No. 293 NOVEMBER 2010

T.W.I.T.T. NEWSLETTER

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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., **1011** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, November 20, 2010, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row at 1720 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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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

This issue will start the presentation of a 1947 paper by A.R. Weyl on "Stalling Phenomena of Tailless Aircraft". This is a very long paper so I will be including parts in future newsletters depending on the space available. The rest of this issue is a mix of full size and model information so we are covering the interests of a majority of the membership.

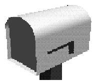
As noted in the letters section someone has inquired about one of Jerry Blumenthal's designs for an R/C model. This is great and hopefully he will see the project through with the limited views that are available. I look forward to seeing some pictures and perhaps get a short article for a future issue.

Now that we are going into the winter months, perhaps some of you can take a little time from building and send us something about the project you are working on. If you aren't working on a project but have some historic information or would like to ask a question, I encourage you to write or e-mail me so I can share it with the rest of our members.

I think the lack of some constructive dialog over the past year has been part of the reason we are also seeing a decline in membership. We have lost almost 10 members and if a large group now coming due don't renew, we will shrink even more. This won't stop production of the newsletter but it will mean fewer resources to provide material that could be of interest to everyone.

PLEASE CONTRIBUTE

Andy



LETTERS TO THE EDITOR

October 7, 2010

Hello 'The Wing Is The Thing'.

On your 'literature' Web Page : (http://www.twitt.org/commads.htm#nurflugel) you show a listing for the Horten book 'Nurflugel'.

I am writing to let you know that the book is out-of-print and not available from the gentleman listed.

I tried sending an e-mail to the gentleman shown as providing the book ('Scott' on Lutheran Church Road in Lovettsville, Virginia) and when the message 'bounced' I did a phone number search and found his number.

I phoned Mr. Scott and explained why I was calling. Mr. Scott said that the book has been out-of-print for several years and that he did not have any copies (he explained that it was he who had provided the translation).

I suggested to Mr. Scott that he contact you and request that the entry be removed from the TWITT Web Page and in reply Mr. Scott asked "Can you do that?"

So now I must continue my search for a copy of the Horten book ....

Sincerely;

Paul N. Nix
2845 Laurel Oaks Drive
Garland, Texas 75044
paul_nix@ticnet.com

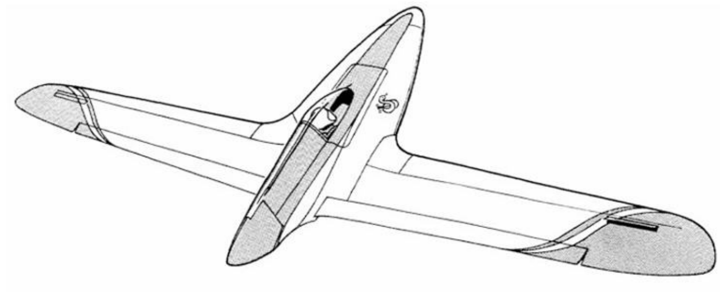
(ed. - I seem to recall this came up once before a long time ago and I probably should have removed the ad from the web site. It has now been deleted, although it is a shame that the book in English is no longer available. I guess the only way to find one will be to keep an eye open on E-Bay to see if someone has their copy for sale.)

October 10. 2010

Hi, I am interested in building the Rattler. Is the drawing on the page the only one available? I suppose I can extrapolate the size from that but I'm not too good at it. Do you have any further information on it?

Regards,

Ryan Flowers
geocrasher@gmail.com



(ed. – Here is the design from Jerry Blumenthal being referred too. You can see more of Jerry's designs at: http://www.twitt.org/BLUMENTHAL.htm - JERRYDREAMS*.*

I responded with: " It was unfortunate that Jerry passed away before he could create any working drawings of his favorite designs. He was working on an RC model of one, but again wasn't making any drawings as he moved along.

Sorry we can't be of more help. We would certainly like to see what you come up with as a model, if you would be kind enough to forward any pictures when it is done."

He responded with: "Indeed I will! It will not be a 100% faithful reproduction, as my building skills and supplies are limited, but it will be an obvious model of it. Thanks a bunch!")

October 11, 2010

I am trying to find someone who has flown a Kasperwing. I weigh 245 lbs and wanted know if this is a good design or are there other designs I should consider.

My goals are low and slow with short take off and landing. I live in Indiana 650' above sea level.

Also do you have a contact telephone number where I could reach you?

Jerry Reed 812-360-6000
Jerrybreed@aol.com

(ed. – I have no way of answering this question for Jerry so if anyone out there who has some knowledge in this are could please give him a call, I am sure he would appreciate it.)

This paper was published in THE AEROPLANE dated APRIL 25, 1947.

AERONAUTICAL ENGINEERING

Stalling Phenomena and the Tailless Aeroplane, Part 1
By A. R. Weyl, A.F.R.Ae.S.

