No. 327 SEPTEMBER 2013

T.W.I.T.T. NEWSLETTER

Center section of Al Bower's new R/C flying wing that he introduced at the 2013 ESA Western Workshop. He hasn't flown it yet but is excited about the prospect. See page 4.

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

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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.

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Password – **twittmbr**

Subscription Rates:
$20 per year (US)
$30 per year (Foreign)
$23 per year US electronic
$33 per year foreign electronic

Information Packages: $3.00 ($4 foreign) (includes one newsletter)

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Multiple Back Issues of the newsletter: $1.00 ea + bulk postage

Foreign mailings: $0.75 each plus postage

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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

Well another ESA Western Workshop is in the record books and it was another great gathering of aviation enthusiasts. For those of you in living in the western US this is a must to learn about all sorts of things aviation. This year covered small sailplane design but included a talk on the stratosphere balloon jump, propeller design and a modern electric powered self-launching sailplane. So mark your 2014 calendar right now for the Labor Day weekend and make plans to attend at Tehachapi, CA.

For those of you in the eastern half of the country the Eastern Workshop it is being planned for the second or third week of may 2014 and will be a visit to the NASM Udvar-Hazy Center Mary Baker Engen Restoration Hangar in Chantilly, Virginia. I will provide you more information as it becomes available, but this one sounds like a once in a lifetime opportunity to see some unique aircraft.

This month I will also be making use of Sailplane Builder material to provide you a summary of Jim Marske's presentation at the 2013 ESA Eastern Workshop where he talked about the Pioneer III. Mike Hostage is currently building one from the kit but I haven't had a recent update on his progress. Being a General in the USAF I don't imagine he has a lot of time at night to work on it, but he has completed other builds so obviously knows how to manage his time to get a project done. Hopefully we will hear more in the near future.

Andy

LETTERS TO THE EDITOR

I just came across this new Guillow's product, the "Pocket Launcher" (see:

www.guillow.com/pocketlauncher.aspx).

All of the gliders are tailless! Maybe you could get a batch of them imprinted with the TWITT logo and sell them? In any event, they look like fun new items.

The French (with English version pages) "MiniJets" website is devoted to small (not model), personal jet aircraft (see:

www.minijets.org/index.php?id=accueil&L=3&cHash=eec8acf0b9

Several of the aircraft that are featured on the MiniJets site are flying wing and tailless designs (see below). The site is arranged by the thrust of the engines in kilograms. (The *newton* is the "proper" SI [metric] unit of force, but I'm a rocketry guy--and besides, I still also use *pounds* of thrust anyway. :-)) In any event:

The designs of jet aircraft in this size range are quite diverse, ranging from jet motor gliders to converted propeller-driven homebuilts to jet fighter-like machines. One of them, the sailplane-derived, twin-fuselage Fouga CM88 Gémeaux, made Jet Age history. This French aircraft was built for use as a flying "test-bed" to flight test small jet engines. In 1952, it was flown under the power of a Turbomeca Aspin I, the first turbofan (fanjet) engine to fly. Although little-noted at the time, this engine heralded a worldwide revolution in aviation power plants that is still going on today, including ever-larger (and ever-smaller) jet engines. Also:

Below is the list of tailless and flying wing designs that are covered on the MiniJets website:

Mitchell Wing B-10J (see the *JFS 100 TurboJet* under the "0 to 50 kg" heading)

Fauvel AV-45-01R (see the Microturbo *Eclair* turbojet under the "50 to 100 kg" heading)

N-20.2 Arbalete (see the Turbomeca *Pimene* turbojet under the "100 to 150 kg" heading)

Payen PA 49 Katy (see the Turbomeca *Palas* turbojet under the "150 to 300 kg" heading)

Short SB-1 (test glider) and Short SB-4 Sherpa (see the Turbomeca *Palas* turbojet under the "150 to 300 kg" heading)

Payen PA 249 (proposed design--see the Turbomeca *Palas* turbojet under the "150 to 300 kg" heading)

Northrop XP-79B (see Westinghouse *19B* turbojet under the "300 to 500 kg" heading)

I hope this information will be helpful.

