning shows that it is not so self-evident that indoor models can fly longer when the hall is higher. I have had several discussions with other flyers about what would be the optimum flight pattern of my VD equipped F1D-Beginner model. I was advised to adjust the prop such that the model would climb twice and descend twice. For the abovementioned reasons this did not seem logical to me. I decided to do some more investigation and in the following article I will try to explain why I ***think*** that it is good to fly in a relatively high hall (and climb to relatively great height). For explanation of the symbols which I use see the end of the article.

Theory

I mainly want to outline the general approach to the problem and therefore present only a simplified derivation of the formula and theory.

Study figure 1. Suppose our subject is an F1D-Beginner model. Figure 1 shows the characteristics of it's rubber motor (1,5 gram acc. to the rules). The energy in the rubber is as follows:

$$(1)\quad U_{rub} = \int_0^{N_{max}} 2\pi \cdot Q \cdot dN$$

This formula shows that the area under the curve is a measure of the available potential energy in the rubber. Actually this area multiplied by 2π equals the amount of potential energy in the rubber. The graph also shows that during unwinding the rubber motor returns less energy than was put into it during winding. This loss is caused by hysteresis.

The useful amount of energy that remains is converted by the propeller into a pulling force which propels the model through the air. For a good flight with a F1D-B model in a low ceiling hall (10 m height) the cruise torque ($\mathbf{Q}_{cruise}$) has to be at about the indicated point in figure 1. The maximum torque ($\mathbf{Q}_{max}$) could easily be five times as high as the cruise torque, that's where the problem is..... We want to make efficient use of all the available energy in order to obtain the longest possible flight. Therefore we want to keep the average required power ($\mathbf{P}_{ave}$) as low as possible (at a given optimum rubber mass = given energy):

$$(2)\quad P_{ave} = \frac{U_{given}}{Flightduration}$$

Therefore we must try to minimize the power consumed by the propeller. The propeller RPM increases with the torque (**Q**). The power consumed by the propeller is:

$$(3)\quad P_{consumed} = M \cdot \omega = M \cdot \frac{rpm}{60} \cdot 2\pi$$

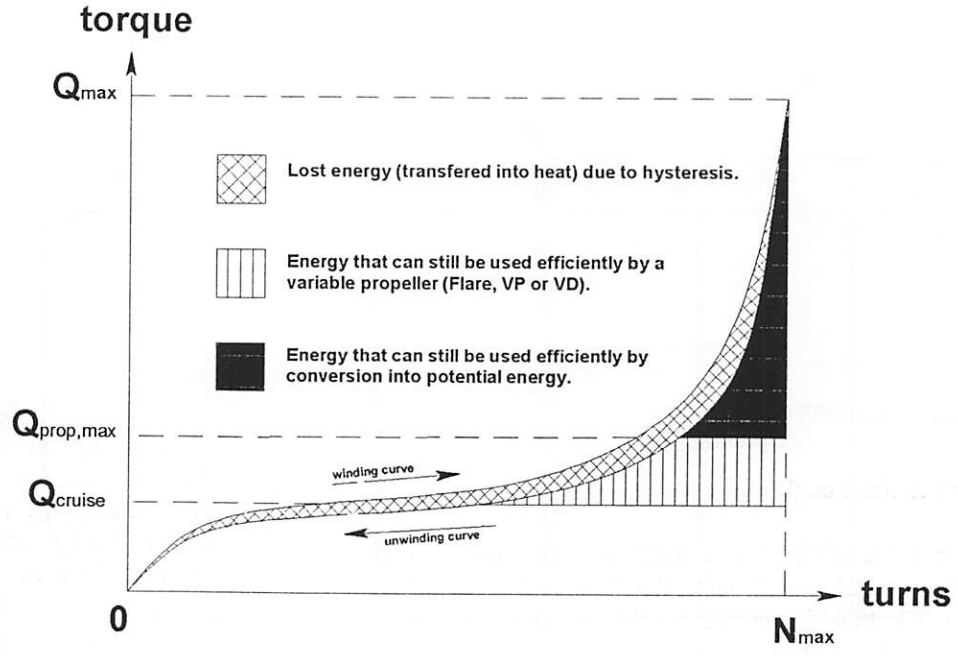


FIG 1 Winding and unwinding curve of rubber.

The propeller RPM depends on the "drag" moment that the propeller gives due to its rotation and to the forward speed of the model. The "drag" moment equals the torque of the rubber. Ignoring the effects of propeller acceleration and friction in the propeller bearing it can be stated that:

$$(4)\quad \sum M = I \cdot \alpha \approx 0 \quad \Rightarrow \quad M_d = Q$$

This means that given the number of turns remaining in the motor there is a specific torque value (see figure 1) at which "any" amount of power can be consumed as long as the propeller "drag" moment equals the torque at the correct RPM (ω).

Conclusion: by changing the design of the propeller we can at a given M_d define at which RPM (ω) this "drag" moment will occur. This way we can influence the amount of power consumed by the propeller. Usually we do this by changing the pitch, diameter or blade shape/area of the propeller.

For the climb and descend the following formula can be derived, which are valid only if we ignore the acceleration forces on the model. This is allowable because it does not effect the general reasoning. Also at small accelerations the error is negligible. See also figure 2.

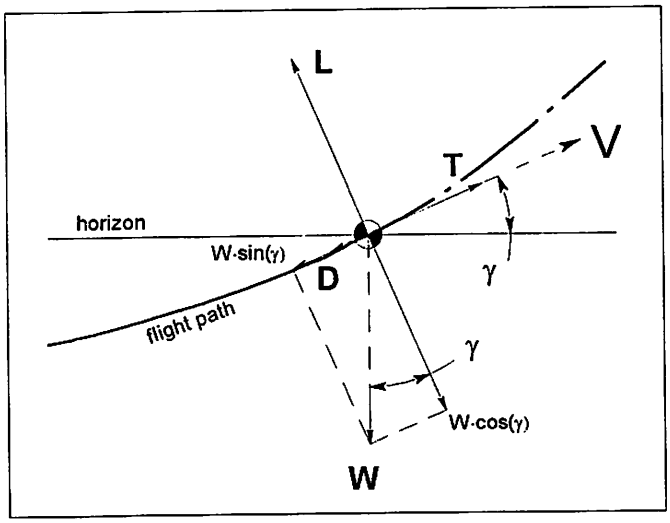


FIG 2

$$(5)\quad \text{Climb:}\quad P_{required} = \left(D + W \cdot \sin(\gamma)\right) \cdot V$$

$$(6)\quad \text{Descend:}\quad P_{required} = \left(D + W \cdot \sin(\gamma)\right) \cdot V$$

γ is the climb angle of the model

During the climb γ>0, so sin(γ)>0, during the descend γ<0 and sin(γ)<0. I make the following assumption, which I think is correct: a relatively fast descend or climb is less efficient than a smooth climb or descend at a shallow angle. Note that I assume that the total model is optimally trimmed for the cruise part of the flight.

The amount of energy stored in good Tan rubber is about 9 Joule per gram [J/gr]. The potential height energy in the model is:

$$\Delta U_{pot,height} = m \cdot g \cdot \Delta h \Rightarrow$$

$$U_{pot,height} = m \cdot g \cdot h$$

with $U_{h=0}=0$

Though not so relevant for this explanation an effect that cannot be neglected is the temperature gradient of the hall: the temperature increases with height. The torque of the rubber motor increases with temperature, also during flight! In higher halls the temperature difference between floor and ceiling level can be much greater than in low ceiling halls and near the ceiling the temperature gradient is the largest.

