

# T.W.I.T.T. NEWSLETTER

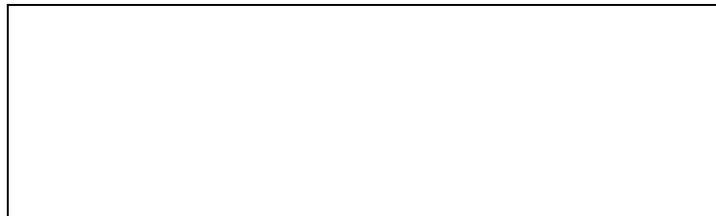


The Northrop X-4, Bantam, was a single-place, swept-wing, semi-tailless airplane designed and built to investigate that configuration at transonic speeds (defined as speeds just below and just above the speed of sound, but in this case, the testing was done primarily at just below the speed of sound).

Source: <http://www.aircraftresourcecenter.com/rh/articles.php?id=13077>

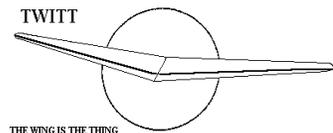
## **T.W.I.T.T.**

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., **1209** means this is your last issue unless renewed.

**Next TWITT meeting: Saturday, September 17, 2011, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (1720 Joe Crosson Drive - Southeast side of Gillespie).**



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

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

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

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**PRESIDENT'S CORNER**

Last month I had anticipated including another section on the “flying saucer” article covering the power plant system. As usual I started putting the issue together using the letters section and then some threads from the U-2 group. It turned out to have some interesting threads that others should be aware of if they are not associated with the U-2 group and are thinking of looking into one.

Then the Nurflugel group had the announcement that Jim Marske had flown the Pioneer 3 flying wing sailplane, so I had to add that material into this issue. Jim wrote two letters covering his initial flights and answering some of the questions being asked by the group. He doesn't have an performance figures since it is very early in the flight program, but it will be interesting to see if he achieves the L/D numbers he was striving for.

The ESA Western Workshop was held over the Labor Day weekend and although there were no presentations directed at flying wings, there were frequent mention of them being viable solutions to some aerodynamic issues. The last one on Sunday was particularly interesting since it was two engineers from Paul MacCready's Aerovironment telling how they made a remote controlled hummingbird. It is designed with a camera for the operator to navigate and the ability to actually drop a surveillance payload inside a building. Go to <http://www.avinc.com/> to learn more under nano UAVs. See the next page for pictures.

*Andy*



**LETTERS TO THE EDITOR**

August 14, 2011

Hi Andy:

Several of my "bird-model" associates have sent me this website. I thought you might have also picked up on it, but didn't see it mentioned in the last newsletter.

<http://www.flixyy.com/airplane-flies-like-a-bird.htm>

A very impressive piece of work! I am amazed at how slow the bird flies. It is extremely light weight (16 oz.) in spite of the propulsion and control mechanisms contained inside.

I noticed that it has a small (non-bird-like) ventral fin, but the technology and structural advances demonstrated by the flights may overshadow that little necessity.

I have also enclosed my renewal for the next year.

Bob Hoey  
[bobh@antelecom.net](mailto:bobh@antelecom.net)

*(ed. – Thanks for the link, which I had not seen yet. The flight is quite amazing, yet the mechanics inside don't appear to be extremely complex to get the necessary action.*

*This piggy backs nicely on what was shown at the ESA Western Workshop by the engineers from Aerovironment on a mechanical hummingbird. This is a DARPA project for a nano UAV that is still in its initial development stages although they have a flying example that can be seen at the links below. I have also included a couple of stills I took at the workshop.)*

<http://www.youtube.com/watch?v=Cov7-XWUa18>  
<http://www.youtube.com/watch?v=xolH02Zba04&feature=related>

August 23, 2011

Hi Bob,

I have only just come across your designs for birds. I was about to build a Buzzard from Traplet plans, using conventional rudder/elevator when I saw your

control method. This is so interesting I just can't build using a rudder now and would like to use your far more natural approach. Do you know of a UK outlet for your plans? Are the ailerons configured so that there is down only available on each wing, so that there is no up movement i.e. differential control?



