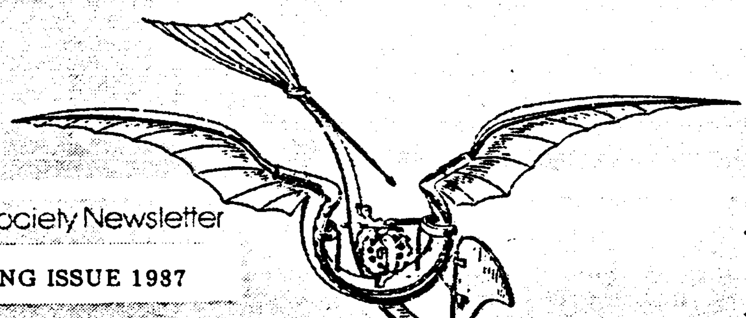
Ornithopter Modeler Society Newsletter

SPRING ISSUE 1987



flapper facts

VOLUME 5 NUMBER 2 ROY WHITE. EDITOR

Just to set the record straight Cat. 1 Roy Harlan 5 min. 25 sec. Cat. 11 Roy Harlan 7 min. 08 sec. Cat. 111 Frank Kieser 8 min 26 sec. Cat. 1V Roy Harlan 11 min. 19 sec.

Over the laber day week end 1986 Al Rohrbaugh did 11 min 14 sec. to hold the Cat. 1V record. The next day Roy Harlan put up a flight of 11 min 18 sec. Also Roy is the first 11 min. flight. NICE GOING.

Thank to Walter Erbach for all the work on translating these paper for the new letter.

We have a neat begenner ornithopter plan from Jonas Romblad (Swenen) Thank to Bill Gough for the plan of Ed. Litgard 1941 ornithopter

Roy

QUESTION & ANSWER

I have had several people question the conformance to AMA rules of Les Garber's Butterfly I design which was published last issue. My judgement was that it was legal but to be sure, I went to the expert, Bob Meuser. Here is his answer:

Dear Frank

I'm writing in response to your question regarding the legality of Garber's Butterfly I.

I wrote the part of the rules that says, in effect, that if there are two wings, they must be essentially identical in size, shape, and degree of flapping motion. That was to prevent some guy that had an unbraced fixed wing that flapped a teeny bit from calling it a flapping surface.

I don't see that Butterfly I violates either the spirit or letter of that part of the rule. The fact that the motorstick "flaps" along with the lower wing doesn't give me a problem. Yes, if one were to regard the motor stick as fixed, then the lower wing would have to be regarded as fixed. But the laws of nature as delineated by Isaac Newton — action vs. reaction, and all that — ensures that the flapping motion of the two wings are substantially equal.

Sincerely,

Bob

R. B. Meuser

"CUTTING" BORON

by Frank Kieser - 3/2/87

Every one using boron should already be knowledgable of the safety hazzards involved. The problem is that in cutting, loose slivers are sometimes generated that must be captured. This also can result in inaccurate cut length. To my knowledge, the method to be described is original. Of the many ways tried, I have found it to be by far the best yet for precise, safe cutting. I hesitate to say that "slivers" never will be generated but to date I have seen only slight traces of powder remaining.

The method is this:

1. Obtain an insulin syringe and cut off the point square. The O.D. should be about .Ø14. The boron will be a tight, smoothe sliding fit in the I.D. of the needle. Remove the plunger.
2. Obtain a metal ruler and attach to it a one to two inch piece of tape, preferably Scotch No. 23Ø Drafting Tape, with the sticky side up. This tape has low, but adequate stick. I place the tape so that I can use the ruler as a length measure.
3. Insert a length of boron in the needle, from the tip end is easier, with the desired cut length protruding.
4. With the needle at a very shallow angle to the ruler, press the tip of the neeedle and the boron onto the sticky tape.
5. Gradually rotate the needle to a steeper angle being sure to keep the tip pressing into the tape. The boron should snap when the needle is at about 45 degrees. The cut piece is retained on the tape.
6. Although I have never found extra loose pieces, after cutting, with the needle still over the tape, I push through about an inch of boron to be sure there isn't a loose piece in the tube.

I hope you are as successful with this method as I have been.

