CELEBRATING

THE HANGAR PILOT

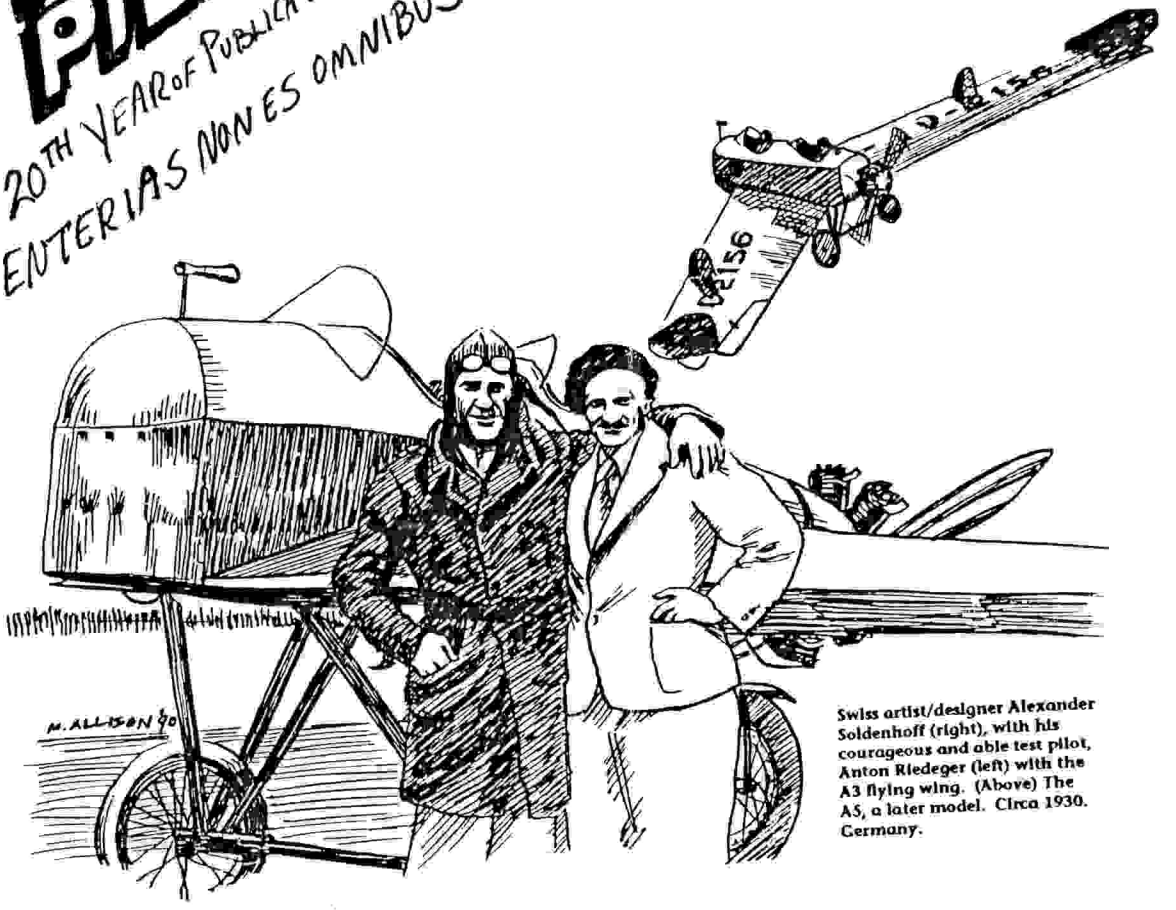
MIAMI INDOOR AIRCRAFT MODEL ASSOCIATION — MIAMA

ISSUE 138

- RESULTS KING ORANGE MIAMA #3
- WINDHAM TANDEM PISTACHIO
- DESIGNING MODERN RUBBER PROPS

20TH YEAR OF PUBLICATION

ENTERIAS NON ES OMNIBUS



Swiss artist/designer Alexander Soldenhoff (right), with his courageous and able test pilot, Anton Riedeger (left) with the A3 flying wing. (Above) The A5, a later model. Circa 1930. Germany.

NEXT FLY IN - FEB 10 MID SOUTH COLLEGE 9-5

NEXT MEET - FEB 16,17 USCOAST GUARD - ST PETE

- CAT II MIAMA MEET #4

FAC GOLDEN AGE MASS LAUNCH

(1)



The Hanger Pilot, edited by John Martin Jr., who is solely responsible for its content, is published 8 or 9 times a season for bunch of middle aged guys who refuse to grow up. MIAMA (Miami Indoor Aircraft Model Association) - AMA club 986. One of two active all indoor free flight clubs in AMA. For a mere $12.50 you will receive all of the published issues that year. We encourage reader contributions because, frankly, we need the material. Letters, plans, 3-views, complaints, gripes and compliments to: Dr.John Martin Jr., President / Editor, 2180 Tigertail Ave., Miami, FL 33133 USA. phone: 305-858-6363.

IT MUST BE FUN!

THE 1990 KING ORANGE

For you pilots who don't get to see much indoor flying we tell you that the King Orange was a real flying circus. All kinds of new and innovative stuff going on. New records..TEN of them...were set in our annual free for all. Dave Aronstein set 4, Trivin had 2, and one each to Nunez, VanGorder, Voorhees, and Ganser. A fine turn out ...23 pilots from Fla.,Ohio,N.J., Kansas, Pa., Georgia,and Washington....I checked out the OUTDOOR King Orange on Mon.,and they had a big turn out there too..53 flyers.5 of 8 did ROW.

If you like the unusual you have to watch Aronstein in action. He flys non stop (Like Bob Randolf)...Jet NO-Cal, Canard Bostonian, Buck Rogers Embryo,..all record breakers. How did he bring all those boxes from Wash.? Jorgen Korsgaard flew a peanut ducted fan here and at Johnson City. Not much thrust from a rubber powered fan, but Dave had a 15" span ducted FANSTAR that weighed 5 gm. and did 42 sec. This is the way new events start. FUN!

Bostonian continues super popular. I love those names they keep thinking up for them...especially "Ugless" and "I'm Bad".

If you like great names, I HAD to build the BEARDMORE INFLEXIBLE.. a big brown ugly tri-motor that was the highlight of the meet for me. My Bostonian was a flop, my Embryo dissapointing as was my Peanut. My monster No-Cal Hosler Fury refused to do 3 min., and my WWII mass launch hit Linstrum in the back of the neck in round 2...but the INFLEXIBLE saved the day. The sight of that big Coconut moose climbing way up there with all three props pumping away did my old heart good.. The interesting thing is that the above is my experience of this meet, and the other 23 contestants have their own personal story of the kind of meet they had..the good and the bad.

Coconut is another event growing in popularity. We had six big birds in a ROG mass launch on the Sunday finale. What a beautiful sight! Flight times are well over a minute, and the take offs, flights, and landings are the most realistic of all scale models. Just a bit awkward to carry around. 23 pilots flew 78 entries in 18 events for the biggest Fla. indoor meet ever.

