No. 316 OCTOBER 2012

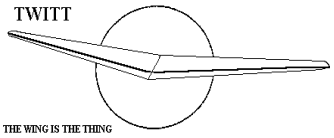
T.W.I.T.T. NEWSLETTER

We haven't talked much about the BKB-1 or BEKAS wings lately. Go to the link for a discussion.
Source: http://www.homebuiltairplanes.com/forums/light-stuff-area/2943-witold-kasper-2.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., **1210** 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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48oz/48	40.00	42.00	30.00
60oz/60	50.00	53.00	37.00

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 was sort of a struggle so I hope you get something out of all the Nurflugel stuff I stuck in it as space filler. So it is time for my soapbox plea for material again.

Larry Routson send along a nice package some of which I could use in the newsletter format. But that is just a few pages out of the 9 that I need to fill up each month. Activity on all the bulletin boards has been really slow lately, so there is no guarantee that I will continue to be able to find pertinent threads that will be of interest to the group.

This is a member supported newsletter so please take some time to write in with information on your projects to share with the rest of us. It doesn't have to be fancy but, of course, pictures are always welcomed since the get your point across better than words. If you want some help putting it together I would be glad to work with you through e-mails or even snail mail to make it come out in a way you would enjoy putting your name on it.

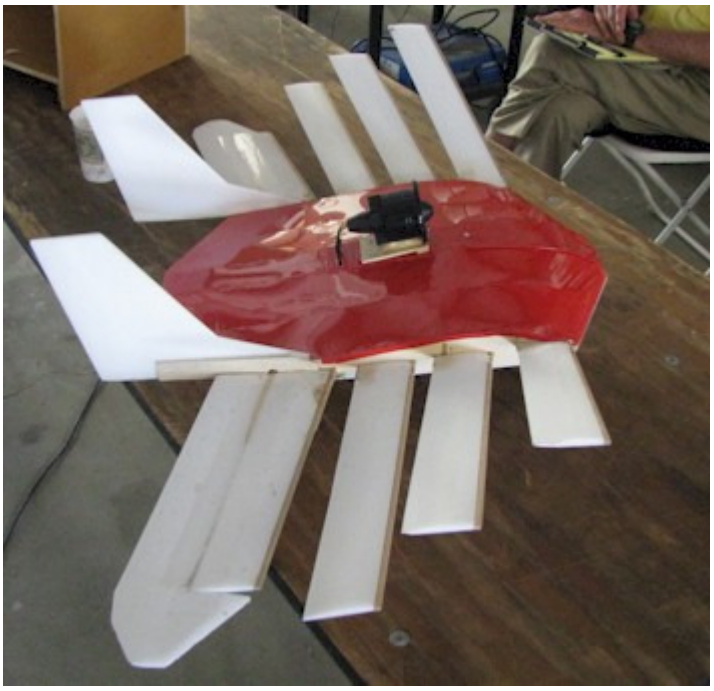
Summer is coming to an end, although you couldn't tell based on the temperatures across most of the US. I imagine some of you are going to hold up in your workshops for the winter so I know something has got to come of it.

PLEASE CONTRIBUTE

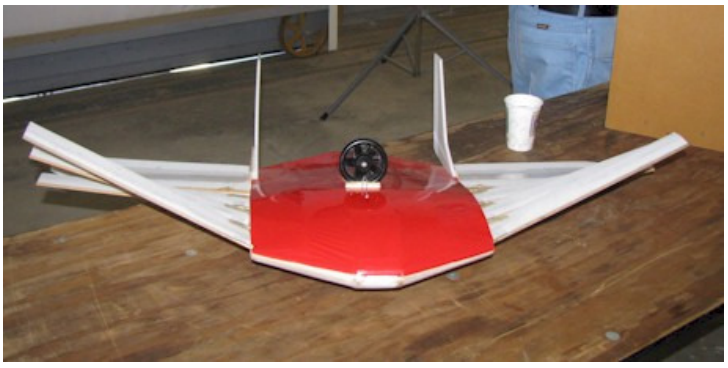
Andy

LETTERS TO THE EDITOR

The ESA Western Workshop over Labor Day weekend at Mountain Valley Airport in Tehachapi, CA included a short presentation by Bob Hoey on his experiences so far flying the Pegasus model based on Max Perraualt's design. Max also gave a presentation outlining his design philosophy that hopefully he will put into written form so I can include it in a future issue.