FLAPPING WING MODELS

by

Dipl.-Ing (FH) Horst Händler

from

Flug + Modelltechnik (3/83)

Translated

by

Walter Erbach

The response to the article by Hans Rähmer in the June 1982 issue concerning flapping surface propulsion has shown us again that many experimentally minded model builders, virtually unknown and out of the competition circle, are, at substantial expenditure of time and material, working in this previously ignored area of flight mechanics. Here Horst Händler writes of his many years of experimentation with flapping wing models.

The first contact I had with flapping wing models was with Lippisch's "Schwinguin" in 1937/38. I also built duplicates of the other rubber powered flappers of this noted builder; they all had delightful flying abilities.

The two flapping surfaces of Doctor Lippisch's models were either hinged to the extremities of the fixed wing or attached directly to the body at the front. The flappers serve solely for propulsion and provide no lift. After 1938 there were additional attempts in this model area. Unfortunately, the material pertaining to this work was lost through the vicissitudes of the war.

In 1963 my interest in flapping wing models was rekindled by a series of articles about flappers by Mr. Herzog in the magazine "Mechanikus" and I turned to building them. From 1975 fruitful cooperation with Mr. Herzog began. In these articles the efforts of the reticent investigator Dr. E. Holst were written up in detail together with a few drawings of his free flight rubber models.

In contradistinction to the flying models of Dr. Lippisch we here concern ourselves with full flapping wing models. In these both wing panels move up and down bird-like. Through an ingenious mechanism a twisting motion is super-imposed upon the up and down movement of the wing halves. There is an additional passive twisting as a result of the elasticity of the wing panels. It is noteworthy that the up stroke occurs with greater power than the downstroke. As with birds, the wing panels are subdivided into arm and hand sectors. The arm portion is attached to the body and for the most part provides lift while the hand portion stretches to the wing tip and is employed almost solely for propulsion.

Figures 1 and 2 show a duplicate of Holts' free flight model, "Buzzard". The cant of the hand portion can be clearly seen in the pictures. Shortly after bottom dead center in Fig. 1 the wing up-stroke occurs. Here the hand sector is negative. On the down-stroke (Fig. 2) the hand portion is oriented positively.

To study this Holst principle more thoroughly I built a number of rubber powered models of which there are no illustrations. During this effort it became evident that a feel for the construction was necessary and that the flying was not simple. (May the translator good-naturedly ask, "So what else is new?")

The flying weight of the Buzzard was 19 grams and that of the Swallow 10 grams; they are approaching indoor models.

It seemed within the realm of possibility to equip the larger of Holts models with more substantial power plants. The thought of later adding radio control also played a role. But first the mechanism had to be developed. For the model I chose the "Swan", Fig. 3, with a 2000 mm span. The complete mechanism is shown in Fig. 4. A Cox TeeDee020 is connected through a centrifugal clutch to a reduction gearbox with a 306 to 1 ratio. The last gear is mounted on the crankshaft of the flapper system. The mechanism is a compact unit, easily mounted and removed. Nothing particularly positive resulted from flight attempts with this flapper. Most attempts resulted in a broken wing. For further attempts with the TD020 I built a new mechanism which provided also a back stroke at top dead center. The model employing this is shown in Figs. 5 and 6. With this model I also tried various types of wings.

Fig. 7 shows the details of the all balsa wings. Flight attempts were in no way satisfying. Fig. 8 shows a model in which attempts were made using parts of the latter mechanism. In this model the hand sectors twisted passively with adjustable stops to control the degree of motion. The model glided well; flapping flight was not satisfactory.

In a further attempt the mechanism was powered with an electric motor, Elektromotor T 03/15 with built-in reduction gearing (Figs. 10 and at the head of this article).

As results of this many yeared set of experiments based on the Holst system it can be stated for certain:

1. The most important requirement for a satisfactory flapping flight is a good glide with the wing halves fixed.

2. It is essential that the wing halves can be brought to the best position for a good glide from any stroke location.

3. On one hand the wing halves must be elastic enough that in adition to the mechanism induced twist they will flex of themselves. On the other hand they must be stiff enough so that in gliding or sailing the shape change is the smallest possible. Two diametrically opposed requirements.

4. A regulatable amount of flapping angle is desirable.

5. The amount of stroke above and below the midpoint should be adjustable. Birds use this method for flight control.

6. Power should be variable between up and down stroke as well as the time for the two strokes.

This is a group of requirements difficult to attain simultaneously. Above all, points 1 and 3 are hard to fulfil with models of the Holst type.

