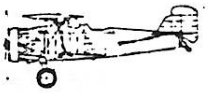
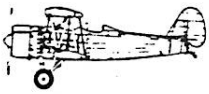
Curtiss-Hall F4C-1



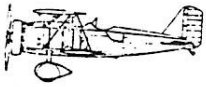
Curtiss F8C-4

Douglas XFD-1

Boeing FB-5



Vought XF2U-1



Curtiss XF10C-1

MAX - FAX

THE NEWSLETTER OF THE D.C. MAXECUTERS
JAN/FEB 1986

MEMBERSHIP

Dues for membershp in the D.C. Maxecuters is $10.00 per year for residents of the U.S.A., Canada, and Mexico, and $11.00 for all other countries. Your mailing label indicates the year and month of the last issue of MAX–FAX for your current membership. A red mark in the box below is a reminder that your current membership is nearing its end. Send a check, payable to D.C. Maxecuters, to the Treasurer.

DUES REMINDER ☐

MEETINGS

The D.C. Maxecuters hold meetings on the first Wednesday of every month at the College Park Airport, the oldest continuously operating airport in the world.

PRESIDENT

TOM SCHMITT
11014 Marcliff Road
Rockville, MD 20852

SECRETARY

BILL POOLE
9301 Lynmont Dr.
Adelphia MD. 20783

TREASURER AND
NEWSLETTER EDITOR

ALLAN SCHANZLE
20008 Spur Hill Dr.
Gaithersburg, MD 20879

UPCOMING EVENTS

JAN 1:	NO MEETING!!
JAN 8:	MONTHLY MEETING AT COLLEGE PARK AIRPORT.
JAN 11:	FLYING AT NORTHWOOD H.S., 2:00 TO 5:00 PM. BOSTONIAN MINI CONTEST.
JAN 18:	BULL SESSION AT DAN DRISCOLL'S, 8:00 PM. SEE DIRECTIONS IN THIS ISSUE.
JAN 25:	FLYING AT NORTHWOOD H.S., 2:00 TO 5:00 PM. NO-CAL MINI CONTEST.
FEB 8:	FLYING AT NORTHWOOD H.S., 2:00 TO 5:00 PM. RICH HENSEL ALL BALSA CONTEST.
FEB 15:	BULL SESSION AT RAY RAKOW'S, 8:00 PM.
FEB 22:	FLYING AT NORTHWOOD H.S., 2:00 TO 5:00 PM. HELICOPTER/AUTOGYRO MINI CONTEST.
MAR 8:	CONTEST AT PATUXENT RIVER N.A.S., 9:00 TO 5:30. SEE NOTICE IN THIS ISSUE.
MAR 22:	FLYING AT PEARY H.S., 2:00-5:00 PM. NOTE LOCATION CHANGE.
JULY 18-20:	F.A.C. NATS, MK V.

CLUB NEWS
ALLAN SCHANZLE

I've got to start this issue by thanking Tom Schmitt for editing the last issue of MAX-FAX while I was enjoying the glories of Europe. Tom has certainly helped make this rag become a quality product with his photo pages as well as helping with the duties necessary to get MAX-FAX into the mail. So thanks, Tom, not only from me, but from all our readers.

Thanks also go to "Massimo", another mystery cover drawing contributor for this month. That makes two local individuals with artistic talents who are willing to give their time for MAX-FAX. Yes, folks, we are very lucky to have this group of modelers in Metropolitan Washington D.C.. MAX-FAX is a cooperative effort of several local MAXECUTERS. It makes living in the D area tolerable, even enjoyable, and based upon what many of you write to the editor, you're envious. Thanks to all of you for your support.

And I would be remiss if I failed to thank all the folks responsible for the Patuxent contest - Claude Powell, the Parks and Recreation Department, and the Navy staff at PAX River. This is becoming a well attended contest, and as noted in the "Upcoming Events" section, we've got another contest planned for March 8. We hope to see you there.

We've been supplied with a rather extensive schedule of flying dates for the Glastonbury, Conn. Modelers. Contests are planned for an outdoor "MID-WINTER MADNESS MEET" on January 12 at Durham Fairgrounds and an indoor contest on April 6. For complete details, contact Mark Fineman, 56 Charlton Hill, Hamden, CT 06518.

The local postperson brought several requests for HELP!! Does anyone have plans for the Jasco FLASH (X-18 or X-24). If so, please contact Bill Johnstone, P.O. Box 7850, Newark, DE 19714. Bill is teaching a bunch of young-uns, so your help may just introduce a few new kids to this hobby.

A second request for information came from Leonard Wieczorek, 35A Leslie Rd., Bridgeport, CT 06606. He is looking for 3-views and/or color data for the following German aircraft:

LF-2 Kiebitz (1959, 1960)	ERLA 6A
Euler Triplane (1918)	Mücke
Bücker 134 (1936)	Darmstadt D-29

Our plans for an international commemorative for the Spitfire is gaining considera recognition. We have recently enlarged Earl Stahl's drawings for an 18 inch MK IX version to 24 inches. If you're interested in building either of these sizes, send the editor a SASE for information on their availability.

The Christmas Banquet for 1985 set a new record for the number in attendance. The local MAXECUTERS and their guests numbered 38, and thanks to the efforts of Hurst Bowers, our guest of honor and speaker was Ed Packard, founder of Cleveland Model Supply. Ed gave us a summary of how Cleveland got started in the early 1930's and how it blossomed during the war years. His presentation was followed by a question and answer period. For the local model aviation buffs, this was a memorable night. I think that we should start recording some of these presentations as they may contain otherwise unknown or forgotten facts.

Check the notice in this issue for the March Patuxent River Contest and you'll find an event for helicopters/auto-gyros. You'll find one such plan from Bill Hannan's book "MODELS AND MUSINGS" in this issue, and if you are an old time subscriber, you'll recall a helicopter plan by Roy Clough in the July/August 1981 MAX-FAX. You'll also find a second plan in Bill's book called "UNICOPTER" that we'll try to fit into the next issue of MAX-FAC. So give this event a try - it should be fun.

As you have already discovered, another full size plan is enclosed with this newsletters. The Knoll is a most unusual biplane model design by Claude Powell, our "Patuxent Connection". As far as I know, this is the first model plan even published of this aircraft. In addition to this feature plan, we have the model helicopter noted above, two editorials, contest results from the PAX River event, a construction hint by Richard Jordan, and the concluding Part 2 for WING SECTIONS FOR MODEL PLANES.

GUEST EDITORIAL
DAVE REES

I wish to recount to you my experience with the graciousness of the Comsat Corp. employees, which put me forever in favor of having meets at their field.

The prevailing winds this year were fortunately away from the woods, but the hot weather and resulting updrafts swept Allan Schanzles' and my airplanes up to the point where they paid a visit to the factory roof. Not wishing to loose my recent nats placer, we approached the security guards' desk to see if anything could be done.

I don't think I have ever been treated more courteously and helpfully than these two gentlemen did. We were immediately escorted to the rooftop where Allan's plane was retrieved unharmed. Mine was on the roof of the cafeteria, which had no access, but was fortunately close enough to the ground to be reached with Allan's 24 foot ladder. One guard even helped us haul the ladder in his truck and assisted while my plane was fetched plus another in a nearby tree - all just before it began to rain.

I think this kind of action reflects in the highest manner on the entire Company, and explains why the Comsat Corp. will always be the industry leader.

EDITORIAL
ALLAN SCHANZLE

Sometimes it's hard to find words to express an esoteric feeling. Several years ago (MAX-FAC, Nov/Dec 1981), I wrote about that special sensation associated with my first visit to Cole Palen's Rinebeck aerodrome. While walking thru that marvelous collection of flyable old aircraft, they played the theme from "THE GREAT WALDO PEPPER" over the public address system. I got chills down my back as I heard the music while standing next to a WW-I aircraft, and thought that would be a once-in-my-life experience. But fortunately, I've recently relived those chills. This time, it occurred at the "BATTLE OF BRITIAN" museum in Hendon, England, just north of London. There are actually 3 museums at this one location: The RAF Museum, The BOMBER COMMAND Museum, and that for the Battle of Britian.

The B.O.B. museum has an occasional tape recording that plays over the public speaker system, and I had just finished reading on the walls of this museum two famous quotes by Winston Churchill - the ones that read something like "Never in the history of human conflict have so many owed so much to so few," and his more extensive paragraph which ends, "This was their finest hour." Just as I finished reading these quotations, the sweet purr of a Spitfire Mounted Merlin "flew thru the speakers," in stereo. That, folks, sent chills once again down the spine, and the mental image of that most beautiful of WW-II aircraft flashed in the mind. And, mind you, all of this while standing in the midst of an Me 109, Stuka, HE 111, Me 110, Fiat CR 42, Boulton Paul Defiant, Spitfire, Hurricane, and several more. If I could somehow "beam" that image to all of you readers, we would be flooded with results for the "Spitfire Commemorative" event.

This was the climax to my recent two week trek thru England and Scotland. Time limitations prohibited planned excursions into Wales and Ireland, but let my simply tell you that England has an unbelievable number of aviation museums. Let me know if you plan to make a trip to that part of the world, and I'll be sure you get a copy of a brochure sent to me by Alan Carr, one of our English subscribers.

And speaking of Alan, I can't close this editorial without giving public thanks to him for escorting me to the Shuttleworth Collection Fly-by. Alan, your hospitality was second to none, and I hope you will sometime find a way to make it "to the Colonies", so I can return a small portion of your kindness. How 'bout a visit during the FAC Nationals this July?

BOX FUSELAGE JIGS
RICHARD JORDAN

The outline of the jig formers are 1/2 inch larger than the height and width of the station. The former is cut from 8 ply poster board and I feel that the thin cardboard that pizzas come in from Pizza Inn or Pizza Hut would work as well.

I use a maximum of four formers to put a fuselage together. One at the nose, two in the cabin or wing area and one between the wing and tail post. This gives the freedom to hold the fuselage in my hands and rotate it as I work on it.

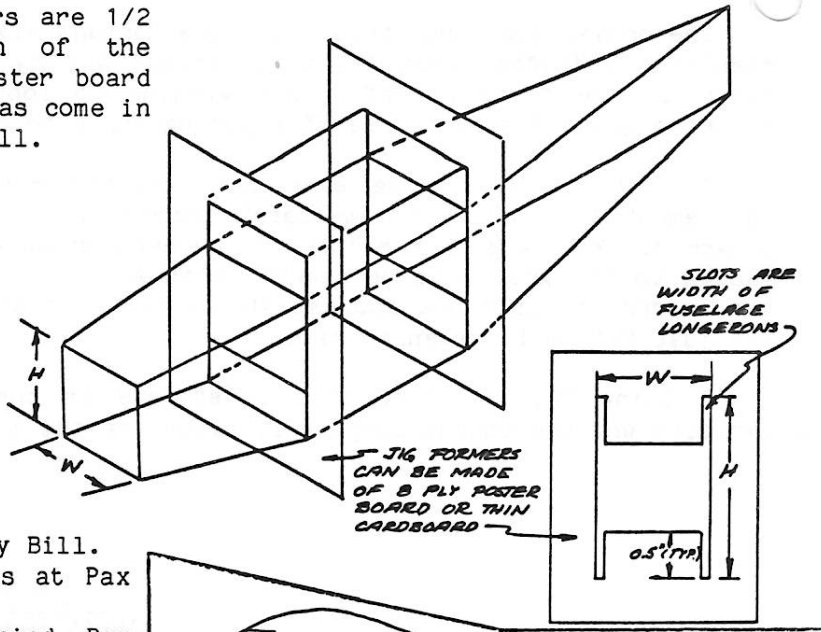
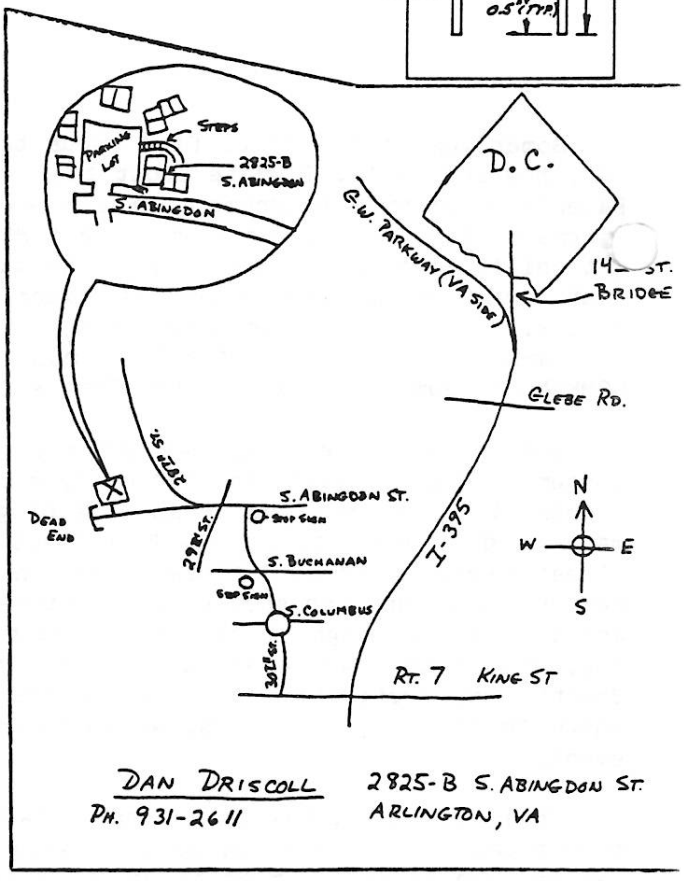


