The Stout Outdoor Record Holder

HOW THIS REMARKABLE PLANE MADE ITS RECORD FLIGHT-

PLANS WITH COMPLETE DETAILS OF HOW YOU CAN BUILD IT

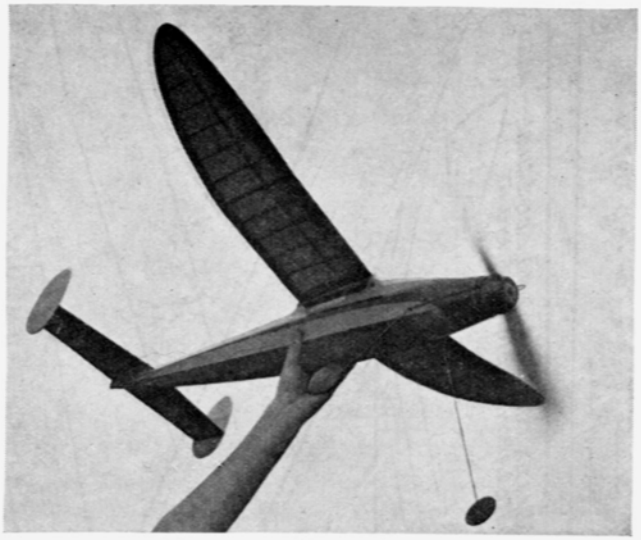
By FRANK ZAIC

"IT IS about time!" was all I could say when the New Yorker IV caught a thermal over Wayne County Airport during the 1938 Nationals. It had been a long time since one of my ships got sucked up into the clouds. Of course there was considerable luck attached to it as it is with most thermal flights. However, the flight was predetermined after a fashion and a great deal of credit belongs to Dick Everett.

Off to a flying start

I'll never forget the way he timed our walk with the timer from the check-in table to the take-off runway. He was constantly watching two billowy clouds which were drifting over the field. At the same time he kept an eye on the models taking off. As soon as he saw one of them caught by the first thermal he hurried us into preparation and it was a matter of minutes before the New Yorker IV was spiralling upward. The thirty-four inch pitch prop under the stress of tightly wound eighteen strands of 1/4 pulled the ship quite high. Over a minute passed before we noticed that the model managed to keep its altitude, and then it began a slow upward spiral. The model which showed us the initial thermal was already a speck under the cloud.

Well, it seems that we caught the fringe of the passing thermal. The model first drifted at right angle to the ground breeze; very likely due to the circulation of the thermal. Getting ready to follow it, we noted that the drift was now in the opposite direction, and that the second cloud was coming up. Could it be possible that the circulation of the second thermal was doing this lucky thing? At any rate, minutes ticked off and it looked worthwhile losing the model. But "Luck" stayed on. Instead of being drawn into the center of the coming cloud, the model persisted in staying in the fringe so that when the cloud passed by the model began its long spiral glide which landed it inside the field after 17 minutes 6.2 seconds of mixed emotions. Might mention that the other model was lost into the cloud with official time of less than ten minutes. Such is Fate!



The twin rudders and large stabilizer provide great stability and soaring capacity

THE DESIGN

The general design follows a definite predetermined theory. A high pitch prop was used to get every bit of possible altitude. Eighteen strands of ¼" flat rubber in determined hands has quite a kick in it and it could handle well the 34 inch pitch on 17 inches diameter. Of course the torque is greater than on smaller pitches, but the generous and poly-shaped dihedral of the wing was adequate for its control. The wing was set at a comparatively high angle of incidence of five degrees to keep the fuselage close to being parallel with the air stream, as well as to obtain higher lift. The airfoil was specifically designed to present a good entry

at angles between six and twelve degrees. Twin rudders were used to give the stabilizer a better lift efficiency.

The initial rudders were too small and at the contest tabs had to be added. The fuselage was designed to have the minimum of material on the stressed members; hence, the square type of basic structure with stringers and cabin to provide the needed cross section area. All these considerations proved of value in the final accounting.