Because of this I continued my experimentation using flapping wing models of the Lippisch type.

The RC model had a glowplug motor coupled to a crank arm through a centrifugal clutch. The crank had two throws from which push rods, through the right and left wing halves, drove the flapping tips. Fig. 11 shows the complete mechanism in the fuselage. Fig. 12 shows the attachment at the flappers. Figs. 13 and 14 show the RC model on the test stand.

With the RC unit the following functions could be performed:

1. Motor throttle to permit engaging or disengaging the clutch to the flappers as well as varying the flapping speed. When disengaged the flappers were moved to their highest position by a balancing rubber tensioner.

2. Elevator for up and down control.

3. Rudder for direotional control.

Tests with this flapper showed clearly that careful adjustment of the flappers was necessary for thrust. On the flying model itself I tried flappers of varying sizes and flexibility. From the results no clear conclusions could be drawn. Only one thing remained: I must build measuring equipment for the flappers for comparative measurements. This equipment is shown in Fig. 15.

Description of the equipment: A light balsa superstructure mounted on a four wheeled balsa box carries an Electromotor with gearing to drive flapping wings. The flappers are moved by steel wire shafting. At the front sits an Electromotor and folding propellor unit removed from and electric RC model. The thrust of this power plant suffices for the RC model.

Procedure: Through the pull of the propellor the wagon is pulled forwards and moves a linkage which acts to depress a postal scale, measuring the pull in grams. The motor current and voltage are obtained from two multimeters. These become the normal for the test stand! Now we try, using the flappers only, to obtain the same or greater thrust. Obviously the propellor remains stopped while testing the flappers! In this way I have tried over 25 flappers of varying shapes, measurements and flexibility, obtaining useful results.

Fig. 16 shows another radio controlled flapping wing model. A Mabuchi-Elektromotor serves for power. Control possibilities: Motor on and off, slow and fast, rudder and elevator. This flapper had a span of about 2200 mm. The flapping surfaces are rigid but can twist upon a conical support. They can therefore be oriented by pushrods, negative during the downstroke and positive during the upstroke. The best setting for gliding flight can be accomplished by switching off the motor at the proper time.

I can summarize my many years of working with flapping wing models by stating that this is still a rich field for the experimentally minded model builder. Through perfected radio control equipment, modern building techniques, and materials it is possible to achieve positive results more quickly now than it was years ago. With respect to mechanics and aerodynamics there are many possibilities to leave the beaten paths in the model building area. May this article stir up a little interest.