Forward: The tailless layout was one of the earliest adopted for aircraft and from time to time in the post, designs have been produced with varying degrees of success. Now, with the advent of very high-speed aircraft, much more attention is being paid to the tailless arrangement and to the associated aerodynamic problems, which are being closely investigated. by no means the least of the problems to be examined is the very vital question of the behavior of these aircraft at the stall with all the attendant stability and control problems under such flight conditions as indicated in Sgdn. Ldr, Kronfeld's article on test flying tailless aircraft (April 11). With this in mind, we feel that a detailed account of the stalling phenomena, with particular reference to their relation to the tailless aircraft, would prove both timely and instructive. We present here the first part of a comprehensive article on this very important subject.

IN A BROAD SENSE, stall means the breakdown of the lift1producing airflow over the wing of an aeroplane. Generally, with tailless aircraft, a breakdown of the orderly flow over the wing has far greater consequences for stability, control and trim than those brought about by stalling phenomena on conventional aeroplanes. Moreover, common forms of tailless aeroplanes are more prone to exhibit certain types of flow separation than normal aircraft.

There are two kinds of such breakdown phenomena known as the high incidence " stall and the " compressibility stall." Of these, the former occurs at high angles of incidence when the boundary layer is unable to follow the aerofoil contour to the trailing edge; it separates from the wing surface and causes a disruption of the circulatory flow about the wing. The latter type of stall occurs at very high speeds of flight when compressibility (shock) waves are formed at the wing. They, too, cause separation of the boundary layer from the wing surface, with subsequent breakdown of the orderly lift generating flow.

Contrary to a frequent erroneous belief, the high-incidence stall may take place at any speed of flight. The compressibility stall is restricted to air speeds which exceed the critical Mach Number, i.e., to a particular speed appropriate to the wing system and to the temperature of the atmosphere in which the aeroplane flies (minor influences of the air, such as moisture, etc., are neglected).

The following discussion of stalling phenomena treats both categories of stall separately, although aerodynamically, they have a number of characteristics, both causes and consequences, in common.

The High Incidence Stall

Not every separation of the boundary laver from. Parts of a wing surface can be classified among the “stalling phenomena” defined above. So, for instance, the boundary layer may separate from heavily reflexed (stable) aerofoils at very small incidences, especially at low Reynolds Numbers. Though such a separation can have a profound influence on stability and control when flying at such incidences, it is not connected with what is understood by the pilot under "stall." Most probably it is the result of a laminar boundary layer flowing along the concave surface on the underside.

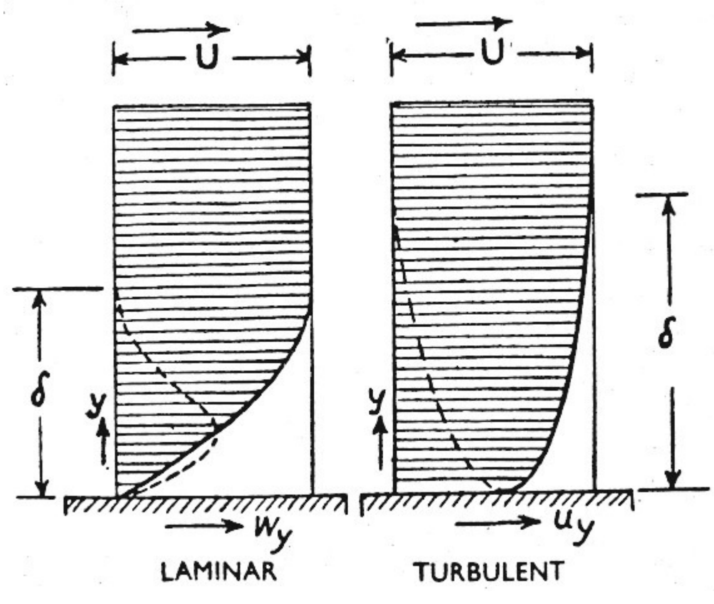


Fig. 1. Velocity profiles of a laminar and of a turbulent boundary layer. The broken curves give the momentum loss in the boundary layer; the scales of the two figures are so adjusted that their total loss of momentum is the same (according to B. M. Jones).

Another phenomenon of a similar nature is provided by a partial separation, which may take place at medium incidences far below the critical angle of incidence. This transient "front" stall, too, is probably due to the separation of a laminar boundary layer, which has become tired before transition to fully turbulent state is reached. Some way farther downstream, the laminar sub-layer which has separated from the surface forms a " transition vortex," and full turbulence develops throughout the boundary layer; particles with full flow energy are taken in from the outer fluid strata, and the energized boundary layer adheres to the wing surface again.

The phenomenon expresses itself in a discontinuous decrease of the slope of the lift curve (dCL/dα), or in a bend of the lift curve, both at medium incidences. From the point of stability and control of tailless aeroplanes, this transient “front" stall may be deemed innocuous.