THANKS, BILL CRISS, FOR LAST MINUTE SAT. SWITCH TO MAC DILL. THANKS AGAIN TO DELTA AIRLINES.

RESULTS OF 6th ANNUAL KING ORANGE (MIAMA #3) Dec.29,30 1990 CD RICHARD MACENTEE

Dave Linstrum (2)

Peanut Scale Results:	Static Points	Two best flight		Total
1.Wayne Trivin 14-Bis 111	1:11.9	1:14.7		184.3
~~2.~~George Nunez Turbo Beaver	86.8	1:21.5	1:21.6	168.3
3.John Martin Nieuport 10	90.8	:58.8	:56.6	148.5
4.Millard Wells Micro Veloz	76	1:16	1:08	148.0
5.Ron Ganser 1911 Cessna	89.6	49.1	57.0	142.6
6.Carl Hedley Fike	81.2	52.0	49.8	132.1
7.Judi Nunez Couger	75.0	50.6	56.5	128.3
8.Mike Nassise Cougar	74.8	41.2	39.1	114.9
X.Millard Wells Wiley Post A	88	53.2		114.6
X Geo. Nunez Caudron	76	30.9	32.3	107.5
9Bill Stoutenburg Cougar	70.6	28.1	28.6	98.3
10.H. Gibbs Monocoupe	70.5	38.0		89.5

SAT DEC 29:
MAC DILL AFB
HANGAR 2

SUN DEC. 30
DELTA
MAINT.
HANGAR
TAMPA INT.
AIRPORT

Flying Aces Scale:	Static Points	Best fly	Total
1.Wayne Trivin 14 Bis	82	1:29	156.5 NEW STATE RECORD ★
2.John Martin Beardmore Inflexible	83	1:02.	144.3
3.Millard Wells Waco E	69	1:26	142
4.George Nunez Grumman Avenger	65	129.7	140.0
5.Judi Nunez Daphne	52	1:36	129
X.George Nunez Aronca K	62	1:08	126
X. " " " " Devestator	66	59.1	125.1
X " " " " Dauntless	64	54.5	118.5
X. Millard Wells Falcon	68	1:09	132.5
X. " " " " " Avenger	64	59.9	123.9
6.Walt Schlesinger Pilatus	51	:23	74

PISTACHIO SCALE
L.John Martin, Windham 3 Pts.
2.Millard Wells, WeeBee 4 Pts.
3.D. Linstrum, Kalinin K-5 5 Pts

INT. STICK:
1.Ron Ganser 18:22
2.Dick Obarski 16:53
3.John Ba ker 7:24

Coconut Scale:	Scale Rank	Pts.	Fly/Pts		Total
1.John Martin Beardmore	1	1	:17	2	3
2.Dave Linstrum Compte	1		1:15.3	3	4
3.George Nunez Potez 36	3		1:35★	1	4
4.Millard Wells Ford 2AT	2		44.0	4	6
5.Walt Schleshinger Porter	4		:23	6	10
X.Linstrum Sperry Jenny	4		41.7	5	9

NEW STATE RECORD TIME

PENNY PLANE:
1.John Voorhees 11:1★ NEW RECORD
2.Walt VanGorder 10:4

EASY B EVENT:

1.Stan Chilton	17:29
2.Walt VanGorder	17:15
3.Dick Obarski	16:27
5.Gary Underwood	12:28
6.Dave Aronstein	11:38
4. John Baker	12:39
7.Millard Wells	6:27
8.Roger Laudati	5:11

FEDERATION ROG:

1.Dick Obarski	4:43
2.Dave Aronstein	1:29

LIMITED PENNY:

1.Dick Obarski	10:19.4
3.Ron Ganser	9:01
4.Walt VanGorder	8:56.3
2.John Voorhees	9:48.8
5.John Baker	7:59
6.Millard Wells	6:28

MORE RESULTS NEXT PAGE. NOTE: JOHN BARKER'S NAME IS CONSISTANTLY MISSPELLED

(3)

CATAPULT GLIDER:

1.Wayne Trivin 110.9 NEW STATE RECORD ★
2.Dick Obarski 42.6 40.8
3.John Voorhees 37.6 36.6

ORNITHOPTER:
Frank Kieser 6:13

AUTOGIRO: 1.Ron Ganser 10:06.3 ★ NEW STATE RECORD

BIG BOSTONIAN EVENT:

		Charisma	
1.Dave Aronstein	Hi-5 Falcon	1.12	★480.2 NEW STATE RECORD Best: 3:43.5
2.Wayne Trivin	More Colors	1.11	405.1
3.Ron Ganser	Elvira	1.12	392.9
4.Dick Obarski		1.11	377.4
5.Dave Linstrum	7-Up	1.11	343.5
6.Millard Wells	Wee Bost	1.12	309.1
7.Sidney Gilbert	7-Up	1.11	267.5
8.John Baker	Perrikorda	1.11	197.5
9.Carl Hedley	7-Up	1.11	190.6
10.Judi Nunez	Pup	1.11	169.1
11. Mike Nassise	I'm Bad	1.10	138.7
12.Bill Stoutenburg	Pup	1.10	83

EMBRYO ENDURANCE: ★

1.Dave Aronstein	NEW RECORD	
	Laminar Animal	719.4
2.Wayne Trivin		422.2
3.John Martin		346.9
4.Dave Linstrum		333.0
5.Mike Nassise		79.1

THANKS ★ MAC DILL, DELTA, MACENTEE, LINSTRUM, ET. AL.

FAC NO-CAL SCALE:

1.David Aronstein
2.John Voorhees Farman Postal 3:04.4
3.Dave Linstrum Cassutt 3:00
4.John Martin Hosler Fury 2:45
5.Wayne Trivin 14-Bis 2:13.6
6.Walt Everson Boing 727 1:20
7.Mike Nassise Vanguard :59.3
8.Bill Stoutenburg Waterman Gosling :23

MANHATTAN: Walt VanGorder 10:23 State RECORD ★
4:01 NEW STATE RECORD ★

FAC MASS LAUNCH:

Out in round 1: Headly and Voorhee flying proxy Avengers.
Out in round 2: Martin and Wells Avengers.
Out round 3: Judi Nunez, Dauntless, and Linstrum FW 190
Final Winner: Aronstein, Fiat, 1:43, and 2nd, Nunez, Avenger, 1:30

Coconut Mass Launch, 6 entries:
Winner:
Dave Linstrum, Compte

WOW!, DID YOU EVER SEE SO MANY RESULTS FROM JUST ONE MEET? THIS WAS A RECORD ENTRY FOR ANY FLORIDA INDOOR MEET AND WE SURE HOPE YOU HAD AS MUCH FUN AS I DID. THANKS TO ALL INVOLVED IN THIS EFFORT FOR A GREAT TIME!!.

