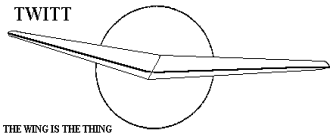
No. 333 MARCH 2014

T.W.I.T.T. NEWSLETTER

The Chance Vought F7U Cutlass was inspired in part by the swept-wing, tailless aircraft research that was recovered from German aircraft manufacturer Arado after World War II.
Source: http://junkcarnation.com/blog/category/uncategorized/

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., **1403** means this is your last issue unless renewed.



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. Officers:

President: Andy Kecskes (619) 980-9831
Treasurer:
Editor: Andy Kecskes
Archivist: Gavin Slater

The **T.W.I.T.T.** office is located at:
Hanger A-4, Gillespie Field, El Cajon, California.
Mailing address: P.O. Box 20430
El Cajon, CA 92021

(619) 589-1898 (Evenings – Pacific Time)
E-Mail: twitt@pobox.com
Internet: http://www.twitt.org
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Wt/#Issues	FRG	AUSTRALIA	AFRICA
1oz/1	1.75	1.75	1.00
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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

By the time this gets in the mail it is going to be a little later than normal. For multiple reasons I just couldn't get to producing this issue last week and get it to the print shop. I apologize for the delay.

Next month we will have an English translation of the 1932 Prandtl paper that has been done by Dennis Olcott. Al Bowers has cited the concepts from this paper in many of his presentations on minimum induced drag, like at the 2014 SSA Convention in Reno in February. My thanks to Dennis for allowing us to publish this translation.

I was able to attend the convention again this year and it was well worth the time. I also was convinced to take my recently restored Schweizer 1-26 to put on display for the 1-26 Association. This was the first time I had towed the fully loaded trailer more than a few blocks and I was pleasantly surprised at how well the trailer behaved behind my Honda Pilot. Most of the time you couldn't even tell there was something behind the car until you looked in the mirror. We were also very lucky to make the trip north and south in between the storm systems that dumped a lot of snow in the Sierra mountains. I am not sure where the next convention will be held, but if it in your area I highly recommend attending to take in the displays but more importantly sit in on the many informative presentations done by leading experts in the sport.

Andy

LETTERS TO THE EDITOR

Gentlemen, a good while back my design, the Mothbat 2, was presented on the front of the TWITT Newsletter. I have gotten older and wanting to simplify my life have donated the aircraft to the Miracle of America museum at Polson, Montana. I would like to maximize my tax deduction considering the value of the aircraft as a one only prototype rather than just the 'sum of its parts'. Is there anyone to whom I could talk?

Thanks

Gerry Geske
ggeske@blackfoot.net

(ed. – If anyone out there has come across the same situation and has any advice on how to prepare a tax basis for the donation, please correspond directly with Gerry. Any help would certainly be appreciated.)

Nurflugel Threads

(ed. - This is the final letter from the Nurflugel group on the vectored thrust discussion started in the January issue that I couldn't fit into the newsletter.)

My experiments with the pure Nurflugel design began in '83 when I developed the 'Sling Wing' free-flight catapult launched folding wing glider. I started out copying the plan forms used on the HG's that I had flown, and had some familiarity with. As time went on I found that for a free-flight model a wider nose angle, or less sweep, provided more consistent roll stability.

These gliders can exhibit positive roll stability, even with a couple/few degrees of anhedral built in to them, thus qualifying the theory that aft swept wing plan forms have some dihedral effect. The Sling Wing is usually produced in 'flat mode', with no geometric dihedral or anhedral. The minimal directional stability resulting from the wide nose angle (approx 13 degrees sweep at the leading edge) makes this toy stable enough in roll that John Q. Public and his kids will have a good time, without having to have any aeronautical expertise. So long as the lift distribution is closer to the elliptical than the bell version, the glider is very insensitive to asymmetric displacement of the elevons, As with Don's RC wing, these toys exhibit 'wrong way' response to small amounts of aileron input. Moving the CG fwd will load up the elevons sufficiently to get proper roll response to adjustments, but the loss of efficient glide is noticeable, and the glider starts getting less roll stable. So just like in life, you pays your money and you takes your choice.