You can see the elevon arrangement in the picture above. There are no rudders in the verticals and none of the forward "wings" move in flight. However, the wings are built in such a way that Bob can change the angle of attack of each one to try different combinations and how they affect the flying quality. This front shot below gives you a good idea of the dihedral in the wings and the size of the electric fan being used for the powered flights.



With the addition of the motor, the model couldn't be dropped from the mother ship as was the case during the glide tests. Bob's team built a simple blend of a launching ramp and high start to give the model that initial momentum where the motor can provide enough thrust for regular flight. From the video clip it appeared to have a launch angle of about 25-30 degrees and was built of PVC pipe.

Bob showed several short videos of the flight performance and discussed some of the maneuvers he tried to make the model diverge from normal flight like how did it perform in a deep stall. He noted a couple of times that the model showed high drag coefficients at high angles of attack, but that it was completely controllable although it resulted in high descent rates. There didn't appear to be any tendency to drop off on either side.

As he gained more experience he did what every good R/C pilot does with a new design and that is see what kind of aerobatics it can perform. So there were several "aileron" roles, which were very crisp and showed a very good roll rate. Loops looked pretty much normal with enough entry speed.

Below are Max (left) and Bob showing off the Pegasus model for the session attendees in a photo opportunity at the end of their combined presentations. The videos created a lot of oohs and aahs especially when the model was performing very much like what had been seen in the simulation software.

(ed. – I got a package from Larry Routson that was asking a question about a paper by A. M. Lippisch titled "Wing Sections for Flying Models". He wanted to know if it had ever been published since he thought it was in the December 1951 issue of Model Airplane News, but when he got a copy of the magazine he found an entirely different article. I will include the first few pages of the wing section paper below to see if anyone recognizes it as having been published in some mainstream magazine in the past. There is no date on the paper that I can find so this might be a shot in the dark. Let me know if you have any ideas or know for sure where it was published.)

WING SECTIONS FOR FLYING MODELS

By A. M. Lippisch

The skilled model designer, whose aim is to build models of high aerodynamic quality, will always have the experience 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_{fr}) is considerably 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 several wind tunnel measurements exercise its influence mainly on the characteristics of the wing and the wing sections.

You will 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 cord length, and the velocity of the flow and dividing by the kinetic viscosity of the fluid.

$$RN = \frac{V \cdot L}{v} \left(\frac{\text{velocity} \cdot \text{length}}{\text{kin. viscosity}} \right)$$

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

The Reynolds law of similarity is essentially important if we apply test results from wind tunnels to 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 can not always be realized completely, the influence of the RN – say the aerodynamic scale – was carefully investigated and it was found that the similarity is not seriously affected is 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 unfavourably lower in performance. At low RN flow conditions the flow character can change so much that for instance two different sections will give reversed performance, profile A being much better than profile B at an RN of say 3×10^6 and profile B being much better than profile A at RN of say 1×10^6.

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 that 800 times this product. For instance:

Chord length = 6 inches
Flight Speed = 25 mph

Reynolds Number = (6 x 25) x 800 = 120,000 or
= $1{,}2 \times 10^6$

The wing sections which have been successfully developed for modern high speed aircraft – as for instance the laminar flow section – are not favourable 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.

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 for tests at the low RN range. But it is clear, that nowadays 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 guild why I could not provide them with some special model sections something that gives a gliding or 1: "never meet again" or even somewhat better. Well, I thought that if I remembered right there were some old forgotten measurements on wing sections. Why shouldn't these tests turn out to fit just into the RN range of the flying models of today?

These "measurements of wing sections" by Max Munk *(the later Dr. M. Munk of the NACA)* and Ernst Hueckel present the tests carried out in the first small wing tunnel at the Prandtl Institute at Goettingen, during the years of the first world war. The publication was printed in "Technische Berichte der Flugzeugmeisterel Adlershof (TB) Vol. I and II". (Techn. Reports of Air Material Center Aldershof), which were under selected distribution. Most of the reports were published later in a revised form. But the measurements of the wing sections were completely forgotten because the RN of these tests was so small, that there was no more interest in them.

