No. 317 NOVEMBER 2012

T.W.I.T.T. NEWSLETTER

Interesting view of a bird's wing with cranked-down tips here, because of their nerve reflexes, muscles & feathers, they don't need sweep & toe-in (twist) to be stable & steady like we do with our man-made contraptions. Source by Dan Moser: http://www.homebuiltairplanes.com/forums/aircraft-design-aerodynamics-new-technology/11146-flying-wing-diffuser-tips-aka-weltensegler-crank-aka-stromburg-wing-3.html

T.W.I.T.T.
The Wing Is The Thing
P.O. Box 20430
El Cajon, CA 92021

The number after your name indicates the ending year and month of your current subscription, i.e., **1211** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, November 17, 2012, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - Southeast side of Gillespie).

THE WING IS THE THING (T.W.I.T.T.)

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation, which is dedicated to furthering education and research in a variety of disciplines.

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Members only section: ID – **20issues10**
Password – **twittmbr**

Subscription Rates: $20 per year (US)
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$23 per year US electronic
$33 per year foreign electronic

Information Packages: $3.00 ($4 foreign)
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Multiple Back Issues of the newsletter:
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Meetings are held on the third Saturday of every other month (beginning with January), at 1:30 PM, at Hanger A-4, Gillespie Field, El Cajon, California (first row of hangers on the south end of Joe Crosson Drive (#1720), east side of Gillespie or Skid Row for those flying in).

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PRESIDENT'S CORNER

First let me say a couple of words about what you might see on your mailing label for an expiration date. Gavin is my mail courier from the post office box and he has had some transportation problems the past couple of weeks. This means I probably haven't gotten some of your membership renewals in order to update the mailing list. So if you notice your date is highlighted and you have mailed in a payment, please disregard the indicator.

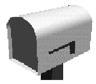
On the other hand, if the expiration date is highlighted and you haven't renewed, please take a few minutes to write/send a check to the post office box or you can go to the website and pay through PayPal (it's a few dollars more to cover processing charges, but quicker). Go to:

http://www.twitt.org/aboutus.htm - PayPal

I would like to thank all of you for your continued support of TWITT and its newsletter over the years. We have a base of 70+ members that fluctuates very little over time. We have a nice mix of enthusiasts who are interested in full size aircraft and those who are really into the scale model side of the subject. I try to cater to both of these groups as you have seen in past issues and again in this one.

I hope everyone has a great Thanksgiving holiday with family and friends.

Andy



LETTERS TO THE EDITOR

I read in the October newsletter that Larry Routson asked about the original publication date of Alexander Lippisch's article, "Wing Sections for Flying Models." I was sure I remembered this article, but was surprised not to find it in the "Related Interest" section of my extensive bibliography. Next stop was just to look in my files, where I found the ***very similar*** two-part article, "Wing Sections for Model Planes", filed under "Lippisch" (none elsewhere) and mistakenly marked as entered in the bibliography. This article begins identically to the one you printed, but diverges later in wording and extends for another page. Unfortunately my copy is just a reprint in *Ultra-Lite Aircraft Journal* (date now unknown). I had penciled in that Parts 1 and 2 had appeared in the April and May, 1950 issues of *Air Trails,* the words "presented by *Air Trails Pictorial*" also appearing at the bottom of the first page.

(ed. – My reply to this part was: Thanks for the material. I compared your images to the typed document that Larry sent me and it is the same thing with just a few minor variations in the way some of the paragraphs in Larry's version start. He also sent along most of the illustrations but I wasn't quite sure where some of them went, but now I have the full picture.)

Because of the apparently close relationship of the articles, I am attaching scans of the two reprints described above, hoping that they may prove of value. I hope they're legible, since my scanner is no longer working well.

I won't send configurational pictures of mine yet, but I was surprised to find that Bob Hoey's "Pegasus" model is close in concept and configuration to a CL model I've had on the board now for 2-3 years, without actually building a powered version - yet! Mine has fewer outboard wings, since it is intended to do "inside" and "outside" aerobatics and must be somewhat symmetrical in its up/down pitching. I call it my VS-1, for "Vortex Splitter". A year or so ago, I analyzed lift centers and computed a composite, gliding a flat foam model to determine that the model's actual a.c. compared well to computed values. I'd employed what I remembered of my freshman calculus to try to get this quite unorthodox model to fly well "off the board" with the maximum theoretical input I could muster. That included finding the mass and c.m. for all parts, including composite surfaces and paint, by computation and combining them all. The fun was in comparing the rudiments to experimental data, so that I could be confident to extend the analysis. For example, I wasn't much good at line integrals, especially applied to polynomial wing section contours; so I made a simple Excel program and checked out the answers for perimeter and fore/aft c.g. of an NACA section surface by rolling a foam model edge along a ruler and balancing a wire model of the wing surface.

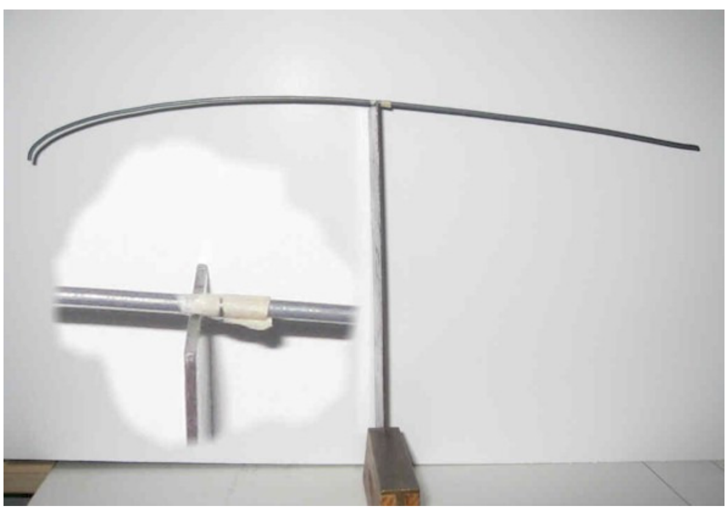
I probably didn't word it well, but aside from liking what I came up with, my real original purpose was to prove to all the flat Earthers in my CL model hobby that principles upon which aircraft, especially advanced or unconventional ones, are designed hold for all and should be used instead of the math-defying pseudo "engineering" some of them practice. You'd be surprised at what basic ideas some of them will not accept. Anyway, I thought it'd be great to design something that would stretch my own abilities and have it demonstrate how real theoretical engineering, combined with what I had to glean from collective experience, could produce a well flying plane for which less guesswork would apply. Optimizing wing loading and moments were an objective.

