No. 292 OCTOBER 2010

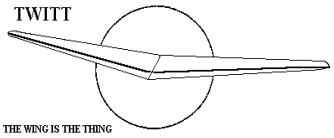
T.W.I.T.T. NEWSLETTER

Schapel 882 Model. Source: Jörg Schaden, www.IG-Horten.de

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., **1010** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, November 20, 2010, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row 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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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 month's issue is mainly filled with letters from the Mitchell U-2 group since they had interesting discussions going on that I thought would be of interest and many of you don't have a membership to this Yahoo group. There are also some items from the Nurflugel group and I have tried to include as many pictures as possible that were associated with the letters.

There were only a few letters from our members to include this month, so I would really like to hear from more of you with information on our projects or with questions we can put out to the group. Since we don't have any program material anymore, I have to depend on all of you to provide me with subject matter for each of the issues.

If I don't have enough letters next month, I will plan on starting another series on one of the technical papers I have on file. Since I haven't had any feedback that you don't like this type of material I an going to assume you like reading through some of this old time aerodynamic analysis that has had such an impact on today's aircraft.

It just dawned on me that I am about a week behind in getting this issue in the mail. Here it is Sunday evening and the file should have gone to the printer last weekend. I lost track of time since I am now going to prepare the ESA Sailplane Builder newsletter on a monthly basis to go out at the end of each month. Time management adjustments are going to need to be made.

Andy

LETTERS TO THE EDITOR

This article about Scott Winton, in the Australian publication "Flying for Fun", has a few details that I haven's seen before so I figured I should pass it along to you:

<http://www.flyingforfun.net/2010%20Magazines/May%202010/May%202010%20page%207.html>

Norm Masters
nmasters@acsol.net

(ed. – I have taken some of the sections from this story and included them here for those of you who don't have an Internet connection. The remaining parts were more personal recollections of the author on the life of Scott.)

"Perth non-stop. On Mothers Day Scott flew the Opal to his parent's property. After making a low pass over his parent's property. He continued to his brother Dean's Place. Scott crashed about 500 meters past Dean's shed. The Opal suffered catastrophic airframe failure and the wings folded. Scott was killed on impact. The reasons for the failure began with a hole Scott had drilled through the main spar to mount the oxygen equipment for his altitude record attempts.

Scott *(above)* had arrived at Deans house and Jenny (Dean's wife) had gone out side and waved. Scott gave an 'aileron wave' back. At the end of the wave the Opal slipped sideways.

One of the characteristics of the Opal was that if would slip sideways at slow speed and if it did the recovery procedure was 'hands off' to let it settle down before correcting. Scott was at low altitude and with insufficient height to let the Opal settle so he used violent control movements to recover. After flying past Dean's shed Scott started a left turn and the Wings on the Facet Opal began to flap and then separated.

Facet Opal Wing Section

Facet Opal to mount Oxygen equipment. The failure began at this hole and probably it was due to Scott's violent recovery from the slip. When Scott turned left and the sheer web through which the hole had been drilled failed allowing for the spar caps to become closer. This in turn pulled the elevators down causing the unrestrained wings to flap and fail. The Opal broke up in mid air and the pod with Scott traveled another 300 meters before impact. Scott died instantly.

Facet Opal in the Workshop

The Facet Opal

This story on the Facet Opal has been written with the help of Dean Winton who supplied most of the information.

The origins of the Facet Opal were very low key. Scott's brother Dean went to Scott's factory to work on his Sapphire. When work finished for the day Scott and Dean played with making a foam wing on the hot wire machine. Scott and Dean soon become addicted flying model wings. After many models, disaster, and a lot of fun Scott and Dean settled on a flying wing with a 4:1 aspect ratio and the C of G at 20% of chord. The Facet Opal had arrived in model form.

Facet Opal before installation of the vertical fins and landing gear.

Later Dean went to Scott's factory and the wing of the Facet Opal was there. It had taken one month to build. There were no drawings for the Facet Opal. As Dean says both he and Scott made it up as they went along.

Howie Hughes (Australian Lightwing) description of the first flight of the of the Facet Opal is that when Scott rotated the opal it went straight to an attitude of 45 degrees and climbed out very rapidly at that angle. Scott had a lot of trouble because of the sensitivity of the Elevator and had great difficulty landing it safely. This was exasperated because the landing gear was built out of fishing rods.

The first thing Scott did after the first flight was to remove the Rotax 582 and replace it with a 447, and then he set about making it controllable. This was basically the reason why nobody but Scott flew the Facet Opal. It took a lot of work to make it a safe machine to fly.

The next part of the Facet Opal story was the world records set in March/April 1989. Not long after the Record breaking flights Scott had spoken to Dean on the phone and told Dean that he had fitted a small trim to the Opal and it now flew hands off, and was ready for Dean to fly.

Facet Opal Technical Information.