PHOTO PAGES
Tom Schmitt

1. Bill Hannan's Pistachio Farman. Photo by Bill.
2. One of the hard working EAA scale judges at Pax River examining Bill Bell's O-43.
3. Claude Powell, the driving force behind Pax River, with his Cessna at our September contest.
4. Ton Avak always shows up with something different. How about a gumband powered airship!
5. A neat early model SNJ by Stew Meyers; a good flyer.
6. Our Naval Academy experimenter, Bud Carson, with his latest.
7. Paul Spreiregen has a lot to smile about; he carried home one of Claudes neat trophies from Pax River.
8. Hurst Bowers and Doug Buchanan with their Navy entries.
9. No contest would be complete without the smiling faces of Bert and Evelyn, waiting for Peanut mass launch event.
10. Mike Moscow with a good launch of his Earl Stahl Rearwin. Wish we had a photo of its spectacular collision with the hangar wall!!
11. Bill Bell with his great flying Golden Age F4B-4.
12. John Houck winding his pretty Ansaldo for the WWI event. Mark is overwhelmed by - - -.
13. -- -- Don launching his "14 bis" backwards! Don decided to give the rest of us a break and handicap himself by flying his Santos-Dumont in reverse. Paul just cannot believe it!



14. Marv Yoder launches his 'Lincoln', a good flying design by Hurst Bowers.
15. Another neat model by Hurst. A Gypsy powered Rumanian Fleet, adapted from Peerless plans. The Golden Age kit is a good starting point.
16. To the victors belong the awards; go for it Bud! The professor realy cleaned up; not only the grand prize but also a resounding kiss from that terrific "99er", Ada M. Barrett.
17. Rolfe and Nancy Gregory finally made it to Pax River. Rolfe resurrected his old Stinson for the Navy event.
18. Too bad there is no recording of this conversation. Our editor shares in the fun and awards.

1


2

3


4

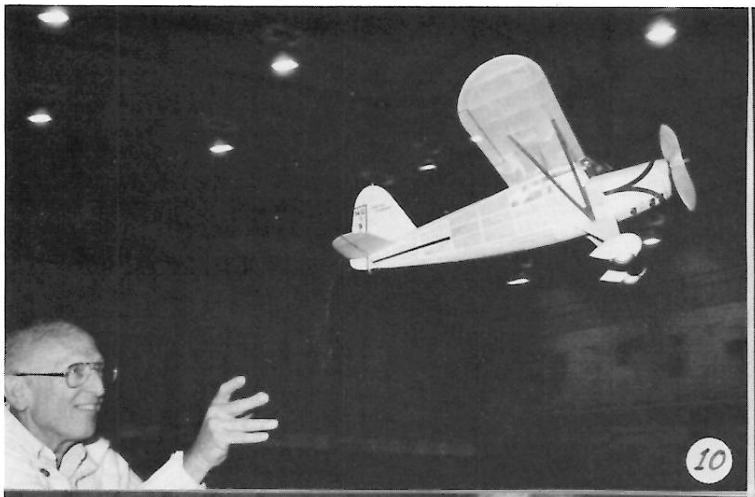

5

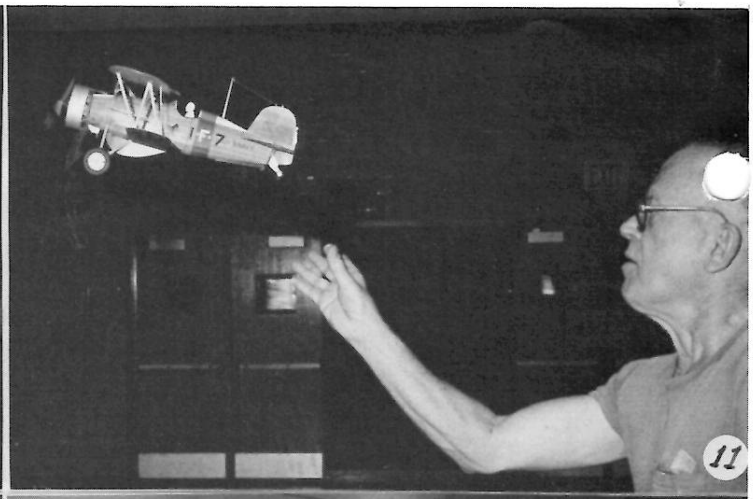

6

7

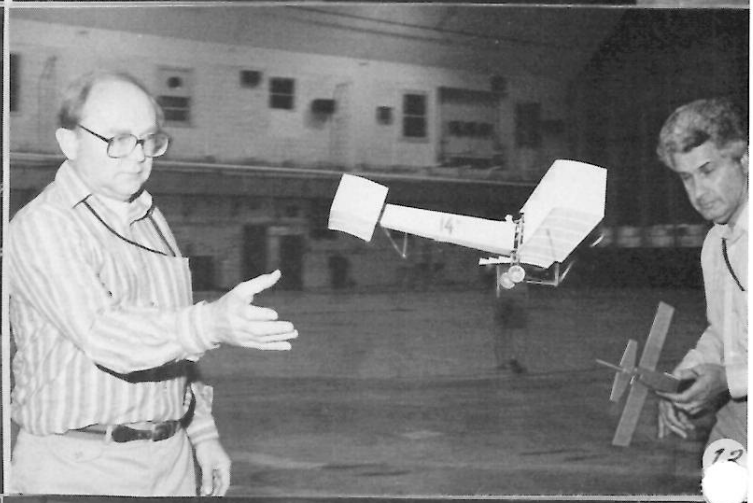
8


9


10


11


12


13


14

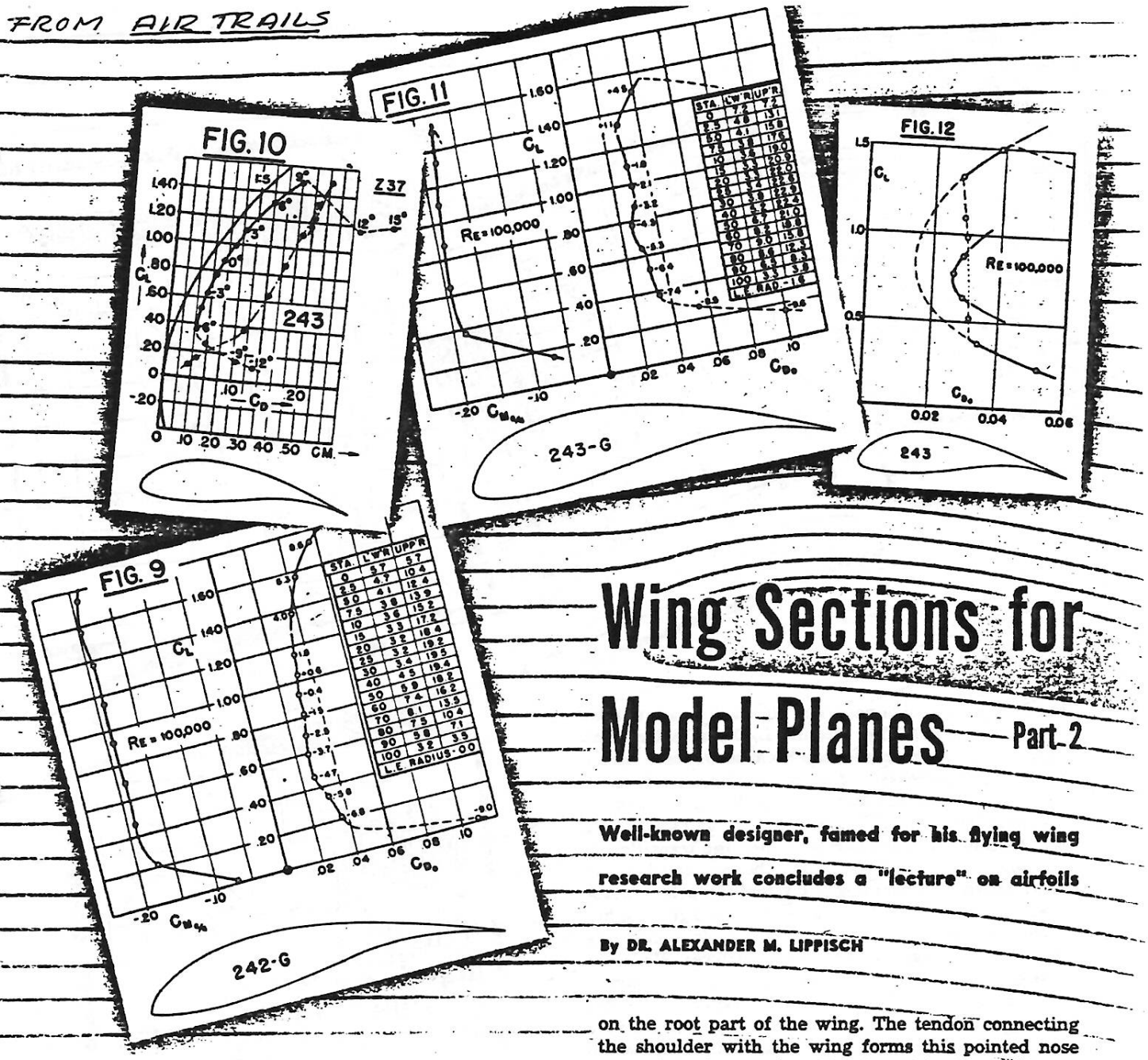

15


16


17


18

FROM AIR TRAILS



Wing Sections for Model Planes — Part 2

Well-known designer, famed for his flying wing research work concludes a "lecture" on airfoils