FEB. 16+17 ST PETE CLEARWATER AIRPORT USCOAST GUARD HANGAR - CAT II

DICK OBARSKI CD 813-634-8683

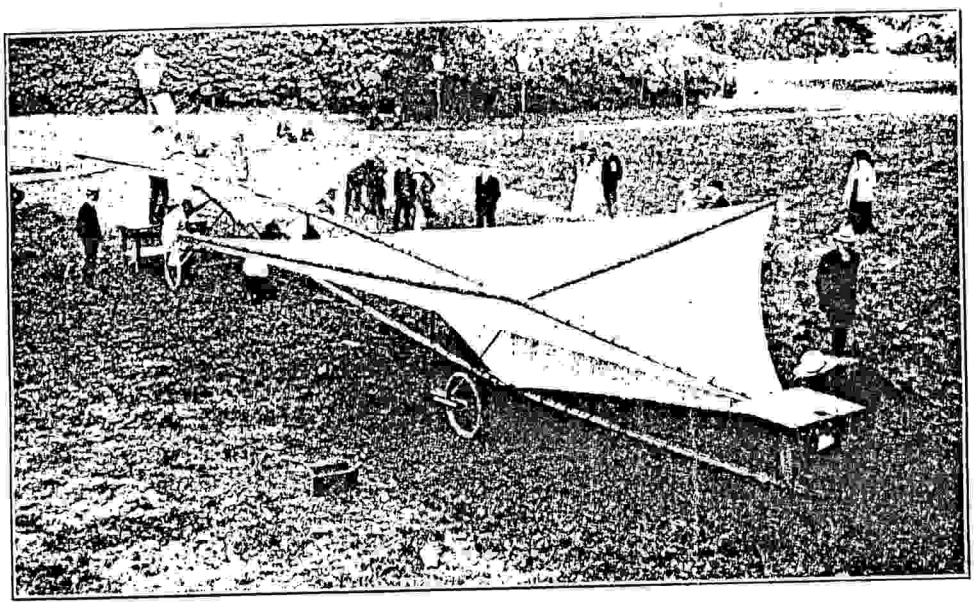
GOLDEN AGE FAC MASS LAUNCH SAT. 5PM

FUN FLY - M/D SOUTH COLLEGE 9-5 FEB 10

PEANUT MASS LAUNCH

WINDHAM. Tandem Monoplane I.

(4)



THANKS TO BENNO SABEL + BUTCH HADLAND

JANES 1909

Maximum length, 50 feet / 15·23 m. **maximum breadth,** 24 feet / 7·31 m. **supporting surface,** sq. feet / m². .

Total weight.—

Body.—Bamboo. Weighs *about* 125 lbs. (56·50 kgs.)

Wings.—These form a square, placed point forward, each wing being triangular in shape. They are supported by large bamboo booms. The wings are non-rigid.

Motor.—

Speed.—

Propellers.—1, right forward.

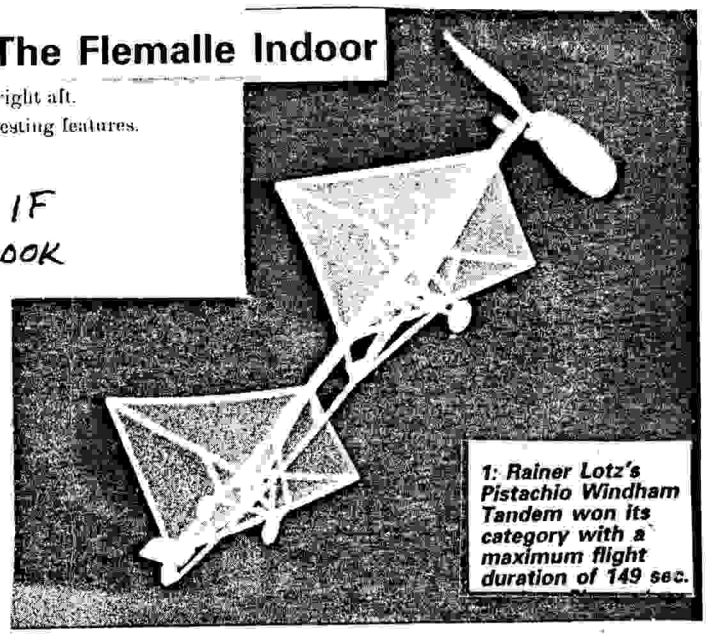
Steering.—Both vertical and horizontal rudders are placed right aft.

Remarks.—This machine embodies several novel and interesting features.

TRY THIS PIONEER MODEL IF YOU ARE BORED WITH THE LOOK ALIKE MODELS. THE ORIGINAL HAD A BAMBOO NO-CAL FUS-ELAGE + LOOKED LIKE 2 DELTA DARTS.

MAKE THAT TOP LONGERON OF HARD BALSA. IT TAKES A LOT OF STRESS

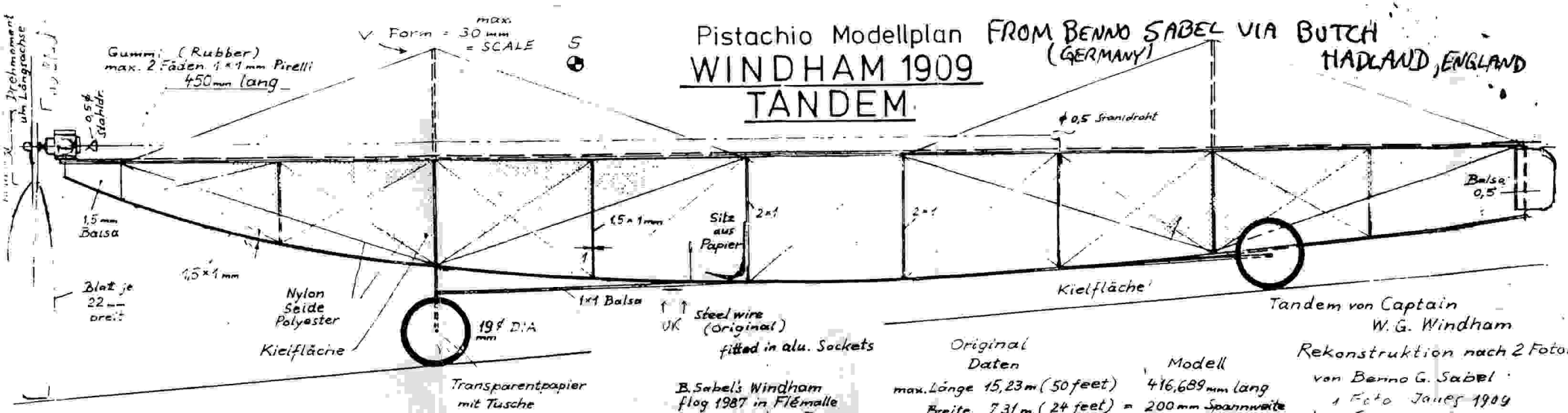
The Flemalle Indoor



1: Rainer Lotz's Pistachio Windham Tandem won its category with a maximum flight duration of 149 sec.

