Winning Indoor Designs

2002-2005

Edited by
Carl J. Bakay

Published by
The National Free Flight Society

Cover Photo – A work of art by any standard, Tom Sova's F1D is caught resting at the United States Indoor Championships, Johnson City, Tennessee

Winning Indoor Designs 2002-2005

Forward to the New Edition

The 1987-1989 edition of Winning Indoor Designs has proven to be timeless. Many of the designs presented there, or their descendents, are still flying competitively today. One could pick just about any model, if it is legal in today's rules, and get a jumpstart into any class of flying they choose. I am on my third Limited Pennyplane from this edition, and its performance seems to be 'limited' only by my building, winding and flying skill.

Still, there have been many changes in our hobby in fifteen years. International F1D has been reduced to 55 centimeter span, and the rubber motor to 0.6 gram. F1L is now flown in a widely popular 1.2 gram version. Widespread use of boron and carbon fibers has expanded the flying of unbraced models, and carbon rod and tube are now seen in composite glider designs. Some events have lost their popularity, and new ones have popped up. The A-6 model began with Clarence Mather in a meeting room of the San Diego Orbiteers for some winter time fun, and has grown into a hotly contested event of its own. The ministick had its origins with Tom Vallee, and flew for a minute or two in a living room, until flyers like Walt Van Gorder and Rob Romash pushed times to 12, then 15 minutes at Johnson City. For the tech types we have Event 221, Indoor Electric Duration. Take a Mabuchi M-20 motor, two rechargeable cells, and an airframe, and see what you can do. Finally, no collection of today's Winning Indoor Designs would be complete without the Science Olympiad model. Not only are SO events to be found at almost every contest, but most of our hottest Juniors and Seniors have come to the hobby and stayed because of it. We "big kids" even have an Open event, to not miss out on the fun.

There is also more diversity in these pages in a geographical sense. Just like you, I remember the day I became absolutely hooked on Indoor, walking into the E.T.S.U. Minidome, looking up, and seeing these gossamer creations circling above for the first time. But since that day in 1998, yours truly has flown with great guys from Tampa, Florida to Champaign, Illinois, to Moscow, Idaho, and just because we all can't make it to Johnson City, Tennessee, is no reason to leave a winning design out of this volume.

The credit for this book goes to many, many people. Frank Sinatra used to say that with Cy Oliver arranging, Benny Goodman on trombone, and the Pied Pipers as backup, a mynah bird could make a hit record. Thanks to Bob Stalick of NFFS Publications, Jim Buxton, NFFS Indoor Editor, and Walt Rozelle for all the help and support. Mike Palrang and Jim O'Reilly rendered many drawings for us in CAD and Autocad. Thanks, most of all, to each and every one of the contributors in the following pages who took the time to put their ideas on paper, not just for me, but for all of us.

Finally, we would like to dedicate this volume to the memory of Lt. Col. Bob Randolph, who passed away in February, 2006, as we were going to press. One of the best F1D modelers there ever was, his timeless article on FAI building and flying from 1993 is reprinted inside.

Carl Bakay,
New Orleans
February, 2006

ABOUT the National Free Flight Society

The National Free Flight Society (NFFS) is committed to the preservation and promotion of free flight model aviation in all of is aspects and manifestations. It maintains a website for more information on the items below at www.freeflight.org.

The NFFS currently sponsors the following activites:

- The United States Indoor Championships
- The annual Indoor National Cup, a national competition involving a variety of AMA events flown at many AMA-sanctioned contests. The National Cup awards are presented at the NFFS Annual Banquet in July-August. See the Competitions section for complete information.

Society publications:

- Free Flight, a monthly magazine that contains the most complete free flight coverage published in the country
- The NFFS Symposium, published annually, presents articles on current state-of-the-art concepts and free flight developments, along with descriptions of the Ten Models of the Year and biographies of Inductees into the NFFS Hall of Fame
- An extensive list of full-size plans for Nostalgia and AMA-type models is maintained and made available. See the Publications section for details about all NFFS publications and the Plans Service.

The National Free Flight Society is affiliated with the Academy of Model Aeronautics as a Special Interest Group. Membership in the NFFS is encouraged for beginners and experienced free flight modelers alike. See How to Join or Join, Learn, Fly for information and a membership application. Join the NFFS and enjoy advantages of membership offers.

About the editor –

Carl Bakay was born and raised in New Jersey, and from the age of 11 years flew 1/2A free flight and control line stunt in the fields around suburban Trenton. His most vivid memories of the time are trips to the Mirror Meet at Floyd Bennett Field in New York, and the AMA Nats every third year at Willow Grove, PA .
Moving to New Orleans as a petroleum engineer with the Chevron oilfield, Carl joined the local SAM Chapter 59 there, and now flies his Casasno, Gollywock and Jimmie Alan models on their sod farm. A 1998 trip to the USIC in Johnson City, TN started a passion for indoor, which he has to this day.
Carl is the founder and editor of the South Louisiana Indoor Modeling Journal (S.L.I.M.), Indoor News and Views (INAV), and the SAM 59 newsletter Hot Air.
With his wife of 31 years, Sharon, he enjoys tent camping the Pacific northwest, especially the Lewis and Clark Trail, which just happens to go right by Moscow, Idaho in time for Kibbie Dome.

This Book is Dedicated to
Lieutenant Colonel Bob Randolph
1923-2006

A true friend of indoor modeling, Bob Randolph died on February 2, 2006 after a five-month illness.

A 30-year veteran of the U.S. F1d Team Selection programs, Bob made the team five times and was team manager twice. He competed in World Championships in the U.S., England, Japan and Romania. Concentrating on Paper Stick, Cabin, F1d and Hand Launched Stick, he held 22 AMA records and four FAI World Records.

Bob organized an average of 20 indoor contests a year for more than 20 years. He gained access to many sites including Wingfoot Lake, Norton AFB, Edwards AFB, March AFB and Los Alamitos NAS.

He was a career officer in the U.S. Air Force, seeing combat in World War II as a B-24 bomber pilot. After retirement in 1971 he flew competition sailplanes and earned an FAI Diamond badge.

Bob was well known to indoor flyers around the world and all who knew him will miss his enthusiasm and experience.

- *Steve Brown*

FROM OUR PRESIDENT

Winning Indoor Designs 2002-2005 is another indoor gem. The work of all of those involved in the preparation of the book should be commended. As with all National Free Flight Society publications, the sole source of all of the great material is you the modelers. You make free flight the constant challenge and enjoyment that it is.

Your constant work to meet the challenges of free flight and share your successes and failures with all of us is commendable.

The sole responsibility of the NFFS is to preserve and promote free flight in all of its forms. To this end we help locate flying sites, both indoor and outdoor, provide support for Contest Directors, and provide special awards for those that excel. The NFFS also interfaces with AMA to insure that the rules and events we want to fly are accepted.

We also have a very successful scholarship program that recognizes the modeling and community accomplishments of our young modelers. If you are not already a member, come join us and help promote free flight.

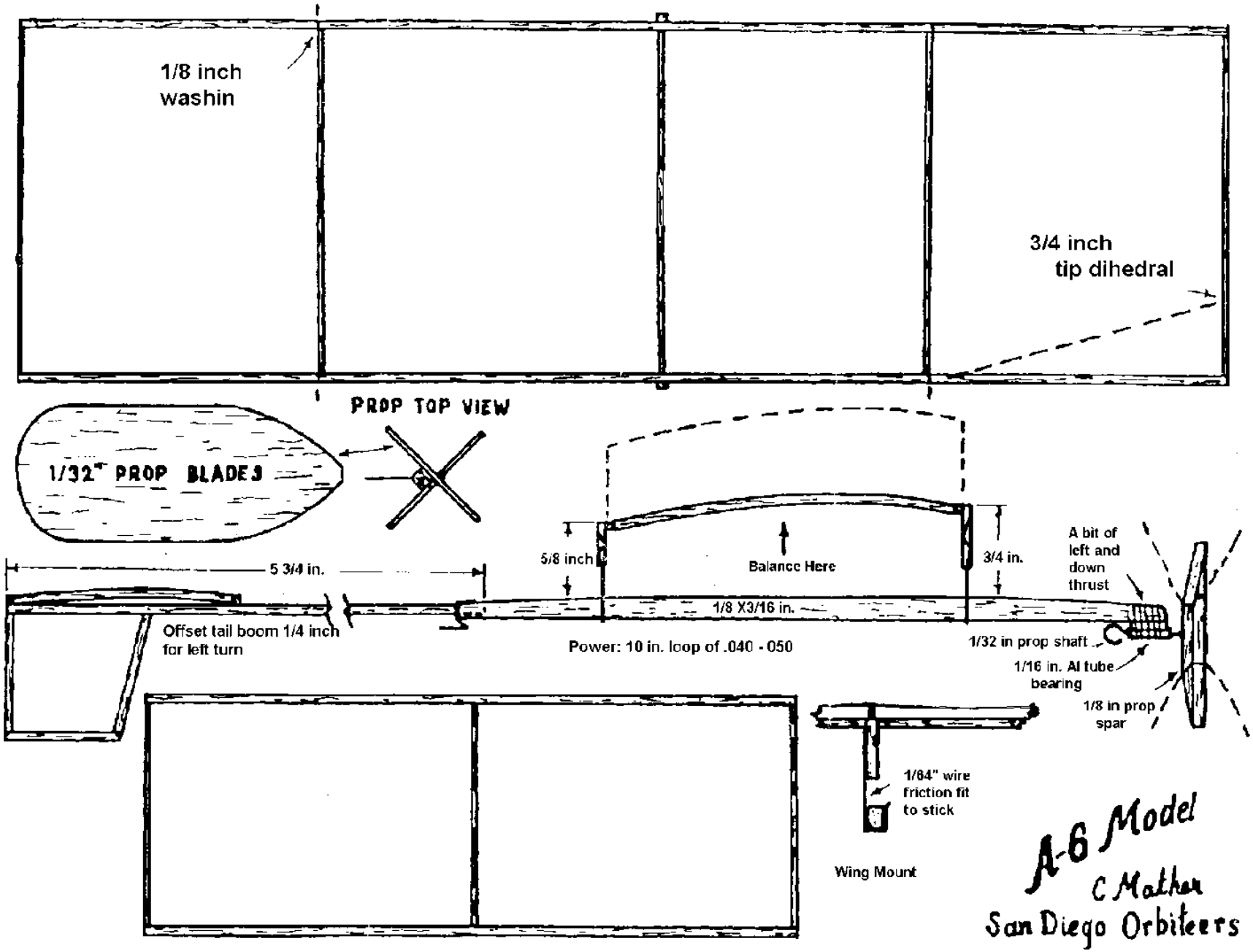
In closing, I again want to applaud all who worked on this fine book.

Rex Hinson
President
National Free Flight Society

WINNING INDOOR DESIGNS 2002-2005
TABLE OF CONTENTS

Abbreviations used:

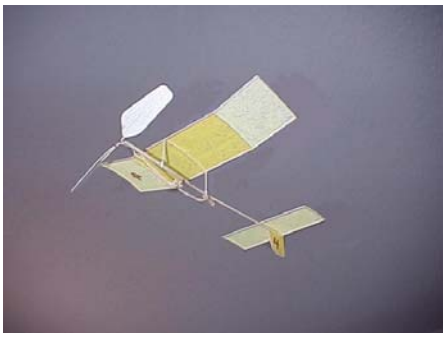
WC	World Championships, Slanic, Romania
MC	Midwest Championships, Champaign, IL
WB	West Baden Springs, Indiana
KD	Kibbie Dome, Moscow, Idaho
USIC	U.S. Indoor Championships, Johnson City, Tennessee


1/8 inch
washin
3/4 inch
tip dihedral
PROP TOP VIEW
1/32" PROP BLADES
5 3/4 in.
5/8 inch
Balance Here
3/4 in.
A bit of
left and
down
thrust
1/8 X3/16 in.
Offset tail boom 1/4 inch
for left turn
Power: 10 in. loop of .040 - 050
1/32 in prop shaft
1/16 in. Al tube
bearing
1/8 in prop
spar
1/64" wire
friction fit
to stick
Wing Mount
A-6 Model
C Mather
San Diego Orbiteers

The A-6 Model

by Clarence Mather

Philosophy, Rules, and the Original Plan



Edtior's model shown, fitted with a Tagiafico Prop

In a letter to Roger Schroeder, Clarence Mather described the origin and philosophy of the A-6 model:

Dear Roger,

The San Diego Orbiteers held their meetings in a small recreation center gym, and decided to do some indoor flying after the business meetings. A couple of us had some indoor experience, but most of the other members felt overwhelmed by indoor models and did not participate. I decided to create a model that used materials familiar to everyone and would be small, simple to build, and sturdy enough to survive most of the banging around that would occur. No special indoor materials were allowed.

Thus 1/16 square strips and 1/32 sheet were the minimum sizes to be used. The "A" part of the name is from the old AMA Class A model of 30 square inch maximum wing area. The span was not limited so that some experimenting could be done. A high aspect ratio might be more efficient but would weigh more because of the longer spars required. Similarly the tail boom length was not limited. AMA limits stab area to 50% of the wing's, or it must be counted as wing area. Perhaps it would have been better not to limit the area of the stab. As Dave suggests, tandems might be fun to experiment with. The added weight of the large "second" wing might cancel out the added lift, because the rear wing cannot produce as much lift as the front. The flat sheet prop blades make the prop easy to build. The prop shaft and tube sizes specified produces an easily built, smooth working front end. The six inch motor stick and prop diameter produces a well-proportioned model. The wire wing mounts are not required. I use them on the plan so that trimming a model could be done easily -- CG position, incidence and washin can be adjusted with no cutting or gluing.

I built and tested a model before we announced the event. Then plans were included with a newsletter. Fudo Takagi and I agreed to provide rubber for anyone who wanted it, and we came with several sizes, so a modeler could have a model to fly with little effort and cost. And it can be carried in a small box. The event meets our goals very well and flies three or four minutes in a small gym. That is long enough to be rewarding.

Clarence Mather

The rules are: (correct me if I'm wrong)

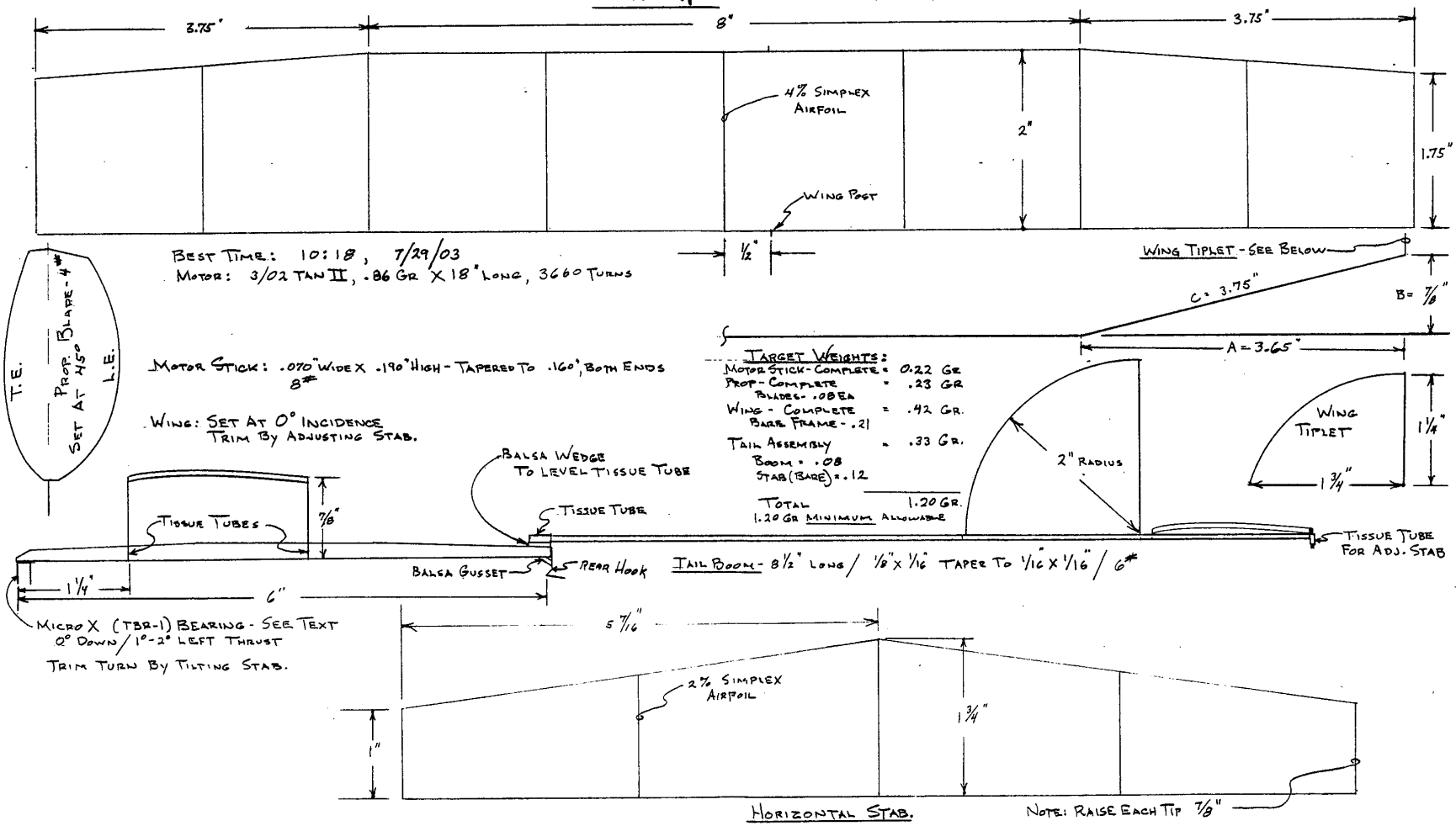
No special indoor materials
Maximum 30 square inch wing area
Maximum 15 square inch horizontal tail area.
Maximum six inch motor stick.
1/16 x 1/16 inch minimum wing and tail spar dimensions.
1/16 x 1/32 inch minimum wing and tail rib dimension.
Maximum six inch prop diameter.
1/32 inch minimum prop shaft diameter.
Prop must have flat 1/32 inch sheet balsa blades.
  or be an unlightened commercial plastic prop.

2002 Contest Rules Added Later

Minimum weight 1.2 grams (w/out motor)
Best flight of six. Highest time wins.

"WART"

A-6 By Gary Hodson — Revision #1 12/10/04



Best Time: 10:18, 7/29/03
Motor: 3/02 Tan II, .86 Gr X 18" Long, 3660 Turns

Motor Stick: .070" Wide X .190" High - Tapered To .160", Both Ends 8"

Wing: Set At 0° Incidence
Trim By Adjusting Stab.

Target Weights:

Motor Stick - Complete	= 0.22 Gr
Prop - Complete	= .23 Gr
Blades - .08 Ea	
Wing - Complete	= .42 Gr.
Bare Frame - .21	
Tail Assembly	= .33 Gr.
Boom = .08	
Stab (Bare) = .12	
Total	1.20 Gr.
1.20 Gr Minimum Allowable	

Micro X (TBR-1) Bearing - See Text
0° Down / 1°-2° Left Thrust
Trim Turn By Tilting Stab.

Tail Boom - 8 1/2" Long / 1/8" X 1/16" Taper To 1/16" X 1/16" / 6"

Horizontal Stab.

Note: Raise Each Tip 7/8"

WART (A-6) by Gary Hodson
First Place Kibbie Dome 2004, USIC 2004

Originally, A-6 was conceived by Clarence Mather in southern California as simple a club event. The concept spread rapidly across the USA until today it is among the more popular events (with the largest number of entries) at the USIC. It is essentially an entry level duration event. The rules are basically:

Rubber powered.
30 Sq. In. Max projected wing area.
Maximum projected area of the stabilizer is 50% of the wing area.
1.2 gram minimum weight, less motor.
1/16" X 1/16" minimum strip wood size.
1/32" minimum sheet wood thickness.
Ribs may be 1/16" X 1/32" minimum.
6" maximum prop diameter. Prop blades to be flat. I.E. No camber or twist. 1/32" thick sheet minimum.
6" Max. motor stick length, measured from the thrust bearing face to the apex of the rear hook.
Covering material to be tissue paper or condenser paper. No plastic film.
No "high Tech." materials such as carbon fiber, boron, etc.

The A-6 is easy to build, sturdy by indoor standards, good for teaching indoor trimming techniques, small enough to be easily transported and flies well in small gyms as well as large sites. (A perfect next step from the Delta Dart – Ed.) By specifying only wing area, rather than wing span & cord, experimentation is encouraged. The same is true for tail boom length & tail surface area.

Wart

Named after my cat who liked to help me build airplanes. For several years the **Heart of America Free Flight Association** (Kansas City area) has selected the A-6 to be its "official event" for our annual club championship. As a result, we all have been focused (some would say obsessed) on improving our A6 times. We fly a lot of ¼ motor flights & share information on what works & does not work. This design has evolved from our shared experiences & has won at both the USIC and the Kibbie Dome.

Best time: 10 minutes, 18 Seconds, 7/28/03, Kibbie Dome, Moscow, ID

The plan contains most of the information you need to build a competitive plane. Following are a few details of the construction not shown on the plans:

Thrust bearing: I order thrust bearings from **MicroX (part #TBR-1)** unbent (flat). This allows me to bend them to suit my requirements. I want a relatively large stand off (7/32") between the prop shaft & motor stick in an effort to prevent the knots that form as the motor unwinds from snagging on the motor stick. The rear hook is also 7/32" from the motor stick for the same reason.

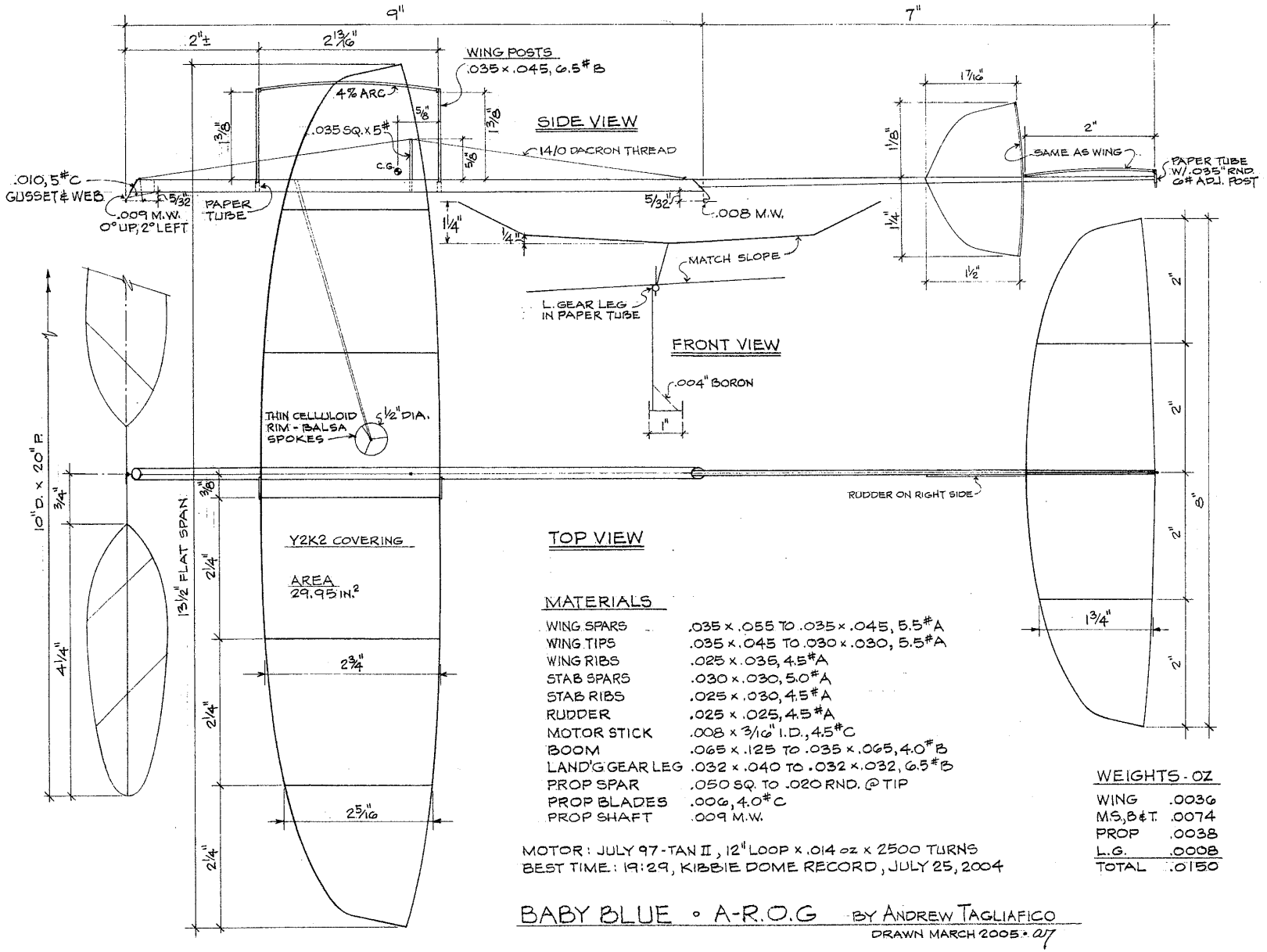
Motor Stick: The large stand off mentioned above results in a lot of bending force so the motor stick needs to be very stiff. I test my motor sticks for bending as described by **Larry Coslick** in his EZB articles in **INAV**.

Motor: The 10 Min., 18 Sec. flight was made on an 18" loop of **March 2002 Tan II** rubber, weighing 0.86 grams.

Wing Ribs: You could eliminate some of the wing ribs to save weight, but they help me maintain the airfoil shape when I cover with wrinkled condenser paper.

Covering: The flight surfaces are covered with wrinkled condenser paper to minimize warping as the paper shrinks over time. The condenser paper is wadded up into a tight ball, flattened out & ironed between two sheets of newspaper. It is attached with rubber cement diluted approximately 50% with naphtha, brushed onto the frame. If necessary, the cement can be reactivated with naphtha until the paper is positioned to your satisfaction.

Wood Selection: I find the stiffness rating of **Tim Goldstein's Tru-Weight Indoor Balsa** to be particularly helpful in selecting wood for specific applications. Light, stiff wood for the 1/16" wing & stab spars keeps the surfaces warp free & allows more weight to be built in to the motor stick where it is required for stiffness. Also, a stiff, light tail boom is essential. Light weight prop blades are important, but their stiffness can be lower. In order to build down to the 1.2 gram minimum weight, it is important to have a reliable source of excellent wood.



MATERIALS

WING SPARS	.035 x .055 TO .035 x .045, 5.5#A
WING TIPS	.035 x .045 TO .030 x .030, 5.5#A
WING RIBS	.025 x .035, 4.5#A
STAB SPARS	.030 x .030, 5.0#A
STAB RIBS	.025 x .030, 4.5#A
RUDDER	.025 x .025, 4.5#A
MOTOR STICK	.008 x 3/16" I.D., 4.5#C
BOOM	.065 x .125 TO .035 x .065, 4.0#B
LAND'G GEAR LEG	.032 x .040 TO .032 x .032, 6.5#B
PROP SPAR	.050 SQ. TO .020 RND. @ TIP
PROP BLADES	.006, 4.0#C
PROP SHAFT	.009 M.W.

MOTOR: JULY 97-TAN II, 12" LOOP x .014 oz x 2500 TURNS
BEST TIME: 19:29, KIBBIE DOME RECORD, JULY 25, 2004

WEIGHTS - OZ

WING	.0036
M.S., B&T.	.0074
PROP	.0038
L.G.	.0008
TOTAL	.0150

BABY BLUE • A-R.O.G

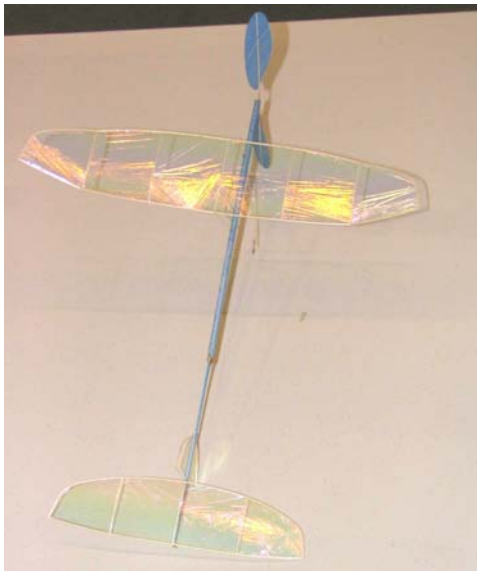
BY ANDREW TAGLIAFICO

DRAWN MARCH 2005 • 07

BABY BLUE

An A-ROG
by Andrew Tagliafico
Portland, Oregon

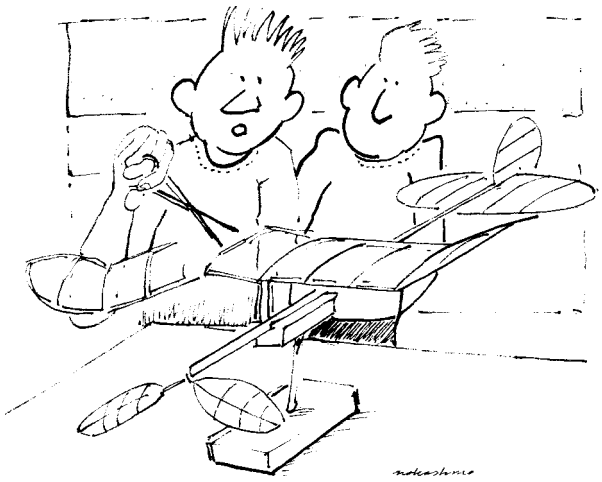
Kibbie Dome Record Holder, July 2004

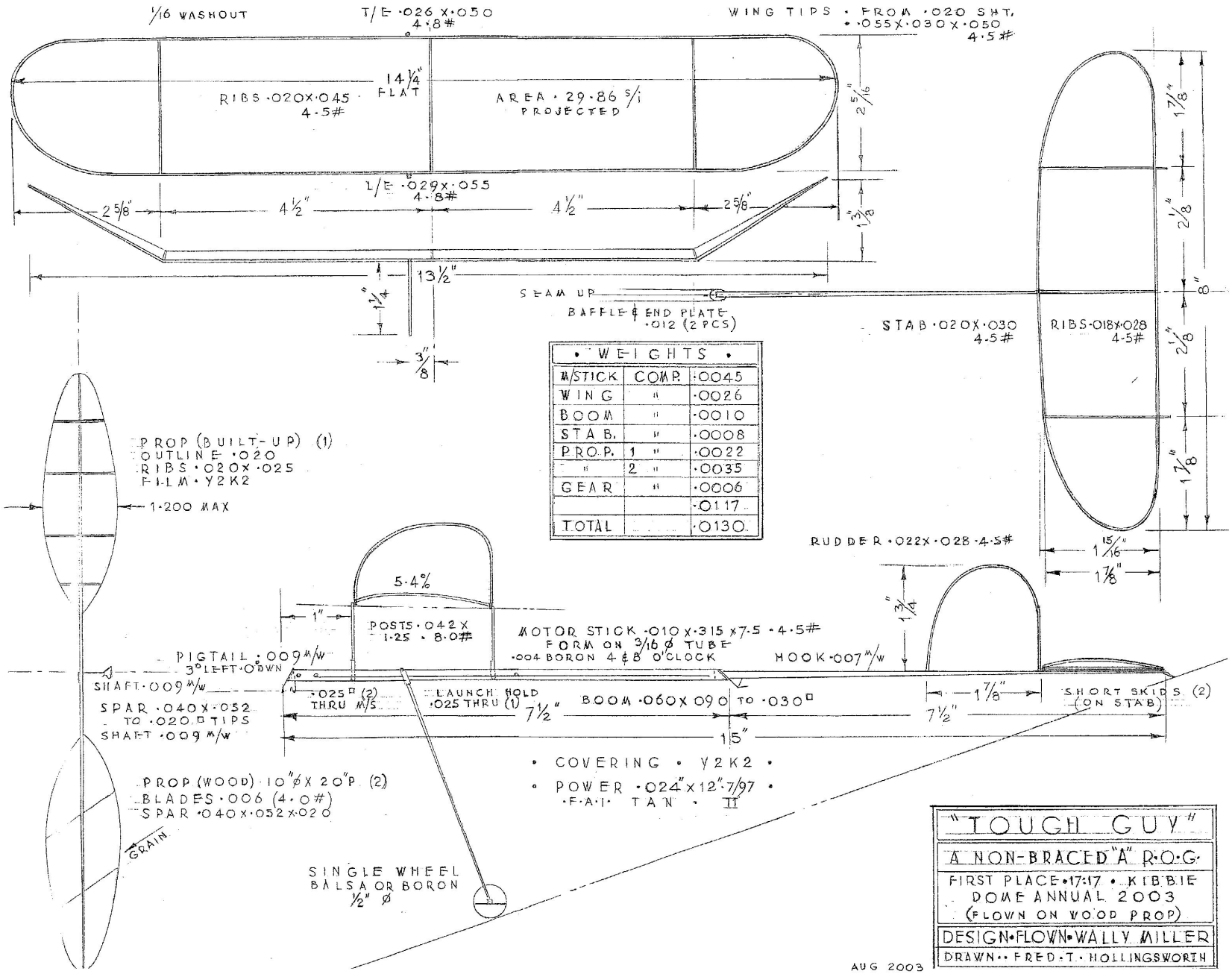


Baby Blue was deliberately designed heavy to explore a different approach to flying an A-R.O.G. It is a totally stiff model with warp-free wing and stabilizer. The long motor stick keeps tension on the rubber motor to allow a good cruise. By adjusting the height of the stick bracing post to allow bend down of the stick at launch torque, the model takes off in a steep slow upward spiral that reminds me of the old 1-gram F.1.D's. The bulky boom keeps the stabilizer and rudder rock steady during the launch. The 19:29 flight, which resulted in the A-R.O.G Kibbie Dome record, was a shock to me. That was the model's fifth flight, and I did not consider it fully adjusted.

I plan to build a second Baby Blue and attempt to lower its weight at least .003 oz and play with rubber weight, prop size and pitch. And about that name! I dyed the propeller a light blue to allow better visibility against the white Kibbie Dome ceiling. It helped enough to make it worthwhile. It also attracted a lot of positive comment. The models I will build for the 2005 season are going to be dyed, and I will explore various colors and darker shading. Dying does not measurably increase the weight of the wood. Give it a try!

Editor's Note: Andrew not only flies at the Kibbie Dome each July, but has the full weight of Contest Director on his shoulders. The 2005 event was the best attended and possibly the most memorable ever, but only because Andrew handled hoards of volleyball players, picked up and delivered his own helium supply, directed the setup of tables and chairs and did all the signup and scoring, with the help of good friends Wally Miller and Ed Berray. He has our thanks in securing and keeping this world-class site, and our hopes that he will go on forever.





"TOUGH GUY"

A NON-BRACED "A" R.O.G.

FIRST PLACE • 17:17 • KIBBIE DOME ANNUAL 2003
(FLOWN ON WOOD PROP)

DESIGN • FLOWN • WALLY MILLER

DRAWN • • FRED . T . HOLLINGSWORTH

AUG 2003

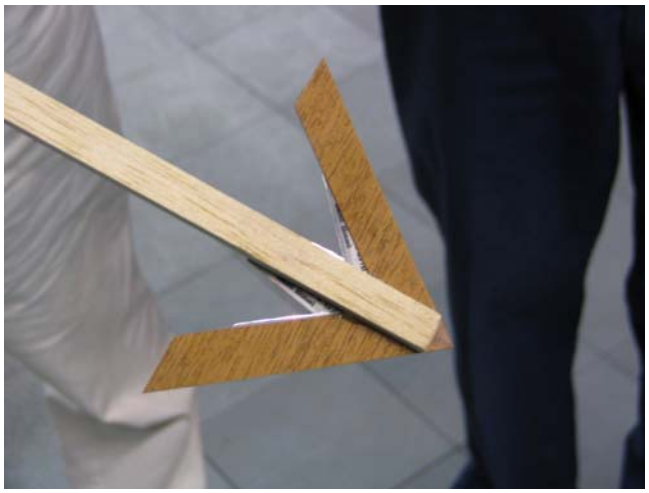
TOUGH GUY

A-ROG by Wally Miller

The R.O.G. Stick has long been perceived as a fragile, difficult model to build & fly. The main reason being microfilm covering was almost mandatory. Now with the advent of lightweight plastic film this is no longer a problem, and the not-so-little R.O.G. is gaining in popularity. Also, a major plus is that the rules for this class are practically non-existent - simply stay within the projected area limits & have a take off gear strong enough to support the model at rest. As for the actual take off: with the normal high angle of attack & at least one point touching the take off area, you can expect your model to literally jump into the air.

My design goal was a beefy, plastic covered, non-braced model that could achieve reasonable performance & still take a little abuse. As for the flying: I was fortunate to end up with high time & feel there is still a lot of potential remaining. I damaged my built up prop & had to revert to a back up solid one. The winning flight was made with this and a slightly underwound .025 x 11" motor. For the next official a .025" x 12" resulted in the model 'going over the top'. End of model & story. I will start next year with a new model & less aggression. (And yes, Wally went on to win A-ROG in 2005 –Ed.)

Left to Right - Wally Miller, John Lenderman, and Ed Berray with John's String Cutter

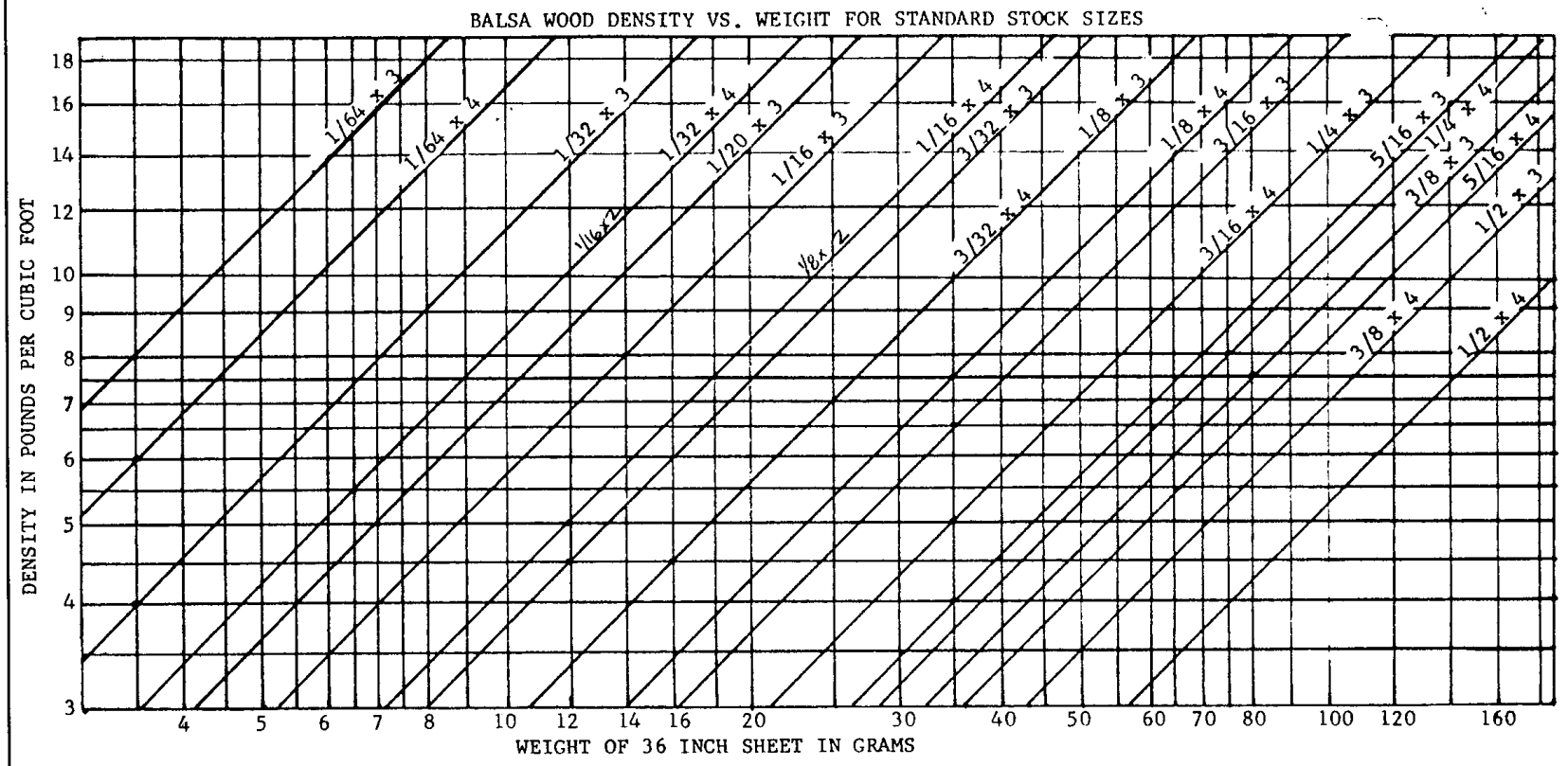


A Close-up of the String Cutter Business End

Yet Another Editor's Note:

What is "going over the top"? The University of Idaho's Kibbie Dome is a great site, some would say the best, with a 141 foot ceiling, and enough floor space for lites on one end, heavies on the other end, and FAC scale off to one side in the center. But it does have large acoustical ceiling tiles, hanging down a few feet below the roof. A model will slide into that space, and never be seen again. Balloons also get away from us all, and stick to the ceiling, leaving long strings hanging down for others' planes to get caught on.