THE CONSTRUCTION

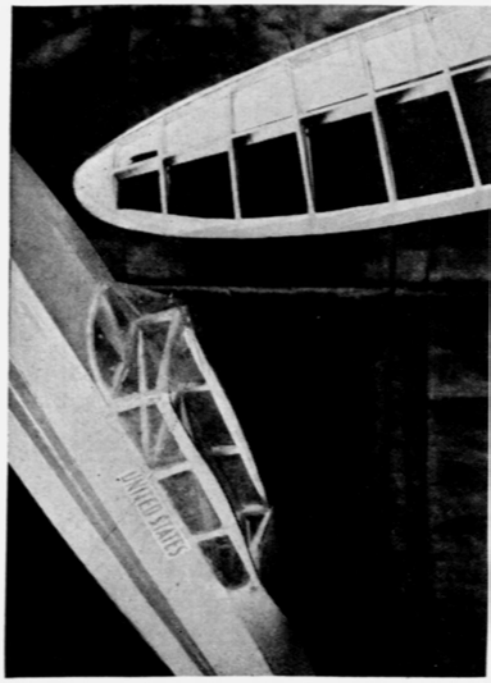
Before any attempt is made to duplicate the model, be sure that you have a good idea of every part. Drawings were prepared to show up the doubtful points. To some of you the construction might seem complicated, but if you just follow the suggestions and stick to the job you will be wiser in many construction points. The (#) marks indicate the poundage of balsa used. Color coded balsa was used for just this purpose. "C" indicates that quarter grain was used.

FUSELAGE

The fuselage is composed of square cross section basic structure, and is a straightforward job. The only deviation from the square is the tail portion which supports the stabilizer to zero degree incidence. It was found that the best method for cementing the two sides into a square is to first cement the bulkhead "A" and the sides at the tail end. The cross braces can then be positioned with assurance that the fuselage will be true. The construction from here on can shift from one end to another to speed it up. Details are well covered in the plans. Especially note how the wing mount is made to be rigid without braces. This is done by use of pins and having the wing rubber mounting hooks abut longerons and airfoil shaped mount. Motor anchorage should be made and the landing gear mounted before stringers are applied. The landing gear might give a bit of trouble but this will be more of handwork nature than perplexity. Just be sure that the large face bushings are bent as shown, and slipped on the wire before any bends are made. Do not bend the axle portion until the model is covered since the silk has to be pierced and slipped over it. The easiest way is to cement the upper bushing first, let it set well and then press the wire against the upright with the extra upright.

The stringers are exceptionally large because they have to provide an eight-sided fuselage for streamlining and the

needed cross section. They are shaped to dimensions before being cemented in place. With longerons in place, the front portion can be rounded with very "mushy" balsa blocks. This is standard "Henry Struck" construction and it is much superior to balsa sheet. (Sheet was used at the beginning but blocks have been substituted since.) The fuselage is now ready to be covered with silk.



Here you see how the wing is constructed and details of the cabin construction

The whole secret of successful silk covering is to wet it before applying. This was discovered by Paul Plecan. Cut silk to an approximate size which would cover the entire fuselage. Spring the landing gear together and determine the two small holes. Now follow this routine:

Soak the silk well. Coat the bottom stringer with cement. Slip silk through the wires and center it on the stringer, holding it in place with pins. The cement will dry even though the silk is wet, so don't worry. It will "blush" of course but dope will cover it up. After you are sure that the cement is set, coat the longerons marked "W" and pull the silk up evenly on both sides. As you tighten the silk hold it in place with pins on stringers "X." Do not use pins on longerons. Continue this process for stringers "X" and longerons "Y." Be sure that silk is kept wet. A bit of trouble might be experienced at the top, but if the silk is well set on other points, you can let it dry and then rewet the upper portion

and cement one edge at a time. Just be careful not to twist the fuselage in the process. This is the only worry. A very good curve is obtained right behind the wing if the silk is cemented to the bamboo braces and the dihedral angle of the mount. If the job is well carried out, the silk will tighten all over when the moisture evaporates. In fact, if you have slack, better take it out as dope just won't.

When the silk is dry, apply a coat of clear, full strength dope. Then two thinned coats of yellow dope. The original had a red trimming line which was done with the aid of Scotch masking tape, using the center stringers as base line. The 1/16" square balsa curve is cemented on the silk, and when set the silk can be trimmed. The final job is to cement the windshield in place. It is advisable to make a paper pattern first. Note how "D" edges are made to overlap the leading edge of the wing and so provide a very smooth continuation for the air stream. The celluloid is cemented to the ring, over the wire hooks and to the dihedral angle of the mount. The side celluloid is then cemented in place. Note how it over-laps the longerons, uprights and the airfoil shaped mount. This provides extra strength. The fuselage is finished by cutting the silk on three sides of the motor hatch, leaving the remaining side to act as a hinge. Might mention that the stabilizer mount is cemented in place before covering so that the silk can be worked into a round fillet.