Nurflugel Bulleting Board Threads

Ultralight version of Marske FW

I just read the article and watched the video on Soaring Cafe site. Over the past few years I've been wonderfully entertained by my own thoughts and those of others on this site about "airchairs" and various other "flying apparatus".

I've been lucky and now have 36 years of HG experience. I hope someday to find the psychic energy to build my own soaring craft. Like many others, I haven't yet found the design that I want, but I'm sure it's coming soon.

Although aluminum tubes and steel cables have served me well, for some reason or another I feel most attracted to the "Skypup" type of wood and foam construction, and having so many hours of fun flying without a horizontal stabilizer, I also find the flying wing's simplicity more attractive than the tailed design, this despite the fact that I once tumbled and broke one. Now that I know how to do that, I no longer need to practice it, and feel somewhat confident it won't happen again, knock on wood (and foam?).

I want a relatively small and as light as possible flying wing, plank style, built like an RC glider using wood and foam. I want to sit down instead of flying prone, as my neck has had enough, but I don't like the seating found in sailplanes. I want to sit more upright, with a better downward view. I'm visualizing the type of cockpit/pilot fairing like the human powered planes used. I'm spoiled by the simplicity of two axis control, so I don't want rudder pedals, a coupled aileron and rudder with a castering main wheel for crosswind operation seems right to me.

As a group we have many varied personalities, each with it's own idea of what the best design is. Just wanted to share mine, on the off chance that someone else sees it as I do.

I presume you are aware of the Marske Monarch ultralight sailplane.

I am kind of new to all of this , but I think the only ultralight Monarch ever built was one that was mostly made of carbon fiber and it weighed in at about 135 pounds. A Monarch "G'" would weigh in at about 175 pounds. I am sure there are people on this list that can give us the exact numbers.

I **have read** about the Monarch, it comes very close to what I'm imagineering, but I'm interested in a version that's smaller and lighter.

The places where I fly are mountainous, and I really don't require the high L/D's that I believe flatland flyers need. I could have a great time with 15:1, and with a shorter span I could get some really sporty roll rates. I'm thinking of a span less than 35', and I'd like to stay under 90 lbs.

Strut or wire bracing would be OK. I think that a simple FW built like the Skypup is will do the trick. In my mind the emphasis should be lightness, simplicity, low cost, and overall user friendliness.

My Hg experience indicates that mountain flying requires less all-out performance than flatland towing type flying does, as wind generally has at least some vertical component.

Actually, most pilots would say they need MORE L/D for mountainous terrain since it lets them glide away from unlandable terrain and mountain weather. I think you'll find the Monarch has a lively roll rate.

I agree with you. I always though a Super Floater / Goat type would be fun too. And one of my three hang gliders is a single surface Wills Wing Falcon.

In the vertical ridge lift, it soars very well and at slower speeds of course than my intermediate Sport 2 or advanced Mylar sail Moyes Litespeed.

I only need the speed and glide after I leave the ridge to go cross country over the back. I might add that Falcons have been flown XC over 100 miles right here on the east coast too. On a good day at cloud base, everything seems to soar very well.

As we all well know, the complexity of a lot of flying wings & other aircraft:

#1. Turns a lot of pilots away because of the task of finding the materials.
#2. Most folks don't have a place to build anything or store it.
#3. How about transporting it?
#5. Hardly anyone wants to be a test pilot.
#6. Usually takes years to build.
#7. Does it need a trailer?

We know most plans built / kits in general aviation are never finished.

My Litespeed hang glider is 89 lbs, sets up in 15 minutes with one person & glides 15:1 at 28 mph.... 10:1 at 45 mph. Not impressive numbers by no means but it's a 10-year-old design, well proven and factory built. Not to mention you can buy one for $1500 used.

So I wonder why we don't use a wing like this as a primary glider? Build a primary glider frame and tail then add the hang glider wing? You could tow and motor it as well.

Thousands of flying wings exist today as hang gliders and the general aviation sector ignores their existence (except some as trike powered). Where else can you buy a ready to fly used wing for $500 and up...store it on the garage wall, unfold it from a bag off the top of the car (no trailer) that weighs 50 to 90 lbs & go soaring?

What a novel concept.

Why don't we have more experimental designs from these wonderful flying wings? If you have the money for one, an ATOS or a SWIFT is really slick.