By DR. ALEXANDER M. LIPPISCH

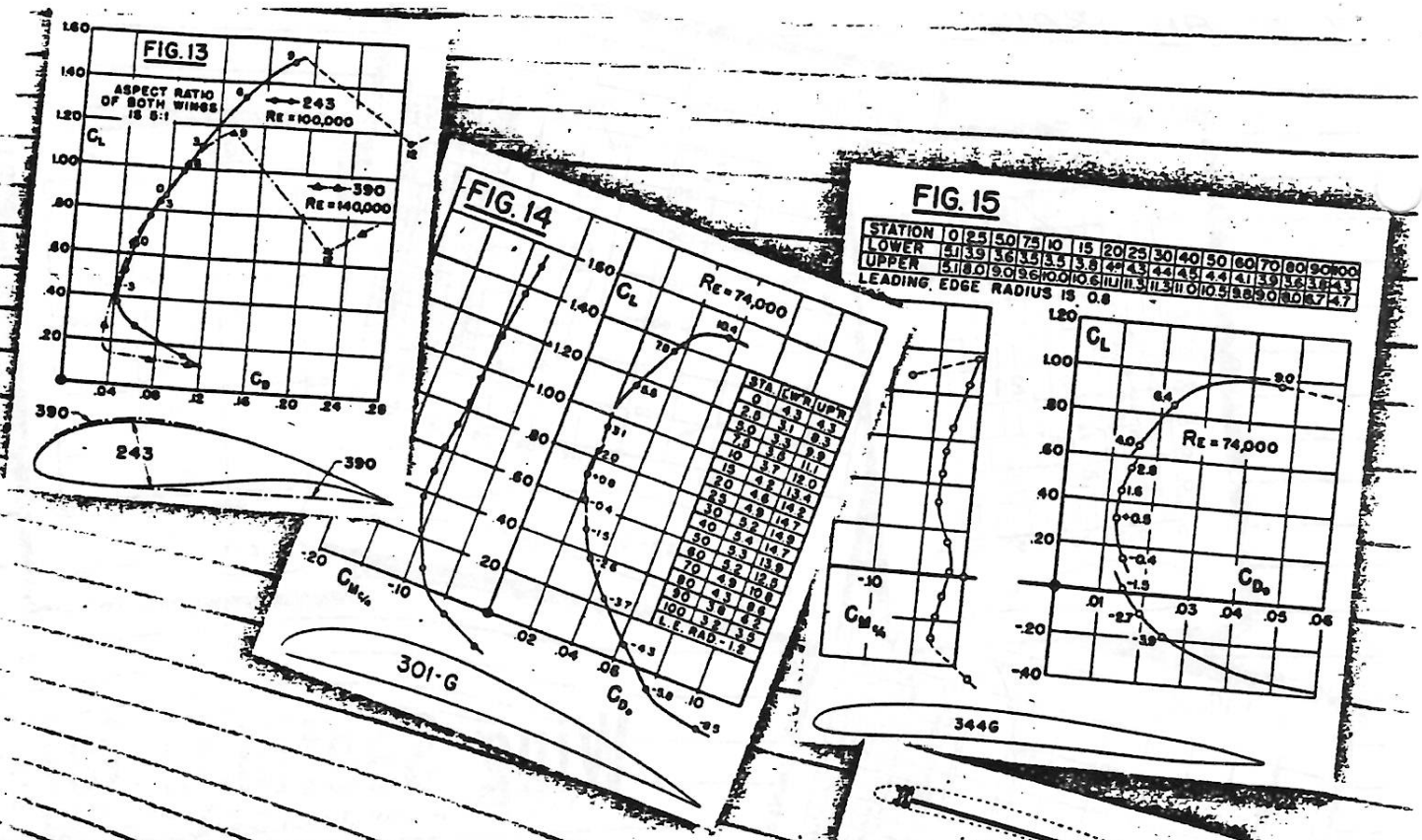
Editor's Note: In the April issue Dr. Lippisch introduced the subject of scale effect on models and its importance in the selection of airfoil, aspect ratio and wing efficiency. He confirmed many suspicions that the so-called laminar flow airfoils do not act as laminar flow sections when reduced in scale; now he goes on to show that some full-scale non-laminar flow airfoils may assume laminar flow characteristics when scaled down.

LET us now have a look on the next section, 242, which is somewhat thicker (*Fig. 9*). It is interesting to see that the sharp pointed nose does not have any bad effect on the maximum lift. On the contrary, this section has the highest $c_{l\,max}$.! It is remarkable that the larger birds have such pointed nose sections on the root part of the wing. The tendon connecting the shoulder with the wing forms this pointed nose part of the inner wing. The drag shift is not so pronounced with this section because the "undercamber" is not extended enough toward the leading edge. The drag minimum is somewhat larger than for 227 (*see Part I*), but the absolute $L/D_{o\,max}$ is about the same.

A real thick section of the bird type is section 243, which I will show you next.

Fig 10 illustrates the original measurement. You see that again we have a sudden stalling at the 9° point but at least at a considerably higher $c_{l\,max}$ of 1.50. Therefore, this is not very serious and could be smoothed out if we made the nose a bit sharper. The thickness ratio of this section is close to 20 percent, which means that you really can design some aspect ratio with it.

The absolute characteristics of section 243 are represented by *Fig. 11*. Here you see again the distinct branches of the absolute polar. The inner laminar



bump is well pronounced and shows a $c_{D\,min}$ not far from section 227. The absolute $L/D_{\bullet}$ is higher than that of the two other sections because we have here a pronounced decrease of drag on the lower surface.

How the different branches of the polar can be distinguished is more clearly shown on *Fig. 12*. We see the inner laminar part and then the transition to the outer branches which could be connected by an ideal dotted line. You might say that the points measured are not sufficient to warrant this suggestion, but more detailed recent tests on other sections show the characteristic shape of the different curves. While the flow conditions on the boundary layer are very sensitive against little changes, we can expect to get the outer branches more extended if we produce a very clean design. The maximum $L/D_{\bullet}$ which is here about 50 proves that with some higher aspect ratio we can get a gliding angle above 1 : 20 with some larger model.

I thought it would be of special interest to compare this thick-cambered section with a section of about the same thickness though without the undercamber. *Fig. 13* illustrates the two sections 243 and 390 together with the polars for AR = 5 (AR, of course, meaning aspect ratio). The values of section 390 were taken from a later test in the larger wind tunnel and at a somewhat higher RN (Reynolds Number). The effect of the undercamber can be seen very clearly. The break-away of the flow happens at about the same angles of attack but the cambered section has at that incidence a considerably higher lift coefficient. The camber at the lower surface shifts the curve up into a higher c_L region, which is most favorable for gliding and sinking speed at high AR. I think that this figure just speaks for itself.

Now you may think that I

Wing Sections

(*Continued from page 45*)

am only interested in the thick-cambered sections for gliders or high-loaded gas models. Therefore let us turn now to some thinner sections of high performance. There is for instance the excellent section 301. The original measurement does not show very much, so let us look at the values of the section characteristics (*Fig. 14*).

The minimum drag coefficient is substantially lower than that of the thicker sections and the L/D_o turns out to be above 1:50. We must realize that this one and the following measurements were done with smaller chord length, the RN being smaller than with the first three sections. The RN range of 70,000 is not far from the range of medium models.

We tried this fine section with several models and obtained excellent results. It is important to note that the camber of the lower surface starts near the leading edge. The thickness ratio of section 301 is about 1:10.

And now let us have a real fast job, section 344. From all the test results I checked this is the section with the smallest drag coefficient measured in this tunnel. *Fig. 15* presents very interesting absolute characteristics. The polar shows clearly the different branches according to the different boundary layer flow conditions. To demonstrate the high efficiency of this section as clearly as possible we have plotted the c_{D_o} values at twice the scale of the other profiles. The c_{D_o} minimum is 0.012, and if we plot this value into the well-known friction drag graph we will find that this value at RN= 74,000 indicates that this section is a pure laminar section for the low RN!

We could hardly get a smaller drag in this low range. Since the camber is small and the mean line of the section has some S shape, the c_m is *very* small, indicating that this section is near to the constant C_p position. It could therefore be applied to tailless or flying wing type models.

The shape of the section is a really interesting one. First of all the nose is rather blunt. Then comes the main part with nearly constant thickness and small camber. The "tail" of the section is then turned upwards and has a pretty large angle at the trailing edge.

This type of sections had its origin with the English fighter planes, like the Sopwith. Section 344 dates from the Pfalz biplanes and is listed in the report as "Pfalz 71". It is amazing to learn how this funny shape was designed. From the strength calculation somebody figured out that the two spars of the wing should have a certain shape and that the rear spar should be extra strong (the rear spar getting the highest load on the biplane). The chord length was also fixed, and so they compromised as much as their French curves would allow and hence they arrived at this kind of section which is illustrated in *Fig. 16*. Don't think it is a joke. I was in aviation in these days and know how aerodynamics were handled.

If you like to get some high performance with very thin-cambered sections, take either the 123 or the 342 (*Fig. 17*). They are almost the same and it is startling how near the two different measurements fit together, even with the interesting saddle at $c_L = 1.0$. Section 123 is the one with the best L/D_o absolute I could find in the report with about 64 : 1!

The minimum drag coefficient is nearly as low as that of section 344, and is also somewhat laminar, which can be seen from the course of the absolute polar. The section can in addition be used for any kind of full balsa wing where you cement several layers on a cambered jig and sand the profile shape out. But don't forget that the correct form is very important even with these thin sections. Make an exact pattern out of metal to work the wing out. The best method to obtain exact patterns is to get a photographic engraving as is done for printing jobs.

I promised you to give an example how to do a calculation on the performance of a new design. Well, let us take wing section 301 and design a larger glider model with 500 sq. in. wing area and an aspect ratio of 14. The span is then 84" or 7 feet, and the chord length 6". To get the RN around 70,000, the ship should have a speed of at least 15 mph or 22 ft. per sec.

The following table shows the performance calculation:

Glider Model Performance (Section 301 G).

Aspect Ratio = 14.

Parasite Drag Coefficient $c_{D_p} = 0.010$ (Fuselage + Tail Unit)*

Induced Angle of Attack

$$\alpha_i^\circ = \frac{57.3}{\pi(AR)} c_L = \frac{1.822}{AR} c_L = 1.3^\circ c_L$$

Induced Drag Coefficient

$$c_{D_i} = \frac{c_L^2}{\pi(AR)} = \frac{0.318}{AR} c_L^2 = 0.0227\, c_L^2$$

Section Characteristics for Infinite AR			Induced Drag and Angle of Attack	
α°	C_L	C_{D_o}	α_i°	C_{D_i}
−4.3	0.078	0.062	0.1	0.000
−3.7	0.238	0.048	0.3	0.001
−2.6	0.378	0.034	0.5	0.003
−1.5	0.497	0.027	0.6	0.006
−0.4	0.611	0.022	0.8	0.008
+0.8	0.723	0.019	0.9	0.012
2.0	0.837	0.020	1.1	0.016
3.1	0.950	0.020	1.2	0.020
5.5	1.165	0.025	1.5	0.031
7.8	1.370	0.035	1.8	0.043
10.4	1.510	0.056	2.0	0.052

Wing Characteristics AR = 14			Total Drag Wing + Paras. Drag	L/D Wing	L/D Total
α_{14}	C_L	C_{D14}	$C_{D\,Total}$		
−4.2	0.078	0.062	0.072	1.3	1.1
−3.4	0.238	0.047	0.057	5.1	4.2
−2.1	0.378	0.037	0.047	10.1	8.0
−0.9	0.497	0.033	0.043	15.1	11.6
+0.4	0.611	0.030	0.040	20.4	15.3
1.7	0.723	0.031	0.041	23.3	17.6
3.1	0.837	0.036	0.046	23.3	18.2
4.3	0.950	0.040	0.050	23.4	19.0
7.0	1.165	0.056	0.066	20.8	17.7
9.6	1.370	0.078	0.088	17.6	15.6
12.4	1.510	0.108	0.118	14.0	12.8

We take the absolute values from the graph and convert the drag coefficient and the angle of attack into the values at AR = 14 by adding the induced drag coefficient c_{D_i} and the induced angle of attack α_i to the corresponding absolute values. To many of the model designers this may look like too much theory and math. But there is only one way to get best performance and that is by the union of experience and knowledge. You cannot build as many different models as is necessary to find out how to get best performance. But if you have a method to predict the performance you are immediately at the point where you want to be.

The graph of *Fig. 18* illustrates the performance of such a ship. The wing loading is according to the RN limit. You see that we would get a gliding of 1 : 19 and a sinking speed of a little bit more than 1 ft. per second. The angle of attack in the best performance range is between 4° (best gliding) to 7° (lowest sinking speed). To get the smallest parasitic drag of the fuselage, the centerline should have about 6° to the chord of the section.