So of course when the foamie 'combat wings' came on the scene I was excited to explore the arrangements that led to a fun wing. I made adjustable sweep and dihedral/anhedral gliders, and had a real blast flying them with no vertical fins, although of course one thing I learned right away that this aircraft configuration's Stealth qualities make them almost useless as everyday 'sport' models. Unless the glider is very large, like 10 foot span or more, they are easily lost to view; reflective or neon bright LE's are practically a must. I found myself almost always keeping the glider high enough that I would always have some kind of planform view of them.

One of the complaints that the fliers had was the Dutch Roll thing, so when I started playing with them I would simply bend the airframe at the root and use tape to lock in a anhedral angle. Doing this made these gliders track better and be more responsive in roll, and the size of the tip fins could be reduced, if desired. If the anhedral built in is great enough, the glider will be quite roll unstable, and that sure takes some getting used to, especially I guess for those of us who usually fly polyhedralled rudder and elevator planes. I do believe that having to 'high side' the stick while thermaling can actually improve the climb rate some. With the inside elevon down and the outside one up, the glider seems more stable in yaw while circling, and it feels like it is easier to stay in the lift when stronger lift tries to lift the inside wing, you simply ease off the high siding and she'll roll into the turn. Over the years, I've on a couple occasions increased the anhedral of my HG's to help prevent getting spit out all the time.

One thing that was a lot of fun was flying with no tip fins, and an anhedral built in. By oscillating the aileron control properly, the glider could sometimes be made to 'depart controlled flight entirely', with a resulting span-wise flight direction and tumbling about the pitch axis. This was best done with the glider close-in, as they often needed a lot of height for recovery, if they would recover at all.

Of interest to me was that the 'dihedral effect' due to sweep varies with AoA. At high AoA the wings would exhibit greater roll stability than at the lower values.

I was delighted to fool around with these toys, both the free-flight and RC ones. The aero-modeler venturing into the Nurflugel area will soon discover that these things are an animal of a different color. Those who live for adventure will have a ball messing about with them, but others who may prefer a more cut-and-dried approach to design may wish to avoid them altogether. They will never prove to be boring, IMO.

I just uploaded 2 scanned pages from a book regarding the late Dr. Karl Nickel's "Falter 1" flying wing ultralight design... in the photos section.
Very interesting concept, but I can find very little additional information about it. It had the unique combination of:

Wing warping control.
No vertical surfaces
Foldable like a hang glider wing
Controlled side slips and coordinated turns

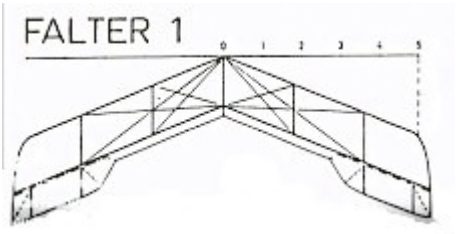
I would like to learn more about this design.

Does anyone in this group have more information about it? Perhaps some features and/or lessons learned from it could be applicable to newer designs.

The book is "Tailless Aircraft in Theory and Practice" by Karl Nickel and Michael Wohlfahrt. I have the English language version published by AIAA... I think the German version is also available on the web.

Daniel Moser

(ed. – Below is the best I could do in downloading a copy of the image from the group site.)



Hi Dan:

I have a copy of this book, I remember reading the section about the Falter 1 and finding it very frustrating that there was so little information given on this aircraft, particularly given that large portions of the book are devoted to adverse yaw and here was a potential solution designed by the author himself. Even basic information seems nigh on impossible to come by. It is all the more frustrating as if it did fly as well as claimed it would make a very useful comparison study to the Horten style designs.

Looking again at this it looks like the wing is rigid and fixed and the fuselage frame is rigidly mounted to the wing (i.e. no weight shift). The elevon control surfaces have two control horns on them, one at each end allowing them to be warped. Presumably the elevons could be moved up and down together for pitch, oppositely for roll and then the warping applied to control yaw and/or induce pro-verse adverse yaw as required? I may be wrong but that is what make the most sense to me. I guess that using the warping elevons you can effectively control the twist and therefore lift distribution over the outer 1/3rd of the wing semi-span enabling yaw control.