Clearly shown, however, is the importance which the state or mode of the boundary layer has for all phenomena of flow separation from surfaces. Hence, for the stall, decisive factors are the flow energy and the thickness of the boundary layer, with the flow energy being paramount. The exigencies for safe stalling behavior may, moreover, not be identical with those for minimum expense in drag. This leads to intricate problems for designers of tailless aircraft.

When a boundary layer is vigorous, it will adhere to a wing surface longer when flowing against an adverse pressure gradient. A less boundary layer becomes easily stagnant and thickens, due to subsequent layers overlapping each other. The adverse pressure gradient induces backflow, a free vortex sheet is then formed in the boundary layer, and, finally, the whole layer breaks away from the surface into the undisturbed air stream, forming individual eddies. That is, the picture of the stall.

The formation of eddies indicates that the phenomenon is fluctuating. Every eddy shed means a corresponding temporary - reduction of the circulation, i.e., of the lift. There is no steady separation taking part at a defined chord station or region of the wing. Consequently, the disturbance of the regular flow and the forces produced by the latter are 'no longer independent from time. It is this, which makes the observation and recording of stalling phenomena difficult.

The boundary layer is that layer of fluid nearest to the wall, in which viscous forces are acting between the fluid and the wall, and between the fluid particles themselves. These viscous forces, the surface friction and the inner friction of the flow, dissipate the kinetic energy of the flow particles in the form of frictional heat due to shear. In a laminar boundary layer, this energy loss is least, hence the low profile drag associated with it. On the other hand, a laminar boundary layer keeps distinct from the flow stratum of undisturbed air beyond it. That is it does not exchange flow energy with this, by its nature, more vigorous stratum, except to a minute extent, which is due to action of viscosity. Thus a laminar boundary layer tires easily, because its-original flow energy is not replenished. It is, therefore, very apt to separation, and, hence, prone to stall.

A turbulent state in the boundary layer entails a constant interchange (intermingling) of flow particles with the outer, stratum of undisturbed air. Hence flow energy is continuously, transferred to such a boundary layer by transportation of momentum. Thus, although a turbulent boundary layer dissipates far more energy in internal friction (higher profile drag), it keeps more vigorous. It adheres, therefore, better to wing (or body) surfaces; a turbulent boundary layer is less liable to produce stalling phenomena when an adverse pressure gradient is reached in the flow over a lifting wing. On the other hand, when flowing along a surface, the thickness of a turbulent boundary layer grows with the 0.8 power of the chord-wise distance from the leading edge, while the thickness of a laminar boundary layer grows with the 0.5 power only.

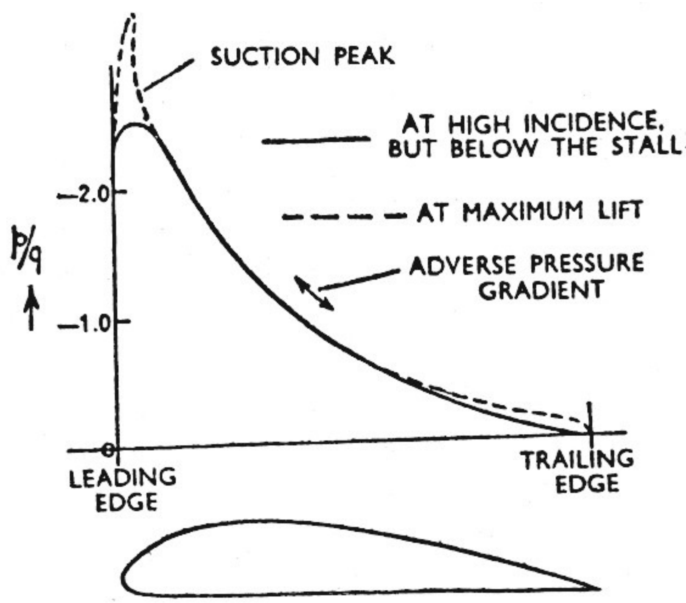


Fig. 2. Distribution of negative pressure over the upper surface of an aerofoil at high lift coefficients.

This is only a somewhat simplified, though true and experimentally verified conception. In reality, there is no fully turbulent boundary layer. As Sir Thomas Stanton found (as long ago as 1911), a minute sub-layer of the boundary layer will always retain laminar state, whatever the mode of flow in the rest of boundary layer. This sub-layer is nearest to the surface. Apparently, it can be upset by surface roughness, but it tries to reform again.

There is not yet a satisfactory explanation why in one case a laminar boundary layer thickens and then separates from the surface, whilst still being in the laminar state of flow, when an adverse pressure gradient is encountered (i.e., when the local, velocity of flow is decelerated); while, in another case, the thickened laminar boundary layer breaks down into turbulence before separating from the surface.