Pistachio Modellplan
WINDHAM 1909
TANDEM

FROM BENNO SABEL VIA BUTCH HADLAND, ENGLAND (GERMANY)



Transparentpapier mit Tusche Reifen u. Speichen malen

B. Sabel's Windham flog 1987 in Flémalle (erste Flüge) Ws 57 sek.
Rainer Lotz Windham flog (Nachbau) 1989 in Flémalle (149, 148 u. 155 sek.)
Zelle 1,1 g

Original Daten
max. Länge 15,23 m (50 feet)
Breite 7,31 m (24 feet) = 200 mm Spannweite ~(8") circa

Modell
416,689 mm lang

Rekonstruktion nach 2 Foto-
von Benno G. Sabel
1 Foto Jones 1909
1 " Flights of fancy S.13
S.39

Original = mit Bambus gebaut
Keine Verspannung

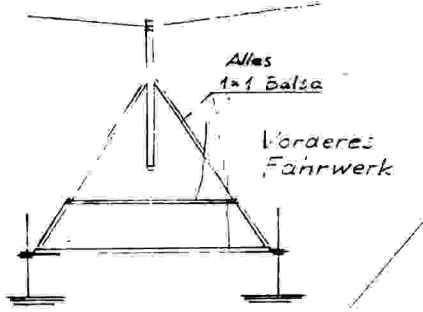
Auf der Oberseite Grasrohr max. 1 ϕ mm

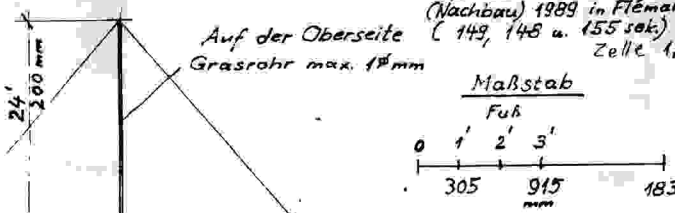
Maßstab Fuß
0 1' 2' 3'
305 915 1830 mm

Auf der Oberseite Grasrohr 1 ϕ mm als Holm

Seidenfaden oder Nylon

Condensatorpapier

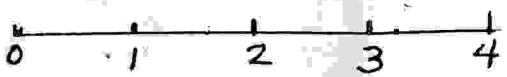


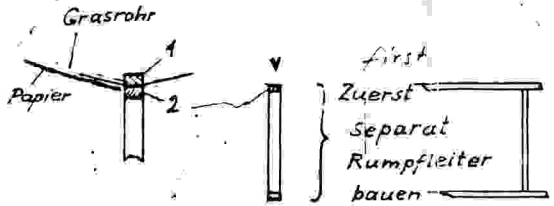




Motor 35 HP (25)
Dutheil-Chalmers
(Buch Brit. Aircraft 1908-1914 S. 542)







B. Sabel's Modell
Zelle 3 g
Gummi 1,5 g

SCALE 1:36,55

Pistachio Plan
Ffm. 6. 6. 87 ©
Benno Sabel

FOR PISTACHIO PLAN THIS PAGE SHOULD BE ENLARGED SO ABOVE SCALE IS FOUR INCHES.

(5)

FELLOW PILOTS: We begin a new series...a real unique treasure. Poems about airplanes and aviation. I recently came across a volume of LEAVES FROM AN OLD LOG by Gill Robb Wilson published in 1938 when aviation was really romantic, and we were a lot younger. This volume has a foreward by Jimmy Doolittle who says:"these poems have the lift of wings,and the rhythm of propellers." The author,Wilson, flew with French Escadrille 66 and American Sqdn. 163 in WW I, with several decorations. He remained in aviation through barnstorming, early airmail and pASSENGER service with the developing technology. His poems are based on these experiences. I hope you enjoy them as much as I do.

THE NAMELESS LEGION

When the records tell the story of the conquest of the air
By the instruments and motors and the ships,
Of Pioneer, and Bendix, with their gauges and their brakes,
Of Wright, and Pratt & Whitney, and Eclipse,
Of Boeing, and of Douglas, and the salty Thompson valves,
Of Kollsman, and of Sperry, and of Beech,
Of technicians and designers, and of schools and engineers,
And have catalogued the skill and scope of each,
Will they swing a shredded wind-sock in the west'ring winds
o' time
For the nameless men who toiled behind the scene
With the blow torch and the pliers, with the pistons and the
plugs
That the glory might be as the glory's been ?

When they tell of Stearman, Stinson and Bellanca, Ryan, Breeze,
Of Sikorski and of Loening with their boats,
Of Fairchild with the cam'ra, and of Hamilton and props,
And of Edo and the landings made on floats,
Of Rosendahl and airships, and of Goodyear and balloons,
Of Martin, and Menasco, and of Vought,
And describe how each was loyal to the single thing he loved,
And the many gallant battles that he fought,
Will their flight plan think to mention some citation to the years
For the nameless ones who kept the vision too
By the faith in which they fashioned every spar and rib and strut,
That the game might have its chance at coming through ?

CONT. ON PAGE 9

(1) THE LARRABEE WAY TO A BETTER PROPELLER.

FROM AEROMODELLER

Reg Boor describes top prop techniques for rubber fliers

IN THE March 1990 issue of Aeromodeller, Dave Hipperson, in describing his latest Coupe d'Hiver model Pure Fantasy, enthused about the Larrabee propeller blade-form and the increase in efficiency that he had obtained by its use. Dave, very rightly, connected my name with that of John O'Donnell in the development and use of the Larrabee propeller, for although I had originated a design method for aeromodellers it has been John who has used them consistently and indeed has interested the Editor in this article.

The method was described during the SMAE Free-Flight Experts' Forum at the 1986 Model Engineer Exhibition but that presentation was extremely mathematical and I'm afraid must have left the modellers somewhat shell-shocked and confused about the advantages of these propellers.

This time we shall steer clear of any mathematics and give instead a description of the principles involved followed by a method of designing a Larrabee-like propeller blade. But first of all, some background.

Powerhouses and propellers

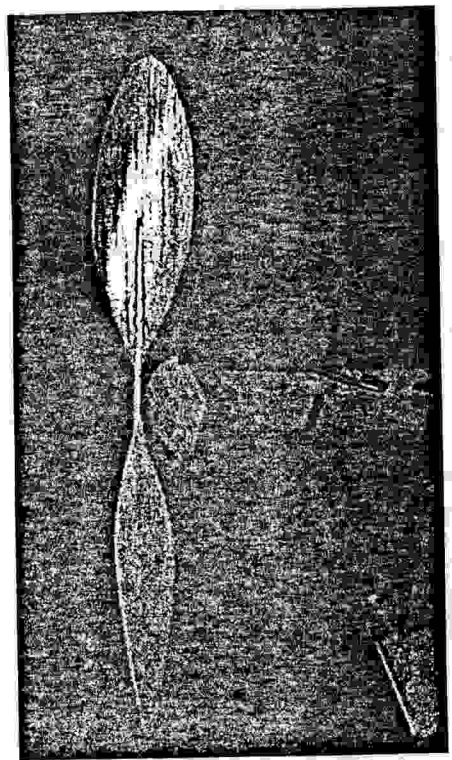
The story starts in 1979 when the September issue of Aeromodeller printed a first-class report on the crossing of the English Channel by Paul McCready's main-powered aircraft Gossamer Albatross. My opinion is that this feat ranks equally with any in the history of aviation in terms of technical achievement and I would urge all aeromodellers to read a book on the subject called Gossamer Oddessey by Morton Grosser.