I look forward to hearing if you manage to get any further info.

Anyway, must get back to sanding some rib templates.

John Newton

Speculating from the pictures of the Falter 1 in the book, it looks to me as though the inboard control horn on one wing is deflected opposite to the outboard control horn on the other wing in aileron mode.. And in elevator mode, I suppose they work in unison.. but I have many questions on how the control linkages were designed.. And, he refers to control pedals as well.. what do they do?

I'd really like to learn how those controls were designed, how they worked, and what modifications or variations he tried out on this one-of-a-kind aircraft. It seems a shame that we know so little about it.

The only thing I know of that was similar to the Falter 1 were the C model Kasperwing ultralights. The 3-axis control with elevon-type controls that were hinged rather than warped (I'm not sure about this) .. it also had spoilers and vertical tip fin/rudder controls.

The C model was more expensive than the earlier A & B models, which had only weight shift & rudder control. The company only made a few C models ~1987 before going out of business .. they never became very popular... I know of only one in existence today.

Dan Moser

I also have questions about the design and construction of mixer boxes. I guess that it works the elevons as ailerons in one plane of the stick and to make the work like an elevator control, one must pull the stick "up" to work it in a different plane so those controls are actuated. So there are up and down motions to the stick as well as fore and aft and side to side. At least this is about as clear as I understood it from "Only the Wing"...seems complex, and I don't understand how one would initiate a climbing turn since both "planes " of the stick would have to used simultaneously...I guess? Please someone "school" me as to my thoughts on this, as I am most probably totally off base and 180 degrees off...BTW..been off for years now..LOL!

Thanks

Rich Nunn

Horten Documentary

Apologies to all if this is very old hat by now but I have been watching 'DOKU Hitlers letzte Flieger - Die Flugzeuge der Nazis' on YouTube. It is a documentary on the Hortens in the context of the end of the war. Lots of cine film of Hortens being built and in the air that I have not seen before, including one superb piece of an H III coming in to land on top of a hill scattering the sheep as it does so. Plenty of familiar faces too. But all in German, of course!

http://www.youtube.com/watch?v=l0gMZtgiXSg

Chris Bryant

Thank you Chris, and it was new to me. A well done mix of old footage interspersed with excellent recreations. My German is rusty and minimal, but there were few places I couldn't follow the presentation. Even then the visuals kept my attention.

Cheers,

Bob

(ed. – This is a 49-minute video so plan on spending some time with it to get to the Horten sections.)

I was in need of a side stick for a Flying Flea design I am working on. Inspired by some side stick (by Emile Croses) I saw, which used sliding parts, I wanted to avoid sliding parts and came with this idea. It is using the system of Emile Croses together with something I know from a motorcycle. That suspension is called the Hossack suspension.

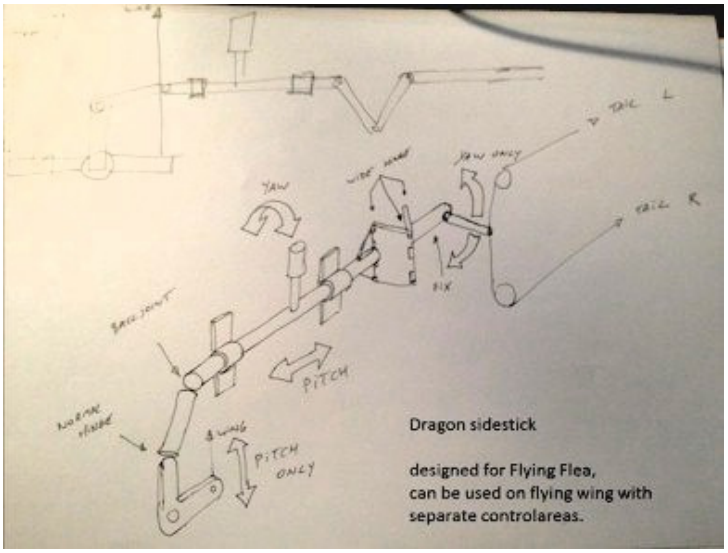
I will place a draft in the files sections after this email. Directory "Nest of Dragons thoughts".