Jason Wentworth

(ed. – The Pocket Rockets are only $6 each with several different models. Looks like they might be fun when teaching kids about flight. As for putting TWITT logo on them, we looked into something similar a number of years ago and the survey said that not very many members would be interested in buying it in quantities to make if economically feasible.

Thanks for the information on the mini-jets. One previous jet powered glider, the Prue 215 was on static display at the ESA Western Workshop. It is being restored to the basic glider iteration.)

(ed. – This was extracted from the ESA Eastern Workshop report prepared by Jerry Gross, Ron Ogden and Al McCarty and published in Sailplane Builder's September issue.)

Pioneer 3 Flying-Wing Sailplane
By Jim Marske

Our group was also very fortunate to have Jim Marske visit us in person for this year's workshop. Jim actually did double duty: He gave his own presentation on the Pioneer 3 flying wing sailplane, and also pinch-hit for Mike Hostage on the construction of the first kit of a Pioneer 3. Mike Hostage was originally scheduled to attend our workshop, and looked forward to coming. But, being a General in the United States Air Force, duty called him to meetings for the security/economy of our country that weekend. Mike was able to forward copies of the presentation he had prepared for this workshop, and Jim reviewed the slides as the second part of the Pioneer 3 presentation.

The table below summarizes some of the differences between Jim's Pioneer 2, of which quite a few have been built, and the new Pioneer III:

Pioneer 2	Pioneer 3
Span: 13 m	Span: 15 m
Aspect ratio: 12.6	Aspect ratio: 16.8
L/D: 35:1	L/D: 42:1
Empty weight: 380 lb	Empty weight: 345 lb

Jim led us through many of the design decisions made with Pioneer 3, and showed numerous shots of steps in the construction. The Pioneer 3 has a slimmer fuselage than Pioneer 2, and has a new laminar-flow airfoil, with 25% drag reduction over Pioneer 2. The spoilers are plug type, rather than forward-hinged-door type. Jim is sold on the advantages of carbon-fiber in construction, because of its high strength and low

Jim Marske Observes the Partially-Completed Pioneer 3 Fuselage
(Early Photo)

weight. The wing spar is made up with 3-mm round carbon rods. Jim brought along a mock-up of a section of the wing, illustrating the spar, rib, and aileron pushrod construction. He also showed a number of different sizes and shapes of carbon structural materials, as examples of possibilities. One of the samples was a beautifully made carbon hollow triangular-cross-section trailing-edge piece. However, Jim refused to divulge the secrets of its construction. Jim also brought along a couple of small model flying-wing gliders, to demonstrate the inherent stability of the Pioneer 3 design, and which we all tried our skills at flying.

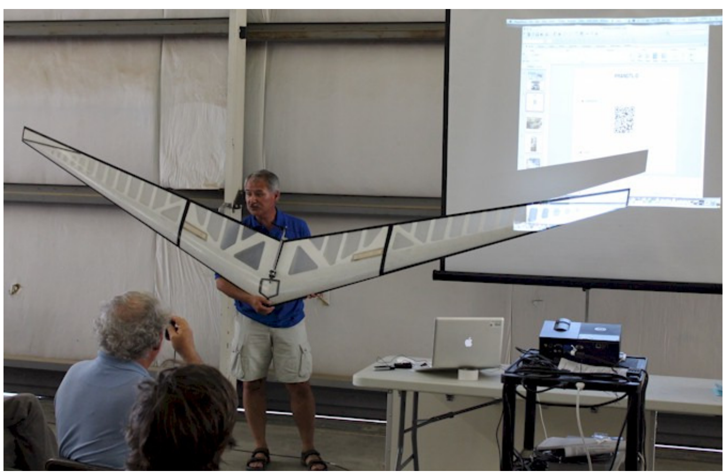
Jim Looks Happy in His Completed Pioneer 3

The first flights of Pioneer 3 had been made with auto tows in August 2011, with Mike Hostage assisting, and numerous flights have been made since then. Jim reports that the elevator pitch control was responsive, but not too sensitive. He had made the elevator area somewhat larger than normal, but restricted its travel to 10 degrees up and 10 degrees down. Rudder and aileron response felt normal, with light control pressures to complement the elevator.

