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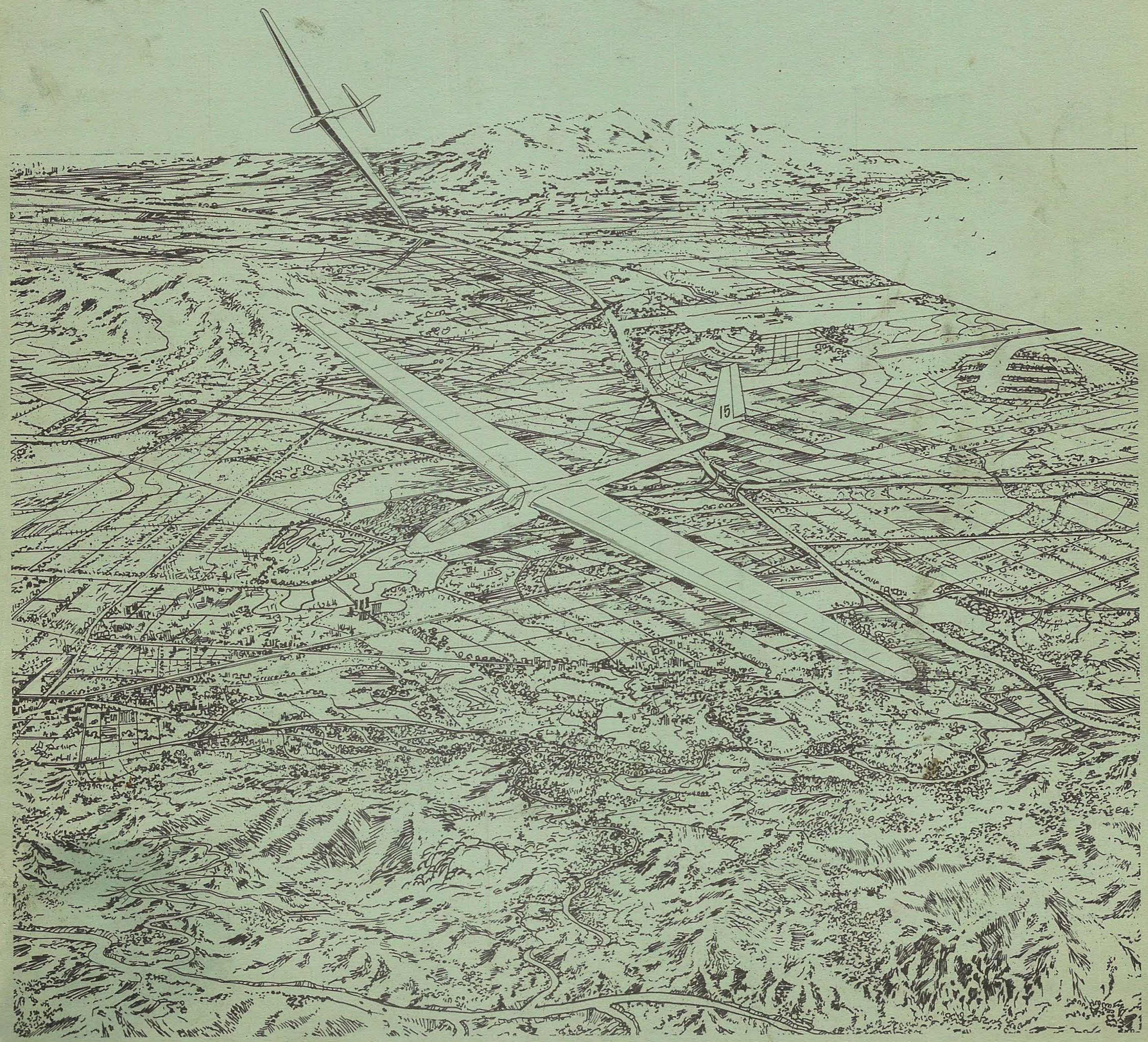

DEDICATED TO FURTHERING THE ART AND TECHNIQUES OF THERMAL AND SLOPE SOARING IN AMERICA

Volume One Number . Four

THE

ZEPHYR

DEDICATED TO FURTHERING THE ART AND
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Note: The Editor will be competing in the 1st International Slope Soaring Competition at Rana, Czechoslovakia, on 12 & 13 September. The September-October issue will have complete details, with photos, of this noteworthy event. However, the release date of the ZEPHYR will be after this competition... Bear with us... it will be worthwhile.

Previous issues of the ZEPHYR are available at the same rate as a single copy. Plans are also available separately for $3.00 postpaid.

EDITORIAL POLICY

The sole aim of this publication is to endeavor to bring together, through the exchange of ideas, photos, designs and techniques, and the publication of R/C glider contest calendars, those individuals in this world who are firm in their opinion that of all the various phases of modeling -- THE SIGHT OF A RADIO CONTROLLED GLIDER FLYING HIGH ABOVE - is the most satisfying.

Help us achieve this aim by your contributions and support of the ZEPHYR. We are looking for consistently reliable reporters who are also R/C glider fans.

Laminar Airfoils For Gliders

By Bernhardt Huber
TELAVES MODEL ENGINEERING

INTRODUCTION

Modellers are becoming more and more interested in laminar flow airfoils. They are expecting "better" performance from such airfoils but are not quite sure about all aspects of this subject. To my knowledge, laminar airfoils are only rarely tested at the Reynolds number of model aircraft, especially R/C gliders. We cannot find literature on this subject with respect to specific questions and answers posed by modellers.

Therefore, I will, in the following article, give an introduction into the theory of laminar airfoils and to point out some practical values. And further on, will try to give some salient points in the use of laminar airfoils for model sailplanes. For those readers who want some more specific information beyond that of the ordinary model builder, other references for study will be given at the end of this article.

THEORETICAL ASPECTS

An airfoil is an aerodynamic body where the larger amount of drag is effected by the friction of air on the surface. (The induced drag is dependent on wing geometry and C_e, we will therefore not consider this aspect here.) If we want to reduce drag, we can only do it by reducing the surface friction. As we know from our lessons in physics, the laminar boundary layer causes much lower friction that the turbulent boundary layer, so we must therefore try to have the transition point between laminar and turbulent boundary layer as far toward the rear of the airfoil as possible.

The transistion point between laminar and turbulent boundary layer on a smooth surface is predictable and is dependent upon the Reynolds number. To get a minimum drag coefficient it is very important that the transition point is located before the positive pressure coefficient (maximum airfoil thickness), because the risk of laminar separation with a large drag coefficient. With lower Reynolds numbers this risk will increase. If we want to use laminar airfoils for model sailplanes, consider the advice of Pfenninger (footnote 2) to fix the transition point between laminar and turbulent boundary layer by a smallstep or some other means on the airfoil surface. (Terraced airfoil).

Good airfoil characteristics of laminar airfoils are limited to a reduced range of angles of attack, higher or lower angles will cause laminar separation, i.e. more drag. The dimension of the area with a minimal Cd coefficient is related to the airfoil thickness. Therefore a thicker airfoil has better stalling characteristics on a larger $C_{d\,min}$-area, but also a higher C_{d} min.

A quick look at some airfoils designed for R/C gliders. Those with laminar capabilities can be recognized by the maximum thickness shifted toward the trailing edge.

AERODYNAMIC CHARACTERISTICS

Some words of explanation about the diagrams indicating the aerodynamic characteristics of airfoils. The most widely used system was introduced by O. Lilienthal, and shows the airfoil section lift coefficient as a function of the drag coefficient (C_d).

If we know the geometric data of the model aircraft, such as wing geometry, wash-out, fuselage outlines, etc., it is possible to calculate the various characteristics of the whole model, by using the characteristics of the airfoil itself. However, calculation in this manner is very difficult, inasmuch as we rarely know the exact aerodynamic coefficient of the fuselage and the induced drag factor. It is normal procedures to use wind tunnel methods of testing scale models to determine exactly the entire range of characteristics of such models. Model R/C gliders fly at such low Reynolds numbers such calculations are considered redundant.

Therefore this paper will deal with only the two dimensional flow around the airfoil. We recognise the limitations caused by limited aspect ratio, aerodynamic twist and induced effects from the fuselage, which have a distinct influence on the airfoil characteristics. BUT, if we want to compare two identical wings with different airfoils, the difference between such wings becomes immediately apparent. With all other things such as the fuselage, tail surfaces, antenna and area of testing constant, the results are more evident between the two wings using a different airfoil. The more important values are first, the gliding angle and second, the minimum vertical speed. It is generally known that the gliding angle can be calculated by dividing the drag coefficient (Cd) by the lift coefficient (C_L), i.e.,

$$\text{Gliding angle} = C_d/C_L \quad \text{(in radians)}$$

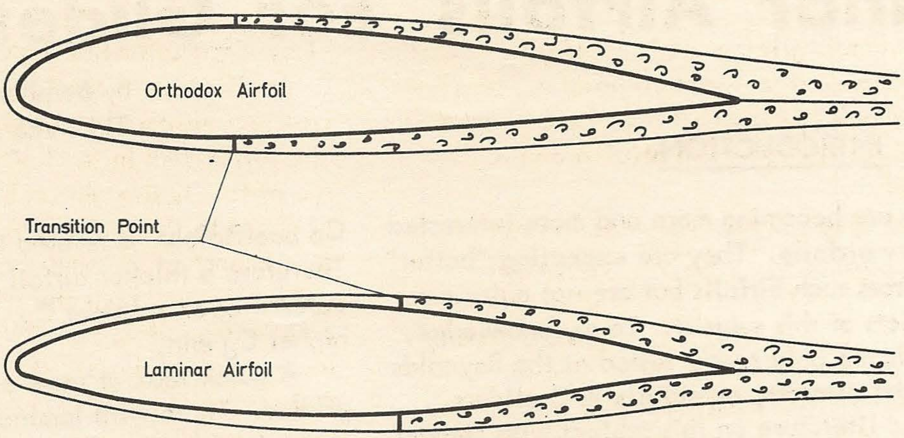
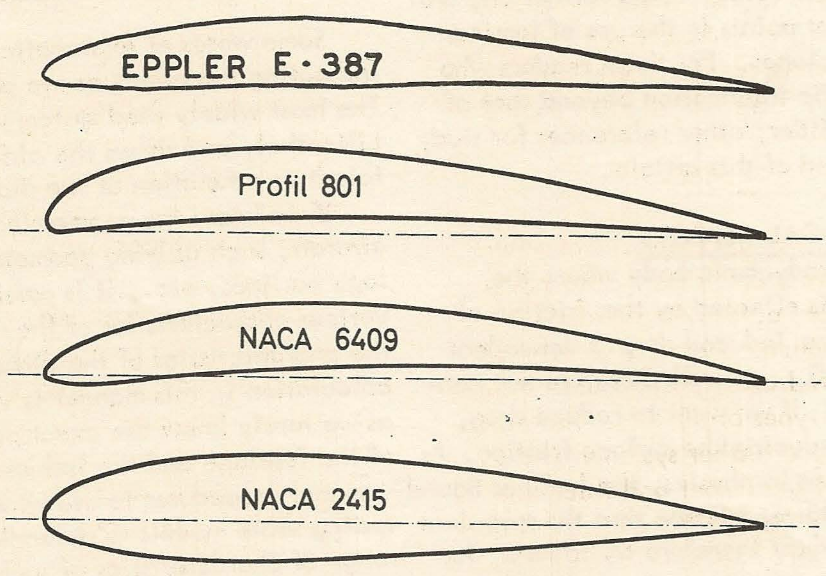
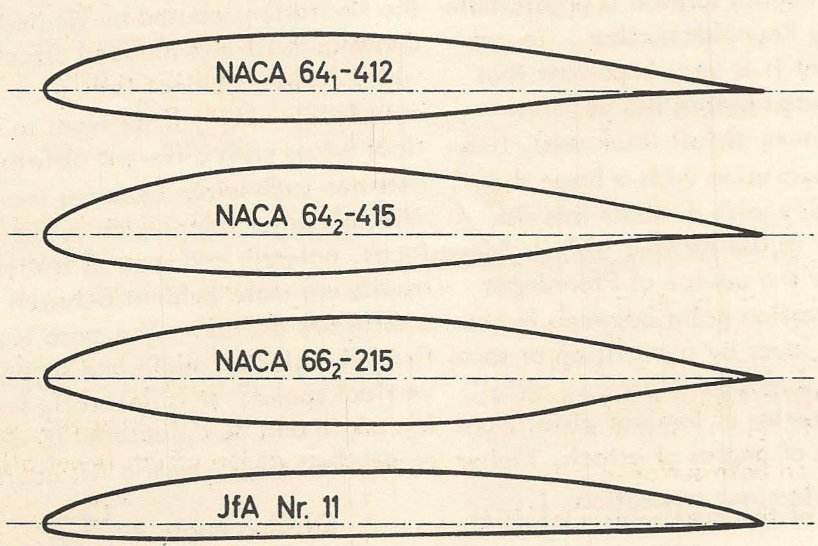


Fig. 1



Orthodox Wing Sections



Laminar Wing Sections

To find the minimum gliding angle by simple methods just draw the tangent from the zero point to the characteristic. The point of contact sets the C_L and the C_d coefficients for the minimum gliding angle,(see Figure 2 and 4).

The vertical speed is calculated as follows:

$$V_v = \frac{W}{S} \quad \frac{2}{g} \quad \frac{C_d^2}{C_L 3}$$

W: Weight
S: Wing area
g: Mass density of air

The minimum vertical (sinking) speed of a given set of conditions (model weight and area, mass density) is at the minimum of the value C_d^2 / C_L^3 (or at the maximum of the reciprocal value as shown in Fig. 8 and 9). The C_L value for the minimum vertical speed is normally slightly higher than for the best gliding angle. NOTE: The values given in this article are the ideal values for the model airfoil, so the values for the model itself are slightly smaller.

NACA Family of Wing Sections

Until World War II, the development of wing airfoils was almost entirely empirical. The Eiffel and early RAF series were outstanding examples of this approach to the problem. Tests at Goettingen, Germany during the WW I contributed much to the development of modern types of airfoils. American NACA investigations were further systematized by separation of the effects of camber and thickness distribution. An explanation of NACA airfoil designations follows:

NACA Four-digit Wing Sections

First digit: Maximum value of the mean-line ordinate Y_c in % of the chord.

Second digit: Distance from the leading edge to the point of maximum camber in tenths of the chord.

Third & Fourth digit: Section thickness in % of chord

NACA Six-series Wing Sections

First digit: Series designation

Second digit: Chordwise position of minimum pressure in tenths of the chord behind the leading edge for the basic symmetrical section at zero lift.

Third digit: (following a comma or as an index) Range of lift coefficients in tenths above and below the design lift coefficient in which favorable pressure gradients exist on both surfaces.

First digit after the dash or letter: Design lift coefficient in tenths.

Last two digits: Thickness in % of the chord.

The letter "A" instead of the dash indicates that the airfoil is straight on both surfaces from 0.8 of chord to the trailing edge.

It is important to remember that in the NACA Six-series wing sections the width of the minimum C_d area is dependent upon the airfoil thickness. Below a 12% thickness, this width is smaller than 0.2 of chord, at 12% thickness, it is approximately 0.2; at 15% - approximately 0.4; at 18% approximately 0.6 and at 21% approximately 0.8 of the chord.

When we choose a new wing section for our model glider, first calculate the design lift coefficient and the desirable range of C_d min. Then this value will give us the means to find the right wing section. Because the C_L- coefficient of the model glider must be relatively high (between 0.2 and 0.6) and the range of minimum C_d-coefficient must be large, there is only a limited number of laminar flow wing sections in the NACA series.