From experimental evidence, it is not easily seen if, and in which way, the laminar sub-stratum of the boundary layer is connected with these phenomena, since the relative surface, roughness is apparently without influence. The behavior might more likely be due to the stability of the velocity distribution (velocity "profiles") within a thickening and slowing-down boundary layer.

When the boundary layer retains its laminar state, strata of boundary-layer material seem to overlap each other in a well-ordered way, so that a velocity profile across the boundary layer is formed in which the velocity continuously increases from the surface to the upper limit of the boundary layer, i.e., to the velocity of the potential flow. In the second case, parallel strata with higher velocity may become interspersed between such of lower velocity. Such a velocity distribution through the boundary layer is unstable, and is necessarily followed by breakdown into turbulence, after formation of a vortex (the "transition vortex") in the boundary layer. When the boundary layer as a whole is decelerating, the tendency to damp out such unstable velocity distributions without breakdown of laminar flow is but small.

The stall of a wing may assume a variety of appearances, and this variety results in great differences for tailless aeroplanes in particular. First of all, one may distinguish between the incipient stall with its development in time or in incidence, and the fully developed, complete stall.

In practice, the development of the incipient stall is vital for the stability problems of normal flight. Upon it, the safety depends. It also marks the extent to which the aerodynamic qualities of the wing at high incidences can be utilized for practical flying, which is linked up with the manner in which the stall begins to spread over a wing.

The characteristics displayed by the aeroplane after a state of complete stall has been reached are essential for the stability of the flight path in stalled attitude. They decide upon the spinning (autorotation) properties. Also, they are of fundamental importance for aeroplanes, designed to fly controlled when stalled, i.e., the so-called " Safety" aeroplanes

The Incipient Stall

There is no doubt that the development of the stall when the incidence is slowly increased up to and beyond the critical angle of incidence affects the tailless aeroplane far more than any other category of winged aircraft. With the conventional (tailed) aeroplane, a separation of the flow, which sets in at the tips leads only to a loss of roll damping and to impaired control in roll. In general, it is the span wise spreading of the stall at slowly increasing incidence, which affects the conventional aeroplane. With the tailless aeroplane, the chord wise development of the flow separation is also important, and longitudinal stability, trim and control are affected by the incipient stall.

From this is seen that the following characteristics of stall development over the wing system with slowly increasing incidence will have to be taken into consideration:

(1) Span-wise spreading of the flow separation.
- (a) Origin of separation (inception of stalling phenomena, locally);
- (b) Direction of the spreading of the stall (inboard; outboard);
- (c) Rate of the spreading of the flow separation in relation to the incidence increase (incidence range of the stall development, from its inception to its travel over the entire span);
- (d) Span regions remaining unaffected by flow separation even after the critical incidence has been substantially exceeded;
- (e) Variations in the affected span regions when the incidence is retained (stall development with time).

(2) Chord-wise spreading of the flow separation.
- (a) "Front" stall;
- (b) "Rear" stall;
- (c) Rate of chord-wise progress of the flow separation when the incidence is slowly increased (incidence range of the chord wise stall development from the stall inception to its fully developed form);
- (d) Loss of lift associated with the flow separation during and after full development of the stall.

Unfortunately, experimental research has not yet progressed very far into investigating all these characteristics of the incipient stall. This is certainly not due to lack of interest in the matter, but is caused by the difficulties which are besetting the way of the experiment into non-steady flow phenomena.

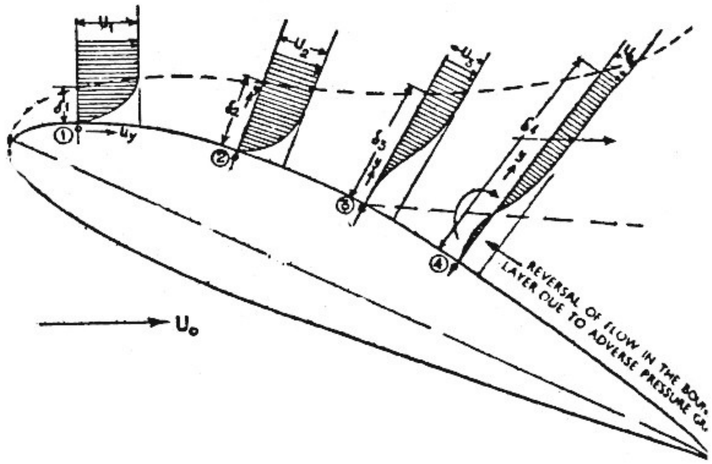


Fig. 3. SEPARATION OF A LAMINAR BOUNDARY LAYER AT THE STALL. Four velocity profiles are indicated. The dimensions of the boundary layer are grossly exaggerated for the sake of clearness.

Uo; undisturbed flow velocity.
U1, U2, etc. = local flow velocities of the potential flow at the airfoil
A=total thickness of the boundary layer.
Uy=velocity In the boundary layer at a distance y from the aerofoil surface.