At the Workshop, Jim Explains the Pioneer 3 Wing Construction

Jim's Model Demonstrates the Stability of the Pioneer 3 Design

(ed. – From the ESA Western Workshop here is one of the pictures I took of Al Bowers showing his new flying wing model. I hope to get more about this from him in the months ahead but I wanted to show you that flying wings do occasionally show up in the talks, especially when the discussion is around low drag configurations.)



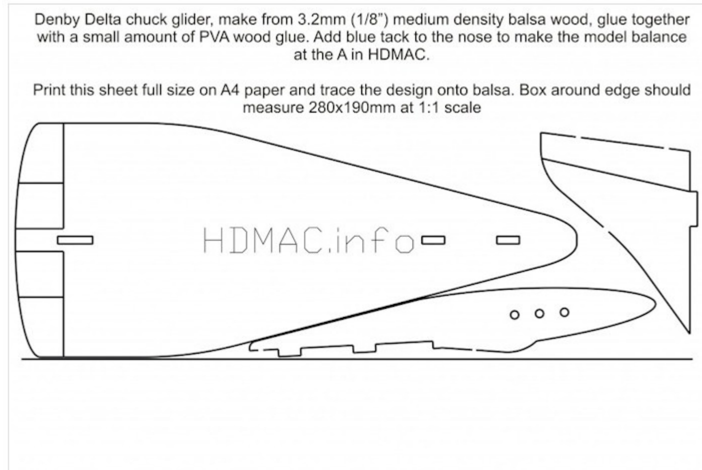
Nurflugel Bulletin Board Items

Just a bit of fun, for my local carnival an R/C club I am a member of had a stand so I designed a laser cut chuck glider to hand out to on the day, naturally it had to be a flying wing! It flies very well despite the low aspect ratio. No twist or reflex is used, just flat balsa sheet. See:

http://hdmac.info/?page_id=111

for a plan of the model.

John Newton



(ed. – Here is the image from the web site link. Might to fun to give it a try if you have some spare balsa laying around.)

Hi Rich,

Uh, yes. I am one of the Dream Chaser team. But I can't talk about it yet. When the part I am helping out with comes out, it will ring a few bells with folks and we can all talk more.

I hope a few of you will come to the Experimental Soaring Assoc Western Workshop in Tehachapi CA over the Labor Day weekend. We're going to talk a little about our Prandtl-D glider some. *(ed. - **P**rimary **R**esearch **A**erody**N**amic **D**esign **T**o **L**ower **D**rag – It sounded like Al didn't have much say in the title or acronym.)*

Al Bowers

Thanks, Al...I understand the need for the quiet action. After all, this is a private adventure....Anyway, hope that all is well on your end of the world. Thanks for the reply.

Rich Nunn

Koen my friend, You will get ALL the info...

Al

PS. The noted and famous author Russell Lee has an article in Technical Soaring. Anything written by Russell Lee and Peter Selinger are always "must read" for me...

Is the Lee/Selinger article published yet?

It does not seem to appear in the Technical Soaring archive so may I conclude that it will be in the next issue? May we know the subject matter please?

Chris Bryant

Chris,

Apologies for the confusion. First its an older article (my issues says its from Oct 2012, vol 36 no4). Second the article is by Russ Lee (I was merely commenting that I watch for Peter Selinger articles as well as from Russ). The title is "Know the Sky: A History of the Interaction Between Meteorology and Soaring".