THE WING

The wing has a very high Strength-Weight ratio, which is due to the deep and hard center spar; using quarter-grained and capped ribs and covering top and bottom of the leading edge with balsa sheets. There is a definite procedure in making the wing.

The rib template is made by pin pointing through the drawing on a stiff paper or fiber. Make all ribs full size as tapering is done while assembling. The center spar is made next. Be sure to have the taper and dihedral angles correct and true. Assemble the spar over a drawing. Next shape the two center portions of the leading edge. This can be best done by drawing two lines "m" and "n" with soft pencil to show the limit of taper. Take the leading edge and superimpose it over the dihedral drawing and butt joint in the center. Now mark the rib spacings on both spars.

The wing is assembled by cementing the thirteen ribs which constitute the two center panels to the leading edge

and center spars. The wing is kept aligned by sighting chord wise from the leading edge. If the leading edge and center spar are parallel you may be sure of perfection, since both have the same center dihedral.

While the ribs are setting make the trailing edge. The center portion is a straightforward taper, while the curved tip outline has to be cut from 3/32" sheet. Keep the 3/32" inner edge thickness throughout. The center trailing edges are cemented one at a time, and be sure to block the inner edge about 1/16" to have it conform to the airfoil outline. You can now handle the wing without fear of having it fall to pieces, as is the usual case when it is assembled all at once.

The tips are simple to duplicate if you stick to the outline. Set the tip flat on a table. Cement tip rib in place and follow up with the tip and trailing edge outline.

Note that the trailing edge angle changes from positive to zero. This is done by first cementing it to the last full size rib and letting it dry well before attempting to give it a twist. You will find that blocking and putting on weights will be of help.

The next step is to cut the full size ribs to taper. The drawing covers this well. Do not attempt to make every rib fit individually. Just cut off the bottom camber so that it rests flat on the table while the spar is abutting the top portion of the spar slot in the rib. Fine tapering is done after the leading edge is in place and you can see what you are getting. This is done with plane and sandpaper. Note how the leading edge is made. It was too difficult to bend one piece so it had to be made in laminations. It works fine and gives very strong construction. The wing is finished by covering the top and bottom of the leading edge with sheet balsa and capping the ribs. Be sure to taper the caps for the trailing edge before cementing, and cement the sanded portion against the edge. Cover with regular red tissue and apply two coats of clear dope.

TAIL SURFACES

If you've managed the wing, the stabilizer should give you no problems. The only awkward part is the tapering of the ninety-degree cuts on the ribs. The idea is to assemble the ribs on center and trailing edge. Then cut the ribs so that they form a straight line for "A" and "B". Cuts can be done with "eye-guestimating." The tapering of ribs is done after the leading edge is in place. The 1/64" covering of leading edge and rib caps complete the job. Rudders are self-

explanatory. Cover the stabilizer with red paper and the rudders with yellow. Water-dope and then apply two coats of clear dope. Cement the rudders to the stabilizer when both are dry.

PROPELLER

The original propeller was made as perfect as possible, using hard and clear balsa. Carefully mark out your blank and drill the shaft hole. The original prop balanced at every point of carving operation. Cut the lower camber first and shape it to a flat angle. Then draw a line one-third from the leading edge and cut out the front portion to the camber depth. Then carve away the rear portion. This will guarantee a true airfoil shape. After making sure that both sides are identical, shape the upper camber. Stop every now and then to feel the curvature. The tip outline can be had from side view and pictures. The blades are finished with 10-0 sandpaper and at least six coats of dope-thinned cement. This produces a glass-like surface.

The nose plug is made as shown. Note how the square cut-out from the front bulkhead provides us with a perfect setting plug. Cement the plug and round disk together. When dry, drill a 1/8" center hole for the threaded bushing. This threaded bushing clamps the pieces together as well as makes it very easy to fasten various metal parts securely to the plug. The prop shaft is made full size. Start the bending with the hook.