To do this I wanted to choose a structure and then compute the plane's mass and c.g. for a base size to be scaled in appropriate ways for different sizes, some parts not changing size or varying only linearly or as the squares of dimensions. So, what you see in the two photos are experimental verifications of my mathematical expressions to be used in computing the mass and c.g. of surface structure and finish. The first things computed for this were the length of the edges of a wing section and the c.g. or c.m. of a "thin" strip of that edge surface (I had already done this for the two-dimensional section area. After I computed these answers, I had to test my results to verify their validity, before using them with a bit of calculus to get answers for the full surface. If you look at Bob's model, you can see that this can be laborious, unless you have AutoCad or something similar. I'd like to learn that, but it was sort of a matter of personal challenge to see if I could do it from scratch with an NACA 00XX-series section (Control-line stunt models have symmetrical sections). So here's what you se in the two images:

1) ***Finding the edge length of a scale cut-out of the section being considered.*** I just placed the leading-edge center point to zero point along a ruler lying flat on a flat surface. Then I rolled the section model without slippage along the table, until the trailing edge came to rest next to the ruler and read off the length.

The computed and measured values were extremely close. So I felt that I could use my mathematical expressions for that length to compute surface area, and thus mass of skin and paint on the wing.

2) **Finding the c.g. or c.m. of an infinitesimally wide strip along that edge.** I didn't believe my Excel answer. So I measured the length of a rigid piece of piano wire and marked its center. I then bent it to the shape of the NACA section edge and balanced it on the end of a vertical blade of a tri-square, so that l.e. and t.e. were at the same height. It turned out that counter-intuitively (for me), the position was any within visual error of the computed position.



That's all there was to it - just very simple ways to check some complex (again, for me!) math.

Incidentally, I think my simpler plane configuration would make a better R/C idea than C.L., but I like to feel the model in flight, and unless I really want to perfect something practical, I'll probably stick with this once dominant, but vanishing model plane genre. So wing stagger would only destroy symmetry in aerobatics. CL planes are much touchier and use greater than normal static margins too. Mine is thus more basic and simpler than Bob's. But I like it.

I guess I should just cave in and build the old trial and error method and get one into the air, before I pass on. Keep up the good work Andy!

Serge Krauss

(ed. – Thanks for the additional material on your project. It sounds like you are having "fun" with it in trying to do it the "hard way" without the benefit of a fancy computer program. We will be waiting to see what the actual model looks like. Bob Hoey might be a good resource for some of it since he has perhaps solved some of the problems you might come up against. He can be reached at: bobh@antelecom.net)

Remember the winged suborbital and orbital spaceships in G. Harry Stine's "Earth Satellites" book? Well, guess what?

A new company called Rocket Crafters, Inc. in Titusville, Florida (see: http://rocketcrafters.com/) is

developing a combined jet/rocket powered, tailless suborbital space plane called Sidereus. Front Range Airport in Watkins, Colorado, which wants to be the home of Spaceport Colorado, has signed a letter of intent with Rocket Crafters, Inc. for operations of their vehicle at the airport (see: www.space.com/18132-colorado-spaceport-suborbital-private-spaceflight.html).

The company is interested in point-to-point suborbital travel, bringing to fruition Wernher von Braun's, Hideo Itokawa's, G. Harry Stine's, and Hsue-Shen Tsien's dreams of transcontinental and intercontinental winged rocket ships.

Jason Wentworth

(ed. – Thanks for the update and links. I have included an image from each of the sites so our members can get an idea of the spacecraft's shape and what is conceived for the spaceport.)

Very interested in your web page and will join.

We're currently flying a couple of fairly standard planes - a CTSW and a Taylor Monowing.

We've been contemplating building a fast, blended wing designed to run either a single Rotax 100hp or preferably, two electrically-driven props.

Where would be the best place to start looking for plans that might match these ideas?

Regards

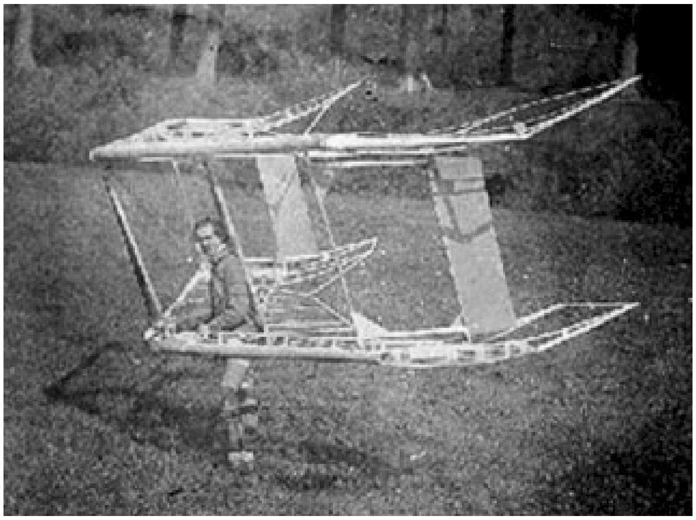
Murray Slavin
<murray.slavin@slavinarch.com.au>

(ed. – I wrote back with: Thank you for visiting our website and becoming a member.