I have flown flying wings for 40 years. You can tell a flying wing is my passion :)

Do hang gliders vary by gross weight? A wing for a normal pilot might not have enough margin to fly a pilot, cage and tail.

Is a "Big and Tall" version available? That might have the strength to support a cage, tail and normal size pilot. It would be a 2-axis ship, but that's not all bad.

What a radical idea. Use a hang glider for the wings and put a Goat style cage and tail to turn it into an Airchair.

Hang gliders are very strong... 6 G's positive. They even have tandem models with a 500 lb gross load capability! They are towed 35 mph with two people behind an ultralight or boat.

Boat
http://www.youtube.com/watch?v=036j0xhTfY4

Ultralight
http://www.youtube.com/watch?v=Vgsyh_8l-1g

Platform truck tow
http://www.youtube.com/watch?v=ufKg-vzN4ts

Some pilots loop them.
http://www.youtube.com/watch?v=YatqkvAKAn0

So yes, they are plenty strong enough for experimental applications. They are used extensively as light trike platforms. A trike frame is 80 to 100 lbs & the engines are 60 lbs more.

http://www.youtube.com/watch?v=4zHWHD8DcQQ

My idea is a folding wing model where the wing stays attached to the fuselage frame and the horizontal tail is foldable like on the Kolb ultralights. Portable and no need for a hanger. If your racks are right on top of the car, it can be transported like the hang gliders too.

Where else is a flying wing or anything for that matter able to carry 2 people on a 70 lb airframe?

Especially foot launch'n and land'n too!

http://www.youtube.com/watch?v=ftw_fG0HgsE

Money Killing Another Nurflugel Project ???

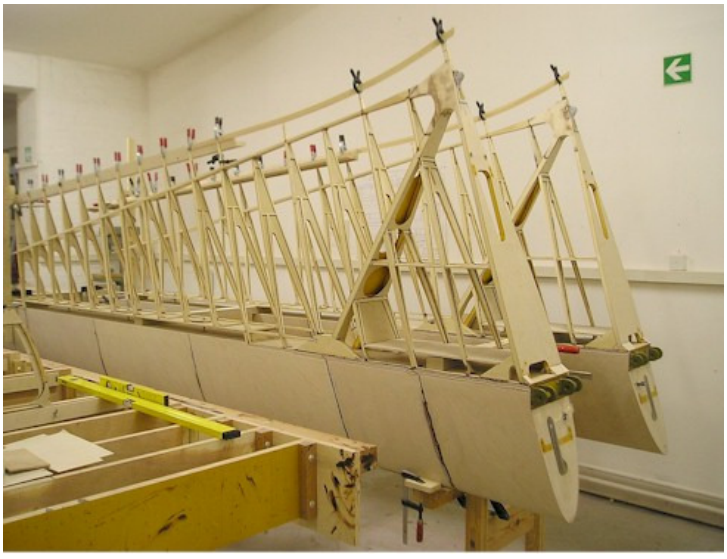
I guess you all know the current rebuild of the Horten HIV.

http://holzleicht-flugzeugbau.de/Heuser_Dateien/H-IV/Prj_H-IV.html

I just found this text on their site.

"The completion of the Horten IV project is in danger because of a lack of funds. Therefore please allow this urgent call for donation."

(ed. This site is in German but there are an enormous number of construction pictures that I think you will enjoy so make sure to click on the link and check it out. Here is a sample.)



Wow, that's a lot of man hours in that project! So what ever happened to the spirit of building wings like in the early days like these folks did?

Way ahead of it's time. Icarus V

http://www.youtube.com/watch?v=4hLNG2875tk&feature=related

Very successful designs.

Easy Riser & Millennium

http://www.youtube.com/watch?v=zRaOz7iWo5g&feature=fvwrel

This playlist on YouTube gives several videos of the Aachen flying wing.

http://www.youtube.com/user/horten21st/videos

Flying Wing World Record Yesterday

I wonder what the world records were on the older flying wings? Now we are approaching 500 miles on hang gliders! Lots of sailplane pilots have not even attempted flights such as these. Of course a modern sailplane can do much better than this on good days too :) But these are amazing flying wing records by any standards. Especially when you consider the limited performance of 15:1 and airspeeds of only 45 mph. That 20 to30 mph surface and upper wind speeds contribute a lot!