The spinner portion is made by the planking method. Large face bushings with crimped edges provide the extra strength needed for ball-bearing and shaft hook bearing. The cone portion was made from celluloid, but it was done hurriedly and it did not prove ideal. However, it is recommended that some sort of spinner be used as they will come "into their own" soon.

FLYING

The original model needed very little down and side thrust, though the rudders had to be increased to the size now given. The wing was left alone and the glide was taken care of by the stabilizer. It was slightly positive, but since then the rubber anchorage was moved forward two inches so that there was less load on the tail and the stabilizer came back to its zero setting. Do all testing with gradual increase in winds. The original had two large face bushings

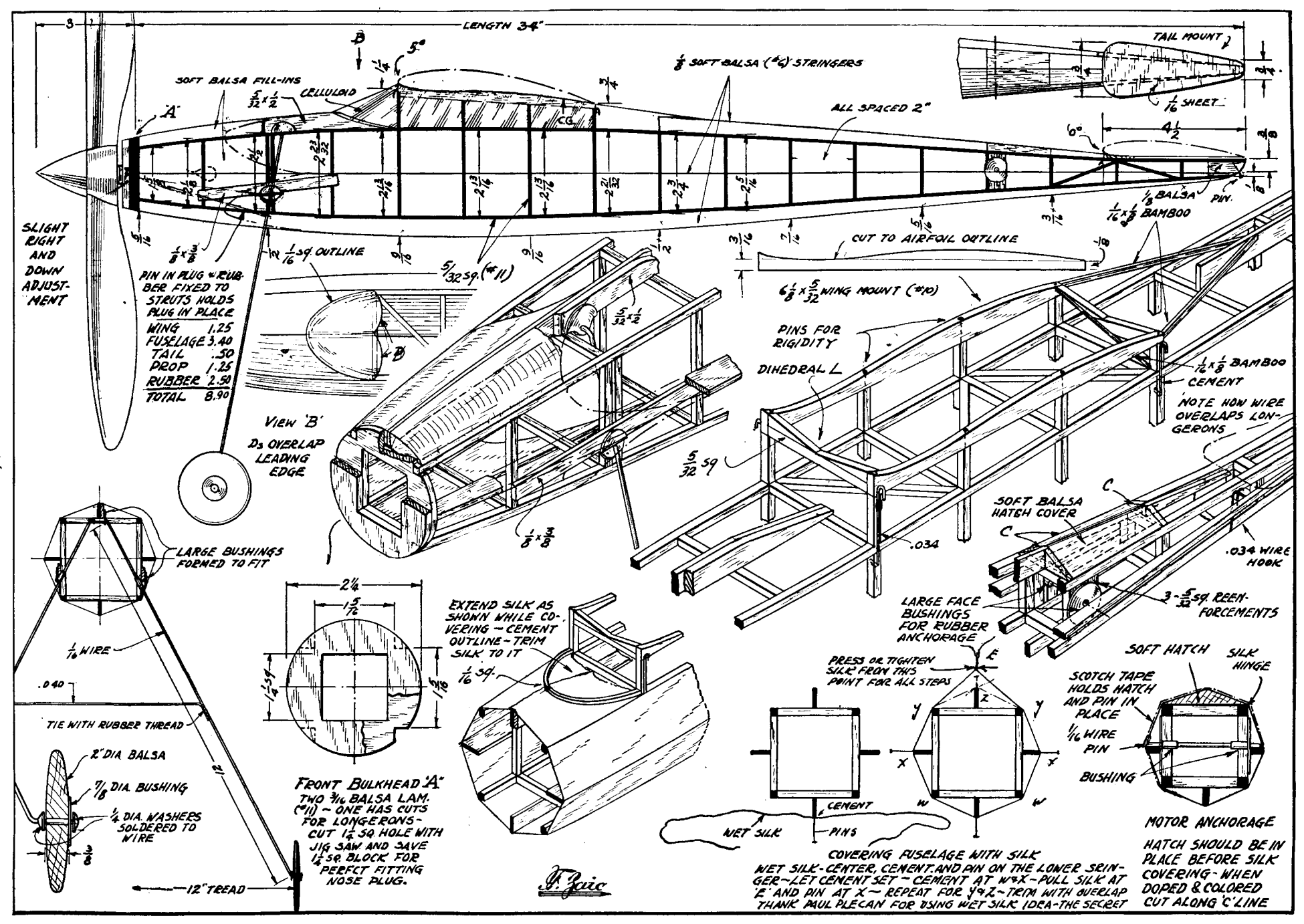
fixed near the middle to provide motor anchorage for full power, but short power tests.