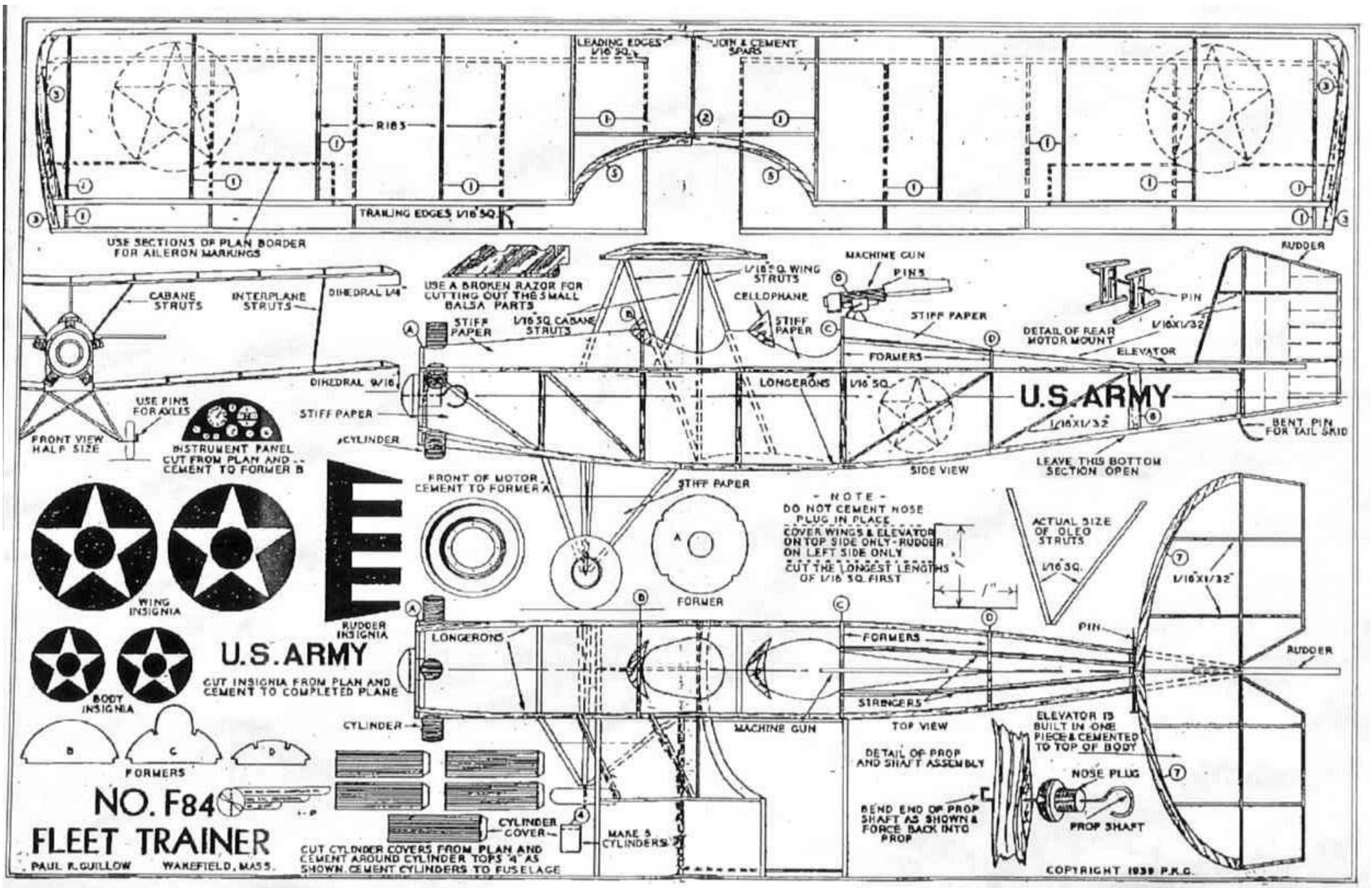
But for the 2005 Kibbie event, Wally Miller and John Lenderman, with the help of Ed Berray, devised a balloon string cutter pictured above, which not only cut string, but enabled John to pull out a few models which went over the top, above the tiles.

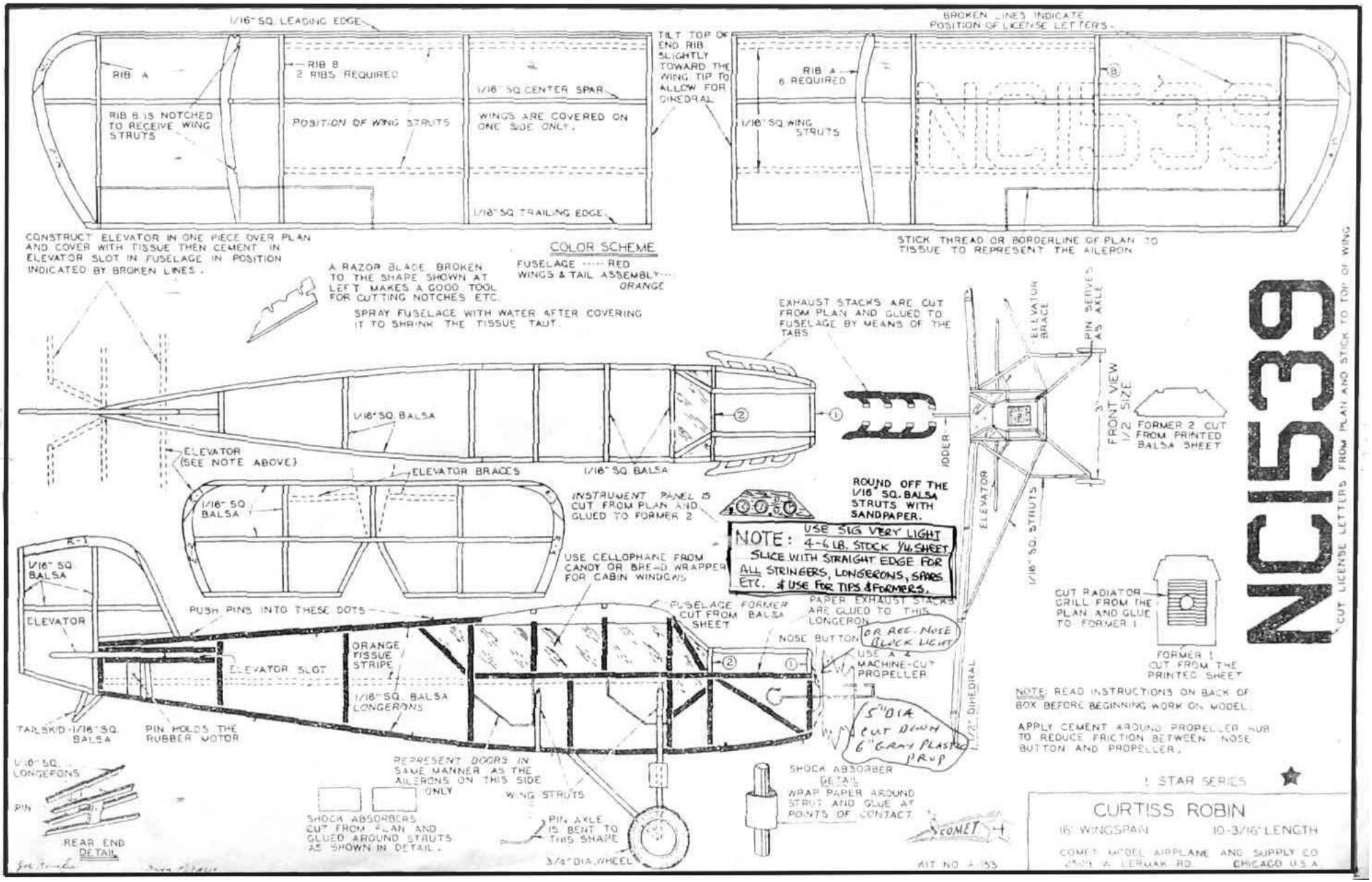


Note: For 2" wide stock, weigh and multiply by 2. Then use 4" wide data

EQUIVALENT SIZES

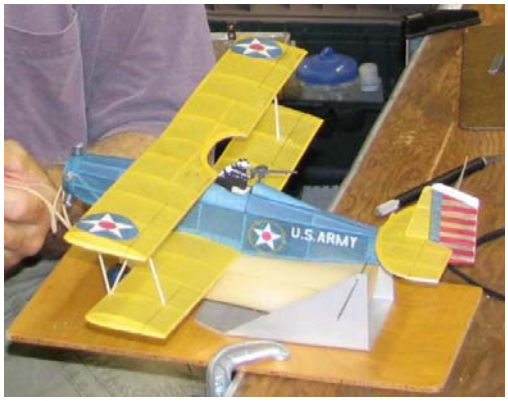
1/64 x 3	1/64 x 4	1/32 x 3	1/32 x 4	1/16 x 3	1/16 x 4	3/32 x 3	3/32 x 4	1/8 x 1
1/8 x 3/8	1/4 SQ	1/8 x 1/4 (3)	1/4 x 1/2	1/8 x 1/2 (3)	1/4 x 1	3/16 SQ (8)	3/8 x 1	1/2 x 1
3/16 x 1/4		3/16 x 1/2		1/4 x 3/4	1/2 SQ	3/8 x 3/4	1/2 x 3/4	
1/8 SQ (3)		1/4 x 3/8		3/8 x 1/2		3/8 SQ (2)		


LEADING EDGES 1/16 SQ.
JOIN & CEMENT SPARS
RIBS
TRAILING EDGES 1/16 SQ.
USE SECTIONS OF PLAN BORDER FOR AILERON MARKINGS
USE A BROKEN RAZOR FOR CUTTING OUT THE SMALL BALSA PARTS
CABANE STRUTS
INTERPLANE STRUTS
DIHEDRAL 1/48
DIHEDRAL 9/16
USE PINS FOR AXLES
FRONT VIEW HALF SIZE
INSTRUMENT PANEL CUT FROM PLAN AND CEMENT TO FORMER B
STIFF PAPER
1/16 SQ CABANE STRUTS
1/16 SQ. WING STRUTS
CELLOPHANE
MACHINE GUN
PINS
STIFF PAPER
FORMERS
LONGERONS
1/16 SQ.
CYLINDER
FRONT OF MOTOR CEMENT TO FORMER A
SIDE VIEW
DETAIL OF REAR MOTOR MOUNT
PIN
1/16X1/32
ELEVATOR
RUDDER
BENT PIN FOR TAIL SKID
LEAVE THIS BOTTOM SECTION OPEN
U.S. ARMY
1/16X1/32
- NOTE -
DO NOT CEMENT NOSE PLUG IN PLACE
COVER WINGS & ELEVATOR ON TOP SIDE ONLY - RUDDER ON LEFT SIDE ONLY
CUT THE LONGEST LENGTHS OF 1/16 SQ. FIRST
ACTUAL SIZE OF OLEO STRUTS
1/16 SQ.
WING INSIGNIA
RUDDER INSIGNIA
BODY INSIGNIA
U.S. ARMY
CUT INSIGNIA FROM PLAN AND CEMENT TO COMPLETED PLANE
FORMER
LONGERONS
FORMERS
STRINGERS
PIN
RUDDER
CYLINDER
MACHINE GUN
TOP VIEW
ELEVATOR IS BUILT IN ONE PIECE & CEMENTED TO TOP OF BODY
DETAIL OF PROP AND SHAFT ASSEMBLY
NOSE PLUG
BEND END OF PROP SHAFT AS SHOWN & FORCE BACK INTO PROP
PROP SHAFT
FORMERS
NO. F84
FLEET TRAINER
CYLINDER COVER
MAKE 3 CYLINDERS
CUT CYLINDER COVERS FROM PLAN AND CEMENT AROUND CYLINDER TOPS "A" AS SHOWN. CEMENT CYLINDERS TO FUSELAGE
PAUL K. GUILLOW WAKEFIELD, MASS.
COPYRIGHT 1939 P.K.G.


1/16" SQ. LEADING EDGE
RIB A
RIB B
2 RIBS REQUIRED
1/16" SQ. CENTER SPAR
RIB B IS NOTCHED TO RECEIVE WING STRUTS
POSITION OF WING STRUTS
WINGS ARE COVERED ON ONE SIDE ONLY.
1/16" SQ. TRAILING EDGE
TILT TOP OF END RIB SLIGHTLY TOWARD THE WING TIP TO ALLOW FOR DIHEDRAL
BROKEN LINES INDICATE POSITION OF LICENSE LETTERS.
RIB A
6 REQUIRED
1/16" SQ. WING STRUTS
NC1539
CONSTRUCT ELEVATOR IN ONE PIECE OVER PLAN AND COVER WITH TISSUE THEN CEMENT IN ELEVATOR SLOT IN FUSELAGE IN POSITION INDICATED BY BROKEN LINES.
COLOR SCHEME
FUSELAGE ..... RED
WINGS & TAIL ASSEMBLY ..... ORANGE
STICK THREAD OR BORDERLINE OF PLAN TO TISSUE TO REPRESENT THE AILERON
A RAZOR BLADE BROKEN TO THE SHAPE SHOWN AT LEFT MAKES A GOOD TOOL FOR CUTTING NOTCHES ETC.
SPRAY FUSELAGE WITH WATER AFTER COVERING IT TO SHRINK THE TISSUE TAUT.
EXHAUST STACKS ARE CUT FROM PLAN AND GLUED TO FUSELAGE BY MEANS OF THE TABS
1/16" SQ. BALSA
ELEVATOR (SEE NOTE ABOVE)
ELEVATOR BRACES
1/16" SQ. BALSA
1/16" SQ. BALSA
INSTRUMENT PANEL IS CUT FROM PLAN AND GLUED TO FORMER 2
ROUND OFF THE 1/16" SQ. BALSA STRUTS WITH SANDPAPER.
NOTE: USE SIG VERY LIGHT 4-6 LB. STOCK 1/16 SHEET. SLICE WITH STRAIGHT EDGE FOR ALL STRINGERS, LONGERONS, SPARS ETC. & USE FOR TIPS & FORMERS.
USE CELLOPHANE FROM CANDY OR BREAD WRAPPER FOR CABIN WINDOWS
PUSH PINS INTO THESE DOTS
FUSELAGE FORMER CUT FROM BALSA SHEET
PAPER EXHAUST STACKS ARE GLUED TO THIS LONGERON
NOSE BUTTON
OR REG. NOSE BLOCK LIGHT
USE A 2 MACHINE-CUT PROPELLER
5" DIA CUT DOWN 6" CARV PLASTIC PROP
1/16" SQ. BALSA
ELEVATOR
ELEVATOR SLOT
ORANGE TISSUE STRIPE
1/16" SQ. BALSA LONGERONS
TAILSKID-1/16" SQ. BALSA
PIN HOLDS THE RUBBER MOTOR
1/16" SQ. LONGERONS
PIN
REAR END DETAIL
REPRESENT DOORS IN SAME MANNER AS THE AILERONS ON THIS SIDE ONLY
WING STRUTS
SHOCK ABSORBERS CUT FROM PLAN AND GLUED AROUND STRUTS AS SHOWN IN DETAIL.
PIN AXLE IS BENT TO THIS SHAPE
3/4" DIA. WHEEL
SHOCK ABSORBER DETAIL
WRAP PAPER AROUND STRUT AND GLUE AT POINTS OF CONTACT.
COMET
AIT NO. A-153
ELEVATOR BRACE
PIN SERVES AS AXLE
FRONT VIEW 1/2 SIZE
3"
JIGGER
ELEVATOR
1/16" SQ. STRUTS
1/2" DIHEDRAL
FORMER 2 CUT FROM PRINTED BALSA SHEET
CUT RADIATOR GRILL FROM THE PLAN AND GLUE TO FORMER 1
FORMER 1 CUT FROM THE PRINTED SHEET
NOTE: READ INSTRUCTIONS ON BACK OF BOX BEFORE BEGINNING WORK ON MODEL.
APPLY CEMENT AROUND PROPELLER HUB TO REDUCE FRICTION BETWEEN NOSE BUTTON AND PROPELLER.
CUT LICENSE LETTERS FROM PLAN AND STICK TO TOP OF WING
NC1539
STAR SERIES
CURTISS ROBIN
16" WINGSPAN
10-3/16" LENGTH
COMET MODEL AIRPLANE AND SUPPLY CO.
2509 W. LEMAK RD. CHICAGO U.S.A.

Fleet Trainer
FAC Dime Scale

Gary Hodson, Bonner Springs, KS



The first plan is the F-6 Fleet Trainer. It is a 1939 version by Guillows with a 16" span, and qualifies for FAC Dime Scale. It could also be flown in Peanut Scale if reduced to 13" span. The model at right is by Gary Hodson of Bonner Springs, Kansas. He has it decked out in blue and yellow tissue with the color scheme of the time period. It is suitable for indoor or outdoor FAC scale events, and is a great flying model.

Built for indoor, this model weighs approximately 6 grams, less the motor. The motor is 18" long and weighs 1.75 grams. Both wings are set at the same incidence.

Curtis Robin
Dime Scale

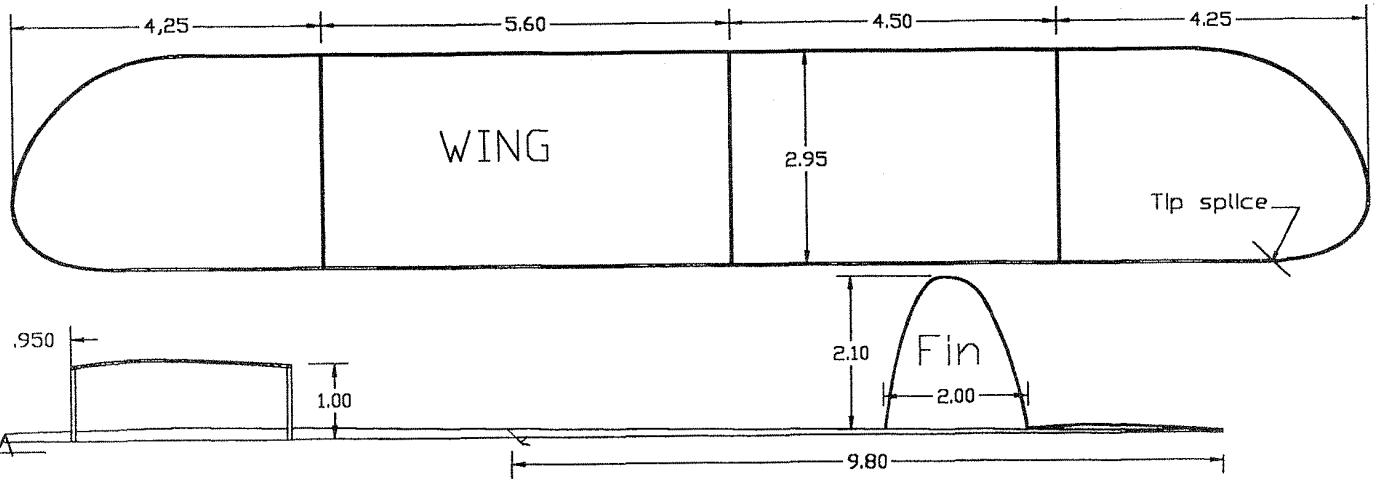
John Barker, Atlanta, GA

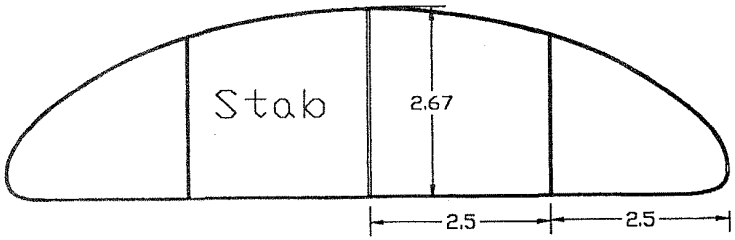
Photo by Gary Hodson

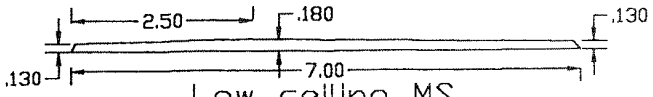
My venture into building scale came when I joined the MIAMA club with Doc Martin. Flying my favorite lightweights did not gain many points for the annual trophy. Dime scales were popular with 6 or 7 flyers at each contest. The Robin was cute and seemed to be a good flyer, so I built one. It was lighter than most and won the first two monthly contests getting me a lot of points. Doc would not let any two time winner compete any more that season. So I had to start building again.

Permitted deviations from the original dime scale kit plan include a larger tail and a regular nose block. The construction is simple, however, I have added some notes of my own on the plan. It took me a while to figure out the landing gear and I wondered if all those struts would hold up. No problem. Keep the plane light. I sliced all the 1/16 sq. from light sheet. Use the 'hard' side for longerons, wing L.E., wing and gear struts. The soft side for all else especially the tail. When covering, do not dope the wings or tail, and only one much thinned coat for the fuselage. Assemble the ship, being careful to get the wing settings identical. Attach the vertical stab so that a glue spot at the L.E. can be softened for turn trimming.

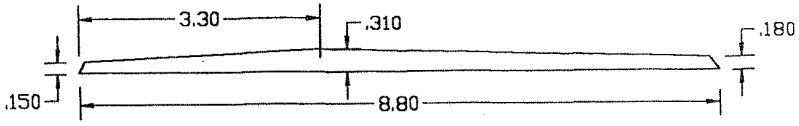
The wheels are two laminations of 1/32 sheet with aluminum tube bearing. The prop is last. Use one of those nice gray 6 in. plastic ones, or similar, cut down to 5 in. dia. Turn on your favorite TV program and start scraping away on the front face of the prop with a single edge razor blade. The object is to reduce its thickness so that it provides the right weight to balance the model about 1/8 in ahead of the wing spar. Hold it up to a bright light to judge your progress. My model which (now !!) weighs 6 1/2 grams flies well in a gym using an 18 in. loop of 0.07" Tan. For much higher sites a longer, thicker motor plus nose ballast will be required.



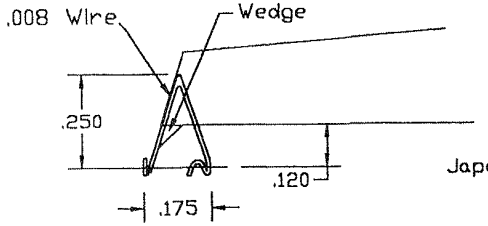




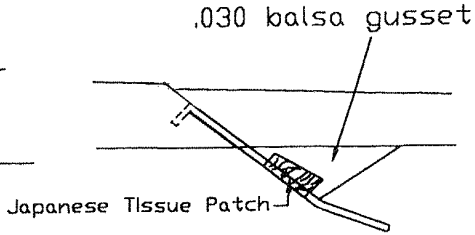
Low ceiling MS



high ceiling MS



Bearing Detail



Rear Hook Detail

MICRO-B

Designed by Larry Coslick
Drawn by Steve Gardner

3-11-02

MICRO-B

An EZB For All Ceilings
by Larry Coslick, St. Louis, MO

Larry needs no introduction to the indoor community. His watershed Hobby Shopper design was voted best indoor Model of the Year in the 1999 National Free Flight Society's Symposium. Plans for the model came out in Indoor News and Views in 1997, and included step-by-step wood selection, building and trimming instructions, with clear plans and illustrations by Steve Gardner.

The idea was for an entry-level modeler to use hobby shop materials and build a competitive indoor model on the first or second try. Now with the Micro-B concept, Larry moves us on to contest-grade materials from F1D.biz, and a flexibility to fly both low and high ceiling sites with the same model design. Only the motorstick is different.

"The Micro concept was started in the early 1990's when I became interested in no touch flying. The idea was to get an EZB to post 13 minutes flights, in a 30 foot site. At that time my EZB's weighed around 0.8 grams with a 9 inch motor stick and I didn't think it was necessary to use a long motor stick to achieve 13 minute no touch flights. After a series of motor stick length changes, a 5.6" version was settled on, and this model weighed 0.5 grams. It proved to be the ideal EZB for local contests and did every thing that I wanted, and more. As my building and wood selection skills improved, the motor stick was lengthened to 7" with a model weight of less than 0.4 grams. The 7" version provided the extra motor stick length to use a longer motor which gave a longer cruse, and the flight times increased to around 17 minutes. I flew a 6.75" model at the 1997 Canadian Nationals in Toronto. The model did 24 minutes, no touch, in a 65' ceiling on a 0.025 x 8" loop of 8/93, Tan II.

"Selecting the lightest and stiffest wood is extremely important when building these light models, and it may be necessary to cut wood from several sheets to get the desired weight and stiffness. My Micro-B's have won twenty four out of twenty seven low ceiling contests that they were entered in, and these models are a delight to watch as the prop rotates in the low sixties."

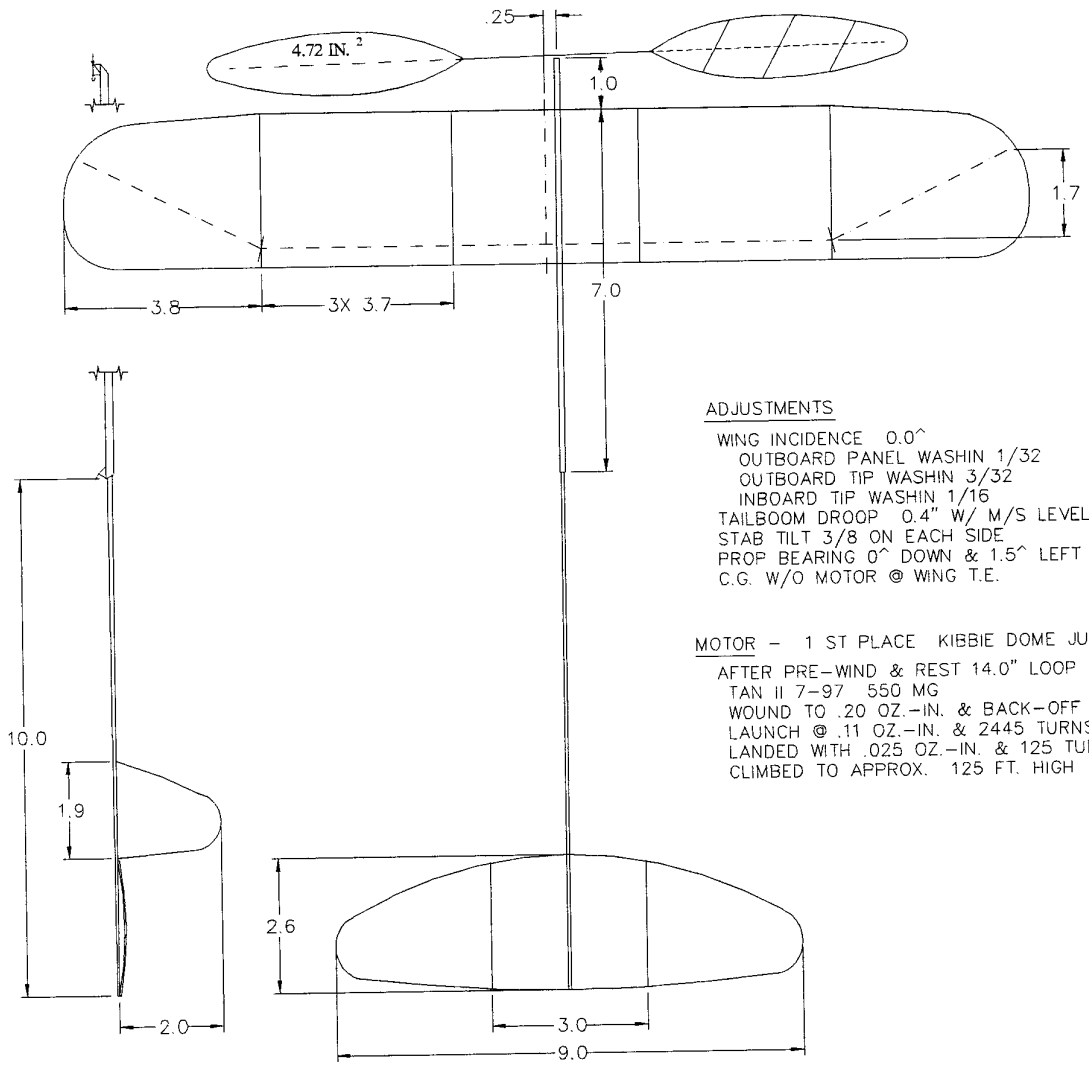
We would refer the reader to the original articles for stiffness testing, and to Mike Palrang's method in this issue. The idea is not to make one motorstick, but to make a dozen, and test them against one another.

Wood Dimensions and Weights

Motorsticks			
Low Ceiling	3.9#	0.095” thick, 0.130 high front and back, 0.180” middle	0.102 g
High Ceiling	3.9#	0.095” thick, 0.150 high front and back, 0.310” middle	0.102 g
Tail boom		0.055” x 0.070” taper to 0.025” x 0.025”	0.032 g
Wing L/E	4.8#	0.025” x 0.067” x 10.5”	0.025 g
Wing T/E	4.8#	0.025” x 0.061” x 16.5”	0.032 g
Wing Tips	3.4#	0.025” x 0.060” at LE taper to 0.025” x 0.035” at TE	0.018 g for 2
Wing Ribs	4.5#	0.018” x 0.055”	0.01 g for 3
Wing Posts	8-9#	0.032” x 0.058” x 1”	0.01 g for 2
Stab Spars	4#	0.023” x 0.027” x 18”	0.02 g for 2
Stab Ribs	4.5#	0.008” x 0.030”	0.003 for 3
Fin	4#	Same as Stab spar	
Prop Blades	3.8#	Cut from sheet 0.006” x 1.2” x 18”	0.06 g for 2
Prop Spar	4.6#	0.035” x 0.058” taper to 0.025” x 0.030”, 6.2” each	0.02 g
Prop Shaft		0.008” wire	0.005 g

AUW without motor – 0.382 grams

"If you're going to launch like that you need to wear spandex pants."



ADJUSTMENTS

WING INCIDENCE 0.0^
OUTBOARD PANEL WASHIN 1/32
OUTBOARD TIP WASHIN 3/32
INBOARD TIP WASHIN 1/16
TAILBOOM DROOP 0.4" W/ M/S LEVEL
STAB TILT 3/8 ON EACH SIDE
PROP BEARING 0^ DOWN & 1.5^ LEFT
C.G. W/O MOTOR @ WING T.E.

MOTOR – 1 ST PLACE KIBBIE DOME JUL '04 28:24

AFTER PRE-WIND & REST 14.0" LOOP .031 X .040
TAN II 7-97 550 MG
WOUND TO .20 OZ.-IN. & BACK-OFF 165 TURNS
LAUNCH @ .11 OZ.-IN. & 2445 TURNS
LANDED WITH .025 OZ.-IN. & 125 TURNS LEFT
CLIMBED TO APPROX. 125 FT. HIGH

WING
L.E. .024 X .107 – .024 X .055 (4.3#) 22 MG @ 12" LG
T.E. .024 X .107 – .024 X .045 (4.3#) 21 MG @ 12" LG
TIPS .018 X .045 – .018 X .025 (4.0#) 9 MG @ 12" LG
RIBS .018 X .030 (4.5#) 6" RADIUS ARC
POSTS .046 X .046 – .046 X .75 LG. (5#)

STAB
SPARS .018 X .037 – .018 X .024 (4.5#) 8 MG @ 11.5" LG
RIBS .021 X .022 (3.8#) 7.5" RADIUS ARC

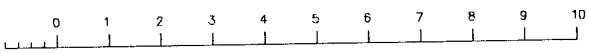
MOTORSTICK
.078 X .174 – .135 X 8.0 LG. (4.7#)
PROP BEARING .009 WIRE W/ .020 GUSSET
REAR HOOK .008 WIRE W/ .020 GUSSET

TAILBOOM
.040 X .098 – .024 X .025 X 10.0 LG.
RUDDER .020 X .020 (4.5#)

PROP 13.5 X 25 PITCH
SPARS .047 X .072 – .020 X .030 X 6.25 LG.
PROP SHAFT .008 WIRE
BLADES .007 THK. (4.0#/4.5#)

WEIGHTS

WING DRY 67 MG
WING COVERED 107 MG
WING COMPLETE 114 MG
STAB DRY 18 MG
STAB COVERED 28 MG
MOTORSTICK BLANK 142 MG @ 8.05" LG.
MOTORSTICK COMPLETE 159 MG
TAILBOOM BLANK 36 MG
TAILBOOM W/ RUDDER 39 MG
PROP SPAR W/ SHAFT 35 MG
PROP BLADES 39 MG EACH
PROP COMPLETE 112 MG
COMPLETE PLANE W/O PROP 344 MG
COMPLETE PLANE W/ PROP 455 MG



EZ-B #12

MIKE PALRANG
AUG. 1998

DEFLECTON DATA FOR EZ-B #12

MIKE PALRANG APRIL '97

WING SPAR L.E. (SEE FIG. 1)
" L " = 7.0"
" W " = 125 MG
" E " = 0.1"
" D " = 0.23"

WING SPAR T.E. (SEE FIG. 1)
" L " = 7.0"
" W " = 125 MG
" E " = 0.1"
" D " = 0.23"

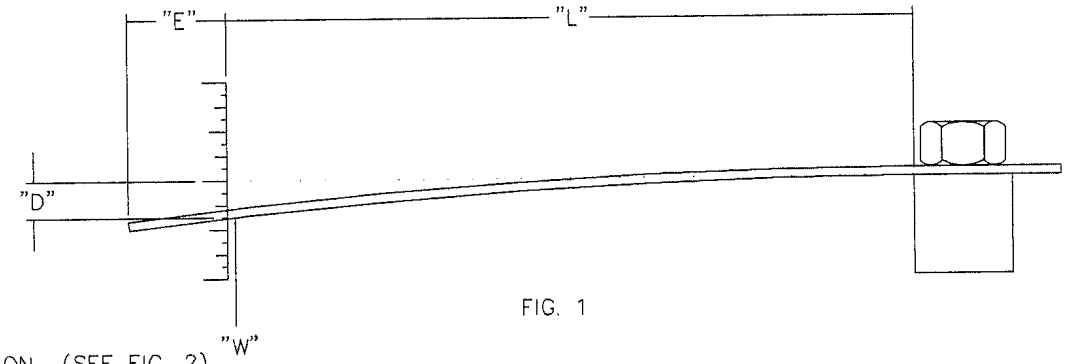


FIG. 1

MOTORSTICK BLANK-IN THE STRONG DIRECTION (SEE FIG. 2)
" L " = 7.0"
" W " = 50 GRAMS
" D " = 0.120"

MOTORSTICK-IN THE WEAK DIRECTION (SEE FIG. 2)
" L " = 7.0"
" W " = 16 GRAMS
" D " = APPROX. 0.120"

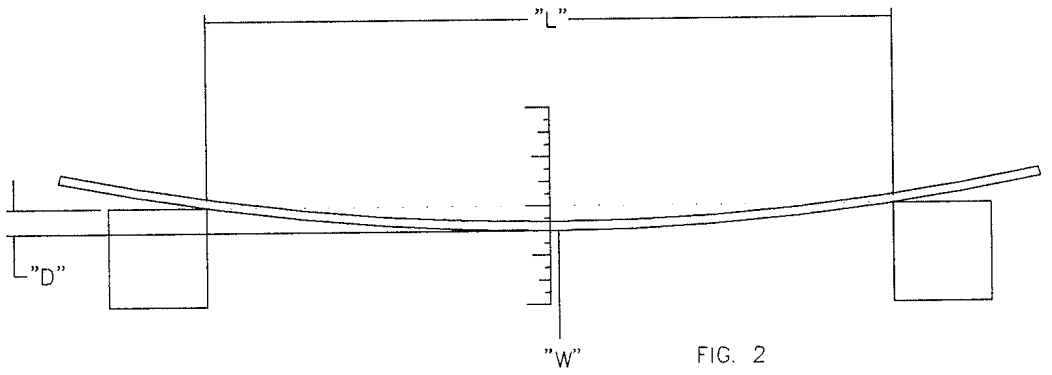


FIG. 2

TAILBOOM-BEFORE TAPERING .040" WIDTH (SEE FIG. 1)
" L " = 7.0"
" W " = 360 MG
" E " = 2.0"
" D " = 0.30"

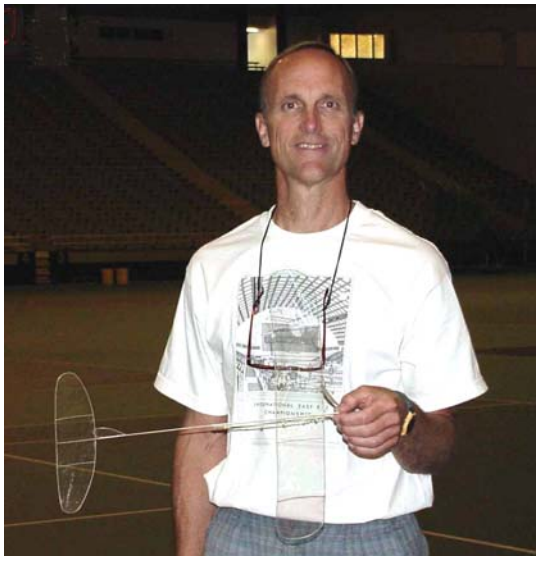
PROP SPAR-BEFORE TAPERING .040" WIDTH (SEE FIG. 1)
" L " = 5.0"
" W " = 125 MG
" E " = 0.5"
" D " = 0.12"

MOTORSTICK TWIST= 42° @ 15.6 GM-IN

EZB-12

First Place Kibbie Dome 2004, 28:24
University of Idaho at Moscow

by Mike Palrang, Mountain View, CA



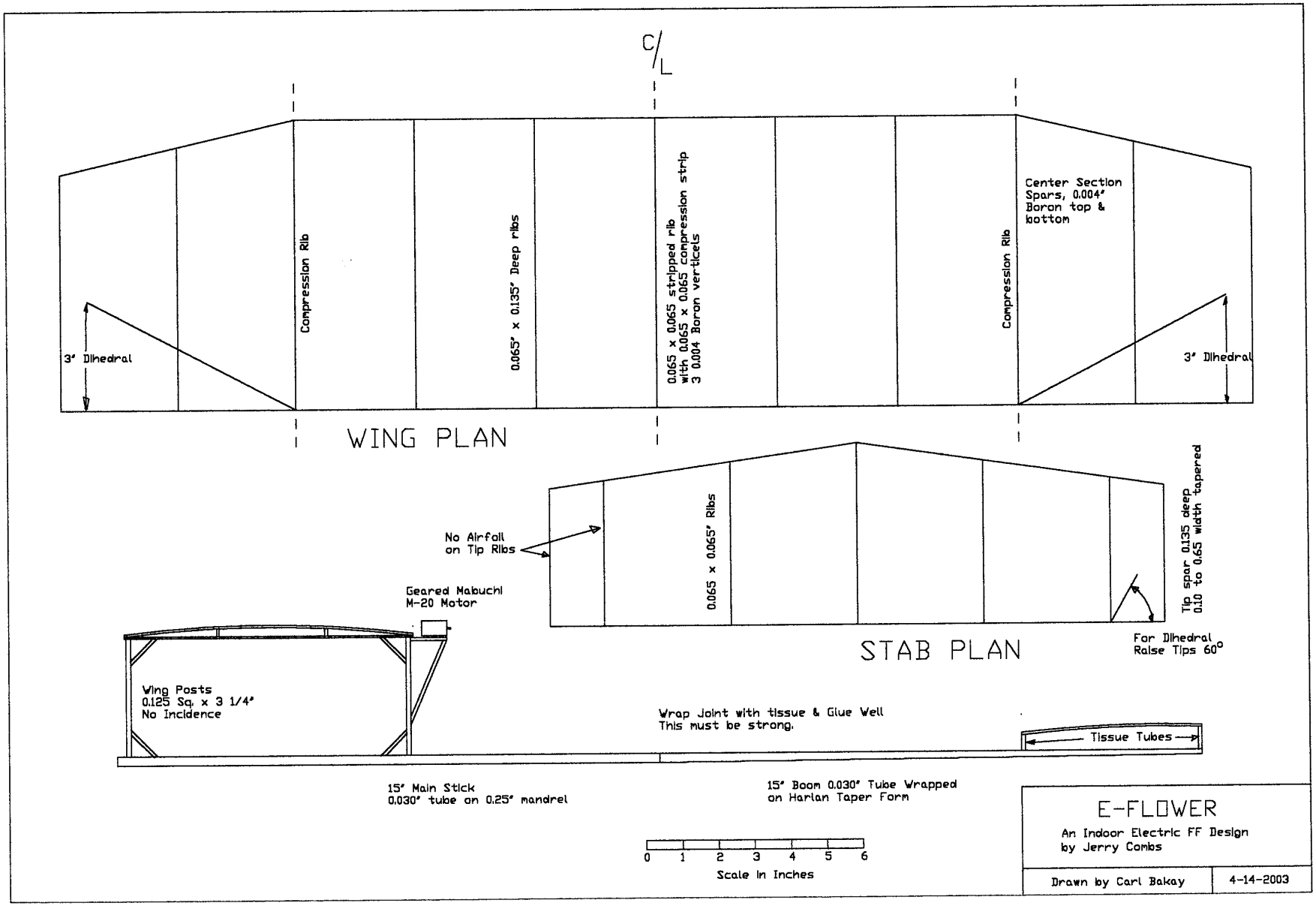
The best advice I could give someone wanting to build competitive, light weight EZ-B's is to build the simple fixtures needed to test wood and record your test data. Test motor sticks for twist as well as bending. A piece of balsa that is good in twist, but not so good in bending is preferable to the reverse. You can't just test for bending and figure its a good piece of balsa and therefore will be good in twist. Test wing spars, prop spars and tailbooms for bending.

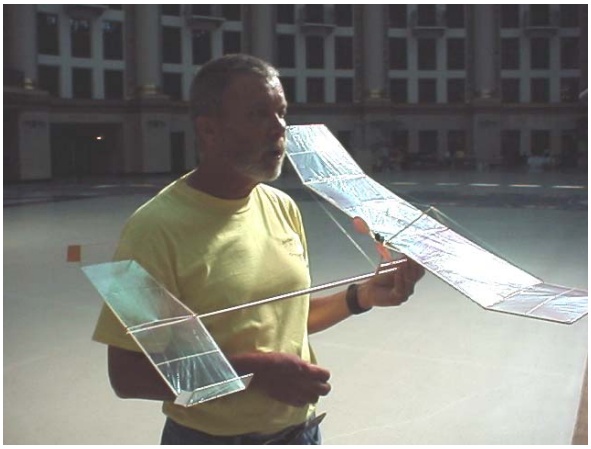
And very importantly read everything that Larry Coslick has written on the subject of EZ-B's. After you've flown them for a while go back and reread his stuff. Things that you didn't understand the first time might now be more clear. Realize that anything you do to "change or improve" on his plans has about a 90% chance of causing a problem or making the plane fly worse (even if you don't understand why). Read ANY articles on EZ-B's. Bernard Hunt, Chuck Markos and many others have published plans and info that is invaluable when building this design. Don't be afraid to back-off 100-200 turns to get a clean launch. My 450 mg EZ-B launches at 0.11 oz-in and my 1.2 gm EZ-B launches at 0.30 oz-in. If your plane weighs some where in between, it should launch at the proportionate torque.

If you struggle with flaring props as I did, then try a symmetrical prop or just build more props. I have built 15 EZ-B's and 2 or 3 times that many props. My flaring props fluttered and would not climb. Wood selection is even more important with them. I did have some success with them for flying full motors in a low ceiling site where the launch torque is low. Blade area as well as prop diameter both have a large effect on how your plane flies. Starting out with an undersize prop and working your way up to larger props is preferable to me. At least your plane is flying and letting you get the flying surfaces dialed in. An oversize prop will make your plane stagger around and it won't climb. All the subtle flying surface adjustments required to get an EZ-B flying correctly will be masked by the prop induced problems.