But we are digressing. In the Aeromodeller article the powerhouse and pilot of Gossamer Albatross, Bryan Allen, was reported to have said that the feat would not have been possible without the propeller designed by Professor Eugene Larrabee of The Massachusetts Institute of Technology. Now, despite having worked in aerodynamics for many years I had never seen a really theoretical method of propeller design. It seemed to be based on experience and what had been done before, although this situation is changing now that very powerful computers are available.

Intrigued, and being fortunate enough to have had an excellent technical library at my place of work, I eventually found the proceedings of a conference held by the American National Aeronautical and Space Agency (NASA report CP 2085) on the subject of low speed and motorless flight. In these proceedings was a paper by Professor Larrabee describing the complete theory of his new and unique approach to the design of propellers for low-powered flying machines such as motor gliders and man-powered aircraft.

Theory – and to the point

You all know broadly what is meant by the wing lift coefficient. Now, each narrow chordwise slice of a wing lift coefficient. Now, each narrow chordwise slice of a wing in the direction of the airflow has a 'local' lift coefficient and the addition of all these local lift coefficients (or integration, in mathematical jargon) makes-up what we know as the wing lift coefficient.



Six inch Peanut Duration propeller has 12in pitch. Blade planform taken right down to shaft – easily done with this type of prop.

AEROMODELLER - HIGHLY RECOMMENDED BY HANGAR PILOT!
EXPENSIVE BUT WORTH IT. ONLY FF AND CONTROL LINE.
CONTAINS NO R/C ARTICLES!
US RATE $50.00/12 ISSUES

Overseas Availability: Second class postage paid at Rahway N.J. USA. Postmaster: send address corrections to Aeromodeller, c/o Mercury Airfreight International Ltd Inc, 10B Englehard Ave, Avenel, NJ07001. Distribution to news stand sales by Eastern News Distributors Inc, 1130 Cleveland Road, Sandusky, Ohio 44870. Distribution to North American hobby and craft stores, museums and bookshops by Bill Dean Books Ltd., 166-41 Powells Cove Blvd. Post Office Box 69 Whitestone NY 11357, USA. Tel: 1(212) 767-6632. USA Subscription agent Joseph D Dalleda. Wise Owl Worldwide Publications, 4314 West 238th Street, Torrance CA 90505.

You all know also that an elliptic wing produces less induced drag than any other planform. Actually, we should say that an elliptically loaded wing produces less induced drag than any other loading. What do we mean by this and why does it minimise the induced drag? If, right across the span of a wing, you multiply the local chord length by the local lift coefficient that it is carrying and if, when you plot a graph of the result it is elliptical, you have elliptic loading and that wing will have minimum induced drag. So the wing doesn't need to be elliptical in planform; the result can be obtained using a suitable combination of planform, twist and aerofoil camber by playing off local chord against local lift coefficient.

Such a wing has minimum induced drag because, in aerodynamic jargon, the donwash along the trailing edge is constant. This minimises the strength of the trailing vortex system which is cast off any wing and hence minimises the power required to drive the wing through the air.

Now, to the point at last. A propeller is nothing more than a wing. Professor Larrabee sought a way of achieving for the propeller this ideal of minimum induced loss so as to maximise the efficiency for a given power input. But a propeller, of course, is a very complex wing. Each local chord is travelling at a different speed to its neighbour because of the rotational velocity and the blade has to be twisted helically to keep the blade incidence constant. Also, the trailing vortex system consists of a pair of intermeshed helicoidal vortex sheets, one from each blade, which mutually affect each other as the flow develops. So the problem that Larrabee faced was very complex one, not easily put into words and he adapted the work of some of the worlds most famous aerodynamicists to solve it.

In the case of apropeller it is the 'displacement velocity' which is required to be constant along the blade radius. This is the apparent speed with which the helicoidal vortex sheet moves downstream. You can get an idea of displacement velocity by twiddling a woodscrew in your fingers. If the screw is held by the head between the right finger and thumb and rotated rapidly, the screw thread appears to move towards the head. Actually, nothing moves axially, it is a phenomenon of the helical thread form and the rotational velocity.

Additionally, that mysterious quantity, the 'slip', which is related to the displacement velocity, has to be calculated. You can get an idea of what slip is by the difference between screwing a screw into wood and then into modelling clay. In the first case the screw moves into the wood by its geometric pitch at each rotation. In the second, some of the clay is forced back by the pressure of the screw so that it no longer moves as far on each rotation. This is the slip and is what a propeller does to the air.

Professor Larrabee's method needs to know the power of the engine, the flight conditions to be optimised and the local aerodynamic characteristics of the blade aerofoil sections. It then goes through an iterative, that is, a constantly re-calculating, procedure to design a propeller of minimum, induced loss to suit the conditions. Not a promising situation for even the most enthusiastic aeromodeller knowing, as he does, very little about any of these things.

An aeromodelling solution

Searching for a method of applying the theory in a simple way, it struck me that the aeromodeller, for all the major competition classes, has by long experience already optimised the power side of the equation by his choice of pitch to diameter (P/D) ratio and propeller size. Roughly a P/D of 1.2 for Wakefield, a P/D of about 2.0 for EZB and so on through the classes with only minor variations.

Would it be possible to substitute the P/D ratio into one of Larrabee's equations and obtain Larrabee-like blade planforms?

By making some sweeping approximations, which amounted to assuming that the design criterea had already been met, this was done and sure enough I did obtain similar blade planforms but, of course, because my equations did not take account of the power these blades were of no particular size. John O'Donnell came to my rescue with a paper by the Professor in which, by making assumptions about the rubber power, he had designed a Wakefield propeller. Putting the P/D ratio from the paper into my method I was delighted to discover that by assuming 12.5 percent slip and simply scaling to the same radius and maximum blade width my propeller was the same planform as the Professor's.

If you look at Figure 1 you will see an illustration of how the blade planform changes for four values of P/D ratio using this approach. Notice that the maximum blade width is between about a quarter and a half of the distance between shaft and tip. The old 'wing shovel' planform that aeromodellers used to employ was not efficient. It may have absorbed the power but this, knowing what we do now, should be done by a blade wider nearer the shaft.

The same is true of full-size propellers, as Larrabee points out. Early propellers of the 1930 and 1940 eras had such blade forms; it was only with the advent of very high power piston engines that crude rectangular bladed propellers were used, simply as the easiest way to absorb the power.

Incidentally, only aeromodellers use P/D ratios greater than 1.0 or so. Most full-size applications are lower than this and the blade shapes are nearer to that of the P/D=0.5 propeller on Figure 1.

CONT. ON PAGE 11

(9)

When they dwell on Trippe and Lockheed and on Waco,
Cessna, Ford,
And on Pitcairn, Warner, Jacobs, Grumman, Fleet,
When they eulogize Aeroncas and the Rearwins and the Cubs,
And the ones with which the little ships compete;
Will they throw the switch o' mem'ry for mechanics they have
known,
For the greasy tribe which keep the game in trim,
The patient lads who scan the skies until the ships return—
Will they spin the prop in praise of such as him;
Will they wipe their hands in fancy on the coveralls 'e wore
Though the records do not rate him by his name,
When they catalogue the backers and the pioneers of flight
In the annals of the men who made the game?