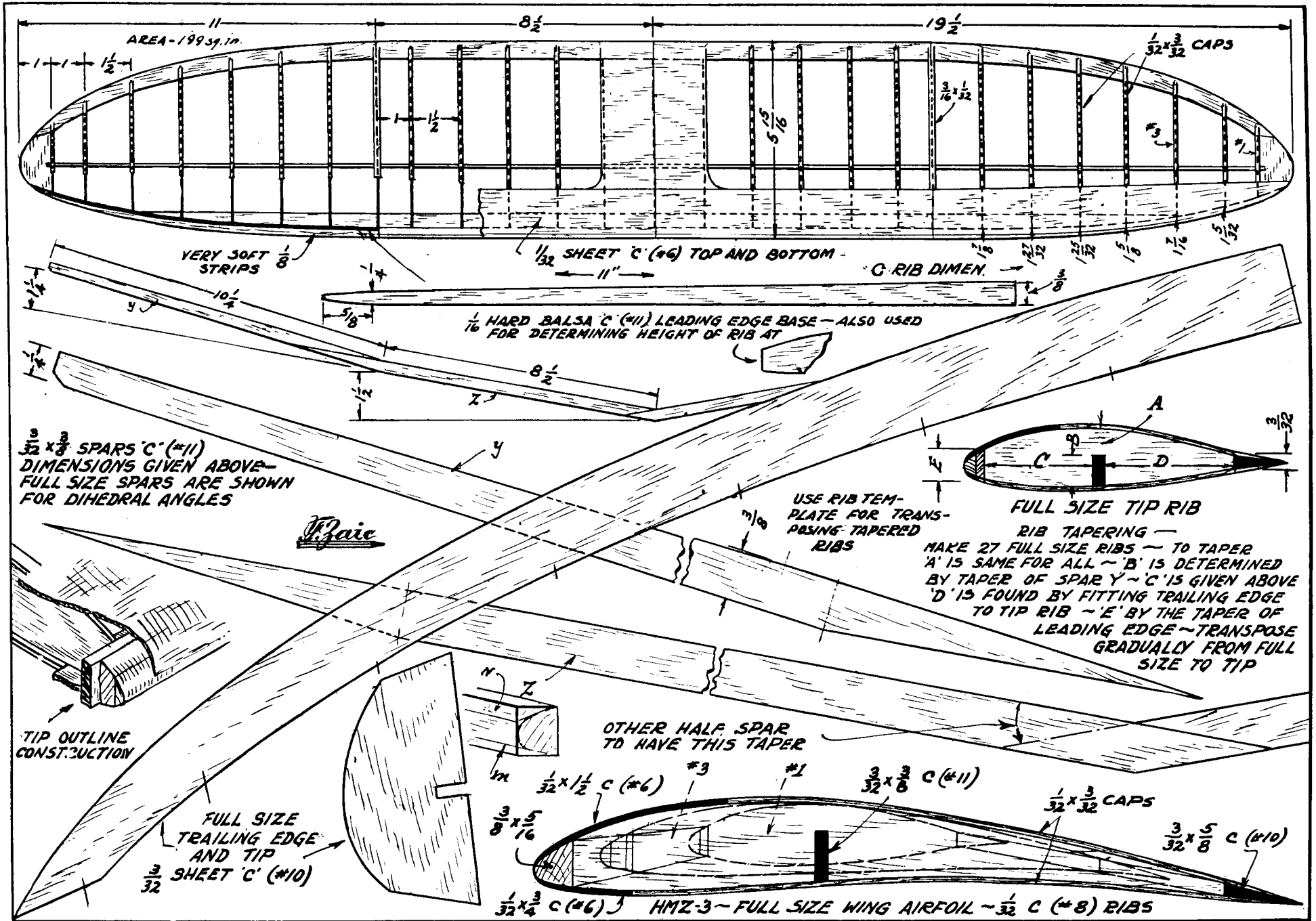
After the 17 minutes, 6.2 seconds flight an attempt was made to qualify for the Wakefield team. But "Lady Luck" was looking elsewhere. While connecting the free-wheeling hook to the prop hook, the wire pulled out of its anchorage and the rubber whizzed away the hard earned turns. Pretty soon the windows were covered with balsa dust and scraps. When the fun ended it was found that the main longerons by the nose were sheared away; only the silk-covered balsa sheet prevented utter collapse. Temporary repairs helped but the "IT" was gone for that day. Undoubtedly the fuselage was weakened too much to keep the necessary adjustments. During the Moffett finals, the model turned in a flight over two minutes in high wind to place sixth in the final result.