But it would be too long a story to tell everything about a special design. One word only on behalf of the CG position. The best flight is around $c_L = 1.0$ where $c_{m\,c/4} = -0.1$ and $c_{m\,c/4} / c_L$ also equals -0.1. That means the CG for unloaded elevator (low drag condition) is 10 percent behind the ¼ point of the chord, or at 35 percent chord length behind leading edge. Having a chord of 6 inches, the CG therefore lies 2.1 inches behind the leading edge.

I hope that this little lecture about model aerodynamics may give some ideas to the model designer. To fly models is a lot of fun but be always aware that many achievements in large-scale aviation made their way through aerodynamic childhoods as models. This holds true even for the fast sweepbacks of today.

*Polar taken from test results at same wind tunnel.

FROM BILL HANNAN'S "MODELS & MUSINGS"

MONOCOPTER

Simple, single-rotor design that flies...and flies!

By Bill Hannan

BUILDING A Monocopter can offer hours of free flight fun with little investment in time or materials.

This helicopter is simple, with only one rotor blade and no belts, pulleys, or other intricate parts.

Although it is a profile design of the Italian Agusta A-109 Twin, it can be built with another design if the layout is similar.

Before building, make a copy of the plans to preserve the originals, and when selecting materials, remember that weight is a performance enemy in any aircraft, but especially in helicopters.

CONSTRUCTION. Cut the Monocopter's motor stick from a stiff, medium-hard strip of 3/16x1/8 inch balsa. Glue a short section of balsa to one end to act as a spacer for the rotor-shaft bearing.

The bearing is a section of 1/16-inch diameter aluminum tubing. Cut it to length by rolling it under a single-edge razor blade, then snapping the tube along the scored line. Smooth the end with a fine file and sandpaper.

A Peck-Polymers nylon thrust bearing can also be used. For either tube bearing, roughen the outside for better glue adhesion.

Bend the rubber-motor retaining hook from thin music wire, then roughen it and insert it in the lower end of the motor stick. Wrap both the rotor-shaft bearing and retaining hook with strong thread and secure them with glue.

Glue the fuselage, which consists of 1/16 and 1/8x1/16 inch strips. Pin the strips in position while the glue dries.

Cut the fuselage covering directly from the plans. Apply color with fiber-point pens. My Agusta was white with red ornamentation.

ROTOR. Cut the rotor hub from hard 3/32-inch sheet balsa. Drill a small hole for the rotor shaft. Make sure it is square with the hub so the rotor will run true. Carefully cut away one corner to form the mounting face for the rotor blade. Use 1/32-inch diameter music wire for the rotor shaft. Make the bends in proper sequence, forming the hook for the rubber motor first.

Next, slide the shaft through the motor stick bearing, and add brass or teflon thrust washers, then the rotor hub. Make a right-angle bend in the shaft above the hub using the plans as a guide. Make another right-angle bend in the end of the shaft arm to help retain the counterbalancing weight. Bind the shaft arm to the rotor hub with thread and glue.

Meredith Lueken puts the rotor in motion, ready to launch the Monocopter.

Shape the rotor blade from 3/32-inch sheet balsa. An exact airfoil is not critical, but a suggested section is shown. The model will perform without washout but twist some in to give the blade tip less incidence than the root.

ASSEMBLY. Make the counterbalance from a length of electrical solder evenly wound onto the end of the rotor shaft arm. Adjust the balance horizontally. A drop of glue will secure the solder in position.

Glue the fuselage framework to the back of the fuselage covering and weigh it down to prevent warping.

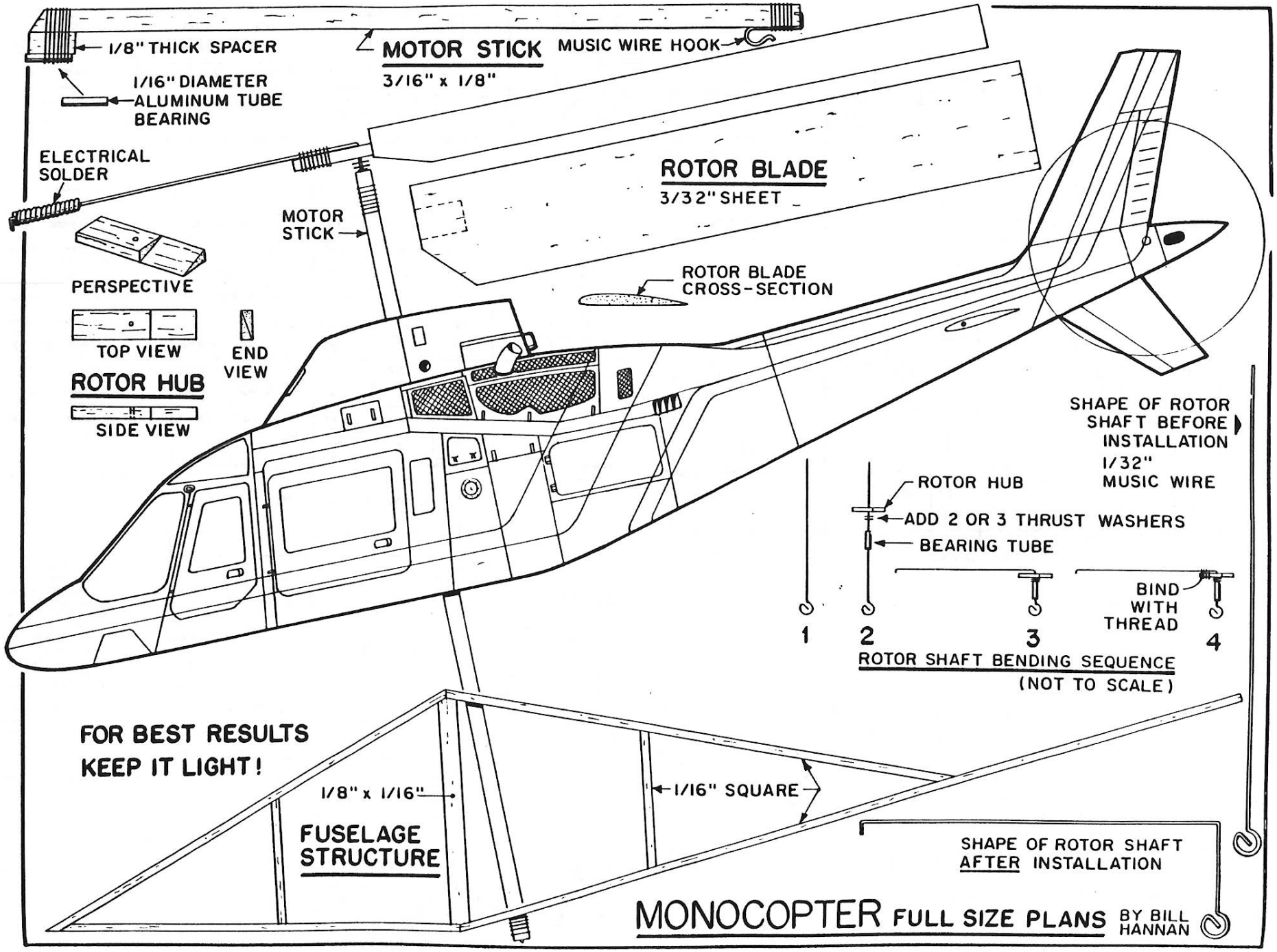
Then glue the motor stick firmly to the 1/8x1/16 inch portion of the fuselage framework. Moving the fuselage position up or down relative to the motor stick will alter the model's flight path.

FLYING. Add a drop of oil to the rotor bearings. Power requirements will depend on your model's weight and testing site. With low power the model can be flown in a fairly small room. Too much power can cause the Monocopter to hit the ceiling. Start with a single loop of 2 mm rubber.

A long loop of lubed rubber winder-wound can yield impressive results in a large indoor site. During the recent West Baden indoor championships, Charles Sotich proxy-flew a Monocopter 80-feet high for over 40 seconds. Outdoors, with more power, the model can fly much higher.

EXPERIMENTS. The Monocopter invites modifications! Improve the balance. Add or subtract from the counterbalance weight to affect vibration. Bend the rotor counterbalance arm slightly forward and down for better dynamic balance.

There you have it, the world's simplest helicopter. Why not give it a whirl? ■


1/8" THICK SPACER
MOTOR STICK
3/16" x 1/8"
MUSIC WIRE HOOK
1/16" DIAMETER ALUMINUM TUBE BEARING
ELECTRICAL SOLDER
ROTOR BLADE
3/32" SHEET
MOTOR STICK
PERSPECTIVE
ROTOR BLADE CROSS-SECTION
TOP VIEW
END VIEW
ROTOR HUB
SIDE VIEW
SHAPE OF ROTOR SHAFT BEFORE INSTALLATION
1/32" MUSIC WIRE
ROTOR HUB
ADD 2 OR 3 THRUST WASHERS
BEARING TUBE
BIND WITH THREAD
1
2
3
4
ROTOR SHAFT BENDING SEQUENCE
(NOT TO SCALE)
FOR BEST RESULTS KEEP IT LIGHT!
1/8" x 1/16"
1/16" SQUARE
FUSELAGE STRUCTURE
SHAPE OF ROTOR SHAFT AFTER INSTALLATION
MONOCOPTER FULL SIZE PLANS BY BILL HANNAN

Contest Results For Bostonian

NAME	AIRCRAFT	FLIGHT TIMES (SEC.)					BEST	PLACE
		1	2	3	4	5		
BUD CARSON	BOSTON BISON	70	75	78			78	2
DAN DRISCOLL	OBSERVER	47	50	55			55	8
BERT PHILLIPS	BOX	53	57	53			57	7
BERT PHILLIPS	YOU NAME IT	54	48	52			54	9
BERT PHILLIPS	BB MK II	41	40	38			41	10
RANDY KLEINERT	GREAT EXPECTATIONS	72	79	93			93	1
BILL BELL	FOUND	25	33	37			37	12
TOM SCHMITT	HARVARD SQUARE	62	65	69			69	5
MIKE MOSKOW	SPLAT II	61	63	74			74	3
MARK HOUCK	CANARD VAR	40	26	-			40	11
CLAUDE POWELL	BOSTON FOUND	64	61	-			64	6
BILL BOWLES	BOSTON FOUND	30	18	14			30	13
DOUG BUCHANAN	BOB'S BOSTONIAN	48	53	54			54	9
PAUL SPREIREGEN	FOUND	65	71	-			71	4

Contest Results For No Cal

NAME	AIRCRAFT	FLIGHT TIMES (SECONDS)				PLACE
		1	2	3		
BUD CARSON	BEBE JODEL	167	173	175		1
JOHN HOUCK	SWEE PEA	55	-	-		7
MARK HOUCK	BONANZA	21	22	24		9
BRUCE PRICE	SWEE PEA	129	130	128		3
GLEN SIMPERS	HENSCHEL P.75	128	78	136		2
RANDY KLEINERT	CHAMBERMAID	106	-	-		4
BILL BELL	CITABRIA	25	27	30		8
TOM SCHMITT	AIRABONITA	87	83	83		5
L.H. BERG	CALABRA	58	32	38		6

Contest Results For Penny Plane

NAME	AIRCRAFT	FLIGHT TIMES (SEC.)					BEST	PLACE
		1	2	3	4	5		
PAUL SPREIREGEN	CEZAR BANKS	121	-	-			121	3
BILL CLARKE	CEZAR BANKS	381	417	386			417	1
GLEN SIMPERS	NO NON-CENTS	329	-	-			329	2