Consider the possibility of "cross-breeding" orthodox and laminar airfoils.

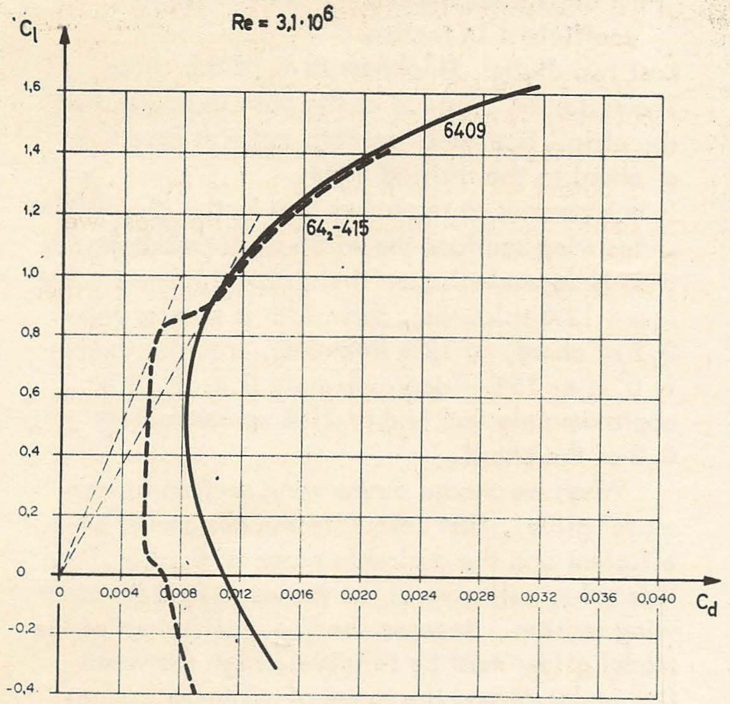
Modelers believe they can win contest with a laminar equipped wing are taught to look again when checking the wing section characteristics. The really good performances are only useful in a very limited C_L-range, in which the C_d is small and practically constant. Below and above this range the performances are poor.... the conventional wing sections are superior (Fig 3).

Mr. F. X. Wortmann and Richard Eppler have succeeded in finding (computing) airfoils with extraordinarily large laminar range. Only a variable wing section will give a decisive improvement over those generated by them. (See Pfenninger in Ref 2). The laminar range of the airfoil has a direct bearing on the flight characteristics of the model glider. A really good gliding angle is limited to a defined range of lift coefficients (C_L) ... and by that to a defined range of angles of attack...linked with a defined speed range -

Because model gliders are not normally equipped with a speed measuring device, permitting measurements of a critical speed range, we must learn by observation which is not all that accurate. It

Fig. 2

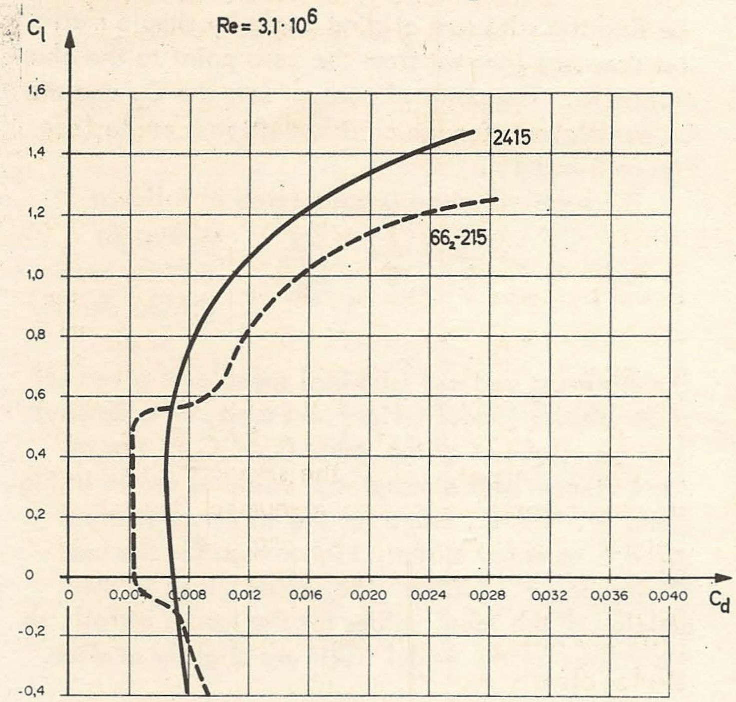
Comparison NACA 6409 - 64_2-415



Nach (4)

Fig. 3

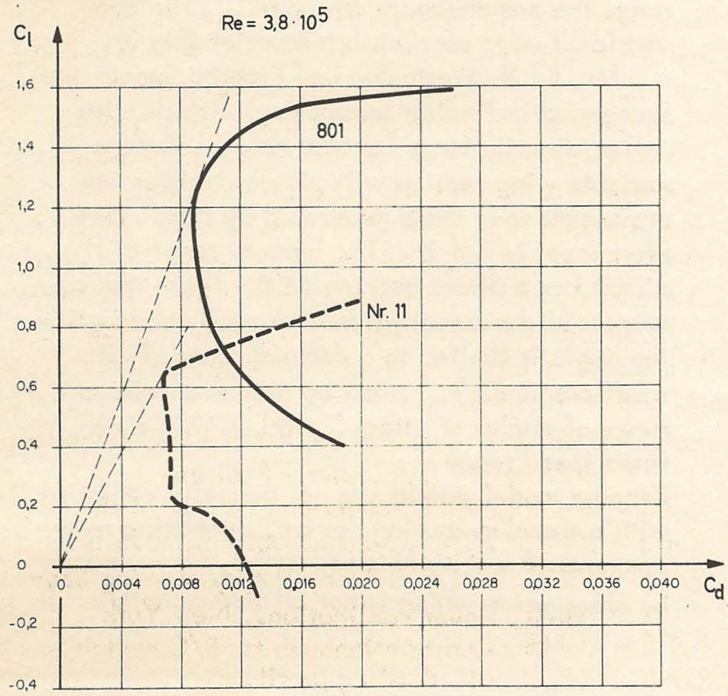
Comparison NACA 2415 - 66_2-215



Nach (4)

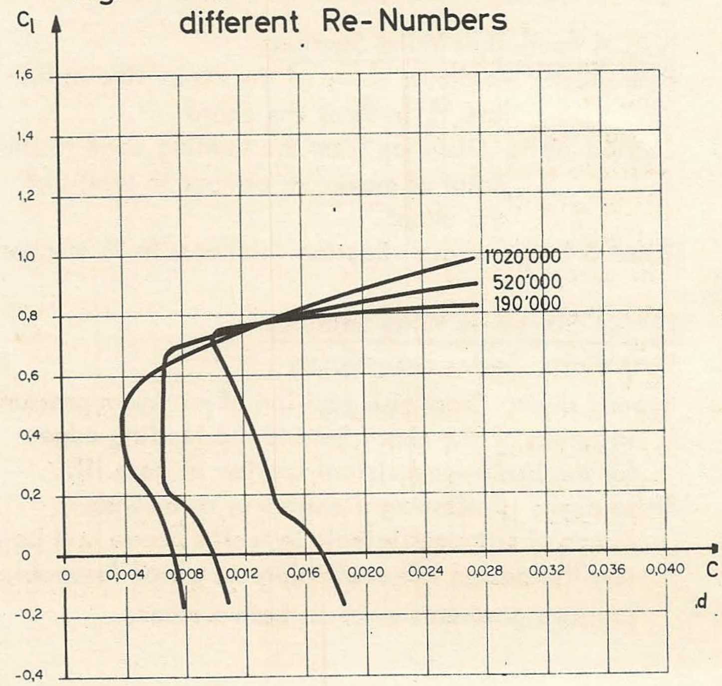
Fig. 4

Comparison Airfoil 801 – JfA Nr. 11



Nach (2) und (6)

Fig. 5 Laminar Airfoil Nr. 11 at different Re-Numbers



Nach (2)

therefore follows that we run the risk of letting the model glider fly at speeds above or below the laminar range.

LAMINAR AIRFOILS FOR MODEL GLIDERS

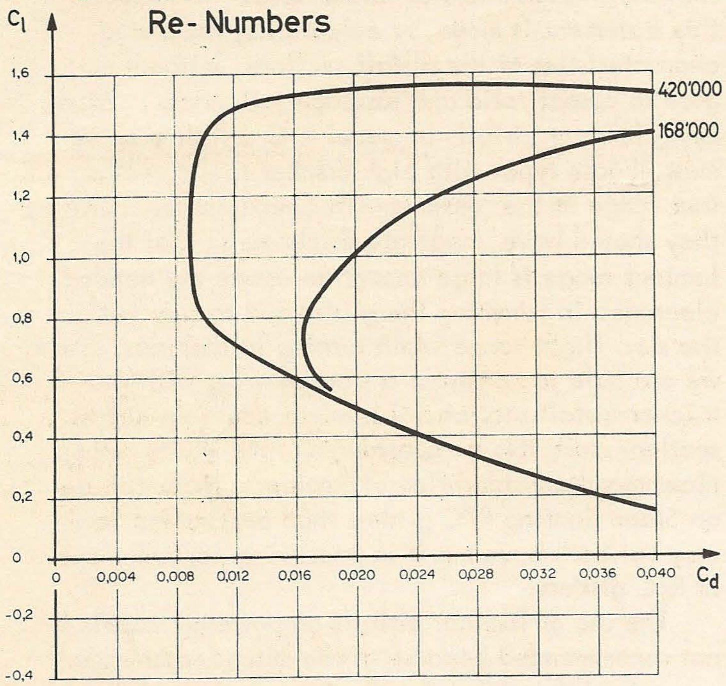
From the viewpoint of aerodynamic science, modelers are unlucky in that they fly their models in an uneconomical range of Reynold numbers. As shown in Figure 7, the most intriguing Re-numbers are in the range from 100,000 (small R/C glider) to about 1,000,000 (Kaseberg's World Record Speed Model - over 200 mph). The theoretical work of Mr. F. W. Schmitz (Ref 3) covers the range from Re- 20,000 to 200,000, while the standard airfoil tests in wind tunnels begin with Re-number 3,000,000. Between these two values is a rarely explored range, which we would like to recommend to any aerodynamic research institute. Figure 5 and 6 depict two different airfoils at different Re-numbers. It demonstrates clearly that the maximum gliding angle decreases with a decreasing Re-number. Thats why the big sailplanes have much better performance than the little ones! With laminar airfoils we have a larger laminar range with decreasing Re-number, and the transition between laminar and turbulent range is steeper. The superiority of laminar airfoils at high Reynolds numbers design factor decreases with a decreasing Re-number. Figure 4 gives a graphic comparison of two wing sections at a Re-number of 380,000. One airfoil is similar to an R/Cglider wing section with a relatively high camber and a thickness of 9.8%. The other is a laminar airfoil measured at the Institute for Aerodynamics of the ETH with athickness of 9%. The wing section 801 has a gliding angle of 1:150 and a minimum vertical speed of 2"/second, while the laminar airfoil has an optimal gliding angle of 1:93 and a mimimum verticle speed of 1.375"/second. The conventional glider airfoil is superior to the laminar type in both criterias, in spite of the higher drag coefficient. The comparison is not fair, because the camber is not identical, but it gives an idea of the facts involved. The main purpose of an R/C glider (in most cases) is to stay airborne as long as possible, so we must look for a minimum sinking speed. This can be achieved by a wing section with a high camber, having minimum drag coefficients at high lift coefficients. The models therefore have also low flying speed. We look to our ELFE S-3 R/C scale sailplane, published in the December 1969 FLYING MODELS magazine. The ELFE S-3 had to fly at 16 mph for minimum vertical speed with the 801 airfoil. Yet, it had to fly at 22.5 mph with the JfA Nr. 11 laminar wing section shown at the end of this article. Remember, this statement is made by calculating the stated characteristics of the airfoil sections, without regard to apsect ratio and fuselage influences. When using laminar airfoils in model R/C sailplanes, we must choose types with high camber to get thelaminar range at the optimum lift coefficients. Further, they should have moderate thickness so that the laminar range is large enough to assure the needed clearance in trimming the glider and to stay within the slow flight range when turning in thermals. Also we are able to construct a sturdier wing with the thicker airfoil section. Turbulent edges on airfoil sections must also be considered. We would rather recommend consideration of laminar airfoils for use on Slope Soaring R/C gliders than on Thermal Soarers, but both have merit in improving performances of R/C gliders.

The use of laminar airfoils on powered models is not recommended because of the much larger speed range (and therefore also the C_e range), and the small vlue attributed to the gliding range. Due to the much higher weight/area ratio the high lift coefficient is not considered essential at low speed. To use high cambered airfoils on powered models we run the risk of getting out of the laminar range, with subsequent laminar separation and loss of lift. High speed stalls cause crashes. (Ref. 5)

An aerodynamically pure design is the basis for the successful use of laminar wing sections. The knowledge of the design lift coefficient is very important before choosing the airfoil. Also a smooth surface is very important. Experiences with the FM-1-68 laminar airfoil on the ELFE S-3 were good, but when comparing this airfoil on the same model with the NACA 6412 wing section there were no remarkable differences. The generation of FM 2-68 airfoil by Franz Meier (shown at the end of the page) is the next step in determining the design characteristics of the ideal Laminar Airfoil for R/C gliders. We would be happy to learn of your experiences in the use of this airfoil.

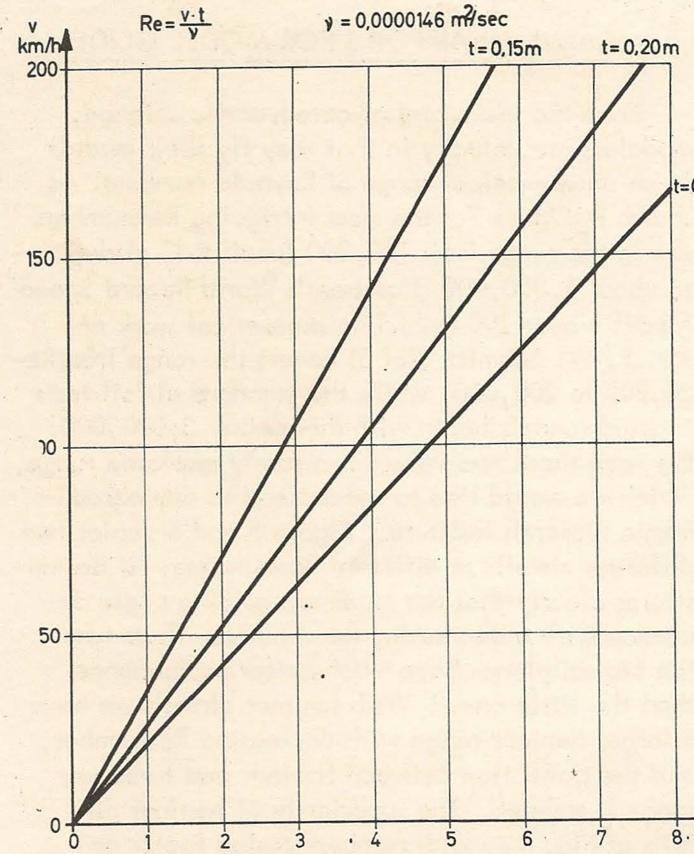
Ref 1 - DUBS, Aerodynamik der Rennen Unterschallstramung. Birkhauser - Publisher.
Ref 2 - PFENNINGER, Mitterlung Nr. 13, IAF.
Ref 3 - SCHMITZ, Aerodynamik des Flugmodells.
Ref 4- ABBOT & DOENHOFF, Theory of Wing Sections, Dover Publications, New York.
Ref 5 - HUBER -Konstructionbuch for R/C models.
Ref 6 - RAEBEL - Modellflug profil.