I also love the rigid Horten type designs. And my preference would be a 3 axis flying wing glider for this type of flying. But it is what it is. Weight shift, portable, light (carbon fiber) and easy to assemble :) Oh but that looooong ride back home!

Jonny Durand on July 29th 2012

http://www.youtube.com/watch?v=C9ad_zArZBg&feature=g-all-lik

Wonder how far they will go today (July 4th) ?

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From the Oz Report: http://ozreport.com/1341403241
2012 World Record Encampment
Dustin and Jonny smash the World Record for longest hang gliding flight

(Zapata, Texas, USA)
You can find the flights here

http://chorlton.homeip.net/spotmap/zapata.html.

Choose Yesterday Jonny and Dustin (Thanks to David Wheeler for putting up this page for us).
Dustin and Jonny flew from Zapata in south Texas to

just east of Lubbock up in the Texas panhandle, approximately 475 miles (I'll know more accurately later today) with Dustin landing two miles further north than Jonny. Many people around the world followed their record flights on the internet as they happened. Dustin launched first just before 10 AM (Manfred and Paris launched at 10 AM in 2001). Jonny launched fifteen minutes later. They were in radio contact and sometimes in visual contact with each other throughout the flight. Timothy Ettridge was driving for Jonny and they agreed during the flight to have Tim bring them both back to Zapata (apparently the stayed the night up north).

The winds were 20 to 30 mph out of the south-southeast, which is what you want here in Zapata. They turn south at about 200 miles out.

Cloud base started at 2500' AGL (421' ground level at Zapata) and rose to over 10,000' near the end of the day up on the Edwards Plateau (2,500' ground level). Dustin said that he was climbing at 10,000' at 150 fpm at 8:30 PM. Sunset was 9:01 in Lubbock, and Jonny landed at 9:02. They both carried strobe lights to allow them to land within a half our of sundown.

Dustin states that they both went on final glide wing tip to wing tip and Dustin was able to eek out two extra miles on Jonny. Dustin in a Wills Wing T2C 144 and Jonny in a Moyes Litespeed RX 3.5.

The free distance record for hang gliding was held by Michael Barber. He flew a distance of 704 km (437 miles) on June 19, 2002 in Zapata Texas. So the old record held for 10 years. Yesterdays record is reported to be 477 & 475 miles respectively.

(ed. – This was one of the feats that Gary Osoba covered during his evening talk at the ESA Western Workshop over Labor Day weekend. He sponsors an annual records camp out of Zapata for all types of sailplanes. He and his wife had also tried setting a new two-place record but couldn't get away early enough to make the flight they needed for the record.)

Tommy's Idea (Using Hang Glider To Create A Airplane)

I know ...title is badly chosen, but my English is not good enough to tell otherwise. This idea I had several years ago. It was my way of trying to cheat the regulations of weight shifting hang glider competitions. Why not use a rigid wing hang glider. Hang a streamlined pod under it. The pod can hinge on the point where normally the harness hangs. Two streamlined struts hold the wing up. Those struts are the controls of banking. Both are connected to a stick in the pod. Move the stick to the left, the strut on the left gets pulled in, the one on the right gets pushed out. At the same time those spoiler like on the Atos can be activated. The same control stick is also connected to a rearwards strut. If the stick is pushed forwards the rearwards strut gets pushed outside. So ...the pod is pushed forwards. Euh ...does it sound to easy??

I guess ...if properly done you get a kind of airplane but ...with weight shift control. The pod shifts, so the weight is shifting. The pilot has a stick in hand. Hmmm ..might be a big stick to get the power on the struts right.

We are on the same page pal. I have considered the exact same concept myself. It's all about moving the weight of the pod / pilot or the wing (which either you prefer to call it, with mechanical leverage.)

A stick with a series of pulleys and cable will take the force pressures away like the VG block & tackle does on modern day hang gliders cross tubes.

Not only a rigid wing but a weight shift wing can be done this way too. Pilot sits up for better comfort. Plus uses the stick to eliminate forces to fly more like a 3 axis control. It is very doable!

(ed. – From Al Bowers)

Its been tried many, many times. And it doesn't work in roll-yaw. What typically happens is when you shift your weight, you increase the wing loading on one side, so that wing goes down (not as much as

you'd want) but it flies faster so you get an extreme version of adverse yaw. To correct that you need to add dihedral and/or verticals which increases roll stability and reduces the effect of weight shift.