If you have access to a small building for test flying don't underestimate the value of partial motor testing. They won't fly exactly the same in a big building, but they will be very close. And above all else have FUN with your EZ-B. There are many opportunities to advance your knowledge of what it takes to make one fly good (or many opportunities to find out what doesn't), but there are also many rewards of good flights. For such a seemingly simple plane some pretty long flight times are attainable.

Sincerely, Mike Palrang


C/L
3° Dihedral
Compression Rib
0.065" x 0.135" Deep ribs
0.065 x 0.065 stripped rib
with 0.065 x 0.065 compression strip
3 0.004 Boron verticels
Compression Rib
Center Section
Spars, 0.004"
Boron top &
bottom
3° Dihedral
WING PLAN
No Airfoil
on Tip Ribs
0.065 x 0.065" Ribs
Tip spar 0.135 deep
0.10 to 0.65 width tapered
For Dihedral
Raise Tips 60°
STAB PLAN
Geared Mabuchi
M-20 Motor
Wing Posts
0.125 Sq. x 3 1/4"
No Incidence
Wrap Joint with tissue & Glue Well
This must be strong.
Tissue Tubes
15" Main Stick
0.030" tube on 0.25" mandrel
15" Boom 0.030" Tube Wrapped
on Harlan Taper Form
0 1 2 3 4 5 6
Scale in Inches
E-FLOWER
An Indoor Electric FF Design
by Jerry Combs
Drawn by Carl Bakay
4-14-2003



E-FLOWER

An Electric FF Model

By Jerry Combs, Wyandotte, OK

Photo shows Jerry at West Baden in 2003

For a long time I was making powered glides with my FF Duration model. I was trying the Campbell 10 cm red prop; it didn't have quite enough oomph at 1.2v to climb. Now I am trying cut down blue 12 cm props. Static tests look fair with motor run times around 20 minutes. Here is some info.

My model is not really that light, it weighs 19 grams. I am using 0.100 x 0.080 spars which are pretty beefy. Each spar has 0.004 boron on all 4 faces and I still had to brace the wing with 0.004 spiderwire (in the fishing tackle section of your local box store). I may well be all wet on this, but I think a wing that flexes too much is giving away efficiency. Dihedral on the wing is 3". Tip dihedral on the stab is 60 degrees.

I am running the low kV M-20 Mabuchi motor with 4.6 to 1 gearing, and using an uncut 12 cm blue plastic prop, with the cells in parallel so the voltage is only 1.2V. This upped the run time considerably. I am using the same gear ratio on the FF as on the R/C. I tried going for a double reduction gear train like Ray Harlan uses, but apparently I am not as good as he is at setting up the gear train. It cut my duration in half, so now I use a single stage gear train. I do like to use Futaba gears since they are easy to find for me.....I used to fly a lot of slope gliders which are murder on servo gears. (Some bigger RC hobby shops sell Futaba replacement gears in wall packages in all sizes. –Ed.)

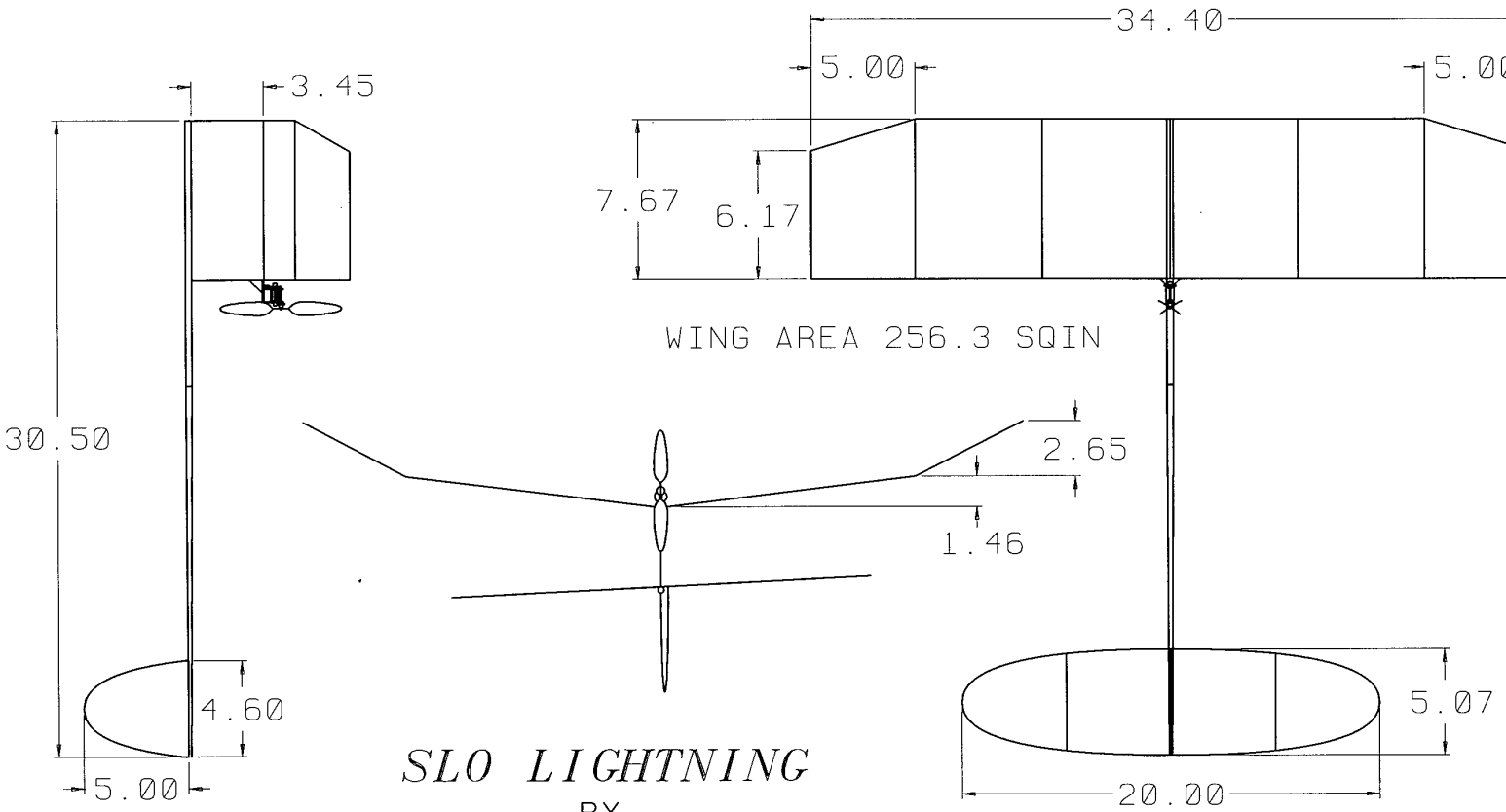
I am using a 0.063 carbon rod for a shaft and a Q-Tip as a bearing. Here is a tip that I use on the model: the 0.063 carbon output shaft is almost a perfect fit in a piece of tubing that is used on the generic Q-Tips that you find at Wal-Mart, it makes a pretty good cheap bearing. Cut a thin slice for a thrust washer and use a small o-ring made from fuel line to keep the shaft from sliding from the gear train.

By the way, a source of KP00 low Kv motors is those E-Chargers that you find in Wal-Mart toy departments. The 12 tooth pinion gear works well with Futaba servo gears too. Can you tell I am a scrounge?
(Bravo, Jerry. E-Charger planes cost $9.95, and you get the same Mabuchi M-20 motor geared the same 12:32, or 2.6:1, but called the KP-00, which is $17.95 in other catalogs!!! -Ed.)

I started testing my batteries in a different way than I had been, with interesting results. I am now testing the batteries one at a time by charging them and recording the voltage and capacity readings from my Astro Flight 110D charger, then timing the run on a test motor and comparing the results. I am finding that some cells will only charge to 20 mAh and give a run time of 4 to 5 minutes while others give 15 minutes. These batteries are all from the same lot, so there is apparently a huge difference between cells, even in the same batch. Sounds like the Tan II situation doesn't it? <grin> Hope this will help you in your endeavors too. Testing individual cells is very time consuming but I think it will be worth it in the long run.

I am getting 13+ minutes on my E-Flower. I think you would enjoy one. It is very simple in concept and very easy to build.

MOTOR: MABUCHI M20
PROP: 5.75 DIA, 6.8 PITCH
WEIGHT: 18.4 GRAMS
POWER: 2 50-MAH CELLS



SLO LIGHTNING

BY

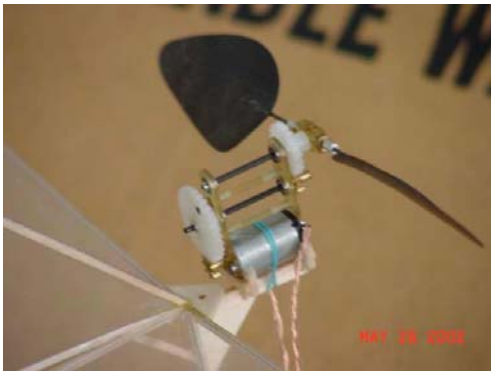
RAY HARLAN

SLO LIGHTNING

EVENT 221

ELECTRIC FF

by Ray Harlan



When the Indoor Electric Free Flight event was going to be adopted in 2002, I was intrigued by the concept. I had never flown any electric models and wondered what a motor and batteries would be like as a powerplant. The event was flown at the Buffalo meet in 2001 and Jack McGillivray flew a model for more than 20 minutes in the Bill's field house. I had to find out what motor he used; he showed me the KP00 and that was the start for me. This motor has plenty of power, yet can draw little current, if just one cell's worth of voltage is used. That means running the two allowable cells on parallel. Just don't try to charge them in parallel!

I had a model built by the time the event was official, in January of 2002. I flew it for 10:48 in the MIT DuPont gym and applied for the Cat II record. At Lakehurst in May, the model did 28:32 and at USIC it did 30:30. The next year I had a better understanding of controlling altitude and flew it to 26:28 in the gym for a new Cat II record. Then on to West Baden, where it had its longest flight, 31:00. Over the course of these two years, the model has had a number of crashes and wings were rebuilt. Building a structure that will handle the weight and inertia of two nicads is tricky. Boron helps a lot, but it must be glued down well.

Controlling altitude with electrics is very different from rubber. The peak torque from rubber is 6-7 times higher than the average torque. The peak voltage in a Nicad cell is only 20% higher than the average. You can't back off voltage to control the climb very effectively. The answer is to adjust the pitch of the prop. Do this a little at a time, or else the model might race to the roof. My prop has a plastic hub with tapped holes for threaded rod prop spars. A locking nut is used to hold a blade at a set angle. I use a pitch gage to get both blades the same.

If you try your hand at one of these, do your best not to let it hit anything. It will be easily damaged. It will fly a little faster than a Pennyplane, so steering is something of a challenge, but can be done. All covering is Super Ultrafilm. I put the motor behind the wing to protect the prop and make steering easier. If the wing tips are strong, the model will pivot on the balloon string if it contacts a tip.

SLO LIGHTNING WEIGHT SCHEDULE

Wing	Spars	0.055" sq 6# +4 .003 boron		
	Ribs	0.042 x 0.070 5.5#		
	Stilts	0.075 dia. + 0.004 boron		
	Cabane	0.063" sq 5#	1.38 g	
Stab	Spars & Ribs	0.055 sq 5.0#	0.51 g	
Rudder	Outline& Ribs	0.055 sq 5.0#	0.08 g	
Sick & Boom	Blank	12.75 x 1 x 0.020 4.5# +4 .004 boron		
	Blank	18 x 0.65 x 0.014 4.5# +4 .004 boron		
	Battery Box	0.03 sheet 4.5#	1.77 g	
Motor		Mabuchi M-20	3.62 g	
Gearbox		9.375:1 homemade	2.03 g	
Prop		5.75 D x 6.8 P	1.50	
Wiring			0.31 g	
Batteries		2 x 50 mAh NiCd	7.20 g	Total Weight 18.40 g

35 CM

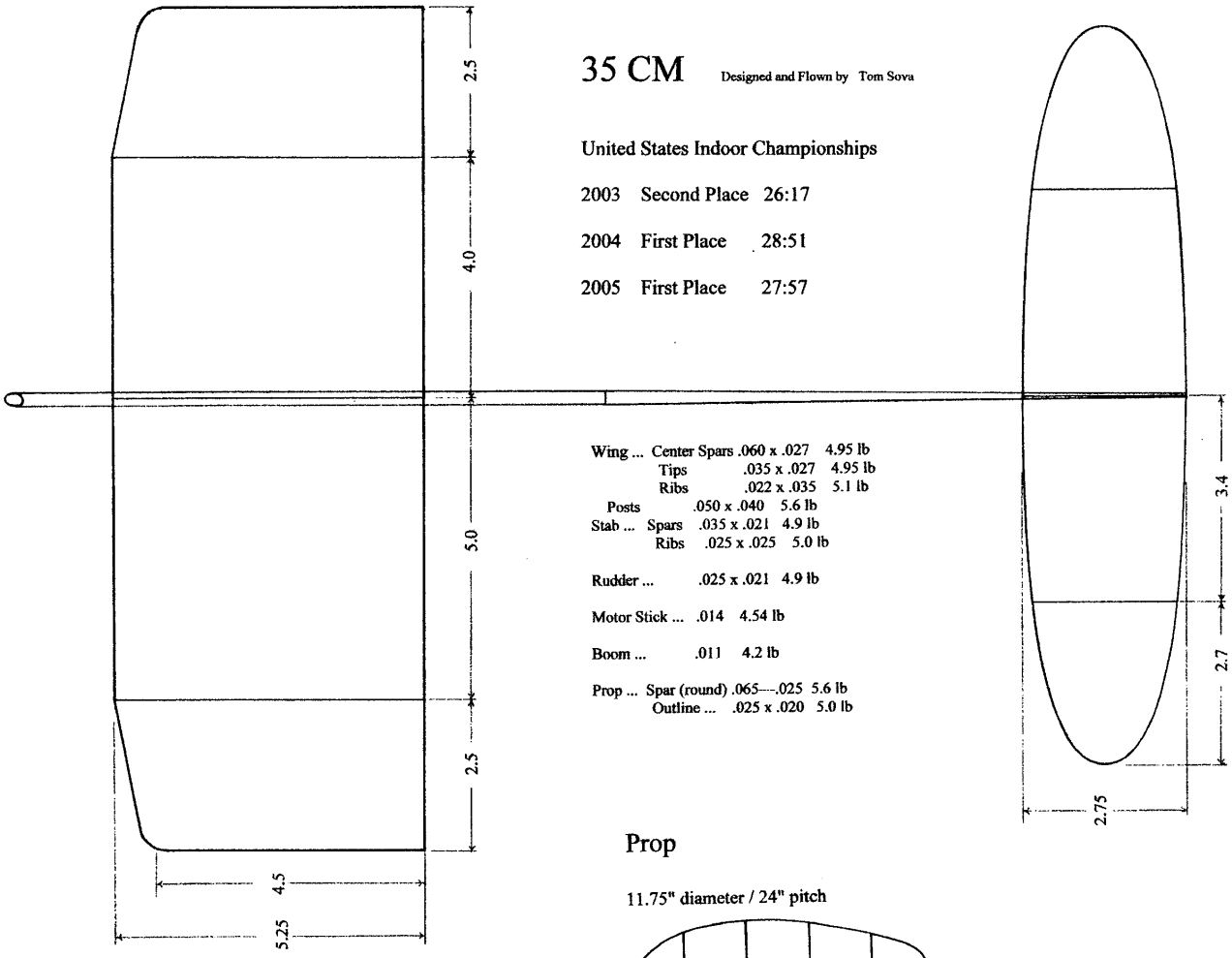
Designed and Flown by Tom Sova

United States Indoor Championships

2003 Second Place 26:17

2004 First Place 28:51

2005 First Place 27:57



Wing ... Center Spars .060 x .027 4.95 lb
Tips .035 x .027 4.95 lb
Ribs .022 x .035 5.1 lb
Posts .050 x .040 5.6 lb
Stab ... Spars .035 x .021 4.9 lb
Ribs .025 x .025 5.0 lb

Rudder ... .025 x .021 4.9 lb

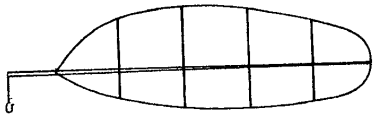
Motor Stick ... .014 4.54 lb

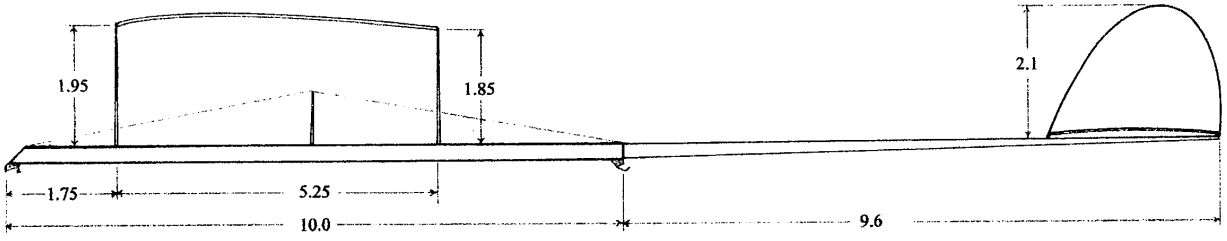
Boom ... .011 4.2 lb

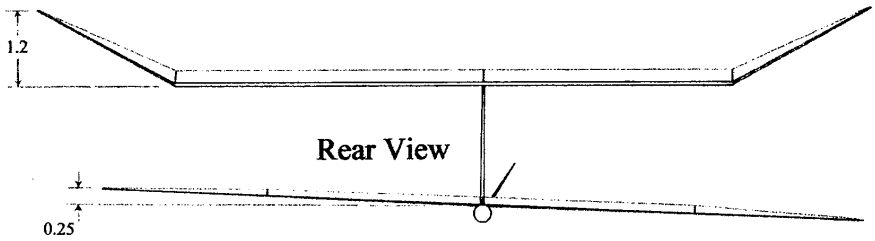
Prop ... Spar (round) .065—.025 5.6 lb
Outline ... .025 x .020 5.0 lb

Prop

11.75" diameter / 24" pitch







Rear View

Weights (grams)

Wing.....0.100
Prop.....0.095
Rest.....0.250

Total....0.445

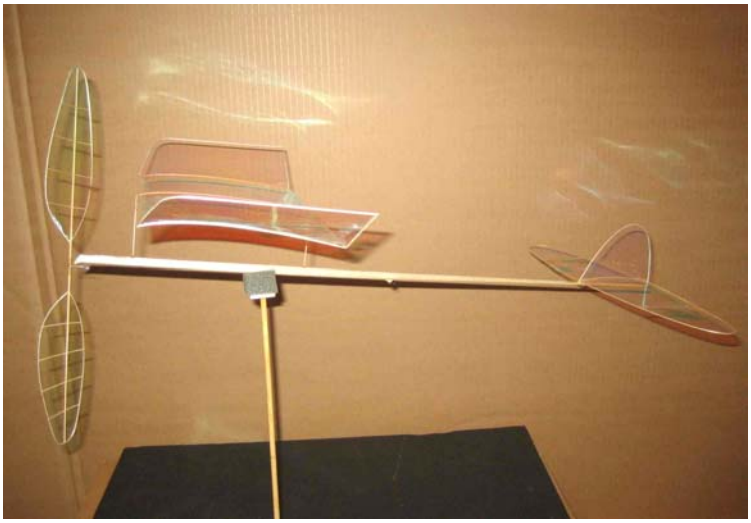
A Winning 35 Cm Design

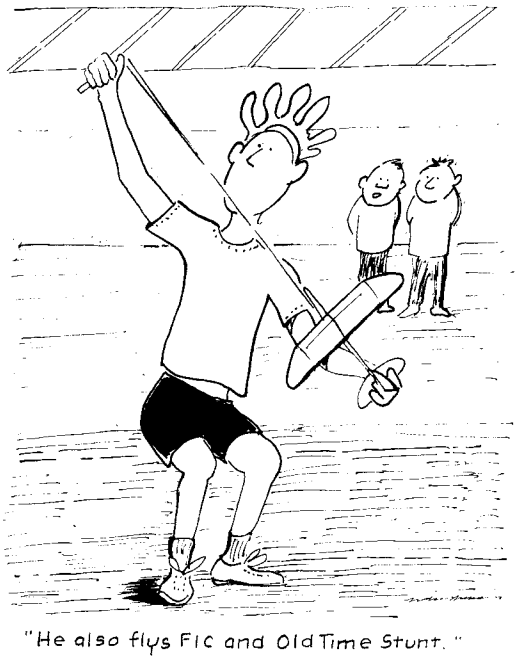
By Tom Sova, Sylvania, Ohio

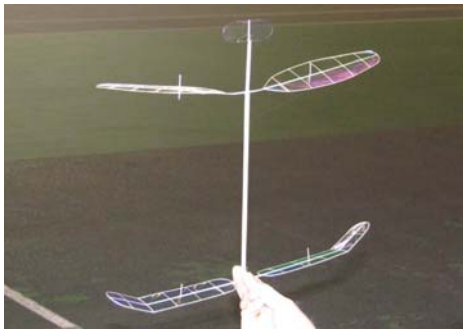
First Place Winner
USIC 2004, 2005

One of my favorite events is the 35 CM event. The rules are simple. The only restriction is that the wing span shall not exceed 35 cm. There are no restrictions on chord, model length, prop, covering, or rubber weight. These simple rules allow for a lot of experimentation in design. My first 35 cm model was built for the 1995 USIC. This model was built to regain some building and modeling skills following a long layoff from modeling. I managed to win the event with a time of 19:11. Over the last couple of years this event has become more popular and the competition has become fierce.

The plane shown here was designed for the 2003 USIC and is my third in a series. Times progressed from 19:11 to 25:47 for the second plane and are now around 29 minutes with a fixed pitch prop for this design. Bob Bailey is currently able to turn times in the mid 30 minute range using a variable pitch prop in this event. Construction is straightforward. I haven't been very concerned with weight. The model is quite robust at 445 mg. The prop is an enlarged version of Larry Loucka's winning A ROG prop and works well for me. If this is going to be your first 35 cm I suggest you start out with a lower pitch or slightly smaller diameter prop, trim the plane, and work your way up. I hope this design will spark more interest in this simple, fun event.





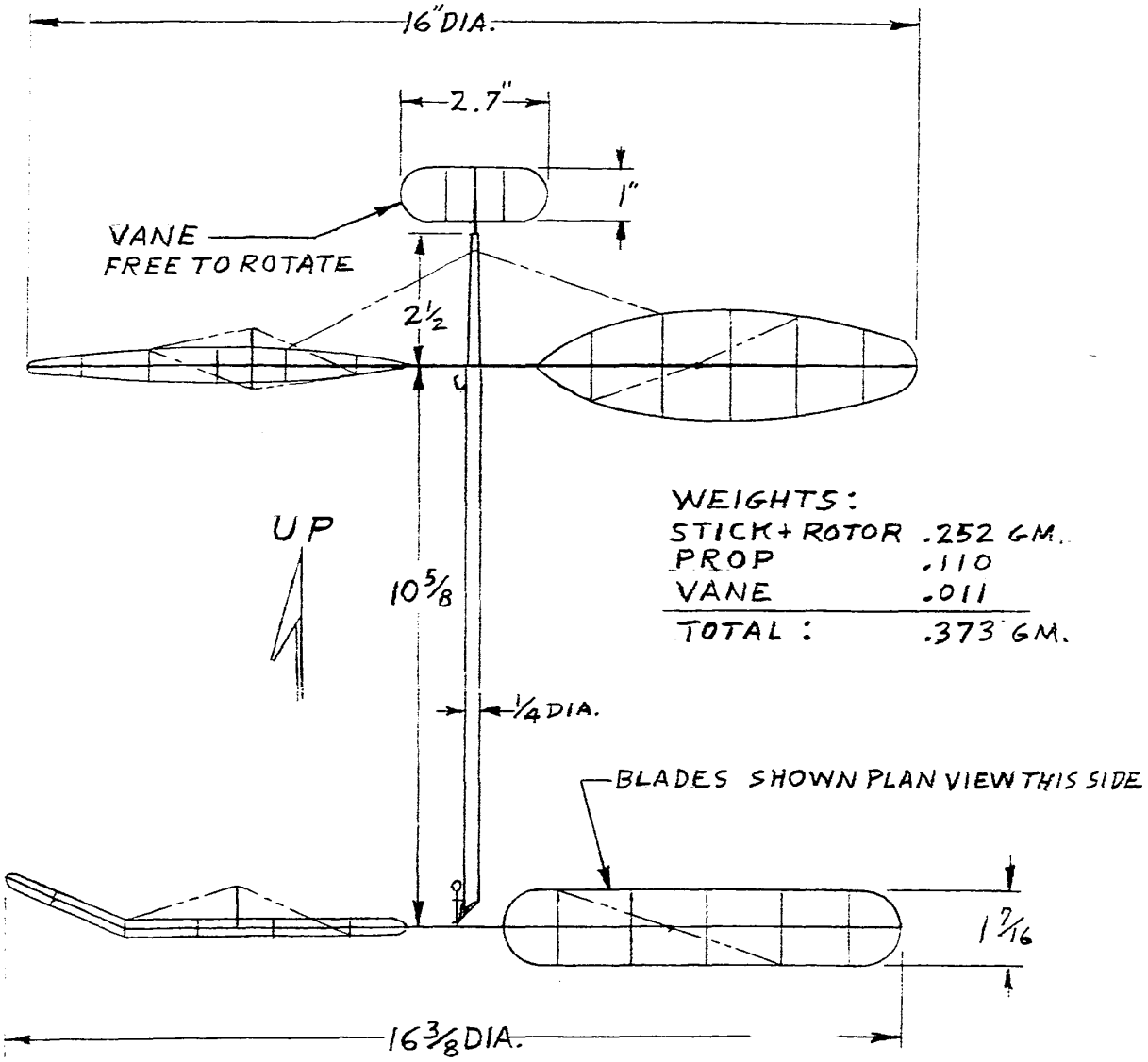


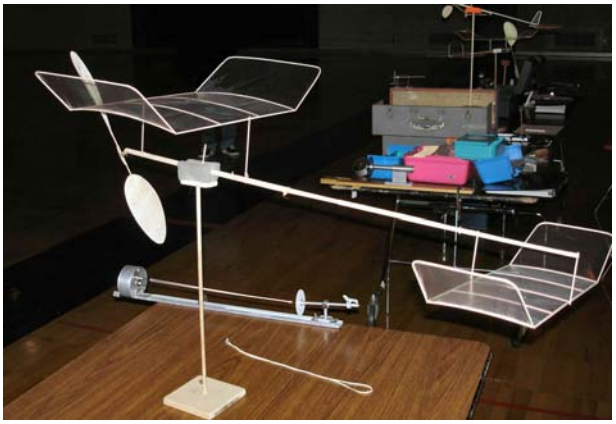
AN INDOOR HELICOPTER

by Jim Richmond, Carmel, Indiana

Cat III Record 10:18
West Baden, IN
8-15-03

Jim has modestly told us there is nothing special about the design. It uses retired F1D propellers and whatever motorstick works. The only thing made special was the vane at the top. Thanks to Abram Van Dover of the Brainbusters for publishing it.





F1 Monster

A Canadian Champion for All Categories
by Fred Tellier, Windsor, Ontario

Canadian Records Set Cat 1 14:16
Cat 2 15:34
Cat 3 19:16
Cat 4 19:50

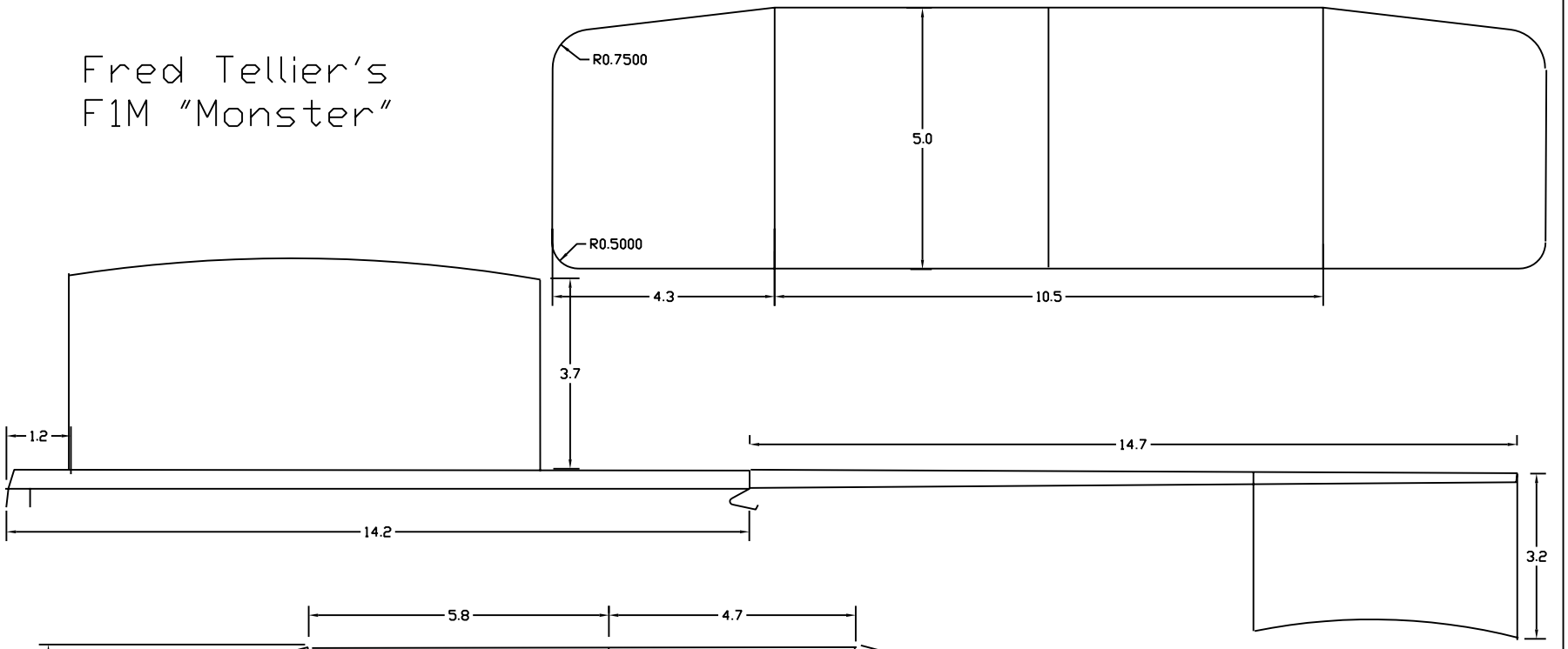
The name originated with Larry Loucha's comments when Tapio Linkosalo and I were flying at West Baden, he kept calling the F1M's 'Monsters' and I decided when filling out the record application that it would be a good name.

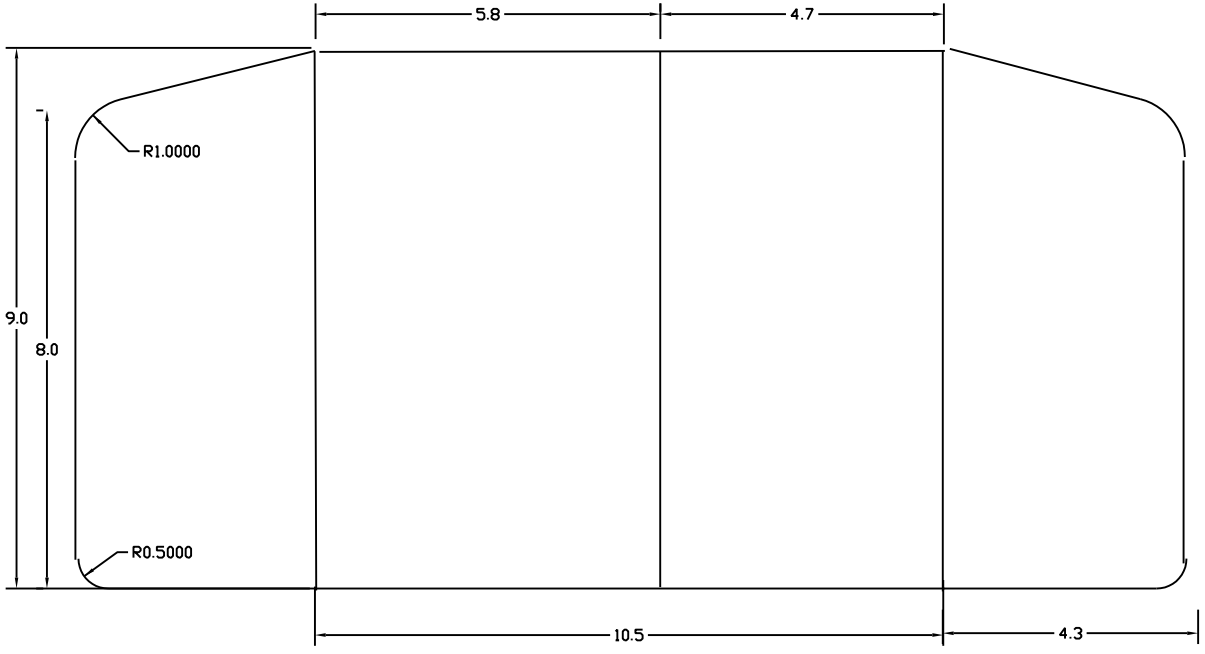
I started out flying F1M with a tandem design consisting of 2 limited penny plane wings as wing and stab. This was a waste of time except I had a usable motor stick, boom and stab, the next step was to increase the wing chord to 8 inches and lengthen the tail boom. This combination using my penny plane prop was somewhat successful and I managed a couple of trophies at Johnson City but was still not flying as long as I felt was needed. After seeing Vlad Linardic fly his new plane with a 9" wing chord a few years ago at Johnson City I decided that was to be my next step. I built a new wing with the 9" chord and much stiffer spars and the rest is history. The improvement with the larger wing area was much greater than I expected and the stiffer wing allowed me to launch with full torque on a higher VP pitch setting.

A VP prop is needed for top performance in any of the sites we fly as these planes will climb at a very steep angle of attack and would require too much torque back-off with a fixed pitch prop. I have found that a solid sheet prop blade is much better than a built up prop, and since the minimum weight is 3 grams the extra weight is not a factor. The plane I set the last two records with has .5 gram of ballast to come up to minimum weight.

The flying setup is with no built in inboard wing wash in, a slack bracing wire on the motor stick to control high torque down thrust, a little more left thrust than I would normally use and a fairly high angle of attack in the cruise. The motor stick twist gives enough wash-in for the steep climb and the stick bend under torque controls the power stalling under launch torque. The prop is set with a low pitch of 18" and the high pitch is higher than most people would use in the sites we fly, the success seems to be the ability to climb to the ceiling with such a high pitch at the start. This is largely due to the high torque launch causing a vertical climb to about 80 or more feet where the plane then levels out and slowly climbs to the ceiling as the VP starts to lower its pitch. The prop is fully at low pitch around 14 minutes with a still lot of height from the floor. To get the prop set for this flight profile is touchy as the spring adjustment is critical as it controls the last part of the climb. I find that once the high pitch is set for the initial vertical climb I must only adjust the spring for final altitude control, if you reduce the high pitch to get more climb the RPM increases too much in the first couple of minutes and the turns are used up too soon for a long flight. The problem with these rubber weight controlled classes is getting enough turns into the motor and using them up as slowly as possible. I actually had enough turns left at the Kibbie dome for a couple more minutes but had ran out of flights and time to make more adjustments.

Fred Tellier's
F1M "Monster"

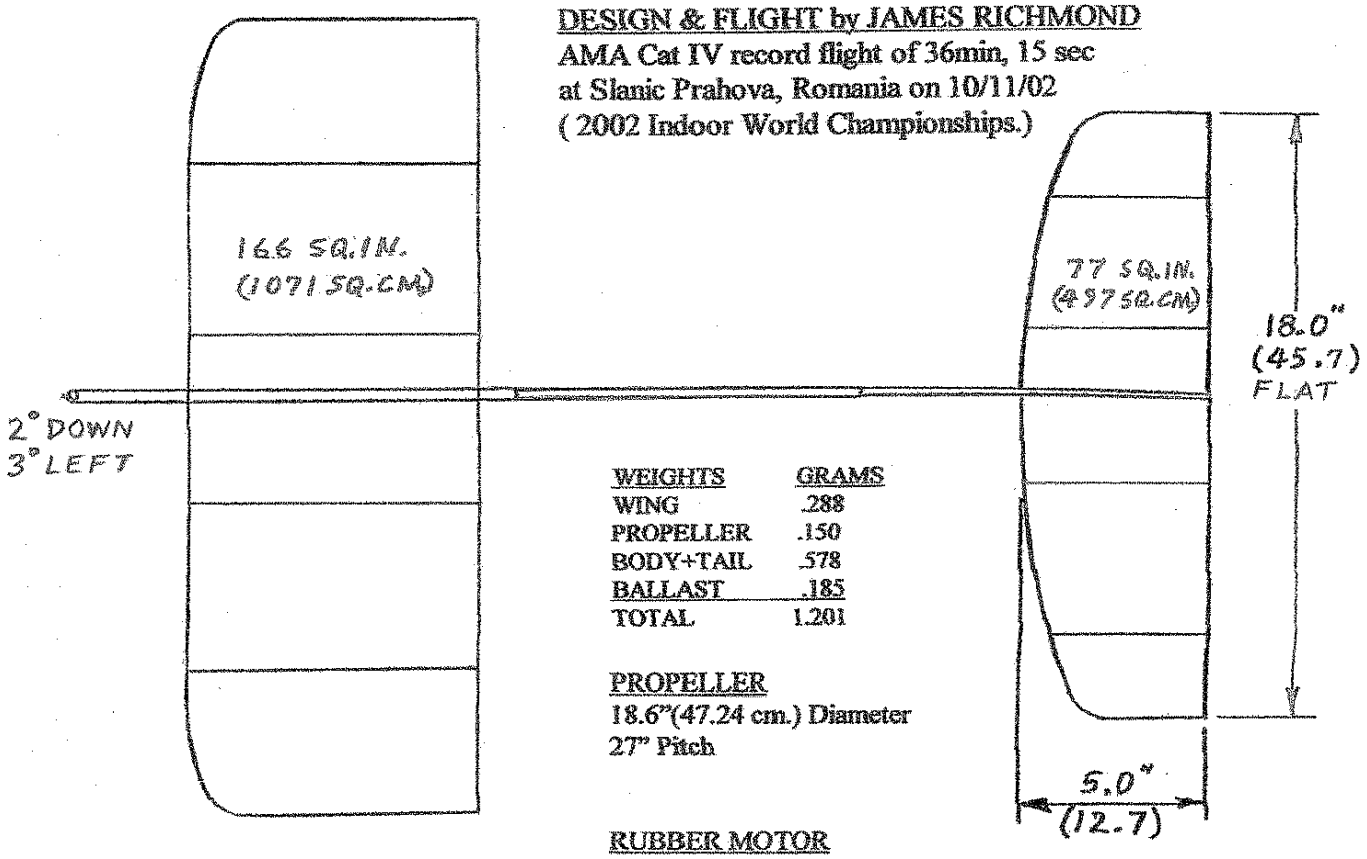




Prop used:

17" VP from my PP, 18" low pitch
High pitch as needed for climb

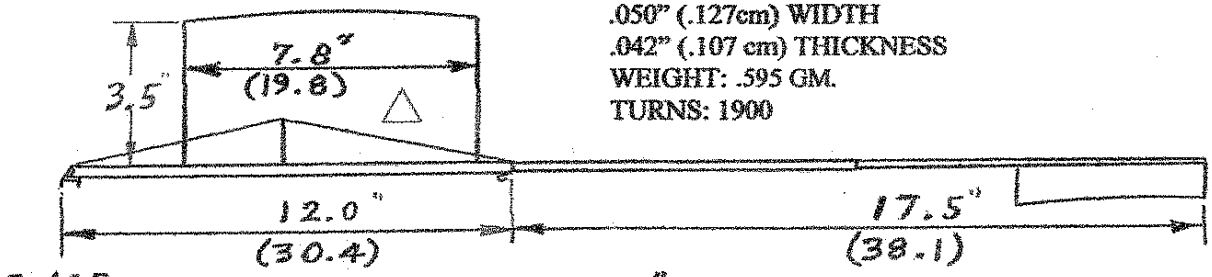
DESIGN & FLIGHT by JAMES RICHMOND
AMA Cat IV record flight of 36min, 15 sec
at Slanic Prahova, Romania on 10/11/02
(2002 Indoor World Championships.)