Fig.6 Airfoil 801 at different Re-Numbers



Nach (6)

Fig. 7 Re-Numbers



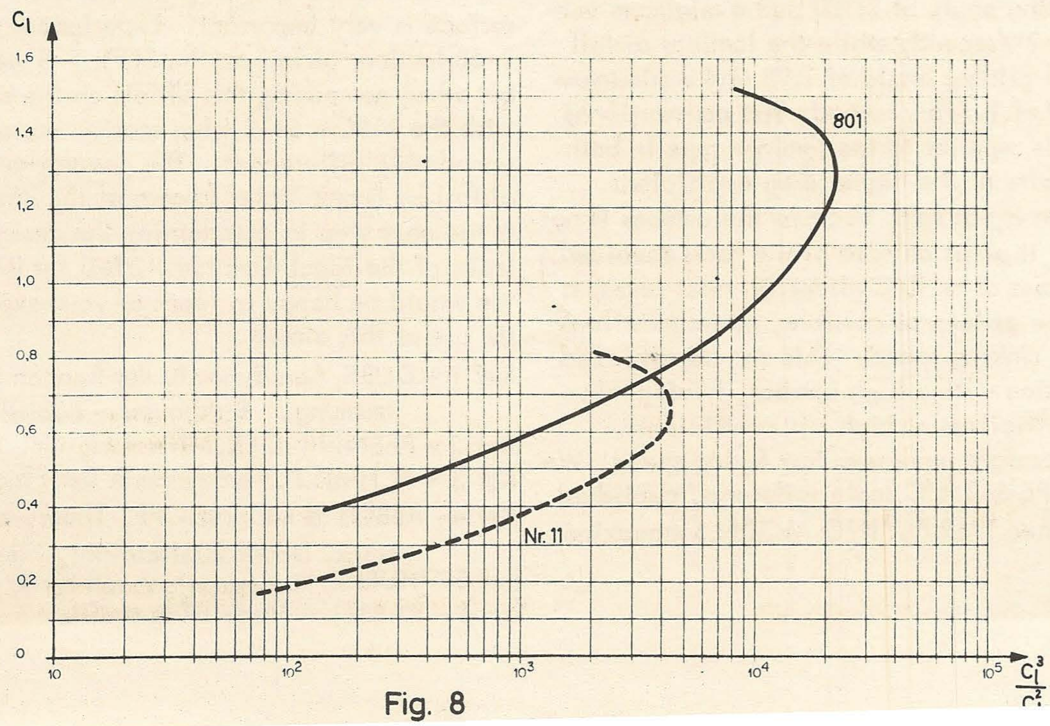


Fig. 8

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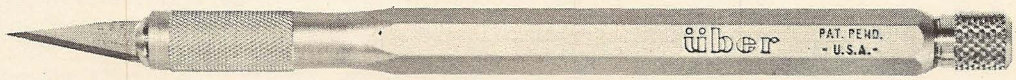

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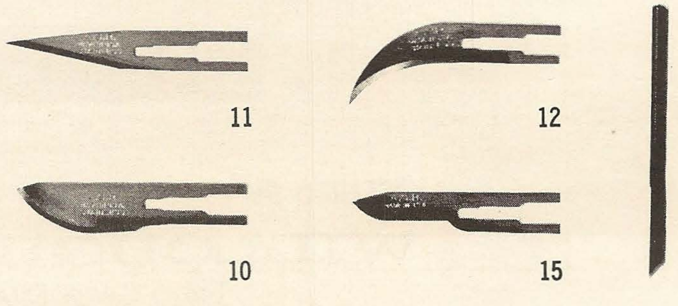

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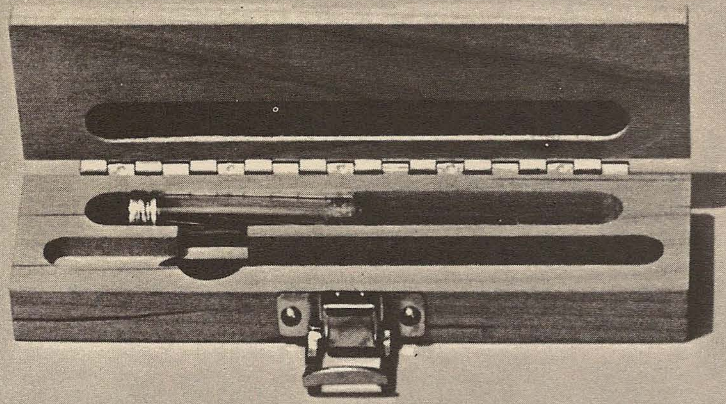

the über skiver

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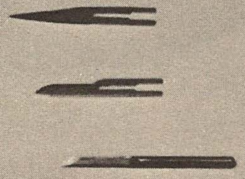
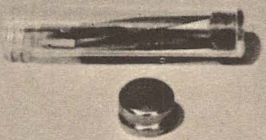
$9.50

h-1 handle with no. 11 blade



6 no. 11
6 no. 15 } *blades*
2 no. 20



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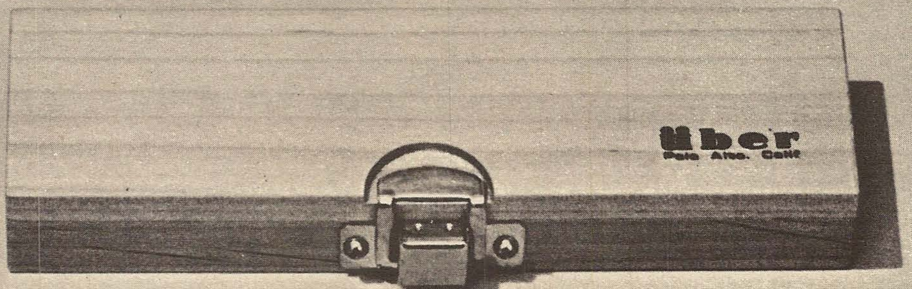

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OVERSEAS NEWS

AUSTRALIA - Alan B. Villiers, Secretary of the Victorian Association of Radio Model Soaring - V.A.R.M.S - sent a summary of R/C gliding "Down Under" which makes very interesting read; and shows that R/C gliding is catching on in that part of the World also.

" Thank you for the 3 copies of your new magazine 'ZEPHYR' and the enclosed plans. There is no doubt about it you have really put some work into this project and provided you get sufficient publicity I have no doubt that your circulation will increase considerably. With this in mind and with your permission, I would like to insert a paragraph in our VARMS Newsletter detailing your subscription rates and objectives. The copies which we have received so far will be circulated.

As I see you have no correspondent for Australia so far and as I am now free of my secretarial duties I thought I might drop you a line and keep you posted of our activities here in Australia. Our current membership is now over 80 and we have just elected a new committee which appears to be so full of energy and new ideas, and so we all hope that the Association will continue to grow.

We still run our monthly contests at sites in various parts in Victoria. Contests would appear to be growning in popularity and the most interest appears to centre in Pylon Racing followed by Limbo and Aerobatics. (Note: Limbo is under a line held taut by two poles a certain distance from the ground). So far we have been formulating our own rules for these contests and from what we read from the World Press we seem to be progressing in the same directions. For instance, our current Pylon Racing rules are as follows:

A 120 yard (360 ft) course with up to 6 model aircraft competing. A massed flying start from over the left hand flag with a count-down to ZERO and over 15 laps with times taken for the first three places. This is repeated for each heat. Winners are decided on the 3 shortest times. (We find this is essential as the first places in each heat are not necessarily the fastest round the course).......

We appear to be undecided as to whether we s should in fact run a final as we appear to strike a problem of clashing frequencies. One of the problems we are currently facing is that of mid-air collisions, as hardly an event goes by without this occuring. .... (Ed note: Take heart, the last Pylon Race the Editor entered, he and ten others never finished the race due to mid-air collisions in only two days of racing.).......

An idea is being considered to prevent this by having a third pylon some distance out in fromt of the slope so that the gliders have to fly a much more circular course and less traffic on the slope face. One of the advantages of this system is that if you take the third pylon sufficiently far our in front of the left pylon, then a different type of model will be necessary as sheer speed will not necessarily be so important. We intend experimenting with this idea as the only problem at the moment is one of communication with the 3rd pylon. We have given away the flag system on the turning point as it is difficult to operate and we have installed a microphone amplifier-loud speaker set up so that the model is called from the far pylon. The pilot stands and fly from the starting point. It seems to work extremely well.

The limbo event is so well patronised that we are running into a problem of time it takes to run it. For instance at our last even something like 9 contestants got through the first height of 6 ft., 9 thru 5 ft., and so on, so that at 3 feet we still had three and this had taken an hour. We have thoughts of limiting the attempted pass to five minutes from launch to completion. Once again we fly as many as five up at a time.

Many new models are appearing on the slope, the accent is fast becoming Scale or near scale and the many problems we had originally with super regen and single channel models have disappeared as the majority are now on proportional equipment. FOKAs and CIRRUS kits are still the two most popular kits, but many fiberglass creations are beginning to appear and some are first class workmanship. Size appears to be standard,... around nine feet.

If you are interested I will attempt to get hold of the plans and photographs of a new miniature slope soarer which is really making a name for itself here... it is called "BAMBINO". This 6 ft model with 3.5 inch chord wing and fiberglass fuselage is fantastically fast and maneuverable - the wings are mostly solid ranging from 1/4" balsa to 1/4" Moranti. Wing loadings are arount 22 oz/sq. ft. But believe it or not due to the tremendous finish available with solid wings and solar film finish these models are keeping up in what we would term "Foka conditions".

Without a doubt the great surge of interest in Australia at the moment is toward some form of sailplane activity. The last year has seen the first Australian Slope Soaring Championships, the first in

OVERSEAS NEWS (Continued)

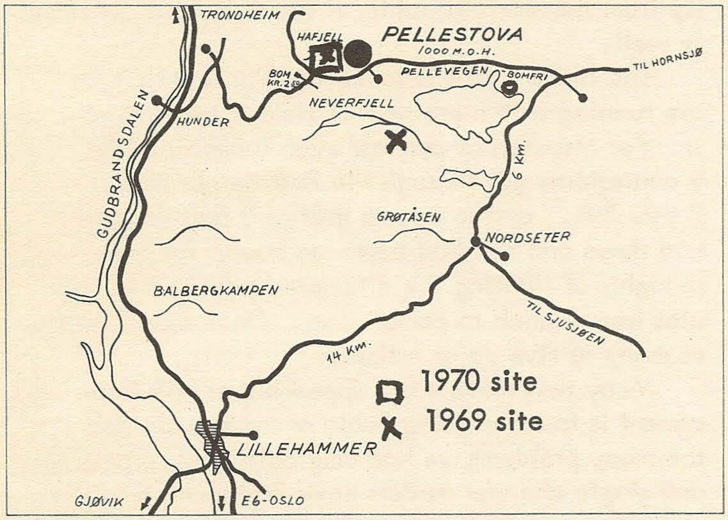
AUSTRALIA

inclusion of a slope soaring event in the Victorian State Championships and now I believe for the first time we will have a Slope Soaring event in the National Championships to be held in South Australia at Christmas. ... So, slowly but surely we are making our mark..... etc.... etc....

NORWAY

Rune Blaker of Oslo sent this message:

Sending you some pictures (color photos) from the R/C Soaring activity at Neverfjell, Lillehammer, 27 June thru 5 July 1970. Ottar Stensbol told me that he had sent you a report, but no pictures yet. The hotel "Pellestova" is an excellent place, as you can see, and is only 10 minutes walk to the slope. I have plotted the flying site on the map.



It was a very good slope for winds from West, North and East. Most of the time we had steady winds from the West. I have also plotted the site we used in 1969 where you set the World's Speed Record. As you probably know, Georg Friedrich had announced his arrival for World Record Trials, but unfortunately he had to move his vacation time away from the actual week we planned. No Norwegian or Swedish flyers were prepared for World Record Trials.

The first part of the week was used for training, and we had planned competition in FAI Class B Slope Soaring later on in the same week. But alas, bad weather moved in and we had to cancel it. I flew the good old KAISERADLER, because I wanted to have more experience with the ELFE S-3 before I flew it in the mountains.

This year we have ran several contests in FAI Class A with some minor changes... We used 150 meter line WITH 50 meters of rubber. My opinion is that this kind of competition is o.k. for beginners. It is, however, not enough for an experienced R/C sailplane flyer just to keep a plane in the air a stipulated amount of time, and then go in for a landing. I have suggested for the Model Committee in Norwegian Aero Club to look into the matter before the CIAM meeting. As a basis for discussion I have suggested to fly FAI Class "A" and " B" after the same rules, namely those for Class "B" with a 200 meter line PLUS 50 meter rubber or 250 meter line on a winch. In this way you use thermals, not only for flying around for 6 minutes (or 10 minutes or 20 minutes) before landing, but you use the thermals to gain altitude for more passes between pylons. What do you think about this? (Ed note... The Western R/C Soaring Championships used very similar thinking in formulating rules for that event, and so have the forthcoming League of Silent Flight 1970 Soaring Tournament).....

Sorry, but I can't come to CSSR in September. It is impossible because of my work, no vacation left. I hope you will succeed in coming and hope will send me a short report..... etc...

Norwegian correspondent, Rune Blaker, Oslo, testing the Elfe S-3 R/C sailplane with amazing results

Siri Blaker poses with a newly built Elfe S-3 R/C glider. Results of test flying in next issue of ZEPHYR

LEAGUE OF SILENT FLIGHT

1970 RC SOARING TOURNAMENT

August 29 - 30

Livermore, California

CO-HOSTS

NORTH BAY SOARING SOCIETY ● SOUTH BAY SOARING SOCIETY

AMA Class AA Sanction No. 437

- Two days of R/C thermal soaring - an ideal FIRST CONTEST for newcomers
- Come out ... FLY and have FUN. Meet and greet others in your sport. This is the BIG ONE.
- Open and Sportsman classes ... Sportsman class limited to pilots who have flown in no more than 3 R/C soaring contests in 1970.
- Three flight categories ... two tasks each:

PRECISION
- -One minute with Spot Landing (Sat)
- -Five minutes with Spot Landing (Sun)

DISTANCE
- -Max closed course laps in 10 minutes (Sat)
- -Fastest clocked time, 5 lap course (Sun)

DURATION
- -Ten minute max plus landing points (Sat)
- -Fifteen minute max plus landing points (Sun)

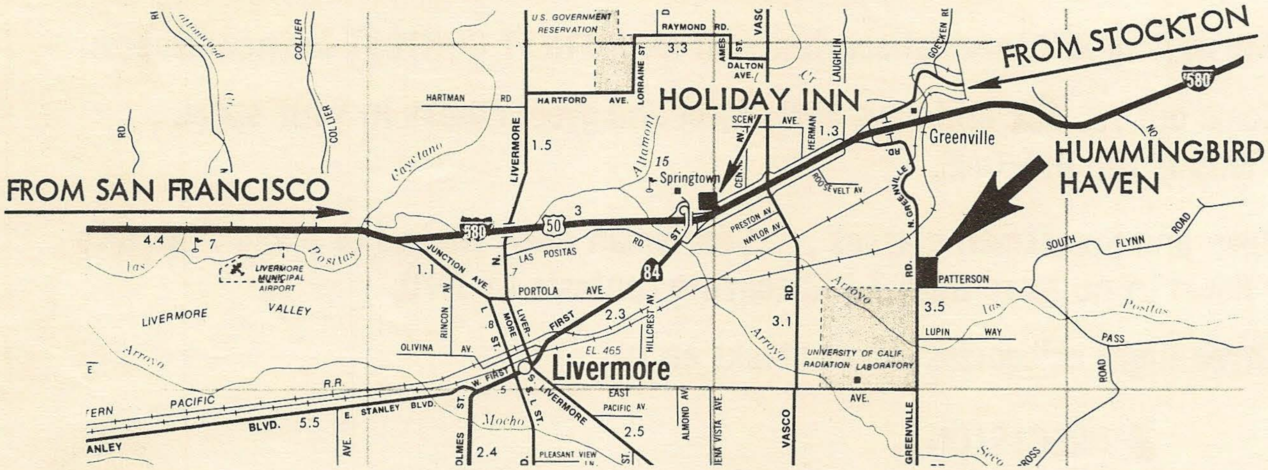
- Trophies 1st through 3rd, Open and Sportsman, each flight category
  1st through 3rd, Overall Tournament
- Transmitter Plaques for all entrants
- ONE Sailplane/ONE Wing with single backup model on same frequency allowed
  Current FAI R/C model sailplane size and weight rules apply
- Scoring by GE Time-Sharing Computer Service
- Tournament Meteorologist- Harry Perl

PRE-REGISTRATION RECOMMENDED

- Sign-in opens 0800 Saturday
  - -Pilots Briefing 0830 to 0845... FIRST Launch 0900
- Entry Fee- $5.00 plus AMA and FCC licenses
- ALL launches ROG with electric winches - models over 5 pounds total may use gasoline winch
- Re-launches ONLY if winch fouls or line breaks - NO unofficial flights

PRE-REGISTRATION RECOMMENDED

- Contest site - "HUMMINGBIRD HAVEN", a private glider port owned by Alice and Ted Nelson, east of Livermore and south of Interstate 580 at 8638 Patterson Pass Road and N. Greenville Road



- Catering trucks on site with food and drink
- Contact motels in Livermore - closest is Holiday Inn; (415) 443-4950

MAKE RESERVATIONS NOW!