Right now I don't know of any type of plans for a BWB that would fit your criteria. However, there are a couple of designs like the Horton Wingless and a model called Pegasus that might give you a starting point. They are very basic designs and may not be "fast", but could be worth looking at. The Horton has some shots on our website and you will be able to see the Pegasus in our electronic newsletter issues. For this one I wouldn't think you would like the wing arrangements, but it does fly relatively well as proven through a model.

Also, I can put out your question to the TWITT membership and the Experimental Soaring Association (www.esoaring.com) to give it a wider exposure to groups of engineers and designers that might be intrigued by the idea.)

(ed. – Since Serge was so kind to provide the real Lippisch article in a format that is generally readable, I have included the pages from Part 1 starting on the next page. We have a good proportion of our members who are modelers so this should be of value to them. But it should also be of benefit to the rest of us by providing a lot of good information that can be applied in the real world. There is a Part 2 and I will include its several pages next month so you have the entire thing for your library.)

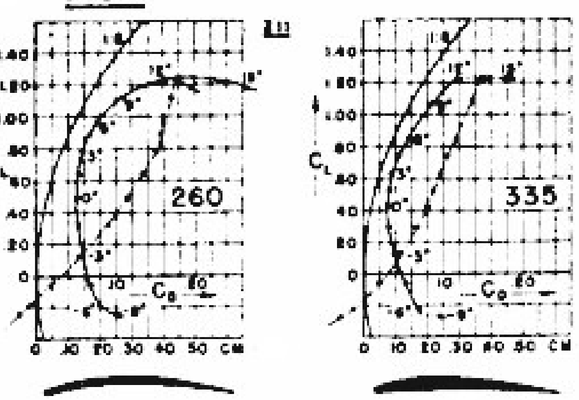


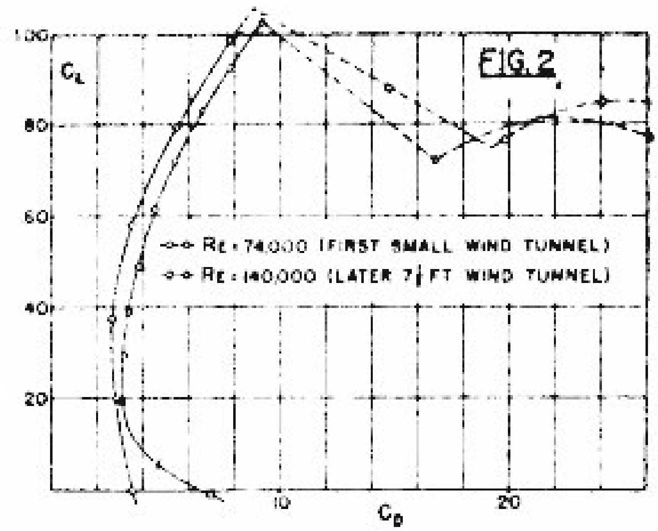
Lippisch Biplane Glider 1920
(Source: Tommy Thompson's photo collection posted on the flying plank Yahoo group.)

(ed. – This seemed appropriate since we have been looking at other work by Lippisch so far in this issue.)

DARNED GOOD AIRFOIL

FIG. 1





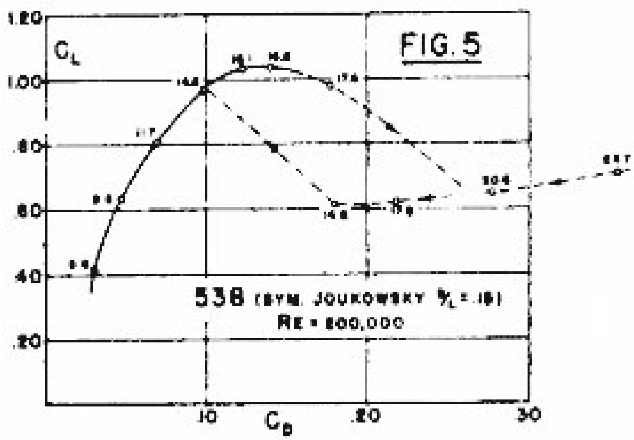
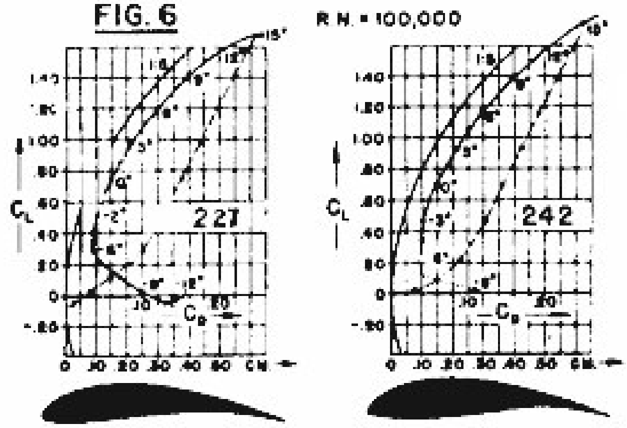


FIG. 6



Wing Sections for Model Planes Part 1

World-famous aerodynamicist, designer of the ME-163, presents his researches in the field of model airfoils

By Dr. Alexander M. Lippisch

THE skilled model designer, whose aim it is to build models of high aerodynamic quality, will always find that even the most accurately constructed models do not attain the performance of the corresponding full-scale aircraft.

We know that this "scale effect" is due to the fact that the friction drag coefficient (C_{F}) is decidedly higher at the low Reynolds' numbers of the flying models, and that in addition the low RN range shows an earlier separation of the boundary layer. This phenomenon, which has been proved by wind tunnel measurements, exercises its influence mainly on the characteristics of the wing and the wing sections.