WEIGHTS	GRAMS
WING	.288
PROPELLER	.150
BODY+TAIL	.578
BALLAST	.185
TOTAL	1.201

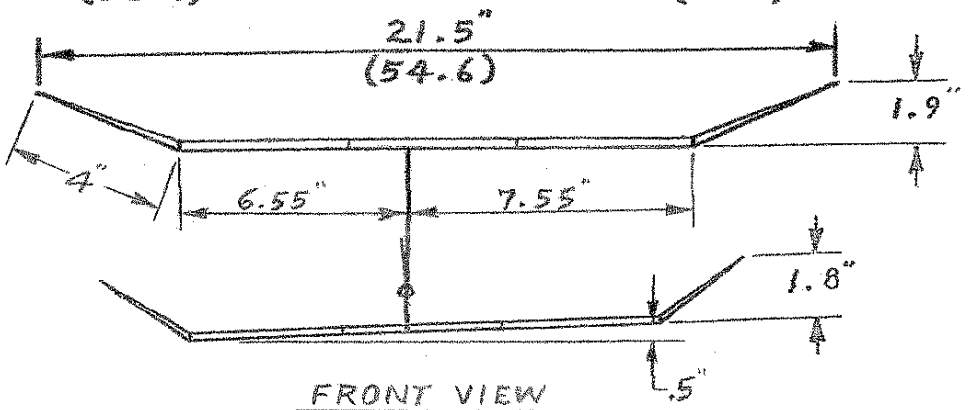
PROPELLER
18.6"(47.24 cm.) Diameter
27" Pitch

RUBBER MOTOR
9.5" (24.13 cm)
.050" (.127cm) WIDTH
.042" (.107 cm) THICKNESS
WEIGHT: .595 GM.
TURNS: 1900



SCALE 1:5

INCHES	CENTIMETERS
0	0
1	2.5
2	5.1
3	7.6
4	10.2
5	12.7
6	15.2
7	17.8
8	20.3
9	22.9
10	25.4

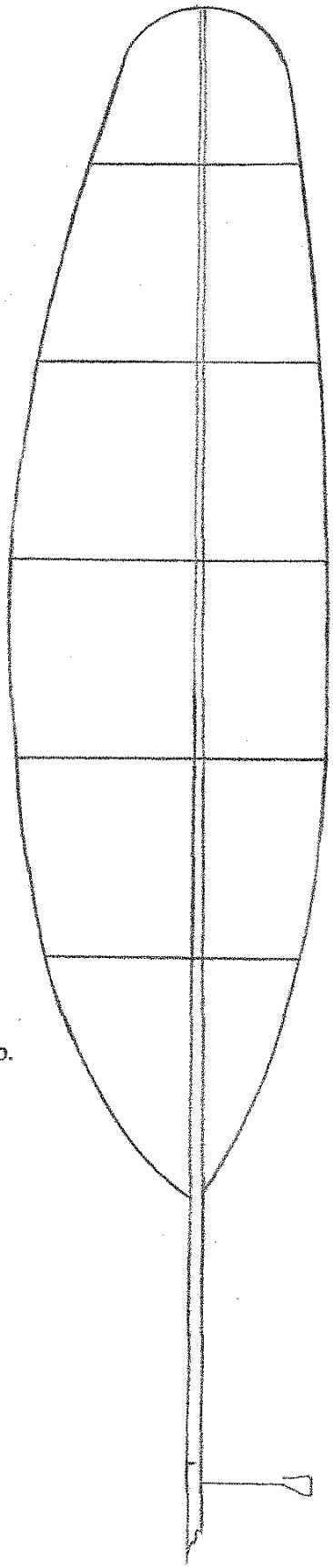


FRONT VIEW

Salty Dog

Materials & Dimensions

Wing	
spars	.035 x .046 - 5 lb.
	.003 boron top & bottom
middle ribs	.030 x .037 - 4.5 lb.
compression ribs	.032 x .040 - 4.5 lb.
tips	.032 x .043 - 6 lb.
tissue tubes (2)	1/16 I.D. x 3/8 long
airfoil	3 % arc
Stabilizer	
spars	.042 x .032 - 5 lb.
ribs	.030 x .040 - 4.6 lb
tissue tubes (2)	.050 I.D. x .300 long
airfoil	2.5 % arc
Motor Stick	
tube	.0135 wall- .250 I.D. x 12"- 3.9 lb.
	(3) .003 boron ; (each side& bottom)
webs	.020- 4.5 lb.
rear hook	.013
bracing post	.045 x .045→.034 x .934- 5.5 lb.
thrust bearing	.012 aluminum
wing posts (2)	.037 x .045 x 3.5"- 5.5 lb.- ends
	fattened to mate with 1/16 I.D.
	wing tubes. .003 boron 3 sides
Extension	.010 wall - .250 O.D. x 9"- 3.9lb.
Tail boom	
tube	.009 wall- .235 O.D.→.100 O.D. x 9"- 3.9 lb.
stab post (front)	.054 x .035 x 1. 200 "- 5.0lb.
stab post (rear)	.054 x .035 x .950"- 5.0lb
Propeller	
spar	.055 x .090→.030 x .030 x 18.6- 4.5 lb.
ribs	.020 x .020- 4.5 lb
outline	.020 x .020- 4.5 lb
shaft	.013 dia.
airfoil	3.5% arc



Jim Richmond's World Champion "SALTY DOG" F1D

A NFFS 2003 Model of the Year
First Place 2002 World Champs, Slanic, Romania
Category III Record 33:47, West Baden, Indiana

This rather simple looking plane with the less than complementary name is the result of the most extensive developmental effort I have made in a long history of model plane design.

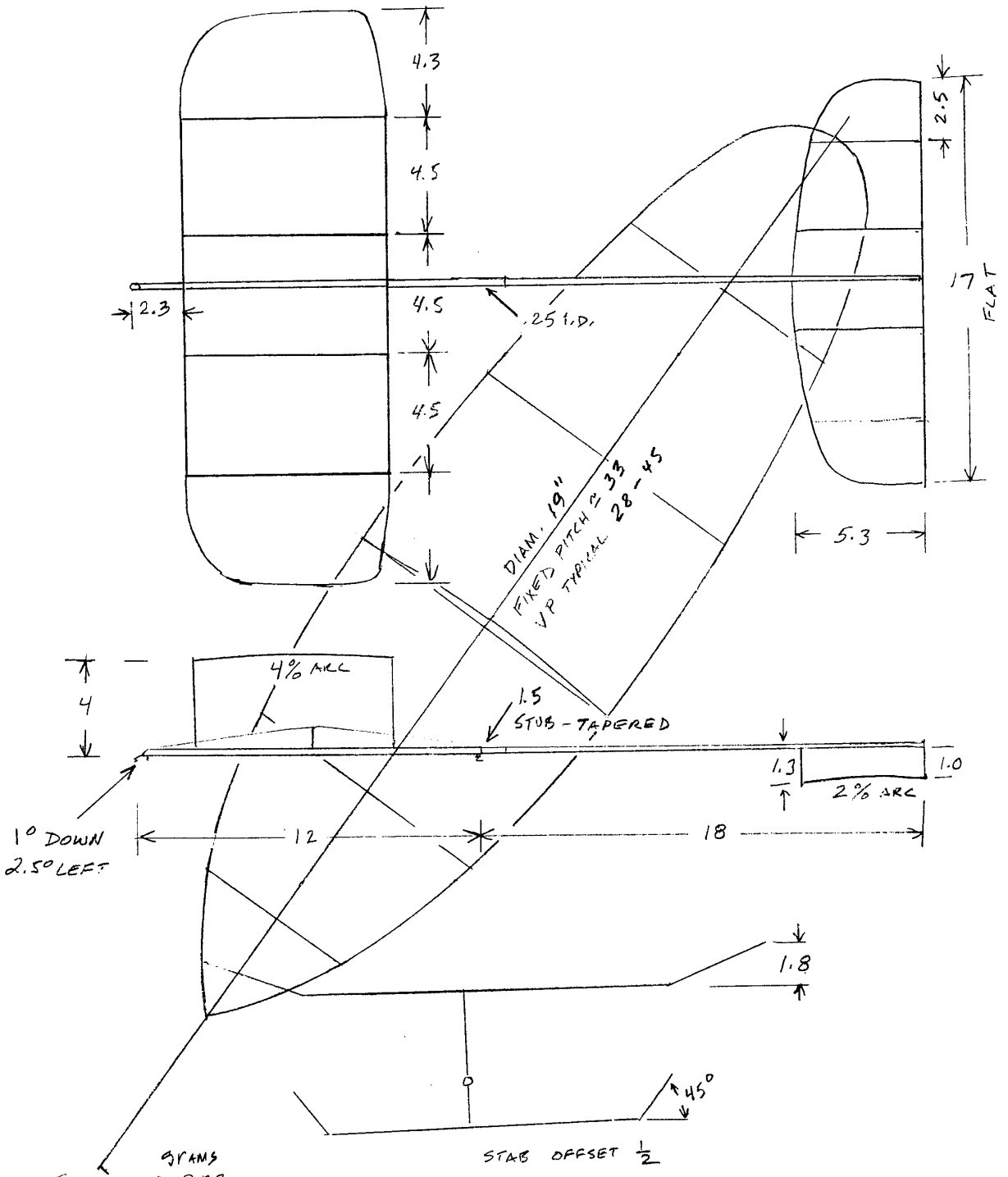
This program was begun after the 2000 world championship with an effort to apply the old F1D technology to these smaller planes. It became apparent right away that the high torque climb-out had to be handled differently-something like the way the Easy B's do itand so the wing bracing was eliminated. The following are the design changes that were made, and the reasons for them:

1. No wing bracing. Permits wing twist for good climbing turn.
2 Boron stiffened wing spar. Needed due to lack of bracing.
3. Stab lowered 1" below boom. Reduces the center of drag and lowers the C. G. to improve the late stage climb-out (less likely to stall during a steep climb).
4. Shortened wing posts from 4" to 3 1/2". Same reason as #3 above.
5.The use of stab tip dihedral (and no rudder) for easier construction, less drag, and less weight.
6. The use of a wire spacer on each end of the motor. They are removable to avoid adding to motor weight and they permit moving the wing away from the prop. They also permit the use of a motor stick long enough to accommodate the wing posts.
7. Stronger wing posts with boron on 3 sides. The twisting wing was tough on prior wing posts (broke 3).
8. Straight instead of angled wing posts. This provides a longer inboard wing and gives more wash-in than wash-out during the wing twist phase for a better climb-out.
9. 75% C.G. instead of 70% for a better cruise.
10. Y2K2 instead of microfilm. Hey, I like this stuff ! It's strong, dimensionally stable and doesn't die of old age

Now that we have a plane that flies, all we need is a prop/motor combination that works in the Slanic salt mine. Not having had the opportunity to fly a plane of this type in the mine before, we were all scratching our heads trying to figure it out. In my case, I had brought an assortment of 11 props, hoping at least one of them would do the trick. As it turned out, the oldest and least likely one of the bunch gave the best performance.

When I go to a competition, it is my usual practice to take a less desirable plane out of the box first, especially if it needs testing anyway. Then I can develop my "indoor touch" once again without risking the "good stuff". In this case I took out plane #2 which I regarded as the worst in the box (the "dog") and began the series of 1/6 motor test flights. After the last day of testing of several planes, guess what ? The "dog" of the bunch was doing the best time! Not being one to argue with the facts, I made my first few official flights with plane #2 and it made my second longest flight of 35:29. The full motor flights however, were turning up some problems- like power stall and a huge first circle. At this point, the competition was already won, but I switched off to the #5 plane for the remainder of the officials and it behaved perfectly.

O.K., so we tested and adjusted the planes and managed to win the world championship. Now for the rest of the story: The prop I had selected as being best had been modified from an old F1D 17-1/2" prop made in the 1960's. Props made during this era were very light and delicate and this one was no exception. When I arrived home from Romania, I found I needed a drawing of this prop to go with the drawing of the plane. So when I started measuring it, guess what? One blade was broken in 4 places ! The three inboard ribs were cracked just behind the spar and the outline was broken at the rear spar junction. All were being held in position only by the sturdy green microfilm covering. I knew immediately that this was steering damage and that it must have occurred during my 1 st round attempt when the prop caught on the line. So all of my official flights were made using a prop that was broken in 4 places. How about that ?



	grams	
STICK	0.293	
BOOM	0.156	
WING	0.320	
STAB	0.147	
VP PROP	0.235	} TYPICAL
FIXED PROP	0.147	}

Fld 2003-4
by Steve Brown

55 cm F1D
by Steve Brown, San Dimas, California

After the 2001 Team Finals I needed models that would fit into a small carry-on model box for airline travel. My 2001 models were not suitable. Not having access to a flying site to develop my own design, I turned to a model based on Jim Richmond's Salty Dog.

This airplane was flown using two .012" wire spacers that centered the motor on the long motor stick. The idea was that the longer stick would allow changes to the CG by moving the motor forwards or backwards. The spacers also acted as ballast. It's best performances came at the 2003 Team Finals at Lakehurst using a VP prop. I flew this model at the 2002 and 2004 World Champs using fixed pitch, symmetrical props.

Wing

Spars	.035 tapered .100 at center to .067 at dihedral break, 5.5lb
Compression ribs (2)	0.030 X .055, 5.0lb
Middle ribs (2)	0.030 X .040, 5.0lb
Tips	0.031 X .043, 5.0lb
Tubes	Japanese tissue, 3 wraps, 0.035 x 0.057 (i.d.) X .375
Covering	Y2K

Stick

Tube	.240 i.d. X .013 X 12, 3.8lb, 2 - .003 boron, 3 & 9 o'clock
Webs	.018 X .8, 4.0lb
Bracing Post	.045 X .045 tapered to .032 X .032, X 1.4, 7.0lb
Hook	.013 music wire
Bearing	Harlan
Bracing	.001 tungsten, one wire
Wing Posts	.035 X .057 X 3.7, 5.8lb, 3 - .003 boron (sides, back)

Boom

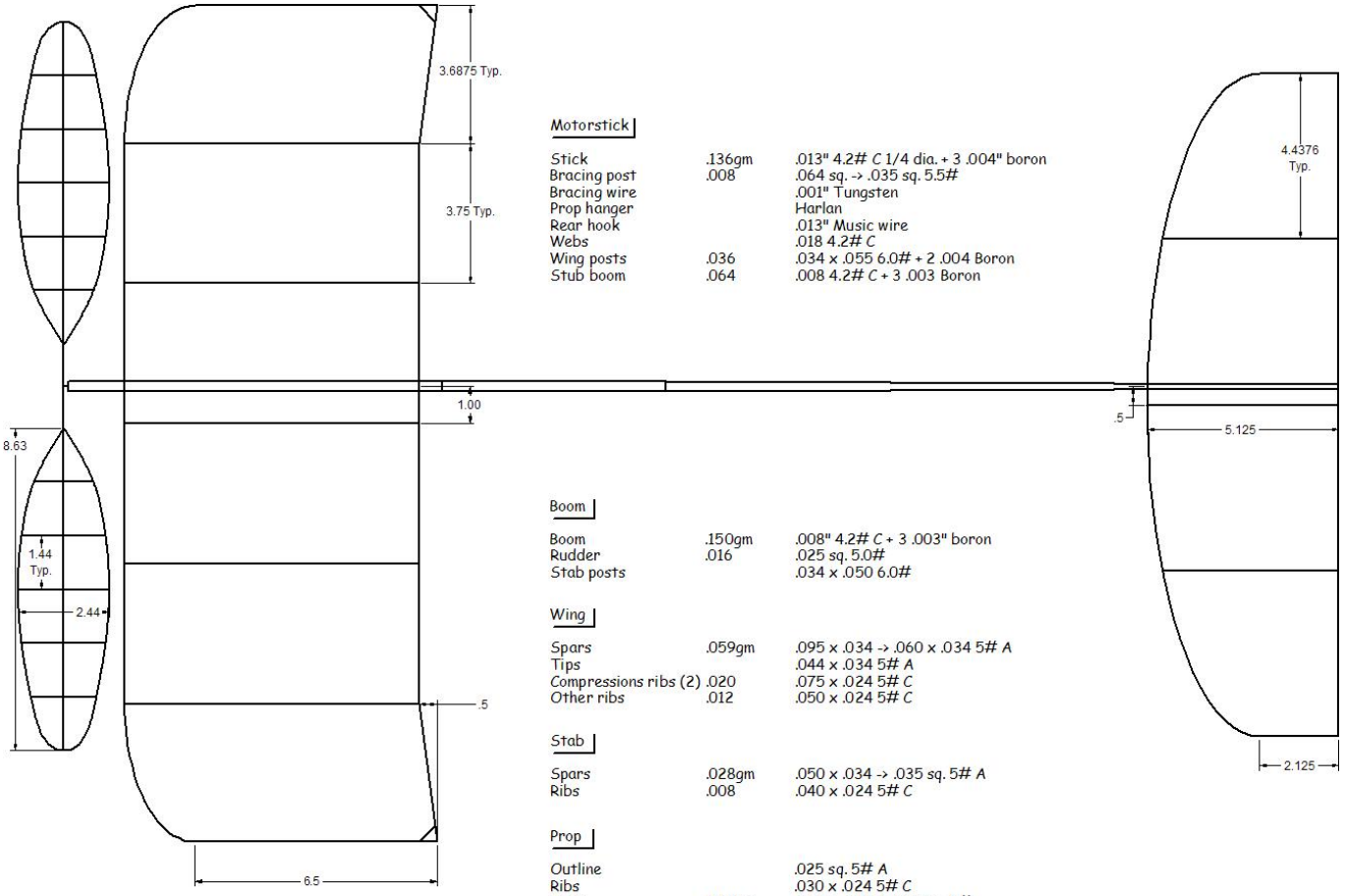
Tube	.220 i.d. tapered to .120 i.d. X .009 X 18, 4.0lb, 3 - .003 boron, 12, 4, 8 o'clock
Plug	.011 X 1.5, 4.0lb, snug tapered fit into .220 i.d. of boom
Stab Posts	.035 X .050, 6lb, front 1.3" long, rear 1" long

Stab

Spars	.029 X .043, 5.3lb
Ribs	.025 X .043, 4.8lb
Tips	.027 X .040, 4.5lb
Tubes	Japanese tissue, 3 wraps, .035 X .050 (i.d.) X .25
Covering	Y2K

Prop (fixed pitch)

Spars	.068 X .082 tapered to .032 X .032, 5.6lb
Outline	.025 X .025, 4.3lb
Ribs	.023 X .025, 4.5lb
Shaft	.013 music wire
Covering	Y2K



Motorstick

Stick	.136gm	.013" 4.2# C 1/4 dia. + 3 .004" boron
Bracing post	.008	.064 sq. -> .035 sq. 5.5#
Bracing wire		.001" Tungsten
Prop hanger		Harlan
Rear hook		.013" Music wire
Webs		.018 4.2# C
Wing posts	.036	.034 x .055 6.0# + 2 .004 Boron
Stub boom	.064	.008 4.2# C + 3 .003 Boron

Boom

Boom	.150gm	.008" 4.2# C + 3 .003" boron
Rudder	.016	.025 sq. 5.0#
Stab posts		.034 x .050 6.0#

Wing

Spars	.059gm	.095 x .034 -> .060 x .034 5# A
Tips		.044 x .034 5# A
Compressions ribs (2)	.020	.075 x .024 5# C
Other ribs	.012	.050 x .024 5# C

Stab

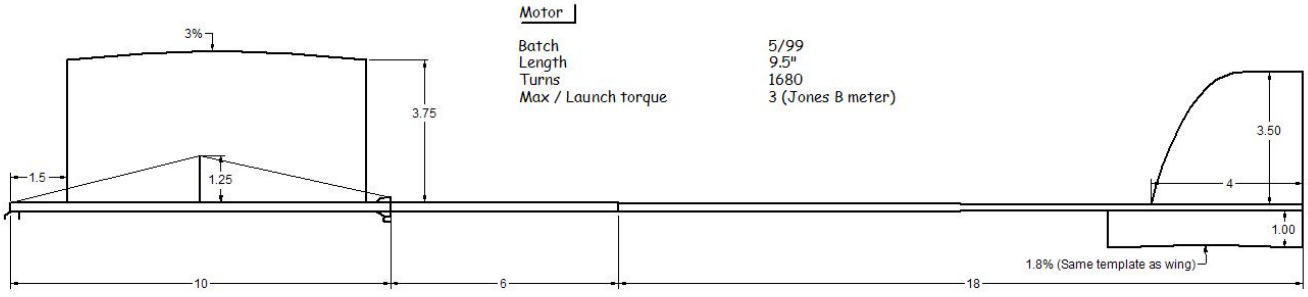
Spars	.028gm	.050 x .034 -> .035 sq. 5# A
Ribs	.008	.040 x .024 5# C

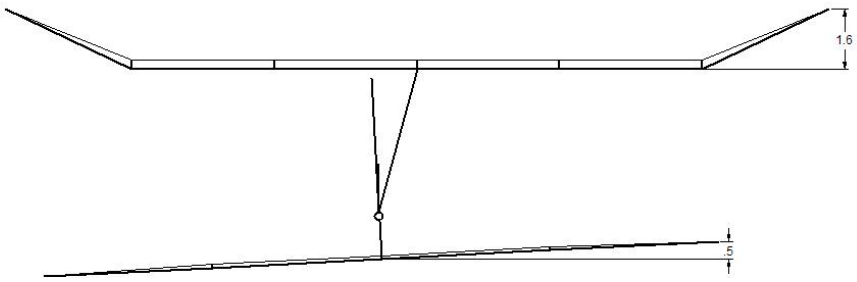
Prop

Outline		.025 sq. 5# A
Ribs		.030 x .024 5# C
Spar	.048gm	.082 x .074 -> .030 sq. 5#
VP hub		Banks style w/ Kagan loop & hinges
Low pitch		27"
Diameter		19.5"

Motor

Batch	5/99
Length	9.5"
Turns	1680
Max / Launch torque	3 (Jones B meter)





Weights

Stick & stub	.350gm
Boom & rudder	.174
Wing	.320
Stab	.130
Prop	.240
Total	1.214

EIDOLON - by John Kagan

37:59 Lakehurst 9/03
Cat IV AMA Record

EIDOLON

A Winning F1D by John Kagan

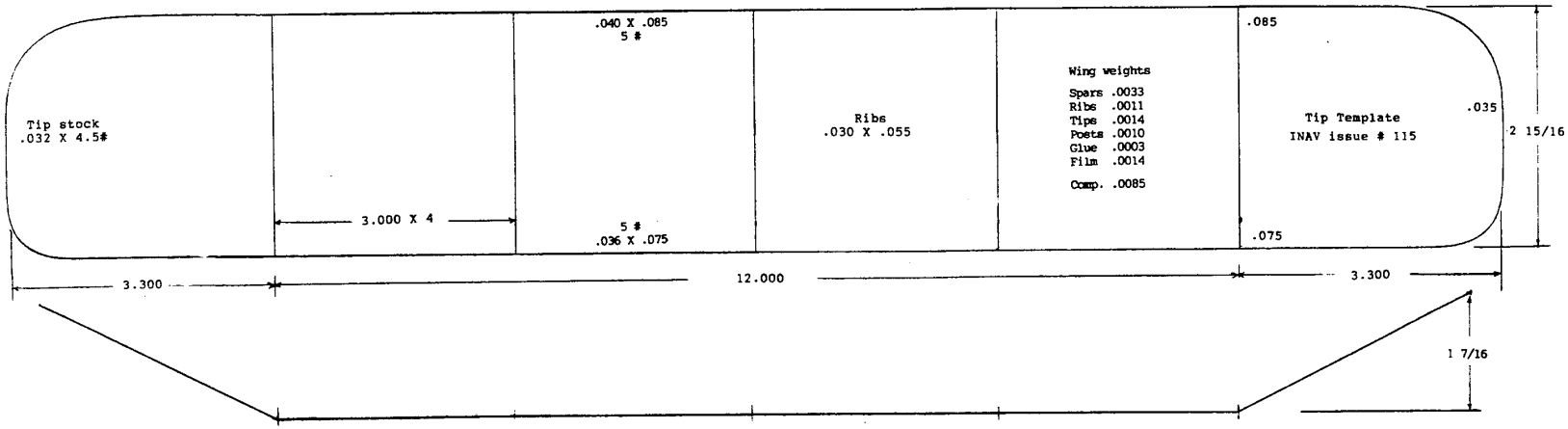
Category IV Record Holder
Lakehurst, NJ, 2003

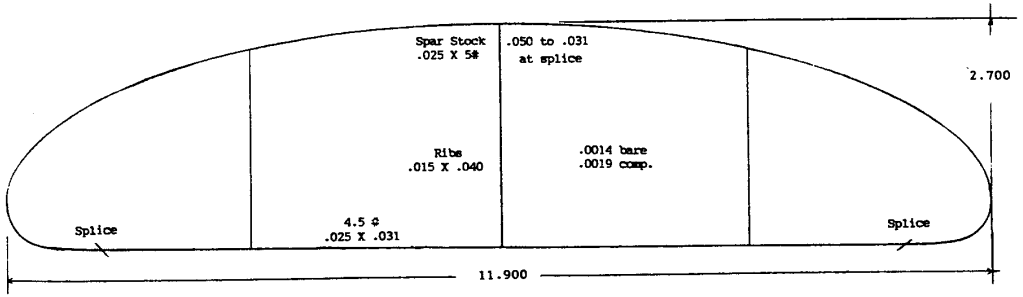
Eidolon is homage to several model designs that resonated with me. It is based on the dimensions and layout of Ron Green's Dreamduster, with a few cosmetic changes. It uses the parabolic wing and stab leading edge of Jim Richmond's Cat Walker F1D, which always looked so good in that anonymous line drawing on the cover of the previous Winning Indoor Designs. I dig the swept back wing tip trailing edge of Jim Buxton's IHLG, so I used something similar. Larry Caillaiu's EZB looks great with its single rudder (as opposed to the stab tip rudders) so I borrowed that, too. I have theories on why these style choices work well, but they were all initially based on aesthetics.

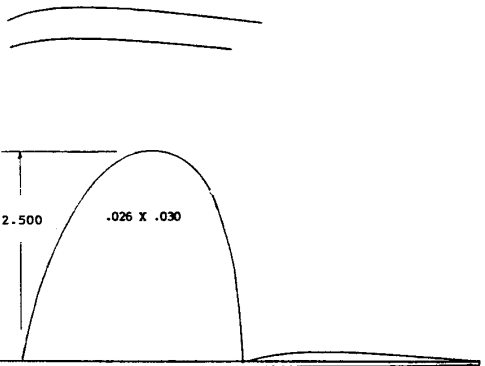
Variable pitch props are essential on F1D's in almost every flying site and they were crucial on Eidolon's successful USIC and team selection flights. I select a spring that has a stiff enough rate to close over as much of the flight as possible - starting about 6 minutes after launch and finishing about the same amount before landing. I then use the high pitch screw to fit the climb to the site. As a result, the model starts with a very slow initial ascent and a prop RPM around 35. Soon the RPM starts to rise, preferably with no major changes in the flight profile, until it reaches about 50 RPM and the end of the flight. Since there is a limited amount of rubber on F1D's, I find it best to keep the low pitch reasonably high - around 27" - so the model does not deadstick too high.

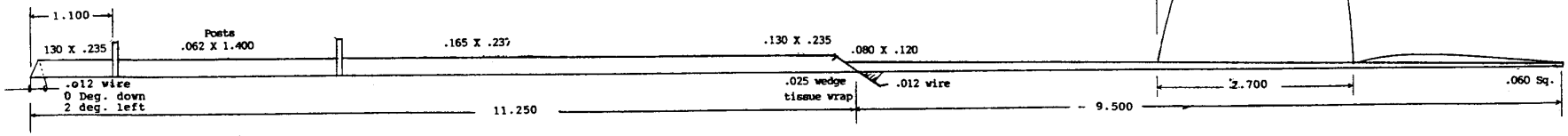
As trim and launch details have been worked out, I've found Eidolon will fly on longer loops - now around 9.7". I feel this is an indication of efficiency improvements that have translated into better flight times.

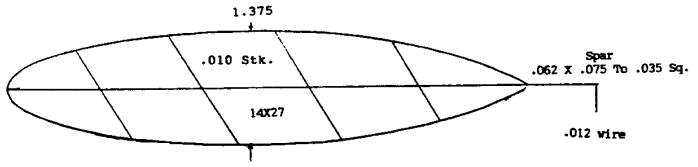
Eidolon looks beautiful in the air, and it is a solid platform with which to work out the details that make a winning F1D. Give it a try!











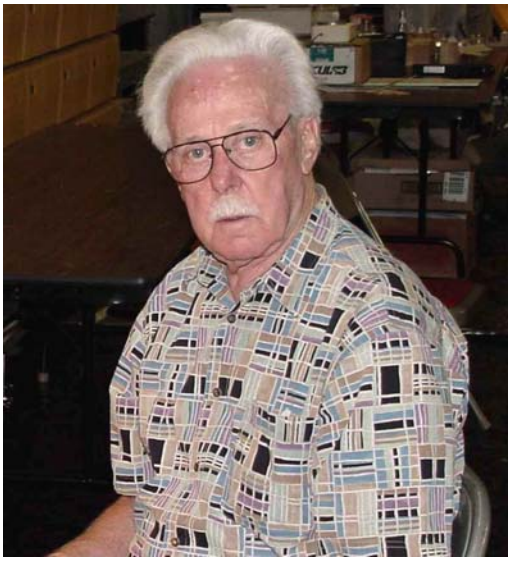
Adj.
3/8 tail tilt, wing
flat at full torque

Power 7-97
.047 X 17.0
2,980 turns

Weights
M/S .0184
Wing .0085
Prop. .0095
Stab. .0019
Boom + Rud. .0037
Comp. .0420

FIL EAZY B
Kibbie Dome Winner
2002
Best 22:15
2'nd 22:02

Wally Miller



F1L “EZB” by Wally Miller

First Place Kibbie Dome, 2002

Several years ago, some of the Kibbie Dome regulars thought it would be a grand idea to incorporate a 2 day F1L EZB contest within their annual 4 day meet. It would work as follows: on day 2, you could fly three official flights, then three more on day 3. The total of your best 2 flights would equal your score. No extra entry fee of precise rounds, just the regular fly-when-you-want-to.

At this point in time, not one of us had ever built an F1L. We all faced the same problem of how to best distribute the weight for maximum strength and efficiency.

EZB's and many other indoor models fly great with the wing positioned well forward; this model would not be an exception. A moderately long motor stick dictated a shorter than normal boom and a 49% lifting stabilizer. Next, taking into account the larger and stiffer wing spars, the flat section of the wing was extended one inch longer than I use on a AMA EZB, plus a much thicker 6% airfoil was implemented. The wing was covered with Y2K and the stab. with Y2K2.

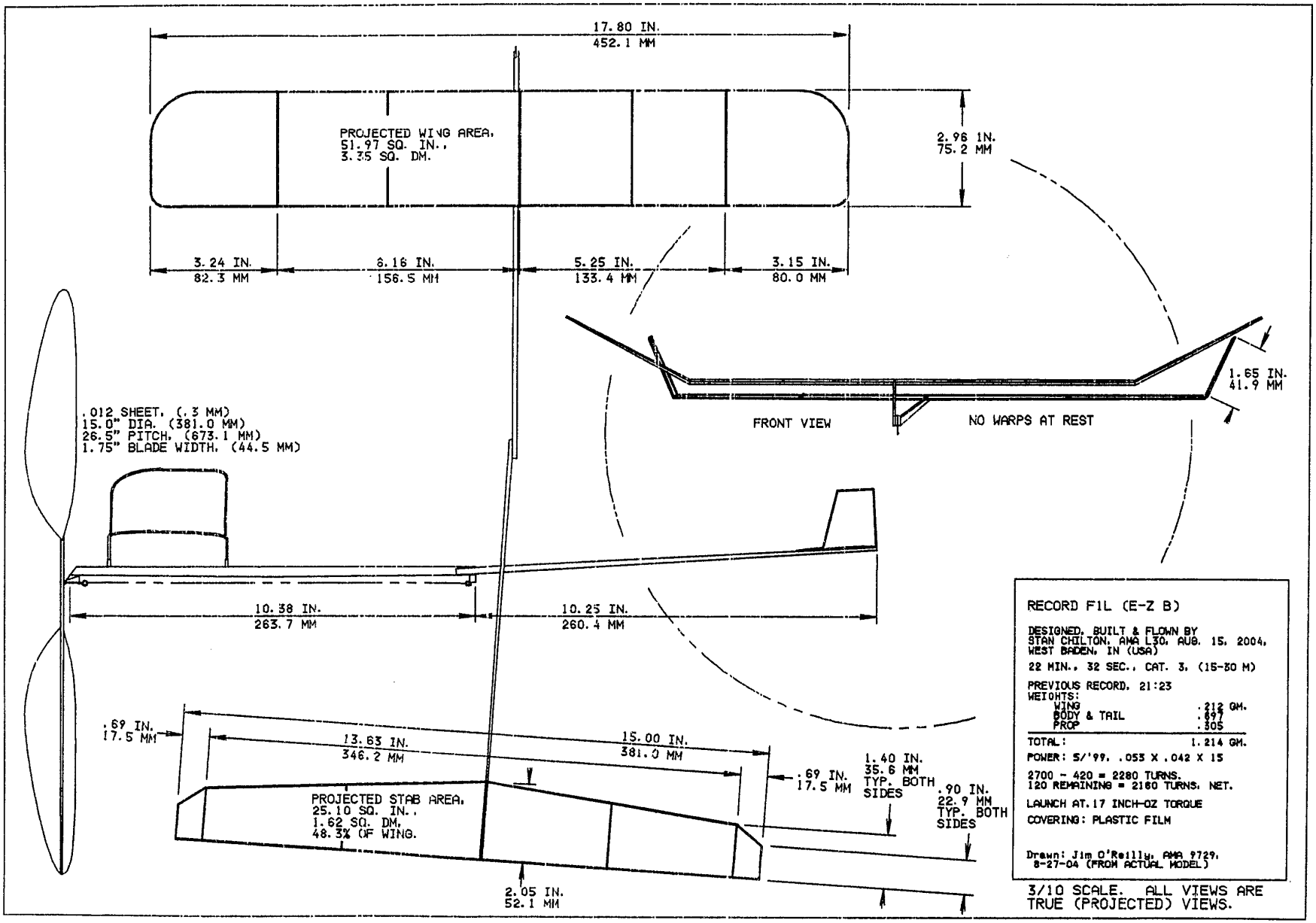
IMPORTANT, depending on how much your motor stick twists under full torque, add washin to the outboard wing (trailing edge down) until all flying surfaces look flat when viewed from the front.

Follow the given weights, no wimpy tail booms or spars allowed and you will be rewarded with a fine flying model. Then it's only a matter of some good rubber and the fun begins.

One final note: Thanks to the efforts of Larry Coslick, as of Jan. 2005, this class is now recognized by the AMA for National record purposes.

Good Times to All,

Wally Miller



RECORD F1L (E-Z B)

DESIGNED, BUILT & FLOWN BY
STAN CHILTON, AMA L30, AUG. 15, 2004,
WEST BADEN, IN (USA)

22 MIN., 32 SEC., CAT. 3, (15-30 M)

PREVIOUS RECORD, 21:23

WEIGHTS:

WING	.212 GM.
BODY & TAIL	.697
PROP	.305
TOTAL:	1.214 GM.

POWER: 5/'99, .053 X .042 X 15

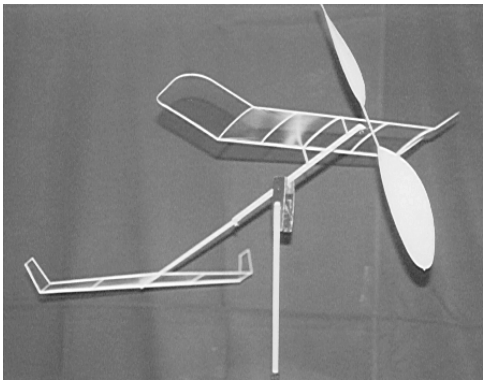
2700 - 420 = 2280 TURNS.
120 REMAINING = 2160 TURNS, NET.

LAUNCH AT 17 INCH-OZ TORQUE

COVERING: PLASTIC FILM

Drawn: Jim O'Reilly, AMA 9729,
8-27-04 (FROM ACTUAL MODEL)

3/10 SCALE. ALL VIEWS ARE TRUE (PROJECTED) VIEWS.



Mystic F1L Record Holder

Cat III Site Record
22:32 West Baden, Indiana

by Stan Chilton
Wichita, Kansas

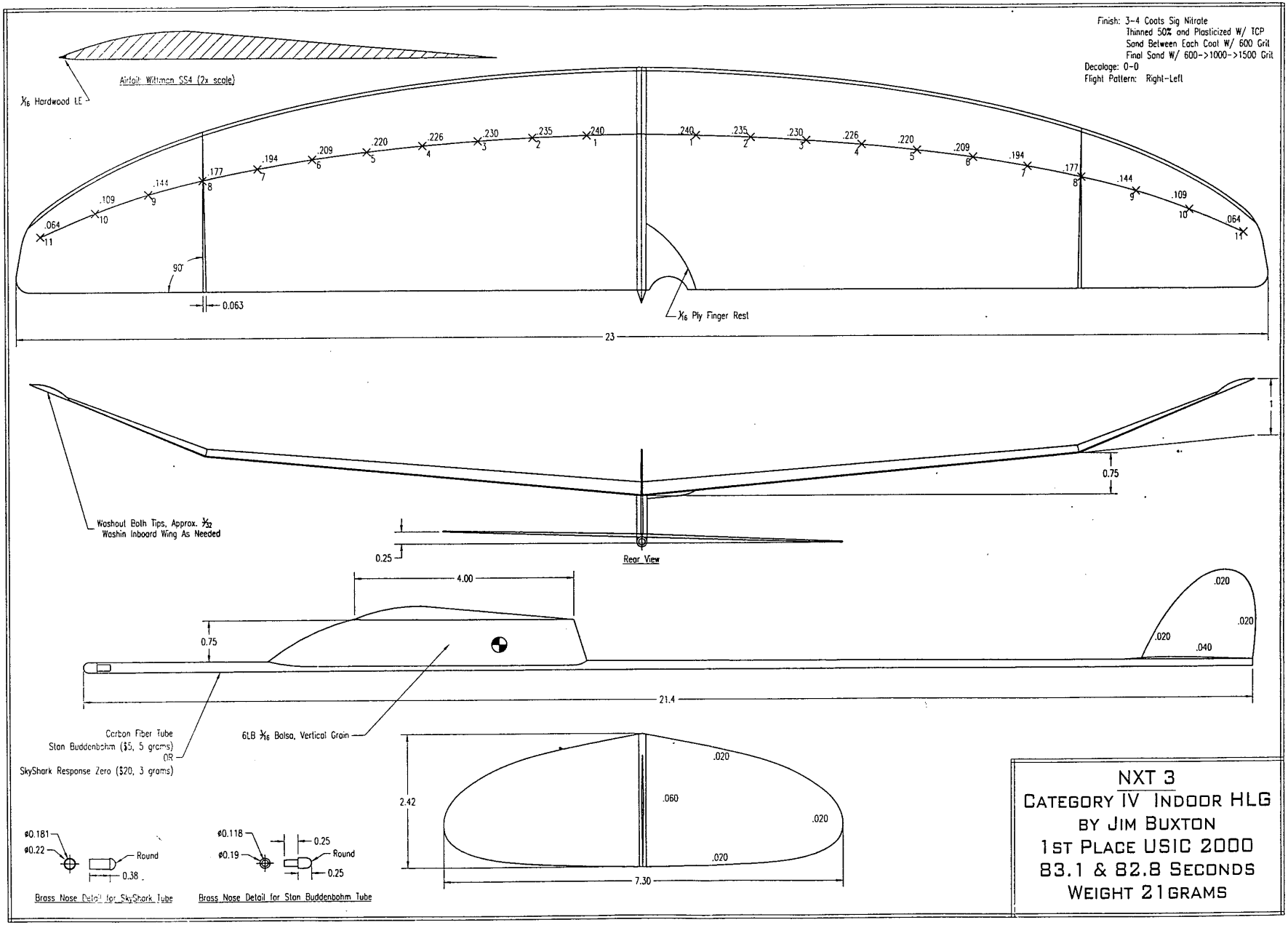
Outdoor atmospheric conditions on August 15, 2004, the day of the record flight, were mild and calm with mostly sunny skies. The temperature was low 80 degrees Fahrenheit. The humidity was 50 to 60 percent and the wind was light and variable. There was very little drift in the atrium at the time of the record flight. Temperature inside the dome was 75 to 80 degrees.

The record flight was initiated at approximately 3:45 p.m., Central Daylight Time. The rubber motor was wound to 2700 turns using a 20-1 geared winder. 420 turns were unwound to provide a 0.17 inch ounce torque. The model was launched in the center of the atrium at a shallow climb angle and slowly climbed toward the ceiling. At about 5 minutes the model reached an altitude of 95 feet and once each flight circle was bumping the vertical plastic shrouded "dish" at the top center of the atrium. After 5 or 6 easy touches the model drifted outside the dish and then the top of the wing was gently brushing the bottom of the exposed steel roof joists but not in any danger of hanging up.

At 10 minutes into the flight the model entered the cruise portion of the flight and slowly descended. Touch down occurred at 22 minutes, 32 seconds and this was the official duration after the officials had discarded the fractions of seconds from their actual watch times. The model landed 25 feet from the launch point and was never steered or even close to requiring steering. About 120 turns were left unused in the rubber motor resulting in an average propeller rpm of 96.

Wood Sizes and Weights

Motor stick – 0.115 x 0.210 to 0.115 x 0.252 to 0.100 x 0.203 at nose		5.8#
Rear Hook & Front Bearing – 0.013 wire		
Tailboom -	0.112 x 0.172 front to 0.060 x 0.090 rear	3.9#
Stabilizer -	0.027 x 0.045 to 0.027 x 0.060 to 0.027 x 0.045 LE & TE	5.7#
	0.028 x 0.028 Tips	
	0.025 x 0.031 ribs	5.1#
Wing -	0.034 x 0.065 to 0.034 x 0.078 to 0.034 x 0.065 LE & TE	5.9#
	0.030 x 0.060 to 0.030 x 0.033 to 0.030 x 0.060 Tips	5.9#
	0.035 x 0.059 Posts	6.2#
Prop Spar – 0.075 x 0.060 at center to 0.028 x 0.028 at tip		6.0# A grain
Prop Blade – 0.010” sheet ¼ grain perpendicular to spar		
Prop Shaft – 0.012 wire		



NXT 3

Category IV Indoor HLG

by Jim Buxton

1st Place USIC 2000

83.1 & 82.8 Seconds

Weight 21 grams

NXT 3

A Hand Launch Glider
by Jim Buxton, Hilliard, OH

Here is a great shot of Jim, but with a Cat Glider – Oh Well

How to Get Started in Hand Launch Gliders

Let's assume you want to chase the Holy Grail, or perhaps you are just tired of waiting by the mailbox for your Y2K2 and 8/93 Tan II to arrive. No problem, the local hobby shop, and the Internet, and that treadmill in the basement are all you need, and readily available to make a run for the top spot at USIC, or the Kibbie Dome depending upon your location. First step is to download Ron Wittman's two part article on the Supersweep from September and October 1974 American Aircraft Modeler. If the Internet is not your bag drop me a buck in an envelope and I will mail you a copy with the plans. Read the article start to finish, and then read it again. It is the best one ever done on the subject. Build a copy as close as you can. This is the starting point.

Now I will give you my personal opinions of the model and the techniques. Now, I admit I have never done 90 seconds. I have come as close as 84.7 seconds at the Buffalo Bills practice facility two years ago. So why am I making changes to a design I have never beaten? I have built about thirty gliders for category IV flying. The first several were stock SuperSweeps. The gliders have gradually changed since then, and what I am passing along is what has worked for Me to improve my times from 60 seconds to 84. Your results may vary, that's why you built a stock one first as a baseline.

Things I Changed From The SuperSweep:

1) Add dihedral
Adding an extra dihedral break to the inside wing panel only improved my time from 60 seconds in 1989, to 73 seconds in 1990. The SuperSweep needs more dihedral to achieve good rollouts. This will allow you to throw a more vertical (and efficient) launch trajectory than you can with a stock wing.
2) Less finish is more
Finish sand the wing with 400-grit paper. Mix Sig Nitrate 50-50 with a good lacquer thinner. Add 4 drops to the ounce of TCP for plasticizer. Throw in a little talcum powder for fun. Rub some talcum powder into the wood before the first coat. Brush on a nice heavy coat. Sand with 600 grit 'wet/dry' paper attached to a 2" x 2" x ½" balsa block. Apply a second coat. Sand with 600. Apply a third and final coat of dope with no talcum to keep the wing from turning white when you sand it. Sand with 600, then 1000, then 1500.
3) Wing wood does not need to be 4lb density
Thanks to the reduced finishing weight you can utilize wood up to 5.5lb density in the wing. This helps in many areas. First off you can find it in a local hobby shop more often. Another benefit of stiffer wood is that I have been able to eliminate adding carbon reinforcement to prevent wing failures. This happened to several of my early gliders.