- For further info contact: Bob Andris, Tournament Director, (408) 252-5439
  Les Anderson, North Bay SS, (415) 454-6451
  Keith Brewster, South Bay SS, (408)245-3050

TO: Registrar: LSF R/C SOARING TOURNAMENT
P.O. Box 2606 Mission Station
Santa Clara, California 95051

SIGN ME UP - I'M COMING. Here's my $5.00 (check or money order) payable to LSF R/C SOARING TOURNAMENT
I plan to fly in Open( ) Sportsman( ) Class (PLEASE PRINT)

Name: ______________________ Address: ______________________

City/State/Zip ______________________ AMA No.: ______________

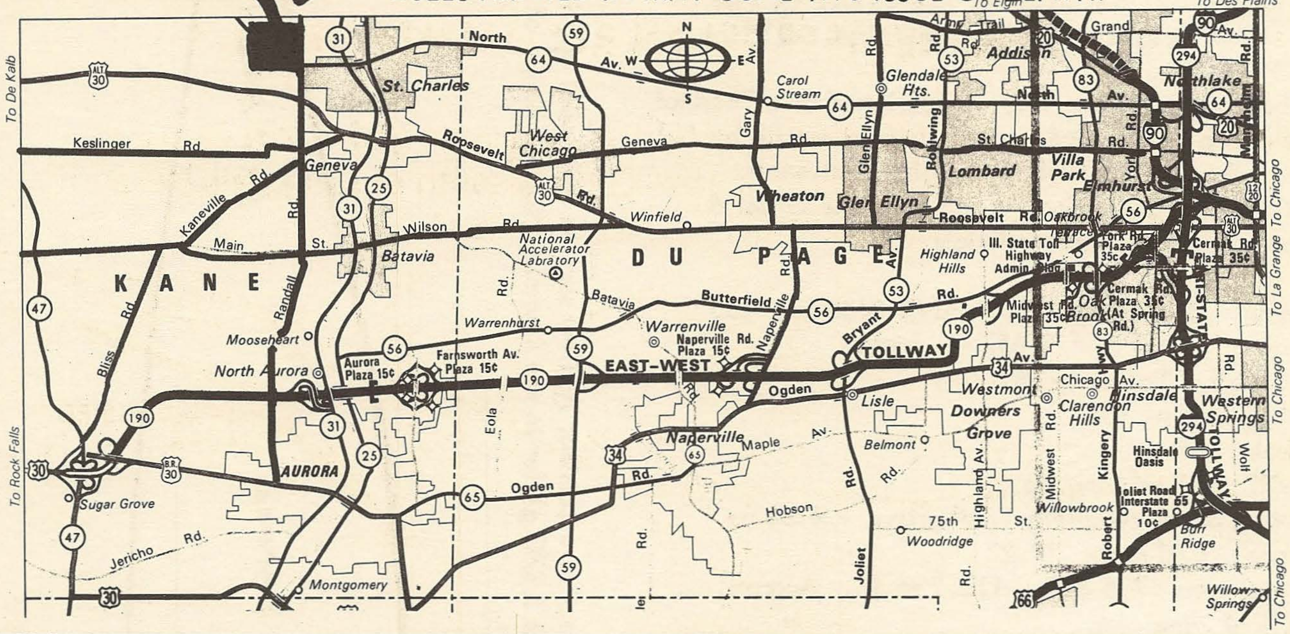
Club: ______________________ Radio Frequency: ______________________

PRE-REGISTRATION RECOMMENDED

SITE OF NATS WEEK RADIO CONTROL GLIDER MEET
JULY 27 - 28 1970 - Flying 10 a.m. to 4 p.m.

EAST-WEST TOLLWAY
ILLINOIS 190

RULES PRINTED IN MAY-JUNE 1970 ISSUE OF ZEPHYR



SCHWEIZER SGS 1-34 SAILPLANE

Kit FS-26 Span 8 ft. 2½ in. Area 615 Sq. in. Wgt. 2¼ lbs. (less R/C) Scale 2 in. = 1 ft.

CAN BE FLOWN WITH SINGLE CHANNEL THRU FULL HOUSE R/C

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☐ Catalog of entire line of airplane control line model kits, R/C scale and Trainer kits, boat model kits, accessories; etc. 10c enclosed.
☐ "Secrets of Model Airplane Building," including design, construction, covering, finishing, flying, adjusting, control systems, etc. 25c enclosed.
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Ghost Family Of Soarers

Editor's Note: This series on the Ghost family of Soarers began in the March-April issue of ZEPHYR and very nicely covered the history of this excellent Norwegian design, up through the Ghost 4 model. The last issue then took the Ghost 5 R/C glider, and this issue will cover the Ghost 6 model. The final Ghost 7 R/C Thermal Glider will be described in the next issue with full size plans and building instructions.

The Ghost 6 R/C glider was designed as a Thermal Soarer of top performance and proved its mettle by placing FIRST in the 1968 Norwegian Nationals. The attached drawing (not to scale) of the Ghost 6 had the following characteristics:

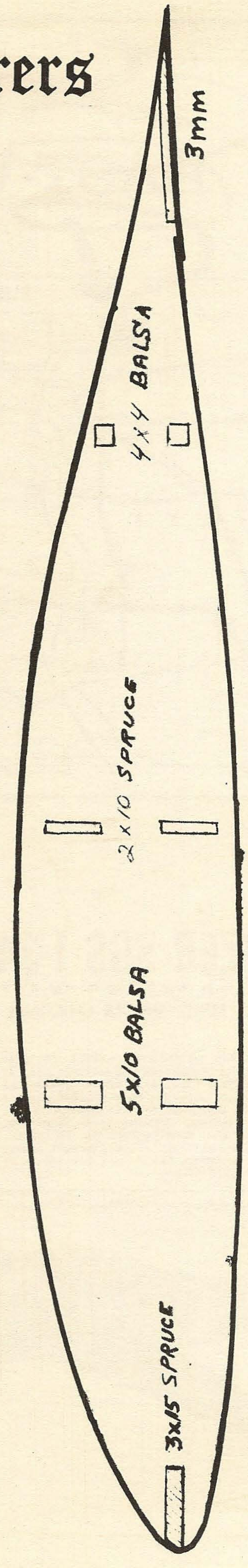
Wingspan: 2360 mm - 92.9" AND 2660 mm 105"
Wing area: 42,4 dm^2 - 657 sq. inches
Wing airfoil : Eppler E-385
Wing incidence: +3°
Dihedral: +5°
Washout: : 2° at wing tip
Each wing panel complete: 130 grams - 4.58 oz
Tailplane: 690 mm - 27.2"
Tailplane area: 7,6 dm^2 - 118.2 sq.in. Approx. 18% of wing area.
Tailplane section: 60% Clark Y
Incidence: 2°
Dihedral: +3°
Tailplane complete: 28 grams - 1 oz - Jap tissue covered.

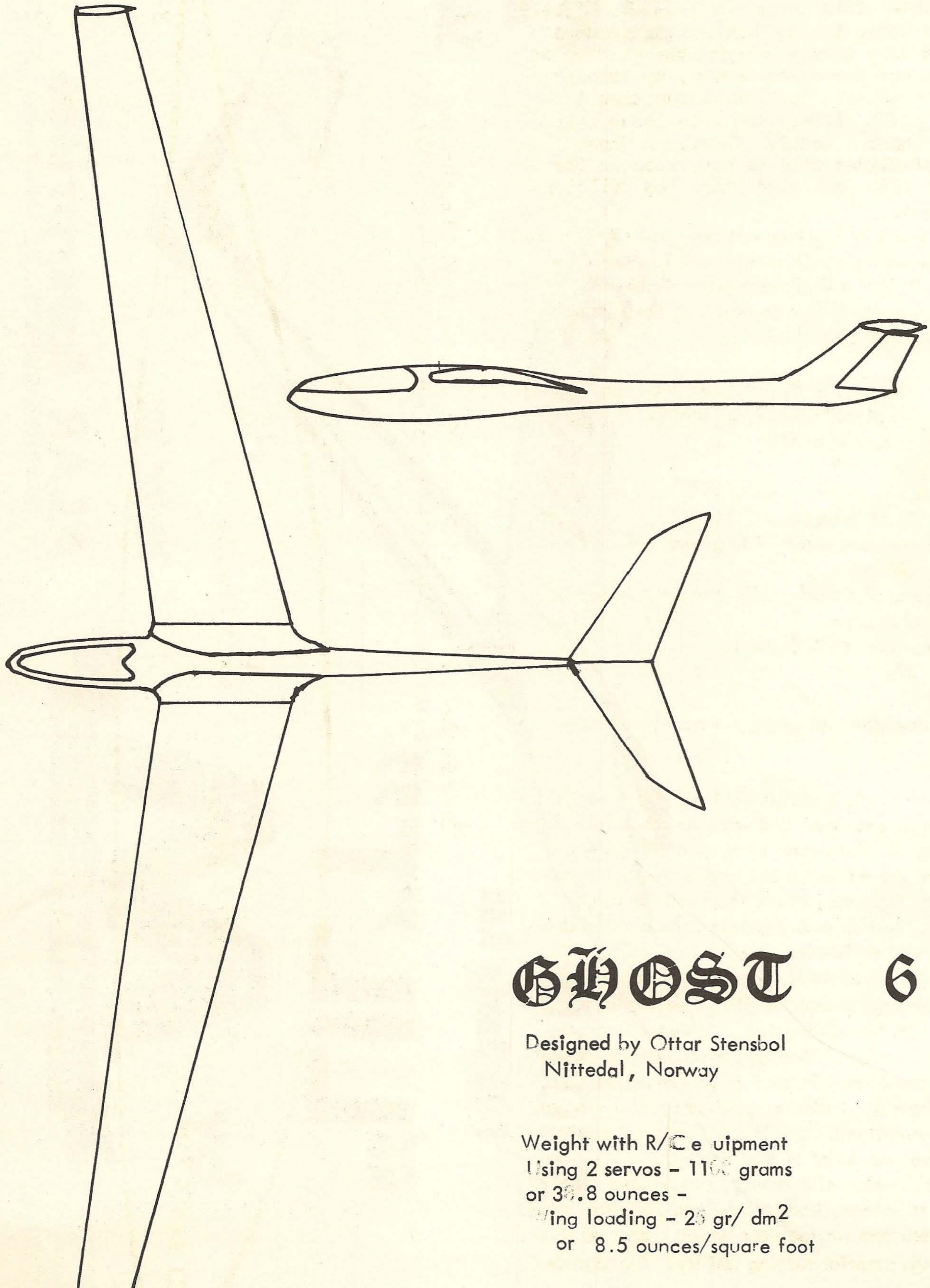
The Ghost 6 was extensively flown in thermals both over snow and over land with good results. Then it was equipped with a new wing spanning 2660 mm (104.7") and proved to be even more thermal sensitive. It did, however, prove the need for larger rudder area. As this would create considerable drag in the maximum deflection, I went to the Ghost 7 rudder layout, which will be covered later in the text. However, it proved to give a better turn/roll capability with less deflection... thus reducing rudder drag in a turn. Besides, a comparison of the plans will reveal that Ghost 7 is very much an enlarged Ghost 6. I like to proceed carefully along a proven footpath and my GHOST family of R/C Soarers is the best proof of that theory!

The combination of a forward swept wing, rearward swept tailplane, both rudder and elevator, gives a long moment arm wetted area which increases total wing-lift with superior turning ability. Need more?

To be continued next month.......

Ottar Stensbol's concept of a Laminar Airflow section for Model application
Used on the Ghost 5 R/C glider in the Reynolds Number Range of 109,200.