**Above:** Hummingbird on its launch stand (landing gear/legs). It is about 4" tall. It flew without the stand due to the high altitude at Tehachapi so you can see it is truly a tailless aircraft since the stand is not necessary for stability.



**Above:** Matt Keennon of Aerovironment flying the hummingbird inside of Jeff Byard's hanger during the workshop. He not only flies it but also is one of the technology engineers responsible for development and construction of the micro components.

This is particularly interesting as I fly at Old Warden in the UK, which houses the Shuttleworth collection of historic aircraft, but there is also a bird of prey centre on the same site, with a wide variety of species including eagles and vultures. The latest addition is a captive bred Andean Condor chick. Sad to have them in captivity, but its chances of survival are probably better than in the wild just now.

Alastair Hobbs  
[ah@hobbsnet.demon.co.uk](mailto:ah@hobbsnet.demon.co.uk)

**T**he only outlet for my Turkey Vulture plans is Model Airplane News who published a construction article in June, 2002. You can order plan number FSP0602 (\$19.95) by mail;

Air Age Mail Order  
 P.O. Box 407  
 Mt. Morris IL, 61054-0407  
 USA

If you have trouble ordering, email me your mailing address and I'll send you a set of plans.

Each wing tip aileron has its own servo, so differential deflection is easily accomplished through the transmitter. I have tried differential aileron and found it unnecessary. These aileron feathers are not drag devices for initiating turns as is done on most flying wings. They appear to be operating in the upwash region outboard of the normal wing tip vortices and thus are producing both lift and thrust.

You will notice that the forward tip feathers of a real soaring bird are operating at a rather large negative angle of incidence relative to the rest of the wing. In spite of this large negative angle, the feathers are bent upward, indicating that they are loaded upward and thus are producing lift. The optimum neutral setting for my two forward tip feathers is -27 degrees. Plus or minus 10 degrees of aileron deflection produces normal turns with no noticeable adverse yaw, even without a vertical tail! Try it -- you'll like it!!

I'll be glad to answer any questions you might have about the model.

I have seen several California Condors, in the wild, here in southern California. They are struggling to survive, but are beautiful to watch!

Bob Hoey.

Dear Bob,

**M**any thanks for your reply, it's much appreciated. I spent many years sailing before moving to model aircraft, and I found the pictures on

<http://www.twitt.org/1partdrib.html#top>

so interesting as I recognized the slots as similar to sail settings. Fortunately while sailing someone had lent me a book called "The Best of Sail Trim". This was a collection of articles by various authors, one being Arvel Gentry ([www.arvelgentry.com](http://www.arvelgentry.com)). He wrote several articles on the slot effect as experienced by sails and so I could see your wing tips were operating much more efficiently than other methods. Though the feathers on birds appear to be at a negative angle, they are working at a positive angle of attack for the airflow around them.

This is one of several articles, which showed me what was going on (fig 13 illustrates it). My apologies if you have already seen this, it has just occurred to me you may even know Arvel as he is, or was, based around California.

I have ordered a copy of the plans, then at least I can ask informed questions, and not take your time unnecessarily.

Alastair

**T**hanks for the references to Arvel Gentry. I was not familiar with his work. I am an aeronautical engineer and agree with his comments that most explanations of "wing lift" are misleading at best.

I sort of stumbled onto the wing-tip-feather effectiveness and settings by trial and error on my Raven model, but later built a small model of my wing and mounted it in the water tunnel at NASA DFRC at 10 degrees angle of attack. It confirmed that the flow over the forward tip feathers (as mounted on my model (- 27 deg) was smooth, and stayed smooth for aileron deflections of plus and minus 5 degrees from the -27 degree setting.