The reason flexwing/Rogallos work, the sail allows some degree of distortion which allows the "heavy" wing to billow more, and the 'light" wing to flatten, this provides the yaw we're looking for. Russ Velderain figured this out in about 1972. Russ would leave the sail on old standard Rogallos "loose" to improve roll response (Russ was also famous for flying gliders that were way too big or his small size, this being the era of "floaters" in hang gliders). Later Mike Riggs (Mike, are you still out there?) was the first one I saw that made sails with center pockets that stood up to allow the sail to move from one side to another. Center/keel sail pockets got deeper and allowed more sail motion from side to side. I know Mike's company, Seagull, was doing this in 1973/1974. My Seagull III (early 1974) was this way. It also made the first series of high aspect ratio Rogallos manageable in roll, like the Seagull IV, the Windlord (I remember Burke Ewing flying with Curtis in one), Tom Peghiny's Kestral (first double surface flexwing I remember seeing), Roy Haggard's Dragonfly (later built by Pete Brock's UP Company), and Wills Wing Swallowtails. Later gliders like the Seagull VII and Seagull 10m developed this much better. Current gliders are using unstable spiral modes (too much anhedral) to made up for stiff roll handling, but with the VG full on, L/Ds in the 14+ range are achieved, dang impressive. Only by fairing the pilot, eliminating the control bar, and deleting the flying wires can you get up over L/D of 20. And an open cockpit design with an L/D of 30 would be at the ragged edge of the possible.

I don't remember if Jerry Katz's Alpine had a deep keel pocket or not (I want to say it did, but my memory isn't that good). Katz and the Alpine made the first 100 mile flight in a hang glider. Current Record set a few days ago, by Dave Glover in a Wills T2C went 475 miles…

#1 using a mechanical leverage to control a wing can be done, it's that no one has figured it out just yet. The control wing flying boat and the flying fleas are examples of the basic concept. So we already know the pitch is no issue. I'd think roll could be solved by maybe adding a rear stabilizer w/rudder (on the back of the pod)? How about tip rudders or spoilers? I think this mechanical tilt wing technology is a gray area of sorts. I've though about it for years in the trike configuration. I really though it'd be a safer way to tow a weight shift flex wing.

#2 Dustin Martin set the record of 477 miles, not David Glover. Jonny Durand came up short with 475 miles.

http://www.youtube.com/watch?v=Wjqcp7z_i4U

#3 I had a Pacific Gull Alpine & I'll need to dig out an old photo but I don't think it had a tall keel pocket like the Comet.

All the yaw problem is avoided in the class 5 rigids (Exxtaccy types) by using spoilers instead of ailerons. These rigids fly with weight shift spoiler control. The principle is simple, kill the lift and increase the drag in the inside wing and voilá, one gets a coordinated curve.

I built one and I am flying them for 12 years. The flying qualities are impressive. A modern class 5 rigid is a bit slow in roll but very coordinated and easy to fly. Since eight months I am trying to fly flexwings again and I am having a hard time. I fly hang gliders for 26 years and competed in several international competitions until I started with the rigids. The spiral instability and light roll forces associated with the contemporary flex wings require a high level of coordination and anticipation. Compared to flexies the class 5 rigids are very easy to fly. So much that in Germany a flex wing pilot does not need special exams to transition to rigids but the other way around yes. I see a potential in Tommy´s/Koen ideas....