4) Wood has no place in the fuselage of a glider built after 2000
Other than the pylon that is... Tapered carbon tubes are a real advantage for many reasons. They eliminate about 2 grams (more weight for the wing!) and eliminate many potential problems. All of my wood fuselages ended up needing carbon reinforcement to prevent breakage during any impact that exceeded glide speed. Breaking a fuselage can prove disastrous, as the incidence will surely change when repaired, and that is ultra-critical on these models. The carbon fuselage also eliminates altitude robbing 'tail wagging' at launch. The correct carbon tube will start out 32.5" long and weigh about 5.5 grams. Once cut to size (cut off the larger diameter end) you should have a three-gram tube. Curt Stevens carries them at www.modelresearchlabs.com. Although I have not personally seen any from his stock his specs match the obsolete 'SkyShark Response Zero' tubes that are very good.
5) Decrease the stab size
Not much to say here, but I think the SuperSweep's large stab makes it a little to stable for a snappy rollout.

~Incidence is the most important aspect of building a good glider. It has to be zero-zero to start. If you have any incidence the glider will tend to loop. You want the glider to go straight where you throw it. Place the fuselage pylon against a straight edge and make sure that the top of the boom is parallel to the wing mount. Sand as needed to correct. I place the fuselage on a glass surface against an aluminum yardstick and shine light form the bottom. I then take gauge blocks and check the parallelism of the boom, watching for light shining up through.

~I use Sig-Bond for all wing dihedral joints. A dihedral fixture as seen in figure one is a great tool to have. I saw this gadget in a newsletter somewhere and threw this on together from some stuff I had laying around. Set it to half the total dihedral angle desired, sand both panels, and you have a perfect dihedral joint with no skill required.

~Use a good two-part epoxy to attach the wing pylon to the carbon tube.

~I use Stan Buddenbohm's suggestion of tacking tail surfaces on with glue-stick. Once I have the stab tilt where I want it I run thin CA in the joint.

~I use a razor plane as seen in figure two for wing shaping. Not sure who made them but they work great and seem to be plentiful. I have picked up several at model airplane swap meets over the years. The re-sharpenable blade is adjustable and produces very consistent cuts.

~1/16 basswood for the leading edge, and 1/16" ply for the finger rest.

Weights for NXT 3 components
Fuselage: pylon epoxied onto carbon tube, 3.7 grams
Wing: 5.3 lb balsa, with dihedral joints, 11.7 grams
Finger rest: .6 grams
Stab: 5.8 lb balsa, .75 grams (do not go below .7 grams or failure can result)
Rudder: 5.8 lb balsa, .1 gram
Nose weight: 2 grams
Finish: 1.5 grams
TOTAL=20.35 grams (Flying weight of this glider is about 21 grams with glue etc.)

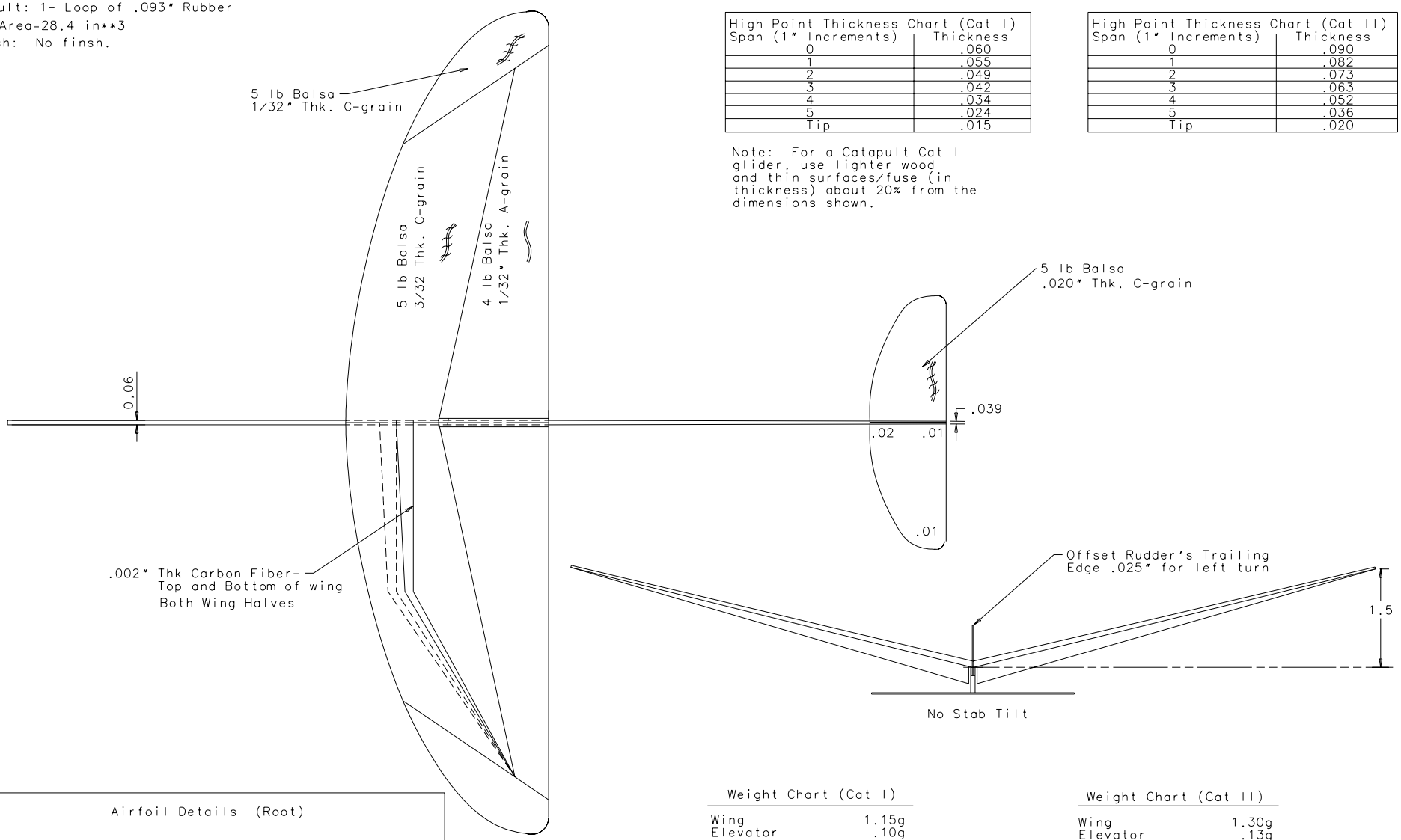
(Editor's Note: This article is reproduced in part from INAV issue 113, where it first appeared)

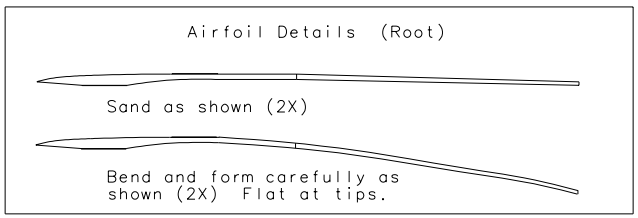
Catapult: 1- Loop of .093" Rubber
Wing Area=28.4 in**3
Finish: No finsh.

High Point Thickness Chart (Cat I)	
Span (1" Increments)	Thickness
0	.060
1	.055
2	.049
3	.042
4	.034
5	.024
Tip	.015

High Point Thickness Chart (Cat II)	
Span (1" Increments)	Thickness
0	.090
1	.082
2	.073
3	.063
4	.052
5	.036
Tip	.020

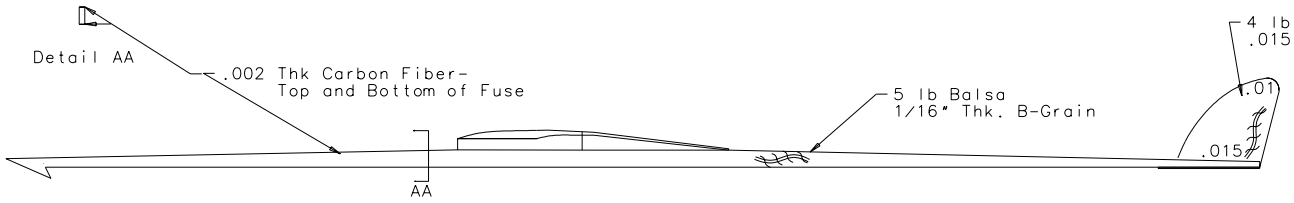
Note: For a Catapult Cat I glider, use lighter wood and thin surfaces/fuse (in thickness) about 20% from the dimensions shown.





Weight Chart (Cat I)	
Wing	1.15g
Elevator	.10g
Rudder	.01g
Fuse	.50g
Clay	.10g
Total	1.9g

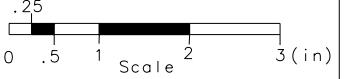
Weight Chart (Cat II)	
Wing	1.30g
Elevator	.13g
Rudder	.02g
Fuse	.60g
Clay	.15g
Total	2.2g



Standard Time Machine

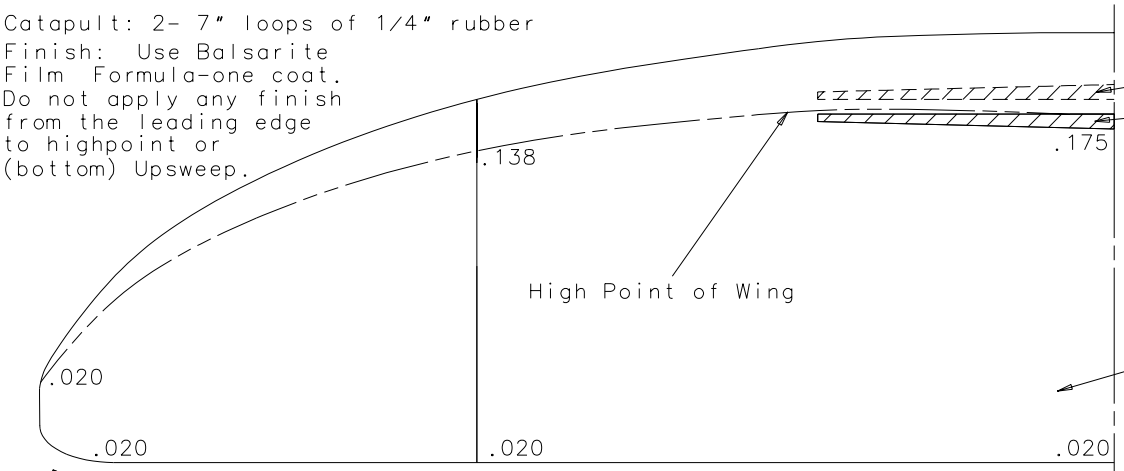
By Kurt Krempetz

Category 1-2 Standard Class Catapult Glider



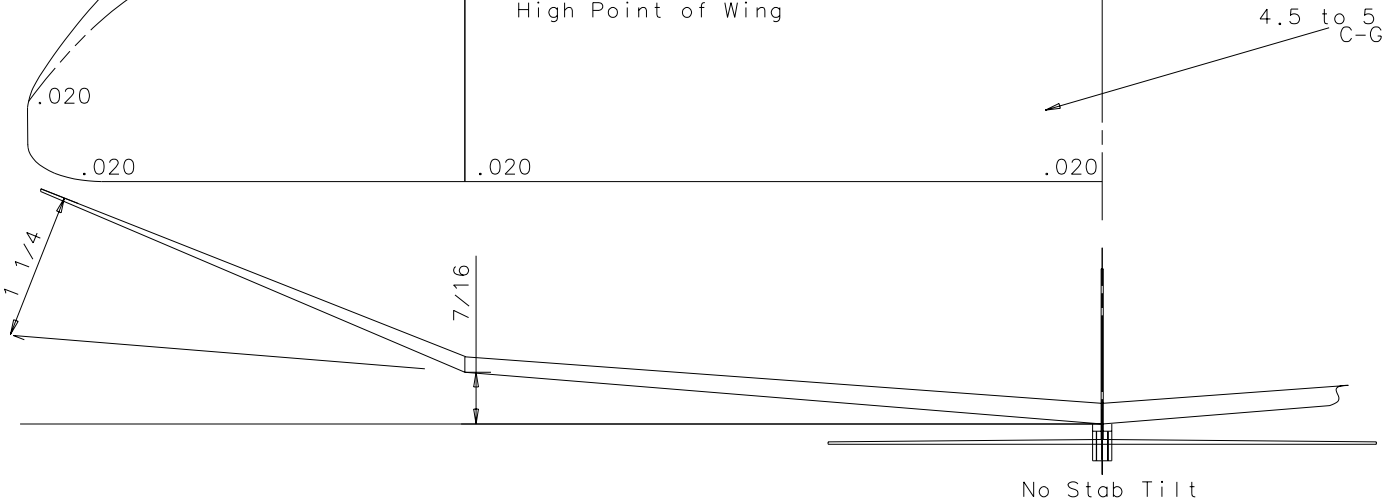
Catapult: 2- 7" loops of 1/4" rubber

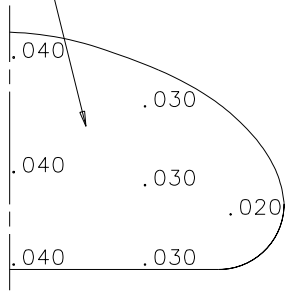
Finish: Use Balsarite Film Formula-one coat. Do not apply any finish from the leading edge to highpoint or (bottom) Upsweep.



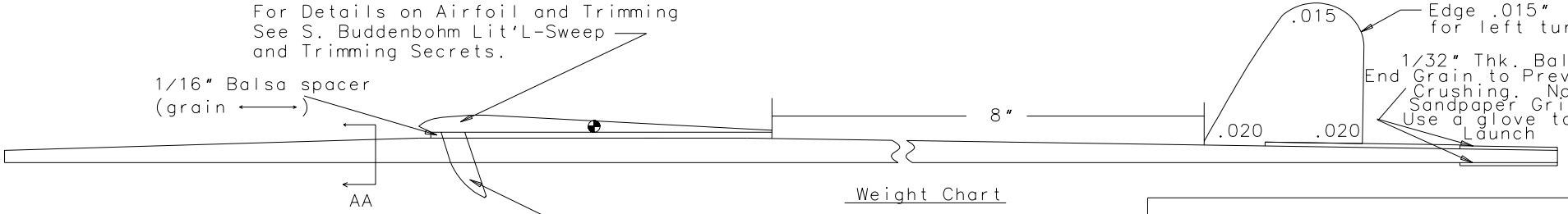
Highpoint Thickness Chart

Span(1" Increments)	Thickness
0	.175"
1	.169
2	.163
3	.155
4	.147
5	.138
6	.127
7	.133
8	.094
9	.020





For Details on Airfoil and Trimming See S. Buddenbohm Lit'L-Sweep and Trimming Secrets.



Detail AA

Weight Chart

Elevator	.25g
Rudder	.05g
Clay	.3g
Fuse	1.6g
Wing	9.1g
Total	11.3g

Modified Upsweep

1st Place 2001 Nationals
Johnson City, Tn.
Original Design by Stan Buddenbohm
Modified by Kurt Krempetz

0 .5 1 2

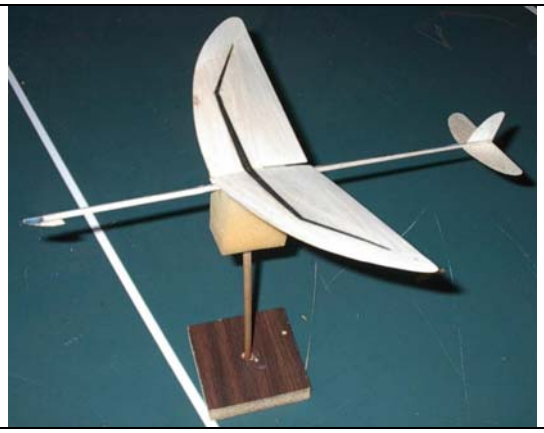
The Modified Upsweep Catapult Glider

Original Design by Stan Buddenbohm
Modified by Kurt Krempetz

First Place 2001 USIC, Johnson City, TN

The Modified Upsweep glider is something that is very special to me. I had tried for many many years to win the Nationals in Radio Control Aerobatics but never did. In 1999 I went to my first FF Indoor Nationals and didn't place very well (lower half). I kept trying and started working with Stan Buddenbohm to improve my skills. It wasn't until I flew a Modified Upsweep glider in the 2001 FF Indoor Nationals that I had my dream come true.

The design was developed somewhat by accident. I had built many of Stan's Upsweep Gliders. About one month before the 2001 NATS I started to build "one more" for the Nationals. I had a very nice piece of wing wood that was slightly larger than the Upsweep wing. I hated to throw away any of this beautiful wood and also felt that a larger plane would be better for the 116 ft. Johnson City site. Therefore, I enlarged the Upsweep to fit the wood I had available. After I returned from the 2001 Nationals I drew up the plans for the Modified Upsweep and have built many more.

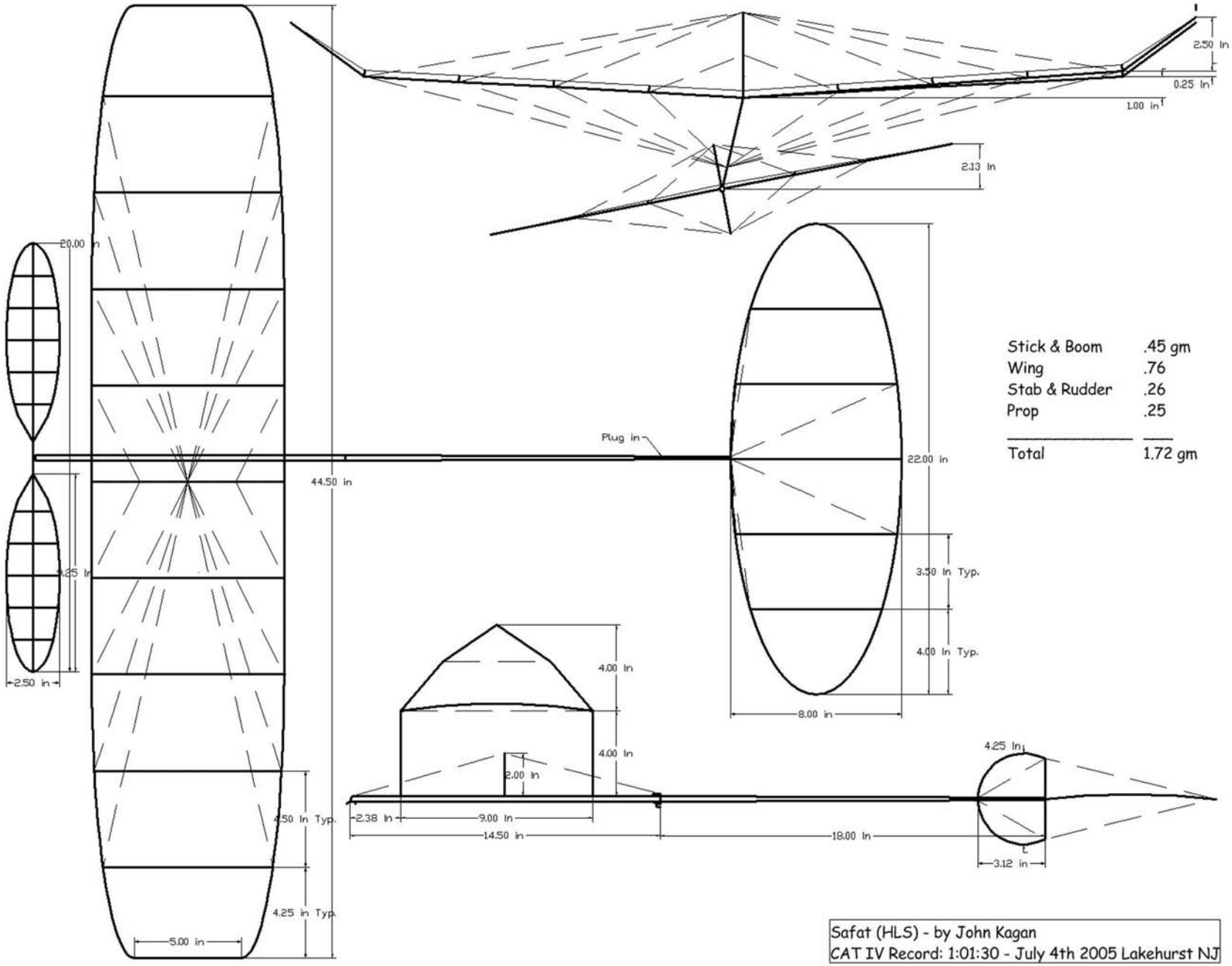


The Time Machine

By Kurt Krempetz

Cat I & II Standard Catapult Glider

The Time Machine was a design I developed over a 3-year period. I wanted a standard catapult glider design that could do well at the Bong Eagles Semi-Annual Indoor contests in Racine, Wisconsin. This site has a 41 ft. ceiling. It was clear to me that a "flapper" design had more potential that the typical glider designs. I refer to a "flapper" as a design, which allows the back portion of the wing to bend or flex. The idea behind this concept is that during the high speed launch the back portion of the wing straightens out making the airfoil have less drag. As the airspeed decreases the airfoil changes and undercamber or flap is added, creating more lift. The Time Machine was developed from three famous "flapper" designs: the Coot by Stan Stoy, the UpStart4 by Mark Drela, and the Slow Poker by Stan Buddenbohm.



Stick & Boom	.45 gm
Wing	.76
Stab & Rudder	.26
Prop	.25
Total	1.72 gm

Safat (HLS) - by John Kagan
CAT IV Record: 1:01:30 - July 4th 2005 Lakehurst NJ

Record One-Hour Flight
Lakehurst NAS, New Jersey

Safat – A Hand Launch Stick Model
by John Kagan

July 4, 2005

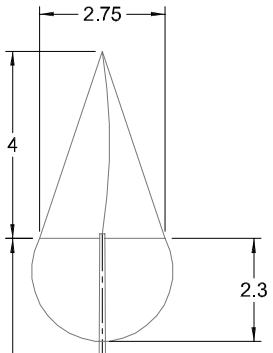
My road to an hour flight began about a year ago. I loved watching the huge hand-launched stick models of Jim Grant, Jim Richmond, Steve Brown, etc. and had to have one for myself. Safat (named after a mythical bird that never lands) was built from old, rejected F1D parts. The wing is from an old rules F1D with an extra center section, bringing the span up to 44". The stab is about the only part built specifically for this model. I decided to cover it with plastic film because I wanted my first HLS to be durable. The plastic saved the wing many times over, include one flight where the model touched the girders at Lakehurst, tail slid, collapsed, and came down in a ball. I caught the model and the wing unfolded and popped back into place. A few spots of glue where spar broke and it was right back in the air. With the covering the AUW is a relatively hefty 1.72 grams.

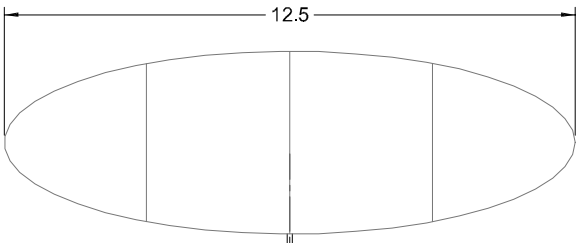
I brought Safat along to the 2005 4th of July contest at Lakehurst mainly because I had to keep my F1D's together for the team selection finals less than a month away and I needed something else to play with. Using an old 20" prop, I began with a few ¼ motor flights that were a consistent 14:15. I decided to put up a full motor flight to verify the results. The model came in with an expected 57:06, but I gained some valuable information: It only climbed about ¾ of the way up and it landed with 400 turns. There were some easy tweaks available, but the day was winding down so I packed up for the evening.

The next day I turned the high pitch down a bit and the ¼ motor flights increased to just around 14:45. Time to try another full motor flight. The model got higher, but still a comfortable 15' or so from the ceiling. It was around 3:00pm so the air was still moving around a bit and several steers were required to keep the model off the walls. The flight looked promising, but came up just short at 58:45. There were still 300 turns left, though. Upon examination, the 22" x .071" 5/99 motor had a cut that was almost all the way through. Something beefier was needed anyway, so I cut the next motor at .074" and increased the length to 23". 3200 turns went in on the first wind and I decided to go with it. The high pitch was increased slightly because I didn't want the extra energy to take the model into the girders, and Safat was on its way. It was around 5:00pm and the air was much calmer – another beautiful Lakehurst evening. The model climbed to about the same altitude, still a comfortable distance from the ceiling, but was much higher at the 30 and 45 minute marks. Only about three steers were needed – one about halfway through, one a bit later, and a final one during the landing – totaling around 36 seconds.

This time Safat crossed the 1 hour mark about 15' up and settled in around 62:07. Subtracting the propstop gave 61:30 – a new record! The motor was about 2.1gm and the model was 1.72, so that should be a 1.22 rubber to model ratio. I used a 20" prop (pretty small), 3200 turns, 50 rpm average. The air was nice and calm. I don't think there were major thermals since the flights were pretty consistent and predictable across two days, but calm air counts for a lot.

Max Zaluska and Matt Chalker were the official timers, but there were several others of us with watches on it. It was a novel experience to see all those zeros when it flipped over an hour!





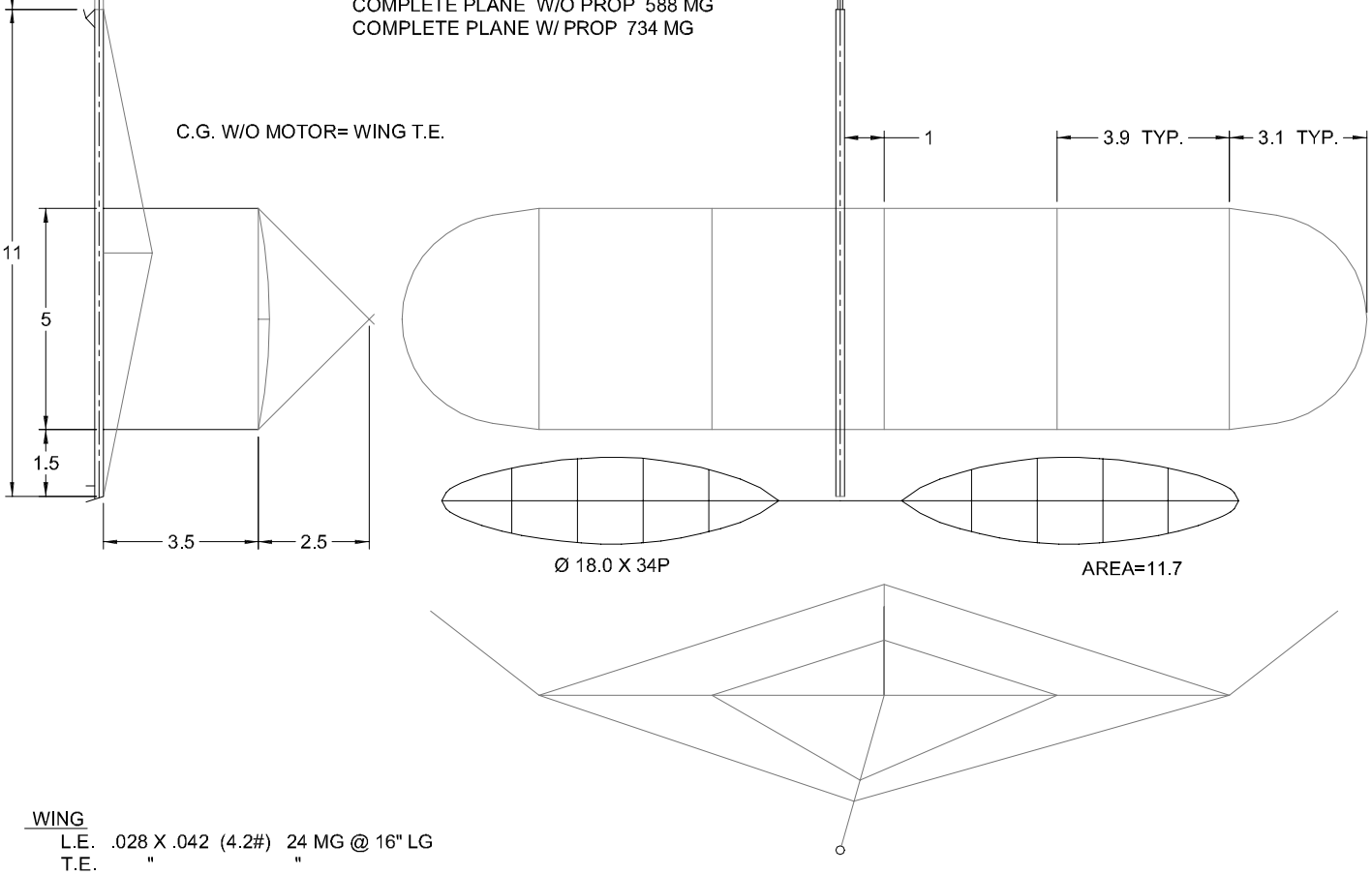
STAB 34%

WEIGHTS

WING DRY 108 MG
WING COVERED 190 MG
WING COMPLETE 270 MG
STAB DRY 39 MG
STAB COVERED 70 MG
MOTORSTICK COMPLETE 200 MG
TAILBOOM 39 MG
TAILBOOM W/ RUDDER 53 MG
PROP COMPLETE 146 MG
COMPLETE PLANE W/O PROP 588 MG
COMPLETE PLANE W/ PROP 734 MG

MOTOR- 1ST PLACE
@ KIBBIE DOME 2004 29:34

TAN II 7-97 PRE-WOUND
11.5" LOOP .047 X .042 720 MG
WOUND TO .37 OZ-IN & BACK-OFF 140
LAUNCH WITH 1760 TURNS & .20 OZ-IN
LANDED WITH 240 TURNS & .06 OZ-IN
CLIMBED TO 125' AT 12:30



Ø 18.0 X 34P

AREA=11.7

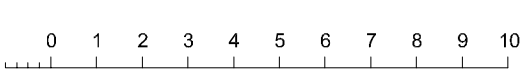
WING
L.E. .028 X .042 (4.2#) 24 MG @ 16" LG
T.E. " "
TIPS .025 X .037 - .025 X .025 (3.8#) 13.5 MG @ 11.5" LG/ EA
RIB, UPPER .023 X .025 (4.6#) 12" RADIUS ARC 15 MG/ 4 EA
RIBS, LOWER Ø .004 BORON 11 MG/ 4 EA
POSTS .028 X .046 X 4.0 LG. (5#) w/ 2 EA Ø .003 BORON 26 MG/PR
CABANE .028 X .046 (5#) 14 MG/ PR

STAB
SPARS .020 X .037 - .020 X .020 (3.8#) 13 MG @ 14.0" LG
RIBS, CENTER .023 X .030-.05-.03 BANANA (4.6#) 7.5" RADIUS ARC
RIBS .023 X .030 (4.6#) 11 MG / 3 EA

MOTORSTICK
.010 X .625 WIDE X 11.1 LG. (4.7#) .20 DIA. 88 MG
W/ 4 EA Ø .004 BORON 26 MG/ 4 EA
PROP BEARING Ø .011 WIRE W/ .025 GUSSET 20 MG
REAR HOOK Ø .011 WIRE W/ .025 GUSSET 11 MG
POST .043 SQ - .030 SQ X 1.3 LG (5.5#)
BRACING Ø .001 TUNGSTEN

TAILBOOM
.006 X .531-.305 WIDE X 9.0 LG. (5.0#) 31 MG
RUDDER, OUTLINE .016 X .016 (5.5#)
RUDDER, POST .032 X .032 X 2.75 LG. (4.5#)

PROP 18 Ø X 34 PITCH
SPARS .050 X .087 - .030 X .030 X 9.1 LG. 71 MG/ PR
PROP SHAFT Ø .012 WIRE
OUTLINE & RIBS .015 X .020 (5.5#) 15 MG/ EA



I.S. #2.4

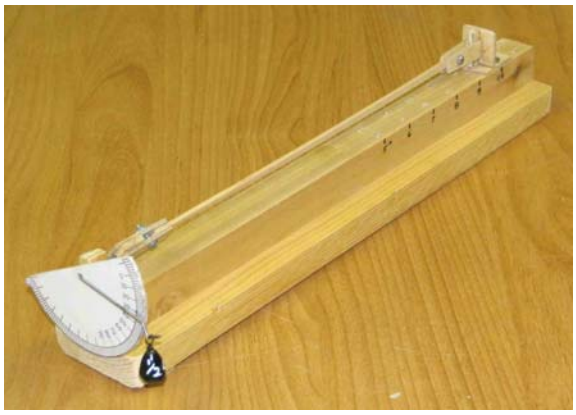
MIKE PALRANG
23 SEP '04
SCALE: 1/4

I.S. #2.4

An Intermediate Stick Design by Mike Pakrang, Mountain View, CA

I don't have much to say on the Intermediate Stick because I haven't flown it that much. Although I will say one thing. The I.S. pretty much flew "right off the building board". The same can not be said of my light weight EZ-B's. All the pertinent weights and sizes are on the drawing. The one thing I could say is that I've been using a 16" diameter prop for some 1/5 motor flights since then. And getting around 6:30 under a 25' ceiling using a launch torque of 0.15 oz-in. So it looks like this combo is going to work better.

A Motor Stick Twist Tester
by Mike Palrang



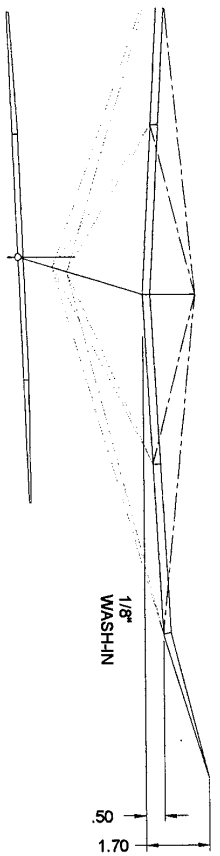
There is more to motor stick testing than bending them. Here, your editor reproduced Mike's twist tester. It ranges from 5" to 10". With A half-ounce fishing weight at two inches, mini stick, A-6, EZB and I.S. motor sticks can be compared to one another at 0.5 or 1 in-oz of torque, to see which is the most twist-resistant. Here is what Mike has to say:

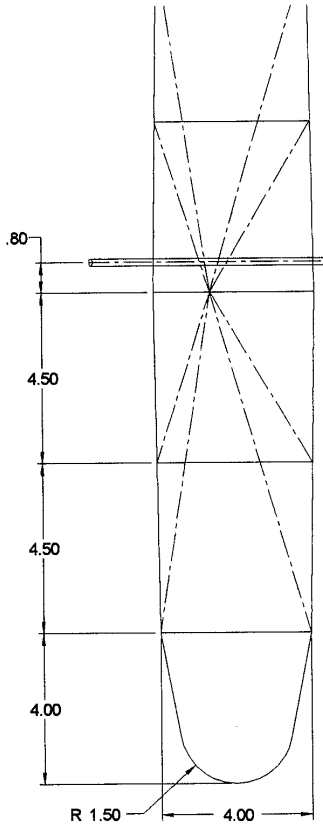
1. The dial is fixed to the base plate. The pointer rotates through the center of it and is connected to the yoke that captures the forward end of the motorstick. The pointer has a hook in it to hang the weight from. The pointer is attached to the yoke such that the pointer is about 20 degrees above horizontal. This way the 40 degrees of total rotation is 20 above horizontal and 20 below and I don't have to tilt the whole jig. Remember, we are looking for a relative comparison, not an absolute number. It doesn't work out so well for the sticks that twist more than about 40 degrees because of the angle the weight is pulling through, but I'm not going to use those anyway.

2. Even the good sticks will have some set, i.e., they don't return to zero after the weight is removed, though it's probably hysteresis in the assembly because it mostly occurs on the first application of the weight. In any case I retest and use the value I get on the second test. The only sticks that take an appreciable set are the ones with large twists and here again, I'm not going to use them anyway. If you are going to test motorsticks for something like a 1.2 gram EZ-B you should use a larger weight but still use the same 40 degrees of total rotation so that the useable sticks do not take a set. You are already applying more twist to the stick to get it to twist 40 degrees than it will ever see during actual flights! (A ½ oz. lead fishing weight is shown, and a good start point)

3. I cut about a dozen, all to approximately the same size. Some of the wood is different thickness and do vary slightly because I've cut them from 12 different pieces of balsa. Some of the motorsticks are cut from wood that has the correct height dimension and some from sheets that are the correct width dimension. I test them and recut and retest any that are heavier and stiffer than desired. I usually then cut more from the wood producing the best sticks from the first round, adjusting the size to get the torsional stiffness I want for the lightest stick.

4. I use 4-6 pound wood. And I don't test any of my wood for "stiffness" before it gets cut to the piece I want to use. I don't think any tests of the overall sheet tell me anything useful about the pieces that will come from that sheet. The orsional test, and to a lesser extent the bending test of the actual stick, are the only ones that really tell you how the stick will work. Test any and all wood that you believe might make a good stick. Remember that when it comes to torsional stiffness it is proportional to the size raised to the fourth power and the density only goes as the second power. There is potentially something to be gained from a larger piece of equivalent weight.





MATERIALS & DIMENSIONS

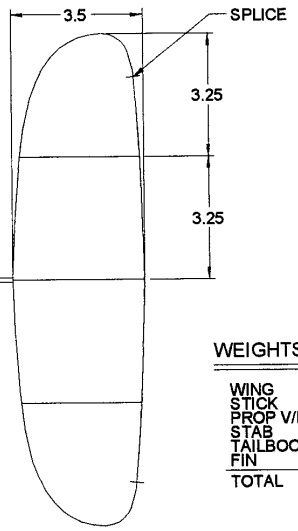
PROP
SPAR: .070 X .080 / .020 X .020
I.M.S. TAPERED STOCK (LIGHT WEIGHT)
OUTLINE: .020 X .020 4.5#
RIBS: .018 X .020 4.5#
CESAR BANKS V/P PROP HUB W/ TISSUE HINGE,
CARBON FIBER DRIVER &
.007 MW SPRING, 4 LOOSE TURNS

MOTOR STICK .011 3.75# .22 I.D.
FRONT WEB: .018 X .75 LG 4.0#
REAR WEB: .014 X .50 LG 4.0#
REAR PLUG: .20 O.D. X .188 LG 3.5#
BRACING POST: Ø .050 7#
HOOK: Ø .010 WIRE
BEARING: Ø .012 WIRE
BORON @ 3,6,9,12 O'CLOCK
BRACING: .0015 TUNGSTEN
TAILBOOM: .007 4.0# .28 O.D. - .15 O.D.
BORON @ 6,12 O'CLOCK

WING
AIRFOIL: 5% ARC
L/E SPAR: .027 X .044 4.8#
T/E SPAR: .027 X .044 4.8#
RIBS: .022 X .040 4.5#
TIPS: .023 X .040 / .023 X .030 6#
CABANE: .030 X .045 / .030 X .030 5#
POSTS: .032 X .062 X 3.2 LG 6#
.003 BORON, BOTH SIDES
BRACING: .0003 TUNGSTEN

STAB
AIRFOIL 2% ARC
L/E & T/E SPAR: .021 X .045 / .021 X .030 4.3#
RIBS: .018 X .040 4#
CENTER RIB: .020 X .045 4.5#
BRACING: .0003 TUNGSTEN

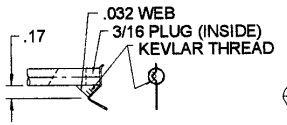
FIN
POST .032 X .032--.032 X .045--.032 X .032 X 3.6 LG 6#
OUTLINE .004 BORON



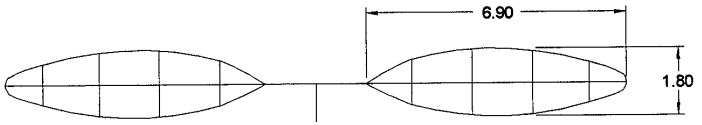
WEIGHTS (mg)

WING	220
STICK	215
PROP V/P	160
STAB	58
TAILBOOM	85
FIN	18
TOTAL	756

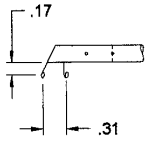
AMA RECORD, CAT IV, 41:48, AKRON, OH, 1995
8-93, .045 X 16.5, 2900 TURNS, LAUNCH TQ. .25
AMA RECORD, CAT II, 31:37, ST. LOUIS, MO, 1995
8-93, .049 X 11, 1990 TURNS, LAUNCH TQ. .27
FIRST PLACE USIC, 41:38, JOHNSON CITY, 2000
5-99, .048 X 16, 2700 TURNS, LAUNCH TQ. .21
AMA RECORD, CAT III, 39:54, WEST BADEN, IN, 2003
5-99, .052 X 16, 2580 TURNS, LAUNCH TQ. .25



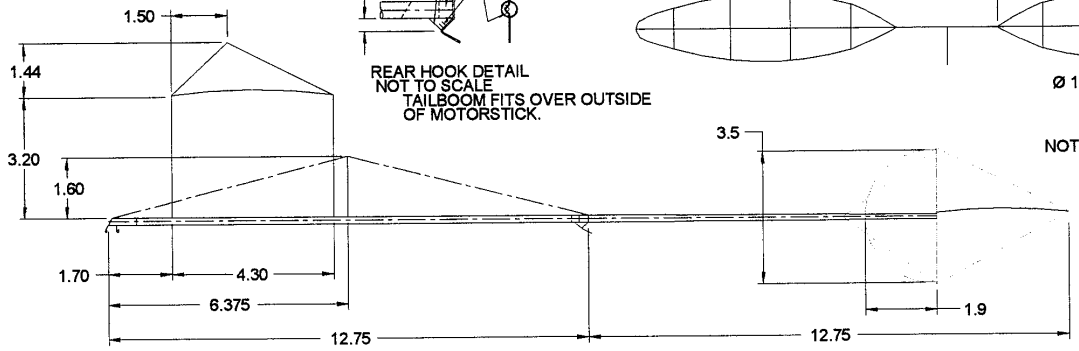
REAR HOOK DETAIL
NOT TO SCALE
TAILBOOM FITS OVER OUTSIDE
OF MOTORSTICK.