The somewhat general expressions "front" stall and "rear" stall are introduced here for a short characterization of the chord wise development of the stall. Formerly it was assumed that a separation setting in not far behind the leading edge was always due to laminar state in the boundary layer and abrupt, while inception of the separation near the trailing edge and spreading forward with increase of incidence, was due to a turbulent boundary layer and resulted in a gentle stall with moderate loss of lift.

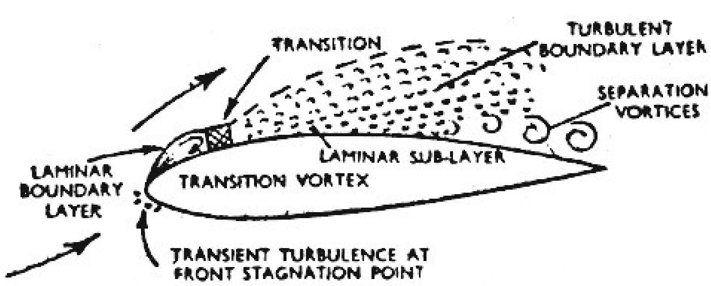


Fig. 4. The transition vortex at maximum lift.

Today, experimental evidence has modified this simple conception and the existence of other forms of the stall has become established. In order to simplify the variety, it seems best to adopt E. J. Richard's (Ref. 80)* differentiation between three distinct main forms of stall:

"A." Gentle stall at relatively low values of the maximum lift coefficient, due to laminar front separation followed by re-adherence of the boundary layer farther-along the chord. Consequently no great loss of lift is experienced beyond the stall.

"B." Abrupt stall accompanied by a sharp drop in lift, due to the complete separation of a turbulent boundary layer not far downstream of the transition point.

"C." Gentle stall with the point of turbulent boundary layer separation shifting slowly towards the leading edge; the loss of lift beyond the incidence of maximum lift is gradual.

The stall forms " A " and " B " correspond to the expression "front" stall used here, while form " C " is the rear " stall.

The difference in the stall forms "B" and "C" is, in two-dimensional flow, mainly due to the aerofoil section shape, and apparently greatly affected by the ratio between surface friction drag and form the airfoil. The section thickness is, hence, of great influence: thin aerofoil sections tend to be afflicted by the sudden turbulent form " B," while thick sections give the gentle turbulent separation form "C." The flow mechanics governing these stall differences are not yet explored; the degree to which the boundary layer breaks down into the turbulent state and the damping-out of turbulence at the stagnation point may be possible causes. For the stall forms "A." and "B," at otherwise equal conditions, the curvature of the aerofoil nose seems to be a major influence; thus aerofoils with sharp leading edges preferably give the gentle laminar stall form, and sharp-nosed thick aerofoil sections are practically free from autorotation, because of the small loss of lift beyond the stall (Ref. 81).

At low Reynolds Numbers another mixed type of very gradual stall has been observed at cambered aerofoil sections of medium thickness (Ref. 1, p. 9): a local Separation of a laminar boundary layer near the leading edge simultaneously occurring with that of a turbulent boundary layer near the trailing edge; i.e., a combination of stall form " A " with form " C,", at the inception of the stall. The separated laminar boundary layer breaks down into turbulence and re-adheres in the turbulent state farther downstream.

This stall form gives, chord-wise, two regions of flow separation, and, as a result, a complete change in the pressure distribution during the stall development. For experiments with tailless models and gliders, the consequences of this stall form are of interest.

The Spreading of the Flow Separation

When considering the particular problem of the tailless aeroplane, i.e., of a self-contained wing system, in stall, in connection with the span-wise spreading of flow separation from the wing surface, it would seem worth while investigating what a simultaneous complete stall all along the span at a particular incidence (true critical incidence) will imply. *(As far as the author has been able to make out, the first to point out that simultaneous stall all along the span would be a desirable feature for an aeroplane wing seems to have been Stanley H. Evans.)*

Flow separation means a decrease of lift over the wing region concerned; the magnitude of this decrease depends upon the chord-wise station at which the flow separates. Flow separation existing at parts of the span only, necessarily results in a distorted span-wise lift distribution, as compared with that of normal flight. With stable wing systems incorporating sweep, this distorted span-wise lift distribution greatly affects the longitudinal stability. A simultaneously occurring flow-separation all along the span will, however, not result in a span-wise lift distribution which would differ essentially from that of the unstalled normal flight.

Theoretically, the condition of simultaneous flow separation is met by a wing system of minimum induced drag; i.e., by a plain elliptical wing having the same aerofoil section and equal effective incidence all along the span. Such a wing, too, would derive the greatest value for the maximum lift. This would he the simplest wing meeting the condition of simultaneous stall.