From theory to practice

After this bit of basic theory we will look at what happens when we let our F1D-B model fly with the rubber motor from figure 1:

1. Without variable propeller and without backing off turns. The model will climb very fast and reach the ceiling very quickly. The energy from the rubber is converted into potential height energy in a relatively inefficient way because of the steep, fast climb. Then it will bounce the ceiling for about 40% of the flight time. In figure 1 these are the black and hatched areas under the curve. The potential energy stays constant and we are unnecessarily fast heating the air around the model..... During the descend the potential energy is returned (see formula (6)). The power required for descending is less than for cruising. The descend will be slow and smooth. This rubber motor (figure 1) might have been a little bit too thick, but the result was a long flight.

2. We could try again and back off turns, but this will not increase the flight time. We will climb more slowly, but will stay at the ceiling for a shorter period of time. We are wasting energy, a bad thing as we wanted to use all of it to achieve a longer flight.

3. By using a variable propeller we can influence the "drag" moment of the propeller during flight, and with that the RPM (ω). When we suddenly change the pitch (VP) or the pitch and the diameter (VD) M_d will change suddenly and the propeller will accelerate until M_d= Q (with flare propellers and propellers with more refined mechanisms this process will go more gradually). This occurs at a different RPM and the power consumed by the propeller will change, a change in energy consumption!

   With variable propellers (flare, VP, VP, etc.) the torque at the start of the flight can be controlled more efficiently at a lower RPM and consequently less consumed power. The excess power that the rubber

motor can deliver at higher than cruise torque leads to a less efficient consumption of the black indicated energy in figure 1. This energy is used for the climb. The hatched part indicates the amount of energy which can be used relatively efficiently by a variable propeller (without climbing). Note that although figure 1 gives a reasonably accurate picture and a sound way of thinking it is too simple to describe the reality exactly correct.

Sadly variable propellers as yet cannot effectively deal with a torque change of five times the cruise torque. The model will still climb too fast and keep battering the ceiling for a considerable time (the black area in figure 1).... By the way, that's why VP and flare props are better for a low ceiling hall than VD props as they are less vulnerable and more reliable.

4. There still remains the black area in the graph of an estimated 20% of the available energy which is so inefficiently used by the fast and steep climb and the crawling against the ceiling. There is no other solution than to choose a higher hall, convert more of the energy from the black area into height and regain it during the descend as earlier described. I don't like this because of the reduced efficiency of the climb. But it is better to climb than to batter the ceiling or to waste energy by use of a VP prop with excessive pitch, or whatever other mechanism that tries to overcome a factor 5 change in torque so ineffectively.

I neglected whether the propellers are continuously or discretely variable. Continuously is better in my opinion, but when that leads to a heavier propeller the net result in terms of flight time could even be negative.

Another positive effect of a high hall is the larger temperature gradient near the roof and the bigger temperature difference between floor and ceiling level. This effectively flattens the flight profile: the difference between cruise torque and launch torque decreases. We can choose thinner rubber and start the flight with none or very little back-off. The increasing temperature makes up for the loss of cruise torque of the thinner rubber so that the model can nicely cruise near the ceiling. The descend will at first be relatively slow and will become faster when the model enters the cooler air. Consequently the energy in the rubber has been used more efficiently. The change in torque is about 1% per degree Celcius.

Example calculation

In the next examples we will look at three halls of different ceiling height and calculate the corresponding potential energies. I assume that about 20% of the rubber energy can only be used effectively by climbing and gaining potential height energy.

height [m]	F1D-Beginner rubber mass 1.5 gr $U_{pot,\ max\ height}$ [J]	F1D rubber mass 1.2 gr $U_{pot,\ max\ height}$ [J]
10	0.44	0.22
30	1.32	0.65
50	2.21	1.08
20% $U_{pot\ max\ rubber}$	2.70	2.16

From this table we can deduce that a F1D model requires a higher hall compared to a F1D-Beginner model in order to achieve better performance. The F1D-Beginner model simply cannot fly as high as a F1D model (we ignore possible differences in model efficiency here). We can come to this conclusion also by looking at the theoretical height that the models can achieve in the hypothetical case that all the potential energy were converted into potential height:

Model:	Maximum "theoretical" height: [m]
F1D-Beginner	306
F1D	500

Conclusions (1)

Principally *cruising is the most efficient way* of achieving the longest possible flight duration (P_{ave} as low as possible). It was shown that climbing is indeed more efficient than all the other methods and means that have been invented to "flatten off" the flight profile. The climb works as a storage box for potential energy. But this is only true as long as variable propellers are unable to tame the high torque climb more efficiently. The model will still start climbing relatively fast. For an ideal motor (with constant torque) cruising has the best efficiency (if the model is optimally trimmed). Otherwise said, a variable propeller (continuous or discrete in multiple steps) will only have its best efficiency at cruise torque and just above or below this. A variable propeller can only be advantagious when the extra energy from the peak of the torque curve compensates sufficiently for the extra weight of the VP-mechanism.

Remarks (1)

I briefly mentioned that the propeller efficiency is not constant. It depends on many variables: blade shape, pitch (distribution), diameter, "slip". At a given optimised model-prop combination for cruising flight it follows that the propeller efficiency *in practice* always varies when we try to adapt the propeller such that the model keeps on cruising. It is because of the relatively poor efficiency adaptation of the current propeller designs that climbing at the moment is the best way to handle the peak torque!

Remarks (2)

There are model classes (like F1D-Beginner) where the construction weight of the motorstick is not of major importance and where the motorstick can easily be designed to handle the peak torque of the rubber. But

for F1D models or Open Class models there are limits to the weight available for the motorstick and here it can be advantageous to design for a lower peak torque (and launch the model with less than the maximum possible amount of energy!). For these models the change in torque and therefore propeller efficiency is less. The increased total weigth due to the VP-mechanism is a major factor also!

Remarks (3)

I do not know at which efficiency the potential height energy is exactly gained by the model and returned to the model again. With these data it would be possible to determine how to handle the peak torque: to whcih extent should the propeller be made variable in order to use the energy from the rubber as efficient as possible (f.i. for cruising).

A competition flyer might prefer reliability of the model-prop combination above fancy mechanisms which can only achieve marginal performance improvements. One could f.i. choose for a moderate climb to get through the turbulence at floor level and to gain some more height to spare for bad luck when Murphy hits you. It is important then to climb and descend *just gradually enough*.

Conclusions (2)

It is right that climbing and descending twice is the best option for a low ceiling hall. The effective hall height is doubled and you can store twice as much potential energy during the flight. The "switching" of the propeller has to occur in the "knee" of the torque curve, or further up the curve when the hall is higher. If we could find a better mechanism to flatten the flight profile instead of storing the energy in height, climbing only once would be better. That's what we should do in Europe with our low ceiling halls: invent this mechanism and beat the Americans, by climbing ever so slowly to a moderate height! An impossible task? Wouldn't such a mechanism be too heavy? Anyway, I wouldn't care, because flying at 50 meter altitude is so much nicer than sticking your model to a 10 meter ceiling!!!