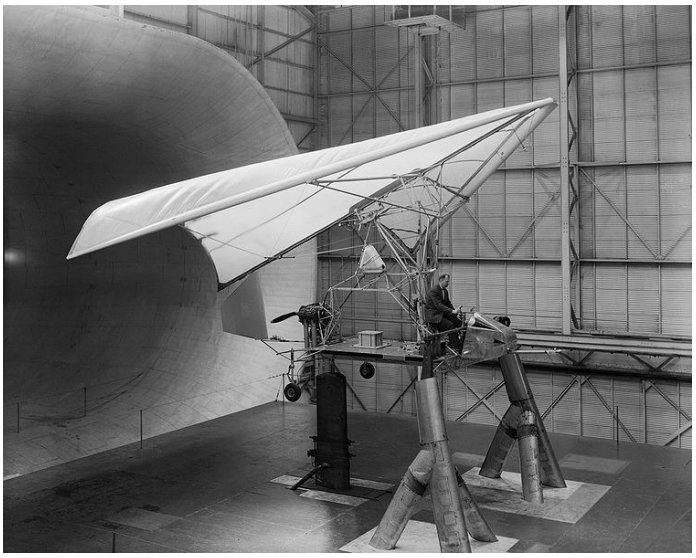
It's possible to make weight shift on rigid wings work. But most ideas involve low aspect ratios (ala Lilienthal or Chanute). It's difficult to get high performance with low aspect ratios. Not that rigid wing weight shift control cannot be done, but it probably won't be easy. DARPA did a study on this...

Al Bowers

The original Ryan research aircraft used a conventional stick via linkages to provide weight shift control: (see image on next page)

http://en.wikipedia.org/wiki/Ryan_XV-8

Modern rigid hang gliders have had pilot pods added with power units. The control is via the spoilers to a stick yoke inside the pod so not weight shift for roll only pitch:-



http://www.youtube.com/watch?v=exS8DF6D7Qo&feature=related

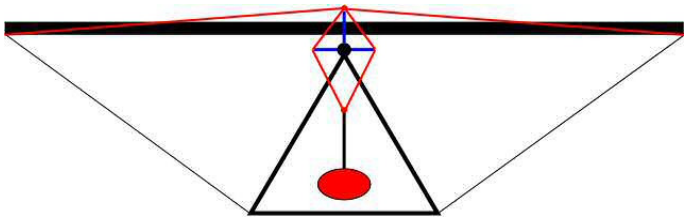
A trend in modern flexwing designs has been to shrink the keel pocket back to a minimum height.. why you ask?

They found that by merging the two rear wires from the control bar into a single wire of some length, the aft part of the keel. This Y-connection allows the sail to freely move side-to-side while restricting up-and-down motion.
We should note that prolific ultralight designer Mark Skull was killed last year when he was test flying his latest design, which featured a conventional cross tail on a weight-shift flexwing .. dangers abound where we tred new ground.

http://www.acesim.com/rc/p2/p2.html

Of interest to those who would like to joystick control a flexwing.. check out the Carbon Falcon and Carbon Kestrel RC models by AceSim:

And check out my old flyin' buddy Jeff Roberson's concept that he calls the "Lever-Link" .. it's basically power steering for a flexwing.. Caution: to my knowledge, has not been tested.



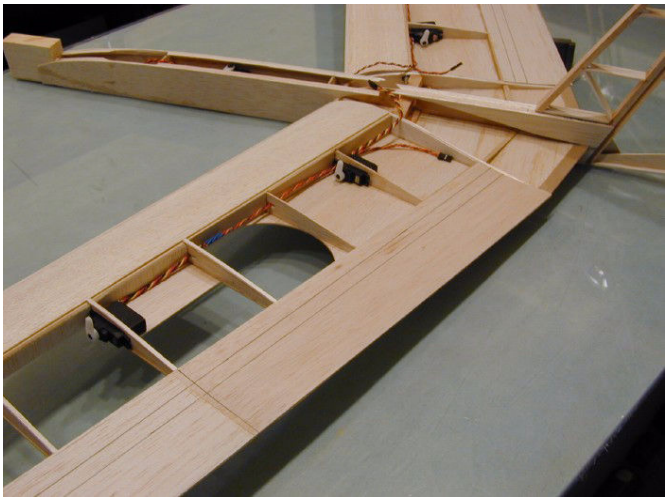
http://jmrware.com/articles/2008/leverlink/LeverLink.html

Weight-shift has been used on some Marske wings but only for pitch trim. There's less drag with the elevator streamlined into the airfoil. Theoretically, it's also possible to over-trim with weight-shift such that the elevator is deflected down at low speed and up at high speed making it effectively serve as a performance flap.

Puzzled. Shouldn't wing ribs (airfoil section) be parallel to the body of the craft?

I was looking in On the 'Wing... #148 for the best way to arrange the control systems in a tailless fwd swept wing...

On page 3 of this document



http://www.rcsoaringdigest.com/OTW/on-the-wing4/191%20B-11%20Intro.pdf

the picture shows a forward swept model (Akaflieg Berlin B-11).