My initial wingtip configuration used the outline of the wingtip of a soaring Raven, but the feathers were all mounted at 0 degrees incidence. The water tunnel confirmed that the airflow for this configuration was separated at the leading edge over the entire wing tip. The improvement in the glide was noticeable with the

angled feathers.

Hoey

*(ed. – I was talking with Bob at the workshop and mentioned that years ago a friend of mine was a sail maker. He applied what he learned of aerodynamics from building and flying an HP-18 to his sail designs and came up with some prize-winning examples. So as Al Bowers emphasized in his talk, we need to think outside the box no matter how trite that phrase may have become over the past years.)*

-----

August 24, 2011

I read the U-2 landing gear problem comments and thought that people might like to know that my 1995 Pontiac Grand Prix has a fiberglass rear spring also. It connects the left and right rear axles. I suspect that you might find the spring on a number of GM vehicles, not just the Corvette, and they might be cheaper especially at a junkyard.

Have fun,

James McLellan  
[ajwmcl@q.com](mailto:ajwmcl@q.com)

*(ed. – Thanks for the information. I will sign on to the U-2 site and pass this long to them.)*

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## NURFLUGEL THREADS

### Marske P3 Flies

Check Photo section. I believe subsequent flight test data will prove this is the highest L/D flying wing glider that has ever flown.

[BILDAN@COMCAST.NET](mailto:BILDAN@COMCAST.NET)

The P-3's first flight is incredibly good news.

My hearty congratulations to Jim Marske, who has labored many years to achieve this moment. This is a beautiful design, which I hope pleases and surprises a lot of folks. Jim computer designed his own wing section for this configuration and these Reynolds numbers, as well as for the P-3's wood and fabric wing structure, and I hope it realizes its designer's (and my own) fondest hopes. I know he spent great effort to

control aft fuselage flow and root interference that hampered the Genesis II sailplane that was a compromise between Jim's and John Roncz's design ideas. I can remember Roncz at Oshkosh later acknowledging that "I am a flying wing guy!" I believe this to be a final acceptance of the ideas Jim had fought for in that design.

The P-3 was designed over thirteen years ago, but may still surprise critics. I truly hope that its performance will justify a strong investment in construction of a glass or CF P-4, that has been in Jim's computer, probably undergoing refinements, at least that long.

Way to go, Jim!

Serge Krauss  
[skrauss@ameritech.net](mailto:skrauss@ameritech.net)

It is great to see this design finally finished. I truly hope that Jim Marske gets now data of the better design. Congrats too to the builder. Looks really great and we see the smile on your face. I guess you are ultra proud.

Koen Van de Kerckhove  
[nestofdragons@hotmail.com](mailto:nestofdragons@hotmail.com)

Thanks Serge! Has it really been 13 years? I really didn't have to know that, guess I'm slowing down more than I realize. An old friend of mine who helped on the Pioneer 1 told me I had better fly it before the fabric rots.

I cannot take an air tow till I get my airworthiness Certificate. The FAA was out a few days ago an the P-3 passed inspection. Fact is, the FAA boys were all excited over the P-3. I still must fill out some paperwork before I get the C of A. So I cheated and did several auto tow hops.

Mike Hostage, who built and flew a P-2D for many years, made the third hop and was equally excited about it. He was so excited that he placed an order for a P-3 kit. The kits will be produced by a few fellows from the old Genesis guys. I will do all the engineering.

A few comments on the flights. Despite the short hops we learned a lot very fast. All controls were light and responsive. I seemed to have the CG in the correct location from the feel of it. Spoilers, plug type responded much better than the old door hinged type. No pitch change or bobble when opened like the door type did. And they are very effective! I should have

used the plug type spoiler long ago although the door type was fine on the Monarch. Only fault I could find was that the main wheel should be moved 2" further forward to get weight off the nose skid and lift it off the runway sooner. Otherwise, the plane is very quiet and glides a long way. It's quiet mainly because I can't hear the air scrubbing against the aft fuselage like the tailed ships. To sum it all up, I feel very much at home in this bird. It's good to get back into a flying wing.