Notations

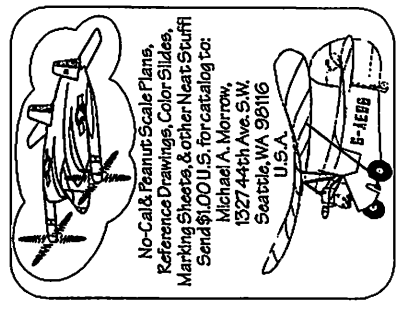
Symbol:	Explanation:	Unit:
D	Air drag (force)	[N]
g	Gravity acceleration	[kg.m/sec^2]
Δh	Height difference	[m]
h	Height	[m]
I	Momcnt of incrtia around rotational axis	[kg m^2]
L	Lift force working on the model	[N]
m	Mass	[kg]
M	Moment	[Nm]
M_d	"Drag" moment of propeller due to RPM and forward velocity of model	[Nm]
N	Turns in the rubber	--
N_{max}	Maximum number of turns in the rubber	--
$P_{required}$	Power required to sustain flight	[W] [J/s]
P_{ave}	Average power during flight	[W] or [J/s]
$P_{consumed}$	Power from the rubber consumed by the propeller	[W] or [J/s]
Q	Torque delivered by rubber	[Nm]
Q_{cruise}	Cruise torque of model	[Nm]
Q_{max}	Maximum torque delivered by rubber	[Nm]
$Q_{prop,\ max}$	Maximum torque at which the propeller just allows the model to climb	[Nm]
RPM	Revolutions per minute	[/minute]
T	Thrust force delivered by the propeller	[N]
U_{given}	Energy available in a certain amount of rubber	[J]
U_{rub}	Energy in the rubber	[J]
$U_{pot,\ height}$	Potential height energy	[J]
V	Velocity of model	[m/s]
W	Total weight of model incl. rubber	[N]
Σ	Addition symbol	
α	Angular acceleration	[rad/s^2]
γ	Climb angle	[rad]
ω	Rotational velocity of propeller	[rad/s]

Model type:	Rules:
F1D	Max. wing span 650 mm Min. mass of model: 1,0 gr
F1D-Beginner	Max. wing span 460 mm Min. mass of model: 3,0 gr Max. rubber mass: 1,5gr

Comments to this (difficult) subject are very welcome. My address is: David Lentink, Zuideindseweg 39, 2645 BE Delfgaauw, The Netherlands, tel. ++ 15 2567050, E-mail: davidlen@stad.dsl.nl

Change of address

Mark Denham of the South Leicester Aero Nutz has moved to: 199A Knighton Church Rd, South Knighton, Leicester LE2 3JP, England.



BALSA QUALITY AND TESTING

by Bernard Hunt and John Taylor (GBR)

INTRODUCTION

We all want our models to be as light, stiff and strong as possible. In order to achieve this, we need to measure the relevant properties of our stocks of wood and choose the best for our purpose. We need to know the density, stiffness and strength.

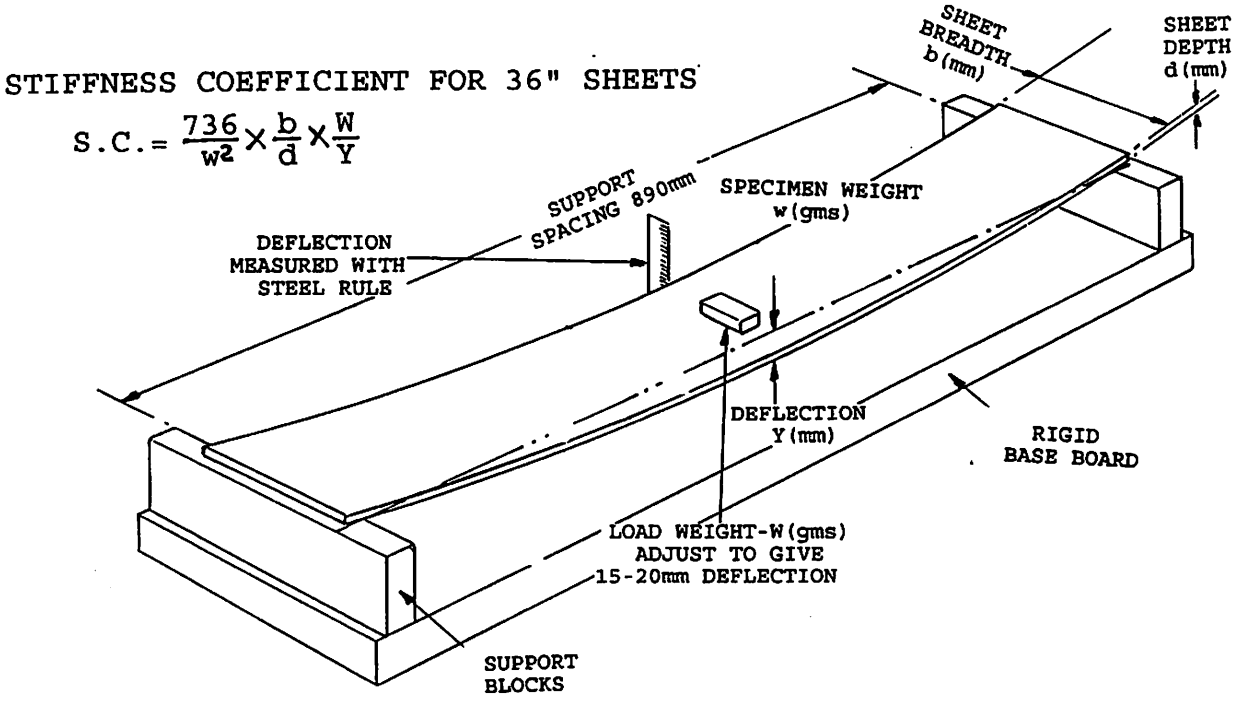
Density is obtained by weighing a sample of wood (in grams) and measuring the length, breadth and depth in (mm). Density (σ)= 62400*w/l*b*d in lb/cuft.

The stiffness of a material is usually measured by it's Young's modulus (E). This can most easily be estimated by taking a sheet or strip which is supported at each end, placing a weight in the middle and measuring the deflection. Unfortunately Young's modulus for balsa varies so much with density that it makes quality comparisons difficult, so we have devised a more useful Stiffness Coëfficient (SC). This is simply the stiffness of a test piece compared to the stiffness of a standard sample of the same weight, length and breadth/depth ratio. A stiffness coëfficient of 120 for a test piece means that it takes 20% more load to produce the same deflection as a sample of typical model shop balsa of the same weight, length and breadth/depth ratio. Most importantly, stiffness coëfficient is independent of density so you can compare 4lb wood with 10lb wood to decide which would give a stiffer spar if the cross section is scaled to give the same weight.

The strength can be estimated exactly as the stiffness by adding weights until the sheet breaks. For obvious practical reasons vey small samples are used.