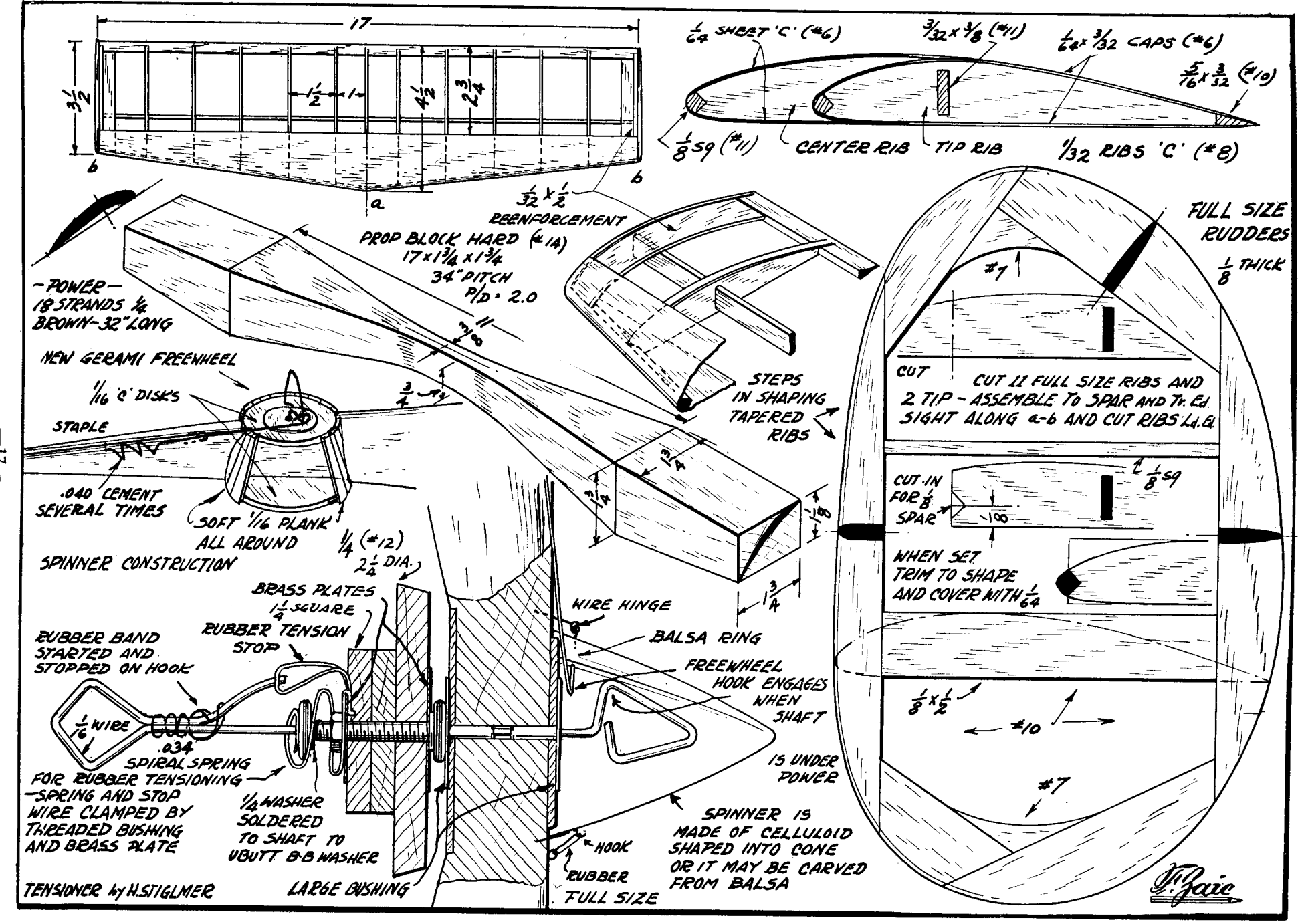
Since the Nationals, the model has been reconditioned during a European trip. The original silk covering was ripped off and the fuselage repaired. While being recovered the rear portion became slightly twisted, but this was offset by changing the stabilizer mount. The model was finally brought into its former self somewhere in Europe and was flown in exhibition in the Italian Nationals; holding up the American tradition of high climb and good glide. In all, the design is something on which one can count.