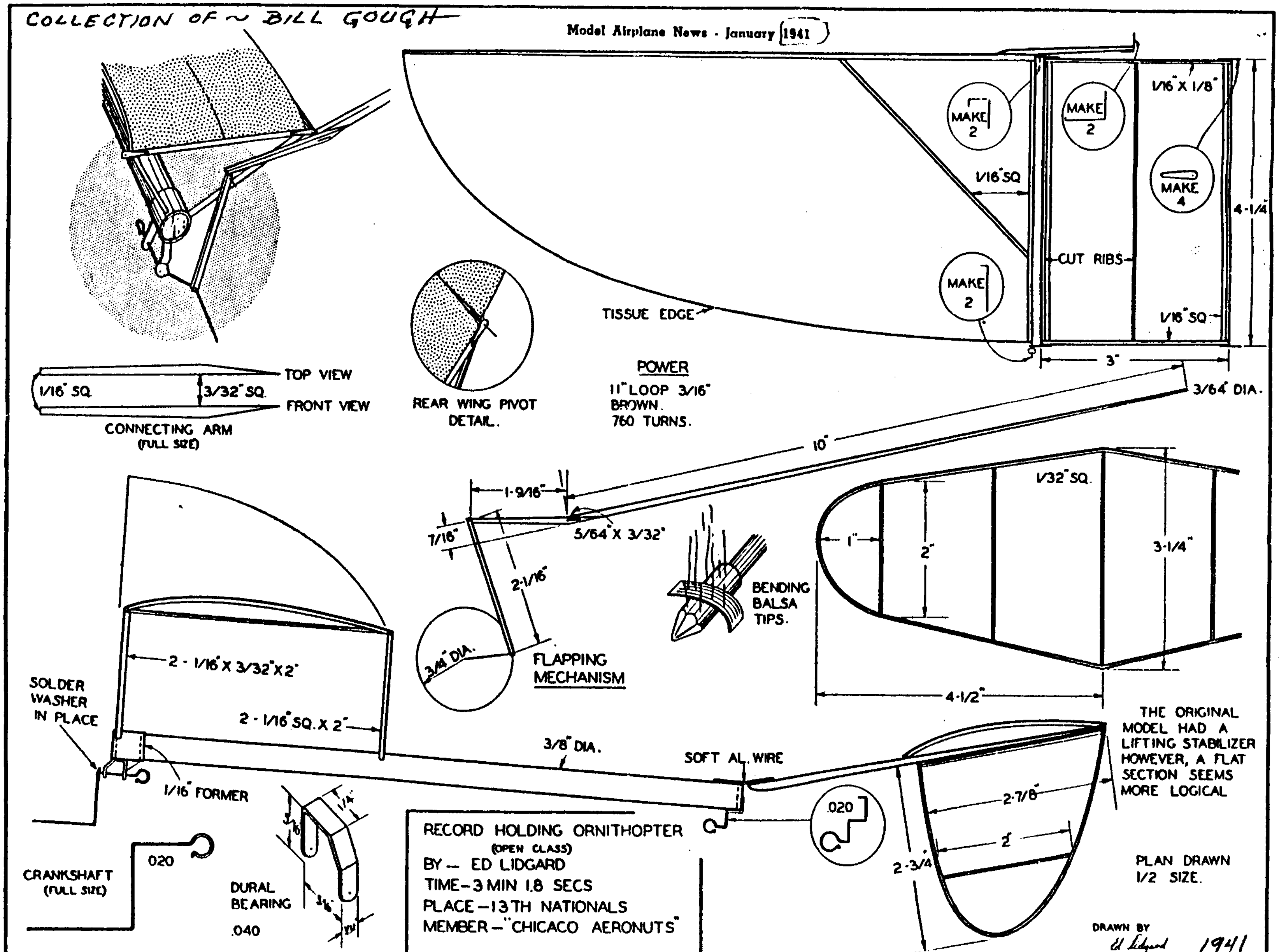
But one must be willing to face disappointment and not give up quickly, then results will be forthcoming.

References:

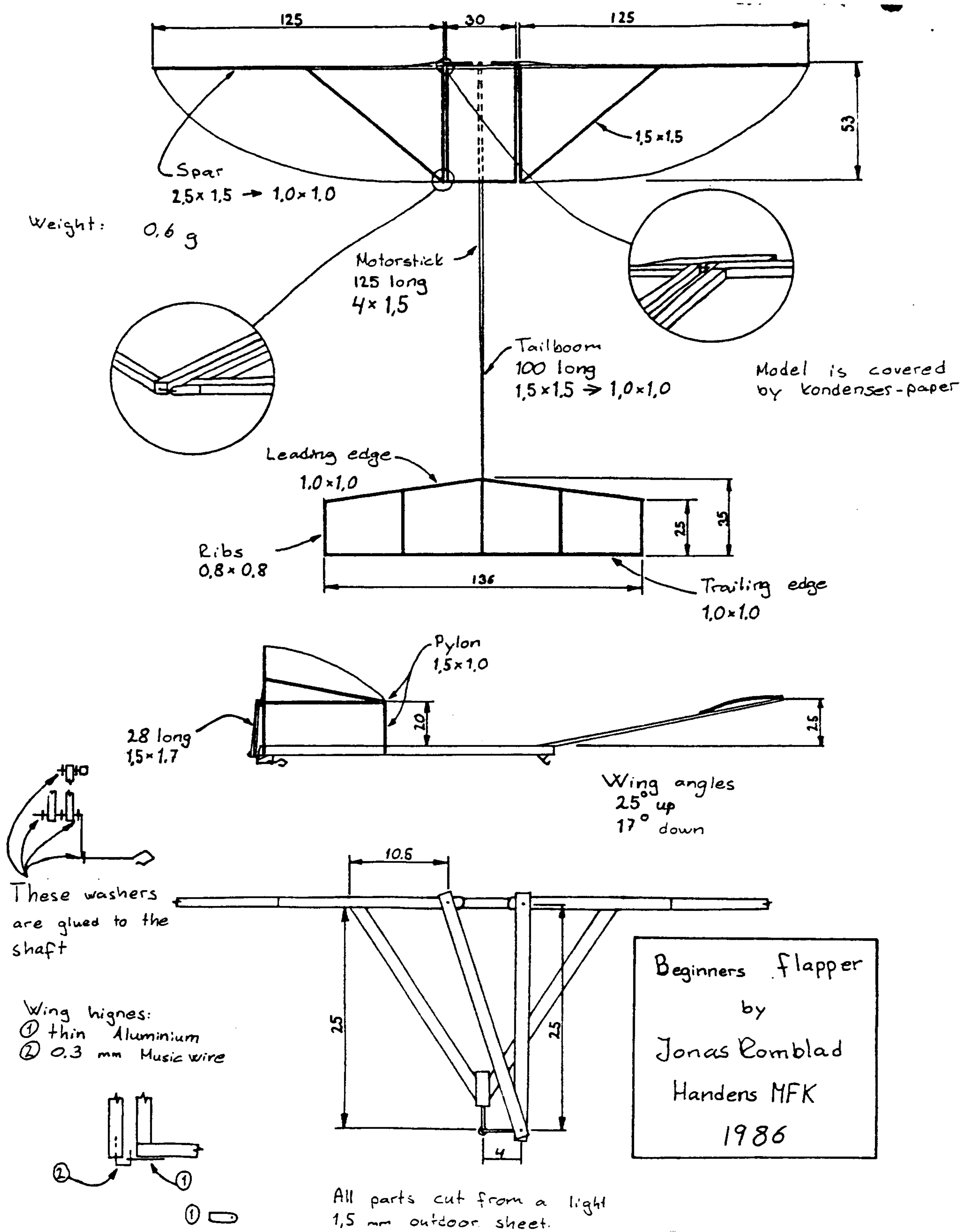
"Anatomy and Flight Biology of the Bird", Carl Herzog, Gustav Fischer Press, Stuttgart