GHOST 6

Designed by Ottar Stensbol
Nittedal, Norway

Weight with R/C equipment
Using 2 servos - 1100 grams
or 38.8 ounces -
Wing loading - 25 gr/ dm^2
or 8.5 ounces/square foot

DEEP-CUT DISCOUNT PRICE

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Wing Span 74 ins.
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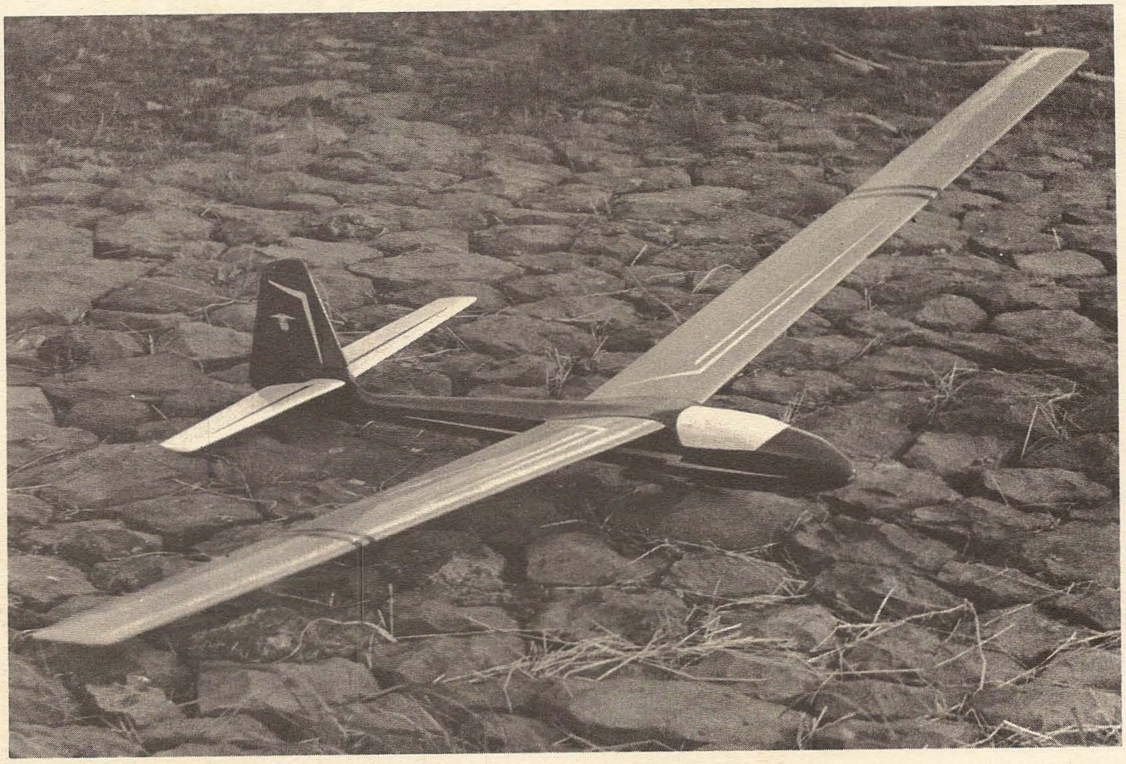
SPUTNIK

Designed by Adolf Stick, Sylt, Germany

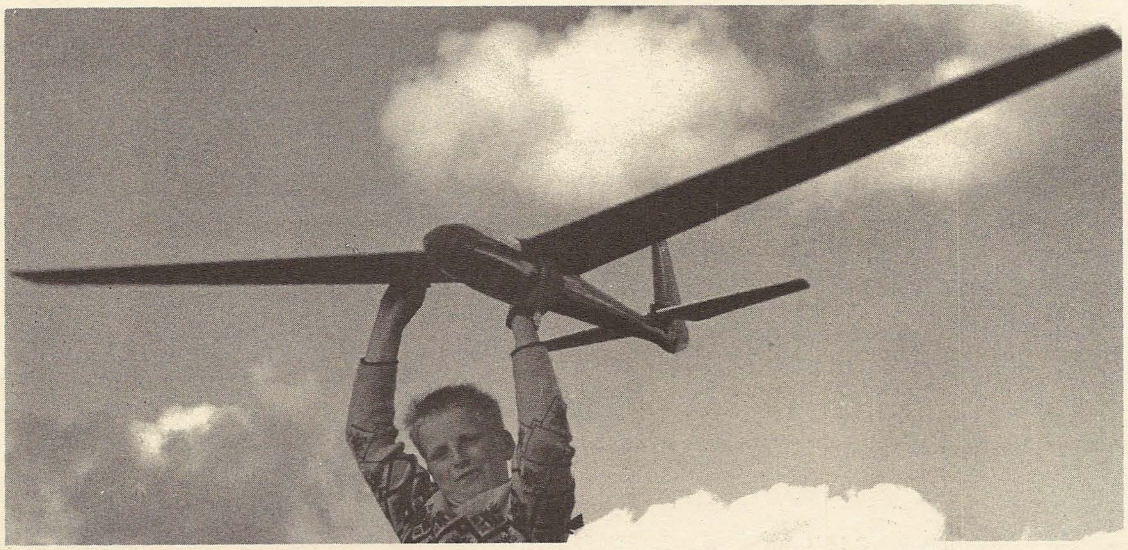
On the island of Sylt, Germany, where I fly, the wind from the North Sea blows almost constantly a lot more than I think is necessary. However, it is very pleasant during the summer time here, so nice that it is a mecca for tourists from all over Europe. The beaches are wide with gradual slopes and a portion of one of the beaches has been set aside for the nudists. I don't fly there.

At the other end of the island are the Red Bluffs about 70 ft high, & very steep, composed of reddish sand. My home is on this island and so I have a natural testing area to experiment with many different R/C gliders and sail - planes. My interest turned in the direction of a fast maneuverable glider designed to fly in winds above 25 Km/H several years ago. The data on the Eppler airfoils was published in the March 1965 issue of MECHANIKUS and from the data for the Eppler E-374 I reduced the camber with a slide rule to 75%. I wanted to improve wind penetration and yet retain the high performance of that particular airfoil. I expected higher speeds, but the modification proved on the slope that this was "the way to go" To maintain control at the higher airspeeds, I designed the vertical stabilizer with a very small fin and a very large amount of rudder area. Also the horizontal tail surface was filleted and made :all-moving. So now in my SPUTNIK, I find a very fast, maneuverable model build mainly for Slope soaring. It doesn't travel as fast as the Russian SPUTNIK, bitter thought. I don't believe the performance can be matched by many other R/C gliders on the slope, but I presume my SPUTNIK would hardly be suitable for thermal soaring unless the wing section airfoil was changed to perhaps an Eppler E-374 or similar from the one shown.



Construction is very simply. The 13 formers are cut from a good grade of 1/16" plywood then hollowed as shown. Next cut the four main notches for the stringers in each former before attempting assembly. "Dry fit" them and hold them in place with rubber bands. Next take a balsa strip with a straight edge and mark the position of the balance of the stringers. Measure each side to insure uniformity as you proceed down the length of the fuselage. Now disassemble the structure and carefully notch each former as required. The guide to the balsa stringer sizes is shown only on former No. 9, but it applies to all formers. Next with a slow drying cement such as UHU-Coll or Elmer's Glue begin the assembly of the fuselage. Strips of cloth or wide rubber bands are the best means of keeping the stringers in tight to each former. Set aside to dry and take care that it is truely aligned properly.

Next mass cut the ribs. Only the Root rib and the tip rib are shown on the plans, with the exception of the full airfoil. This is how to make a full set of ribs in less than an hour. Cut from 3/32" plywood one each rib #1 and 23. These must be to exact outline. Sand to a smooth contour, drill the holes for the wing wires and place 42 pieces of wood between them. Note that ribs 1, 2, and 3 are of 1/8" plywood while the rest of the ribs are 1/8" balsa. Use a firm grade of balsa for these ribs and save yourself worry about warps. With a file or 80 grit sandpaper, remove almost all of the excess wood. Cut it evenly from rib to rib and you will find the constant taper built right into the ribs. Finish with fine sandpaper, and notch for the 1/4" x 1/8" balsa or spruce spars. Begin assembly of both wing panels by laying down the spars on the plans over which you have placed wax paper. We find that the backing that comes with Super Mono Kote makes it easy to build upon. Place each rib at right angles to the spar. The leading edge and trailing edge stock are next added. Be generous with the glue. Make a small fillet of glue at each junction for added strength. Fit the wing wires into the wings before adding the 1/32" sheet balsa covering. The horizontal stabilizer is a symetrical section (NACA 0010) as is the rudder. Take normal building precautions. Note the unusual hinging of the rudder. This presents a bit of drag on one side of the rudder, but it does not seem to effect the lateral control, which is excellent. When completed and sanded, cover both surfaces with a good firm grade of 1/32" balsa. While installing, take care that no warps creep in for they will surely show up at high speed.



Since there are no means of making plastic canopies in my town, I used balsa sheet painted white for the cockpit area.

The fuselage is covered with 1/16" balsa, after being sanded smooth and adding the hollow block for the tail skid. When dry, add a covering of good silk which gives strength to the balsa covering and a good finish to the fuselage. Silk on the wings over the balsa covering is fine, if required where you fly, but the use of Silkspan or tissue is highly recommended to save weight. Add the 3/16" plywood skid last.

We have not shown the radio installation because most American systems are smaller or of a different size than the one I use. Remember to make all controls slop-free AND with no binding at any place. This will make a more maneuverable model and save batteries.

As for test flying, just balance at the C.G., walk to the edge of the slope and launch. It flies. I hope your sand is as forgiving as our nice red bluffs.

While construction of the SPUTNIK is very simple this R/C glider is not recommended for beginners. It flys too fast in the air. It is a real fun ship once the speed of flight is recognized as a part of the flying characteristics of this design. It goes where you point the nose... but fast. I think the only other R/C glider that is comparable in the air is the design flown by Herr Martin of Esslingen, near the Teck. His design uses a fiberglass fuselage and an airfoil very similar to mine, but the wing is a much higher aspect ratio. In addition he uses ailerons, a small rudder and a very small stabilizer.

Happy Speed flying....... Adolf Stick.

Editor's note: Our apologies for putting "ALFRED" on the plans, instead of Adolf. If you receive plans with such a name in the title block, skip it.

SPUTNIKS ARE FOR SLOPE SOARERS

Extra copies of these plans are available from the Editor, ZEPHYR, Box 824, Tustin, CA 92680, for $3.00 each postpaid, 3rd class mail.

SOARSA

SOUTH AFRICAN RADIO SOARING ASSOCIATION

The first issue of the ZEPHYR listed the requirements for membership in the LEAGUE OF SILENT FLIGHT. It also set forth the competition tasks to be accomplished and made participation in contests mandatory in order to be awarded any one of the levels established.

Recent correspondence revealed a similar program underway in South Africa. Apparently they found the FAI Provisional Rules unpalatable and unchallenging and so have established the following rules for SOARSA competition. Like the LSF they only recommend their rules be used. They are not glider competition sponsoring organization, have no dues, (yet donations are accepted), are not a governing body and yet have high hopes of setting up usable National R/C glider rules for both slope and thermal competition, derived and distilled from competition.

Two Schedules are in use at the time of this report.

SCHEDULE A - Proficiency grades in R/C thermal soaring:

Grade A - Bronze Eagle
Six minutes duration off a 150 meter towline plus a spot landing in a 50 meter diameter circle. All in one flight.

Grade B - Silver Eagle
Ten minutes duration off a 150 meter towline plus a spot landing in a 25 meter diameter circle. All in one flight.

Grade C - Golden Eagle
Twenty minutes duration off a 150 meter towline plus a spot landing in a 12.5 meter dia circle. All in one flight. In a separate flight (not necessarily on the same day) a distance run between two points 500 meters (approx 1/3 mile) apart ina straight line, travelling cross wind. 150 meter line to be used.

Grade D -- Diamond Eagle
Thirty minutes duration off a 150 meter towline plus a spot landing in a 12.5 meter dia circle. All in one flight. A separate distance flight over a triangular course of not less than 1500 meters, each leg to be 500 meters. 150 meter line to be used. A thesis to be presented to SOARSA on any aspect of radio control flying.

Note: As many attempts as desired may be made in any one day by a single flyer.

SCHEDULE B - SOARSA Thermal Soaring Rules

Five official flights
Flight under 20 seconds is an attempt and another attempt shall be allowed in that round.
150 meter line to be used for manual or winch tow. Hi-Start shall not exceed 150 meters at time of launch, i.e., stretched.
Maximum flight - Six minutes.
Fifty bonus points for landing in a 25 meter dia. circle.
When stationary, the nose of the model is to be in circle to earn points.
If model is not landed within 9 minutes from start of flight, then bonus points for Spot Landing are forfeited.
Superhet sets only to be used.

Plans are underway to hold an National Invitation Soaring Event in Cape Town over the 1971 Easter week-end.

Mr. Geoff Brooke-Smith accepted the Presidency of SOARSA in view of his services to soaring and his FAI World's Record for Duration for R/C gliders.

Apparently the Bronze Eagle is easily attained for by June 1970, Jack Kaegi, Chris Sweatman, Gerhard Waller, Neville Kelly, Dieter Rabeling, Geoff Brooke-Smith and Jeremy Duffy (a Junior) had attained that grade. Neville Kelly then went on to get a Silver Eagle.

The proficiency badges depict a silver eagle on a dark blue background with the various awards indicated by sewed on tabs.

MORE THAN 230 full size plans

GLIDERS

MPS 1 - "LI'L T" - R/C - HSSS's Best design - BOB HAHN
Rudder only "T" tail glider - 74" wingspan - $3.00
MPS 17 - SCHWEIZER 1-26 SAILPLANE - R/C - DAN LUTZ
One sixth Scale model with '67 Sport Canopy shown 3.00
MPS 19 - RAYDIC 84 - R/C - Rudder & Elevator FRANK ZAIC
Large boxy fuselage - 84" wing, Thermal type 2.50
MPS 23 - SPECTRE - R/C FLYING WING - DON McGOVERN
Designed for thermal soaring with power assist -.15,92" 1.50
MPS 24 - RAY PARKERS "T-BIRD" SAILPLANE - B.HOLMAN
Factory scaled plans (1/6th size), wingspan 106" 3.00
MPS 29 - SLINGSBY "SKYLARK 4" Sailplane - IRA ACHEY
For R/C slope or thermal - High aspect ratio, 119" 3.00
THERMIC 100 R/C GLIDER PLANS FULL SIZE - FRANK ZAIC
MPS 48 - WING & STABILIZER PLANS ONLY - 1.00
MPS 49 - POD & BOOM WITH RUDDER ONLY - 1.00
MPS 50 - REGULAR FUSELAGE WITH RUDDER PLANS 1.00
MPS 51 - FOAMIN'S WING BAT - R/C - ROLF McPHERSON
Ultra modern all wing design using foam cores - 72" 2.00
MPS 56 - BONG BOOMER - FAI R/C GLIDER M. HILL
Once set World's Record for altitude - Wingspan 136" 3.00
MPS 60 - ATHENA - Nordic A/2 - 80" - ROGER SIMPSON
Open class winner at '66 NATS - Uses glass fuselage 1.50
MPS 63 - THUNDERHEAD - Towline Trainer-D. McGOVERN
Practical design for improving towing technique - 54" 1.00
MPS 27 - CASTAWAY - Nordic A/1 - 51" span -JOE BILGRI
Neat low cost competition glider design - Jul66 FM 1.50
MPS 70 - THERMAL KING - R/C-110"-DALE WILLOUGHBY
Uses efficient Eppler E-385 airfoil & glass fuselage - 3.00
MPS 86 - SOAR SAM - A/1 Nordic - BILL DUNWOODY
Excellent design for NATS competition - 48" wing 1.50
MPS 90 - 1931 NORTHROP PRIMARY GLIDER-WALT KESSLER
GI JOE flies this ancient trainer - 72" span - R/C 2.00
MPS 97 - PEREGRINE - A/2 Nordic - 89" -KEN WHITING
Novel design uses fiberglass fishing rod for fuselage 1.50
MPS 99 - RAINBOW - R/C - 100" span - D.McGOVERN
Pod & Boom drsigh with power assist - .15 mill 2.50
MPS 101 - HYPODEMIC NERDEL - A/2 Nordic D.MATHIS
Sharp new design for '68 contest work -47" span 2.00
MPS 108 - LA MILA - Hand launched glider-Maj MEL ALLEN
Over 30 contest wins including '66 NATS - Best yet .50
MPS 113 - DANGER - R/C glider - 144" - CARL LORBER
Sleek Pod & boom "V" tail soarer for thermals 3.00
MPS 120 - ENILWOT - A/1 Nordic - DICK MATHIS
Easily constructed, basic type with underslung rudder 1.00
MPS 122 - AMERICAN CROW - A/2 Nordic DICK MATHIS
Different approach to competition model - 77" wing 1.50
MPS 123 - ROK - R/C - Swiss Champ - P.BAUMGARTNER
Fine design from overseas - Won '66 Slope comp. 97" 3.00
MPS 135 - NORDIC EXTRA LARGE - R/C -CHET LANZO
Pod with fiberglass boom - 113" wingspan - 2.00
MPS 147 - MOLLYMAWK - Super Streamlined - C.LORBER
Excellent R/C design for thermal flying - 108" - 2.00
MPS 149 - SAILWING 50 - FF design - 50" - FRANK ZAIC
All-wing swept design - adaptable to small R/C - 2.00
MPS 152 - PTERODACTYL - Hand Launched/TOM PEADON
Lightweight glider design - unusual & attractive 20" 1.00
MPS 155 - KURWI 33 - R/C glider - 104" -KURT WILHELM
Best all-round R/C glider design now with full size - 2.00
Complete kit with fiberglass fuselage - $50.00 - - - - - -
MPS 159 - TRI-BELLE - R/C glider -105/HARLEY MICHAELIS
Beautiful and graceful - Slope, thermal or power - 2.50
MPS 163 - TUMBLEWEED - A/2 Nordic - DICK MATHIS
Two piece wing for windy weather - 74" span - 1.50
MPS 182 - GAGGLER - R/C Soaring bird - CARL LORBER
Pod and boom type - R/C equipment in line - 117" 2.00
MPS 185 - MISKEET - Big R/C design -HARLEY MICHAELIS
Sleek glider with fiberglass fuselage - 149" span - 2.50
MPS 195 - Swiss "ELFE S-3" Scale sailplane - TELAVES ME
Model of the sailplane that won Standard Class International Competition at Leszno Poland in 1968. Fiberglass fuselage, canopy and plans... $35.00 - Plans only - - 4.00
MPS 190 - MALY MODELLAR - FF Glider - CZECH MAG.
Neat sport design used by Tustin Model Club as a Club project - Building instructions on plan - 30" wing - 1.00
MPS 196 - SCARAB A/2 - FF Nordic ship - DICK MATHIS
Uses fiberglass fishing rod blank for fuselage - 79" 1.50
MPS 200 - Bowlus "BABY ALBATROSS"Dale WILLOUGHBY
One sixth scale model of famous sailplane of 1930's for R/C control. Uses Eppler E-385 airfoil - 89" span 3.00