NOTES

The high pitch prop proved practical. Silk covering gives a very fine finish and good handling strength. High angle of incidence is recommended; in fact, it was found that the model actually glides at about ten degrees. Twin rudders proved to be too sensitive, especially since the entire stabilizer had to be moved. However, if you intend to use twin rudders be sure to incorporate tabs. (Tests on New Yorker III showed that twin rudders do contribute to the stabilizer efficiency and that their combined area must be one-third larger than that of a single rudder.) The 1939 design or the New Yorker V will very likely follow the present general design. However, a single rudder will be used and the wing will be set at even a greater angle of incidence. The fuselage will have a larger section at the rear as the present one proved too flexible under full power. The power will be kept to eighteen strands but the model will be lightened and longer motor used. These are about all the recommendations we have at the moment. So, may the thermals be at your beck and call!


LENGTH 34"
SOFT BALSA FILL-INS
CELLULOID
1/8 SOFT BALSA (4 SQ) STRINGERS
ALL SPACED 2"
TAIL MOUNT
1/16 SHEET
1/8 BALSA
PIN.
1/16 x 1/8 BAMBOO
CUT TO AIRFOIL OUTLINE
6 1/8 x 5/32 WING MOUNT (#10)
PINS FOR RIGIDITY
DIHEDRAL L
1/16 x 1/8 BAMBOO
CEMENT
NOTE HOW WIRE OVERLAPS LONGERONS
5/32 SQ
.034
SOFT BALSA HATCH COVER
.034 WIRE HOOK
3 - 5/32 SQ. REENFORCEMENTS
LARGE FACE BUSHINGS FOR RUBBER ANCHORAGE
PRESS OR TIGHTEN SILK FROM THIS POINT FOR ALL STEPS
SOFT HATCH
SILK HINGE
SCOTCH TAPE HOLDS HATCH AND PIN IN PLACE
1/16 WIRE PIN
BUSHING
MOTOR ANCHORAGE
HATCH SHOULD BE IN PLACE BEFORE SILK COVERING - WHEN DOPED & COLORED CUT ALONG 'C' LINE
COVERING FUSELAGE WITH SILK
WET SILK - CENTER, CEMENT AND PIN ON THE LONER STRINGER - LET CEMENT SET - CEMENT AT W & X - PULL SILK AT 'E' AND PIN AT X - REPEAT FOR Y & Z - TRIM WITH OVERLAP
THANK PAUL PLECAN FOR USING WET SILK IDEA - THE SECRET
CEMENT
WET SILK
PINS
SLIGHT RIGHT AND DOWN ADJUSTMENT
PIN IN PLUG & RUBBER FIXED TO STRUTS HOLDS PLUG IN PLACE
WING 1.25
FUSELAGE 3.40
TAIL .50
PROP 1.25
RUBBER 2.50
TOTAL 8.90
1/2 1/16 SQ OUTLINE
5/32 SQ. (#11)
View 'B'
D3 OVERLAP LEADING EDGE
1/8 x 3/8
5/32 x 1/2
LARGE BUSHINGS FORMED TO FIT
1/16 WIRE
.040
TIE WITH RUBBER THREAD
2" DIA BALSA
7/8 DIA. BUSHING
1/4 DIA. WASHERS SOLDERED TO WIRE
3/8
12" TREAD
2 1/4
1 5/16
1 1/4 SQ
1 5/16
EXTEND SILK AS SHOWN WHILE COVERING - CEMENT OUTLINE - TRIM SILK TO IT
1/16 SQ
FRONT BULKHEAD 'A'
TWO 3/16 BALSA LAM. (#11) - ONE HAS CUTS FOR LONGERONS - CUT 1 1/4 SQ HOLE WITH JIG SAW AND SAVE 1 1/4 SQ BLOCK FOR PERFECT FITTING NOSE PLUG.
A
B
C
CG
E
W
X
Y
Z