Jim Marske  
[jim@marskeaircraft.com](mailto:jim@marskeaircraft.com)



*(ed. – For those of you with the same questions here are a couple of posts after Jim made the one above.)*

I have been a member of the Nurflugel group for a while. Obviously very interested in flying wings, and have more than a few RC ones.

I have also followed the real ones, especially gliders now more than ever since I got my FAA license and have been flying gliders for the last 2 yrs.

I am particularly interested in the Pioneer 3 for which there was a recent post saying that it had flown.

I have tried to find out more information, but Jim Marske's website does not yet have much on it.

One of our senior members was a test pilot for Schweizer, and actually flew the Pioneer 2. He seemed surprised when I told him today that the P3 had flown.

A while back I did find a website that chronicled some of the issues with the pioneer builds as well as some 'disagreements' between the creative parties which led to delays, but nothing I remember concrete.

Is there any more information on the Pioneer 3? I noted mention of a possible kit.

I understand that more information may be forthcoming, but would appreciate any notice of it.

Galo Grijalva  
[galognu@yahoo.com](mailto:galognu@yahoo.com)

All the information that exists has been posted here. No one is holding back. I doubt anything meaningful in the way of performance measurements will be available for months. You'll just have to be patient. Jim works at his own speed.

We need to keep in mind the relatively short history (In number of designs - not years.) of flying wings. They haven't benefited from the large number of iterative design improvements present in "conventional" boom and tailplane designs. Any design concept benefits from a long history of incremental improvements.

In this sense, the flying wing is a still very "young" concept.

I'd love to see what is possible if Jim's concept of a flying wing were put through a series of, say, 20 prototypes with each subsequent design building

on what was learned from the previous ones.

I've long felt if that were done, his flying wings would displace "conventional" designs in the sailplane world.

BILDAN@COMCAST.NET

When I was building my Monarch G, Jim was working on the P-III. He mentioned that his weight goal was 350#. I have no reason to believe he did not achieve it. He also said when John Roncz was collaborating with Jim on airfoil design, John insisted on having 3 degrees of washout at the tips. Jim argued that washout was not necessary on a swept forward wing. They eventually compromised on a 2deg washout. Jim stated later that is what killed the high speed performance of the Genesis II.

If my memory is correct he mentioned that the Genesis II was a little overweight. That is what hurt the climb performance in relation to standard gliders (15M). I am sure Jim will eventually get around to publishing performance figures.

Dave Wells was the test pilot of the P-II. I think Mat and Jim worked together to build very light ailerons, and when Dave test flew it a flutter

developed. Mat then built counterweights into the wing tip and that cured it

Mike Hostage (an USAF general) purchased a P-II, and had Mat re-profile the wings which improved performance. Since the P-II wing is made of wood it is heavier than it would have been if made of composites. After observing the P-III he has asked Jim to build him one.

All this happened a few years ago so I hope my memory has served me well enough.. I am sure Jim appreciates all the praise given here and he certainly deserves it, as he has worked many years in pioneering the swept forward concept which he believes is superior to swept back concept.

Jerry

[nolanjm@juno.com](mailto:nolanjm@juno.com)

**J**erry is mostly correct. My P-3's weight goal was 350 lbs but the official weight was 333 lbs (151 kg). Washout in the wing is zero degrees. Ailerons and elevator are mass balanced.

The Genesis 1 has 4.5 degrees of washout and weighed 600 lbs ( 273 kg ). Climb performance was hurt by several items. The upper surface wing root fairing was not large enough to prevent separation at high CL's. Secondly, the wings washout set the root airfoil at a higher angle of attack than it would have if the wing had no washout. Thirdly, the main wing airfoils pressure recovery zone (around 70% chord) had premature separation at high CL's. Larger root fillets were added to the prototype G-1, which pretty well cured the root separation problem and climb rate improved. The main wing separation problem was minimized by flying a bit faster in thermals.