R/C SAILPLANE DESIGNER'S CORNER

Full size factory approved scale outlines and accurate cross-sections of these beautiful sailplanes. Sketch in rib locations on wing and stab and build right on plan outline - $2.50 each
MPS 24 - RAY PARKER'S "T-BIRD" - 1:6 - BOB HOLMAN
MPS 151 - SCHWEIZER 2-32 - 1:6 DALE WILLOUGHBY
MPS 175 - SHK "CIRRUS" - 1:6+ DALE WILLOUGHBY
MPS 191 - SCHREDER "HP-14,C & T" DALE WILLOUGHBY
MPS 192 - SZD "ZEFIR 4" - 1:5 - 148" D. WILLOUGHBY
MPS 198 - "SB-9" - 1:5 - 148" - DALE WILLOUGHBY
MPS 220 - KESTREL - Scale 1:6 - 119" wing - TIM McKAY
MPS 221 - ASW-12 - Schleicher's production model of the Darmstadt D-36 sailplane in 1:6 scale - - TIM McKAY

EPPLER AIRFOILS - PLOTTED BY COMPUTER - FULL SIZE

Each sheet contains 42 different size airfoils starting with 10" chord reduced 5mm each step to 2" chord - $1.00
MPS 1000 - Eppler E-58 - Best for Nordic A/1 gliders.
MPS 1001 - Eppler E-59 - Best for Nordic A/2 gliders.
MPS 1002 - Eppler E-374 - Best for R/C Aerobatic gliders.
MPS 1003 - Eppler E-385 - Best for R/C Thermal gliders.
MPS 1004 - Eppler E-387 - For R/C Slope Soaring gliders.

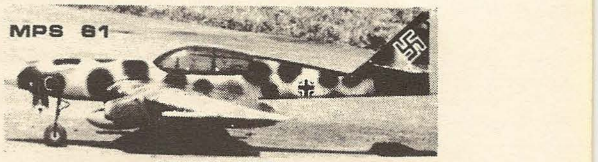
MPS 211 - INVADER - Powered Sailplane - GENE ROGERS
Uses .15 to .29 engine - Wingspan 73" - 4-70 FM 2.00
MPS 216 - HALF MACH - Speedy Glider - CARL LORBER
Semi-symetrical airfoil used on 10 ft wing - 5-70 2.50
MPS 218Z - SOAR - TEE - All balsa R/C - - IRA ACHEY
Published in Mar/Apr70 ZEPHYR - Enlarged version of the LI'L T with two-piece wing of 96" span - Nice - 3.25
MPS 225Z - ZEFIR 2 - R/C Scale Sailplane - Published in May/Jun70 issue of the ZEPHYR - 1/6th model of popular Polish sailplane which won World Soaring in 1963 - 3.25
MPS 227Z - SPUTNIK - R/C glider - 90" - ADOLF STICK
Newest design from Germany - uses Eppler E-374 with only 75% thickness with amazing results on slope - 3.25
MPS 229 - ZING MACHINE - Hand launched - KIT BAYS
Neat fun machine with 17" wingspan - Jul70 FM - .75
MPS 230 - U.S KID - Hand launched glider -Tom PEADON
Best of Peadon's designs - 18" wingspan - 7-70 FM .75
MPS 231 - FLASH - Hand launched glider - DICK MATHIS
Best for Texas thermals - 18" wingspan - 7-70 FM .75

FREE FLIGHT

MPS 6 - WARRIER - Sport design for 15 engine 74" $1.50
MPS 8 - WHIRL-BIRD Helicopter design - LEE TAYLOR - 1.50
MPS 12 - MIRAGE - Wakefield rubber - 51"-ROGER SIMPSON
Top winner at USAF contests - From Feb/Mar66 F.M. 1.50
MPS 21 - CENTURION - FAI Winner - '65 NATS - R. SIMPSON
Set Record of 34 min. 45 sec with .15 engine - Good - 1.50
MPS 28 - ROCK-IT-A-GO-GO - Rocket - P.CROWLEY
Designed for Contest work using Jetex 150 Jet engine .75
MPS 30 - CARAVAN - ½A Contest & fun design - JOE BILGRI
Easily built model, yet competitive in flight - 24" - 1.50
MPS 38 - SAM-PAN - Unlimited rubber design B.DUNWOODY
Tubular fuselage, folding prop, nice design, 54" span 1.50
MPS 39 - DROP OUT - Uses Jetex engine - X-15 type - 1.00
MPS 43 - HEAT SEEKER -Mk III - Rocket - KEN WHITING
Uses Jetex for thrust - Nov66 F.M., 28" wingspan 1.25
MPS 44 - TRIGGER - 1/2A Contest Model - DICK MATHIS
Hi-Thrust Line for Cox engine - .049 to .051 power 1.50
MPS 54 - SKY-SCRAPER, Jr - Unlimited rubber E.HATSCHEK
Father & son teamed up for this fine design - 36" span 1.50
MPS 58 - ONE GRAND - FF Class "C" - 80½" DICK MATHIS
Uses new K&B .40 rear rotor engine - 1,000 sq.inches 2.50
MPS 67 - COMPA-NARD - Unlimited rubber - K.JOHNSON
Large Canard design with pusher prop and 300 sq.in. 1.50
MPS 74 - MICHELLE - Wakefield design - ROGER SIMPSON
Good competitive design for 40 grams of rubber, 53" 1.50
MPS 80 - WILD GOOSE - FF Contest - 36" - BILL COWEE
Uses any ½A size engine - Has unusual airfoil - compact 1.50
MPS 89 - SOUTHERNER - Unlimited rubber -ROGER SIMPSON
Folding prop, high aspect ratio wing, high flyer - 52" 1.50
MPS 94 - MINI - FF rubber - 33" span - JOE BILGRI
For Coupe d'Hiver competition or just plain fun - 1.50
MPS 107 - TEXAS EAGLE - FF Contest - 77" wing D.MATHIS
Hi-Thrust line for K&B .40 engine - Big ship - 2.00
MPS 117 - SOLITAIRE - ½A Contest - 44" GEORGE MURPHY
Hi-Thrust miniature FAI design for contests this summer 1.25
MPS 131 - LI'L SPOILER - ½A Contest Design BOB ADAIR
Small 32" span Free Flighter using .020 engine - - - 1.25
MPS 136 - HYBIRD - Free Flight contest - 60" - BOB ADAIR
For Class A with .15 or Class B with .23 engine - 2.00
MPS 139 - FIRE-FLY - Rocket design - REID SIMPSON
Sport flyer for small Jetex 50 Hellcat jet engine - 1.00
MPS 141 - JALAPENA - Free flight contest - DICK MATHIS
Hi-thrust line for .o49 FAI groomed engines - 48 span 1.50
MPS 143 - EAGER EAGLE - Free Flight - WILLIAM HARDING
Beautiful Class C design for .40 power - 90" wingspan 2.00
MPS 156 - HYSTERIA 600 - Free Flight -63" - DICK MATHIS
Good looking design for Contest work next year -.15 2.00
MPS 166 - ISLANDER - Unlimited rubber - 55"- BOB ADAIR
Newest design for FF competition - Excellent design - 1.50
MPS 168 - "C-NECK" MYTH - FAI FF design - REID HULL
Potential winner with hot .15 engine - 62" wingspan - 1.50
MPS 181 - PANDEMONIUM - 1/2A FF - FAST RICHARD
Neat little design for popular Nats Class - 48" wing - 1.75
MPS 203 - TUBBY TEE - Coupe d'Hiver - DAVE LINSTRUM
Small rubber job with sheet wing and tube fuselage - 1.00
MPS 130 - PSYCHEDELIC TWINS - Rubber - WALT KESSLER
Two plans for indoor flying with unusual planform - 18" 1.50
MPS 213 - LASER CHASER - ½A engine - 48"span - KIT BAYS
Warren truss multi-spar wing on pylon - Apr70 FM 1.50
MPS 215 - LITTLE 'LIM - Unlimited rubber - DAVE LINSTRUM
Coupe D'Hiver - Uses old Wakefield rubber size - 39" 1.50
MPS 219 - MIGHTY MOUSE - ½A Payload - DAVE LINSTRUM
Designed for old PAA event - 34" wing span - .020 - 1.50

CONTROL LINE

MPS 5 - SHEIK - Stunt - Inverted Gull wing - JACK SHEEKS
Twin rudders, slick & snappy looking for .35 engine,53" 1.50
MPS 13 - STRAFER - Sport Mid-winger - DON McGOVERN
High powered design with twin rudders, .45 mill, 40" 1.50
MPS 26 - SUPERSONIC STUNTER - Stunt- BERNARD ASH
Extremely clean design with swept 62" wing, .35-.45 2.50
MPS 32 - ENYA DEMON - Stunt - Flaps - 54"-JACK SHEEKS
Racy looking, capable of full pattern on .35 mill 1.50
MPS 42 - CHIZLER - Slow Stunt Pattern flyer - DICK MATHIS
Uses Fox 35 engine with shaft extension - 50" span 1.50
MPS 45 - CONTROL LINE TALON - Stunt - J. KOSTECKY
Inverted .35 engine, Jet-like appearance - 56" wing 2.00
MPS 53 - SWINGER - Stunt - Swept wing - JACK SHEEKS
Needs hot .35 engine for full stunt pattern - 51" wing 1.50
MPS 57 - C/L FURY - Stunt - Fox .35 mill - DON BAMBRICK
Beautiful design with tricycle gear, full span flaps, 54" 2.00
MPS 73 - EXCALIBUR - Semi-Profile Stunt - DICK MATHIS
For McCoy .40 engine - or similar - Wingspan 51" 1.50
MPS 88 - STARLIGHT - Stunt - Sport - CHARLES MACKEY
Wingspan 56" - For hot .35 engine, Aug67 F. M. 1.50
MPS 96 - MAG JET - Profile Stunt - 44" VINCE MICCHIA
Beautiful stunt job for .29 to .35 engines, fast building 1.50
MPS 102 - FOXEY - Twin boom Sport - 30" - BOB ADAIR
Cute little fun model for .049-.051 engine, maneuverable1.00
MPS 112 - NOVI III - Stunter Supreme - 51" - DAVE GIERKE
Attractive design & very capable, 1st at '67 NATS (ApPt) 2.00
MPS 121 - BOOMER - Twin boom Stunt - VINCE MICCHIA
Profile model using .35 engine, in Apr68 Flying Models 1.50
MPS 127 - FREEDOM 45 - Stunt - wingspan 60" JACK SHEEKS
Uses foam cored wing, sheet covered. Enya .45 engine 1.50
MPS 137 - NOVETTE - Sleek stunt Design - NORM DION
Swept 48" wing, profile fuselage, uses OS Max .35 - 2.00
MPS 142 - SPITFIRE STUNTER - 49½" wing - JACK SHEEKS
Realistic semi-scale model of British fighter - .35 - 1.50
MPS 148 - COYOTE - Stunter Supreme - DICK MATHIS
Long, lean stunt design for .35 or .40 engines - 54" - 2.00
MPS 154 - WINDER - Combat - 42" wing - TERRY PRATHER
Designed for high speed Combat - Over 115 mph on .35 1.00
MPS 158 - FORMULA S - Stunter - 55" wing J. KOSTECKY
Efficient stunter design - 2nd at Olathe Nationals - 2.00
MPS 160 - TORINO - Stunter - 53" wingspan -JACK SHEEKS
Another modern control line design for .35 engine - 1.75
MPS 164 - SCOTTSMAN - Stunter - 54" wing -JACK SHEEKS
New swept wing design using full flaps on .35 power 1.50
MPS 171 - KING COBRA - Combat design - VINCE MICCHIA
Uses .35 for Slow Combat - very maneuverable - 48" - 1.50
MPS 173 - PEGASUS - Stunt design - 57" - BOB HOWARD
Uses McCoy .40 engine - Top Notch - 630 SQ IN - 2.00
MPS 179 - KNIGHT - Stunt design - 52" - JACK SHEEKS
Nice "T" tailed design for relaxed stunting on .35 - 1.75
MPS 188 - HI-LO - Stunt trainer - 51" - PAUL PALANEK
Fast building design for beginners in control line - .35 1.50
MPS 197 - KAWASAKI "TONY" - Combat - VINCE MICCHIA
Profile design with scale appearance - .35 power - 1.75
MPS 202 - TEAR-A-LONG - Combat ship - FAST RICHARD
Speedy, small compact model for Cox .15 engine - 1.50
MPS 214 - NOVI IV - C/L Stunter - 55" Wing -DAVE GIERKE
Latest in NOVI series. beautiful model for .35 power 2.00

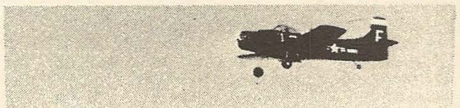


SEAPLANE

MPS 20 - CUSTOM PRIVATEER - R/C-DON McGOVERN
Huge 9½ft wing on Flying Boat for .60 engine - $5.00
MPS 46 - PIRANHA - R/C - 74" span DON McGOVERN
Designed for proportional equipment and .56 mill 3.00
MPS 62 - EDO FLOATS - Semi-scale for ROW's 1.25
MPS 71 - SEA HORSE - Twin floats - DON McGOVERN
Amphibian for .45 engine - Fun on water - 67" 2.00
MPS 84 - MAKO MONSTER - R/C - DON McGOVERN
Another design for Splash & Go Flying - .45 mill 3.00
MPS 92 - UNSINKABLES - Foam Floats- GENE ROGERS
For all big powered models to convert to ROW - 1.50
MPS 129 - KOOKABURA - R/C - 72" wing WILLEM AARTS
Another fine seaplane design for ROW fun .45 mill 3.00
MPS 140 - GRUMMAN "WIDGEON" OSCAR WEINGART
Beautiful R/C Scale Flying Boat for twin .45 engines3.50
MPS 161 - MORAY MONSTER - 72" - DON McGOVERN
Flying boat design with retracting floats - .60 - 3.50
MPS 184 - SCAMPI - Flying Boat - 63" - WILLEM AARTS
Newest seaplane design from Holland - .56 mill 2.50
MPS 187 - ENSIGN - R/C Floatplane - GENE ROGERS
Uses Enya .45 engine - 60" wingspan - Nice - 2.00