The Opal has a wing aspect ratio of 1:3.66. The span is 6600 and the chord width is 1800 with the C of G at 20% of chord width from the leading edge. The wing section is, from Dean's memory, 66 something. This could be Fauvel or a Wortmann FX 66-H 159. The photo of the wing during construction shows the section. The Opal has two fuel tanks, one of 195-liter capacity and a reserve of 65-liter capacity. It cruised at 100 kts, had a max level flight speed of 125 kts and Vne of 263. Stall was between 35 and 45 knots depending on configuration.

The Opal was very stable in 2 axis but Scott could not get the pitch right. There was either too much or too little response to stick input. Scott spent a lot of time trying pushrod adjustments and different bellcranks on the mixer system. Before flying down from Bellina Scott had fitted a trim assist device to the elevons and said that it now flew 'hands off.' The Opal had always flown well but Scott was not willing to let anyone else fly it until the pitch input problem had been solved.

The Future of the Facet Opal

Dean has expressed an interest in completing the program Scott had for the Facet Opal. The Opal is repairable and Dean wants to update the design to make it more user friendly. These changes would be an increase in weight, a new undercarriage, leading edge extensions and butterfly air brakes."

Mitchell U-2 Group Threads

I have an A10 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.

Cell 307-351-5362
tmpilot84@yahoo.com

(ed. – This was posted on 9/19/10. Typical A-10.)

I have now finished all repairs and adjustments of my U2, built by Pekka Klarsäter. It is a very nicely built machine.

The empty weight of this U2 is 179 kg and the tanks hold 27 liters.

The CG was found far too much forward with me (95 kg) in the seat, so I moved 3 kg of lead from the nose cone back to the engine plate (as far aft as possible). I have weighed the machine and calculated the CG carefully with different placing of this lead ballast. The practical tests also confirmed that the CG now is about ok. It feels like Tibor's U2, meaning that it is light on the nose-wheel. CG is now about 1/2 inch forward of the spar with an empty tank and at the front of the spar with a full tank. I have made a number of high-speed taxi runs and now I have also made two hops at 1-meter altitude along the runway. It feels well balanced and harmonic in the air.

Now, I have also relocated the throttle lever and rebuilt the seat to match my body (I am 187 cm tall). After the change of the seat I am sitting a little bit more aft so now the CG might show to be in the middle of the spar (which is close to what is recommended by Guy/Pitbull). I will verify the actual location of the CG before I fly any higher then 5 meters.

Yesterday was the first time I tested the U2 after having relocated the throttle handle and rebuilt the seat to fit my length. I did 4 short flights along the runway, altitude at most was about 3 meters. The machine lifts its nose-wheel at 50 km/h and I get a lift-off at about 65 km/h when taking the stick quite a bit back.

This time I stayed in the air as long as possible before approaching the end of the runway. The ship felt very docile and well balanced. Not nose-heavy the way Tibor's U2 was (even after the last CG adjustment). I cruised along the runway at 80 km/h with the KFM 107 engine at 5000 rpm. (max is 6300). Nice feeling and pleasant control responses.

The landing was easy, as it was with Tibor's U2. It feels like it lands on a cushion of air (which it probably does because of its low wing).

Pekka (the builder) had reported that the machine will lift the nose when reducing engine rpm, so I was prepared for that, but I did not notice any such thing.

Carl Hyllander
Stockholm, Sweden
carl.hyllander@bredband.net

Hi Carl, I am jealous!!! Did not fly mine since last fall because I wanted to finish my new project (Choucas), was ready to go but the CG is far away was what expected so I have major changes to do...You are in the good path with that U-2.I believe Pekka did reinforce internally the spar where the landing gear is. Am I right? To fine-tune the CG, print and read the excellent tutorial from Tasso Proppe in the files U-2 stuff, Test flying. Actually, this is the best practical basic explanations I ever seen concerning the U-2.This is what I used to tune my own bird. Read it...

Finished? Then what I've done is, if you want to easily know how many degrees are your elevons when you are flying: Set the template and put a small bungee (sandow) across the cage which will barely touch the stick when the elevons are at 3-5 degrees. So you can fly and keep that bungee which will still allow the stick movement back and forth. Or you could, like I did, attach to the tube in front (the one that holds the front gear) a small nylon spiral (the one you use to bundle electric cable) and mark on degrees, it is flexible and will not prevent stick movement.

My ship flies level at about 50 mph using 3-5 degrees elevons up and max speed is 80 mph (but it is too fast for the motor, after a minute, it stops (cold seizure!!!) using a vintage 4 cyl. Konig with reduction (24 HP). Also, raising the front wheel while taking off lengthens the take-off distance. You might use that technique only when you take-off from a bumpy runway.

If the thrust line and CG are OK, the plane will take-off by itself at about 35-40 mph. Mine, because I changed the outboard wing airfoil takes off at about 37 but before the change, it was about 42. For crosswind, you want to hold the ship down an extra 5 mph and quit the ground on one sharp move off the stick. But be careful with that, too much speed and a small bump on the runway and it will go up by itself with too much of an angle of attack. I am sure you know that since you flew a B-10. For the thrust line, you should be able to fly level, from full power to idle and there should be no pitch change. You can always shim the back or front of the motor to fix a minor offset of the thrust line...