The condition may, however also be satisfied by more complicated wing systems evolved from a span-wise lift distribution where the effective incidence of maximum section lift is reached simultaneous at one defined attitude of the wing. For other than plain elliptical wings, this entails a wing twist or a corresponding variation of the aerofoil sections along the span. In such cases, however, the induced drag is invariably increased, and it does not become zero when the wing as a whole is at incidence of zero lift. Moreover, there is always a torsional load on the wing structure.

For any such wing system, the lift distribution remaining when the stall has simultaneously occurred all along the span depends on the progress of the flow separation is the chord wise direction. The extent and the rate of this progress greatly depends on the qualities of the airfoil sections employed. When the wing embodies a change in the aerofoil sections along the span, these qualities will not be uniform at all span-wise stations. Hence, although the critical incidences of the section lifts will be reached all along the span at the same wing incidence, it does not necessarily follow that the lift distribution at the stall will be similar in shape (though reduced in magnitude) to that at incidences below the stall.

(To be continued)

(ed. – This is a multi part paper by Weyl so I will include at least a part each month (room permitting).

SECOND TIME LUCKY. Howard Hughes takes off in the second of his XF-11 high-altitude photographic-reconnaissance aircraft. The first, a similar aircraft to the one shown here, had one of its airscrews reverse pitch not long after takeoff on its Initial flight trials. Hughes was flying it and has not long recovered from the serious injuries he sustained in the ensuing crash.

NURFLUGEL BULLETIN BOARD THREADS

There is an article regarding the Ho 229 stealth myth in the new Flugzeug Revue. The Author writes, that according to interrogation reports in 1945/1946 Reimar claimed that the Ho 229 was constructed for minimal radar reflections. I have not seen those interrogation reports yet, so I wonder if this is true. Does anyone know these interrogation reports? Reimar first mentioned anti radar in the 1982/1983 interviews with David Myhra.

Did Reimar ever mention graphite? In the Myhra interviews he only mentioned a coal/glue mixture not graphite.

Maik Swoboda
ErzwoD2@hotmail.com

I still find it difficult to believe that the Ho 229 was designed solely to elude radar, but then again, I would love to see those interrogation reports myself. It was designed as a fighter jet based on the all-wing platform. You all know this! The fact of the matter is that the radar concept was still in its infancy, to say nothing about stealth design. Now, it is a fact that an all-wing aircraft inherently has a low RCS, but the guys at Northrop found that out by accident back in the early 1950's when they had some troubles tracking the YB-49 on radar during test flights.

I'm one of the biggest Horten aircraft fans out there. After all, I am a distant relative of them! Let's face the cold hard truth of the matter; the Lockheed-Martin Have Blue XST was the first true, purpose-designed anti-radar stealth aircraft.

Brian
cbl2799@yahoo.com

I am always amazed by the aircraft from these brothers but am increasingly coming to the conclusion that in later life they appeared to re-interpret history to enhance their undoubted skill and invention in development of tailless aircraft.

I can see that history did not treat them very well but there are three areas where the history appears to be being bent to increase prestige in their later life:

1. The bell shaped lift distribution (not actually used in many Horten airframes).
2. Stealth as a design point in the HoIX/229 (radar reflection).
3. Stealth material within the HoIX/229 due to the design need (radar absorption).

Reading through the book 'Horten Ho229 "Spirit of Thuringia": The Luftwaffe's All-wing Jet Fighter' by Andrei Shepelev and Huib Ottens the genius of the Hortens is clear - but they set out fairly clear and logical reasoning to point out that the three areas of 'claim' set out above appear to have been rather after the fact pasted over the reality to add to the claims of the Hortens.

Don't get me wrong, they were brilliant and obsessive in their pursuit of an ideal they had of an all wing aircraft being the best solution for what they were tasked with or decided to build.

The world needs brilliant and obsessed individuals and it's the ordinary Joe like me that sits on the sidelines admiring what they do.

NB - I have read everything I can get my hands on in English on the Hortens and the work they did including the book by Karl Nickel and flight reports etc. plus some of the German materials (my translation skills are dreadful). My views of the Hortens 'improving' history in later life is not based solely on the Sheplev and Ottens books mentioned but on the entire history I have read. They were humans and they did not receive the recognition they deserved during their life, especially the period after the war.

Cheers.

Kirk Sutton
sutton_ka@hotmail.com

Here is a site with a description and photos of the amazing Air Force B-2 bomber - it's incredible.

(http://www.richard-seaman.com/Aircraft/AirShows/Edwards2005/B2/)

(ed. – I think I have published this link in the past since it covers the 2005 Edwards AFB Air Show, but it is worth looking at again.)

Dick Whitcomb passed away today...

Each of Whitcomb's great innovations for aircraft reduced a different kind of drag.

Winglets - reduced induced drag.

Supercritical airfoils - reduced profile drag.

Area rule - reduced wave drag.