CONTROL LINE SCALE

MPS 4 - SPIRIT OF ST. LOUIS - Scale - 46" - PAUL PALANEK
Fully detailed plans for Col Lindbergs famous plane, .19 $1.50
MPS 9 - WHIRLWIND I - Profile Scale - A. B. SWANSTON
Twin engine design of British plane for two .15 to .19, 1.50
MPS 10 - TYPHOON - Scale - 1/12th - PAUL PALANEK
Inverted .35 engine, 40" wingspan, 2 speed motor - 1.50
MPS 15 - SEA VIXON - Scale - 56" wingspan - JACK SHEEKS
British Royal Navy's Jet fighter with .35 engine, prop. 1.50
MPS 22 - EXTENDED GEE BEE - Semi-Scale - B.MILLER
Lines similar for Thompson Trophy Racer - Sport - 35" 1.50
MPS 61 - MESSERSCHMITT "ME-262" - Semi-Scale-VORNHOLT
Uses single, inverted & throttled .35 engine, 55" span 1.50
MPS 64 - LOCKHEED HUDSON BOMBER - PAUL PALANEK
Scale model of WWII bomber, twin .19 mills, 41" span 2.00
MPS 68 - MITSUBISHI "ZERO" - Profile Scale - N.ZIROLI
Good looking model for C/L combat or sport, .19-40, 40" 1.50
MPS 76 - GRUMMAN "F3F-I" - Scale - 31" PAUL PALANEK
Stubby biplane fighter used by Navy & Marines, .19 mill 2.00
MPS 78 - SEVERSKY "P-35" - Scale - 33" PAUL PALANEK
Sleek Army Air Corps Pursuit for .29-35 engines 2.00
MPS 81 - GRUMMAN "AG-CAT" - Scale - 1/12th-BOB ADAIR
Faithfully detailed "DUSTER" Biplane - .35-40 engine 2.00
MPS 82 - CURTISS "HAWK 75" - Scale - 38"-PAUL PALANEK
French Air Force version of P-40 with radial engine, .35 2.00
MPS 85 - RYAN "SC"- Semi-Scale - 51" wing- JACK SHEEKS
Realistic low wing with in-line engine for .35 mill 1.50
MPS 93 - PIPER "CHEROKEE 140" - Semi-Scale-DICK MATHIS
Profile design, easily built model of popular sportplane 2.00
MPS 106 - FOCKE WULF "FW-190" - Profile - JACK SHEEKS
Semi-Scale German fighter - Uses .35-.40 engine, 50" 1.50
MPS 114 - GRUMMAN "TIGERCAT F7F-I" Scale - BOB ADAIR
Famous Marine Nightfighter - Profile with two .15's - 1.75
MPS 138 - BELL P-39 "AIRCOBRA" Stunter W. SIMMONS
Model of cannon-firing Fighter with 56" wing - .35 - 2.00
MPS 174 - DOUGLAS SBD-5 "DAUNTLESS" - C/L Scale -
Scaled 1" = 1' with 40" wingspan for .35 power - 2.00
MPS 176 - HAWKER "TYPHOON 1-B" - C/L Scale with 3
views on plans, scaled to 1/12th size for .40 power - 2.00
MPS 177 - VOUGHT F4U-1 "CORSAIR" - C/L Scale - Also
1/12th size, for .35 or .40 engines - 41½" wingspan - 2.00
MPS 183 - MESSERSCHMITT "ME-109" - - VINCE MICCHIA
Near scale Combat design with 4 ft wingspan & .35 mill 2.00
MPS 204 - BEAGLE 121 "PUP" - C/L Scale - British lightplane
design for .29 engines - 47½" wingspan - Trike gear - 2.50
MPS 207 - ME-109 CONTROL LINER -52" wing-JACK SHEEKS
Neat semi-scale model of German fighter - .35 mill - 2.00
MPS 208 - RYAN PT-20 C/L Stunter -Dr. AMILCARE DIMEZZA
Near Scale model of dual place trainer - 55" wing .35 2.00
MPS 222 - SABRE JET STUNTER - 57" - ROBERT LAMPOINE
Semi-Scale model of USAF F-86D fighter - .35 power 2.50
MPS 228 - STUKA DIVE BOMBER - JU-87 - JACK SHEEKS
Germany's most infamouns aircraft for C/L .40 engine 2.50



SKYRAIDER AD-6 MPS 125

RADIO CONTROL

MPS 2 - SKYLINER - For Class III Competition-MARTY MEYER
Shoulder wing design for .45 engines, Aug/Sep65 FM 2.00
MPS 3 - TEMPO - Class III multi winner - PHIL D'OSTILIO
Much tested design for AMA & FAI competition - 68" 2.50
MPS 14 - MARK 8 - Class III multi design - JOE FOSTER
Swept wing, trike gear, .60 engine, 67" wingspan 2.00
MPS 16 - TOUCHDOWN - Low wing sport model B.PETERSEN
For small field flying (football fields), 42" wing, .049 1.50
MPS 25 - LUCKY II - Shoulder wing Class II -GENE ROGERS
For .45 engine, 60" span, also flown on floats & ice 2.00
MPS 31 - PATRIOT II - Low Wing Class II - 62" -JOE FOSTER
Uses Bosch airfoil and proportional equipment, .61 mill 2.00
MPS 33 - B.I.R.D.S. "SPECIAL" - Class III-DALLAS MORAN
Uses any standard foam wing - sporty design - .60 mill 2.00
MPS 37 - KOBRA - Class II - Hi-Stab model -GENE ROGERS
Clean competition model for .29 to .35 engines, 60" 2.00
MPS 41 - LADY FINGER - Goodyear style -41" - IRA ACHEY
Semi-Scale "Firecracker" for Sport or Racing - .09 mill 1.50
MPS 59 - BOOMERANG - Big Acrobatic Bipe -WALLY ZOBER
For full house multi with .60 or .61 engine - 58" wing 3.00
MPS 65 - MARK 13C - Swiss Swept wing design-BERNI HUBER
Uses flaps, tricycle gear, unique all-moving stab, 66" 3.00
MPS 66 - DEFENDER - Parasol Wing Class II - GENE ROGERS
Removeable tray for R/C gear and .45 engine, 65" 2.00
MPS 72 - PIRATE III - Twin tail mid-winger - NICK ZIROLI
Much like C/L model of mid-40's - Uses .45 engine,60" 2.00
MPS 98 - SKIPPER - Sport flyer - 31" wing -VINCE MICCHIA
Unusual single channel bird for ½A motors & small R/C 1.50
MPS 103 - MARK SEVENTEEN - Competition - BERNI HUBER
Improved version of Mark 13C shown in Oct67 F.M., 65" 3.00
MPS 105 - BANTAM KOBRA - Sport & contests-GENE ROGERS
For small new proportional equipment on .23 engine - 3.00
MPS 109 - PULCI - Multi trainer design - 59" -FRANZ MEIER
Fine Swiss-designed model by '66 Champ, .29-.35 mill 3.00
MPS 111 - "X-103" - Sport & Experimental - NICK ZIROLI
Uses Hallco 103 radio - Elevators & Ailerons - .15 mill 2.00
MPS 118 - DEVASTATOR - Multi contest - GENE ROGERS
This design uses Enya .60 engine, 66" wingspan 2.00

MPS 119 - TRIDENT - All Weather R/C trainer WALLY ZOBER
Flown on land, snow & water. Also skis - .61 engine 2.00
MPS 124 - FURY DELTA - Large Delta - 75" S. SZAFRANSKA
Wing area 1044 sq.in., 44" long, .61 engine rear mtd- 4.00
MPS 144 - PROFILE R/C "MUSTANG" - STERLING MODELS
R/C equipment buried in foam wing - 56" span -.45 - 2.00
MPS 145 - TIGRE TWIN - Sport 'n Fun - - GENE ROGERS
Trike geared design using two .23 engines with 62" - 2.00
MPS 146 - JUNKER KLUNKER - Unusual - WALLY ZOBER
Uses .45 to .60 engine - Resembles German aircraft - 2.00
MPS 162 - THE URCHIN - Small Sport flyer - GENE ROGERS
Little tail-dragger for .23 power and mini-R/C gear - 1.50
MPS 167 - VIXEN ACROBATIC - Biplane - GENE ROGERS
Inverted .23 engine for power in this cutie - 40" span 3.00
MPS 169 - BOONDOCK BIRD - Trainer -DON McGOVERN
Uses Hallco R/C gear with .15 to .19 engine - 52" - 2.00
MPS 172 - SNIPE - Sport flyer - 68" wingspan-WALLY ZOBER
Good looking design for lots of Sunday flying - .56 - 2.00
MPS 194 - VERT-A-GO - Rocket assist R/C - N. ZIROLI -
V.T.O. model using .19 engine & rockets - 38" span - 2.00
MPS 201 - ACCELERATOR - R/C sport design- GENE ROGERS
For land or water flying - uses .19 to .29 power - 50" - 1.50
MPS 209 - SWINGER TWO - Stunter - 63" - JACK SHEEKS
Coupled flaps & elevator with foam wing - .45 mill - 2.00
MPS 212 - TOUCHDOWN - MARK TWO - BRYCE PETERSEN
Best selling plans for this R/C model for beginners - Two different wings shown on plans - For .15 engine - Plans 1.50
Both wings, cut from foam and finished with KromeKote paper available from ELITE MODEL MFG CO, 103 Avenue "E", Hereford, TX 79045- Specify which wing when ordering :
Trainer wing - completely finished - 48" - $12.00 postpd.
Performance wing - w/ailerons, etc - 45" - 15.00 postpd.

RADIO CONTROL SCALE

MPS 7 - MIDGET MUSTANG - Plans from kit-JACK STAFFORD
For Scale or Goodyear Racing - .40 engine, 48" span 3.50
MPS 11 - LOCKHEED "U-2" JET - 72" span - ROBERT TRISHIN
Prop driven or glider design - Interesting scale model 2.50
MPS 18 - BOEING "PT-17" - Also for Control line - Uses
Morton M-5 engine for C/L, .35 for R/C version - 45" 1.50
MPS 34 - ALPAVAIA "RF-3" - French Sportplane - O.KAMPEN
Goodlooking lightplane design for .09 engine, 63" wing 1.50
MPS 35 - CURTISS JN4D "JENNY" - 42" - NICK ZIROLI
America's favorite biplane for single channel radio 1.00
MPS 36 - AVI "205" - Argentinian Sportplane
Scale model for R/C or for Free Flight rubber - 44" span 2.00
MPS 40 - SPAD SVII - WWI PURSUIT - PAUL PALANEK
From Apr/May64 F.M. magazine, 43" wing, .09 mill 2.50
MPS 47 - DeHavilland "GYPSY MOTH" - ELMER NOWAC
Best size for proportional radio - 68" span, .60 to .71 3.00
MPS 52 - WACO "MODEL N" Cabin Biplane NICK ZIROLI
Tricycle gear on this one. For .09 to .15 engine, 40" 1.50
MPS 55 - PIPER COMMANCHE - Plans from kit - J. STAFFORD
Fully detailed 1/6th size - fully aerobatic - .56 to .60-5.00
MPS 69 - DORNIER "DO 18KI" FLYING BOAT-A. SWANSTON
Two engines in tandem, .19 to .29, Wing 66" - 5.00
MPS 75 - ANTOINETTE - French Old Timer - BERNI HUBER
Designed by Swiss modeler for .45 to .61 engine 62" 3.00
MPS 77 - F-86D SABRE JET - U.S. Air Force - FRANZ MEIER
Engine hidden in radar nose, flaps, with
building instructions in English, .60 to .71, 64" 5.50
MPS 79 - FOKKER D-VII - German Fighter - NICK ZIROLI
One sixth size WWI Terror of the Skies - For .61, 60" 3.00
MPS 83 - STAGGERWING BEECHCRAFT - BRYCE PETERSEN
Beautiful Old Timer Biplane Cabin - 52½" span for .60-2.00
MPS 87 - FAIRCHILD "PT-19" Low Wing - GENE ROGERS
Famous Wartime trainer for Army AF - .49 power 62" 3.50
MPS 91 - FOKKER TRIPLANE "DR-I" WWI - BRYCE PETERSEN
Renown German Fighter, uses .50 to .61 engine - 48" 3.50
MPS 95 - 1915 MORAINE SAULNIER "N"-55"- NICK ZIROLI
Near-Scale French Monoplane of WWI era, .35 engine- 2.00
MPS 134 - HEATH "BABY BULLET" - 56" wing - NICK ZIROLI
Model of Heathkit founders 1928 racer - .46 to .60 2.00

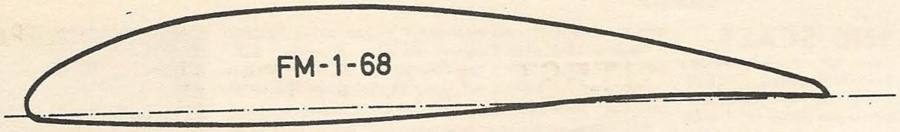
MPS 100 - HAWKER "HUNTER" F.6 - English - FRANZ MEIER
Realistic Scale model of Jet aircraft with .61 engine hidden
in Radar dome, Plans, Instructions 68" - 5.50
MPS 104 - S. E. 5 - British WWI Biplane - NICK ZIROLI
Uses .61 engine, Best Old Timer for Rhinebeck meet - 2.50
MPS 110 - FALK "RIVETS" - Goodyear Racer - JOE FOSTER
First at '67 NATS - Also Cover Shot on Feb68 F.M. 2.50
MPS 115 - EINDECKER "E-III" - German Mono - N.ZIROLI
Another WWI design for Rhinebeck - 55" uses .35 2.00
MPS 116 - JODEL D-150 - French Sportplane-DIETER SCHLUTR
Two place design in 1/4th scale for .56 mill, 71" span 4.00
MPS 125 - DOUGLAS "SKYRAIDER AD-6" - FRANZ MEIER
One Sixth size model of Marine Fighter for .60 engine 5.50
MPS 126 - LEAR "JET LINER 40" - BIZJET BERNI HUBER
Scale model with two .61 pusher engines, 9 ft span - 8.00
MPS 128 - CESSNA "SKYLANE" - 72" - DALE WILLOUGHBY
Modern lightplane with tricycle gear for .56 to .61 - 3.00