The Genesis 2's wing had 2 degrees of washout and weighted 550 lbs (250 kg). Tuft studies still found root fairing separation problems at low and high speed. Filling in the reflex portion of the fairing eliminated most of the root separation at all speeds. This modification improved the L/D from 40.5 to an unofficial 43.5 to 1 as well as reducing the minimum sink rate in thermals.

Two Pioneer II-D's were brought into our shop for wing contouring. One was purchased by Mat Redsell and the other was owned by Mike Hostage. The wings were extended from 14 to a full 15 meters. A lot of flight testing was done with Mat's P-2D. There was a complaint of a buzzing noise coming from the aft fuselage which was eventually traced to a vortex forming in the fuselage to wing juncture. A larger wing

fillet was bonded on and the buzz stopped. The P-2D now flew slower and had a lower sink rate.

A traveling 10 lb (4.5 kg) weight, I call it a C. G. shifter, was added in the fuselage to adjust the CG while in flight. The fiberglass tube containing the lead weight could be moved from the tail post up to the back of the pilot's seat. It became a wonderful speed trim device. The elevators remained in their neutral position whether in slow flight or in high speed cruise. Again our performance improved at all speeds. Don't get the idea that our performance was poor before all these modifications as the Pioneer II was holding it's own against many glass gliders. As near as we could tell, Mat's P-2D's performance increased from 35 to 1 to a bit over 40 to 1.

As for flutter, none of my wings ever had a flutter problem despite not having mass balanced ailerons - until Dave Wells found it in Mat's P-2D. Dave had been flying around for several hours, but then wondered how the Pioneer behaved at 90 mph. He pushed the nose down a bit while glancing out the cockpit side. When it sounded like he was approaching 90 he looked at the air speed indicator and was alarmed to see that it read 125 mph and increasing rapidly. Shocked, he jerked the stick aft a bit, all hell broke loose, the stick ripped out of his hand, slamming full travel side to side at an estimated cycle rate of 200 cpm. Luckily, the aircraft was in a climbing attitude and the speed decreased to 90 mph where the flutter subsided. Once on the ground, the glider was taken apart and inspected for damage but none was found. Before the aircraft was flown again the ailerons were mass balanced.

My analysis of the cause of the flutter was as follows. Inspection of the wings showed that the outboard half of the left wing had 2 degrees of washout. The right wing had none. This condition was known months before the flutter flight. In flight the aircraft required a constant, but noticeable, amount of right stick be held in. This resulted in an imbalance between the two wings. Secondly, the longer wings increased the wingtip deflection under 'g' load. Third, the ailerons were heavy, as verified by the large amount of lead needed for mass balance. Jerry said the ailerons were light, and so I also thought, till I was told later that a lot of filler was used to fair the aileron into the wing. The ailerons were made after hours when I was not there. At any rate, there were no flutter problems after the mass balance was incorporated.

Jim Marske

**Posted** August 17, 2011

Friends,

**T**ED.com (Technology, Entertainment, and Design) and NASA have teamed to bring a new conference format. TED has established itself as a leader of innovation and future thought. TED's motto of "ideas worth spreading" has grabbed some of NASA's best ideas. This is the 5th TEDxNASA event. It will be streamed live on-line from San Francisco. The event runs from 2:30 PM PDT to about 9 PM PDT on 17 August 2011. At least two of the talks will feature flying wing ideas. For more info, speaker bios, and talk topics please visit:

<http://tedxnasa.com/silicon-valley/>

Al Bowers  
[Albion.H.Bowers@nasa.gov](mailto:Albion.H.Bowers@nasa.gov)

*(ed. – Since you are getting this after the presentation you can see Al's comments at the following link provided by Norm Masters. He had to compress an hours worth of material into the 8 minutes you see in the video. He did give the long version at the ESA Western Workshop and it was quite interesting.*

*I joined YouTube just so I could subscribed to TEDx and get the e-mail notifications of new uploads because, like some other folks, I missed the original webcast of Al's talk. It's here guys!!!.*

[<http://youtu.be/223OmaQ9uLY>](http://youtu.be/223OmaQ9uLY)

**N**ow at last I understand more about the Horten design than I did. The part about adverse yaw countered by induced thrust was passing me by in the past. Now at last noticed it. And I am hooked again on the Flying Wing. Thanks Al.