Al

PS. Headed out, hi-start in hand, to let my student interns pound my Zagis into the ground… *(ed. – See below.)*

Dear Al and others,

It may be an older article, but this issue of Technical Soaring has been distributed this week, that means I'd received my copy this week. It's great that Russ did work at this item, because meteorology couldn't have been developed so wide in the first 60 or 70 years of the past century without soaring and soaring as well needed the meteorological progress for its own development and progress. Even today soaring helps for meteorological research by the Mountain Wave Project by evaluating and validation of forecast and calculations of weather phenomena by measuring data during the long distance soaring flights, e.g. along the Andes (no prop disturbs the air). These models are most important for air traffic e.g. due to their detection of clear turbulences and its strength and characteristics, aim is a worldwide forecast of dangerous situations for the airliners! Soaring protects air traffic - an impressive headline.

Peter Selinger

Subject: Bell Shape Lift Distribution

A question for the group, I have been looking into how best to achieve a bell shaped lift distribution for my latest R/C model. As I understand it the Horten brothers achieved a BSLD by a combination of Geometric twist (washout), Aerodynamic twist (Reflexed airfoil at the wing root blending to symmetrical at the tip and strong taper. My question is why did they go this route, was it simply to achieve good stall characteristics?

Could a BSLD be achieved just using a combination of Aerodynamic twist and taper OR Geometric twist combined with taper (or even just planform shape (variable taper) alone with no twist?). The reason that I ask is that if I were to eliminate the geometric twist I may be able to produce a foam wing on a large CNC router I have access to.

On a similar theme I recently stumbled upon a model called the "Norten" in a recent edition of quiet and electric flight magazine, it looks a little like the Northrop N9M with twin electric pusher props, it has a 6mm thick flat plate depron wing and no twist

whatsoever, it relies on having elevons on the outer portion of the wing which are raised at neutral trim. the model appears to have little or no adverse yaw. I calculated a static margin of 8% (assuming the neutral point is at 1/4 of the mac) this suppressed me as I thought it would need to be closer to 15-20% as per the Horten designs, are the twin props adding enough effective side area I to compensate for the lack of a fin I wonder? Apparently it flies well inverted.

I have just modified an old Zagi (plus single pusher prop) in a similar fashion to see if it will work with the fins removed.

Thanks for your time,

John Newton

John, if I recall from reading prior posts, a bell shaped lift distribution has two main benefits compared to an elliptical lift distribution:

1) reduces adverse yaw, and
2) reduces the weight (which may not apply to small models).

Think of a wing cruising in a straight line with an elliptical distribution -- the outer section of the wings are creating quite a bit of lift. To bank to the left, the right elevon moves down, increasing lift and drag, and the left elevon moves up, decreasing lift and drag. More drag on the right and less on the left creates a rightward (adverse) yaw.

If you have a BSLD, the wing tips are producing a small to negative lift in a straight cruise. Let's call it zero. To make that same turn, the right elevon gives you a little positive lift and a little drag, and the left elevon gives you a little negative lift and a little drag, but the increase in drag is about equal on both sides -- so there's no adverse yaw. If you started out with more twist and had negative lift on both wingtips, increasing the negative lift (and drag) on the left and decreasing it on the right would give you more drag on the left, and cause a proverse yaw -- in the direction of the turn.

As to the weight, an elliptical distribution gives you the best lift/drag for a given span, but with lift spread all the way out to the wingtips, you have pretty high bending moments at the root and need a strong (and heavy) spar. With a BSLD, the span wise center of lift is closer to the root. So, with lower bending moments, you could build lighter wing -- even if you have to make it longer to achieve the same L/D.

How you achieve the BSLD involves a trade-off of wing complexity vs. performance. The Norten model you mentioned uses elevons trimmed upward in cruise, which reduces lift at the wingtips but causes substantial drag. Geometric twist is a bit more complex, but should create less drag than having the elevons deflected. But if you're building a high-performance sailplane like the Hortens, you would want to optimize the airfoil for the lift needed at each span section. And if the outer section is producing roughly zero lift, a symmetric airfoil would be optimal.