Contest Results For F.A.C. Scale

NAME	AIRCRAFT	STATIC					FLIGHT (SECONDS)				TOTAL PTS.	PLACE
		LENGTH 0-30	COLOR 0-20	WEIGHT 0-15½	BONUS	TOTAL	1	2	3	FLIGHT POINTS		
JOHN HOUCK	AIRBONITA	26	18	11	10	65	25	32	35	35	100	3
MARK HOUCK	XP-51	20	15	7	10	52	21	46	42	46	98	4
ALLAN SCHANZLE	AVENGER	29	19	11½	5	64½	31	40	-	40	104½	2
BILL BELL	V10-43	29	19½	11½	3	63	24	26	26	26	89	6
KEVIN SHARBONDA	AVENGER	25	18	11	5	59	62	68	74	67	126	1
KEVIN SHARBONDA	GUARDIAN	20	10	10	5	45	47	52	58	58	103	-
TONY AVAK	SOPWITH TRIP.	29	19½	12	20	80½	12	10	13	13	93½	5

Contest Results For Embryo

NAME		FLIGHT TIMES (SEC.)						PLACE
		1	2	3	4	BEST		
BUD CARSON		60	85	76		85		2
MIKE MOSKOW		115	121	123		123		1
BRUCE PRICE		84	70	63		84		3
CLAUDE POWELL		75	71	72		75		4
MARK HOUCK		29	42	46		46		5
JOHN HOUCK		39	-	-		39		7
BILL BOWLES		40	33	42		42		6

Contest Results For Hand Launch Glider

NAME	FLIGHT TIMES (SECONDS)						BEST 2 TOTAL	PLACE
	1	2	3	4	5	6		
RANDY KLEINERT	43	41	20	39	43	28	86	1
MARK HOUCK	18	22	20	20	21	16	43	4
BILL CLARKE	26	25	26	23	-	-	52	3
BEN CLARKE	20	20	-	-	-	-	40	5
GLEN SIMPERS	43	41	40	41	42	41	85	2

CONTEST RESULTS FOR P-NUT SCALE

NAME	AIRCRAFT	ROUND ELIMINATED										PLACE
		1	2	3	4	5	6	7	8	9	10	
FLIGHT A												
BUD CARSON	CORBEN CABIN ACE		X									
KEVIN SHARBONDA	IS-4					X						2
JOHN HOUCK	DAYTON WRIGHT RB-1				X							3
TONY AVAK	PIPER CUB	X										
STEW MEYERS	GIPSY MOTH	X										
FLIGHT B												
MARK HOUCK	COUGAR		X									
DOUG BUCHANAN	MONOCOUPE 110	X										
PAUL SPREIREGEN	LACY (UGG!!!, ed.)											1
ROLF GREGORY	LACY (UGG!!!, ed.)	X										
DON SRULL	HC 100			X								
BERT PHILLIPS	COUGAR			X								

CONTEST RESULTS FOR WW-I

NAME	AIRCRAFT	ROUND ELIMINATED										PLACE
		1	2	3	4	5	6	7	8	9	10	
FLIGHT A												
DAN DRISCOLL	SE-5					X						2
BERT PHILLIPS	MIRCO PLANO VALEZ	X										
RANDY KLEINERT	SE-5		X									
ALLAN SCHANZLE	JUNKERS D-1		X									
BILL BELL	FOKKER D-7	X										
FLIGHT B												
KEVIN SHARBONDA	BRISTOL SCOUT											1
JOHN HOUCK	SVA-5				X							3
TONY AVAK	NEIUPORT 11	X										
PAUL SPREIREGEN	FOKKER D-7	X										
ROLF GREGORY	SE-5			X								

CONTEST RESULTS FOR GOLDEN AGE

NAME	AIRCRAFT	ROUND ELIMINATED										PLACE
		1	2	3	4	5	6	7	8	9	10	
FLIGHT A												
BUD CARSON	FAIRCHILD 24					X						3
DAN DRISCOLL	PIPER J3			X								
BERT PHILLIPS	GOON	X										
ALLAN SCHANZLE	TAYLOR CUB		X									
BILL BELL	LINCOLN AP-5		X									
TOM SCHMITT	REARWIN SPEEDSTER				X							
MARK HOUCK	TAYLORCRAFT	X										
FLIGHT B												
STEW MEYERS	N. AMER. TRAINER	X										
DOUG BUCHANAN	GADFLY	X										
PAUL SPREIREGEN	FAIRCHILD 24											1
ROLF GREGORY	CORBEN SUPER ACE		X									
HURST BOWERS	MUREAUX		X									
MARV YODER	LINCOLN AP-5			X								
CLAUDE POWELL	PUSS MOTH						X					2

CONTEST RESULTS FOR NAVY SCALE

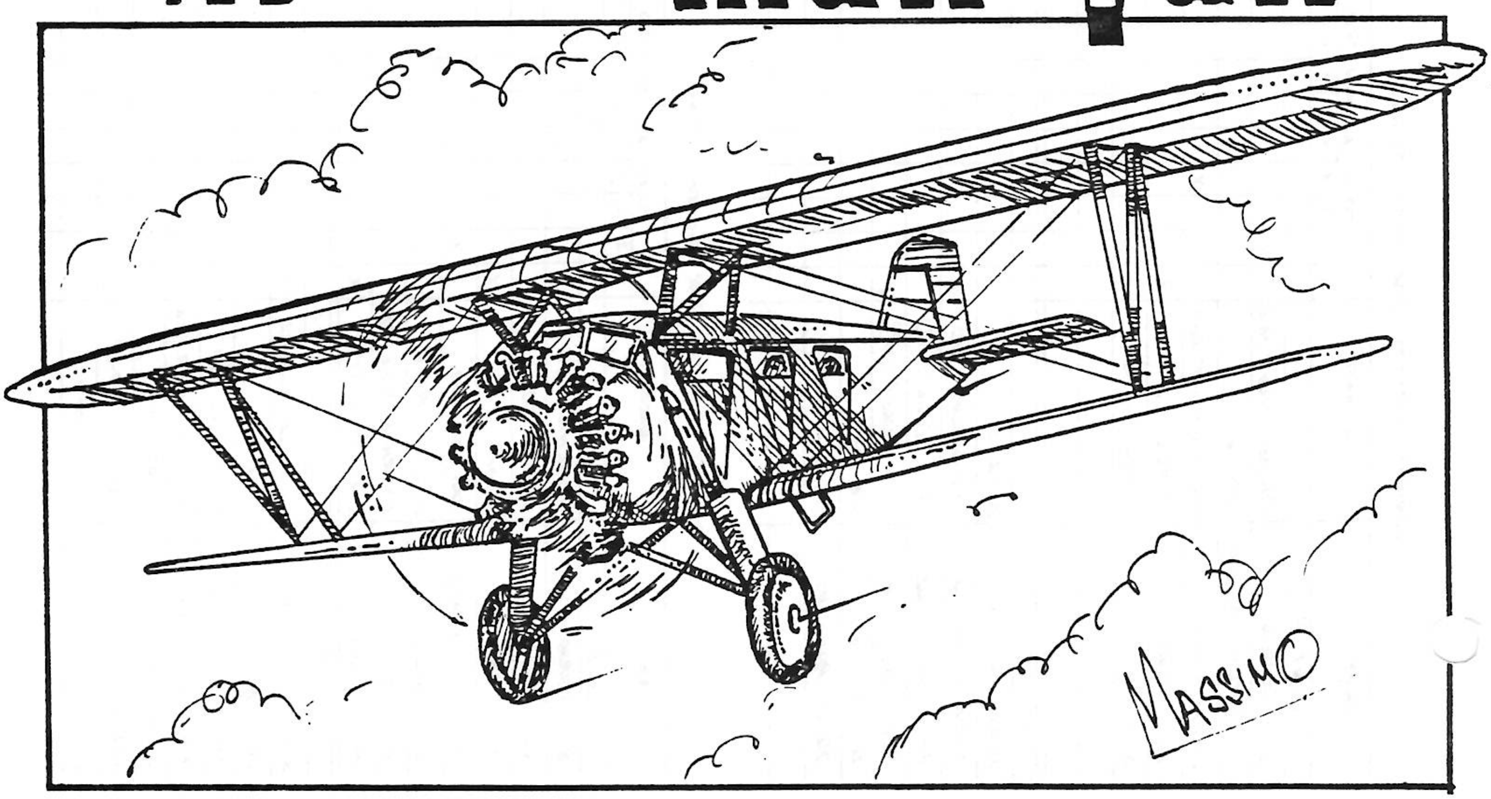
NAME	AIRCRAFT	ROUND ELIMINATED										PLACE
		1	2	3	4	5	6	7	8	9	10	
FLIGHT A												
DAN DRISCOLL	HELLCAT	X										
ALLAN SCHANZLE	AVENGER	X										
BILL BELL	F4B-4		X									
RANDY KLEINERT	HELLCAT				X							3
KEVIN SHARBONDA	BUFFALO					X						2
FLIGHT B												
STEW MEYERS	A.D. SKYRAIDER		X									
HURST BOWERS	PAGE RACER	X										
DOUG BUCHANAN	CURTISS OWL			X								
ROLF GREGORY	STINSON SR-5	X										
DON SRULL	GRAIN KITTEN											1