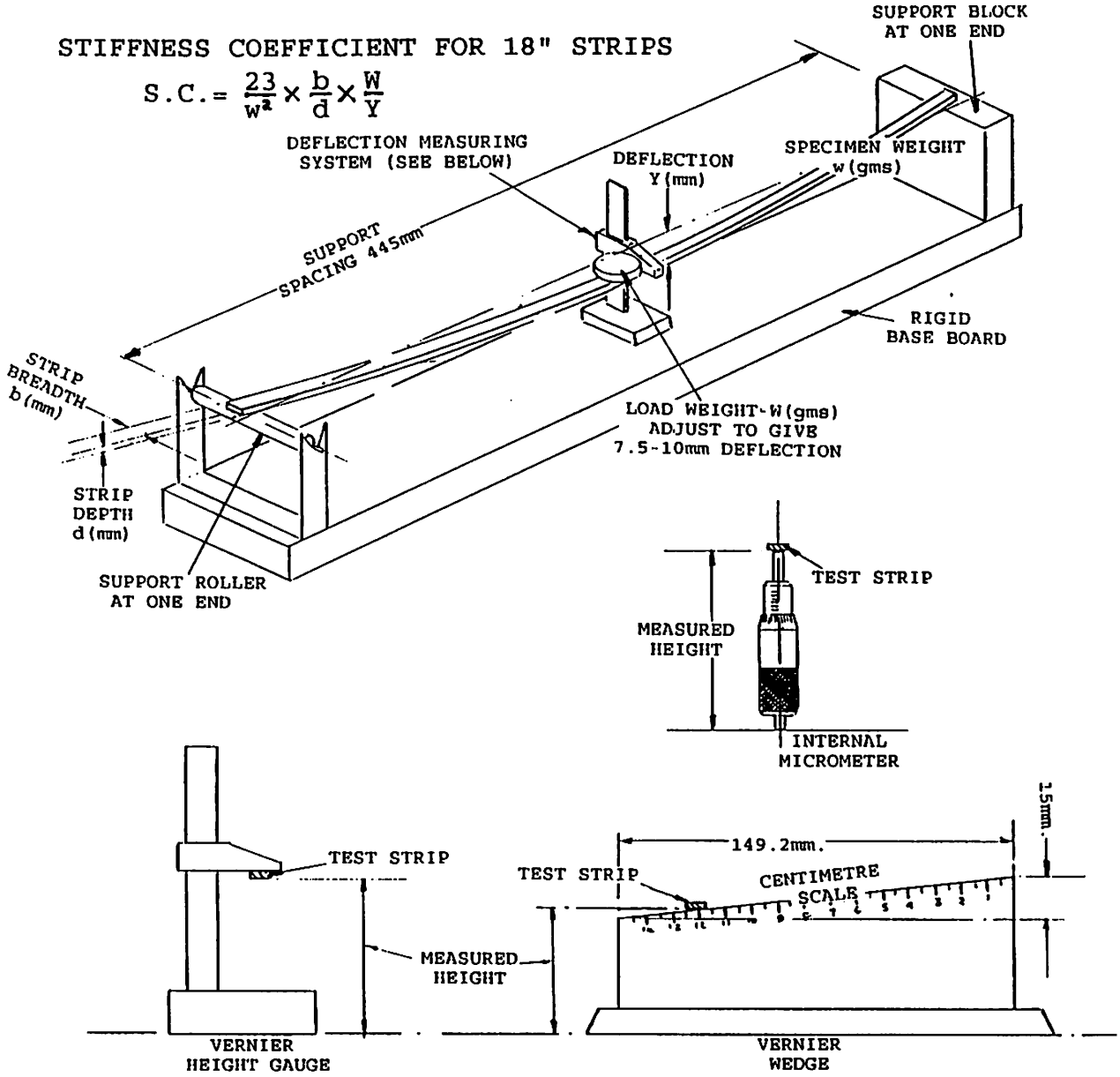
PRACTICAL TESTING FOR STIFFNESS

The cheapest and most readily available wood is from your local model shop which comes in 36" sheets up to 4" wide and thicknesses up to 1/2". The ideal thickness for testing and use is 1/8" but often the best light wood is found in 1/4" sheets. We test these for stiffness coëfficient and calculate the result as shown below.



The results on full sheets are useful for ranking of stocks of wood but, unfortunately, because the density and stiffness can vary enormously across and along the sheet, it is necessary to test much smaller samples to select wood for model components.

We have standardised on 1/4"*1/8"*18" strips which are the ideal starting point for EZB sticks or prop or wing spars. The strips are cut from the sheet with a fine-bladed band saw or a balsa stripper or at a pinch with a ruler and razor blade. The test rig and method of calculating the results are shown below.



DEFLECTION MEASURING SYSTEMS

RESULTS

We have generated about a hundred results on 36" sheets and the range of stiffness coëfficient was 50 to 150 with an average of 104 but this value is not maintained when sheets are stripped down. The average for about a thousand strips is about 90 . There are plenty of strips at about 110 but very few above 130. Using wood with stiffness coëfficient 130 instead of 100 would allow a weight saving of (130/100)^.5 or about 14% at the same stiffness. Testing many sheets/strips and selecting the best is the only way to get this advantage.

An interesting result was that many (but not all) strips, when soaked in water and oven dried (100deg C for 30 min), showed lower density (ca 5%) and higher stiffness (5-15%). We interpret his effect, which was more marked for low density wood, as restoration of damage inflicted by the stripping operation. Sanding rough surfaced strips (from band saw marks) generally increased stiffness a few percent

One very important conclusion from this work concerns the optimum density for stiffness. The highest stiffness coëfficients have been found in the 4-5.5lb region. Unfortunately, most very low density wood (4 lb/cuft and below) has undesirable properties such as low strength and creep (taking a permanent set when bent) and is not suitable for spars but is useable as solid motor sticks. Stiffness coëfficient definitely drops off above 6lb and below 4lb density. The ideal all round wood is high stiffness coëfficient 5-6lb stock.