The only person who came close to touching him in the last half of the 20th Century was RT Jones. RT is generally credited with development of the swept wing (in parallel and independent of Busemann), optimizing span load for the bell shape (in parallel and independent of Prandtl and Horten), and the oblique wing.

Brilliant men, both of them...

Godspeed Dr Whitcomb...

Al Bowers
Albion.H.Bowers@nasa.gov

Hi Al and all,

Maybe I'm just the late one here, Al, but I've just been surprised by your appearance on the "Warplane" Nat Geo series. Glad to meet you!

Besides your participation, I liked the overall shape of the show. Good graphics and footage. And most importantly honest for the general public (i.e. not inventing "truths").

Cheers,

Andre Martins
kriptone@gmail.com

Thanks for the kind words. They help greatly, as I have been struggling with the direction my career has been going the last 2 years.

The only two rays of hope I have are: 1/ I am still allowed to make presentations to interns & students (these kids are so sharp today, I am glad I don't have to compete against them), and 2/ I am the project manager for a small experiment to achieve laminar flow control on 30 degree swept wings at full scale Reynolds numbers at 0.7 Mach on a transport. The current state of the art cannot achieve laminar flow runs on the wings of airliners. When 787 flies, it will achieve the state of the art laminar flow of 0% on the wings (Boeing makes no claims for low drag laminar flow on the wings). We are hoping to achieve 30% laminar flow, upper surface. We have Bill Saric & Helen Reed as our "swept wing laminar flow" experts and they have had some success in wind tunnels for about a decade. But until last year they hadn't been able to make the laminar flow work in-flight. In fact I was an unbeliever. Until I saw Bill's data. Now I think he can do it, and I want to help him make it happen. Bill has proposed to do this with our funding for a very low price on a small glove on part of the wing. I would rather NASA do this on a complete wing (we are thinking a Gulfstream, with a glove that runs from winglet-to-winglet), but the NASA proposal is considerably more costly. We will see which idea the budget can support.

The Warplanes guys were a class act. It didn't hurt that they came in with their slight British "chip on the shoulder" against us "yanks". But in the end, I think they were just a little impressed that we usually knew what we were doing and why. I would be happy to work with them again.

Best regards,

Al

Hi, Group-

I have been playing around with MAC's - really MGC's (mean geometric chord) - deriving the MGC length and its span wise position for general elliptical wings from the integral definitions. Using Cr for root chord and b for the half-span, I found the MGC to be 8Cr/(3 pi) = about .85Cr, located at a distance d = 4b/(3 pi), or about 42.4% of the half-span, from the root. I soon discovered, assuming no mistakes, that the chord at this distance is greater than the MGC, and the chord equal in length to the MGC is located about 53% of the half-span out. I think that my MGC and d values are correct. Have I erred? If not, I need to ask...

How does one position the MGC chord wise, in order to locate the fore/aft position of the neutral point at the computed span wise location?

My values seem to agree with what I've found elsewhere, although the internet is cluttered with misinformation and hasty conclusions from just plugging the computed MGC's into the chord equations and thus locating them unreasonable far outboard. I appreciated Bill and Bunny Kuhlman's graphic method for compound wings, and it sets the NP position, but the integral definitions don't imply much here. My own texts hint that their authors didn't like to say much about MGC, and when they did, they explained very little. So are any of you up for this? All help's gratefully accepted!

Serge Krauss
skrauss@ameritech.net

Serge,

It took me a long time to come to terms with the difference between MGC and MAC. MAC is really the "right" answer in my mind. Let me try to explain, and everyone can chime in correct me where I am wrong...

The MAC is that chord where half of the aerodynamic AREA is larger than this chord, and half the aerodynamic area is smaller than this chord. So it is very easy to have the MAC not correspond to a particular chord on the wing.

It makes sense to me that half the area is larger and half the area is smaller, so it truly is a MEAN AERODYNAMIC chord in that case, as most of our effects are dictated by the surface areas that produce the moments and forces. Our moments and forces are resultants of the surface areas and length of lever arms. Or put another way, our forces and moments are products of (proportional to) the areas and the moment arms. MAC makes the most sense with respect to areas and to moment arms.

So if I were the research engineer in charge, I would much prefer the MAC over the MGC (though I am the first to admit the MGC is much easier to calculate!)...

Al Bowers ...stirring the pot a bit...

Did you mean that the chord that separates the half-span into equal areas is preferred to the integral definition, or were you feeling that they are pretty close and that I was using something simpler? I'm asking just because I find that the integral-derived chord doesn't quite divide the half-span into equal areas.

I've seen MGC used differently over the years and had come to see it not as the "average" chord, but as often presented as the "actual" MAC without allowances for twist, Reynolds Number, wing section, tip loss effects, etc. In other words, when I said MGC, what I meant was "1/A times the integral of C squared of y dy". Is this different from or the same as what you thought I meant by MGC? At this point, I'm not dealing with the "real-world" aerodynamic effects, but just trying to understand application of the basic definitions.