Just one tiny question: if the steering is helped by this induced thrust, how come many of the modern versions of the Horten-look-alike designs still have wing tip rudders? Is the solution in induced thrust not really so easy to find correctly?

Keep that brain spawning wings,

Koen

**I**f you use a straight taper wing, then the usual way to achieve the bell spanload is a very strong

nonlinear twist. Calculating the twist was Horten's secret. Jones always used planform shape to achieve the bell spanload. Prandtl never got that far; he stopped with the spanload (a purely theoretical approach).

And the extension of the idea to the flight of birds is mine. As is using this spanload on propellers.

Direct yaw control is still needed for crosswind takeoff and landing for most aircraft. I think for some sailplanes and most hang gliders it isn't necessary...

Al

**D**oes anyone know the story of this flying wing?

<http://www.materialsgate.de/de/mnews/6103/Should+airplanes+look+like+birds.html>

In this Internet site they talk about a test to compare three configurations. One of them in a flying wing. Where can I find more info or pictures?

Keep that brain spawning wings,

Koen Van de Kerckhove



**MITCHELL U-2 THREADS**

*(ed. – This first e-mail continues with where we left off last month and landing gear issues.)*

**I** used Scotchply legs for a spring landing gear on my Woody Pusher, which has been flying for 22 years. My gear was 18 lb. lighter than a spring steel gear. I'm sure there is an equivalent product in Europe.

It is a little expensive.

My study indicated laminated wood was the lightest

alternative for the U2. 2 plies of 3/4" birch tapering to 3/4" at the axle. Width tapering from 4" to 2".

Norman's reference describes the material very well.

Dave Gingerich  
[dgingerich@cox.net](mailto:dgingerich@cox.net)

**Y**esterday, I had a look at the on-going construction of the 2-seater U-22 prototype of Bernard Fournier, who I have met several times in the last 8 years.

Bernard is now busy adapting the carbon/Kevlar nose (that can be removed for road transport of the wing), and is ready to transfer the working model of the retractable nose gear hatches into the nose. The nose part of the steel tube structure with the nose gear and rudder pedals can also be removed.

Next will be the engine integration into the staggered "apache-heli-style" cockpit, where the motor's radiator is under the front pilot's seat, and the motor itself is under the co-pilot's seat, while a nifty air intake under the fuselage's belly provides the cooling air, which then exits on the sides through exit hatches. Both can be closed after motor shutdown for soaring flight.

The main gear is a mono-trace gear with additional side wheels in the inter-panel wing gaps. The main wheel sits in a aluminum box-spar frame (closed fork) on a trailing hinge and has two oleo struts on the rear of the fork in a V-config going to the steel tube frame of the cockpit section which is bolted to the rear wing spar.

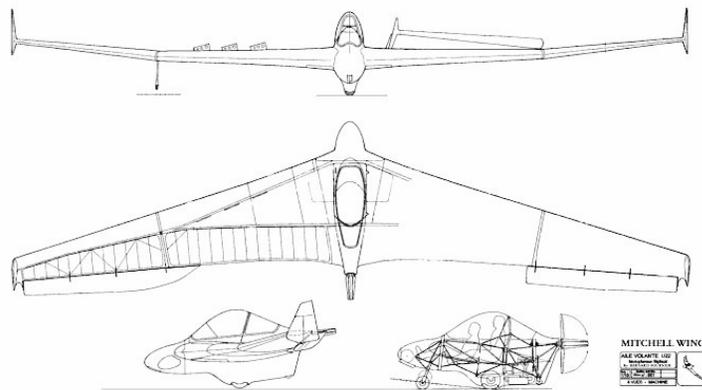
As in everything Bernard makes, it is very good workmanship.