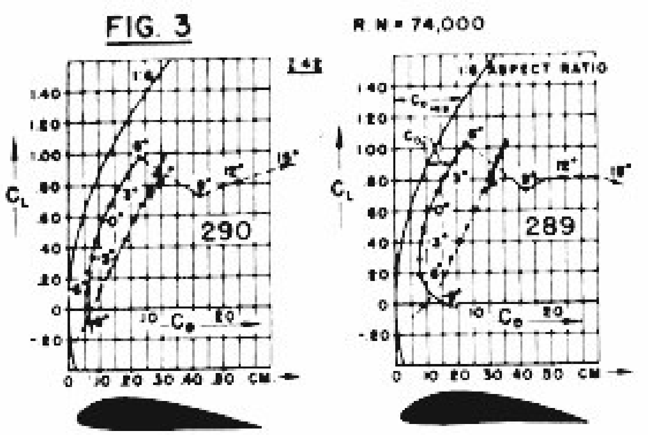
You may ask what the Reynolds' number means. The law of similarity for fluid motion, discovered by Osborne Reynolds, states that two flow conditions (for instance the flow around wing sections) are similar if the Reynolds' numbers of the two tests are the same. The RN is calculated by forming the product of a characteristic length —say the chord length—and the velocity of the flow and dividing by the kinematic viscosity of the fluid:

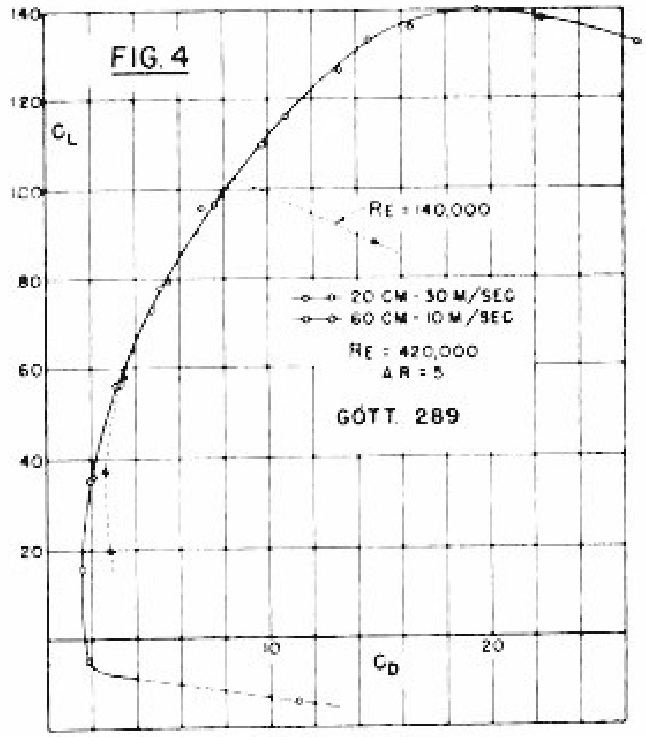
$$RN = \frac{V \times L}{\upsilon} \left(\frac{\text{velocity x length}}{\text{kin. viscosity}}\right)$$

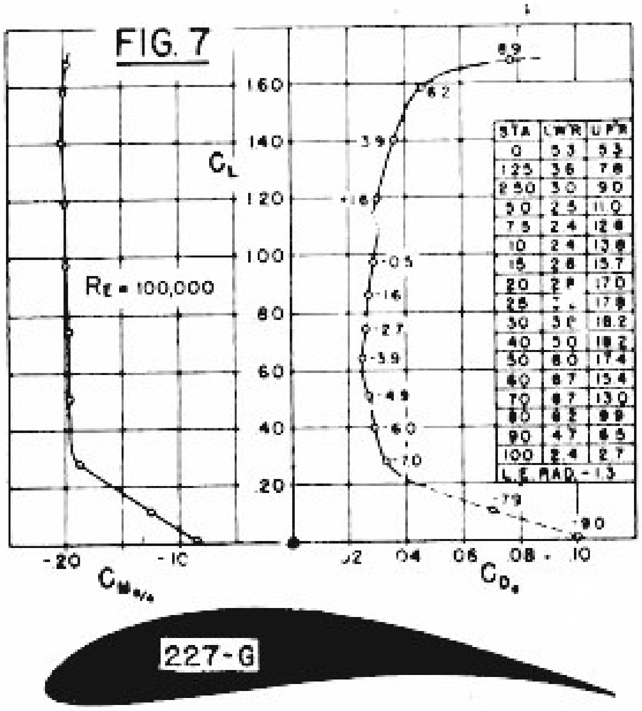
That means that two tests carried out in two different fluids—for instance, air and water—can be compared if we consider the different values of the kinematic viscosity.

The Reynolds' law of similarity is essentially important if we apply test results from wind tunnels to

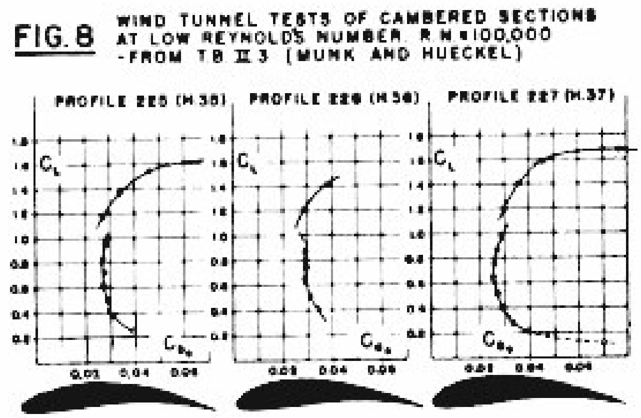
presented by AIR TRAILS PICTORIAL







STA	LWR	UPR
0	53	53
125	36	78
250	30	90
50	25	11.0
75	24	128
10	24	138
15	28	15.7
20	[illegible]	170
25	[illegible]	178
30	[illegible]	18.2
40	50	182
50	80	174
60	87	154
70	87	130
80	82	99
90	47	65
100	2.4	27
L.E. RAD - 1.3		



flight conditions, and we can only expect to obtain the same performance if the RN of the wind tunnel test and the RN of the free flight condition are the same. Since this condition cannot always be realized completely, the influence of the RN—let's call it the aerodynamic scale—was carefully investigated and it was found that the similarity is not seriously affected if the RN of the flight condition is somewhat larger than the test RN.