"Bird Flight", George Rüppell, Rowohlt Pocketbook Press GmbH, Reinbeck near Hamburg

"Flappers", Adolf Piskorsch, Self published



COLLECTION OF ~ BILL GOUGH
Model Airplane News · January 1941
MAKE 2
MAKE 2
1/16" X 1/8"
MAKE 4
1/16" SQ
4-1/4"
CUT RIBS
MAKE 2
TISSUE EDGE
1/16" SQ
3"
3/64" DIA.
1/16" SQ
3/32" SQ.
TOP VIEW
FRONT VIEW
CONNECTING ARM (FULL SIZE)
REAR WING PIVOT DETAIL.
POWER
11" LOOP 3/16" BROWN.
760 TURNS.
10"
1-9/16"
7/16"
5/64" X 3/32"
2-1/16"
3/4" DIA.
FLAPPING MECHANISM
BENDING BALSA TIPS.
1/32" SQ.
1"
2"
3-1/4"
4-1/2"
2 - 1/16" X 3/32" X 2"
2 - 1/16" SQ. X 2"
SOLDER WASHER IN PLACE
1/16" FORMER
3/8" DIA.
SOFT AL. WIRE
THE ORIGINAL MODEL HAD A LIFTING STABILIZER HOWEVER, A FLAT SECTION SEEMS MORE LOGICAL
.020
2-7/8"
2"
2-3/4"
CRANKSHAFT (FULL SIZE)
020
DURAL BEARING
.040
RECORD HOLDING ORNITHOPTER
(OPEN CLASS)
BY — ED LIDGARD
TIME — 3 MIN 1.8 SECS
PLACE — 13TH NATIONALS
MEMBER — "CHICACO AERONUTS"
PLAN DRAWN 1/2 SIZE.
DRAWN BY
Ed Lidgard 1941


125
30
125
53
1,5×1,5
Spar
2,5×1,5 → 1,0×1,0
Weight: 0,6 g
Motorstick
125 long
4×1,5
Tailboom
100 long
1,5×1,5 → 1,0×1,0
Model is covered by kondenses-paper
Leading edge
1,0×1,0
25
35
Ribs
0,8×0,8
136
Trailing edge
1,0×1,0
Pylon
1,5×1,0
20
25
28 long
1,5×1,7
Wing angles
25° up
17° down
These washers are glued to the shaft
10.6
25
25
4
Wing hignes:
① thin Aluminium
② 0.3 mm Music wire
②
①
①
All parts cut from a light 1,5 mm outdoor sheet.
Beginners flapper
by
Jonas Romblad
Handens MFK
1986