AREA - 199 sq. in.
11
8½
19½
1
1
1½
1
1½
5 5/16
1/32 x 3/32 CAPS
3/16 x 1/32
#3
#1
1 1/8
1 27/32
1 25/32
1 5/8
1 7/16
1 5/32
VERY SOFT 1/8 STRIPS
1/32 SHEET 'C' (#6) TOP AND BOTTOM
11"
C RIB DIMEN.
1/4
3/8
5/8
1/16 HARD BALSA 'C' (#11) LEADING EDGE BASE — ALSO USED FOR DETERMINING HEIGHT OF RIB AT
1 1/4
10 1/4
y
8½
1½
x
3/32 x 3/8 SPARS 'C' (#11)
DIMENSIONS GIVEN ABOVE—
FULL SIZE SPARS ARE SHOWN
FOR DIHEDRAL ANGLES
A
B
C
D
E
3/32
FULL SIZE TIP RIB
USE RIB TEMPLATE FOR TRANSPOSING TAPERED RIBS
3/8
RIB TAPERING —
MAKE 27 FULL SIZE RIBS — TO TAPER 'A' IS SAME FOR ALL — 'B' IS DETERMINED BY TAPER OF SPAR 'Y' — 'C' IS GIVEN ABOVE 'D' IS FOUND BY FITTING TRAILING EDGE TO TIP RIB — 'E' BY THE TAPER OF LEADING EDGE — TRANSPOSE GRADUALLY FROM FULL SIZE TO TIP
TIP OUTLINE CONSTRUCTION
OTHER HALF SPAR TO HAVE THIS TAPER
N
Z
m
FULL SIZE TRAILING EDGE AND TIP 3/32 SHEET 'C' (#10)
1/32 x 1½ C (#6)
#3
#1
3/32 x 3/8 C (#11)
3/8 x 5/16
1/32 x 3/32 CAPS
3/32 x 5/8 C (#10)
1/32 x 3/4 C (#6)
HMZ-3 — FULL SIZE WING AIRFOIL — 1/32 C (#8) RIBS


17
3½
1½
1
4½
2¾
b
a
b
1/64 SHEET 'C' (#6)
3/32 x 3/8 (#11)
1/64 x 3/32 CAPS (#6)
5/16 x 3/32 (#10)
1/8 SQ (#11)
CENTER RIB
TIP RIB
1/32 RIBS 'C' (#8)
1/32 x 1/2 REENFORCEMENT
PROP BLOCK HARD (#14)
17 x 1¾ x 1¾
34" PITCH
P/D = 2.0
-POWER-
18 STRANDS 1/4 BROWN-32" LONG
NEW GERAMI FREEWHEEL
1/16 'C' DISK'S
STAPLE
.040 CEMENT SEVERAL TIMES
SOFT 1/16 PLANK ALL AROUND
STEPS IN SHAPING TAPERED RIBS
SPINNER CONSTRUCTION
1/4 (#12)
2¼ DIA.
BRASS PLATES 1¼ SQUARE
RUBBER TENSION STOP
RUBBER BAND STARTED AND STOPPED ON HOOK
1/16 WIRE
.034 SPIRAL SPRING FOR RUBBER TENSIONING
-SPRING AND STOP WIRE CLAMPED BY THREADED BUSHING AND BRASS PLATE
1/4 WASHER SOLDERED TO SHAFT TO ABUTT B-B WASHER
LARGE BUSHING
TENSIONER by H. STIGLMER
WIRE HINGE
BALSA RING
FREEWHEEL HOOK ENGAGES WHEN SHAFT IS UNDER POWER
HOOK
RUBBER
FULL SIZE
SPINNER IS MADE OF CELLULOID SHAPED INTO CONE OR IT MAY BE CARVED FROM BALSA
FULL SIZE RUDDERS
1/8 THICK
#7
CUT
CUT 11 FULL SIZE RIBS AND 2 TIP - ASSEMBLE TO SPAR AND Tr. Ed. SIGHT ALONG a-b AND CUT RIBS Ld. Ed.
CUT IN FOR 1/8 SPAR
1/8 SQ
WHEN SET TRIM TO SHAPE AND COVER WITH 1/64
1/8 x 1/2
#10
#7