As we know that the friction coefficient usually decreases with increasing RN, we may get something better than indicated by the wind tunnel test. But if we apply a test result to the flight conditions of a flying model where the RN is considerably smaller than at the test, we will get something completely different and unfavorably lower in performance. At low RN flow conditions, the flow character can change so much that two different sections will give reversed performance, profile A being much better than profile B at an RN of 3×10^4 and profile B being much better than profile A at an RN of 1×10^5.

To calculate the RN for air at standard (sea) level, multiply the chord length in inches by flight speed in miles per hour and take then 800 times this product. For instance, take this as an example:

chord length = 6 inches
flight speed = 25 mph
Reynolds number = (6x25) x 800
= 120,000
= 1.2×10^5

The wing sections which have been successfully developed for modern high-speed aircraft — as for instance the laminar flow sections—are not favorable if you use these special high RN sections for your models. But even the wing sections of the full-scale gliders, the RN of which is about 1,000,000, are not applicable for a glider model with an average RN lower than 100,000. *(Cont'd on page 11)*

Wing Sections

(Continued from page 4

Therefore the question arises again and again, which kind of wing sections are especially suitable for the design of flying models?

There exist some measurements of commonly used wing sections at low RNs. But these tests merely show that most of these sections have a very low performance at the model scale. While the wing sections for aircraft were especially developed for high RNs, the wing sections for flying models should be selected from tests at the low RN range. But it is clear that nowdays nobody will have the idea of starting measurements for the development of profiles for models.

So I was asked several times by my friends of the model fraternity if I could provide them with some special model sections—something that would give a glide angle of 1: "never meet again" *(infinity), or even somewhat* better.

I remembered there were some long forgotten measurements on wing sections. Why shouldn't these tests turn out to fit into the RN range of the flying models of today?

These "Measurements of Wing Sections" by *Dr. Max Munk* (who later joined NACA) and Ernst Hueckel present the tests *carried out in the first* small wind tunnel at the Prandtl Institute at *Goettingen, Germany,* during the years of the First World War. They were *printed in* the 'Technische Berichte der Flugzeugmeisterei Adlershof (TB)." *(Technical Reports of Air Material Center, Adlershof, Vols. I and II),* which were under selected distribution. Most of the reports were published later *in a revised form. But the measure*ments of the wing sections were com*pletely forgotten because the RN of* these tests was so small there was no *further full-scale* interest in them.

So I unearthed these reports on the old wing sections, and what interesting material they represented! The measurements were made at RNs of 74,000 and 100,000 with rectangular wings of 72 x 12 cm or 80 x 16 cm at a wind velocity of about 9 m/sec (q=5 kg/sq. m.), which means chords of 4¾ in. and 6¼ in. at 20 mph.

Fig. 1 shows you two of these polar curves. Section 280 is like the airfoils used in the early days of aviation and the section 335 was used on the *biplanes* in World War I.

The curve with the angles of attack plotted along the points measured, indicates the polar curve, that means the function between C_L (lift coefficient) and C_D (drag coefficient). The dotted line illustrates C_M, the moment coefficient (related here to the leading edge point on the chord) as a function of C_L. At any point the ratio C_M/C_L gives the position of the center of pressure point in fractions of the chord. (For instance, for #335 at 6° C_M =0.29; C_L=0.85; C_M/C_L=0.34 giving the C. P. position at 0.34 *chord* from leading edge.)

The parabolic curve through the origin point gives the induced drag for the aspect ratio of the wing measured (here A. R.=1:6). The horizontal distance between the parabola and the polar curve is the section drag coefficient—the drag coefficient for infinite A. R.

You see by comparing these two sections that the thin cambered plate has lower performance than the somewhat thicker but arched section because the #335 polar is nearer to the induced drag parabola than the polar of the curved plate.

To find out how closely these early measurements would correspond to some later tests in larger wind tunnels, I compared the results given with a recent test at low RN in the 7¼ ft wind tunnel of the Goettingen Institute. Fig. 2 illustrates this comparison and we can see that even the special kind of stalling characteristic closely corresponds with the earlier test. The difference of the C_D is due to the difference in RN, the latter test having been made at twice the RN of the test in the smaller tunnel.

The section used was *#289* and *Fig.* 3 shows the measurements of two thicker sections, #289 and #290 of this usual type of profiles.

First of all you see in both cases the abrupt breakdown of lift at about C_L=1.0 and *6° angle of attack. I show* you only these two examples but there *are many of the same kind indicating* that the usual flat cambered thick sections have a low $C_{L\,max}$ at the smaller RNs.

This unfavorable behavior is caused by the fact that the flow on the nose part of the upper surface is laminar and that, since the laminar flow is very unstable, it breaks down at the point where the decrease of the local velocity egins. The separation from the upper surface is then so pronounced that recovery can never be established. At higher RNs such sections have usually pretty good characteristics as shown by the measurements of #289 at RN= 4.2x10⁶ (Fig. 4). The two different measurements made with a smaller wing and higher speed and a larger wing with smaller speed are in agree*ment and prove the fact that we cannot select a good model wing section from tests at higher RNs.*

These stalling characteristics of the usual-shaped sections cause most of the troubles you may have with *your model.* This becomes apparent if you have a glider model with such a section and the model enters a strong thermal. The *sudden increase of angle of attack* reaches the critical point and the sud*den breakdown of the lift causes a dive.* Now speed increases and angle of attack decreases, which leads to a recovery of the lift. The model begins to *climb again and the same oscillating* movement happens in a stronger way *and may in the end bring the model* into such a stalling position that a spin *or even a loop is produced by this in*stability.