I'm not sure how aerodynamic twist affects stall characteristics. A swept flying wing designed for an elliptical distribution at cruise would still have elevons up and lower lift on the outboard sections at high angles of attack -- more like a bell shape. I suspect that's more a matter of selecting the right twist and taper so the wing section just forward of the center of lift is the first section to stall. Someone more qualified may be able to shed light on that.

Good luck with your Zagi! I should get new batteries for mine and get it out of the garage and into the air. :)

Regards,

Elliott Whitticar

Hi, Elliott--

Whether or not you have a down-load at the tips in cruise depends on the basic lift distribution AND the static margin. At neutral stability there shouldn't be negative lift at the tips. Now there's the problem of defining the neutral point. If you define it as the 1/4 chord point of the mean chord you'll have A 'wing that can fly with 2% SM but will be unsafe with much less than 5% SM and the tips will have to carry a download. That's the way Northrop did it with linear twist. Instead of using the plan-view of the aircraft to define the neutral point Ferdinando Galè used the center of lift at the design Cl. With a bell shaped lift distribution the AC is much farther forward than with an elliptical lift distribution (even with all sections of the BSLD wing having positive lift). Of course the center of lift on a swept wing moves around as you change AoA and speed so Galè's terminology is imprecise, at best, but that's the phrase in the translated version of his book "Tailless Tale". I'm sure there is an analytical way to find the neutral point of any swept flying wing but I haven't seen it. I'd balance according to Galè and verify with dive tests.

Norm Masters

Elliott,

Many thanks for your detailed comments below, very concise and helpful, I think I am now beginning to understand why the Horten style wing uses the airfoil types it does along the wing, so basically speaking the airfoil should be matched to the amount of lift and pitching moment it is required to produce and the Reynolds number it is at its position along the wing?

Elliott, Norm - A few months ago I came up with a formula that gave a neutral point approximation for a linearly swept and tapered wing allowing for sweep effects, it matched pretty with actual data I could find for sensible aspect ratios and sweeps (i.e. data given in the K. Nickel books for the Horten gliders). I will upload the formula here when I get time.

John Newton

I have managed to create a wing with lift distribution which is fairly close to the Sin^2.5 lift distribution I am after for my Horten style wing design using XFLR5 software. I have posted photos in my album: Bell shaped lift distribution wing.

The only problem is no matter what I try at the design lift coefficient of 0.2 the whole lift dist curve is effectively a sin^2.5 shape moved downward in the Y axis i.e. the tips are lifting downward, how can I avoid this, (shift the whole lift dist. back up effectively)? Any ideas anyone? Any help would be greatly appreciated.

John

Just trying to understand how the term "Bell Shaped" lift distribution is determined and applied.

What I picture is: the local lift is made by manipulation of Local Area and Local Coefficient of lift by twist and/or camber to conform to a wing span load profile that is shaped to conform to a shape that one gets if you plot the Cube of the Sine of angles from 90 deg to Zero deg. where 90 deg is the center line of the wing and Zero is the tip.

Such a plot, when viewed resembles 1/2 of a cross section of a vertical slice through a Bell.

The 90 degrees always plots as One (1), and the Zero (0) always plots as Zero.

If one uses these data points as CL values and applies them along the span of a rectangular wing plan form you find that Zero at the tip is easy but "1" at the Cntr Line with a symmetrical airfoil requires 8 to 10 deg of Wash-in (twist) to achieve CL=1.

If you sum the derived Local load values you get what load that wing will carry at your design speed.

If that load is higher than you need at your operating condition, you need to reduce the total load by a factor of: [required load/calculated load].

Apply that percentage to your Sin^3 span values and recalculate the span to the new values.

If this is incorrect in any area, repainting the picture is requested.....)

My mistake, should be 90 degrees at the root q .