Ø 16.5 X 28 LOW PITCH
X 55 HIGH PITCH



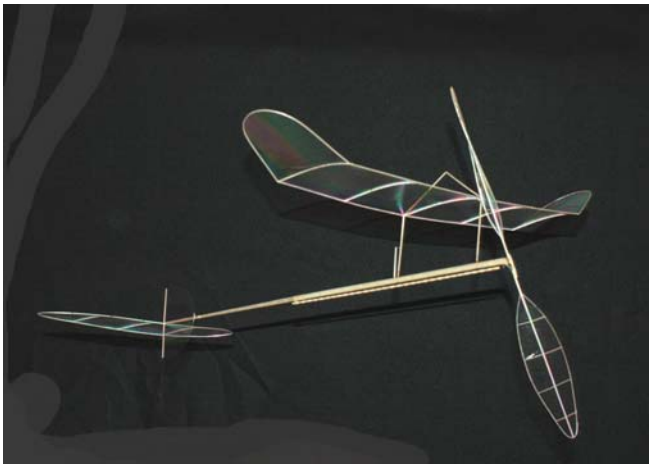
PROP BEARING DETAIL
NOT TO SCALE



NOTE: WING & PROP SHOWN FLAT.
CHANGED FROM V STAB TO
FLOATING STAB IN 1996.

INTERMEDIATE STICK- PHOENIX

BY: LARRY COSLICK
DRAWN: M.PALRANG



PHOENIX INTERMEDIATE STICK

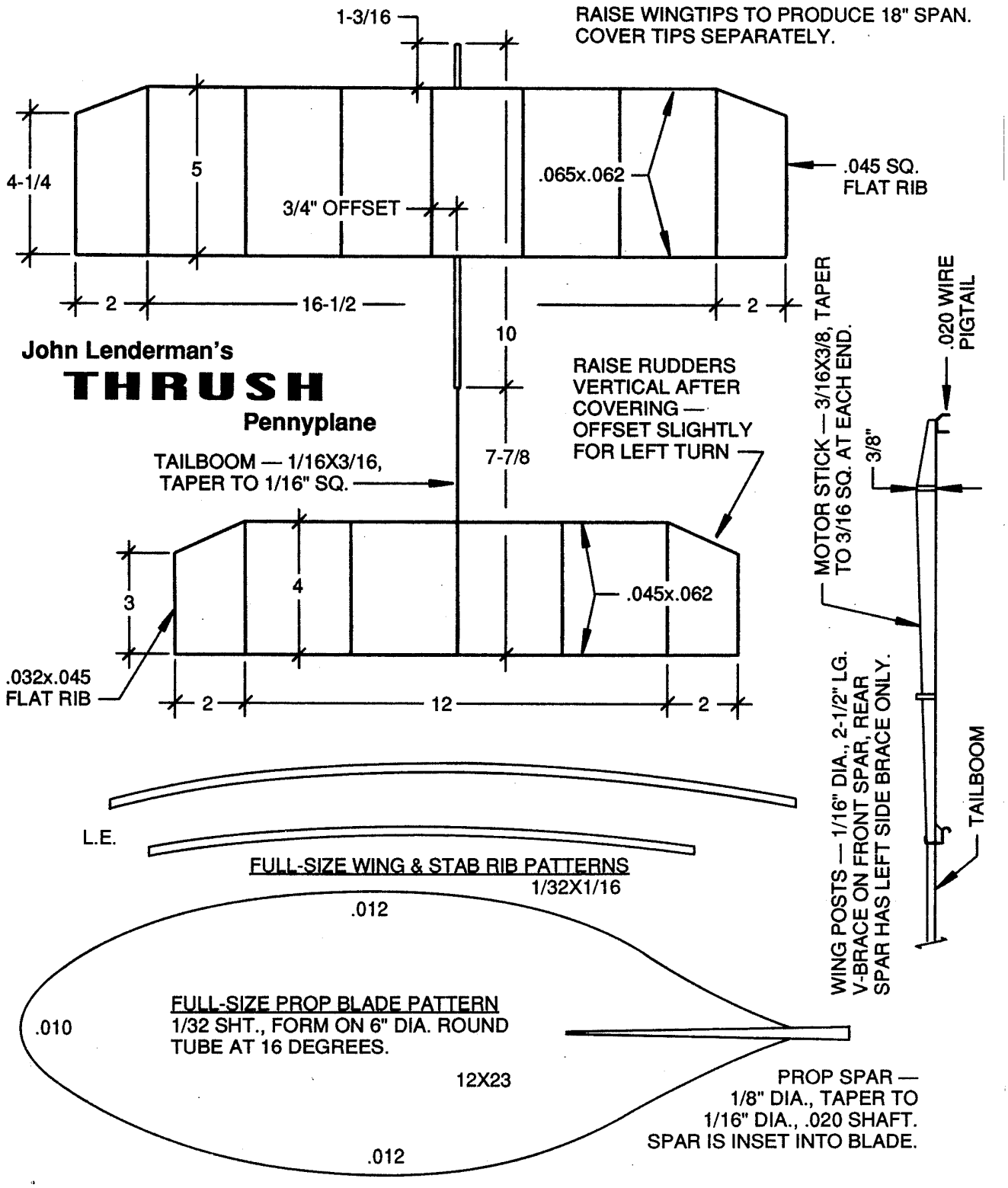
AMA CAT III RECORD HOLDER
WEST BADEN, INDIANA, 2003

by Larry Coslick, St. Louis, MO

I started building indoor models in 1991, and literally wore the cover off of the 1987-1989 Indoor Winning Design book, looking at plans, wood sizes, and densities. My first interest was EZB, but by the fall of that year, I wanted to build an Intermediate Stick. With help from Howard Henderson, and advice, and wood from Lew Gitlow, I finished the first version of the Phoenix. I saw the importance of flying on 1/4 motors, and by the spring of 1992, the Phoenix was getting over 7 minutes, in our 22 foot site. Howard and I went to the 1992 USIC at Johnson City, and even though it was my first major contest, I was fortunate enough to win Intermediate Stick and EZB.

The first Phoenix had a V stab, which was later changed to a floating stab. In 1995, a Variable Pitch Prop was added, and the Phoenix set a Cat IV record of 41:48, at Akron. The motor stick uses 0.010-.011" C grain balsa that weighs from 0.23 to 0.24 gram for a 1.2" wide sheet. The Phoenix requires from 0.25- 0.27 in. oz. of torque with a V/P prop, so it's not necessary to use heavier balsa for the motor stick. If the model is going to be flown on a fixed pitch prop, .009"wood that weighs .2 gram for the same width sheet can be used; Launch torque will be around 0.17 in. oz. Four pieces of 0.003' Boron is used to stiffen up the motor stick, and a slight amount of bend is added to the motor stick, with the bracing wire. If the model has a tendency to stall at a high launch torque, loosen the motor stick bracing wire, until the stall disappears. The Variable Pitch Prop uses a 0.010 x 0.043 x 0.350" carbon fiber driver, a 0.012" music wire prop shaft and thrust bearing. The load spring is made from 0.007" music wire, and is wound on a 0.032" mandrel, with 4 loosely spaced winds. The actuator arms are 0.006" music wire and, two 00-90 screws control the load spring and high pitch settings.

Intermediate Sticks are very elegant flying machines, and have become my favorite indoor model. The Phoenix had a very impressive outing at the 2000 USIC when all of its official flights were over 40 minutes. The Phoenix was flown at West Baden in 2003 and set a Cat. III record of 39:54. The model should have done 40 minutes, but struck the leaves of a potted plant a few feet off the floor.



From the March 1995 issue of Model Builder

THRUSH
LIMITED PENNYPLANE

First Place Kibbie Dome, 2003

By John Lenderman, Clatskanie, OR

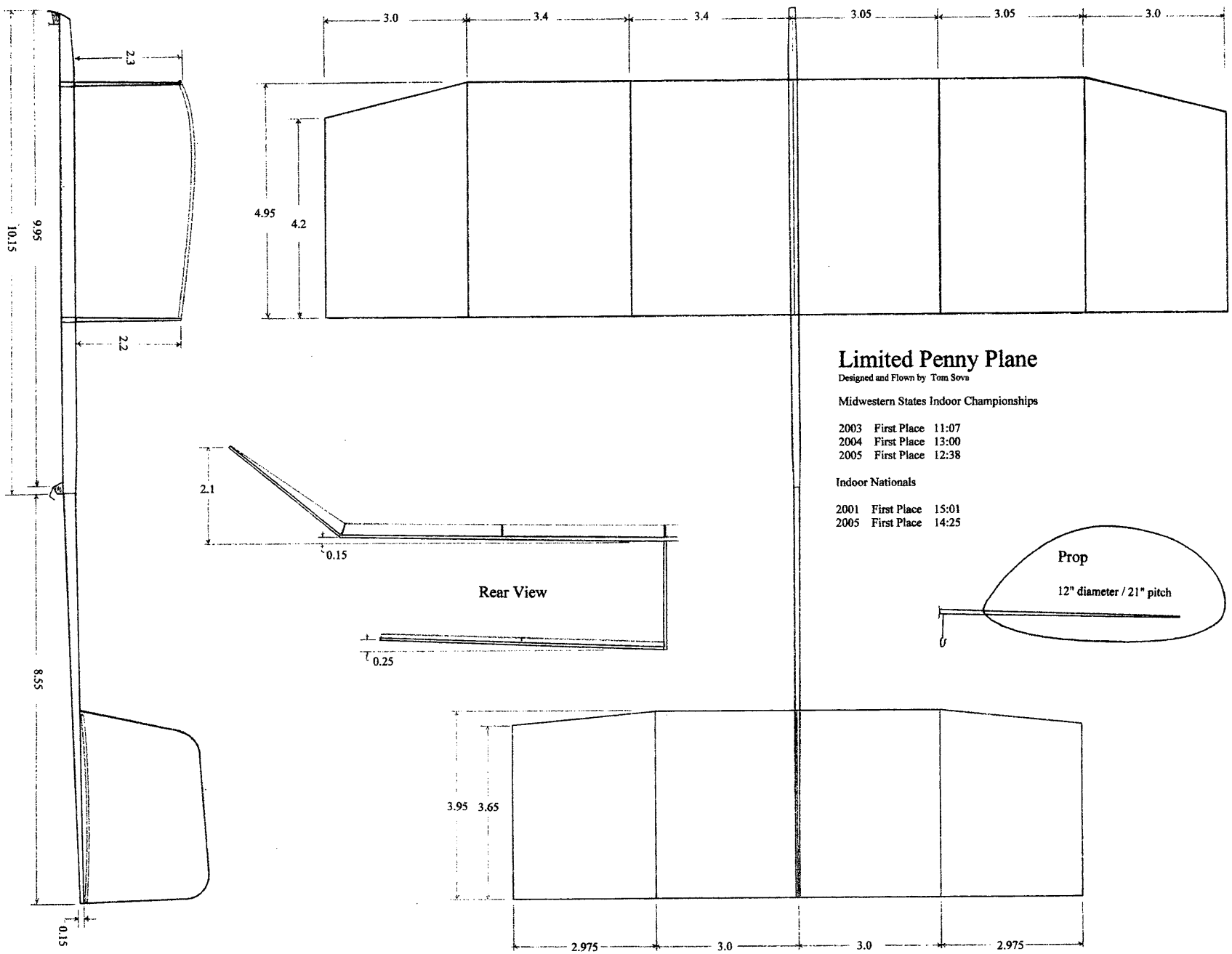
The plan presented here was featured in the March 1995 issue of Model Builder, the year it made its big debut in the Northwest Territory by besting all comers at the University of Idaho with a blistering 15:10 record flight. Formerly a major contender in outdoor Coupe d'Hiver, John is very active in the Willamette Modelers of Albany, Oregon. He is contest director of their annual two-day Indoor Record Trials and Symposium held in April. He also writes up the Kibbie Dome results every year for INAV.

"My Thrush has been an exceptional model ever since it was designed and built in 1994. It set a national Category II record of 11:27 in 1995, and has won just about every competition it was entered in since then. There have been quite a few built by other modelers, and every one has stated that it flew right off the board. The flight characteristics are the same for every model, and it has proven dependable with no problems at every competition.

"One unusual feature is that the thrust line has a built in upthrust of 1 degree. This seems to put the model "on step" during cruise and descent, and makes the model just hang in to almost the last few turns of the prop. The prop design is based on the Larrabee Method, and was used by Walt Van Gorder to set a record in Category IV.

"The nice thing about this model is that it is easy to build, with nothing fancy to make, and uses hobby shop wood throughout. It is one of my favorite models to fly, because it is so dependable. Incidentally, I have built a regular Pennyplane with this design by increasing everything by 10%, except for the length. This is a monoplane, and the best time so far, on the third flight, was 17:55 at Moffett Field in California."

Here are some building notes from John's original sketches, which are not obvious on the final plan. Build the wing flat and cover the center section. Then raise the tips to produce just under an 18" wingspan, and cover separately. Finally, raise the outside of the center panel to build in ¼" dihedral on each side. The tailboom is removable with a tissue tube socket. There is ½" stab tilt for left turn. The front pigtail bearing is made with 0.020" wire to have a 5/16" clearance from the motorstick, and has worked best with 2 degrees left thrust and 1 degree up. The tail hook has a similar standoff from the motorstick, with a 1/32" sheet antibunching insert.



Limited Penny Plane

Designed and Flown by Tom Sova

Midwestern States Indoor Championships

2003 First Place 11:07
2004 First Place 13:00
2005 First Place 12:38

Indoor Nationals

2001 First Place 15:01
2005 First Place 14:25

Prop

12" diameter / 21" pitch

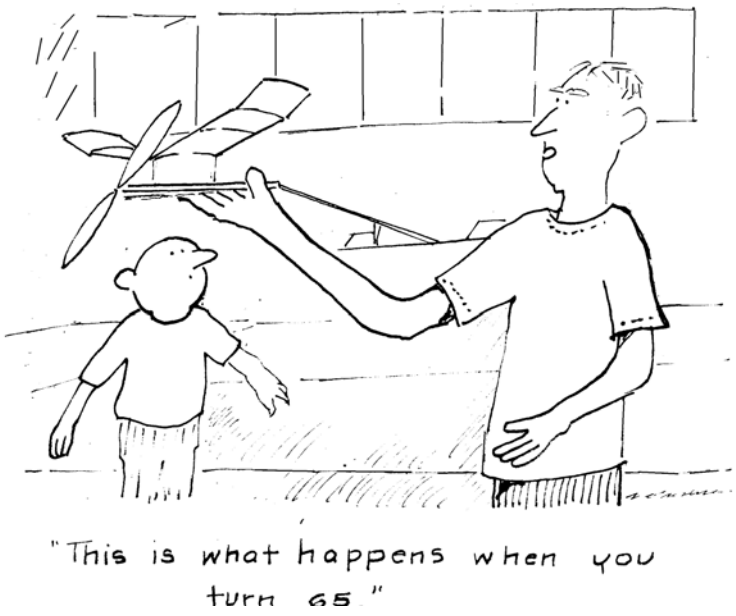
Bad Penny

A Limited Penny Plane
by Tom Sova, Sylvania, Ohio

First Place Midwest Championships
Champaign, IL
2003, 2004, 2005

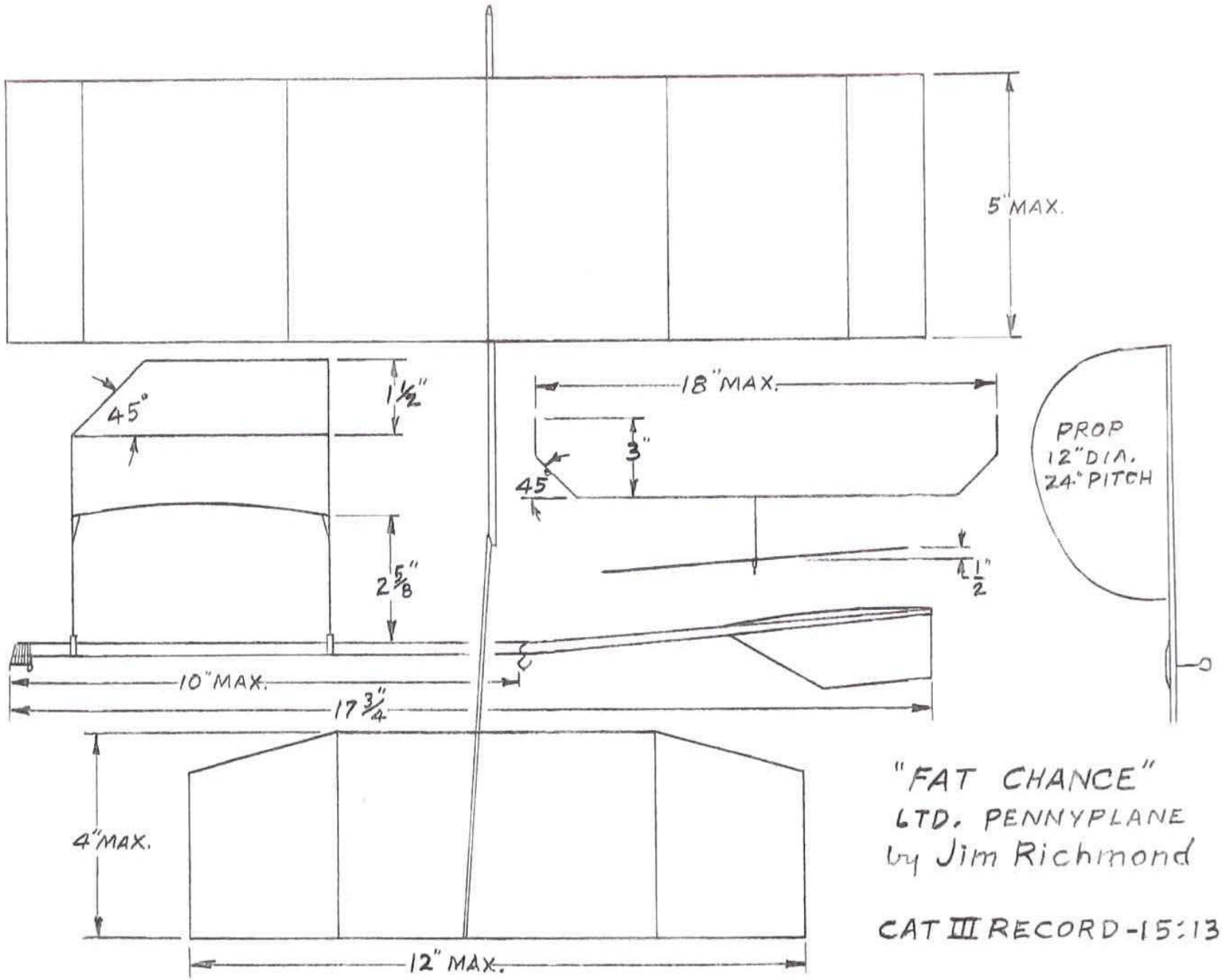
I'm going to call my limited penny plane Bad Penny as I can't seem to break or loose it. It just keeps coming back! I have only built two limited penny planes since desig
ning it in 1995. The only reason I built two is because I decided to actually weigh the original after it constantly tipped the scales while processing. Sure enough it was 150 mg overweight. If the overweight plane flew well a lighter one with ballast where needed should fly better.

This plane exhibits two of my trademarks. The first is that the rudder mounted directly above the stabilizer and the second is colored prop blades. The blades are dyed by soaking them in Rit dye before forming them on the prop block. Red, blue and green seem to work best. In events like mini stick and limited penny plane where all models look alike at 100 feet up, brightly colored blades make it easy to identify your plane.



Most current designs have wings with a flat center panel and tip dihedral or tip plates. I have tried the flat center panel but have gone back to a polyhedral wing. I believe the polyhedral makes the plane more stable at high launch torque and seems to allow a slower cruise with a nice nose up attitude. I use the same flaring prop for all ceiling heights. In high ceilings I have been able to get away with winding to max torque and launching without any back off.

I don't believe Bad Penny is much different than any other of the limited penny planes being flown. The goal for success in this event is to trim for a smooth high torque launch and a slow "on the step" cruise.



"FAT CHANCE"
LTD. PENNYPLANE
by Jim Richmond

CAT III RECORD - 15:13

Fat Chance

Category III Record Holder

A Limited Pennyplane by
Jim Richmond, Carmel, Indiana

1st Place USIC 2004

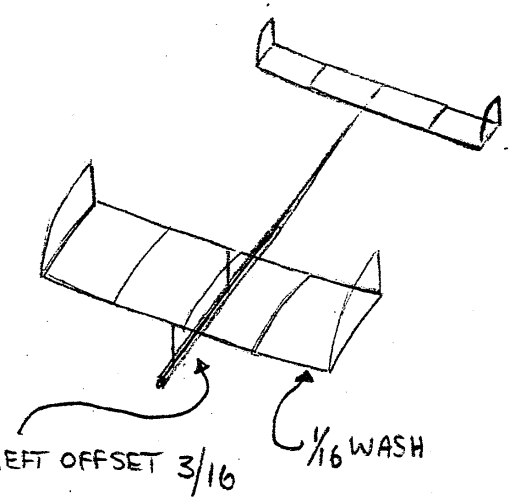
Many people avoid indoor duration flying, as I once did, because they perceive the activity to be slow-paced, dull, and uninteresting. Nothing could be further from the truth, but the only way to find out is to try it. You can't tell by watching as I know from experience. I tried indoor rubber back in the 1960's only because the Aeronuts cut off the glider flying at noon, and there was nothing else to do. And now I can tell you that the most fantastically exciting moments in my life occur when my model is at high altitude in a major competition, getting into trouble. Several well known indoor flyers have been known to actually leave the building on such occasions rather than endure the stress.

So put some excitement in your life. Try indoor duration flying. Here is a good model to start.

The design of the Fat Chance is quite old, maybe 10 years, but its performance has steadily improved, and now it holds the Cat III record, and won USIC at Johnson City in 2004. Time constraints prevented me from flying it in 2005.

THE POONKER MINISTICK

BY ROB ROMASH



WING 7" CHORD 2.5"

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

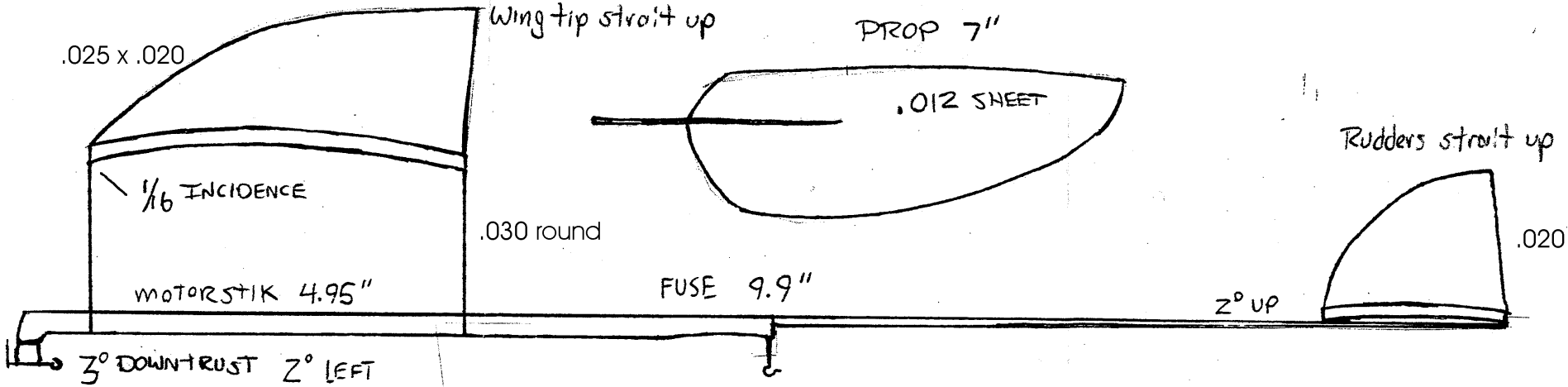
Spar .030 x .025

STAB 7" CHORD 1.25"

.025 x .025

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

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

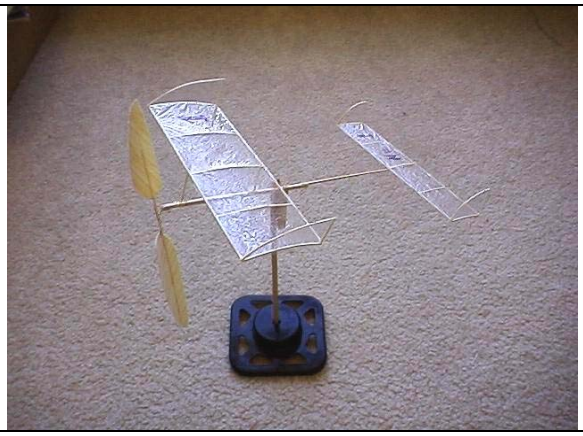


Poonker Notes

A MiniStick Design

by Rob Romash, Colorado Springs, CO

Current Cat IV Open Record Holder



The Poonker arose from a need to get a ministick to the top of the hanger at Lakehurst. I needed a plane that could climb rapidly without the attendant stalling like the little minxies usually do.

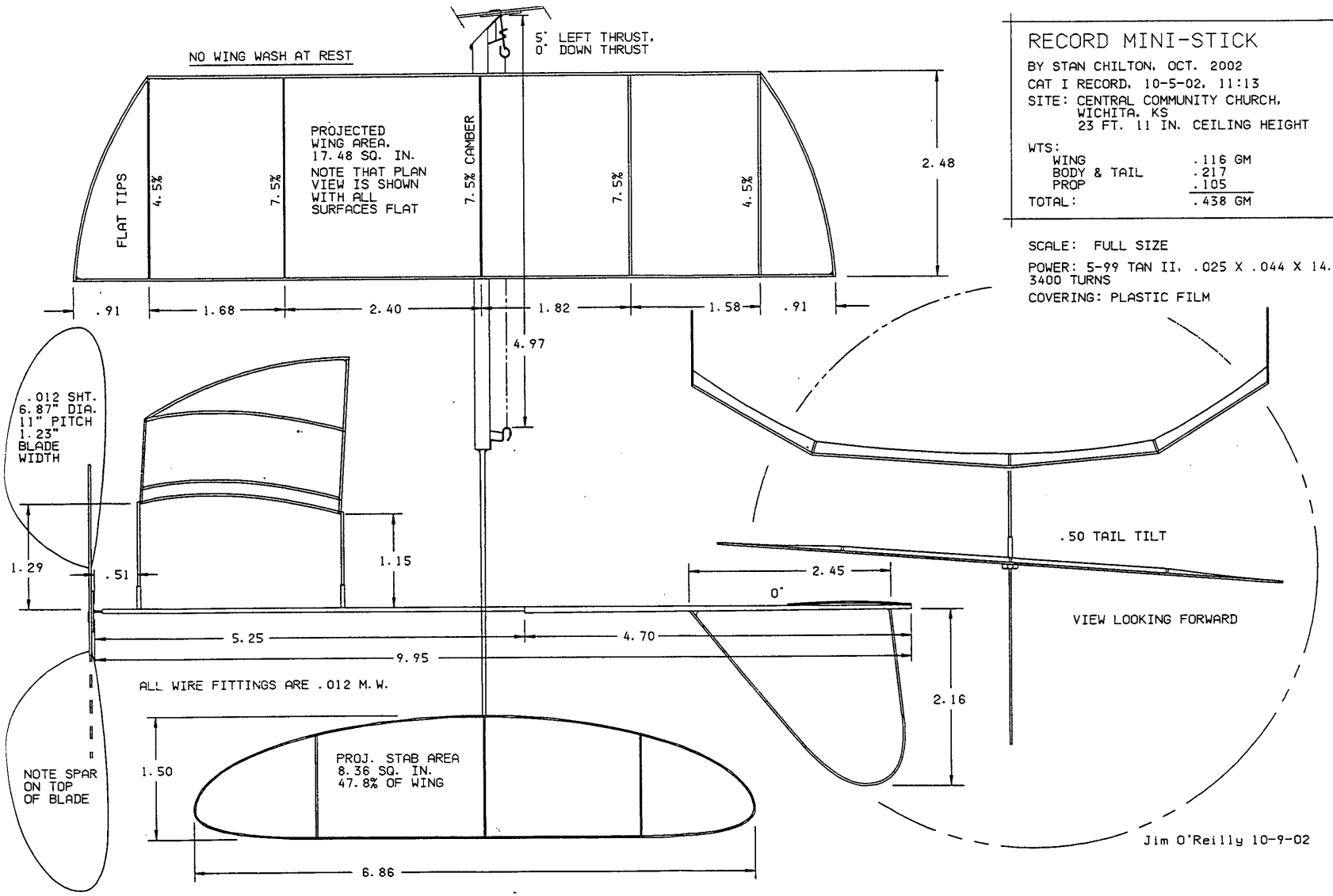
Construction is typical depending on wood strength. My wing does have a tiny bit of flex on launch augmenting the adjustments built in. This ministick is an evolution of Joe Krush's K-777, which is always a consistent performer. The prop was formed on a 2" dia. cylinder which is made from a thin deformable styrene, when the prop is put on about an 18^{o} angle, I then deform the tube to give it a more radical shape - more twist is evident at the base of the prop rather then the tip. I also run a bit less pitch then is usual; I am not sure how much. I use the looks-about-right method and am always tweaking depending on the mood of the aircraft. Walt Van Gorder says it looks pretty low. I use a lot of space between the rubber and the motorstick so as to avoid hang ups. Be sure to have the wingtips very straight to avoid any drag. Wingtips are covered on the inside using separate pieces of mylar. This makes for a very clean transition at this joint; on launch it does a lot of flying on these tips.

I adjust to conditions as I fly this thing so the plans show about what I had that day.
Conditions were in the low eighties in the afternoon when the high time was set. You have to get a lucky day to do big times. There were several flights over 14 min with Poonker the same day but it wasn't until early afternoon that conditions became optimum.

This ship runs on smallish rubber that has the living bejeezus wound out of it, for these flights learning to wind until the next turn on your winder is the last is important. I also massage the knots before launch. This helps a good deal with getting this rubber to
unwind all the way.

Poonker works well in the hanger but I have trouble keeping it out of the ceiling at
Johnson City. This is where I will tweak in more pitch and make it do some tricks before the climb. I think this design will work well for low ceiling with a bit more prop area and a bit more airfoil. Indoorduration.com, Tim Golstein's site, has an updated plan of Poonker with a bit more in the way of sizes and I encourage all to go get it.

This ministick was named after my late cat Poonker who never would give a passing glance to my models flying around her head, but would bring me a dead bird on a weekly basis, go figure.



RECORD MINI-STICK

BY STAN CHILTON, OCT. 2002

CAT I RECORD, 10-5-02, 11:13

SITE: CENTRAL COMMUNITY CHURCH,
WICHITA, KS
23 FT. 11 IN. CEILING HEIGHT

WTS:

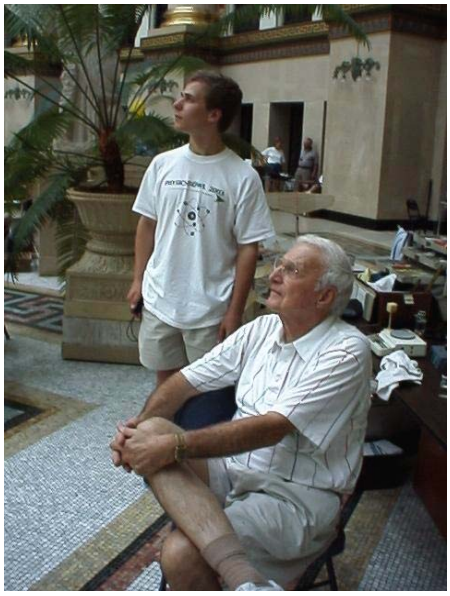
WING	.116 GM
BODY & TAIL	.217
PROP	.105
TOTAL:	.438 GM

SCALE: FULL SIZE

POWER: 5-99 TAN II, .025 X .044 X 14.0
3400 TURNS

COVERING: PLASTIC FILM

Jim O'Reilly 10-9-02



CATEGORY I RECORD MINI STICK

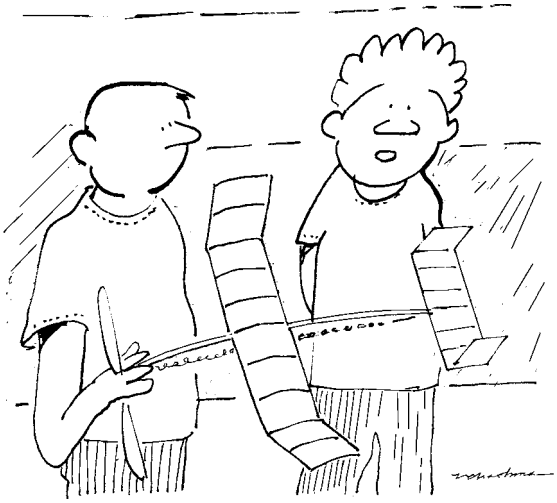
Stan Chilton, Wichita, Kansas
11:13, 10-5-02

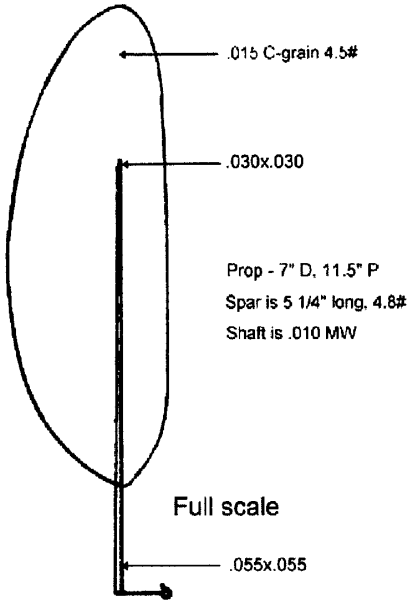
Stan, seated, watches a flight at West Baden 2003 with Jeff Dalton. He currently holds the Open Mini Stick records for both Category I and Category II ceilings.

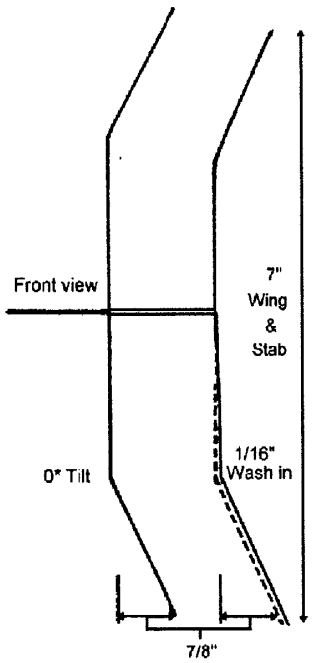
This plane did 12:19 at West Baden this year, 2002, which was good enough for a second place, but was damaged and could not show it's full potential. Stan was kind enough to let us have the plan and the specs below.

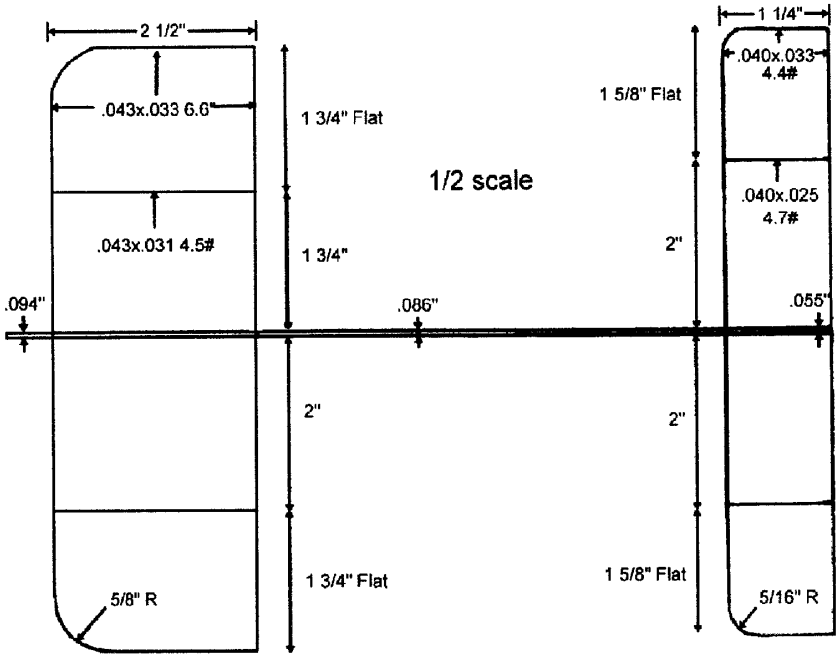
The editor considers the design a major innovation because of the tuneable, side mounted motor stick. Although the concept is common with NoCals, and sanding motorsticks common with EZB's, it's application to this class is unique. Stan recommends building the motorstick slightly over-stiff, then sanding the top for wing warp, and the side for increased right thrust at launch. Wind to full torque with no back off.

Motorstick:	0.050 x 0.195 - 6#
Tail boom:	0.055 x .075 tapered to 0.040 sq. - 4.0#
Stab:	Outline is one piece - 0.020 x .030 – 5.8#, spliced at LE center
Ribs:	Banana Style - 0.018 x 0.030 - 4.6#
Rudder:	Outline - 0.025 SQ
Wing:	Spars - .030 x .038, -5.5 TO 6.0#
	Ribs - .020 x .028, -5.5#
	Posts - .036 x .042, - 6.5#
	Sockets -.046 ID
Prop:	Blades - .011, - 3.9#
	Spar -.023 x .025, Basswood
Motor:	5/99 Tan II, 0.025 x 0.044 x 14" loop



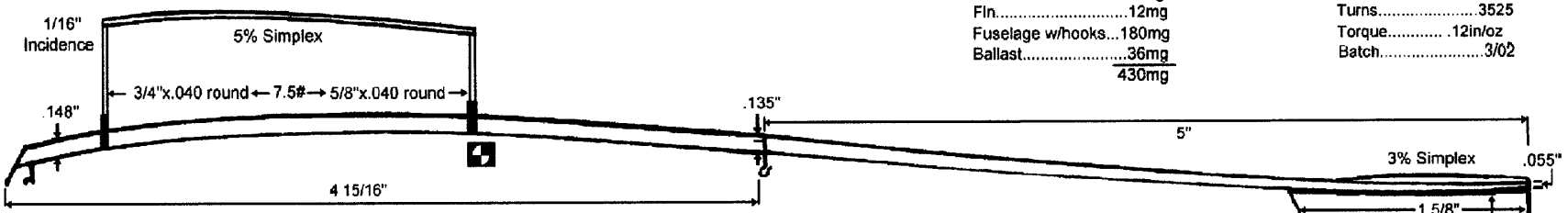






Weights: **Wing w/posts & Y2K..90mg**
Prop w/washer.....72mg
Stab.....42mg
Fln.....12mg
Fuselage w/hooks...180mg
Ballast.....36mg
430mg

Motor: Loop.....15"
Cross section..... .0225"
Weight.....382mg
Turns.....3525
Torque..... .12in/oz
Batch.....3/02

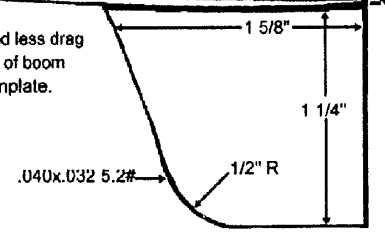


0° Down
3° Left
.010 MW

Motorstick and boom cut from same 6.9# - 3/32" stock with 5% Simplex template.
Curved motorstick prevents motor knots from binding prop.
Both are very rigid and do not flex during flight.

Curved boom droops tail for better flying attitude and less drag
To achieve proper stab incidence of -1° - align end of boom
1 3/4" from leading edge of 5% Simplex template.

Motorstick and boom are over built and
then sanded to final weight of 430mg.



Subrudder prevents rolling on high torque launch.

Full scale

Minislick

Unofficial Cat IV Record - 15:30
Lakehurst - July 5th, 2003
Designed, built, flown and drawn by Alan Cohen

MINISLICK

An Original MiniStick Design

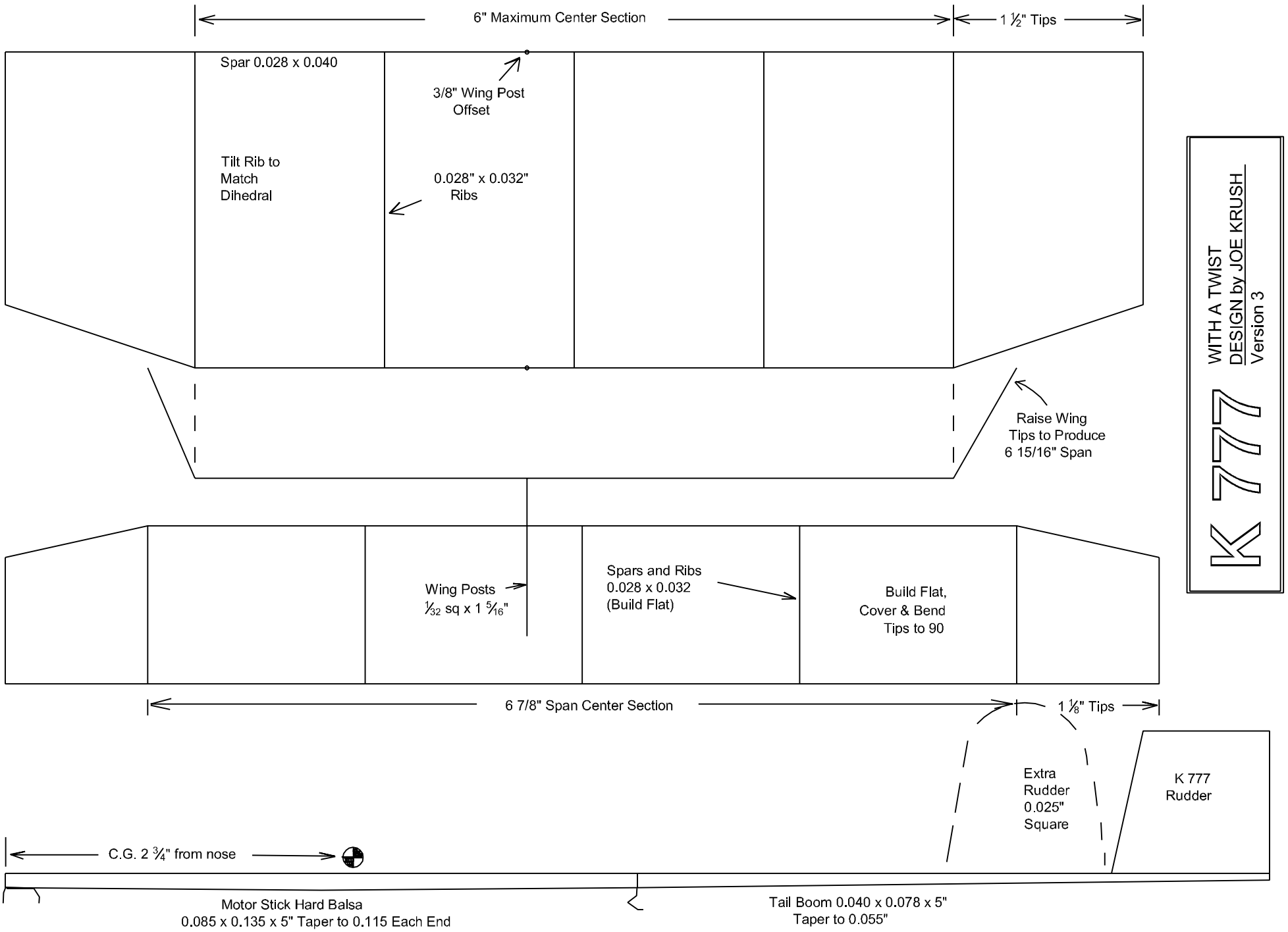
by Alan Cohen, Glen Gardner, NJ

The idea for the Minislick came about after about a year of trying to hit the ceiling at Hangar #1 in Lakehurst, NJ in 2002. For anyone who has built and attempted to fly a ministick for any appreciable duration in a high ceiling site, two major issues arise. The first is the awkward launch typical of most ministick designs. They tend to barrel roll several times on a high torque launch, burning off much of the energy necessary to reach the 195' ceiling. Many of the designs of the time employed wing tip plates in an attempt to stabilize the launch, but I could never get the hang of them and sought a different approach. While certainly not an aerodynamic expert by any means, I did come across the concept that 'guiding' a model's direction is more efficiently achieved from the tail rather than the wing. With this thought in mind I attached a subrudder to an early version of the Minislick and lo and behold…no barrel rolls. The model consistently circled 2-3 times with the wings banked about 85 degrees and then proceeded to climb. At this point it was just a matter of finding the right rubber/prop combination to do the job.