We must realize that when going down with the angle of attack from a stalling position, as for instance the 9° point of the #289 section, we have to go back along the recovery polar which *is illustrated by* Fig. 5, taken from another test showing similar behavior. The curve shows the results of a test where the angle of attack of the wing was increased above stalling and then decreased while still stalling. Several tests show that two branches of the polar curve can be measured—the usual one from smooth conditions up to the stalling point and further, and the recovery branch from complete stalling down to smooth conditions again. The upward branch may show a more continuous change in lift and drag, if you have a good section, but the recovery branch has usually a sudden change from stall to perfect flow at nearly the same angle of attack. So now, when your plane is diving after being stalled, a sudden change in lift will occur and the abrupt increase of the lift forces will bring a considerable upward acceleration. This unbalanced lift increase causes steeper climb.

You may say that there is a hysteresis effect at the stalling point and you can measure two or even three different angles of attack at the same lift coefficient but at different flow conditions. If this hysteresis effect happens at lower angles of attack you will have great difficulty in bringing your model to a steady flight condition. To avoid all these troubles we have to change the type of wing section.

Two sections of considerable high performance in the low RN range are sections #227 and #242. Fig. 6 presents the original measurements. These sections are especially suitable for glider models or larger powered models carrying high load. The $C_{L\,max}$ of nearly 1.80 *makes the models almost stall*proof, and the performance at aspect ratios above 1:8 *is remarkable.*

It would not be *of very much use to my friends if I would only show the* original test results. What we need for *a real evaluation of a certain section* are the absolute values of the coefficients *and the ordinates of the section* to plot it.

By absolute characteristics I mean the the coefficients converted to infinite aspect *ratio. From these values you* can easily calculate any wing if you add the *individual induced drag for the* aspect ratio of the wing you will design.

The slope of the absolute polar curve shows much more clearly what really *happens at the different lift conditions.* Most of the modern wind tunnel results *are presented in this way.*

The angle of attack is also converted into the absolute value and indicates here the direction of the flow in the *neighborhood of the wing and not at* far-off conditions. To obtain the angle of attack for any given AR we have to add the induced angle of attack to the value shown on the absolute polar. (We will calculate an example later, that *you may see how it works.)*

The absolute values for section #227 are shown in Fig. 7. On the right hand you see the polar curve, C_{D_0} as a function of C_L. On the left hand you have the moment coefficient related here to the ¼ chord point.

If you take now $C_{M\,c/4}/C_L$ the value indicates the distance in fractions of *the chord length from the ¼ chord* point backward (if negative). I chose the *¼ chord point because it is near* to the theoretical focus of the section and *the* $C_{M\,c/4}$ *values are then nearly* constant. Below is a larger drawing of the section and on the *right hand* you find the ordinates given for a chord length of 100 parts. *The ordinates of* most of the sections I evaluated were *not counted from the chord which* touches the section from underneath. The reason was a practical one because there are no ordinates given in the original report and to get the values as exactly as possible from the enlarged pictures of the sections *I* measured from a line farther below, which could be drawn with better accuracy.

You can see that this evaluation and research were quite a job and in order to select the best sections from some two hundred many of them had to be converted, plotted and compared until I could see which were the best. What we see is of even greater interest than I had expected. Let us go along the *polar of the section #227*.

At the larger negative angles of attack or at low lift coefficients we have stalling on the lower surface due to its camber. At about 7° or $C_L = 0.2$ the "sane" flow condition begins to establish and the drag coefficient C_{D_0} decreases *slowly. At $C_L = 0.8$ the minimum drag* is attained and the flat peak in this region indicates that also at this low RN we have a small laminar flow effect! You can see that faint swelling in the $C_{D\ minimum}$ region. This is characteristic of the selected family of airfoils and sometimes the laminar bump is really pronounced.

You may say that the $C_{D\ min}$ is much too large for being laminar flow, but remember first that we are working with a RN = 1 x 10⁵ and that there can only be a fraction of the whole surface at laminar flow conditions. When we proceed now to higher lift conditions something much more surprising happens. At zero angle of attack or $C_L = 1.0$ just in the region where the #289 and #290 section types had the complete breakdown, we can clearly observe a sudden change in the drag to some smaller value. The polar curve is shifted to the left by about ¼ of the C_D value. *When I first drew the polar curve along* the points plotted I could not get a smooth curve through the points and I ...red an error in the calculations. But I had been right. I checked some other measurements of similar sections and they turned out to have the same discontinuity as you can see on Fig. 8 which illustrates the results of three of the cambered sections. Sometime later I was looking at some recent wind tunnel tests and I found that this discontinuity of the section drag coefficient appeared in many different tests even in the higher RN range.

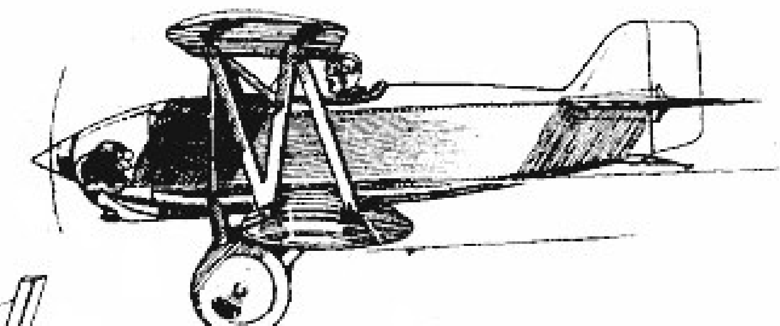
The question arises, what flow effect causes this most favorable decrease in drag? I think there is only one answer, and that is a considerable increase of the laminar flow range on the lower surface of the wing. At the larger angles of attack we have on the lower surface a continuous decrease of pressure or increase of velocity. This flow condition has a stabilizing effect on the boundary layer, so that a more extended laminar flow along this surface is produced. By these means the drag decreases to a lower value and the point where this happens is usually also the point of the absolute maximum of L/D, in respect to C_L/C_{D_i}. In the low RN range the discontinuity is more pronounced and we therefore get pretty high values of the absolute L/D, being sometimes even better than in the higher RN region!