Johan  
[johanprins@free.fr](mailto:johanprins@free.fr)

Hi Johan

**S**o this is actually an ongoing 2-seater U2 development project? Most interesting.  
 -Is this a tandem configuration (copilot behind the pilot)?  
 -How can the motor be under the co-pilot's seat?

Carl Hyllander  
[carl.hyllander@bredband.net](mailto:carl.hyllander@bredband.net)



**I** have a 4-view drawing (above) of the U-22. The extra 4th view is a cross section of the center showing the positions of the seats and engine. I was going put it in the photo album on the group page with the construction pictures of Bernard Fournier's U-22 but I'm not sure if this was ever supposed to be published. The smaller text in the text block isn't clear but it looks like it says "Drawn in 1994" "plan n:001"

Norm Masters  
[libratiger62@yahoo.com](mailto:libratiger62@yahoo.com)

This 4V drawing can be found on the Mitchell Wing web-site, center column, bottom icon of the "Photos from Richard Avalon" heading.

<http://www.mitchellwing.com/B10-pictures.htm>

Philippe Vigneron  
[retrofitprsp@yahoo.com](mailto:retrofitprsp@yahoo.com)

**A**-10 for sale it is like new condition with very low times. It has the KFM 30 hp engine with re-drive, electric start, power fin adjustable prop, BSR soft pack chute, trailer all manuals for the engine and plane. It flies great. \$5000.

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 Cell 307-351-5362

[tmpilot84@yahoo.com](mailto:tmpilot84@yahoo.com)

*(ed. – This starts out with a message from Carl on what happened the first time he flew his U-2.)*

**T**his U2 showed to be highly unstable as soon as I climbed above ground effect level. It did not feel like anything close to the U2 owned by Tibor, which was a delight to fly.

This U2 (built by Pekka) felt like flying constantly at stall speed, although my indicated speed was 85 km/h and full power was applied.

The CG was ok (10 mm in front of the main spar) according to my weighing and calculations.

In the last possible second of the flight I decided to abort and then landed abruptly with a dive after the end of the runway just before a road.

Nose gear and left main gear was damaged. Probably there are damages on the wing spar around the left gear fittings. I have not yet checked.

I don't know why this U2 wouldn't fly properly, but it's a fact that the ailerons were slightly twisted downwards towards the wing tip.

They should be twisted slightly upwards according to the plans.

The machine is now for sale, if someone should want to buy it as a museum artifact or if someone would like to buy the KFM engine and prop (only 30 hours used).

To those of you building U2's: Please make sure that your ailerons (as well as all other parts) are made correctly!

Carl Hyllander



*(ed. – Here is a picture from late 2010 that might illustrate what Joe is saying. Unfortunately, Carl has removed the two videos he had from You Tube so you can no longer see the flight.)*

**A**t the end of the video (approx 3:14) one can see the stabilators. Aren't they installed upside down? I thought the cambered side of the stabilators should be on the bottom. If that is correct it would mean the right and left stabilators were probably flipped and installed upside down on the wrong wing

each. This would also explain the twist being opposite.

Joe

**T**hat's what I thought at first, but after consulting my tech advisor, who told me that the cambered side actually is on the bottom, (the difference between top and bottom on these stabilators are much less obvious than on Tibor's U2) I decided to leave them as is.

Fact is that these stabilators were built and/or mounted the wrong way.

There is a possibility that the machine would have flown properly if I had shifted the stabilators, but that would have necessitated to shift the fittings for the balance weights and the rod connectors as well. (I probably got punished for choosing the easy way)

Anyway, I have had too much trouble with this and spent too much time on this so I do not feel like going through another repair phase. Tibor's U2 is still for sale and it is fairly easy to repair, and has also proven to fly well.