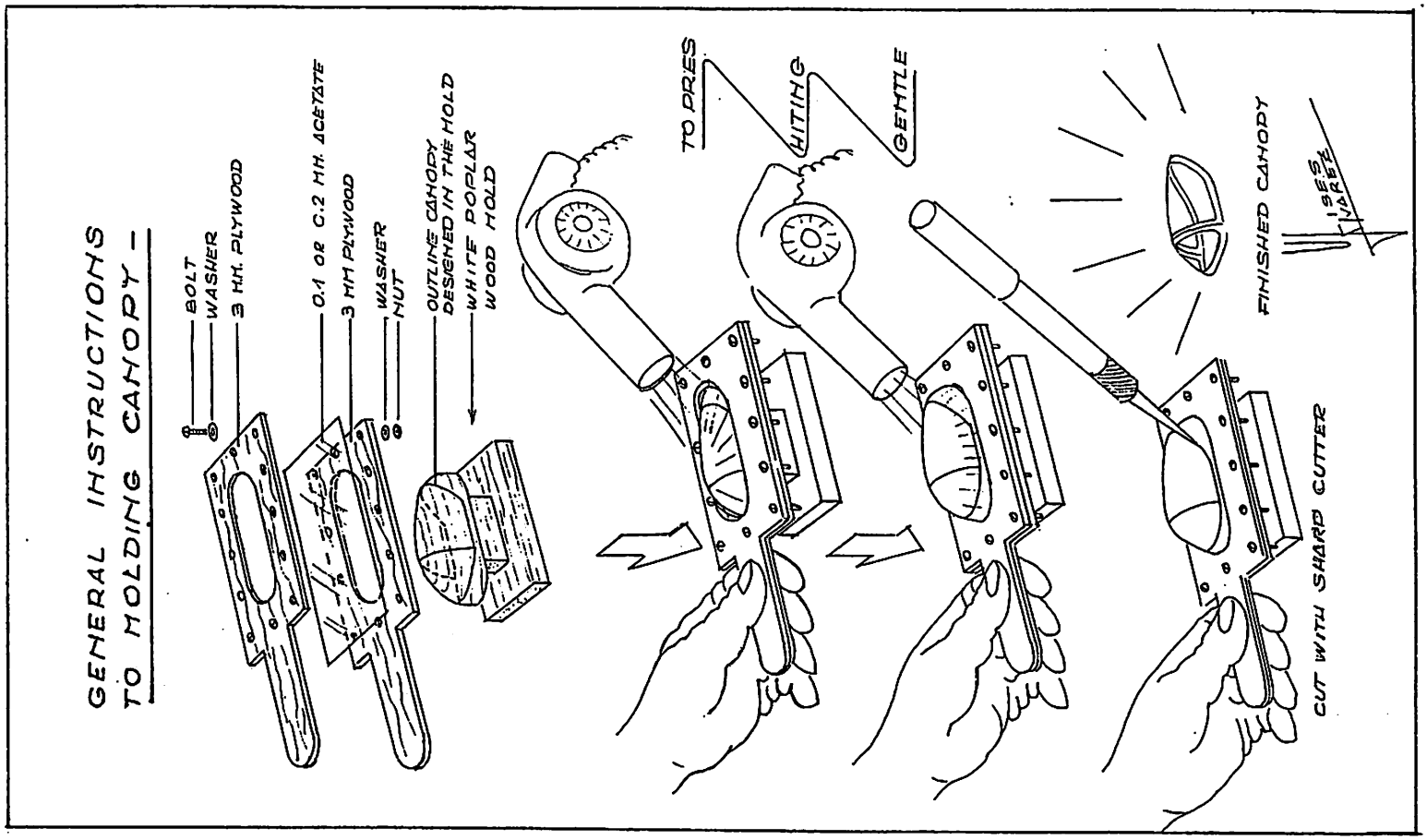
Only a little work has been done on strength and the results are not surprising. Wood below 3.5lb has very little bending strength, which like Youngs modulus, increases with density but perhaps more strongly. This means that the load carrying capability of a constant weight spar increases with density to a peak in the region of 6-8lb density and then declines. More importantly, the resilience or ability of a spar to absorb energy (from say a steering pole) without breaking, continues to increase with density. Very thin, high density spars are almost un-breakable - they just bend and bend. If you want your model to really last, use thinner spars from 10lb wood but you have to accept a 20% weight penalty.

We have done some tests on wood from specialist indoor suppliers. Despite some lovely cutting and accurate C grain, the wood is only of average stiffness, which is all that you can expect for wood that has not been tested / selected for this property. There does not appear to be any correlation between appearance and stiffness.

A comment about grain type. The grain type (a, b or c) has no effect whatsoever on the stiffness or strength in bending of spars or solid motor sticks. It is an entirely different matter for rolled motor tubes, sliced ribs and sheet prop blades that depend on the extra across the grain stiffness of c-grain wood.

CONCLUDING REMARKS

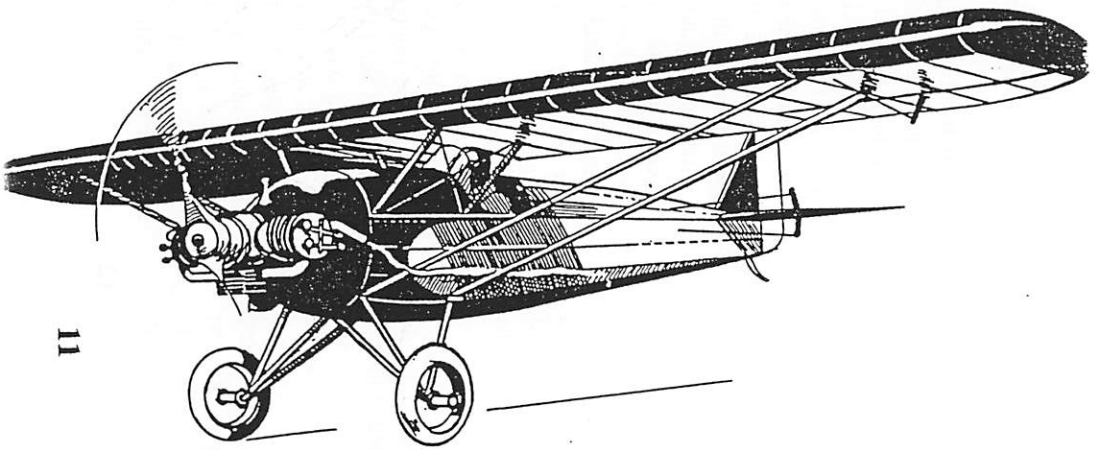
Testing wood for quality is quick and easy and requires no difficult maths. With average luck, testing half a dozen or so 4-6lb density sheets should find one with stiffness coëfficient of 120 or better which is worth stripping down further. If you are really ambitious, sort through the wood rack every time you visit your local model shop and pick out any light straight grained 1/8-1/4" sheets (1/4"*3"*36" at 6lb weighs 43g). By the time you have tested 20 sheets you should have some sheets with stiffness coëfficient of 130. Stripping and soaking/drying should give you some first class stock for sticks and spars and help achieve lighter/stiffer models.



DOMEDUSTER

Plan Packet 7

A Dozen Full Size Plans



CONTRIBUTORS

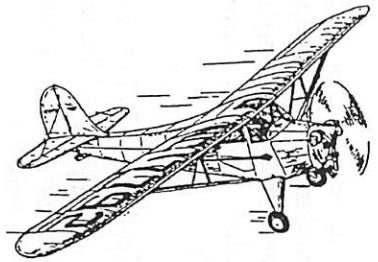
Bob Stalick	"F.A.C. Kaydet" Bostonian
Bob Dunham	"Roll-Out" Catapult Glider
Andy Tagliafico	"Miniquark" World Record Ministick
Doug McLean	"Pennybipe" Biplane Pennyplane
Stan Fink	"Bucky's" F1L (EZB)
Carl Hedley	"Basic" Bostonian
Bob Romash	"Alfonse" Catapult Glider
Greg Peters	Nakajima KI43 WWII Peanut
Stan Fink	1919 McMahon Monoplane Peanut
Stan Fink	1922 "Bee Line" Navy Racer Peanut
Stan Fink	1930 Polish RWD4 15" Walnut Scale
Stan Fink	1935 Rearwin 7000 "Sportster" 16" Walnut

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Tips on trimming a catapult glider

by Rob Eberle (USA)

(from New York Indoor Times)