LiteFlyt

Liteflyt,

Ignore my previous comment regarding how I plotted a Sin^2.5 lift dist, just spotted a big error in my math! Many thanks for the information liteflyt, I will take a good read through. I plotted the Sin^2.5 lift dist simply by getting the span wise position of the point in question (0 being the root) and multiplying it by Sin^2.5, is this correct? I know this seems simplistic but it does appear to give the right shape, see BSLD graph in my photo album, this shows the Sin^2.5 lift dist compared to elliptical and the wing I have laid out in XFLR5.

A question for the group, I have been looking into using a bell shaped lift distribution to reduce adverse yaw as per the Hortens/Al bowers etc . and have managed to model a Sin^2.5 BSLD wing in XFLR5. I see that recently Al Bowers and some interns at NASA flew the Prandtl-D glider which showed promise regarding proverse yaw. The Prandtl-D glider uses elevons that only cover the outer span of the wing near the tips as this appears to be a good placement for reducing adverse yaw on a BSLD wing.

My current thinking is that if a BSLD is good for reducing adverse yaw we want to maintain this lift distribution regardless of the trim of the plane, i.e. regardless of what angle the pitch trimming (elevator) controls are set at, as I understand it when the Prandtl-D gliders elevons are deflected upwards of downwards from their initial position using the pitch control they will alter the lift distribution of the wing.

I am wondering, would it be better if the elevators stretched the whole with of the wingspan so that when they are raised and lowered the shape of the lift distribution is unaltered? In other words have elevons near the tips and elevator surfaces between these, so that when the pitch control is moved all these surfaces move in unison by the same angular amount and when the roll control is moved only the outer elevons move.

Anyone have any thoughts on the above? I may be wrong but would like to know either way. Thanks,

I have corrected my mathematical error, see "Sin^2.5 BSLD test" in my album, is this now correct? I was not sure if the 0 to 90 degrees should be plotted with linear spacing as I have shown on the X axis?

John Newton

Caveat, I'm still trying to understand this myself..

Did you really mean to make Zero (0) at the "root"?

My current picture is that the Wing Center line (Root) is assigned the 90 deg position and the angles are assigned equally divided from Root to Tip where the tip is assigned the Zero deg position. Your "Sin^2.5 BSLD test.jpg" is the shape expected.

From some of the Horten writings, I have pictured the Shape of the Bell curve is to be retained when applied, but the values of the whole are uniformly reduced/expanded to fit the total design load at the design velocity with the control surfaces Fared

Rodger

Hi

I think the most efficient setup would be to have enough sweep so that the central elevator would be ahead of the cg and the ailerons (actually elevons) would be behind the cg. That way when pitching up the elevator would deflect down and the elevons would deflect up. The deflections should be small enough so that the lift distribution is not altered much by trimming. For example, Multibumm uses a similar concept -->

http://www.multibumm.de/

Martin Tigasson

It's my intuitive take that it should be helpful to separate apples from oranges here, twist from bell-shaped-lift-distribution.

Twist: If you put enough washout twist (etc.) on an elliptical airfoil, you could give it proverse yaw. Elliot's description of how this works applies to any wing planform.

Bell-shaped-lift-distribution (as Elliot also describes well) maximizes lift per wing-root bending moment, and minimizes weight per maximum gees. BSLD is stronger and lighter than elliptical. As he explained, one way to hold lift constant is to lengthen the wing, compared to an elliptical. Or you could increase wing area by increasing the chord near the root.

The terms (and purposes) are only mixed when BSLD is achieved with twist methods, as did the Hortens.

'Effective twist' can be by several methods: geometric, from reflexed outboard ailerons or airfoils, or even from inverted tip airfoils (lifting down, gawrd).

To make proverse yaw, to my intuition says both tips have to start in negative lift. Then, to turn right, the left tip aileron travels down from slightly negative lift and drag toward neutral lift and minimum drag. The right aileron travels up, from slightly negative lift and drag to stronger lift and drag. Thus proverse yaw.