CHECKIN' OUT

Hello in the tower! This is Stark! Eastern Air;
Trip ten headed South; Can you see if I'm clear?

Hello Pilot Stark! This is...W...R...E...E...;
Taxi out when you're ready. I'll check up and see;
Use the East an' West runway; Wind's gusty and ten;
Be careful that tractor out there...And those men!
An American Douglas is lettin' down through;
When he gets in the clear we'll be ready for you.

Hello in th' tower! This is Stark! I'm all set!
I see that ship now; Can you let me clear yet?

O. K. Pilot Stark in trip ten, Eastern Air;
You can take 'er away! Everything's in the clear!
Watch an O-Thirty-Eight comin' North! He's on course
In the soup at eight thousand, somewhere by White Horse,
And United has passed Martin's Creek comin' East
Via Camden, so keep your eye peeled at the least!

Thanks Whitey! So long! This is Stark, Eastern Air;
Checkin' out.....Checkin' out.....Chec....

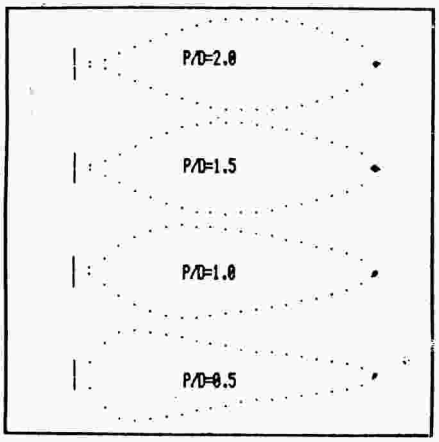


FIGURE 1 VARIATION OF BLADE PLANFORM WITH P/D RATIO

Designing your propeller

Let us be quite clear. This method does not design the propeller. You, the modeller will do that by choosing a P/D ratio that best suits the required performance and by deciding on the diameter and blade chord that will absorb the power. The method given here produces a blade planform that goes some way towards satisfying minimum induced loss conditions for that propeller, making the transfer of power from rubber to thrust a more efficient process.

The figures given in Table 1 are ordinates for Larrabee-like propellers and they are used in a similar way to aerofoil section ordinates. A range of P/D ratios which covers the major duration classes is shown.

You must decide on the propeller diamter, its pitch and the maximum chord of the blade. Divide the pitch by the diameter to obtain the P/D ratio. You then start by multiplying the extreme left hand column of radii in the table by half of the propeller diameter and writing down the values. You must then multiply the column of ordinates under your P./D ratio by the maximum chord that you have chosen and write these figures against the radii obtained above.

You will now have the chord at each radial point along the blade from shaft to tip. Draw a line, which is to be the blade centreline, choose a spot on the line for the shaft and mark-off either side of this line, at its correct radial distance from your shaft spot, half of the chord at that radius. You will now have a template for your propeller blade looking something like those on Figure 1. Any system of units may be used in this process, inches, millimetres, what you will, because the ordinates in the table are normalised.

If your P/D ratio falls between two of those given in the table you can interpolate linearly between them. Although this is not precise is accurate enough for modelling purposes.

Do remember that you have drawn the blade planform only. Making an EZB propeller is simple. Cut the planform from sheet and twist it to the pitch distribution. Carving one from block requires much more thought.

A word about blade angle, or pitch distribution

By this we are talking about the twist of the blade from shaft to tip. My personal stance is that in the manufacturing process for these propellers this should be the helical distribution which is comensurate with your chosen geometric P/D ratio. Also you should continue the blade planform to as near the shaft as possible. This is not difficult for an EZB or F1D but less easy with an outdoor folding propeller.

Although you can use the propeller at these blade angles it is then generating its thrust from the blade camber only, so when the blade is mounted on its shaft supports (that is, the folding mechanism on an outdoor model or the stick on an EZB) you can rotate the whole blade so as to increase its operating incidence by a few degrees, certainly not more than four or five or there is a danger of stalling the tip because of the Reynolds Numbers at which these propellers operate.

Fortunately there is room for experiment here. If it were all cut and dried and we could calculate everything it wouldn't be as much fun, would it?

A program in basic

For those of you who have a computer at home a very basic program in BASIC is listed. It is kept short by leaving out any REMark lines but what it does is this. The required data is asked for and it can be in inches or millimetres or anything else that you prefer. Arrays are then dimensioned to hold the results. The 'slip' is put in line 120 and the major calculations are done in lines 130 to 240 where the raw chord data is stored. A search for the maximum chord is then made in line 270 and stored in line 290. Finally, the dimensional radii are stored in line 310 and the chords in line 320. The dimensional data is then printed to the screen.

It is a short step to plotting the data on the screen instead of printing them and then 'screen dumping' them to a printer, suitably scaled, to make a template.

```
10 REMark Larrabee based propeller design
20 REMark Copyright Reg Boor December
1985
30 REMark This version for AEROMODELLER
1990
40 CLS
50 PRINT "Enter propeller diameter"
60 INPUT d
70 PRINT "Enter propeller pitch"
80 INPUT p
85 PRINT "Enter maximum blade chord"
86 INPUT c
90 LET pd = p/d
100 DIM u(22):REMark Chords,raw data
110 DIM z(2,22):REMark Dimensional data
120 LET pds = .88*pd
130 LET j =pds/PI
140 LET ff-SQRT(j^2+1)/j
150 CLS
160 PRINT "Radius", "Chord"
170 FOR r=0 TO i STEP 5E-2
180 LET f=(1-r)*ff
190 IF (i-r) <0 THEN LET eff=0:GO TO 210
200 LET eff=(2/PI)*ACOS(EXP(-f))
210 LET ex=PI*r/pds
220 LET g=eff*ex^2/(ex^2+1)
230 LET cr-4*PI*j*g/(2* (SQRT(ex^2+1)))
240 LET u(20*r+1)=cr
250 NEXT r
260 FOR r=0 TO 1 STEP 5E-2
270 IF u(20*(r+5E-2)+1)<u(20*r+1) THEN GO
TO 290
280 NEXT r
290 LET cd=u(20*r+1)
300 FOR r=0 TO 1 STEP 5E-2
310 LET z(1,20*r+1)=r*d/2
320 LET z(2,20*r+1)=u(20*r+1)*c/cd
330 PRINT z(1,20*r+1), z(2,20*r+1)
340 NEXT r
```

Propeller blade planforms based on Larrabee theory

Figures in body of table are normalised blade chords
See text for explanation of use

Propeller geometric Pitch to Diameter ratio (P/D)