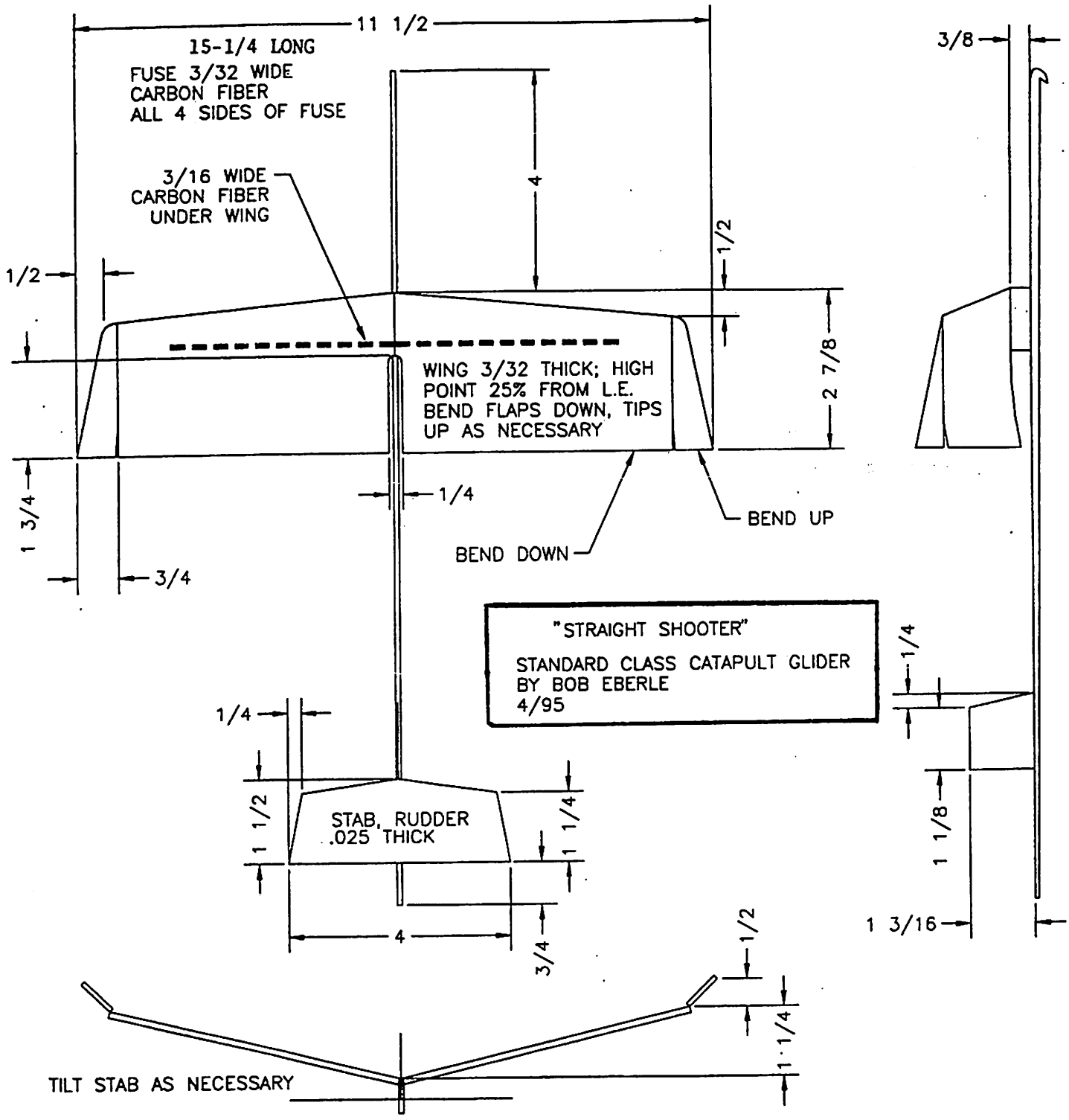
Now that there are two new indoor catapult glider classes, and there still is an outdoor catapult class, you guys can't use the excuse that your arm isn't any good anymore! Now all you need to do is to pick up your old broken Wakefield, or Bostonian motors, and make a little loop for your catapult (a ¼" dowel works nicely) and tie it on, pick up your old glider, pull back and let go! No more running twenty-five yards, lunging and throwing your arm out of its socket all day long, then complaining you're not getting any height. No, now all you need to do is add another loop of ¼" Tan II and let fly!

Keep in mind, many of these tips will directly apply to a hand launch glider also, in fact that's where many of them came from. So if there are any other brave souls that have caught the age old, highly contagious, HLG disease, keep your ears open too. First let's start before you even leave the building room. Pick your glider up, and hold it so you're looking at the side of the fuselage. Now take a very true straight edge and put it on the underside of the wing so that it extends back to the stab. Are the ruler and the stab parallel? If not, then you have a decalage problem! To fix this, simply make them parallel! If this doesn't get fixed, your plane will either balloon tremendously, or tremendously dive on launch. This is one of the most common problems I see with many gliders, and there is nothing else you can do to the trim that will fix it, except for making them parallel. **Don't try,** believe me I have done everything known to man other than making the surfaces parallel, and wasted days doing so, with no luck! Now that you have done this you can go about trimming the plane many ways, if you have a way that works, go for it, but I'll give a brief description of my way if you don't. First I set the stab tilt according to the way in which I wish my glider to circle, but keep in mind this is very little tilt (¼" max on big gliders). Next I set the rudder to it's desired position, this can be done by warping or if you're confident of your plane, by gluing it on an angle. Again, a very little amount will do. Now, if you have a plan find the C.G., or if it's your own design, pick one! Once this is done I add nose weight until I get the plane to balance at the C.G..

The next step is optional, if you fly indoors I would recommend it, but if you're flying an outdoor plane it isn't necessary. I take the tips of my wings and warp the last half inch up about an eight of an inch, but before you do this, your tips **must** be thin enough to flatten out on launch! What this will do is after the launch speed slows down, the tips will return to the position you warped them to and "push" the glider over the top, allowing you to launch the glider very vertical and then have it transition into the glide without much loss of altitude. Now you're ready to go fly, so grab your launching catapult, and your glider and lets head out to the contest!

The first thing I do to trim the plane once at the flying site is to test glide it. This is done by banking the plane into the direction it will glide, and then giving it a **little** push with the nose level, not pointed up or down. Now if the pane dives into the turn, what is happening is the plane is trying to turn so tight that it is trying to roll. What to do if this happens is to first check the stab and make sure that it isn't warped too much, meaning if you trim your plane for a roll out by warping one side of the stab up and the other down that this isn't more than maybe 1/16 of an inch. Once this is checked and fixed, if it still dives into the turn, look at the wing and see if any of the panels are warped up or down (excluding the tips). The desired warp at this point is to have the innermost panel of the wing on the inside of the turn if you have polyhedral, or just the inboard half of the wing if you have a dihedral, warped sligthly down. No other panels should be warped at this point. What this will do is to provide more lift on the inboard wing, the inboard wing being the one on the inside of the turn, and hopefully keep it from diving into the turn. If the airplane still does this after checking the wing, the final solution is to add bits of clay to the outboard wing tip, and glide test it after each bit of clay, until it goes into a smooth glide out of your hand. Now that the plane glides nicely during the glide test I get the catapult or just use your arm if you're flying a HLG, and give the plane a straight ahead launch with no bank at about 1/3 power, again keeping the nose level, not up or down. What should happen is the plane should come off the catapult or out of your hand and start into a climb while assuming its own bank, then gradually the climb slows and the plane goes into a glide. If the plane dives or balloons directly off the launch, check your decalage again. If it rolls over too far into the turn to go into it's glide correctly, give it a little bank in the opposite direction on the 1/3 power launch. Continue this until the 1/3 power launch is perfect, then try the same thing at ½ power, and ¾ power increasing your launch angle with each increase in power until you are ready for an almost vertical full power launch. Keep in mind you will need to play with the amount of bank you put into the glider on launch at each increase in power, until you get that perfect launch.