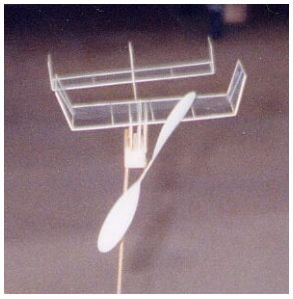
That brings us to the second issue. In order to reach the 15 minute mark, you need a loop of rubber about 3 times the distance between hooks. That size loop creates problems with knots grapevining, hitting the motorstick and causing the prop to deadstick. One evening, while contemplating a new model, I was eyeing the old one from the side and thought it would be neat looking to have the shape of the motorstick conform to the airfoil of the wing. As I worked further with this idea I realized that making a curved motorstick would also allow plenty of room for knots…a very nice bonus! At this time I was reading a lot about drooped tail booms from across the pond and that gave me the idea to continue the curve through the tailboom effectively lowering the stabilizer below the motor. Now I had a model that looked pretty good, but will it fly?

The first test flights were over July 4th weekend at Lakehurst in 2003. I was getting 13+ minute flights consistently, but not reaching the ceiling. As soon as I switched from the 0.020 loop I'd been using to 0.022, I knew I was either in trouble or I was on to something. The model climbed right out and headed for the ceiling. About 3 minutes into the flight the sky got very dark and you could hear the winds kick up. A pretty violent storm had just arrived. Within 5 minutes the plane was dancing at the catwalk and might have bumped once or twice. The air started swirling and in a matter of 8-9 rotations it was blown 300' from the center of the hangar towards the far doors. Since the far doors are not sealed well, I was sure the model would be sucked right out the 4" gap around all the edges. Fortunately, a cool down draft virtually slapped it out of the air 20' from the door at the 11 minute mark. It would live to fly again.

After the storm subsided I sent it up again. It reached the ceiling in 6 minutes and cruised for 5 more. As it started its descent it seemed like it just didn't want to come down – possibly the result of the post-storm buoyant air. It deadsticked at about 35' and landed in 15 minutes and 30 seconds. I was most pleased!


6" Maximum Center Section
1 ½" Tips
Spar 0.028 x 0.040
3/8" Wing Post Offset
Tilt Rib to Match Dihedral
0.028" x 0.032" Ribs
Raise Wing Tips to Produce 6 15/16" Span
K 777
WITH A TWIST
DESIGN by JOE KRUSH
Version 3
Wing Posts
1/32 sq x 1 5/16"
Spars and Ribs
0.028 x 0.032
(Build Flat)
Build Flat, Cover & Bend Tips to 90
6 7/8" Span Center Section
1 1/8" Tips
Extra Rudder 0.025" Square
K 777 Rudder
C.G. 2 ¾" from nose
Motor Stick Hard Balsa
0.085 x 0.135 x 5" Taper to 0.115 Each End
Tail Boom 0.040 x 0.078 x 5"
Taper to 0.055"

K-777 Mini Stick



Designed by Joe Krush
Modified by Walt Van Gorder

Current Cat III Record Holder
13:23 West Baden 2003
First Place USIC, 2004

Here is the information on Joe's K-777. I have twisted it a bit. When the Mini Stick event first started out, I was not going to fly one. Then in 1992 on a trip to Lakehurst, I watched Joe Krush fly his K-777. What a great model – the best I had ever seen!

Joe was the first to get a Mini over 10 minutes. I asked him for a plan, he was kind enough to send me one, and it has been a great model for me. Joe won at U.S.I.C. in 1992 with a time of 10:20. I got one finished for the same contest in 1993, a dead-stock K-777 per Joe's plan, that I finished the night before I left for Johnson City. Joe Krush was there, and I had him check it out before I ever flew it. Joe said it looked OK to him. I came in second in the class behind Larry Coslick, and went on to win the Mass Launch with an 11:20 no-touch flight. I was very happy with the model.

As time went on, I just made a few changes. The plan presented here is Version 3 that I won with at USIC 2004, but I still fly all versions of the K-777, including the original one. In fact, I won the Mini Stick International Postal Event 5 times with the #1 version, and set some records, too.

Many thanks go to Joe Krush, who is one of the many Great Guys in our hobby.

Walt Van Gorder

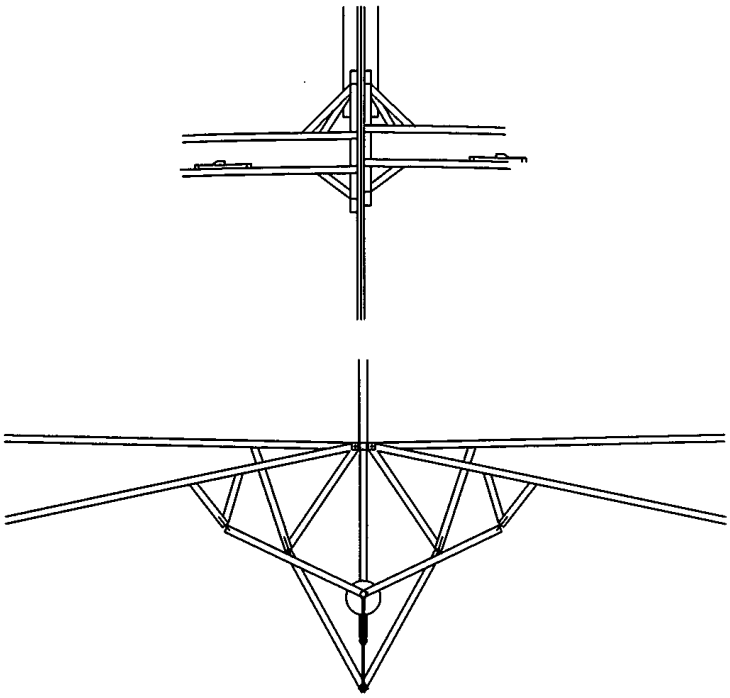
Wing:
Center panel is flat 6" x 2 ½" max. L.E. and T.E. spars are 0.028" x 0.040". The ribs are 0.028" x 0.032", with a 3/16" airfoil. The wing tips extend out 1 ½" on each side, and are raised to form a dihedral and give a 6 15/16" tip-to-tip span.

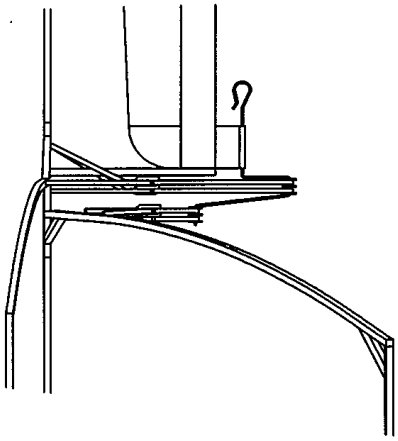
Stab:
The center panel is 6 7/8" x 1 ¼", made from 0.028" x 0.032" spars and ribs. The stab tips extend out another 1 1/8" on either side, and after covering, are bent and raised 90 degrees.

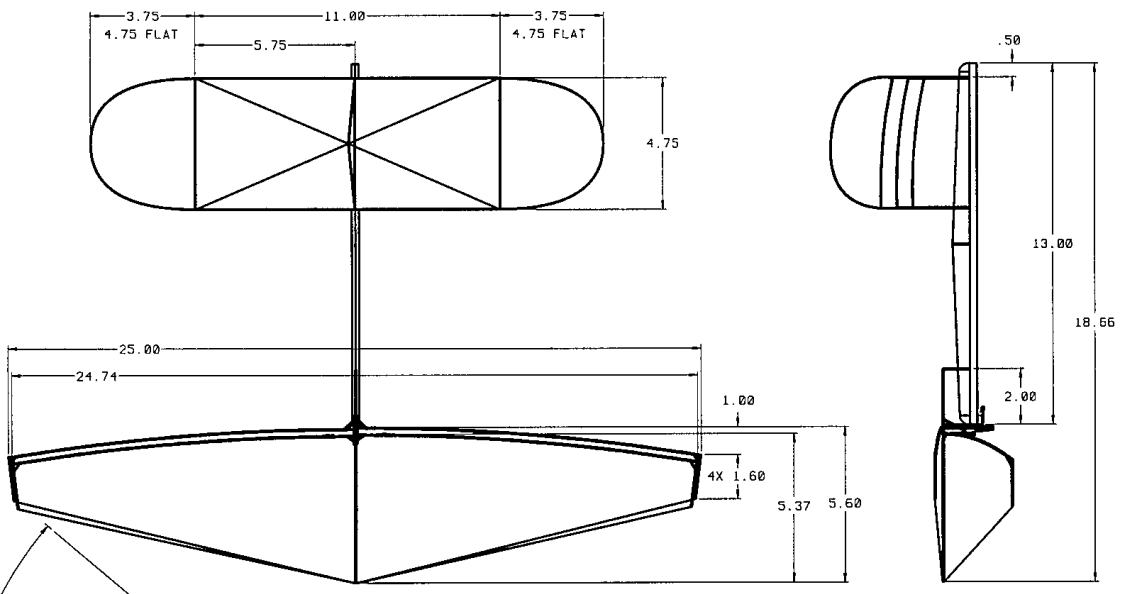
Motor Stick and Boom:
The 5" motor stick is made from 0.085" x 0.135" hard balsa, tapered to 0.115 front and rear. The 5" Tail boom is made from 0.040" x 0.078" balsa, tapered to 0.055" at the rear.

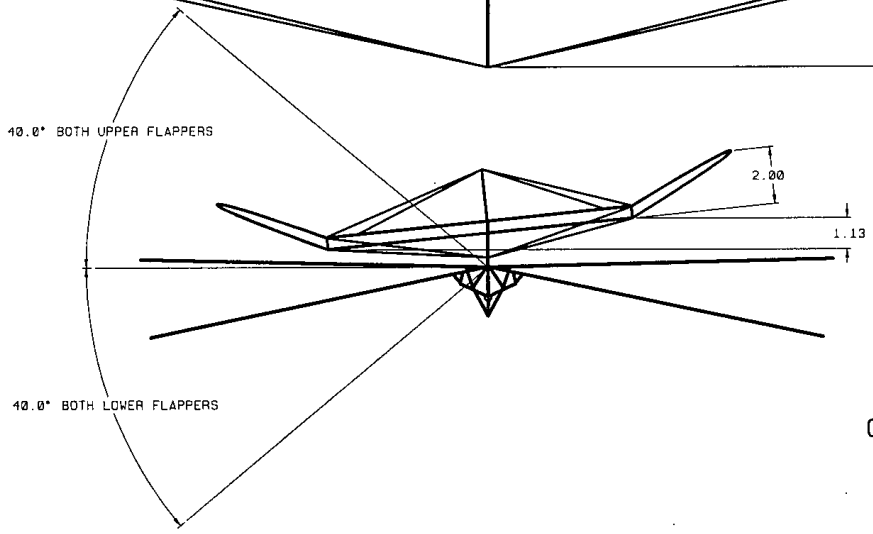
Propeller:
The Bob Eberle 6 15/16" diameter prop is made from 0.010 C-Grain. Pitch is 45 degrees at 2 47/64". or 17.2 pitch

Motor:
9.5" loop of 0.030 to 0.031" 8/93 Tan II. Used 2227 turns, landed with 140 left.









WEIGHTS

FLAPPERS	.0198
STICK ASSY	.0129
CANARD	.0098
TOTAL	.0425

RAY HARLAN

FLAPJACK III
OPEN CAT III RECORD 15:20
AUGUST 16, 2003

Flapjack III

An Ornithopter Design

by Ray Harlan, Wayland, MA
a CAT III Record Holder

Ray spends as much time coaching as flying, here with Tara Taylor of Smyrna, TN

This ornithopter has many similarities to models by Frank Keiser. He has had a profound influence on ornithopter performance over the last twenty years. Although the double flapper wasn't one of his originalities, he quickly recognized its potential. A major benefit is the out-of-phase movement of the flappers, which maintains a load on the crankshaft and avoids the hard snapping over due to backlash in single flapper models. The canard configuration is his idea and all competitive ornithopters dating from about 1987 use it. It effectively lowers the wing loading by having all flying surfaces lift upwards, as compared to the tractor with its down-lifting tail.

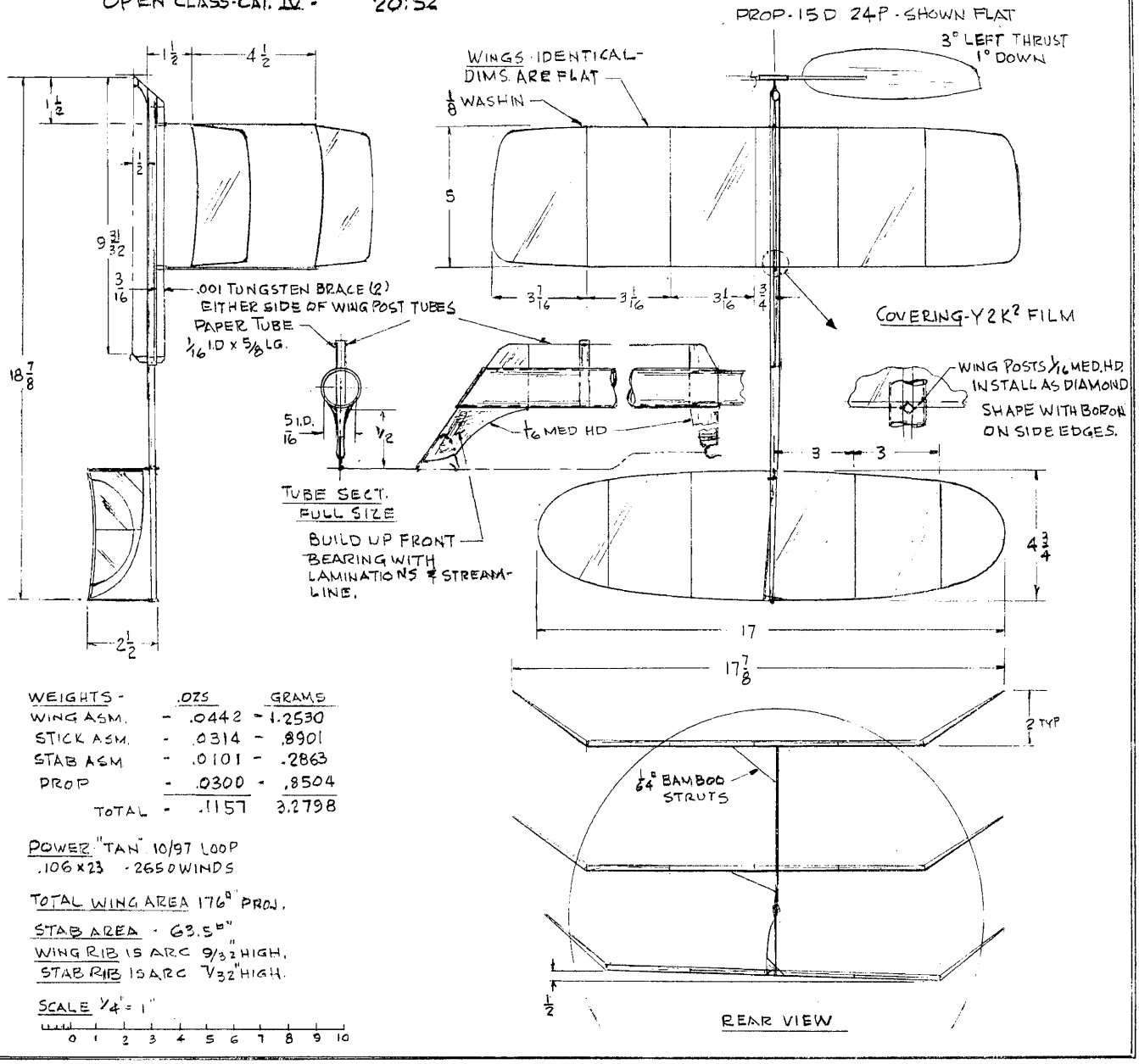
About the only novel claim that I can make for this model is the wing mounting structure. Frank used a bit more lumber to build the hinges. Sometimes these models seem to have a mind of their own and start in one direction and then change over to another direction once the torque has diminished. I have found that stab tilt, combined with a little extra flapping angle in the right wings, helps maintain a single direction, although the circle size still can vary.

The structure follows standard practice with boron on top, bottom and front of each wing spar. All hinge wire is .007" music wire. I use .008 MW to make holes in the balsa and CyA the wire in place. Then I twist it loose, leaving a nice .001" oversize bearing hole. The wing covering is Ultrafilm; lighter coverings can be used, but I don't think the lightest (OS, Y2K) will hold up. I have used a conventionally braced stabilizer. The motorstick is braced with a single .001" tungsten wire on top and 2 pieces of .004" boron on the sides.

Ornithopters are wonders to see in flight, especially towards the end when they are at their graceful best, just lazily flapping and floating. In talks on indoor models to local RC clubs, this model always is the big hit of the evening. It has won USIC in 2001 and 2003 and placed 2nd in 2002.

FIRST 20 MINUTE PENNYPLANE - "TWENTY+" BY ANTHONY D'ALESSANDRO - LAKEHURST N.J. 9-13-03

OPEN CLASS-CAT. IV - 20:52



WEIGHTS -	.OZS	GRAMS
WING ASM.	.0442	1.2530
STICK ASM.	.0314	.8901
STAB ASM	.0101	.2863
PROP	.0300	.8504
TOTAL	.1157	3.2798

POWER "TAN" 10/97 LOOP
.106 x 23 - 2650 WINDS

TOTAL WING AREA 176" PROJ.

STAB AREA - 63.5"

WING RIB IS ARC 9/32" HIGH.

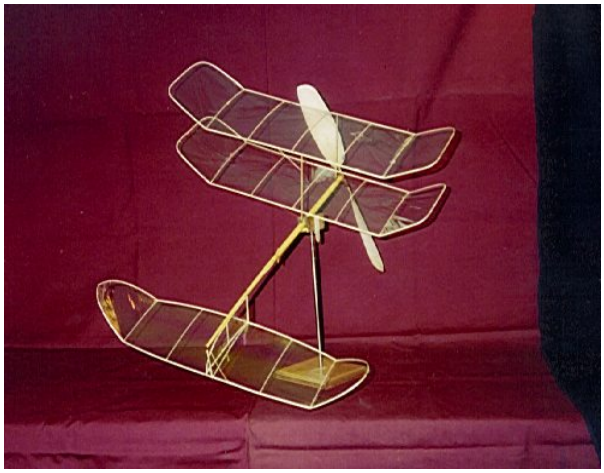
STAB RIB IS ARC 7/32" HIGH.

SCALE 1/4" = 1"

0 1 2 3 4 5 6 7 8 9 10

TWENTY +
The First Twenty Minute PennyPlane

By Anthony D'Alessandro
198 Twining Fork Rd.
Richboro, PA 18954



These plans are for the Twenty +, the first twenty-minute pennyplane. The plans for this model were drawn in 1987. It flew well from the start, using an old narrow bladed, carved propeller and whatever Pirelli rubber I could scrounge up for power.

In 1994 , with Tan II rubber and a new prop, I placed fifth at Johnson City with a flight of 16 minutes. It then occurred to me that if I could do 16 minutes in 120 feet, I ought to be able to do considerably better at Lakehurst at 175 feet. Later that year I broke the then existing record with a flight of 19:21. My goal then became to have the first 20 minute PP flight. Over the years I have broken my own record at 19:33 and 19:45 (officially), and 19:51 (unofficially), until I finally broke the 20 minute mark.

July 19, 2003 was a rainy, windy day, with 75 F. temperature and 79% humidity in the hangar at Lakehurst. I had no expectations of any record times and spent most of the day trying to get my F1D to climb above 100 feet. I decided to fly my PP, assembled it, and had a promising test flight. On the next flight, fully wound, the model climbed beautifully to touch the center catwalk. It then drifted over the simulated carrier training deck (10 ½ feet high). After a long cruise, the model began to descend and I decided not to try and steer it out over the floor area. It was about 20 feet above the deck when it broke the 20-minute mark. It caught the edge of the deck and touched down. With a few more inches of altitude it would have passed out over the floor area and added 20 to 40 seconds to the flight.

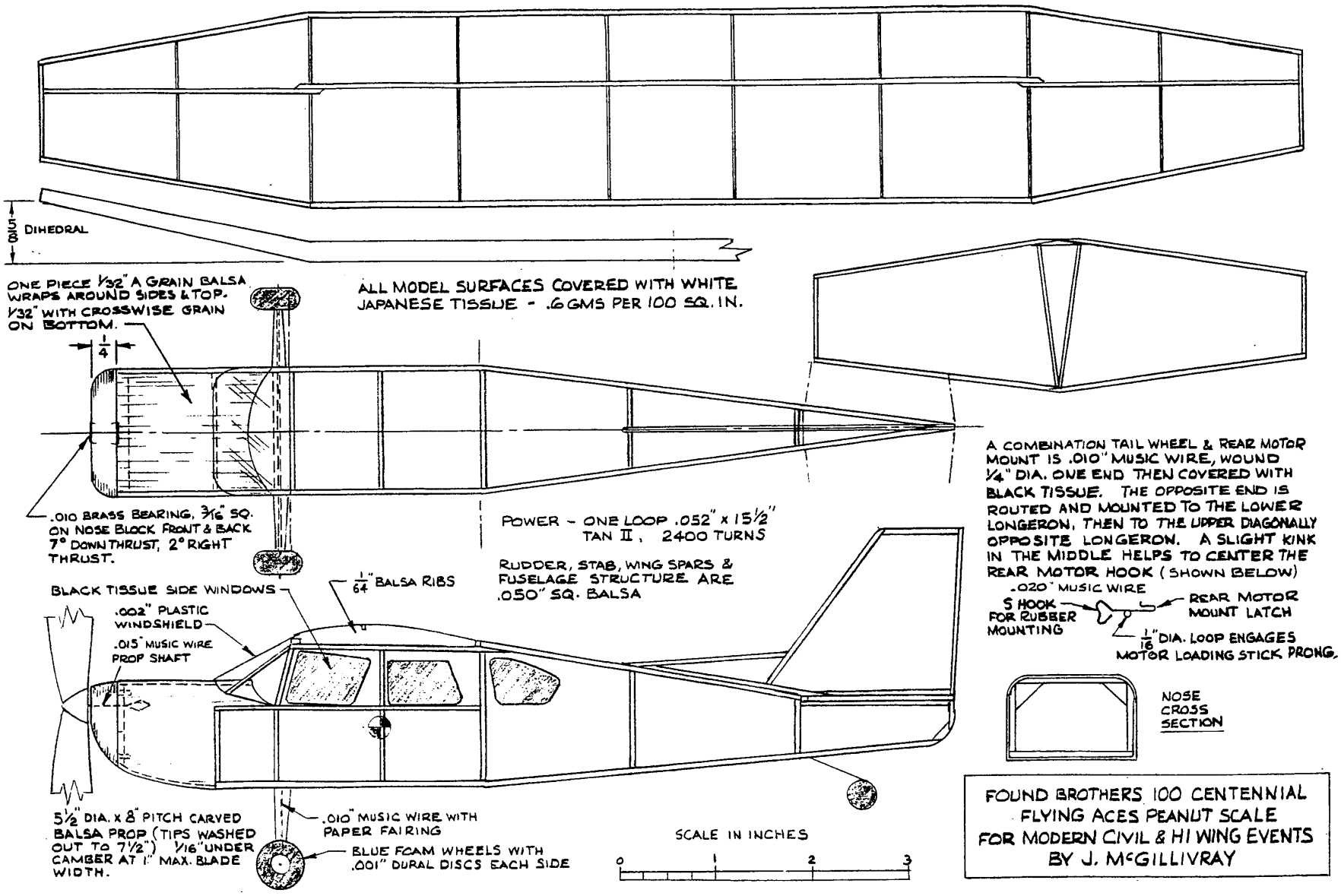
With models of this type, knots and the smooth unwinding of the motor are always a problem. Thanks to Jim Grant for showing me that the motor can be ½ inch away from the motorstick and to Walt Eggert for his information about the use of a. sleeve on the motor.

When applying a sleeve, use lubricant on the sleeve and the rubber. Stretch the rubber and slide it carefully down the wire into the hook. Grip the wire behind the sleeve with a pair of needle nose pliers. Use the thumbnail and forefinger to work the sleeve over the hook onto the rubber. It takes practice and a firm grip to attach a fully wound motor onto the prop hook and slide the sleeve up against it. Some winds will be lost in the process.

I have experimented with props, trying different diameters and pitches, a variable pitch prop and. a. built up, wood covered, true pitch prop. None has performed as well as the original prop shown.

I fly at Lakehurst about 10 times a season. Persistence counts, as I have flown this model with the same setup and number of turns several times in the past without breaking the 20 minute mark.

Any questions, I can be reached at the address shown above, or call me at 215-355-2930, preferably in the evening.



FOUND BROTHERS 100 CENTENNIAL
FLYING ACES PEANUT SCALE
FOR MODERN CIVIL & HI WING EVENTS
BY J. McGILLIVRAY

FOUND BROTHERS 100 CENTENNIAL FLYING ACES PEANUT SCALE

By Jack McGillivray, Toronto, Ontario

The photo shows Jack at Johnson City with another one of his winning models, a British SE5A.

My incentive to build this model was Walt Mooney's peanut, published in the March/April 1978 issue of Model Builder. His model had a flying weight of ½ oz. (14 grams), but the plan specified that it could be built lighter, especially if it was to be flown indoors.

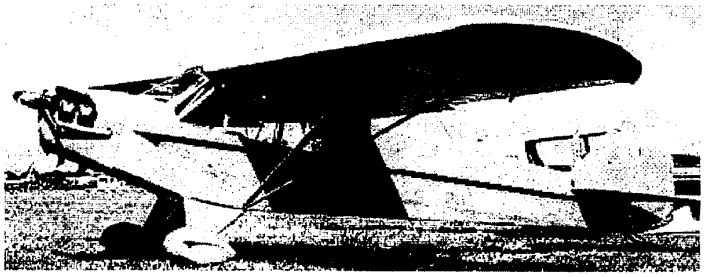
Since High Winged Peanut is a judged event, I obtained three-views and photographs of the full-size aircraft before starting construction. My drawing reflects some of these changes, but my model also has added detail, such as an exhaust stack, air outlet, steps, flap horns, panel lines, doors, etc. Balsa used in construction was of the 4 to 6 ppcf variety, and small cross sections of this material are used, and even some structural components can be omitted when the covering is not tightly shrunk on the airframe. Before covering, the tissue was fastened around the edges to a stiff wooden form, then shrunk and given a couple of coats of low shrinking dope, such as Sig Lite Coat, to seal up the tissue pores. Color, trim, registration numbers, and Letraset lettering can be added while the tissue is still on the frame.

Although built primarily for indoor purposes, this model has been subjected to wet outdoor weather without warping, giving excellent results, with a flying weight of 0.151 ounce (4.28 grams), less than one-third of Walt's model weight. I prefer to wind the motor outside the model on a torquemeter, using a wire hook as shown on the drawing. After attaching the wound motor to the prop hook, a 1/8" square spruce stick 12" long, with a 1/32" wire prong extending sideways from one end, is inserted into the loop in the rear motor hook. The hook is then disengaged from the torquemeter, and the stick with the rubber motor on it is slid through the model's nose and the rear motor mount hook latch engages the rear motor mount. The stick is then removed from the fuselage, and the nose block is put in place.

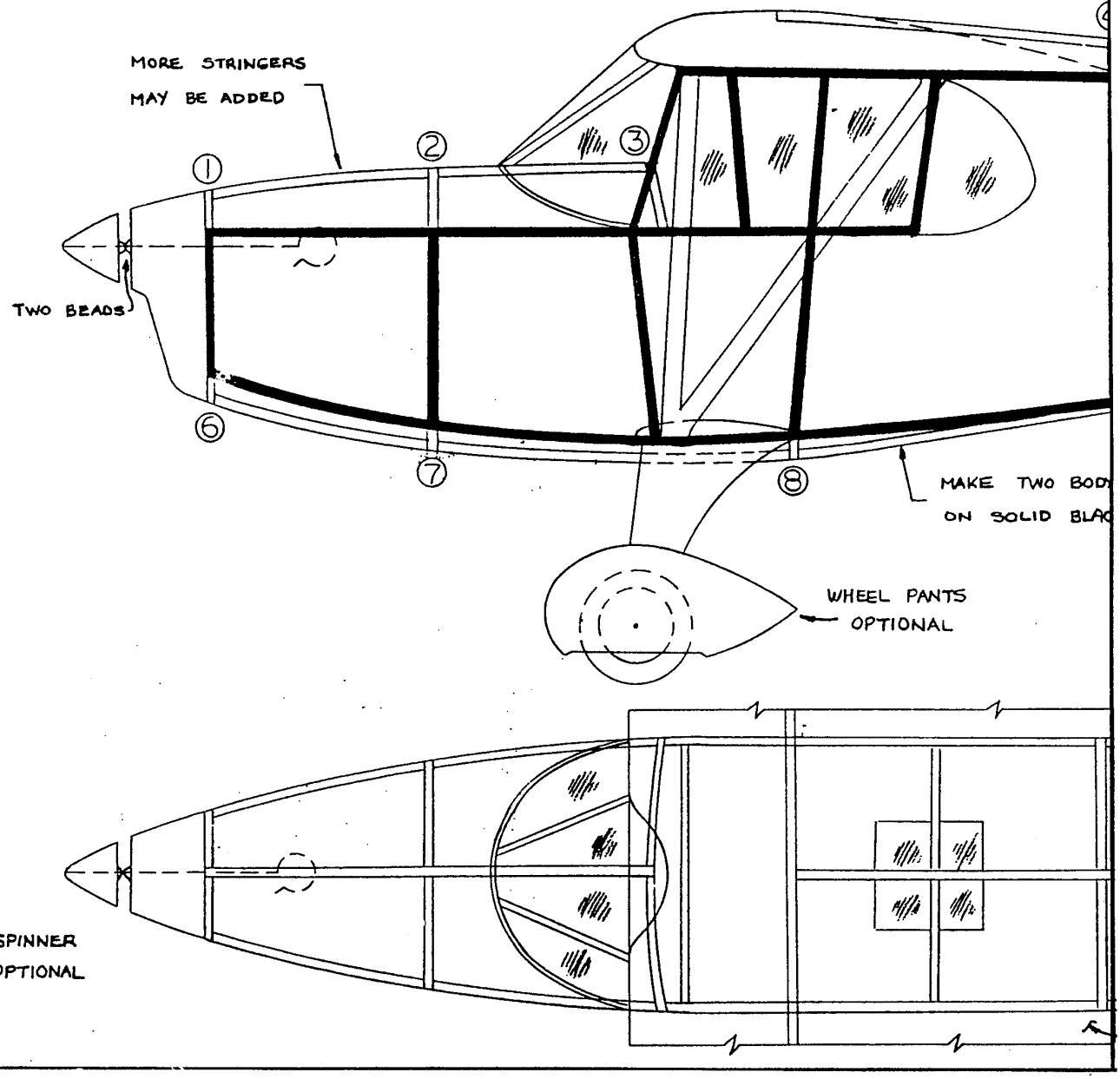
Editor's Note: The original Mooney plan is still available in Bag #5 wherever his Bag of Peanuts plans are sold. As Jack mentions, this plan is most suited for outdoors if built according to plan.

PIPER CUB

FF22



22" wingspan
1/19 scale
Easy to build, easy to fly
Free Flight Rubber Powered
Flying Model
Society of Antique Modelers Qualified



22” EASY BUILT PIPER CUB

By Jack McGillivray, Toronto, Ontario

Eight or nine years ago, here in Canada, we had an indoor postal event for any unmodified Easy Built rubber powered scale model. Mike Thomas and Rich Miller had noted the performance of Ken Wiberg’s 22” Piper Cub, and chose the model presented here. My 18” span Taylorcraft was clearly not in the race with these models. When the Canadian Indoor Nationals was held in the Air Canada 747 hangers, I was amazed at the performance and durability of these Piper Cubs, constructed with ultra-light balsa and using standard plastic propellers.

I then decided to construct a modified version to further increase performance over the stock Easy Built kit. My changes were as follows:

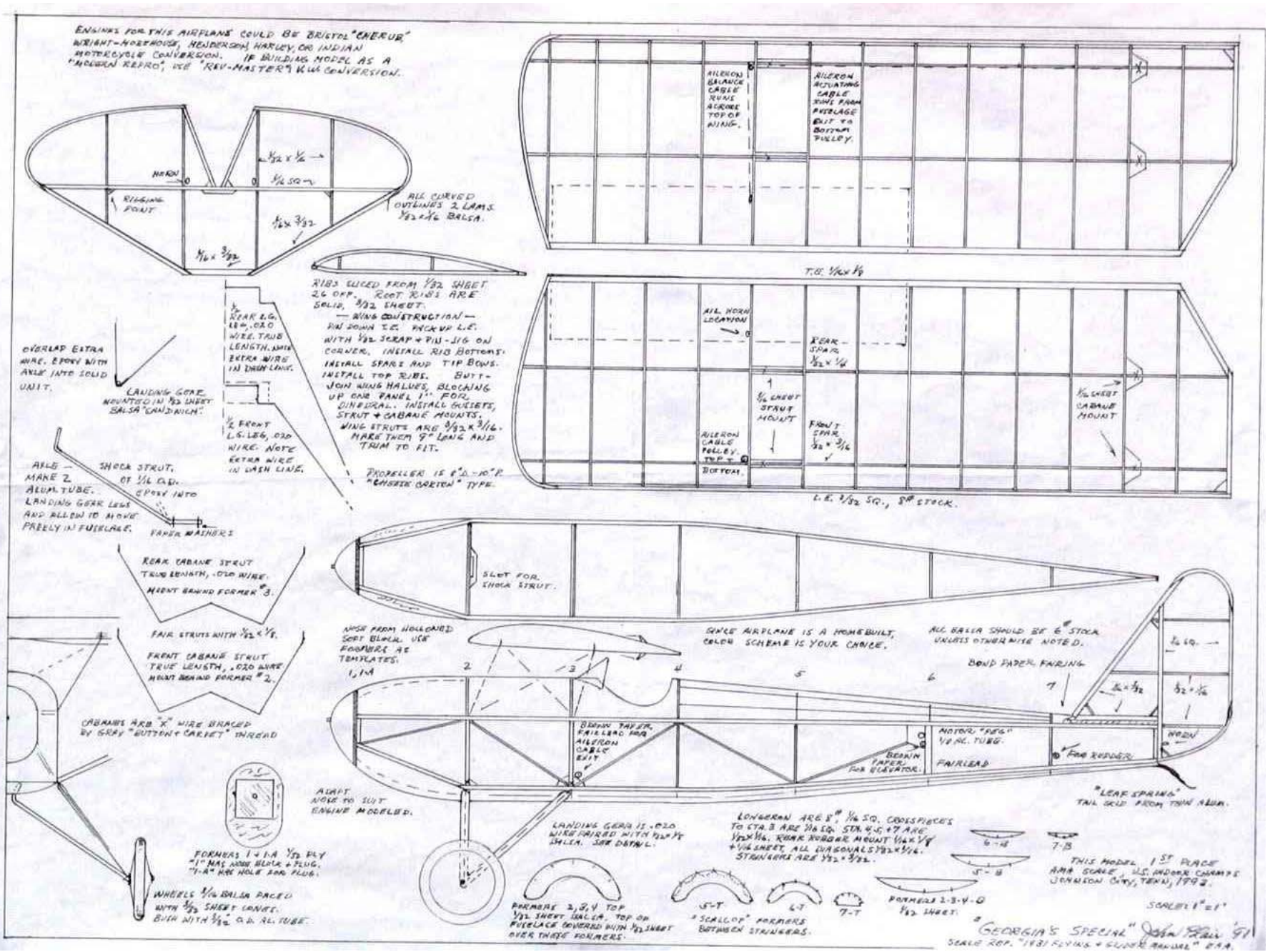
(a) The plastic prop was replaced by a carved 8 ½” diameter by 13 1/2” helical pitch Obechi prop.
(b) Laminated outlines were used for the stab, rudder, and wingtips.
(c) Stab and rudder spars were 1/16” x 1/32” balsa, and all crosspieces were eliminated.
(d) All ribs were 1/32” sheet balsa, except at dihedral breaks and wing strut attachment points.
(e) The combination tail skid and rear motor mount were made from 0.015” music wire (see Found Centennial drawing and text for details).
(f) The stabilizer area was increased by approximately 20%.

Some Additional Notes:

White Japanese tissue weighing 0.6 gram/100 in^2 was dyed yellow on a frame. The registration numbers, side and top windows were masked off, airbrushed in black, then lightly sprayed with Sig Lite Coat non-shrinking clear dope. After covering, some tissue shrinking with alcohol was accomplished on all but the stabilizer and rudder. Blue foam cylinder heads and wheels were painted with black acrylic.

My completed airframe weight is 11.7 grams. The 1/8 x 26 ¼” Tan II rubber loop plus rear hook is 6.5 grams. At the U.S.I.C., regular flights of 3 ½ minutes were obtained with 2350 turns in this motor. With further persuasion, the model has flown up to 4 ½ minutes, but its trim is more critical.

No complete plan is presented at the request of Dave Niedzielski, owner of Easy Built Models. He usually sees a huge drop in orders whenever someone does this. So we recommend you send him a mere $12.48 for rubber freeflight kit FF-22, if you are interested in this model. It will fly well right off the building board. Many Flying Aces squadrons hold Easy Built rubber scale contests in the United States and overseas, similar to the postal event mentioned above.


ENGINES FOR THIS AIRPLANE COULD BE BRISTOL "CHERUB", WRIGHT-NORTHROP, HENDERSON, HARLEY, OR INDIAN MOTORCYCLE CONVERSION. IF BUILDING MODEL AS A "MODERN REPRO", USE "REV-MASTER" K.W. CONVERSION.
HORN
RIGGING POINT
ALL CURVED OUTLINES 2 LAMS. 1/32 x 1/16 BALSA.
AILERON BALANCE CABLE RUNS ACROSS TOP OF WING.
AILERON ACTUATING CABLE RUNS FROM FUSELAGE EXIT TO BOTTOM PULLEY.
T.E. 1/16 x 1/8
RIBS CUT FROM 1/32 SHEET. 26 OFF. ROOT RIBS ARE SOLID, 3/32 SHEET.
— WING CONSTRUCTION — PIN DOWN T.E. PICK UP L.E. WITH 1/32 SCRAP + PIN - 1/16 ON CORNER. INSTALL RIB BOTTOMS. INSTALL SPARS AND TIP BOWS. INSTALL TOP RIBS. BUTT-JOIN WING HALVES, BLOCKING UP ONE PANEL 1". FOR DIHEDRAL. INSTALL GUSSETS, STRUT + CABANE MOUNTS. WING STRUTS ARE 3/32 x 3/16. MAKE THEM 9" LONG AND TRIM TO FIT.
AIL. HORN LOCATION
REAR SPAR 1/32 x 1/16
1/16 SHEET STRUT MOUNT
FRONT SPAR 1/32 x 3/16
1/16 SHEET CABANE MOUNT
AILERON CABLE PULLEY. TOP & BOTTOM.
L.E. 3/32 SQ., SR STOCK.
REAR L.G. 18 GA. .020 WIRE. TRUE LENGTH. NOTE EXTRA WIRE IN DASH LINE.
OVERLAP EXTRA WIRE. EPOXY WITH AXLE INTO SOLID UNIT.
LANDING GEAR MOUNTED IN 1/32 SHEET BALSA "GUSSETS".
FRONT L.G. 18 GA. .020 WIRE. NOTE EXTRA WIRE IN DASH LINE.
AXLE — MAKE 2. ALUM. TUBE. LANDING GEAR LEGS AND ALLOW TO MOVE FREELY IN FUSELAGE.
SHOCK STRUT. OF 1/16 DIA. EPOXY INTO
PAPER WASHERS
REAR CABANE STRUT. TRUE LENGTH, .020 WIRE. MOUNT BEHIND FORMER #3.
FAIR STRUTS WITH 1/32 x 1/8.
FRONT CABANE STRUT. TRUE LENGTH, .020 WIRE. MOUNT BEHIND FORMER #2.
CABANES ARE "X" WIRE BRACED BY GRAY "BUTTON + CARLET" THREAD
PROPELLER IS 8"D - 10"P. "EMERICK CARTON" TYPE.
SLOT FOR SHOCK STRUT.
NOSE FROM HOLLOWED SOFT BLOCK. USE FORMERS AS TEMPLATES. 1, 1-A
SINCE AIRPLANE IS A HOMEBUILT, COLOR SCHEME IS YOUR CHOICE.
ALL BALSA SHOULD BE 6" STOCK UNLESS OTHERWISE NOTED.
BOND PAPER FAIRING
1/16 SQ.
1/32 x 1/16
1/32 x 1/16
NOSE
BROWN PAPER FAIRING FOR ELEVATOR.
MOTOR "PEG" 1/8 SQ. TUBG.
FAIRLEAD
FOR RUDDER
"LEAF SPRING" TAIL SKID FROM THIN ALUM.
ADAPT NOSE TO SUIT ENGINE MODELED.
FORMERS 1 + 1-A 1/32 PLY "1" HAS NOSE BLOCK + PLUG. "1-A" HAS HOLE FOR PLUG.
WHEELS 1/16 BALSA FACED WITH 1/32 SHEET CONES. BUSH WITH 1/32 O.D. AL. TUBE.
LANDING GEAR IS .020 WIRE FAIRED WITH 1/32 x 1/8 BALSA. SEE DETAIL.
FORMERS 2, 3, 4 TOP 1/32 SHEET BALSA. TOP OF FUSELAGE COVERED WITH 1/32 SHEET OVER THESE FORMERS.
LONGERON ARE 8" 1/16 SQ. CROSSPIECES TO STA 3 ARE 1/16 SQ. STA 4, 5, + 7 ARE 1/32 x 1/16. REAR RUBBER MOUNT 1/16 x 1/8 + 1/16 SHEET. ALL DIAGONALS 1/32 x 1/16. STRINGERS ARE 1/32 x 3/32.
4-4B
7-B
5-5B
5-T
4-T
7-T
FORMERS 2-3-4-D 1/32 SHEET
"SCALLOP" FORMERS BETWEEN STRINGERS.
THIS MODEL 1ST PLACE AMA SCALE, U.S. INDOOR CHAMPS JOHNSON CITY, TENN, 1992.
SCALE: 1" = 1"
"GEORGIA'S SPECIAL" John Pond '91
SCALE REF. "1931 FLYING + GLIDER ANNUAL" E.A.A.