		1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	1.1	2.2
	Shaft	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.05	0.082	0.069	0.059	0.052	0.046	0.041	0.037	0.034	0.031	0.028	0.027	0.024	0.023
	0.1	0.290	0.250	0.220	0.193	0.173	0.157	0.143	0.130	0.121	0.112	0.105	0.098	0.092
The	0.15	0.532	0.472	0.426	0.382	0.348	0.319	0.293	0.271	0.252	0.235	0.220	0.208	0.196
figures	0.2	0.740	0.678	0.625	0.575	0.532	0.493	0.460	0.431	0.403	0.380	0.360	0.340	0.322
in	0.25	0.885	0.835	0.789	0.740	0.698	0.657	0.620	0.588	0.556	0.529	0.503	0.481	0.460
this	0.3	0.968	0.935	0.903	0.864	0.828	0.793	0.759	0.727	0.695	0.667	0.642	0.616	0.593
first	0.35	1.000	9.986	0.970	0.944	0.921	0.893	0.865	0.840	0.811	0.786	0.762	0.737	0.715
column	0.4	0.998	1.000	1.000	0.986	0.975	0.959	0.940	0.922	0.899	0.879	0.860	0.838	0.818
are	0.45	0.973	0.988	0.999	1.000	1.000	0.992	0.984	0.974	0.959	0.945	0.931	0.915	0.900
normalised	0.5	0.933	0.955	0.978	0.986	0.997	1.000	1.000	0.999	0.992	0.985	0.978	0.967	0.957
blade	0.55	0.882	0.911	0.940	0.957	0.974	0.985	0.994	1.000	1.000	1.000	1.000	0.995	0.990
radii	0.6	0.827	0.860	0.892	0.914	0.936	0.953	0.967	0.980	0.986	0.993	0.998	1.000	1.000
	0.65	0.765	0.799	0.834	0.858	0.885	0.907	0.925	0.942	0.953	0.965	0.976	0.982	0.988
	0.7	0.702	0.734	0.769	0.795	0.823	0.848	0.869	0.890	0.904	0.921	0.935	0.945	0.954
	0.75	0.633	0.665	0.698	0.724	0.752	0.777	0.800	0.823	0.840	0.858	0.875	0.889	0.902
	0.8	0.561	0.589	0.620	0.645	0.673	0.696	0.720	0.742	0.761	0.780	0.799	0.813	0.829
	0.85	0.480	0.505	0.533	0.555	0.580	0.602	0.623	0.646	0.664	0.682	0.701	0.717	0.732
	0.9	0.388	0.409	0.431	0.449	0.471	0.490	0.508	0.528	0.544	0.561	0.578	0.593	0.607
	0.95	0.272	0.285	0.302	0.315	0.330	0.344	0.359	0.373	0.385	0.398	0.411	0.423	0.434
	0.96	0.242	0.254	0.270	0.282	0.295	0.308	0.320	0.333	0.345	0.357	0.368	0.379	0.389
	0.97	0.209	0.220	0.233	0.244	0.256	0.266	0.277	0.289	0.298	0.309	0.319	0.328	0.337
	0.98	0.171	0.179	0.190	0.197	0.207	0.217	0.226	0.235	0.243	0.252	0.261	0.268	0.276
	0.99	0.120	0.126	0.134	0.139	0.147	0.152	0.160	0.166	0.171	0.177	0.184	0.189	0.195
	TIP	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1

HEADLINE NEWS: 2.4 MILLION FEDERAL WORKERS TO LOSE JOBS DUE TO BUDGET SNAFU, THE QUESTION FACING THE NATION: WILL ANYONE NOTICE THE DIFFERENCE?

Man facing trial in blimp puncture

(13) LOS ANGELES — A man accused of steering his radio-controlled model airplane in a kamikaze-style dive that punched a hole in a Goodyear blimp has been ordered to stand trial.

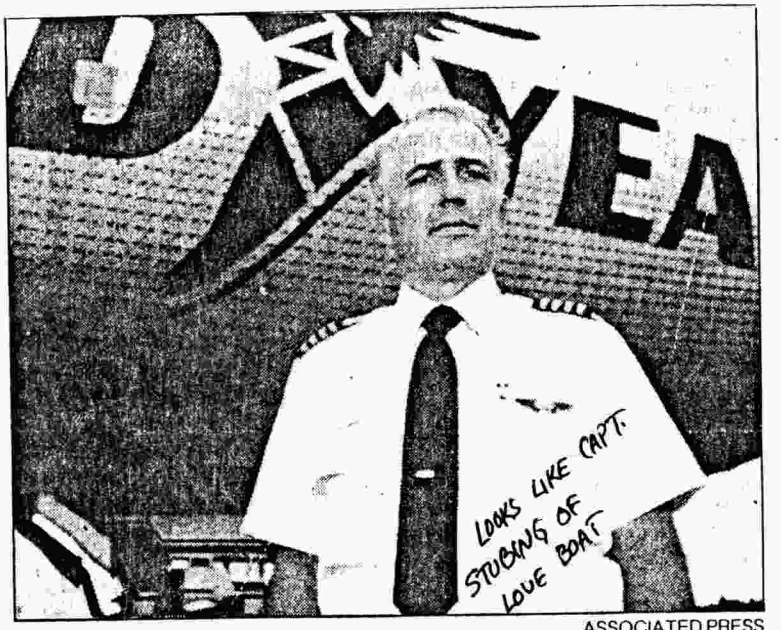
The blimp Columbia was carrying six passengers when hit Sept. 30.

Compton Municipal Judge Morris B. Jones yesterday ordered John William Moyer, 28, to trial Dec. 20 on charges of assault with intent to commit great bodily injury, vandalism and damage to an aircraft.

Prosecutors say Moyer's plane ripped a square-foot hole in Columbia's fabric skin, letting helium leak. Pilot Nick Nicolary guided the 192-foot airship to a safe landing in Carson.

Moyer claims he lost control of the plane.

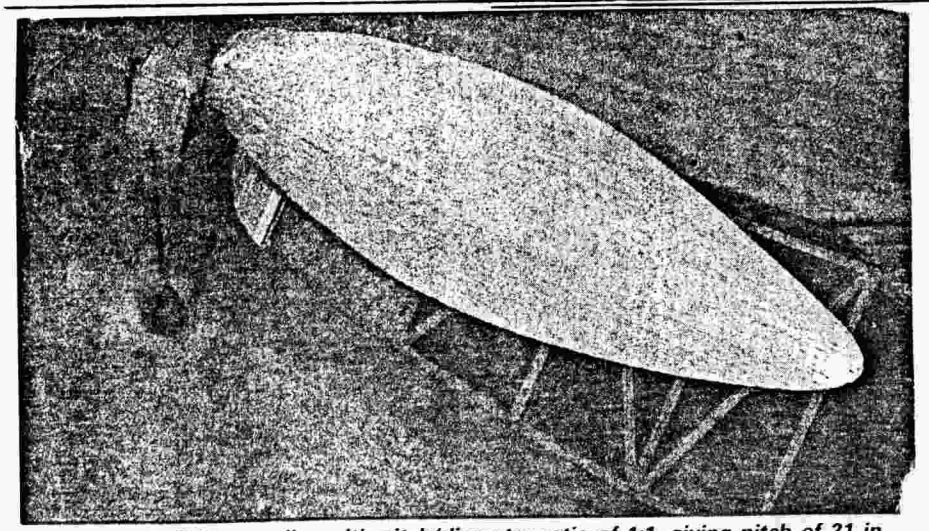
OH, WOW! THERE GO THE OLD PREMIUM RATES! P.S. DON'T LOOK FOR THIS ITEM IN MODEL AVIATION.