Now that you are ready for the next competition, I have to go and build something new so you guys don't go and beat me! Just remember that each glider you build will fly different than the other, even if you build it *exactly* like another one. And also remember everyone will have a different way of doing everything I just expained to you, and *sometimes* their way is even better than mine! Actually, most of the information I gave to you is from these other people and I have taken the best methods of doing things and put them together along with many of my own to accomplish one of the better trimming me



thods I have yet to see. Aside from Karl Von Bueren that is, whose way of trimming gliders is more of an art than a method. In fact all of my success in gliders is thanks to Karl since he got me addicted to this sick, insane end of the hobby, which we all love so much! Anyway have fun, and let me know how you're doing.

Catapult Classes

There are two categories (quoting from the AMA 1994/1995 Competition Regulations):

STANDARD CLASS - Projected span must not exceed 12" & chord not exceed 3". Area of stab not exceed 50% of projected wing area. Monoplanes only.

UNLIMITED CLASS - Projected area of supporting surfaces not to exceed 100 sq. in..

BOTH - Surfaces fixed except for flexing; NO folding, etc.. A max. 6" launching stick with unlimited rubber. Both stick and glider held by contestant.

Conversion table inch/mm

by Jean-Francis Frugoli

On most drawings of "top" competition models the wood sizes are given in thousands of an inch. This is because the specialist wood is supplied by American companies. This conversion table allows those who are used to the metric system a quick comparison of the metric equivalent and measure the wood thickness with a micrometer.

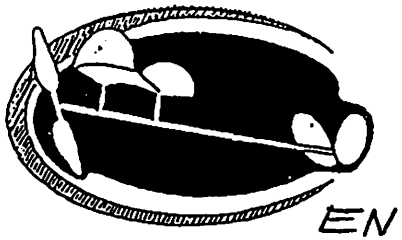
At a glance
D'un coup d'oeil

Indoor News

the / l'

EQUIVALENCE inches / millimètres

Inches	1/10e mm
.006	1,52
.007	1,77
.008	2,03
.009	2,29
.010	2,54
.011	2,79
.012	3,04
.013	3,30
.014	3,55
.015	3,81
1/64e	3,96
.016	4,06
.017	4,31
.018	4,57
.019	4,82
.020	5,08
.021	5,33
.022	5,58
.023	5,84
.024	6,09
.025	6,35
.026	6,60
.027	6,85
.028	7,11
.029	7,36
.030	7,62
.031	7,87
1/32e	7,93
.032	8,12
.033	8,38
.034	8,63
.035	8,89
.036	9,14
.037	9,39
.038	9,65
.039	9,90
	10/10e
.040	10,16
.041	10,41
.042	10,66
.043	10,92
	11/10e
.044	11,17
.045	11,43
.046	11,68
.047	11,93
	12/10e
.048	12,19
.049	12,44
.050	12,70
.051	12,95
	13/10e
.052	13,20
.053	13,46
.054	13,71
.055	13,97
	14/10e
.056	14,22
.057	14,47
.058	14,73
.059	14,98
	15/10e
.060	15,24
.061	15,49
.062	15,74
1/16e	15,87
.063	16,00
.064	16,26
.065	16,51
.066	16,76
	17/10e
.067	17,02
.068	17,27
.069	17,53
.070	17,78
	18/10e
.071	18,03
.072	18,29
.073	18,54
.074	18,80
	19/10e
.075	19,05
.076	19,30
.077	19,56
.078	19,81
	20/10e



15e CONCOURS INTERNATIONAL

PALAIS des SPORTS d'ORLÉANS

21 et 22 Juin 1997

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pour le 10 Juin 1997 →

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CLASSES

1979.1982 ← ←	F1 D	TIMEKEEPING
	BEGINNER	
	EZB	
	Micro 35 senior	
	" Junior	
	" Cadet	

SENIOR FF 100 the first class
FF 50 other classes ------

CADET / JUNIOR FF 40 the first class
FF 20 other classes ------

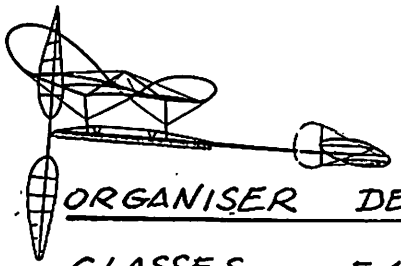
TOTAL ------

NUMBER OF LUNCH(ES) ON SATURDAY x FF 55 + ------

NUMBER OF LUNCH(ES) ON SUNDAY x FF 55 + ------

TOTAL ------

Chèque → U.A.O.V.L.C.M
(or banknotes)



15e CONCOURS INTERNATIONAL

PALAIS des SPORTS d'ORLÉANS

21 - 22 Juin 1997

Entry, Rue Albert LAVILLE

ORGANISER DELCROIX Jacques UAOVLCM

CLASSES F1 D no limitation
F1 D Beginner 3g + 1,5g
EZB 1,2g
MICRO 35, cadet, junior, senior

ENTERING FEES FF 100 PER CLASS FOR SENIOR (+ FF 50 FOR EACH EXTRA CLASS AND FF 40 FOR JUNIOR AND CADET (FF 20 FOR EACH EXTRA CLASS) ENTERING FEES WILL BE DOUBLED IF PAID ON THE SPOT

TIME KEEPING EACH COMPETITOR IS REQUESTED TO HELP WITH THE TIMING OF A (OR TWO) CLASS(ES) IN WICH HE IS NO COMPETING

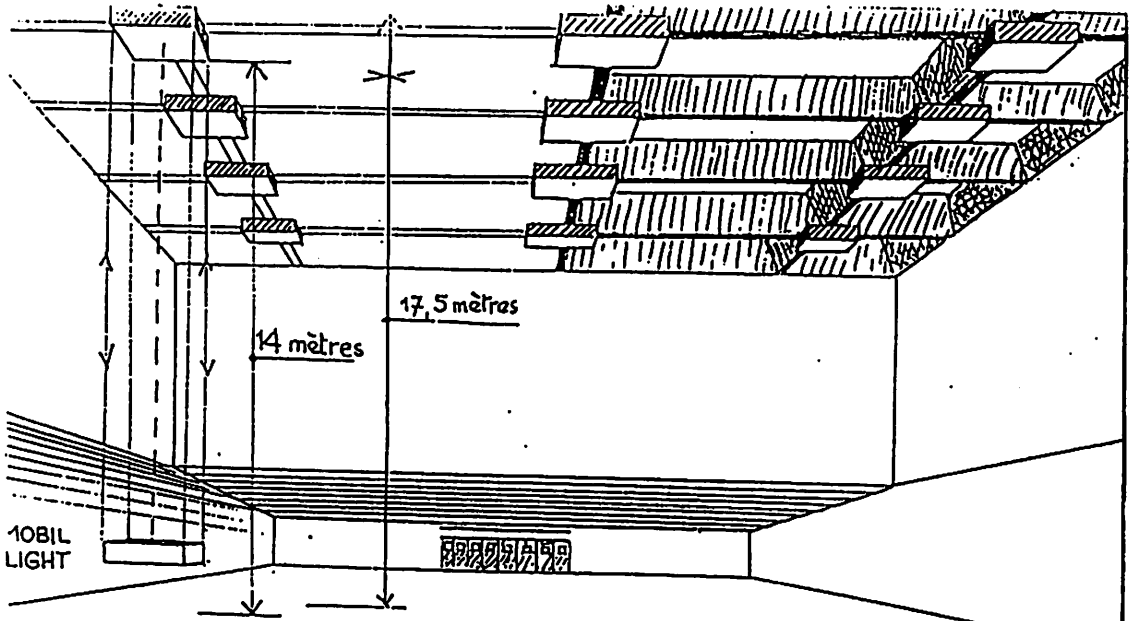
TIME SCHEDULE THE SCHEDULE MAY BE CHANGE.....