Remember, this version is made for the Flying Flea who has a fully rotating front wing (it is a tandem wing). So it steers yaw and pitch. But it can easy be altered into pitch and roll.

I call it the Dragon sidestick. :)

Koen

(ed. – Here is the best I could do with the image that was on the group site.)



A few years back I was asked to teach paraplegics to fly gliders modified with a rudder lever for their left hand among other details like latching spoilers and wheel brakes. Of course, I had to learn to fly with this rig before I could teach in it. I approached the task of re-wiring my brain with some trepidation.

To my surprise, I found it cool to coordinate turns using a hand lever for the rudder. Pretty soon, my feet weren't even twitching when I needed rudder.

If it weren't for the control forces, a twist grip on the stick for rudder like the joysticks for PC simulators would work fine.

Bill Daniels

Bill: nice work. A rudder lever. Cool...

You know, Wilbur and Orville had a rudder lever on their 1905 Wright Flyer III...

Al Bowers

Al, the trick was to fine tune the coordination with adverse yaw - i.e. heave in a bunch of rudder and then quickly move the stick the same way the yaw string went to bring it back to center. If I'd mixed up my right and left with the rudder lever, I still got a coordinated turn - just in the wrong direction. If anybody was paying attention, I just pretended I wanted to turn that way.

Bill

While we were thinking about hand controls at the moment my design was still a tri-gear, I thought to use a lever to control the front wheel and have pitch and yaw in the control stick. Seemed doable, but the easiest way was to use classic gear and simply use the known pitch-yaw control at the side to increase the ability to enter without stuff in the way for the legs.

The system you propose is still possible if using a central stick and a wider steering handle (euh ...Like those H things you saw in the older airliners). But I am not sure how the twisting of that control will result in interference with pitch or yaw control.

Koen

A twist grip could be used for rudder, if the twist grip only had to operate an almost aero-dynamically balanced servo tab on the trailing edge of the rudder.

I've given thought of building a very light and large hang glider, with an un-powered "trike" like affair mounted under it.

This machine would only be used on training hills, or possibly with a scooter tow system. Or a powerful, quiet electric golf cart could be used, with a tow rope from the back of the golf cart, around a pulley, then on upwind to the end of the field or road being used, and then back to the glider.

This system would allow the instructor/cart driver to be beside the aircraft during the low tow, where he could easily observe what the student was experiencing, and easily offer advice without the need of radios.

While the usual triangular control bar and weight-shift could be used, I should think that it would be worthwhile to re-think the controls entirely.

Let's assume a student with no aeronautical experience. He/she has $100 and "Just wants to try it once", so they get a couple/few hours for the hunnert bux.

To make life easier for everybody, let's consider a control system that is as much like what the student already understands as possible: their automobile.

A steering wheel, that, like the good old Ercoupe, controls both aileron (wing warping) and rudder. The wing can pivot in yaw relative to the trike (which actually should be a "quad" with 4 wheels), so that cross winds won't matter.

A "gas pedal" lowers the Angle of incidence to go faster. A "brake pedal" increases the angle of incidence, and if pushed very hard will lower the flaps.

A system such as this would give beginners a taste of flight, without their having to learn too many new things at once.

I'd bet that a system similar to what I'm proposing would be a money-maker in a tourism based economy, and would introduce many would-be pilots to the joys of simple, slow speed flight. All you need is a big field.

Of course, the whole system really should be designed from the ground up with one goal in mind, that being to provide the easiest and safest experience possible to as many as possible. Once they get used to flying, they'll be able to adapt to other control systems if necessary.

This idea requires your willingness to think completely outside of your comfortable box, and yet we must reach back into that box for some foundation to build on.