I have come to expect the MGC (in this guise) not quite to divide the half-wing into equal areas, unless the wing is rectangular. For instance, for the extreme straight-taper case of a pointed wing, this MGC is at 1/3 half-span, but still divides the inside and outside areas in the ratio 5/4. I did this with both HS geometry and the integration method. For an elliptical wing with an aspect ratio of about 5.1 (actually 16/pi; full span is 4 times the root chord), the ratio of areas was about 1.1/1, and that seems to be true for all ellipses, including the circular wing.

I have to admit that I have not always felt comfortable with the methods of weighting by areas or moments about the root; sometimes it makes "perfect" sense, and sometimes I'm having to re-convince myself.

Anyway, I guess my original question still stands. I still am not confident how the MAC is positioned chord wise at its computed span-wise position, when it is not the same size as the actual wing chord at that place. Does it conform to the beginning alignment? For instance, if all the quarter chords were aligned span wise, then the NP would fall on (near) that line. If the wing were truly an ellipse, then the mid chords would be aligned. Then would the NP fall at the quarter-chord point of the MAC centered like the other chords, but positioned at the computed distance from the root? What about other alignments like a linear sweep of some corresponding chord points, like LE, TE, .3c, etc.? Would I just place the MAC at the computed span wise position, placing the designated point along its length onto the sweep line and then use its quarter-chord point as the wing's neutral point?

'still mulling things over...

Serge

From the Mitchell U-2 Bulleting Board

October 6, 2010

Hi,

This is Carol Avalon, Richard Avalon's wife. I sell blueprints for the Mitchell Wing B-10 and U-2.

Richard worked for the original Mitchell Wing company in Porterville, CA in the late 1970's, early 1980's. He was one of the managers and test pilots of the B-10, U-2 and P-38.

He had his own air shows up and down the west coast with at one show 104 ultralight pilots competing in contests.

He went to all the air shows in the US and other countries promoting the Mitchell Wing.

He finally became business partners with Don Mitchell during Don's last few years. He loved Don like a father and they worked closely together.

Since Richard passed away 1-1/2 years ago I have stored his ultralights and supplies in a barn and my mobile home in Fresno, California.

I am ready to have them looked at by someone who is a Mitchell Wing specialist to evaluate his items and determine the value and how I can sell them.

Anyone that is interested in doing this I will compensate upon the sale of Richard's ultralight items.

He has collected things for the last 30 years so some are old and some are new, including the last B-10 he flew.

Please email me at:

mitchellwing@earthlink.net or call me:
home: 559 834 9107
cell: 559 840 5088

I will continue to sell blueprints; I am selling all ultralights, completed and incomplete, supplies, books, misc. I also have a 1973 Buick Century Lexus, which has 66,000 original miles.

Since Don Mitchell was his closest friend, the things Richard had collected are things he accumulated with Don.

Thanks so much. I miss Richard terribly but am ready to sell everything as a complete package (the car is separate). I am not selling general tools, which I will be using to repair my mobile home.

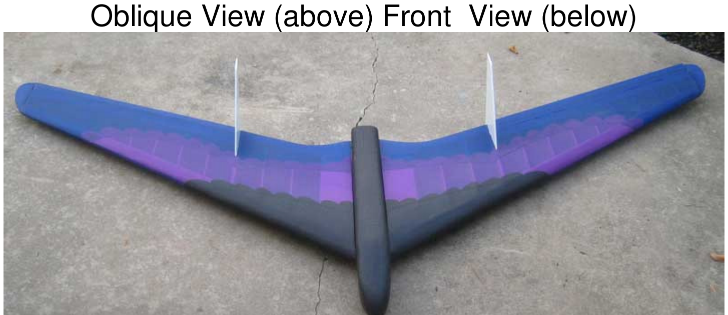
Best Regards,

Carol Avalon

(ed. – Although this message came through in early October, if you are interested in helping Carol please give her a call and see is she still needs assistance with disposing of Richards Mitchell materials. It would be a shame to see them lost if she can't find buyers or someone willing to take over the business.)

(ed. – One of the links included in a message from Norm Masters discussion on adverse yaw and the U-2 elevon settings caught my eye. Unfortunately, if you don't go to the newsletter version on the web site you don't get the full effect of the great colors Joel Scholz used for covering the top and bottom on this Horten derivative model built in 2007.)

Oblique View (above) Front View (below)



Bottom View

AVAILABLE PLANS & REFERENCE MATERIAL

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.

Collected Aircraft Performance Improvements: $30 pp: 14 articles, 7 lectures, Oshkosh Appraisal, AR-5 and VMAX Probe Drag Analysis, fuselage drag & propeller location studies.

Bruce Carmichael brucehcarmichael@aol.com
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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 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