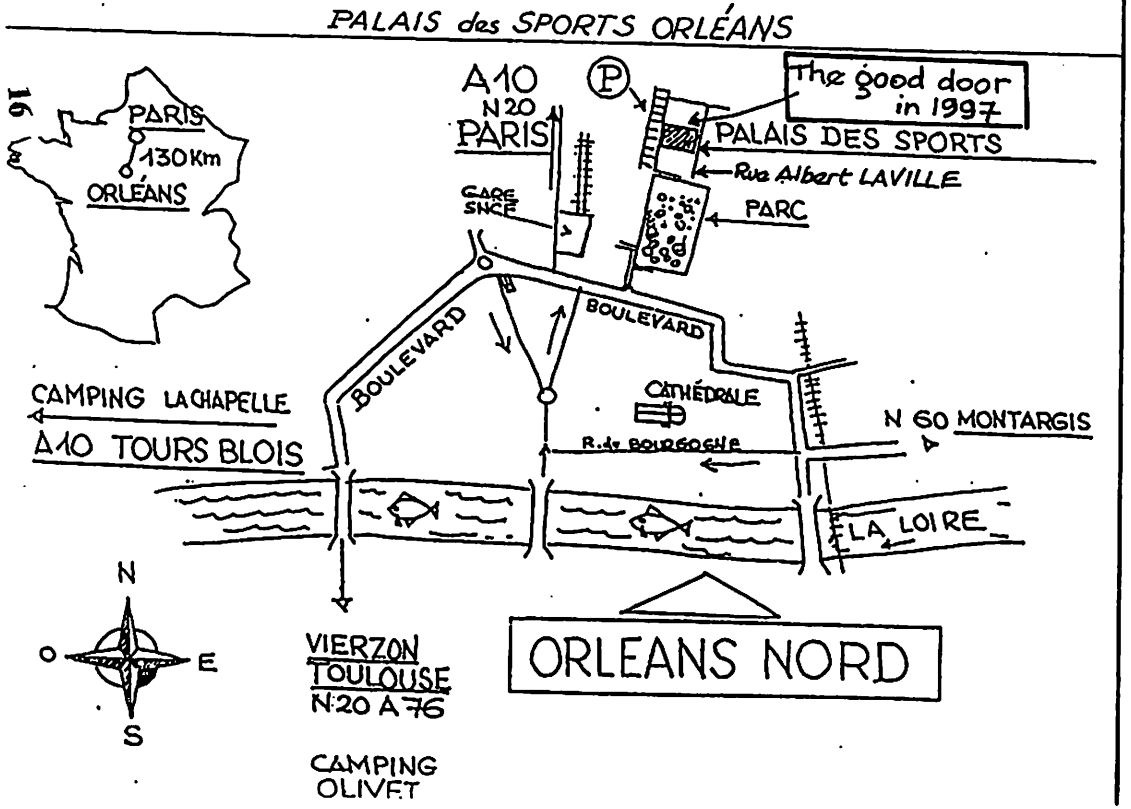
SATURDAY 21.6	8.20 AM → 10.20 AM	TRAINING
	10.20 AM → 11.40 AM	3 FLIGHTS CLASS MICRO 35 S
	11.40 AM → 1.00 PM	3 FLIGHTS CLASS BEGINNER
	1.00 PM → 2.00 PM	LUNCH AND TRAINING
	2.00 PM → 3.20 PM	3 FLIGHTS MICRO 35 CADET-JUNIOR
	3.20 PM → 4.40 PM	3 FLIGHTS CLASS EZB
	4.40 PM → 7.30 PM	3 FLIGHTS CLASS F1D
SUNDAY 22.6	8.00 AM → 9.20 AM	TRAINING
	9.20 AM → 10.40 AM	3 FLIGHTS CLASS EZB
	10.40 AM → 12.00	3 FLIGHTS CLASS MICRO 35S
	12.00 → 1.00 PM	LUNCH AND TRAINING
	1.00 PM → 2.20 PM	3 FLIGHTS BEGINNER
	2.20 PM → 3.40 PM	3 FLIGHTS MICRO 35 CAD.-JUN.
	3.40 PM → 6.20 PM	3 FLIGHTS CLASS F1D
	6.40 PM –	Presentation of prizes

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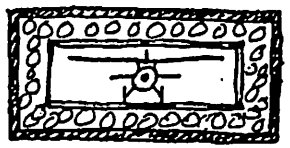




from Hangar Pilot
(with thanks)

Boxing Proxy Pistachios by VTO

Indoor models are fragile- if you build them down to the normal 2 to 2.5 gram weight, they are more easily damaged in handling/shipping than in flying. If you are going to submit a model for proxy flying, you want it to arrive intact. Based on the experience, sometimes bitter (as in smashed to smithereens!) of MIAMA flyers, here are some packaging hints that will enhance survival. Try them for InterGnats '95.

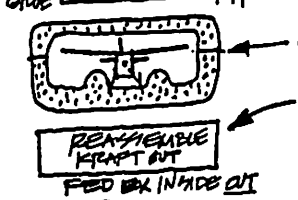


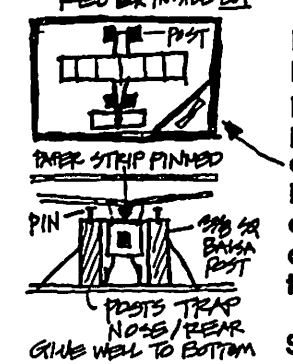
SHIP IN DOUBLE BOXES Find or build an inner box which will fit your model with a little room to spare- say 1/2" all around. If the found box is a bit too small, say for the wingtip or fin, you can add a small room addition of box strength that will fit the model. Often cigar boxes need to have this done for wings over 8" (6" OAL). A slot in lid, with wall around it, can slip over fin.





USE BULLETPROOF/LIGHT BOXES This must be a harmony-one MIAMA flyer built a ply box that was so sturdy, it would have cost $80 air mail to Flemalle, Belgium. Sturdy but light boxes include mahogany cigar boxes, foamcore, small part boxes of cardboard or foam for the model. You can carve extra room inside foam clamshells by using a hot knife. Outer box such as FEDEX 11x 17 report box (turn inside out to hide graphics) or part box should be at least 1" larger-fill void with bubble wrap, crumple paper or bubblepacking.





REGISTER/TIE DOWN MODEL Glue balsa posts to box bottom to locate nose and rear of body. A paper strip pinned to post, or thin rubber band, to pin in post, will secure model. Put prop, rubber in a totally seperate compartment. No heavy stuff! Put return postage/entry data/instructions in an envelope in the packing material. Put note on outer box on how to open safely. Transparent tape that can be slit to open is ideal. Be secure!

SHIP AIRMAIL or UPS BLUE LABEL Worth every $$!