ASSOCIATED PRESS

Blimp aerially assaulted

Pilot L.J. Nicolary stands in front of a Goodyear blimp with a patch showing on the letter "D" Monday. Nicolary was flying Sunday when a remote-control model airplane punctured the blimp, forcing an emergency landing. A Redondo Beach, Calif., modeler was charged with assault.



A Korda Wakefield propeller with pitch/diameter ratio of 1:1, giving pitch of 21 in with diameter of 19in. Large blade width absorbs power – single-blade set-up used on this design.

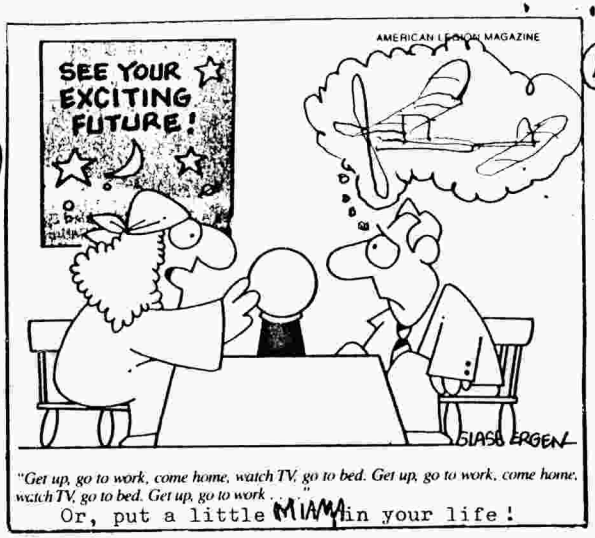
Kids call Santa & get sexpot instead

Two little kids thought they were dialing Santa with their Christmas list, but they got a sexy hotline instead and heard a sultry woman talk about a spanking.

The number they had dialed for Santa the past two years had been assigned to the sex hotline this year, much to the chagrin of the children's parents in Scunthorpe, England.



PUZZLE PICTURE: IS THIS A U.S. MARINE IN SAUDI-ARABIAN GAS MUSTER? NO- A U.S. DENTIST READY TO CLEAN A PATIENT'S TEETH



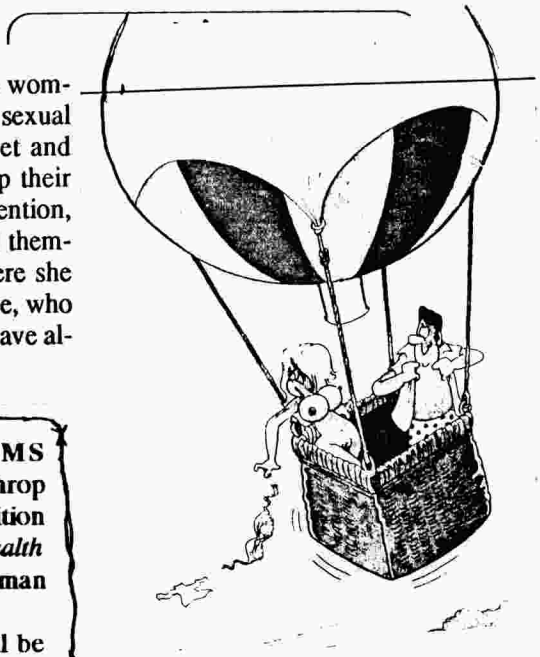
14

"Get up, go to work, come home, watch TV, go to bed. Get up, go to work, come home, watch TV, go to bed. Get up, go to work . . ."
Or, put a little MIAMA in your life!

* * *

EIGHT AIR FORCE Academy cadets, seven men and one woman, are facing dismissal because officials said the woman had sexual relations with one of the men while six others hid in a closet and watched. A spokesman said the six cadets were trying to help their classmate break off a relationship with the female. "Their intention, the male cadets said, was not to witness the act, but to reveal themselves just prior to the act and embarrass her to the point where she would quit pursuing this male cadet," explain Col. Mike Wallace, who is – really – "director of public affairs." Three of the watchers have already tendered their resignations, the Air Force said.

* * *



'You lied to me Derek . . . We're not losing altitude.'

NORTHROP WANTS STEALTH CONDOMS GROUNDED....Taylor, Texas...Los Angeles-based Northrop Corp., builder of the *Stealth B-2 bomber* has filed a petition with the trademark office to block the application of *Stealth Condoms* a condom manufactured by Taylor businessman John Hughes.

The petition states that Northrop believes it will be damaged by the trademark for Stealth Condoms because "its use by applicant (Hughes) is likely to cause confusion, or to cause mistake, or to deceive." The petition also states that "it may falsely suggest a connection with" Northrop, damaging its reputation.

Hughes said that his condoms have a better reputation than Northrop's radar-evading plane which has been the subject of rancorous debate in Congress. "The condoms perform better than the bomber," Hughes stated.

Above information from article by Siva Vaidhyanathan, Cox News Service and submitted by Lew Gunn.

"AS LONG AS SOMETHING IS NOT TESTED IT MAY BE OF HIGH RENOWN"
CHARLES FORT

THE HANGAR PILOT

EDITOR: DA JOHN MARTIN JR FLA.
2180 TIGER TAIL AVE MIAMI FLA.
33133

OH! OH! THE FATAL DOUBLE X-
IS IT HERE? THIS IS YOUR LAST
PILOT. EXCEPTION - SOME HAVE
PAID UP + HAVE UN-
FAIRLY GOT THE XX DUE
TO LOST RECORDS. ARE YOU
BEING TREATED UNFAIRLY?
PLEASE ADVISE ! !

Dear Pilot

WHAT'S ON IN FREE FLIGHT ??:

PILOTS - FREQUENT LAST MINUTE CHANGES FOR MIAMA MEETS
ALWAYS CALL INDOOR HOT LINE BEFORE YOU LEAVE FOR MEET 305-858-6363

FEB 10 - MIAMI DADE SOUTH COLLEGE 9-5 FLY+TRIM SESSION - MASS LAUNCH?

FEB 16,17 - ST. PETE CLEARWATER AIRPORT USCOAST GUARD - MIAMA MEET 4
CD DICK OBARSKI 813-634-8683 CAT II

MARCH 10 - MIAMI DADE SOUTH COLLEGE - FLY+TRIM SESSION 9-5

MARCH 23,24 TAMPA - MACDILL AFB - MIAMA MEET #5

☆ APRIL 27+28 (NOT 23+24 AS PREVIOUSLY LISTED) M/D SOUTH COL.
TWO DAY MIAMA PISTACHIO INTER GNATS PROXY MEET + FUN FLY

MAY 18,19 - TAMPA - MACDILL AFB - LAST MIAMA MEET (#6)