I will not go too far into the physical background of this effect, but it is most important for us to realize that the lower surface is the "sacred surface" on the wing of a model (or even a glider). To get this high performance point of L/D and sinking speed, you have to keep the lower surface as clean as possible and so smooth that "even a fly would break a leg on this slick polished slide."

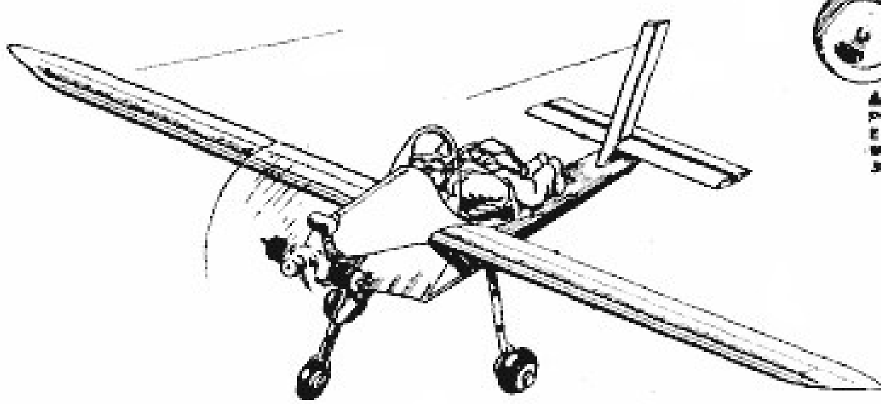
It is interesting to mention that the profiles showing this effect have almost an "undercamber," as they call it. The sections with a straight lower surface as the Clark Y types do not have such a pronounced discontinuity effect. That means that the velocity distribution should have a certain shape. This could be investigated more theoretically. For the model designer it is sufficient to know what he can expect and how to get it.

This is the first of two articles by Dr. Lippisch on wing sections for models.

WANTED: ideas, happenings, hints/kinks, how-to sketches, photos, news, etc.



▲ MINIATURE PERFECTION! THE LITTLE POWELL RACER PRODUCED IN 1924 WAS AN EXCELLENT SMALL AIRPLANE WITH A 15'-9" WING SPREAD, ALL-PLYWOOD FUSELAGE AND 32 H.P. BRISTOL CHERUB AIRCRAFT ENGINE



◄ THE WEE BEE WITH PRONE PILOT POSITION TRICYCLE LANDING GEAR AND METAL CONSTRUCTION IS ONE OF THE REAL NOVELTIES OF RECENT APPEARANCE IN THE ULTRA-SMALL CLASS AIRPLANE FIELD

Nurflugel Bulletin Board Threads

Just finished a new page about the Horten HIVa. I just wonder if my point of view about the HIIIf spar is right. Is it a box construction out of tubes in triangle connection? All I have as reference is the single picture inside NURFLUGEL book and I think to see it that way. Right?

http://www.nestofdragons.net/weird-airplanes/flying-wings/horten-flying-wings/horten-hiva/

This guy restores airplanes for others. But this is his own project. A Horten for himself. The weight is higher of course. But that makes the penetration speed higher too. Good for competition????

Keep that brain spawning wings,

Koen Van de Kerckhove

Hello Koen,

Sascha Haeuser did the biggest part building this Horten IV and he did a great job, but please allow a correction. It is not his own project and is not for himself. The project starts about 10 years ago as an idea of Prof. Dipl.-Ing. Bernd Ewald (Technical University of Darmstadt) after meeting Chris Wills, the founder of the Vintage Glider Club. Ewald build some small parts while he was searching for support. The tubular center section was made by apprentices of Lufthansa Technik at Hamburg, the Akademische Fliegergruppe Darmstadt build the main wing spars and all the ribs are made by apprentices of the DLR Braunschweig. Owner is the Felix Kracht Stiftung (Hessisches Institut fuer Luftfahrt).

On August 29th the freshly painted and nearly finished Horten IV was christened at the German Glider Museum Wasserkuppe to honor Heinz Scheidhauer. If you like to see my pictures go to the following link:

http://pozefilm.multiply.com/photos/album/14/Horten-Ho-IV

Manfred

Hi Manfred,

Does it means that the HIV will not fly? This will be very sad. It would be so great to have a detailed account of the flying characteristics and its performance. I know that there were at least two measurements before with original gliders but it would be fantastic to submit this superbly finished glider to the Idaflieg.

Cheers,

Mario

The German Glider Museum Wasserkuppe was only the location for christening and not the final home of the H IV. This H IV is build to fly and it will fly. If everything is going well, the first flight will be within the next few weeks.

Manfred

I would like to submit my best wishes for the maiden flight of this beautiful rebuilt! I hope everything goes well!

Does anyone know if there are blueprints or other scale drawings of the H IV openly available which could be used to create a detailed scale model (not RC but smaller, perhaps a paper model kit) of this glider?

Best regards,

Thorsten

I sincerely hope that those in charge of this beautiful glider measure its performance and report on its handling. It would be useful to get an up to date view of its capabilities. Most important of all is the choice of who is going to fly it? I don't think there is anyone left alive who could adequately brief that person. Perhaps an Akaflieg Darmstadt test pilot would be suitable?

It is a pity that Chris Wills is not alive to see this. He expressed his doubts to me about it ever appearing and the choice of who would fly it not long before he died.

Above all, when can I have one? Please mister!

Chris Bryant

I will second Chris' sentiments on the new HIVa! I recall that there was talk of the Raspet group's Horten IV no longer having the control sequencing originally designed into that sailplane, with a resultant lower performance than originally claimed. So I'm interested in whether the elevons are as originally designed and then what actual data comes from these tests. With GPS and other techniques, it would be wonderful finally to know the original Horten's true potential.

Serge Krauss

More than that, Serge, the centre section/pilot cover was altered by Raspet's group to the apparent detriment of performance. Also, I believe that the control geometry was adjustable on most Hortens so there should be plenty to play with if the original design was followed. Let's hope that the German group responsible does test it successfully and safely.