Note that (if correct) proverse yaw from twist requires a negative lifting surface, similar to the negative lift of reflex or horizontal stabs. Is the only escape from negative lifting surfaces a canard?

Neutral yaw might (as Elliott explains) be achieved with wingtips in neutral lift, or close to it.

A complicating factor is that foils generally have a 'drag bucket'—small variations of angle of attack (and lift) near minimum drag AoA don't change drag much. That means that to achieve proverse yaw by significant wingtip drag adjustment, wingtips have to be highly twisted. Which, from the photos, was exactly what the Hortens did.

Philip Randolph

Good explanation Phillip.

Somewhat de-complicating the issue, modern construction materials have reduced the importance of minimizing bending moment. Carbon fiber is so strong and stiff that pretty much anything you can imagine can be built. CNT structural materials will carry that much further when it's available.

N141SF

Philip writes:

>...To make proverse yaw, to my intuition says both tips have to start in >negative lift....

No.

The lift just has to be significantly less than what that portion of the wing would make if it had an elliptical lift distribution. As implemented with a typical BSLD, the lift tapers off to zero at the tip, but always stays positive.

Look closely at the plots of lift and induced drag in Al Bowers' TED speech: <http://www.youtube.com/watch?v=223OmaQ9uLY&feature=youtu.be>http://www.youtube.com/watch?v=223OmaQ9uLY&feature=youtu.be

Note that the induced drag plot dips below the X-axis near the tips (negative induced drag = induced THRUST), but the plot of lift at the tips, while reduced below that of the elliptical distribution, is always positive.

Each section of the wing shoves air downward, making lift. That downward motion results in an upward air movement just outboard of there (air going down in one place means some air needs to move upwards someplace nearby to replace it), and this combined action creates a horizontal vortex. All these little horizontal vortices along the wing combine together to make the well known big vortex at the wing tip.

In the case of a BSLD, the tip portions are making a less-intense vortex than they should be. Meanwhile, they are sitting in the upward-moving portion of the vortices of the portions of the wing inboard of there. In effect, the tip portions are "surfing" on the vortices of the inboard portions of the wing. It's very similar to the way that Whitcomb winglets make thrust from energy they recover from the tip vortex, except in the case of a BSLD the lift of the tips is upwards, helping support the weight of the airplane. This is why (unlike a winglet) there is no "crossover velocity", the BSLD provides a benefit at any airspeed where it is properly implemented.

A BSLD with negative lift at the tips would reduce efficiency.

As far as the comment about canards, yes, both the wing and the canard do have positive lift, but that is not necessarily a good thing. The wing is the most efficient lift-producer on the aircraft, and taking lift-making work away from it and giving it to the less efficient (smaller, shorter span, lower Reynolds numbers, etc.) canard reduces the efficiency of the combination. Furthermore, the canard has to make downwash in order to make positive lift, which means the main wing is now forced to fly in this continuous downdraft created by the canard. Because static stability requirements force the flying surface in front (the canard in this case) to carry more than its "fair share" of the total load, this downwash imposed on the main wing is especially intense. Also, because the canard is (by definition) smaller than the wing, its span is typically shorter, so the downwash is not equally distributed along the wing, distorting the wing's lift distribution. Yes, it is possible to twist the wing to compensate for this, but in the real world it's difficult to do this for more than one operating point.

In the case of an aft tail, yes, the tail is flying in a downdraft created by the wing's downwash, but if the tail is lifting downwards, that downwash actually helps the tail do its job, improving the tail's efficiency. Yes, downward lift does impose more work on the wing, but I think you will find that for this particular effect, the overall induced drag (not counting the other detrimental effects of the canard mentioned above and below) for a given amount of static stability is about the same for the two layouts.

Another nail in the canard's coffin is that the design MUST ensure that the main wing NEVER stalls first. This means the wing must carry an increased safety margin below stall, and this in turn means the wing must be larger to accomplish the same mission profile. That results in more wing weight, and more whetted area, which hurts performance, especially at higher airspeeds.