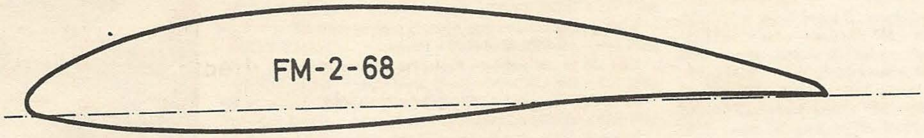
MPS 132 - PILATUS "PORTER P.C. 6" - 75" - BERNI HUBER
STOL model with working flaps for land, sea or snow using
.60 engine. Clear windshield $5.00 - Plans only - 5.00
MPS 133 - FOURNIER "RF-4D" Powered sailplane - F.LEISTEN
With .10 to .23 engine for power assist, capable of thermal
soaring. Foam wing - 87" span - Swiss designed - - 5.00
MPS 150 - LTV "F-8E" CRUSADER - Scale - FRANZ MEIER
Model of Navy & Marines fighter with .61 engine hidden
in radar nose. Working flaps and ailerons - Fixed gear 5.00
MPS 153 - VIGILANTE - Semi-Scale R/C - 51" NICK ZIROLI
Much like Navy's AJ-3 bomber with .45 to .60 pusher 2.00
MPS 157 - AMERICAN EAGLE - Scale R/C - TOM COLLINS
1929 biplane for .40 to .56 engine - 55" wingspan - 2.00
MPS 165 - REPUBLIC "P-47 THUNDERBOLT" - NICK ZIROLI
Near scale version of WW II "Jug" for .45 engine - 2.50
MPS 170 - JUNKERS CL-I - R/C Scale -Jim BURGHOLZER --
German WWI model using Enya .45 engine - 56" span 2.50
MPS 178 - FOCKE-WULF "FW 190 A3" Near scale R/C model
with retractable gear, 54" span, .45 to .56 engine - 2.50
MPS 180 - SPAD SVII - R/C Scale - By special photo process
fully detailed plans enlarged to 85" wingspan - .60 mill 5.00
MPS 186 - MARTIN "MARAUDER B-26" JOE D'AMICO
R/C Scale version of twin engined WWII bomber used in the
Burma campaign, two .45 engines, 72" wingspan - 3.50
MPS 189 - DEMOISELLE - Vern ZUNDEL & AI SIGNORINO
Scaled 3"=1', huge R/C model of Dumont's pioneer airplane
Used in "Magnificent Men" film. Uses .29 mill - 58" - 5.00
MPS 193 - 1915 BLACKBURN "ALL STEEL - VERN ZUNDEL-
Near scale model of early aircraft for R/C - .29 mill 3.50
MPS 199 - SALMSON "Salm 2A2" - French WWI Observation
Two seater modelled for R/C using .45 to .60 engine - 4.00
MPS 205 - GRUMMAN F8F "BEARCAT" - 52" - NICK ZIROLI
Near scale model for .40 to .56 engine - Feb70 FM 2.50
MPS 206 - INSTANT AZTEC - Twin R/C - BRYCE PETERSEN
Detailed conversion of VK Piper Cherokee kit into twin engine model. Two matched Super Tigre .29 used in wings 2.00
MPS 210 - MORANE SAULNIER A1 - R/C Scale - N.ZIROLI
One sixth scale model of French parasol aircraft-57"- 2.50
MPS 226 - VOLKSPLANE - R/C Scale - 57" - GENE ROGERS
Simple-to-build model of new Home-built aircraft .45 -2.50

ORDERING INSTRUCTIONS

ADD 10c for POSTAGE & HANDLING - ALSO ZIP CODE
PLANS MAILED 3rd CLASS - ALLOW 35% for AIRMAIL COSTS
CALIFORNIA RESIDENTS MUST ADD 5% SALES TAX
OVERSEAS ORDERS - REMIT FUNDS BY BANK DRAFT ON AN AMERICAN BANK for faster service OR INTERNATIONAL MONEY ORDER which takes 3 weeks to clear N.Y.P.O.

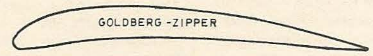
MODEL PLAN SERVICE - BOX 824, TUSTIN, CALIFORNIA 92680





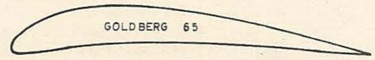
Laminar Wing Sections (F.Meier)

MORE R\C GLIDER AIRFOILS

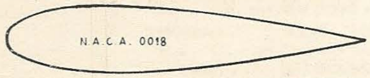


X	0	1,25	2,5	5	10	20	30	40	50	60	70	80	90	100				
Y_s	1,5	3,8	4,9	6,5	8,4	10,6	11,4	11,35	10,6	9,1	7,3	5,3	3,05	0				
Y_i	1,5	0,3	0	0	0,06	1,5	2,12	2,28	2,3	1,9	1,45	0,76	0,03	0				

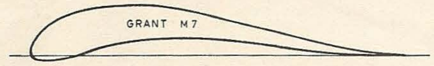
X	0	2,5	5	10	20	30	40	50	60	70	80	90	100
Y_s	0	1,74	2,4	3	3,8	4	4	3,7	3,3	2,7	2	1,15	0,2
Y_i	0	-1,74	-2,4	-3	-3,8	-4	-4	-3,7	-3,3	-2,7	-2	-1,15	-0,2



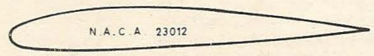
X	0	2,5	5	7,5	10	20	30	40	50	60	70	80	90	100				
Y_s	1,67	5	6,7	8,3	9,6	12,7	13	12,5	11,7	10	8,2	5,8	3,3	0				
Y_i	1,67	0	0,43	0,8	1,25	2,5	3,3	3,3	3,2	2,9	2,5	2	0,8	0				



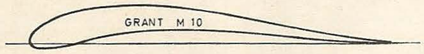
X	0	2,5	5	7,5	10	20	30	40	50	60	70	80	90	100
Y_s	0	3,92	5,33	6,3	7,02	8,6	9	8,7	7,94	6,84	5,49	3,9	2,17	0
Y_i	0	-3,92	-5,33	-6,3	-7,02	-8,6	-9	-8,7	-7,94	-6,84	-5,49	-3,9	-2,17	0



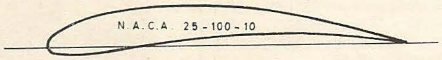
X	0	1,25	2,5	5	7,5	10	15	20	25	30	35	40	50	60	70	80	90	100
Y_s	0	3,90	5,5	7,8	9,52	10,86	12,4	13,2	13,6	13,5	13,18	12,6	10,75	8,5	5,92	3,6	1,5	0
Y_i	0	-1,10	-1,4	-1,5	-1,3	-0,96	0,35	1,88	3,1	4,0	4,58	47,8	4,25	3,4	2,1	0,9	0	0



X	0	2,5	5	7,5	10	20	30	40	50	60	70	80	90	100
Y_s	0	3,61	4,91	5,8	6,43	7,5	7,6	7,14	6,41	5,47	4,36	3,08	1,68	0,13
Y_i	0	-1,71	-2,26	-2,61	-2,92	-3,97	-4,46	-4,48	-4,17	-3,67	-3	-2,16	-1,23	-0,13

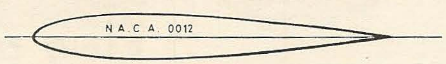


X	0	1,25	2,5	5	7,5	10	15	20	25	30	35	40	50	60	70	80	90	100
Y_s	0	2,8	4,05	5,74	7,0	7,96	9,1	9,7	10,0	9,93	9,69	9,25	7,9	6,25	4,35	2,65	1,10	0
Y_i	0	-0,08	-1,03	-1,10	-0,96	-0,71	0,26	1,38	2,38	2,94	3,36	3,52	3,11	2,5	1,55	0,66	0	0

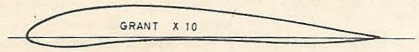


X	0	2,5	5	7,5	10	15	20	25	30	40	50	60	70	80	90	95	100
Y_s	1,6	4,1	5,55	6,7	7,55	8,85	9,75	10,4	10,75	11	10,8	10	8,7	5,55	3,5	1,75	0
Y_i	0	-1,35	-1,55	-1,5	-1,35	-0,8	-0,2	0,3	0,8	1,75	2,55	3,05	3,2	2,8	1,5	0,75	0

X	0	1,25	2,5	5	7,5	10	15	20	30	40	50	60	70	80	90	100		
Y_s	0	2,73	4,27	6,2	7,67	8,8	10,33	11,2	12	11,8	10,8	9,47	7,6	5,33	2,8	0,07		
Y_i	0	-1,33	-1,87	-2,67	-3	-3,07	-2,93	-2,2	-1	-0,6	-0,67	-0,93	-1,07	-0,6	-0,47	-0,07		

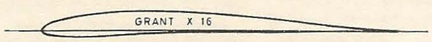


X	0	1,25	2,5	5	7,5	10	15	20	25	30	40	50	60	70	80	90	95	100
Y_s	0	1,89	2,62	3,56	4,2	4,68	5,34	5,74	5,94	6	5,8	5,29	4,56	3,66	2,62	1,45	0,21	0
Y_i	0	-1,89	-2,62	-3,56	-4,2	-4,68	-5,34	-5,74	-5,94	-6	-5,8	-5,29	-4,56	-3,66	-2,62	-1,45	-0,21	0



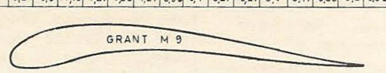
X	0	1,25	2,5	5	7,5	10	15	20	30	40	50	60	70	80	90	100		
Y_s	0	1,93	3	4,33	5,4	6,2	7,27	8	8,4	8,27	7,6	6,6	5,33	3,8	1,93	0,05		
Y_i	0	-0,93	-1,33	-1,87	-2,13	-2,2	-2,07	-1,53	-0,73	-0,4	-0,47	-0,67	-0,73	-0,53	-0,33	-0,05		

X	0	2,5	5	7,5	10	20	30	40	50	60	70	80	90	100
Y_s	0	4,57	6,2	7,67	8,8	11,2	12	11,8	10,8	9,47	7,6	5,33	2,8	0
Y_i	0	-1,87	-2,67	-3	-3,07	-2,2	-0,73	0,6	0,67	0,93	1,07	0,3	0,17	0

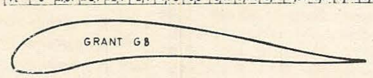


X	0	1,25	2,5	5	7,5	10	15	20	30	40	50	60	70	80	90	100		
Y_s	0	1,2	1,87	2,67	3,33	3,8	4,47	4,87	5,2	5,13	4,73	4,07	3,27	2,33	1,2	0,03		
Y_i	0	-0,2	-0,8	-1,13	-1,27	-1,33	-1,27	-0,93	-0,4	-0,27	-0,27	-0,4	-0,47	-0,33	-0,2	-0,03		

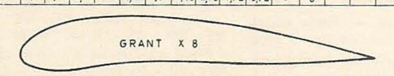
X	0	2,5	5	7,5	10	20	30	40	50	60	70	80	90	100
Y_s	0	3,37	4,82	6,17	6,97	8,84	9,47	9,3	8,57	7,44	5,97	4,24	2,2	0,05
Y_i	0	-1,07	-2,1	-2,4	-2,4	-1,73	-0,8	0,47	0,54	0,74	0,83	0,63	0,37	0,05



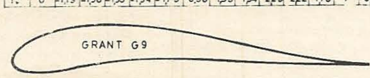
X	0	2,5	5	10	20	30	40	50	60	70	80	90	100				
Y_s	0	4,59	6,39	8,85	10,79	11,10	10,29	8,78	6,95	4,84	2,94	1,22	0				
Y_i	0	-1,14	-1,22	-0,79	1,53	3,26	3,91	3,46	2,78	1,72	0,73	0	0				



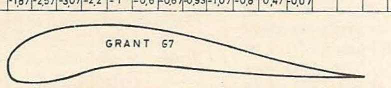
X	0	1,25	2,5	5	7,5	10	20	25	30	35	40	50	60	70	80	90	100
Y_s	0	3,5	5	7,18	8,75	9,95	12,12	12,5	12,4	12,1	11,57	9,89	7,82	5,44	3,31	1,38	0
Y_i	0	-1,19	-1,56	-1,93	-1,94	-1,75	0,38	1,35	1,94	2,25	2,22	1,78	1	0,50	0,13	0,05	0



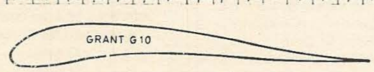
X	0	2,5	5	10	20	30	40	50	60	70	80	90	100				
Y_s	0	4,27	6,27	8,8	11,2	12	11,8	10,8	9,47	7,6	5,33	2,8	0,07				
Y_i	0	-1,87	-2,57	-3,07	-2,2	-1	-0,6	-0,67	-0,93	-1,07	-0,8	0,47	-0,07				



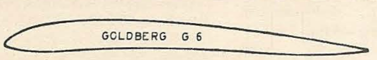
X	0	1,25	2,5	5	7,5	10	20	25	30	35	40	50	60	70	80	90	100
Y_s	0	3,12	4,50	6,39	7,79	8,85	10,79	11,11	11,10	10,7	10,29	8,78	6,25	4,84	2,94	1,22	0
Y_i	0	-1,05	-1,39	-1,65	-1,66	-1,55	-0,33	1,12	1,72	2	1,98	1,58	0,87	0,44	0,11	0,06	0



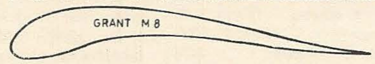
X	0	2,5	5	7,5	10	15	20	25	30	35	40	50	60	70	80	90	100
Y_s	0	6,79	8,2	10	11,38	13	13,85	14,29	14,18	13,84	13,21	11,29	8,95	6,82	3,78	1,57	0,07
Y_i	0	-1,79	-2,21	-2,22	-2	-0,93	0,43	1,54	2,22	2,57	2,54	2,03	1,14	0,57	0,14	0,07	0



X	0	1,25	2,5	5	7,5	10	20	25	30	35	40	50	60	70	80	90	100
Y_s	0	2,8	4,05	5,74	7	7,96	9,7	10	9,93	9,64	9,25	7,90	6,25	4,35	2,65	1,1	0
Y_i	0	-0,95	-1,25	-1,49	-1,5	-1,4	0,30	1,08	1,55	1,8	1,78	1,4	0,8	0,4	0,1	0,05	0



X	0	2,5	5	10	20	30	40	50	60	70	80	90	100				
Y_s	5,1	8,0	9,0	10,0	11,1	11,3	11,2	10,7	9,8	9,0	8,0	6,7	4,6				
Y_i	5,1	3,3	3,6	3,5	4,0	4,4	4,5	4,4	4,1	3,9	3,6	3,8	4,3				



X	0	2,5	5	10	20	30	40	50	60	70	80	90	100
Y_s	0	5,06	7,18	9,95	12,12	12,41	11,57	9,89	7,82	5,44	3,31	1,33	0
Y_i	0	-1,29	-1,38	-0,89	1,74	3,68	4,43	3,88	3,11	1,94	0,83	0	0

CONTEST CALENDAR

1970 - Monthly SOUTH BAY SOARING SOCIETY - Holds a monthly R/C glider contest usually at Del Mar High School, San Jose, CA., with rotating Contest Director. Further details from: Keith Brewster, Silent Flight Center, 556 South Murphy Ave, Sunnyvale, CA 245 - 3050.

Monthly - NORTH BAY SOARING SOCIETY - Holds their monthly contest at Bundy Field, Larkspur, Calif., with a different Contest Director each month. LSF credits, contact: Sam Crawford, 65 Maplewood Drive, San Rafael, CA (415) 456 9591.

Monthly - TUSTIN MODEL CLUB - holds a monthly R/C glider contest. LSF credits, at Foothill High School, Tustin, CA., usually 3rd Saturday of month. Further details from: Dave Anderson, 13892 Holt Avenue, Santa Ana, CA (714) 544 - 5820.

Monthly - HARBOR SOARING SOCIETY - Holds a monthly contest. Contact Bob Hahn, 1866 Chateau, Anaheim, CA. (714) 774 - 2933 for more details.

12-13 Sept - Czeckoslovakia Aero Klubb, Model Section, 1st International Slope Soaring Competition, Rana Hill, near Louny, CSSR. FAI Class B Provisional Rules.

27 Sept - EAST COAST SOARING SOCIETIES - Last of the four contests to be held - Sponsor: Dover, NJ Mosquitos, Dover Del. CD: ? Last resort call Dick Sarpolus, 32 Alameda Court, Shrewsbury, NJ, 07701 for more details.

17-18 Oct - SANTA BARBARA R/C MODELERS - FAI World Record Trials, FAI Class F3B, Category 25 - Distance in a Straight Line AND Category 26 - Height - CD: Roger Grigsby, 210 E. Ortega Street, Santa Barbara, CA 93101. Site: California Valley. More details in next ZEPHYR.

IF YOU ARE HAVING A CONTEST or KNOW OF ONE send details and map to ZEPHYR Editor. Others are interested - would like to watch or participate.

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