"Georgia's Special"
AMA Indoor Scale
by John Blair

The five models in the group shot were all scratch-built on my own plans, and were intended specifically for the "big room" at Johnson City. . The Bristol "Brownie" is the lightest of the group, with a wing loading of 18 grams / 100 sq.in., it will seemingly float forever.

The "Russell Monoplane" is my favorite of the bunch pictured. It is a bit more heavily loaded at 22 grams / 100 sq.in. The increased detail (engine, struts, etc,) presented more of a challenge in "adding lightness". The enclosed full sized plan for my "Georgia's Special" is typical for wood call-outs, etc., for my AMA competition models. The "Nieuport lI" was built on a "Scale Flight Inc." plan from down in your neighborhood, just for fun. The "Wright" was another labor of love, and belongs to my wife, Jo, who guards it jealously. She loves Pioneer aircraft.

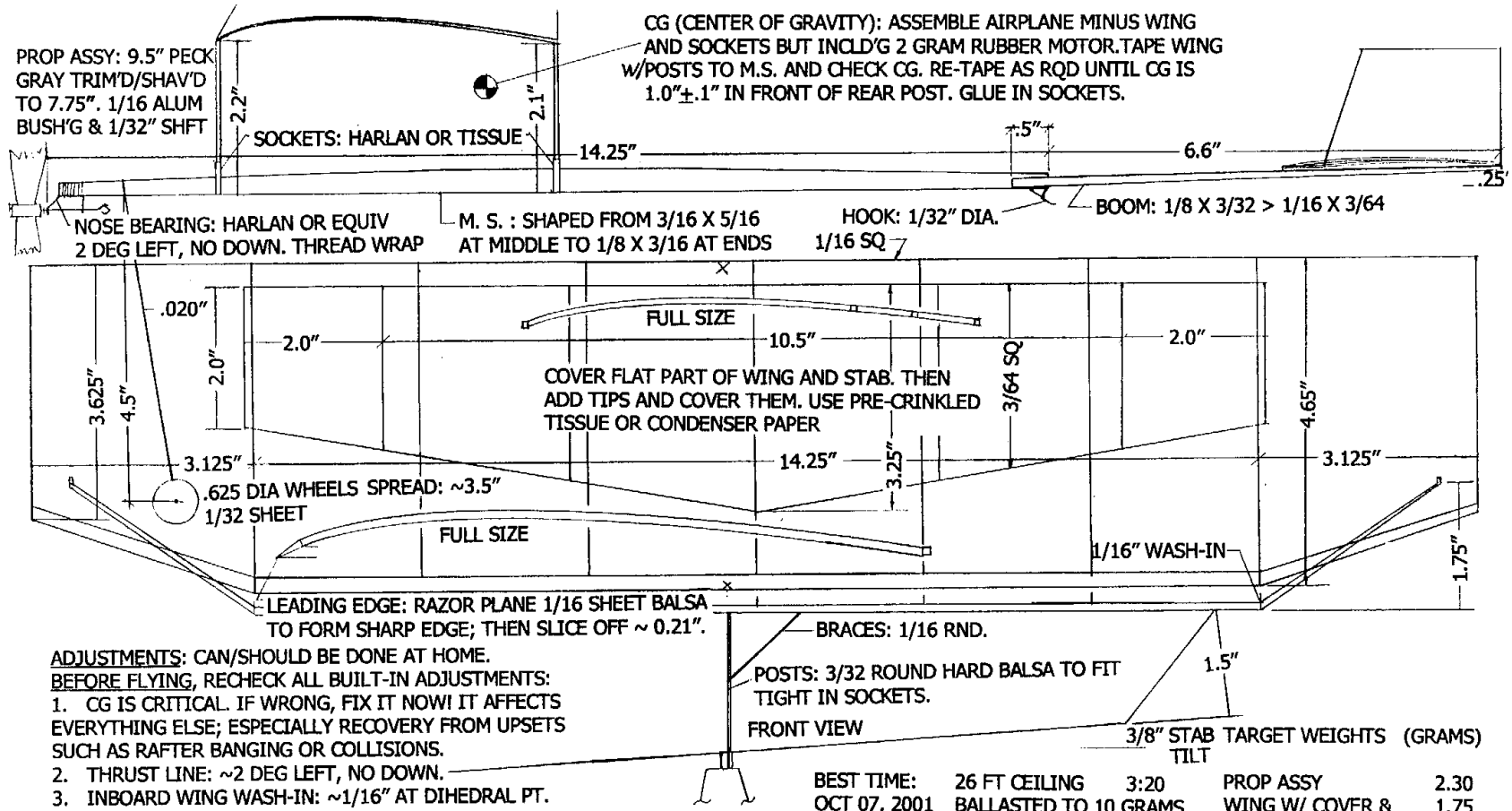
I was hooked on models at a very early age. When I was five or six (ca. 1930-31) my uncle Joe gave me a Baby R.O.G. I flew the thing until it could no longer be repaired (some months) and couldn't wait to get another one. Tried building my first Comet 10¢ model at about age nine, and am still glueing sticks together with Amobrid at 79. A lifer all the way.

A successful indoor scale model must meet a couple of criteria:
1. Low wing loading. The upper limit for good indoor flight is 20-25 grams /100 sq. in. "Light flies better than heavy." This is in large part more or less fixed by the design chosen. Avoid planes with many struts, stringers, fillets and other weight-producing details. No wood over 8 lb. density should be used, and that only for longerons and leading edges.
2. Prop - motor combination. Getting maximum performance can only be reached by experimentation. A good starting point is a prop diameter of 1/3 wingspan, P/D ratio 1.5, a motor 3X the distance between hooks and producing enough power to produce a slight climb when 1/2 wound. Fly the model, varying the different parameters and recording the results, until optimum performance is attained. You are looking for a slow climb to the ceiling and a long cruise back down.

Modeling was interrupted by WW II (Corps of Aviation Cadets, trained as a B-29 flight Engineer, but didn't get overseas). N.C. State university on the GI Bill, marriage, children (4), and a career as an agricultural extension agent. I mostly built models with my sons for fun, and didn't get back into competition until 1979. Since then I have flown about every rubber-powered class except Wakefield. In recent years, loss of contest sites plus bad knees has caused me to concentrate on indoor scale and FAC events. I can fly Dime Scale in my backyard horse pasture, so I design and build a bunch of them.

Growing old is mandatory—growing up is optional.

John Blair



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

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

TRIMMING/FLYING

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

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

TARGET WEIGHTS (GRAMS)

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

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

"Leading Edge"

SO by Cezar Banks

SCALE 1" = 2"

LEADING EDGE

A SCIENCE OLYMPIAD MODEL

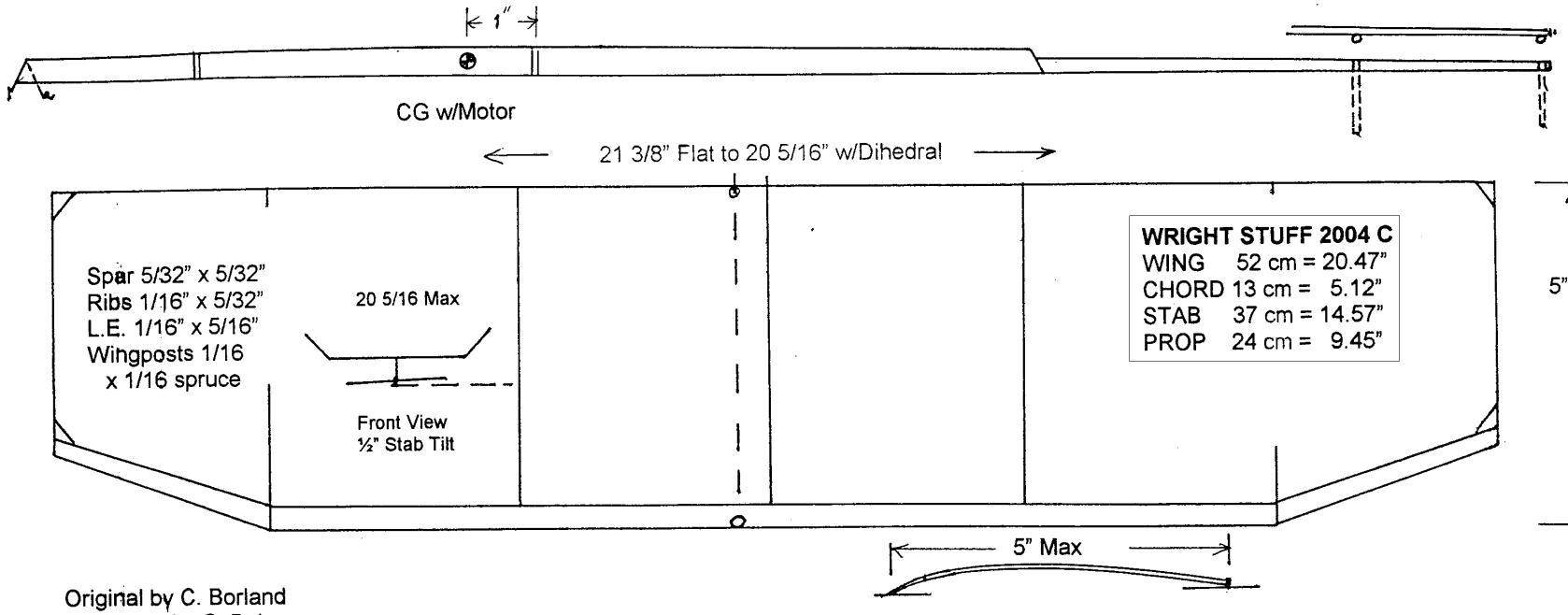
by Cezar Banks, La Mesa, CA

Few events have had as positive effect on bringing young people into indoor modeling as Science Olympiad in our junior and senior high schools. It makes science and engineering fun by using both a team and competition approach. The finale of a bridge building exercise can galvanize an entire class when the time comes to hang weights on everyone's creation, and see how much they can hold before they break. The cheering and jeering and just plain excitement are almost never seen outside of the sports playing field.

The Wright Stuff event involves building a rubber-powered stick model with a plastic prop, and seeing who can get the most duration in a school gym flying site. The ideal is for each school to fund one or more teams of 2 or more students, guided by a mentor, who can be a science teacher or interested parent. In the five years it has been around, the Wright Stuff has not only brought many top notch juniors into our hobby, but many, many adults as well. The Ohio teens who flew at the 2002 World Indoor Championships in the salt mine at Slanic Romania, as well as record setting Parker Parrish from Georgia, were all S.O. competitors to start with. And grownups, too numerous to name, went from just helping their local school to full-fledged competitors of their own. The event is so much fun, that at the USIC at Johnson City, we not only have an S.O. invitational for younger fliers, but a senior 'unlimited' event (I still don't know what that means) for all us big kids. Your Editor managed a little over three minutes, but times of over six minutes were posted. For stick and tissue, that is a long time by anyone's standards, and very satisfying for everyone who entered.

Cezar Banks grew up in Kenosha Wisconsin, south of Milwaukee on the shores of Lake Michigan. His older brother, Ed, helped him with Comet kits and other early rubber models. He credits Joe Hervat as his greatest influence as an indoor mentor. Following a two year Navy career, which included 10 months in the South Pacific during WWII, he married and moved to San Diego, joining the San Diego Orbiteers. Established indoor modelers there, Fudo Takagi and Clarence Mather (inventor of the A-6), taught him joys of EZB's and Pennyplanes. He graduated to representing the United States on the FAI F1D team on many occasions, and this designs and innovations are everywhere. He was entered in the NFFS Hall of Fame in 2000.

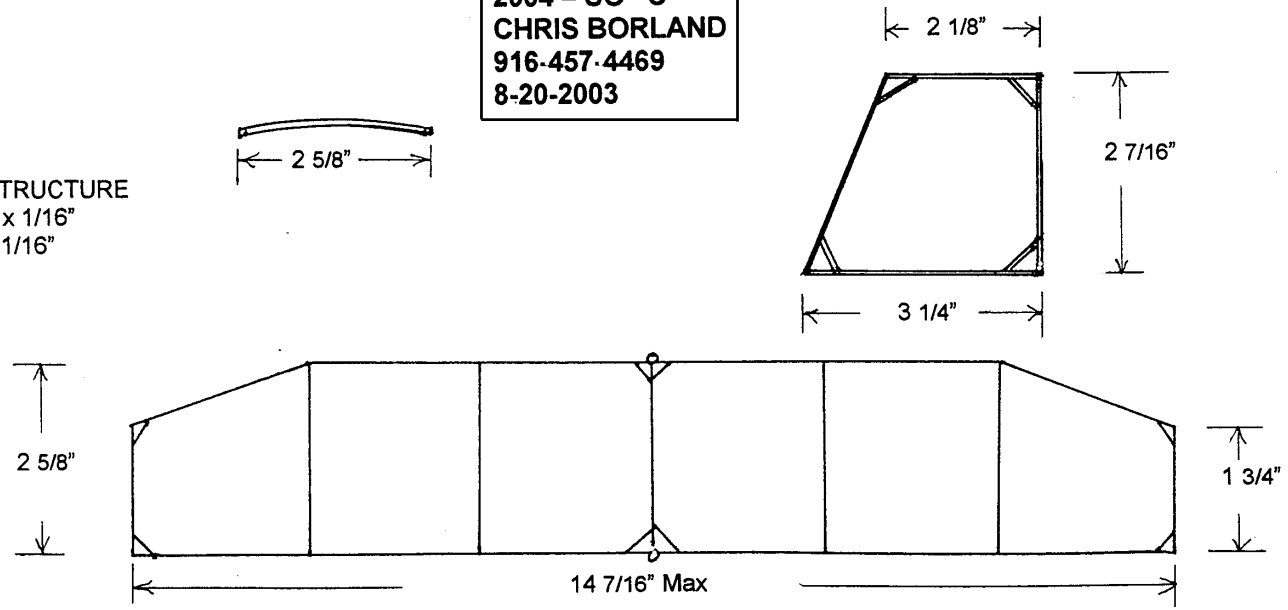
Cezar's Leading Edge Science Olympiad model can be credited as practically a quantum leap as far as wing design. The aerodynamics are so good that SO times have climbed from the 3 to 4 minute range to times approaching 8 minutes. The model floats in the air, allowing one to use thinner, longer motors, and thus more turns for better duration. A variation of the original has been kitted by Peck Polymers, under the name of Leading Edge II.



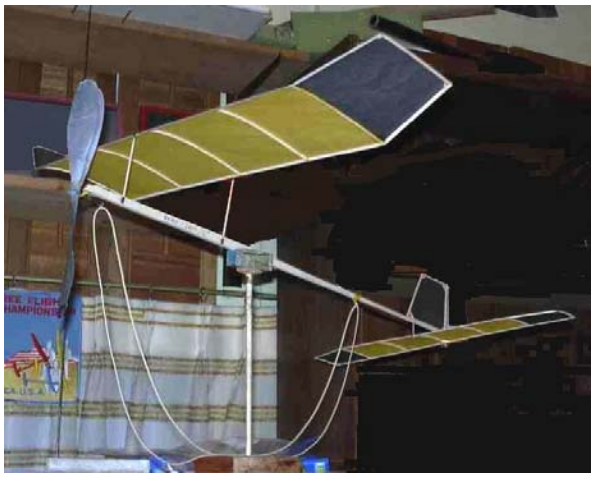
Original by C. Borland
Re-Drawn by C. Bakay

2004 – SO "C"
CHRIS BORLAND
916-457-4469
8-20-2003

STAB & FIN STRUCTURE
Outlines 1/16" x 1/16"
Ribs 1/32" x 1/16"



2004 “C” SCIENCE OLYMPIAD
by Chris Borland, Sacramento, CA



Here is a picture of my "2004" model with my much used super-flaring gray Peck prop. I know it's the right picture because I zoomed it and the fuselage is marked with 2004 "C"

The model uses a Cezar Banks “leading edge” design wing with a fairly high aspect ratio stab and just totally floats in flight. Besides looking nice the stab seems to work well. The 2002 version did 6:25 at the Kibbie Dome meet using a very highly flaring Peck grey prop on .058 rubber. The 2003 version again flew a nice 6:23. The 2004 larger version, using the same, by now becoming tired, ‘super’ prop and an 18 inch motor stick, reached 7:25 at the Kibbie Dome in July and also turned 7:23 in the mass launch there. The competition was getting tight with two at 7:14 and 7:17 including one by Cezar Banks.

In April the model had suffered a mid-air (while in its stand) resulting in 0.4 gram of thin CA to repair and a sanding off of 0.4 gram to come back down to weight. This gave a ‘wimpy’ motor stick which didn¹t like much torque. Under high torque, the model was doing two or three hot level laps and then slowly beginning to climb. A huge amount of height had to be lost because of this and in an unlimited ceiling like the Kibbie Dome, a potential of over eight minutes should have easily been there. By this time the ‘super’ prop was about finished and I was never able to duplicate it. About this time Ikara came on the scene and I went to the fat prop with the trailing edge trimmed off and considerably depitched and the model reached 5:51 in a 35 ft. gym that December. Upon checking, I was surprised to find a 1.4 P/D ratio.

The whole Science Olympiad thing has been a lot of fun, both mentoring and flying. Some of my students have had success at local, state and national levels and one can see the quality of both building and flying increase each year. This year, 2005, the playing field has leveled at an even higher point with great times coming in from around the country. What I thought was an excellent time for my newest model in Don Slusarcyzk’s postal contest was bettered by two Juniors. With the track record of our Juniors on all levels these days, I think indoor modeling will be in good hands in the future.

Chris won the 2005 Kibbie Mass Launch with a 6:32 time. – Ed.

THE F1D CHALLENGE
By Lt. Col. Bob Randolph
As published in January 1993 Indoor News and Views

Introduction
Plenny Bates convinced me that there is an urgent need for more F1D flyers (new blood) if this sport is to endure. He suggested that I write a series of articles to stimulate more interest in this type of model. Because of all the success and pleasure I have received from indoor over the years, I've accepted the assignment and this is the first of the series.

It is a little ironic for me to be pushing F1D when I've had sort of a love/hate relationship for the last 20 years. For example I recall Rick Doig asking if I still hated F1D after I finally made the US team and won the Bronze in 1984. Actually, I never really hated F1D. It is just that I dislike the dumb 65 cm and 1 gram rules that together result in low aspect ratio wings and somewhat ugly models. On the other hand, F1D's are outstanding flyers and have other redeeming advantages. Most important, it is the only class of indoor model recognized internationally for World Championship Competition. F1D provides the opportunity for us to match our skill and ability with the world's best modelers.

Building and flying the many other types of Indoor is fun, however it takes F1D to reach the ultimate goal of Indoor World Champion. I can assure you that nothing equals the pride and satisfaction of standing on the winners platform when the US flag is raised and our National Anthem played. As a retired USAF Lt. Col. with 30 years of service, I've had more than my share of pomp and ceremony, but I frankly admit that my eyes moistened up at each of the four World Champs I've participated in.

Building an F1D model isn't easy but it is not as difficult as many modelers seem to think. My daughter, Linda, built some pretty good F1D's when she was a Junior. I recall I used to tease her that I could teach a baboon how to build indoor. The point is your first F1D won't be the greatest but with determination and effort, each F1D will be better. It took me 15 years to win my first US Team slot. For those modelers that are interested in competition, your first F1D will fly better than anything you have ever built. Please humor this old timer (69 years young) and give F1D a try. My next article will suggest how to get started.

Getting Started in F1D **from April 1993 INAV**

I have assumed that my direct and logical appeal in the previous issue was successful and some have decided to try F1D. My suggestions will not only get you started, but are intended to guide the novice to progress rapidly by doing it “my way”.

I was prepared to start out with a discourse on wood selection. Suddenly the idea hit me that what makes F1D so great is that everything is important. You need a good design, a well built model, a well adjusted model, good rubber, and the capability to find the optimum motor to obtain really long flights. Any one factor that doesn’t measure up will reduce duration. Therefore you goal should be to improve all of the skills required. Some may question what skill has to do with rubber. The skill is being able to identify which of the rubber you possess is best and keep an active lookout for better. For the 84 world champs, Stan Chilton furnished the US Team with three batches of Pirelli rubber that was so superior that I would almost kill for more. Both of my world records were set using good Dolby Tan.

You can’t improve your F1D craftsmanship without good tools. You must be able to obtain uniform readings of wood sizes and weights. I use two direct reading scales that I made. One is 0 – 5/1000’s

and one is 0 – 25/1000ths. (Col. Randolph works in ounces, not grams. -Ed.) I use a dial paper (thickness) gauge that cost $12.50 about 30 years ago. Also, you absolutely need the best rubber stripper available. I've tried them all, and I suggest the one made by Bob Oppegard.

I still use Ambroid thinned with acetone. I don't have a set ratio but go by color and viscosity. I recall the advice from Bill Bigge to use only enough Ambroid that the wood fails before the glue joint after about 2 minutes. You must remember to keep adding acrtone to your glue gun, because it will evaporate after a week or so.

I strongly recommend that your first F1D be a proven superior design. This will not only save a lot of development time, but will also allow you to expedite and concentrate on improving your building and flying skills. One very common mistake is to try and hit the designer's light weights with your first ship, resulting in a really weak model that won't last through a test flight program. It is better to make everything 25-30% heavier, and then keep reducing the weight on your 2nd, 3rd and 4th copy before you match weights. You must also keep detailed records of all parts if you expect to progress.

Set your own reasonable goals for model parts. Here are some of mine: I retire F1D wings when they hit .012 oz. I won't use a stab frame if it exceeds .0027 oz. I won't use a cabane that exceeds .0006 oz, nor wing posts (two plus boron) that exceed .0014 oz.

When I was assigned in Cleveland between 1965-68, my home was only 12 miles from Micro-X. I spent hours sorting through Jerry's 4000 sheet stock, weighing and measuring to find exactly what I needed. I will admit that I am very picky about wood. Because of my standards, about 75% of what I order from both major suppliers I do not use. However, I never send back any wood. For several years now I have been building from my "reject" stockpile, so Jerry thinks I buy from Guitlow and Lew thinks I buy from Jerry.

The secret of my success really is no secret. I love to fly indoor and year after year I make between 500-800 flights. I doubt if anyone does more. I know that constant practice flying, adjusting and steering helps. The word "practice" makes me smile, and I'll explain why. Last year an old friend from my Cleveland days was vacationing in California and looked me up. Since I was all packed up and actually enroute to my flying site, I invited him and his wife and two kids to my practice site. After 2 or 3 flights his 5 year old son said he didn't see why I had to practice, since I knew how to fly. The kid was right, and perhaps we should call these "test sessions".

I don't know about you, but I find it difficult to maintain a high level of indoor enthusiasm if I don't fly frequently. I suggest you look over every gym in your area and try to get the best on a regular basis. I should point out that stable air and a non-catchy ceiling are way more important than a high ceiling. Teachers and principals are usually fascinated at the lightness and technology that goes into an F1D. I got my site by accepting complete responsibility for my "assistants" and being meticulous about cleanliness, locking up, and resetting the school alarm systems. I frequently hold talks and flight demonstrations for classes. School officials know that I am very serious in my efforts to advance the state of the art and are pleased to hear of my accomplishments. Last october I was lucky enough to take the new principal up in a sailplane on an excellent thermal day for a 3-hour flight, topping Mt. San Jacinto (next to Palm Springs). I've never seen anyone enjoy a flight more. The point I'm trying to make is that you have to work at getting and keeping a good flying site.

My next article will probably cover test flying and the use of partial test motors to find the optimum motor. Since you will need an F1D to test fly, start building and good luck.

Partial Motor Test Flights from July 1993 INAV

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

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

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

Make a ¼ test stick that is 3/4ths of the distance between the hooks of your model. I suggest you also make a balance with moment arms in a 3 to 1 ratio to be able to quickly add the right amount of clay to the ¼ test stick to match the ¼ motor you fly. Incidentally, always use lubed test motors for the balance and always center the clay on the mid point of the test stick. Failure to do this will affect the model balance, or worse, crush your motor stick.

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

The following is how I flight test a new ship. I make up 8-10 ¼ test motors (use one o-ring) close to the best guess as to the right length and thickness. Let's say this is a 4" loop of 0.070" Tan. I would also make a 4" 0.068" and 0.072", plus a 3.5 " and 4.5" of these same thickness. Balance the test stick for the motor to be used and put in 100 turns. Adjust wing incidence under this cruise power. Adjust circle size if required and check on the ship's cruise altitude. If not enough nose up, adjust more negative incidence in the stab. This will mean readjusting wing incidence. You are looking for a floating cruise where the nose stays up to load the prop and reduce its RPM. Too much will produce a mush requiring more cruise power.

Peak ¼ motor flying time will require a fully broken-in motor, but I must admit I break in these little motors by flight tests. You do not want to out climb the site, so start out with all the turns it will take, but back off so that the launch torque is 25 units. If this is still too much power, use your steering pole to prevent out-climbing your site. Better to only climb half way up and keep increasing launch torque slowly. You can't really tell if a motor is the right size until you reach full height. Upon landing, the turns remaining will indicate if you have too much or too little power. A non-VP prop should have about 1/3 row of knots left. A good VP prop will have very few turns left. For either type of prop, going deadstick before reaching the floor means the motor is too powerful. Whether to correct this by reducing the thickness or increasing the loop length depends on the flight time you achieved. Keep in mind that we are seeking flight repeatability, so you must be precise in your winding and test stick technique. I like to use several motors of the same size as they can rest and recover fully between flights. The three most important factors for FAI flying are practice, practice, and practice.

FORMING WIRE THRUST BEARINGS

by Andrew Tagliafico

1. Form a V with legs at least twice as long as the required bearing finished length.
2. Bend both legs 90° 90 degrees at required thrust bearing leg length.
3. Cut a mandrel from piano wire .001" to .002" thicker than the prop shaft about 1" long.
4. Insert mandrel and thrust bearing blank with 90 degree bent legs into the slot of the Clamp/Jig as shown in Figure A.
5. Bend front leg of thrust bearing tightly around the mandrel at least 270 degrees additional in the direction of propeller rotation.
   It is important to wind the front bearing and pigtail in the direction of propeller rotation. Front bearing burr will not snag thrust washer after it is honed.
   Pigtail thusly wound will not allow prop shaft to rotate out of the pigtail.
6. The properly honed and finished front bearing will have about 1 1/2 turns forming a secure bearing. The pigtail only needs 1 1/2 turns to hold prop shaft steady.
7. It is important that the pigtail and front bearing have a straight-line alignment. When the thrust bearing is properly formed and aligned it will swing freely on the prop shaft diameter wire.
8. Fabricate a smaller Clamp/Jig from a 1/4" round hardwood dowel and a 4-40 screw with nut for smaller thrust bearings.

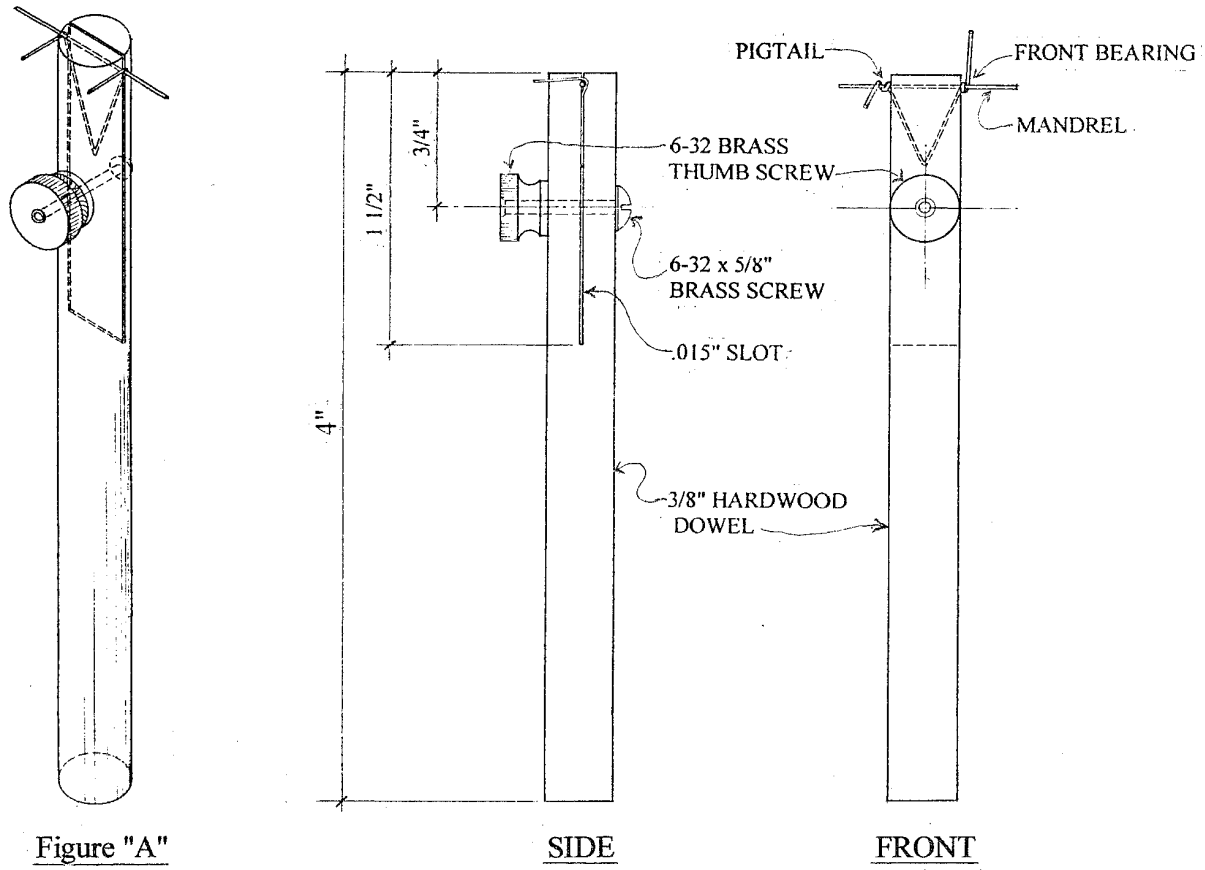
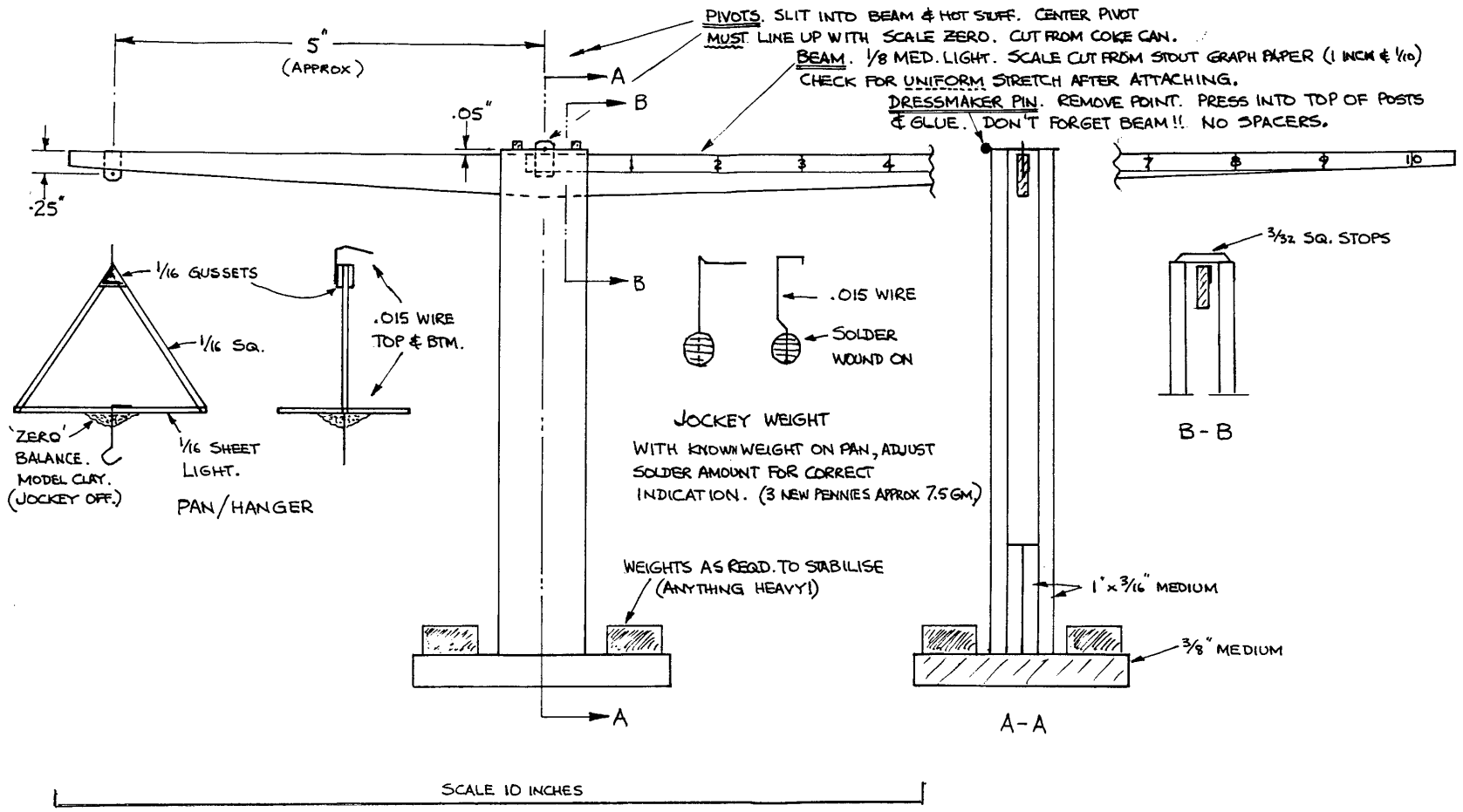


Figure "A"

CLAMP/JIG for FORMING WIRE THRUST BEARINGS



PROPERLY SET UP & CALIBRATED THIS BALANCE IS SENSITIVE TO .02 GRAM. 93.

10 GRAM SCALE

J. BARKER OCT '93

Sources for Plans, Information, and Building Materials

A. A. Lidberg Model Plan Service
(No-Cal, Peanuts, Scale Documentation)
1030 E. Baseline, Suite 105-1074
Tempe, AZ 85283
(480) 839-8154 evenings and weekends
www.aalmps.com

Academy of Model Aeronautics (AMA)
(MA magazine, AMA insurance and services, plans, back issues)
5161 East Memorial Drive, Muncie, IN 47302
(765) 287-1256
www.modelaircraft.org

Bill Kuhl's Delta Dart Site
(Plans and instructions, videos for beginners and mentors for group make-and-takes with Delta Darts)
www.luminet.net/~bkuhl/rubber.htm

Easy Built Models
(Scale & sport indoor & outdoor rubber FF kits, color catalog $3.00)
P.O. Box 681744, Prattville, AL 36068-1744
(334) 358 –5184
www.easybuiltmodels.com

FAI Model Supply
(Tan II rubber, indoor ARFS, kits, winders, Ikara Props, catalog $2.00, a must for S.O. fliers and beginners)
P.O. Box 366, Sayre, PA 18840-0366
(570) 882-9873
E-mail: faimodelsupply@cyber-quest.com
Website: www.faimodelsupply.com

Freedom Flight Models
(Models, accessories, and supplies for high school and middle school TSA and Wright Stuff)
P.O. Box 142603
Fayetteville, GA 30214
(770) 460-0939
E-mail: Dave@FreedomFlightModels.com
Web site: http:www.freedomflightmodels.com

F1D.biz
(World Class indoor balsa wood, Wright Stuff supplies, Ultrafilm covering, carbon rods, tube, strips, Tru Torque Rubber)
Order on-site through Pay Pal
www.f1d.biz

Geauga Precision Models
(Winder/counters, bearings, supplies)
W. D. Johnson
9113 Robinson Rd.
Chardon, OH 44024
Johnsonwd@earthlink.net

Hannan's Runway
(Model aircraft books, videos, $1.00 catelog)
P.O. Box 210
Magalia, CA 95954
(530) 873-6421
www.hrunway.com

House of Balsa
(Wood, hardware, kits)
10101 Yucca Rd.
Adelanto, CA 92301
(760) 246-6462
www.houseofbalsa.com

Indoor News and Views (INAV)
(The Indoor newsletter, articles, plans)
1 year @ $15.00 US, $19.00 Canada
Tony Pavel - Subscriptions
1921 S St. NW, Washington, DC 20009
paveltony@gmail.com
Download a free issue & subscribe:
www.indoorduration.com

Indoor Model Supply
(Novice kits, supplies for beginner and expert, SO stuff, rubber winder, rubber already stripped in common indoor sizes)
Lew Gitlow
P.O. Box 2020, Florence, OR 97439
Phone: (541) 902-8508
www.indoormodelsupply.com

Indoor Model Specialties
(Scales, rubber strippers, coverings, kits)
Ray Harlan
15 Happy Hollow Rd.
Wayland, MA 01778
(508) 358-4013

Micro-X
(Scale kits, rubber & supplies)
P.O. Box 1063-A
Lorain, OH 44055
(440) 282-8354
microx@erienet.net

Lone Star Balsa
(Balsa sheet, blocks, sticks, indoor 4-6 lb. balsa, other hobby products)
115 Industrial
Lancaster, TX 75134
Info: (972)218-9663
Order: (800)687-5555
www.lonestar-models.com

Peck Polymers
(Kits for indoor and outdoor, lots of scale kits and plans, all kinds of supplies, catalog a must-have at $4.00)
P.O. Box 710399 MA, Santee, CA 92072-0399
(619) 488-1833
www.Peck-Polymers.com

Micro Mark
(Quality power tools, hand tools, nuts & bolts, adhesives, complete line of metalworking and woodworking supplies)
340-3399 Syder Ave.
Berkely Hts., NJ 07922-1538
www.micromark.com

Midwest Products Co., Inc.
Educational Products Division
(Classroom kit packs, S. Olympiad, D. Dart, gliders)
P.O. Box 564, Hobart, IN 46342
(800) 348-3497
www.midwestproducts.com

OS Film (Covering Material)
Alan Cohen
2115 State Route 31
Glen Gardner, NJ 08826
908-638-3636
E-mail alan@OSFilm.com

ADDRESSES OF CONTRIBUTORS

Bakay, Carl	118 Gentry Circle, Lafayette, LA, 70508	carl.bakay@scientificdrilling.com
Banks, Cezar	4841 La Perla Way, LaMesa, CA, 91941-4468	flylong@cox.net
Barker, John	3406 Creek Valley Dr. SE, Smyrna, GA 30082-2521	jambarker@juno.com
Blair, John	443 Henson Rd., Warne, NC 28909	
Borland, Chris	1520 40th St., Sacramento, CA, 95819-4033	cborland@surewest.net
Brown, Steve	297 Hartman Ct., San Dimas, CA, 91773-2152	rtxc@yahoo.com
Buddenbohm, Stan	5652 Meinhardt Rd., Westminster, CA, 92683-2423	
Buxton, Jim	4956 Wallington Dr., Hilliard, OH, 43026	jbuxton@norse.com
Chilton, Stan	3010 Grail St., Wichita, KS, 67211-3816	
Cohen, Alan	2115 Rt. 31, Glen Gardner, NJ, 08826	alan@golfclubguru.com
Coslick, Larry	4202 Valley Crest Hills Dr., St. Louis, MO, 63128-1831	coslama@earthlink.net
D'Alessandro, Tony	198 Twining Fork Rd., Richboro, PA, 18954-1847	
Diebolt, John	526 Heater Dr., Carey, NC 27511-3262	
Harlan, Ray	15 Happy Hollow Rd., Wayland, MA, 01778	rbharlan@comcast.net
Hinson, Rex	1141 South Waterview Dr., Inverness, FL 34450	Rexh@tampabayrr.com
Hodson, Gary	512 Lake of the Forest, Bonner Springs, KS 66012	warthodson@aol.com
Kagan, John	20100 Killian's Grove, Strongsville, OH, 44149	john_kagan@hotmail.com
Krempetz, Kurt	1143 Driftwood Ln., Bartlett, IL 60103	krempetz@yahoo.com
Lenderman, John	17086 Hall Rd., Clatskanie, OR, 97016	
McGillivray, Jack	621 Cosburn Ave, Toronto, Ontario, M4C 2V1	
Miller, Wallace	77290 Black Mountain Tr., Indian Wells, CA, 92210	
Miller, Jim	30700 Wekiva River Rd., Sorrento, FL, 32776	
Nakashima, William	2481 Lincoln Rd., Yuba City, CA 95993-9710	nakash@jps.net
Niedzielski, Dave	P.O. Box 681744, Prattville, AL, 36068	Dave.Niedzielski@ipaper.com
Palrang, Mike	520 Thompson Ave., Mnin. View, CA, 94043-2742	debipalrang@comcast.net
Richmond, Jim	11178 Westminster Ct., Carmel, IN, 46033-3702	indoorflyer@msn.com
Romash, Rob	1442 Kirkham St., Colorado Springs, CO 80910	cgrain1@yahoo.com
Schutzel, Emil	6801 Cherokee Ln, Shawnee Mission, KS, 66208	
Sova, Tom	8720 N. Stone Mill Rd., Sylvania, OH 43560-9832	tjsova@sev.org
Tagliafico, Andrew	10039 SW Quail Post Rd., Portland, OR, 97219-6368	
Tellier, Fred	3160 Sussex Ct., Windsor, Ontario, N8T2C6	fred-tellier@cogeco.ca
Van Gorder, Walt	5669 Victoryview Ln, Cincinnati, OH, 45233-4661	