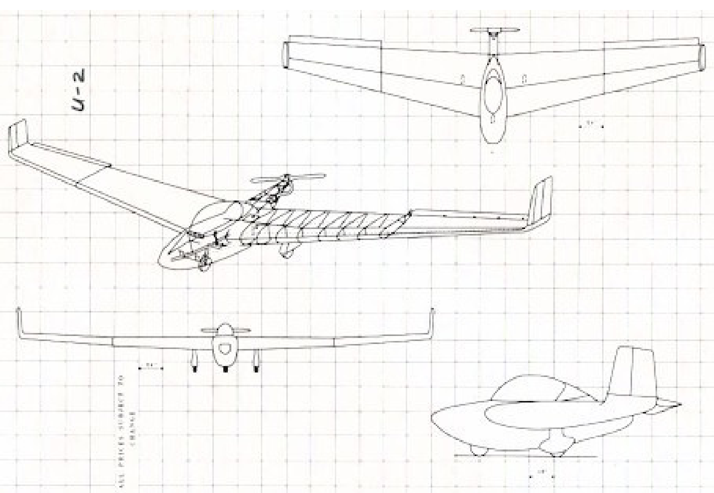
There are exceptions, but in most cases the canard arrangement does not show an overall benefit. Similar to pusher props in that regard.

Don Stackhouse

(ed. – This is a continuing series of discussions, but I have stopped it here. I will add more to subsequent issues so if you have additional thoughts I should add to the mix, please send them to me this month.)

Last month I drove down to Watonga Oklahoma with a friend to pick up a mostly completed Mitchell U-2 "Superwing". It isn't my plane and the cockpit is too small for me so I'll never get a chance to fly it but I'm enjoying helping with the repairs and finishing

http://www.westerntreks.com/Plane/de_plane.htm



Norm Masters

You and your friend must be willing to work a real lot!(lol) Jokes besides, it is still a repairable aircraft and I am sure you will do a good job. Instead of the heavy and weak donkey, I would suggest to use a ROSmotor 125 light: very nice, very light, powerful (29 hp), quiet, economical, reliable and not so expensive. Reduction drive already included. My wife is using one on her trike and she is very happy with it.

http://www.rosmotor.it/product.html

Bruno De Michelis

Perhaps a new canopy like the one on this?

http://home.earthlink.net/~mitchellwing/images/u2/p6.jpg

Rodger

That wasn't just a new canopy it was an entire nose section salvaged from a crashed sailplane. If one of those were handy it would save a bit of work on the pod.

Norm

Bob (Kuykendall) has the molds for his HP-24 design. Maybe his contact at Tehachapi can pull the fwd fuse skin for you. Bob is a homebuilder like many of us and the contact at Skylark is a doer.

http://www.hpaircraft.com/hp-24/

Roger

(ed. – Here is what the first flying example of the HP-24 forward fuselage profile looks like. The best bet would be to contact Bob directly at Bob@HPAircraft.com. His company is developing kits for the HP 24 and he told us about how he has incorporated some variations so he might be interested in doing a forward section.)

I have always thought the BD-5 fuselage could be utilized as a cockpit or aerodynamic fuselage pod for a flying wing design.

Terry Menees

Thanks for the suggestions, guys, but I didn't mean to imply that Roger is looking for a new pod. Although the current pod needs quite a bit of work, retrofitting a completely different pod to both fit the wing and contain the weird control system would not be any less work. The original builder was apparently a very tall, skinny, man. He lengthened the frame a few inches and raised the deck forward of the cockpit by replacing the flat section of the fuselage former with an elliptical arch. The fuselage extension produced a shallow ogee curve on the side of the nose that the existing forward deck doesn't quite match.

The original foreword deck piece was never finished and it warped from the humidity so we have to fabricate a new one anyway. We're in the process of sanding the plastered forward deck to a fair shape right now and will lay up a mold for the new deck over that "soon".

Norm

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
34795 Camino Capistrano
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 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

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