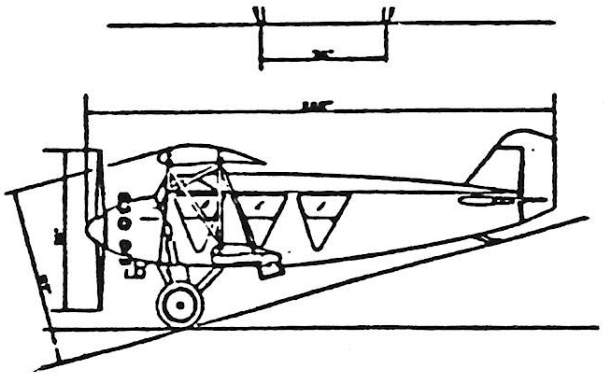
FIRST CLASS

20008 Spur Hill Dr.
Gaithersburg MD 20879

JAN
FEB
'86

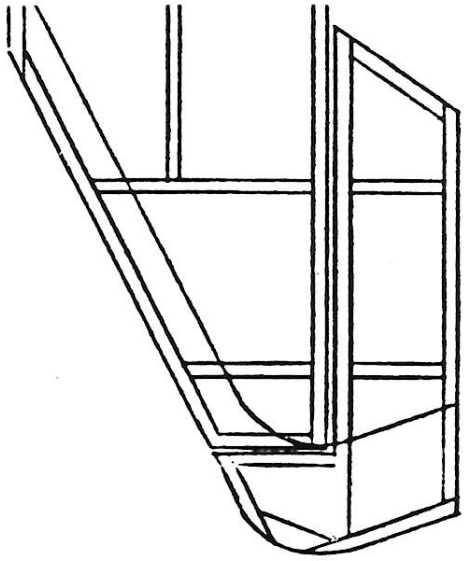
max-fax

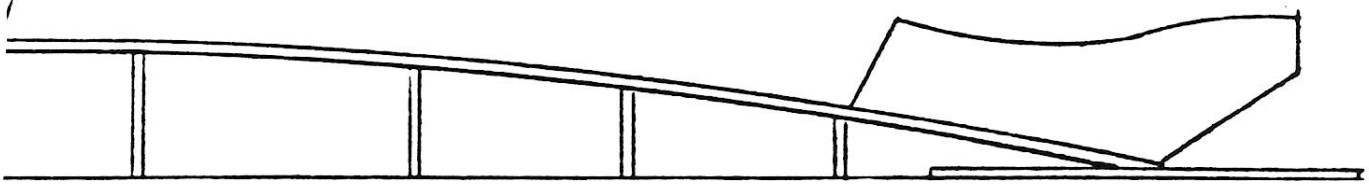


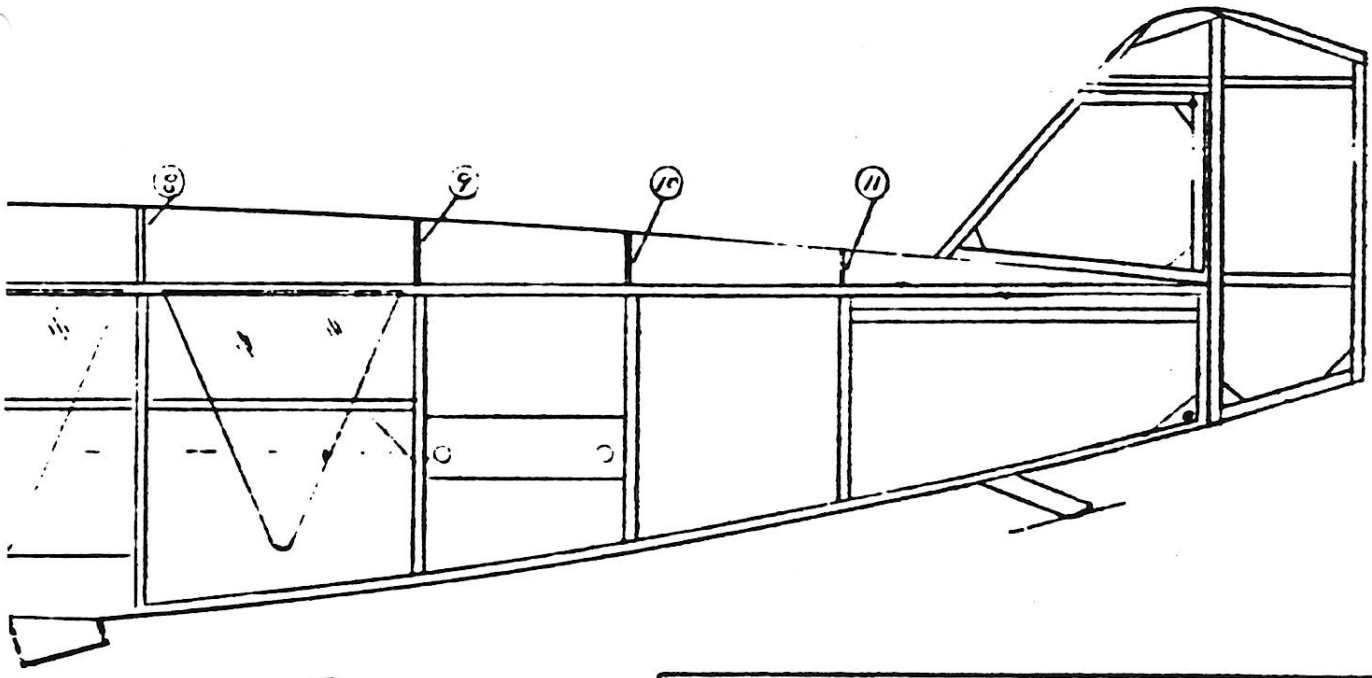


KNOLL AIRCRAFT CORP.
WICHITA, KAN.

KN-1 4-PLACE CABIN BIPLANE
ENGINE—WRIGHT "WHIRLWIND"