It's A Brave New World, and we have the privilege and the duty to shape it.

Yours in Flight,

Steve Corbin

2014 is the 81st anniversary of the first flight of the Horten Ia. There will be a meeting, small exhibition and some lectures about the past, the future of the Horten Nurflügel and some new interesting projects. Venue is Bonn-Hangelar from 6th till 9th June 2014, prime days will be Saturday and Sunday.

Website: http://www.raabenvoegel.de/
and E-Mail 80und1@raabenvoegel.de

Feel free to contact me.

Regards

Jörg Schaden
joergschaden@googlemail.com

Mitchell U-2 Discussion Thread

Hey Guys, I am wanting to make my landing gear for the nose instead of using a bicycle fork. I was wondering, I know I need 4130N stainless steel for fabrication but what thickness should I get. I am thinking of either flat metal or pipe. Could someone recommend the best thickness to use as I do not want it to be too weak.

Thanks

Ryan Derot

If it were me I'd probably use 5/8 or 3/4 x .035 wall square 4130 tubing. . . TIG welded, not torch.

Austin Cole

Why are you doing this? The kit I assembled had a solid, not tubular, bike fork in it. Even then, the weight was negligible. Built per plan, the supporting structure is far weaker than the fork assembly. I think the bike fork is an elegant engineering solution.

Dave G

I need to fabricate front forks as I need 6.25" for the front wheel and brakes and no bike forks offer this space.

We are going to use 1/4" x 0.065

Ryan

Concerning the front wheel. There is very little weight in front so the structure of the fork itself do not have to be sturdy like hell. Mine was done using .500 tubing for the legs and 1.00 for the main tube (all .049 thickness,.035 probably would have done the job but harder to solder with the torch). However, putting a brake in the front gear is a loss of time...It stops the machine only at idle and if you want to use it on landing, the wheel will just slip like a ski and you will have less directional control. I would spend more time designing some kind of a shock and put brakes on the main gears where most of the weight is. I have done this using 1-inch caliper and circular saw blades for the discs. (Cheap but working, please grind the teeth!!!).Cheapest suspension for the front gear is putting just enough air in the tire so the tire does not get out of the rim. Putting small springs in the lower legs would just amplify the oscillations between the front gear and the 'peg ' in the back if you hit a bump at certain speeds....

Guy Provost

I am getting ready to purchase my bell crank bearings for making my controls, my question is I am not sure which bearing I need to get as Aircraft Spruce has 2 different bearings and I am not sure what the difference is besides the price. The one bearing is $100, the other is $20 - could someone help me in advising which one I need to buy and what the difference is. Thanks for your time and help.

http://www.aircraftspruce.com/catalog/appages/bellcrankbcp4.php?clickkey=381530
http://www.aircraftspruce.com/catalog/appages/bc4w10.php

Please advise which to get and what difference is if you know. One has a number of BCP4W10 and the other BC4W10

Ryan Derot

Use the BC4W10 (AN218-4). If it's good enough for Cessna it should be good enough for us? It's also the only one that AS+S carried back when the U-2 was being built in any number so it's also likely that it is the one used in most flying U-2's.

If you are worried about quality from AS+S you could buy it directly from Cessna - $389.00 list - but it does come with paperwork.

Halfvw

Older homebuilt designs used those because they were available as surplus in enormous numbers and were cheap. In my opinion, there would be nothing wrong with re-detailing the devices to use plain or hardware store bearings.

Dave G

I can see no downside to using the less expensive and uncertified bearing such as this one from "Wicks Aircraft" or the same one from "Aircraft Spruce" as the U2 certainly does not put excessive loads on this bearing.....IMHO

http://aircraftproducts.wicksaircraft.com/keyword/?&plpver=10&key=all&keycateg=100&SchType=2&keyword=bell%20crank&refer=http://aircraftproducts.wicksaircraft.com

Kelly Troyer

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.

Serge Krauss, Jr. skrauss@ameritech.net
3114 Edgehill Road
Cleveland Hts., OH 44118 (216) 321-5743

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

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

FLYING WING SALES

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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