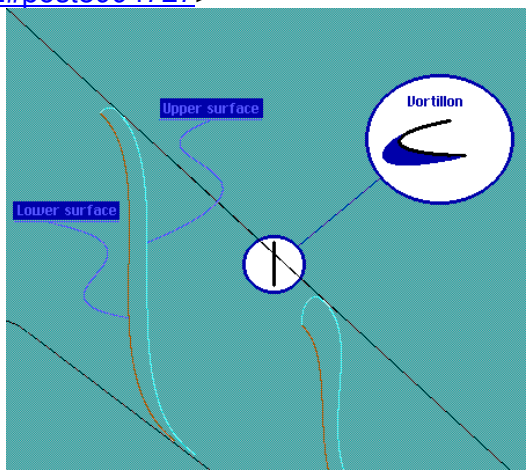
The ribs on the wing are not parallel to the body of the craft. Shouldn't they be? (supposing the rib shape has the airfoil profile)

I believe the reason for building a wing with ribs in the manner that you describe is quite possibly for practical / manufacturing / building reasons. The Messerschmitt Me262 wing ribs are at 90 degrees to the outboard main spar, thus making the jig fixture much easier to construct. (Especially for mass production). This I know in the past has led some to think that the wing sweep was an after thought !
As far as the aerofoil section is concerned, the required aerofoil would simply be built in to the initial design as naturally the DOF effective chord and the aerofoil section would be an elongation of the internal rib structures aerofoil shape.

John (what worked on Paul Allens Me262-Original restoration-till the project returned to the States).....

According to infinite swept wing theory the pressure gradient is perpendicular to the leading edge so the airfoil should also be perpendicular to the leading edge. This is great for fully sheeted wings because it simplifies designing the ribs and construction is a bit simpler. When you have fabric aft of the spar though it does look like it would make a bumpy surface. A lot of full size swept wings are built with the nose ribs perpendicular to either the leading edge or the spar and rest of the ribs parallel to the center ling aft of the spar.

<http://www.rcgroups.com/forums/showthread.php?t=806512#post8994727>



Distortion of the boundary layer stream lines high CL?

<http://www.desktop.aero/appliedaero/potential3d/sweeptheory.html>
<http://en.wikipedia.org/wiki/Sweep_theory>

Carbon Rods Connections for a Spar Shape

Still drafting like always and it got me thinking about the use of carbon rods. Jim Marske made me consider that way as a quicker way to get a spar made and ...it is more rigid and lighter. BUT ...
...my own draft is having a A-spar. And that means two type of connections to be made.

1) The middle of the spar where the left side and the right side come together ...at a angle (sweep and dihedral)
2) The joint where the connection between both spars is fixed.

Now my question: is it possible to create such connections in composites using the carbon rods? Or is it the old metalwork with bolts method we need to use here. The latter i would hate as i think about a non-dismountable A spar. So ...no splitting up in the middle. Any guys with good thoughts?

There have been some fairly radical composite spar connections where the spar stubs take an angle as they come out of the root rib. If the surrounding structure keeps the spar from twisting, it can still carry the bending loads.

With a swept wing, you're going to have to deal with the sweep angle somehow - either with bent spar stubs or an angled carry through structure. Any way you do it, it will be heavier than a straight spar of the same strength. If you don't have access to FEA software and the knowledge to use it, you're left with the "when in doubt, beef it up" philosophy.

One way I've thought about is to make the center section wide and put the wing joins well outboard. The carbon rods can be bent through the sweep angle in the center section using a large radius and the wing joins then become straight using conventional sailplane spar connections. The center section spar will have to be really strong to handle the twisting.

Look at your pictures of the Swift being assembled. It's basically an A-frame. There's a pinned joint at the front and a cross beam that slides into square tubes molded into the wings. That pin

holds the wings together and the square beam takes up the bending loads.

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

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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 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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BLUEPRINTS – Available for the Mitchell Wing Model U-2 Superwing Experimental motor glider and the B-10 Ultralight motor glider. These two aircraft were designed by Don Mitchell and are considered by many to be the finest flying wing airplanes available. The complete drawings, which include instructions, constructions photos and a flight manual cost $250 US delivery, $280 foreign delivery, postage paid.

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