Carl

**C**arl, Joe's observation appears to be correct. From an aerodynamics perspective when one looks at the airflow through the slot, the stabilators would be operating at or near stall conditions. Any control deflection would certainly place the up going stabilator in a fully stalled condition. This would account for the severe roll instability that you experienced as well as the lack of elevator authority.

With regard to your technical advisors comments about the camber. The original NACA report that researched these types of control surfaces as well as implementations on aircraft such as the Kitfox are all predicated on the assumption of generating a predominantly positive (upward) lift. The requirements for a flying wing are reversed. Consequently the stabilator camber must be inverted and the slot geometry adjusted as well.

I appreciate your reluctance to proceed further with the project but after taking a couple of weeks to settle down you may find it rewarding to setup the geometry properly and try again.

Paul

**T**his is such a shame. To put so much time and effort into building an airplane but modify it ignorantly. And then, when the previous owner realized that it was built wrong, to dump it on you.

You're lucky to have survived. It's a good thing that the modifications rendered it uncontrollable so soon after takeoff. Suppose it had gotten to 20 or 30 meters higher and then snap rolled when you banked into a turn. I'm glad you're okay and that you know what a properly built U-2 flies like so that you don't become one of those self proclaimed "experts" who give this type of airplane a bad reputation

Norm

**H**i everybody, I agree with Norm but maybe the first owner did not noticed...But Carl DID know since last year...Carl, I am happy that you were not that hurt. On the other hand, you really took a chance about flying it that way...Seems to me that the elevons were partly working and stalling.

The twist induced as far as I recalled was to tame the pitching moment so it would not be like the B-10 who in pitch is hot...maybe the good news is that the spar did not suffer.

Was the original owner Pekka? If so, I remembered that he sent photos about an internal beefing up of the spar in the landing gear area. You might save the D-cell from the elevons and glue new ribs in back which are easy to cut and glue. Not a big deal...Looks like a nice machine...Too bad you want to 'scrap' it...Very seldom machines are built and finished to that point due to the LACK of support, ignorance and greediness of the plans seller...Who as far as I know still sell those plans...Those, IMHO, are the real BAD guys...

By the way, I am debugging another flying wing , the CHOUCAS, which is more complex. I had to fool around with CG, AOA on the ground, airbrakes and what not. This is not the place here so Norm could I get in touch with you off-line or if this is of everybody interest. I could post the 'unorthodoxed' behavior of my new giant wing here...  
Thanks and Carl, examine closely the ship, maybe it is repairable...

Guy Provost

**H**i, Johan, Guy, Norm and everybody else on the list

Thanks for your comments on my accident.  
Yes, this is the U2 built by Pekka.

I have sent the video to Pekka as well and yesterday I spoke with him on the phone (he called me after seeing the video).

Pekka told me that he never flew it above ground effect level, so that might explain why he never noticed the planes bad behavior.

Also, he was not aware of the fact that the elevons were wrongly built (twisted downwards instead of upwards).

It is correct that I was aware of the elevons being incorrectly built. I was sure of this after checking with the blue prints and comparing with Tibor's U2.

After discussing the matter with my tech advisor (retired EAA official), I decided to take the risk of flying it that way.

Of course I should have taken this problem more seriously. Guy actually warned me about flying it this way.

Anyway, I was aware of the problem and therefore prepared for the worst when I finally took it to the air.

You are probably correct about the life-threatening situation that I would have put myself in, should I had taken it even higher up.

As soon as I was convinced that the plane was unstable no matter of speed as soon as I tried to lift the nose, I aborted the flight (last second possible).

I will investigate the plane tomorrow and see how much damage there is. Until now I have tried to rest my leg and let the wound heal.

I still have the König motor with exhaust and carb, wheels, instruments and very strong main gear legs made of fiberglass from my B10. These parts are for sale.

Now I am turning my interest towards the Falcon and Falcon XP ultralight/experimental canard machine.

Guy: Information about your Choucas project is most welcome

I wish you good flying

Carl

PS I still think that the B10 and U2 are wonderful machines to fly, when properly built, balanced and with a suitable motor.

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