Chris Bryant

Casually browsing at work (doing wirings 8-10 hours long a day, kind of boring) stumbled a report about this not so well known bird. *(right)*

Popular mechanics report (the link shortened, for the mail)

http://bit.ly/SEM86W

After some casual Googling, found the designer Gilbert E. Davis recollections:

http://www.leongoodman.com/wing/early1.html

Happy flying!

Mark Balogh
Hungary

Imagine my surprise when I saw Bill Moyes reply to my email. Man, I was going to interview a legend. Shaky knees.

The talk was about 45 minutes. And it had a lot of new info. I made a page about it on my site.

http://nestofdragons.net/weird-airplanes/flying-wings/horten-flying-wings/horten-hxc-moyes/

I got in contact with Rolf Markman, one of the guys who actually build it, but it will take some time before I can add that info too. Anyway ...I will inform the group if any new info arises.

Enjoy the new page.

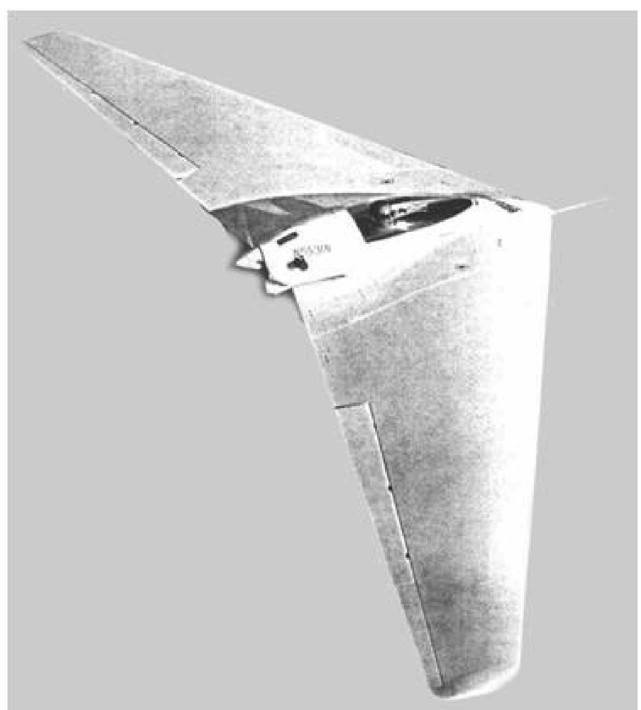
Keep that brain spawning wings,

Koen

Thank you, Koen--

History is important but if it isn't accessible we can't learn from it. You're doing more than most other denizens of the Internet to contribute to its growth and usefulness.

Norm Masters



The Starship Alpha

AVAILABLE PLANS & REFERENCE MATERIAL

Tailless Aircraft Bibliography

My book containing several thousand annotated entries and appendices listing well over three hundred tailless designers/creators and their aircraft is no longer in print. I expect *eventually* to make available on disc a fairly comprehensive annotated and perhaps illustrated listing of pre-21st century tailless and related-interest aircraft documents in PDF format. Meanwhile, I will continue to provide information from my files to serious researchers. I'm sorry for the continuing delay, but life happens.

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Books by Bruce Carmichael:
Personal Aircraft Drag Reduction: $30 pp + $17 postage outside USA: Low drag R&D history, laminar aircraft design, 300 mph on 100 hp.
Ultralight & Light Self Launching Sailplanes: $20 pp: 23 ultralights, 16 lights, 18 sustainer engines, 56 self launch engines, history, safety, prop drag reduction, performance.
Collected Sailplane Articles & Soaring Mishaps: $30 pp: 72 articles incl. 6 misadventures, future predictions, ULSP, dynamic soaring, 20 years SHA workshop.
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Capistrano Beach, CA 92624 (949) 496-5191

VIDEOS AND AUDIO TAPES

(ed. – These videos are also now available on DVD, at the buyer's choice.)

VHS tape containing First Flights "Flying Wings," Discovery Channel's The Wing Will Fly, and ME-163, SWIFT flight footage, Paragliding, and other miscellaneous items (approximately 3½+ hours of material).
Cost: $8.00 postage paid
Add: $2.00 for foreign postage

VHS tape of Al Bowers' September 19, 1998 presentation on "The Horten H X Series: Ultra Light Flying Wing Sailplanes." The package includes Al's 20 pages of slides so you won't have to squint at the TV screen trying to read what he is explaining. This was an excellent presentation covering Horten history and an analysis of bell and elliptical lift distributions.
Cost: $10.00 postage paid
Add: $ 2.00 for foreign postage

VHS tape of July 15, 2000 presentation by Stefanie Brochocki on the design history of the BKB-1 (Brochocki,Kasper,Bodek) as related by her father Stefan. The second part of this program was conducted by Henry Jex on the design and flights of the radio controlled Quetzalcoatlus northropi (pterodactyl) used in the Smithsonian IMAX film. This was an Aerovironment project led by Dr. Paul MacCready.
Cost: $8.00 postage paid
Add: $2.00 for foreign postage

An Overview of Composite Design Properties, by Alex Kozloff, as presented at the TWITT Meeting 3/19/94. Includes pamphlet of charts and graphs on composite characteristics, and audio cassette tape of Alex's presentation explaining the material.
Cost: $5.00 postage paid
Add: $1.50 for foreign postage

VHS of Paul MacCready's presentation on March 21,1998, covering his experiences with flying wings and how flying wings occur in nature. Tape includes Aerovironment's "Doing More With Much Less", and the presentations by Rudy Opitz, Dez George-Falvy and Jim Marske at the 1997 Flying Wing Symposiums at Harris Hill, plus some other miscellaneous "stuff".
Cost: $8.00 postage paid in US
Add: $2.00 for foreign postage

VHS of Robert Hoey's presentation on November 20, 1999, covering his group's experimentation with radio controlled bird models being used to explore the control and performance parameters of birds. Tape comes with a complete set of the overhead slides used in the presentation.
Cost : $10.00 postage paid in US
$15.00 foreign orders

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