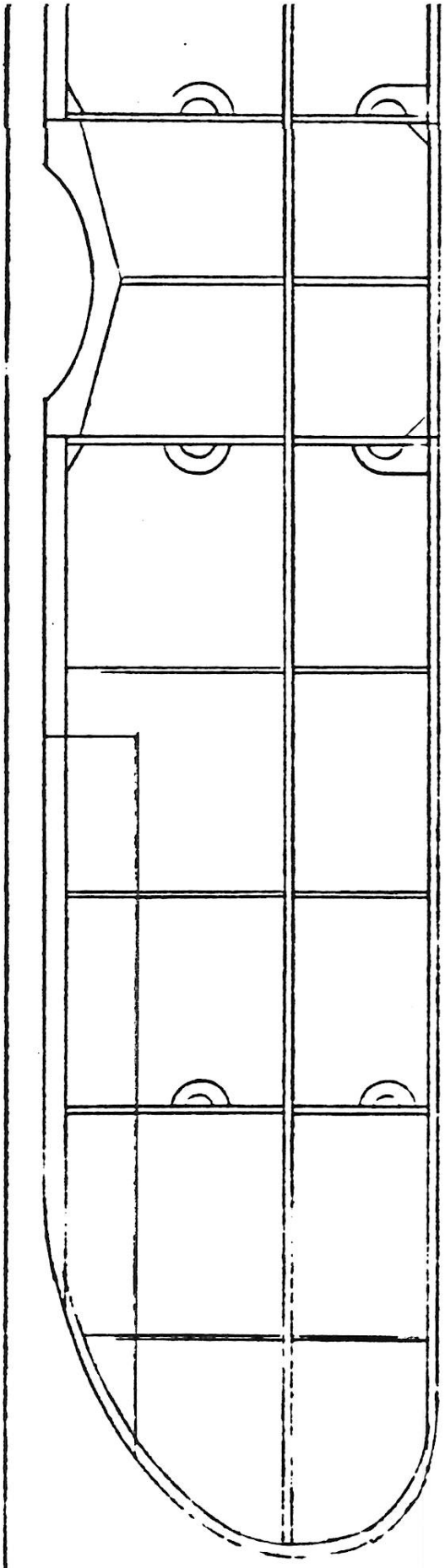


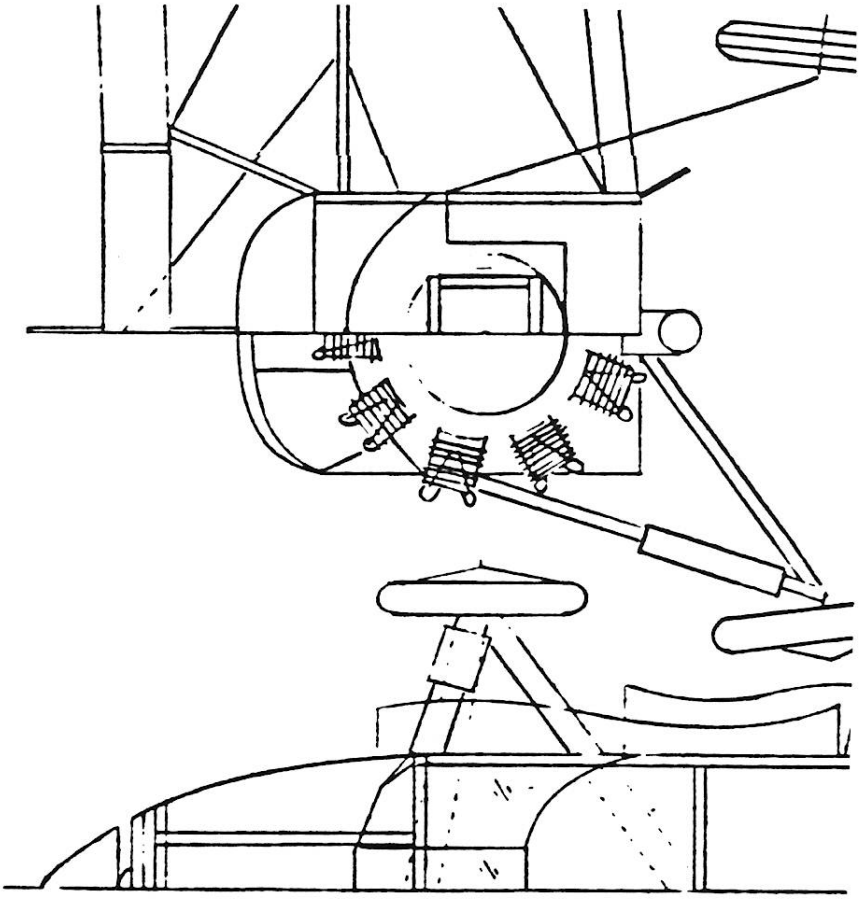


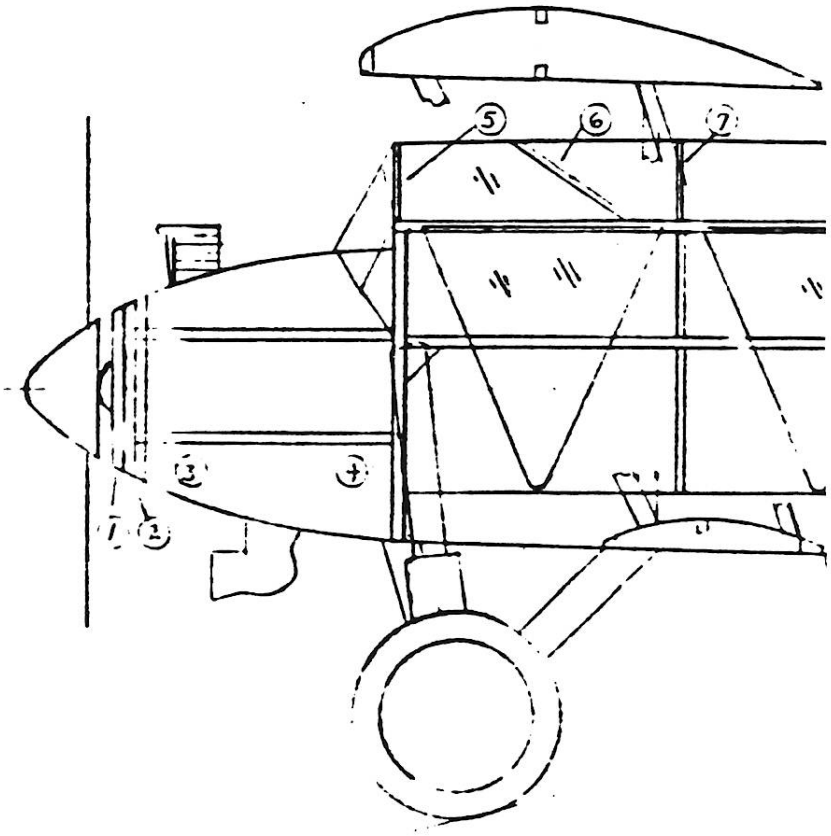


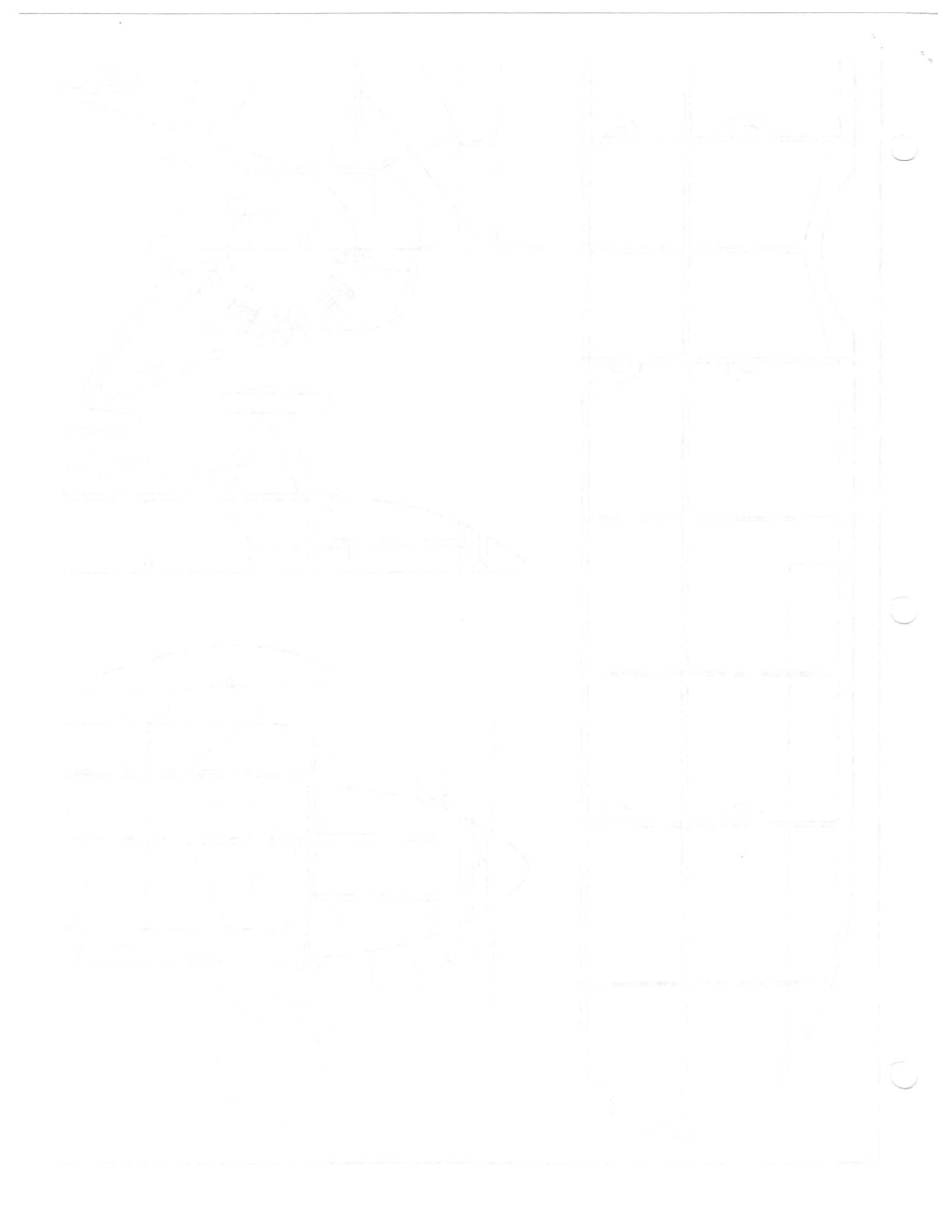
KNOLL KN-1

DESIGNED & DRAFTED by
CLAUDE POWELL
AUG 1985

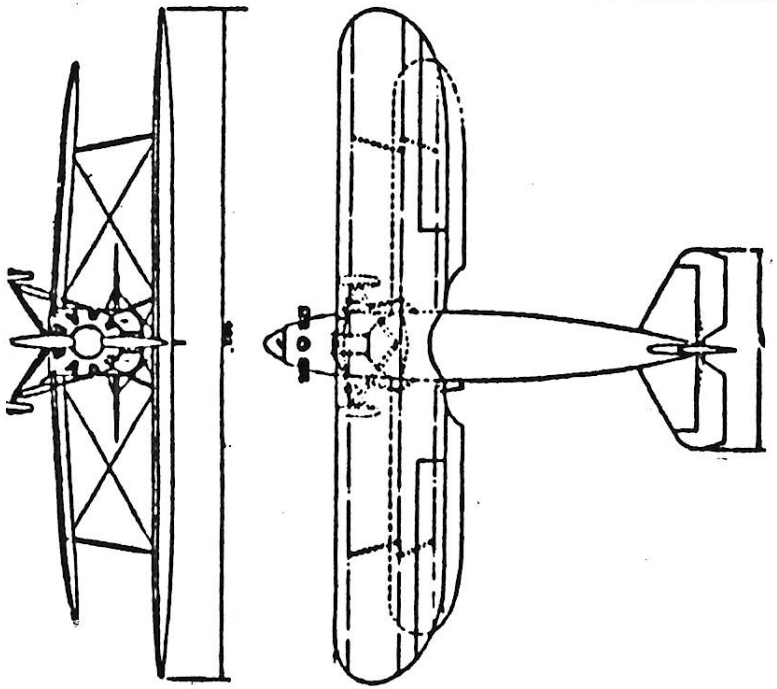


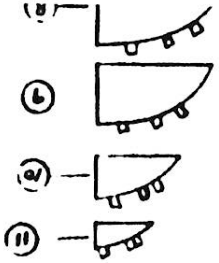


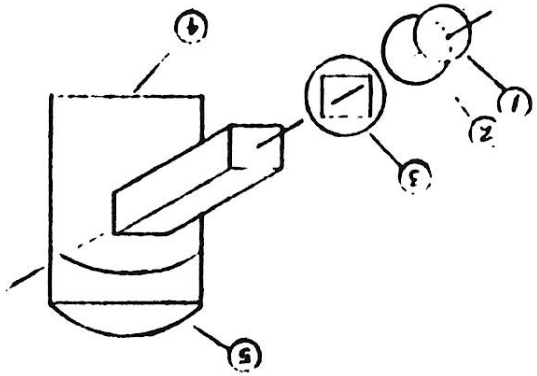

5
6
7
2
4
1
3

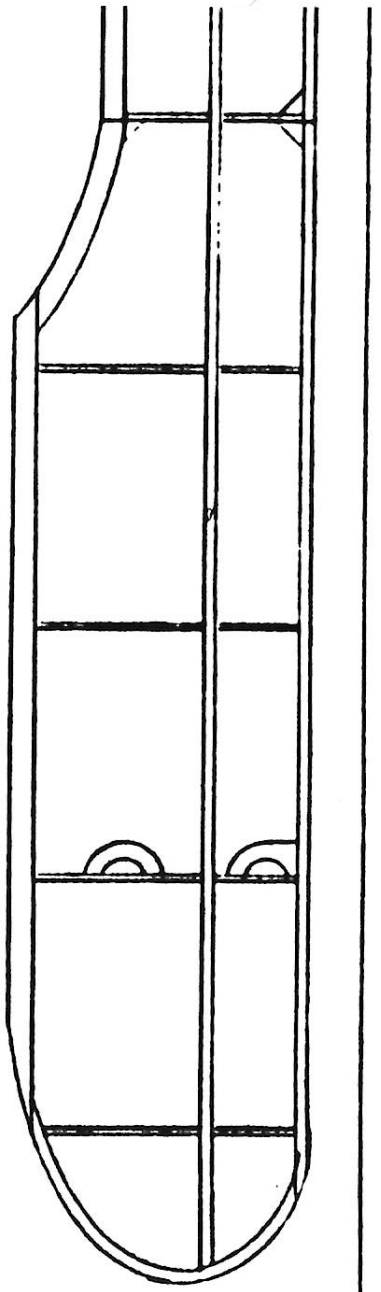


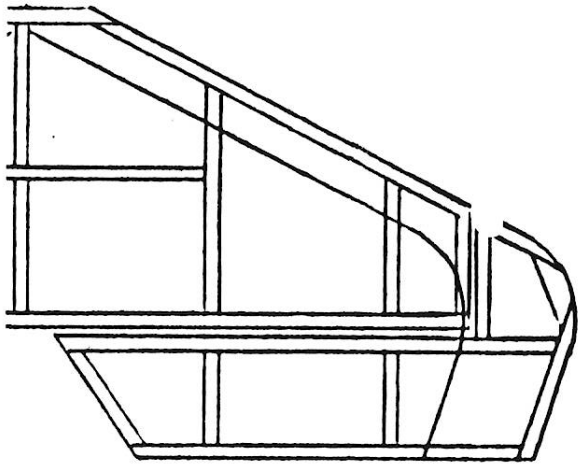
4. To provide better visibility in cockput area, former #5 may be laminated or cut from sheet balsa (on the dotted lines shown on plan). Glue a piece of clear plastic to this frame to provide rigidity.

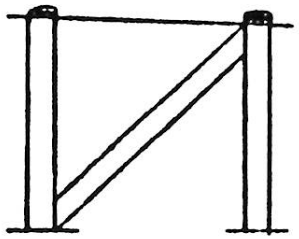


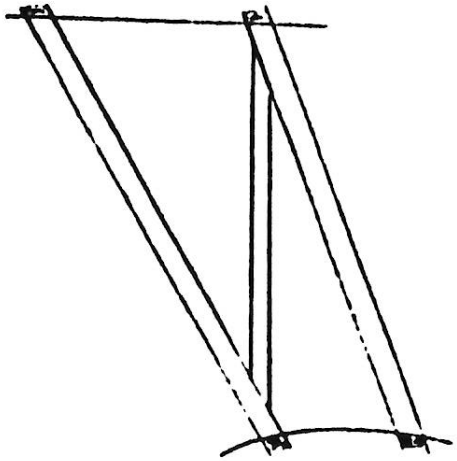


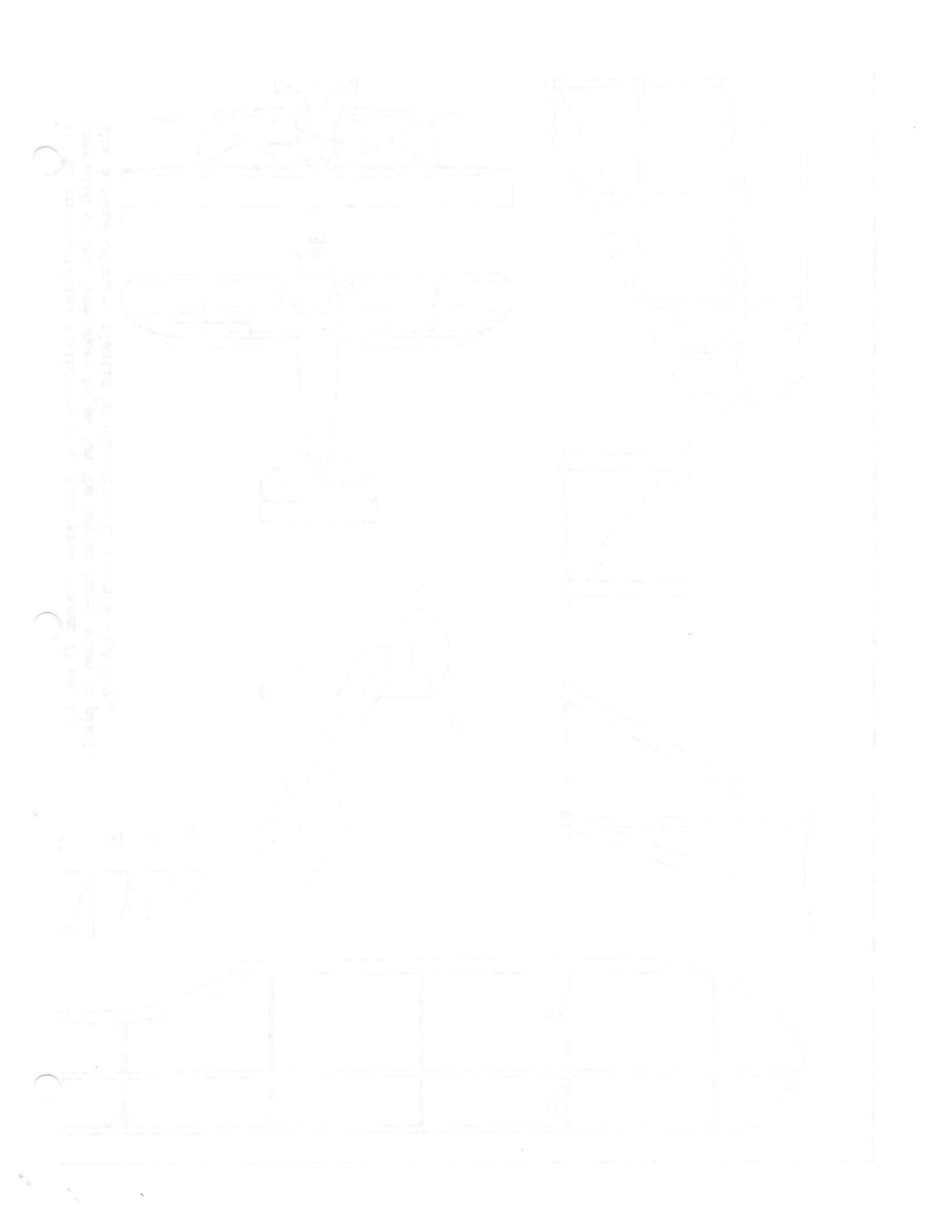


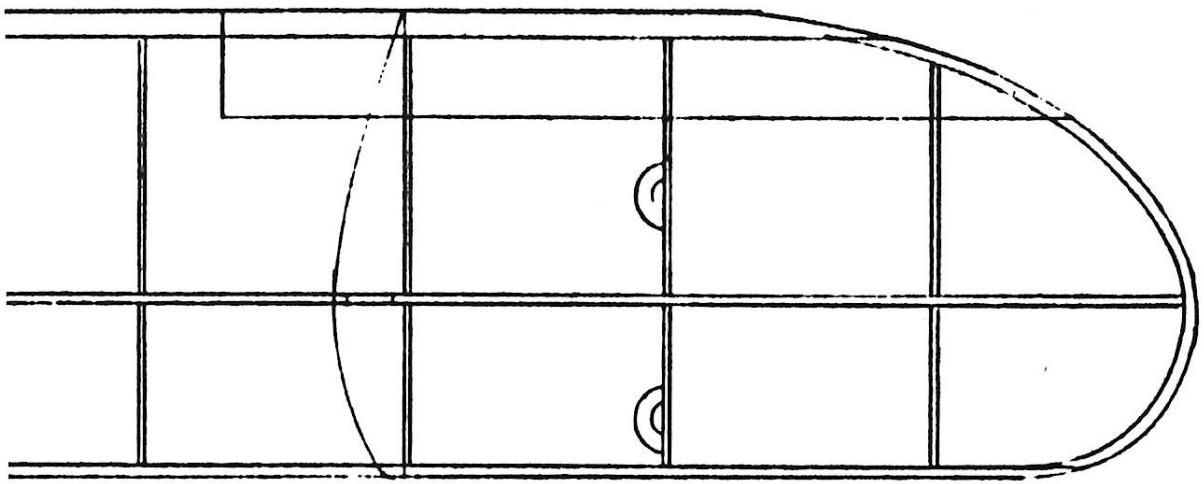


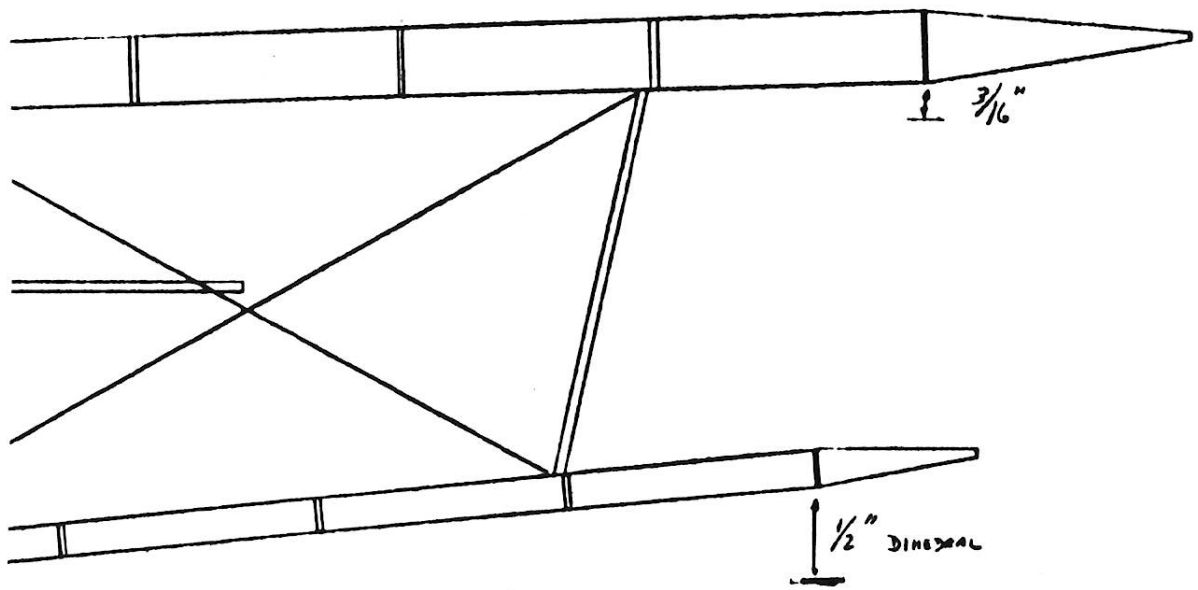


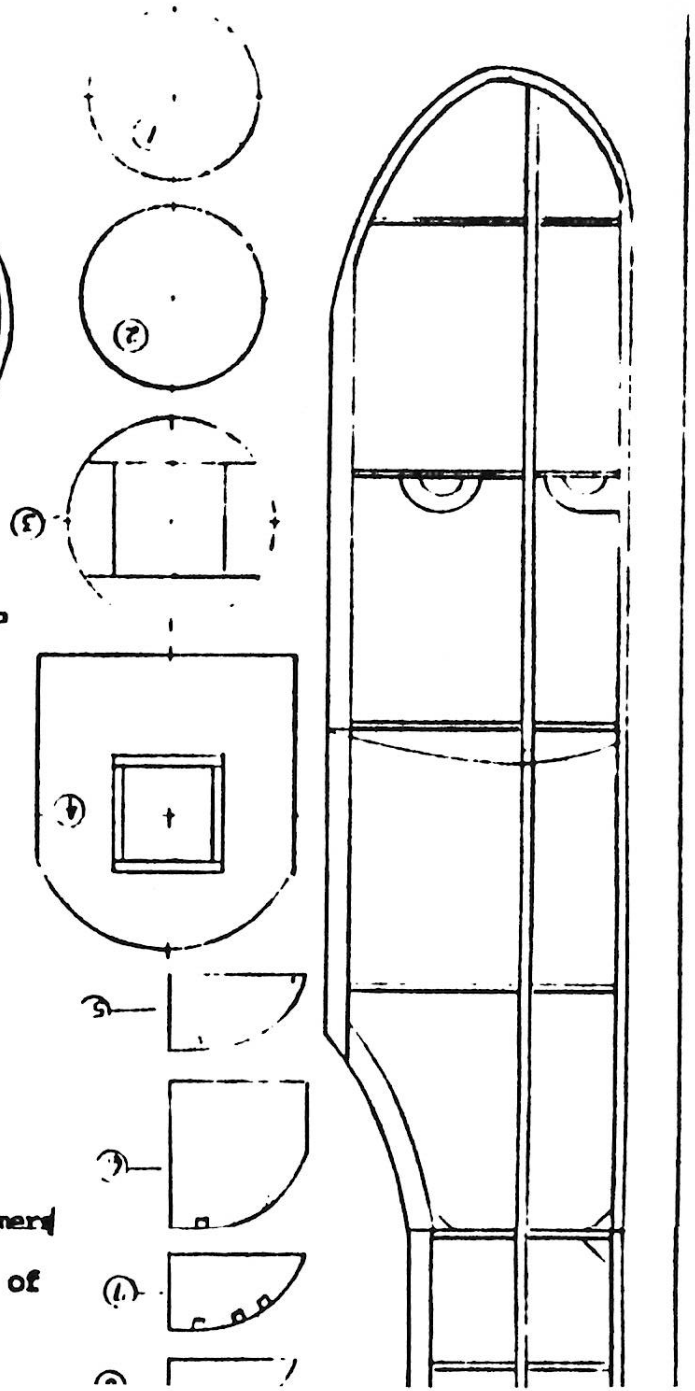






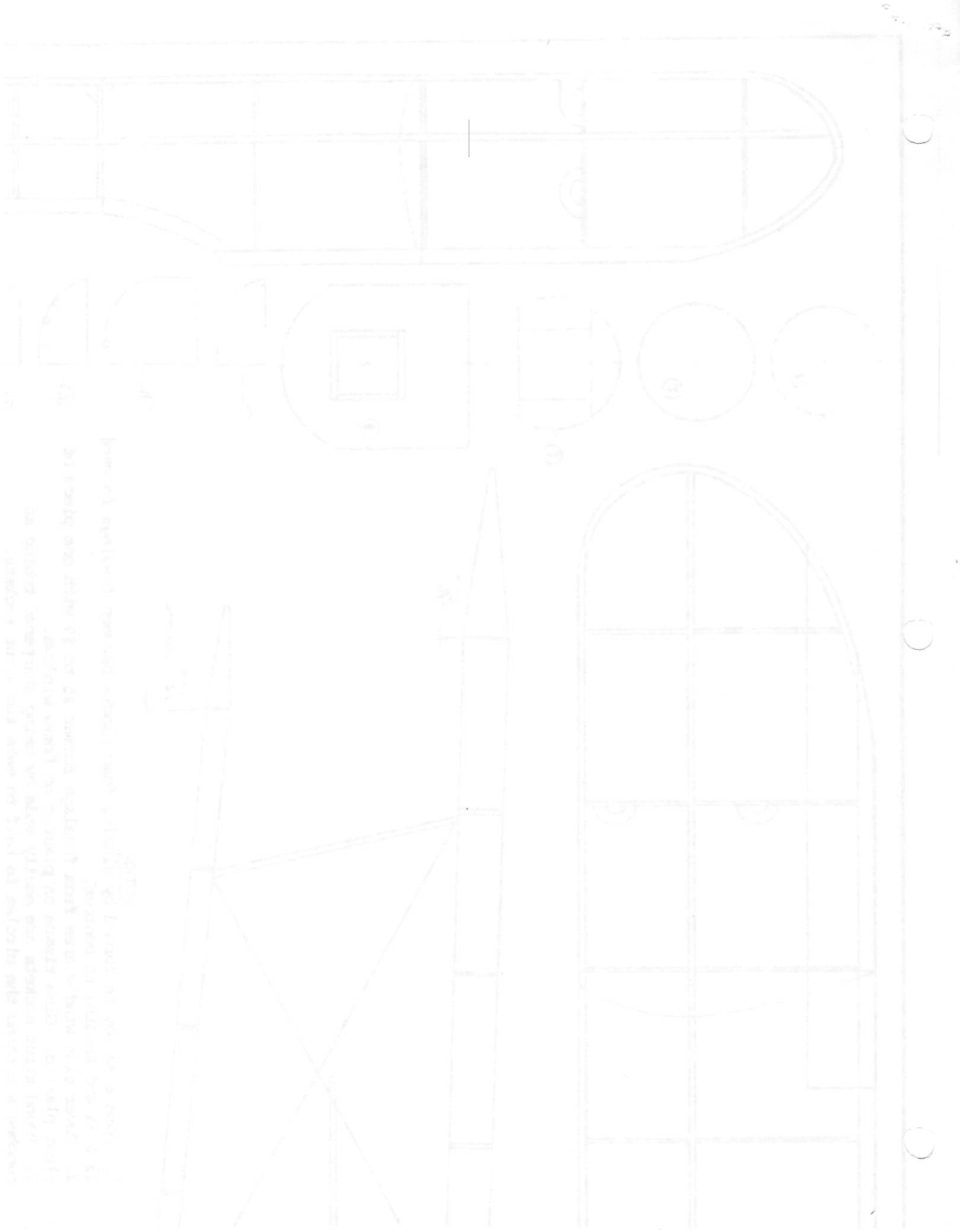






NOTES

1. Nose area may be formed by glueing foam blocks between fuselage formers #3 & #4 and sanding to contour.
2. Cover side window area from fuselage former #5 to #9 with one piece of clear plastic. Glue tissue on plastic to frame windows.
3. Round strut sockets are easily made by using sharpened tubing as punches & cutting the circles in half to make two strut sockets.



NOTES

1. Nose area may be formed by glueing foam blocks between fuselage former #5 to #9 with one piece of #3 & #4 and sanding to contour.
2. Cover side window area from fuselage former #5 to #9 with one piece of clear plastic. Glue tissue on plastic to frame windows.
3. Round strut sockets are easily made by using sharpened tubing as punches & cutting the circles in half to make two strut sockets.
4. To provide better visibility in cockpit area, former #5 may be laminated or cut from sheet balsa (on the dotted lines shown on plan). Glue a piece of clear plastic to this frame to provide rigidity.

½" DIHEDRAL

KNOLL AIRCRAFT CORP.
WICHITA, KAN.

KN-1 4-PLACE CABIN BIPLANE
ENGINE—WRIGHT "WHIRLWIND"

KNOLL KN-1

DESIGNED & DRAFTED by
CLAUDE POWELL
AUG 1985