Take care and ...please, fly a couple of minutes for me !!!

Guy Provost
guy.provost01@videotron.ca

Guy:

Your expertise is really needed in this critical phase. Today, I made 2 flights along the runway.

This time I noticed that I actually have to keep the stick very much to the back to keep the flight level. The previous times I was probably too excited to notice this. There was not time to check much during these short flights (short runway) so I have not observed the position of the elevons, but I am sure

they are too much upwards. I conclude that my CG is still too far forward. The method of applying a bungee seems like a real smart and practical way of figuring it out. I will certainly do that and also read the Tasso Proppe files. I will most probably have to put some more lead on the engine mount. In worst case, I will have to move the battery (or replace it with a less heavy one).

About the reinforcements around the fittings of the main gear; yes, it looks like there is an extra layer of plywood just there. Very good.

It came to my mind that there is a problem with the main gear being so close to the CG.

Because the main gear is fitted to the back of the wing spar and the cg ideally should be located in the middle of (or even at the back of) the wing spar, it creates the problem of very low weight on the nose wheel.

Now when I am closing in to having the optimum cg, I notice that the craft becomes more and more difficult to taxi because of the light nose wheel.

Question: Did you mount your main gear according to the standard drawings or did you make a modification to mount the gear further back?

Carl

Hi Carl, hard to say, the craft is stored now in a hanger 1.5 hours from home. I reviewed some notes and it is about 3 inches from the back of the spar. I replaced the tubing in the back (the one that holds the wheel cage) by a shock/spring assembly that came from a motocross .So when the main wheels hit a bump, it does go backward and up. So maybe it is more or less 4 inches from the back of the spar when I taxi the U-2. It is as a matter of fact very light in front.

They, at the factory, got used to weight the front gear with the pilot aboard, and it was 15 pounds and that was their way to check if the plane was within the flight envelope. But, I never really understood this since there are different sizes of pilots and they sit in front of the CG.

One thing for sure will help...You almost have to run with a flat tire in front, this is the only suspension you have in front. Just enough air to keep the tire on the rim. People frequently tell me that I have a flat tire in front. It does work well. If you take-off from a bumpy runway, you have no choice, you have to rotate the front gear first. For sure, as soon as you taxi faster, than let's say, walking speed, and you turn abruptly the front gear will slip. I have been running on a hard runway for years and it does not seem to be a problem. I guess I am used to it.

Keep the CG at the spar. If you cannot get your elevons at 3-5 degrees flying straight but 6 or 7, I do not think it is unsafe but Tasso wanted average people not to fly at 10 or 15 degrees up straight level.

Your fuselage is different than mine and I know mine makes some lift. Few years ago, I built a small open canopy for those nice summer days but I needed at least 45 mph to take-off and there was a strong tendency to pitch down, so I scrapped it and realized that I was breaking the lift generated by the fuselage itself.

Keep an eye on the spar where the mains are and do not stress the bird by sudden pitch-up, there is a little mod to do in the back of the spar to reinforce it. By the way, how heavy is the craft and what is your take-off weight?

Guy

Guy:

This is very interesting.

I actually had very little air in the nose-wheel on my B10 most of the time, and found that it was ok. Actually, I mounted a front fork with spring suspension on my B10 after having galloped and crashed the nose on my first high-speed taxi run10 years ago.

Your spring suspension in the main gear is a very good idea, especially if it, as an extra bonus, moves the gear an inch back. I will try to make it the same way (then I will have something to do this winter). I will operate my U2 from a grass field so it will be necessary for me to have a spring suspension.

I also heard about the 15-pound rule (Pkeka said 7 kg, which is almost the same), and I also found it a bit strange, considering that the total weight can differ quite a lot (and that the pilot is in front of the cg). But of course it can function as a good approximation if the weights can be assumed to be about the same.

Your experience about the open canopy is very interesting. Probably, I will just add some more ventilation holes in the canopy (Pekka has made one)

My U2 is 178 kg empty and with me on-board (93 kg) it is 271 kg plus petrol. The tanks hold 27 liters, which adds 18 kg. So my take-off weight can be at most 289 kg = 642 pounds.

Carl

Hi Carl, I uploaded some items in U-2 stuff part 2. Somehow, I can not select my own album so I created another one...so there is some more stuff to read CAREFULLY Ha!Ha!Ha!. Sorry, this is an old vintage letter. Those were the days without Internet.

It does somehow show you part of the 'saga' I went trough with the U-2. At least, the mods I have done perhaps allowed me to fly more than 700 hours with the machine...

I strongly suggest that you do the landing gear beef up. I had to beef-up at least 3 times the spar in the landing gear area. The upper landing gear bracket (which was the last culprit) has now a plate about 2.5 inches by 4 inches soldered to it which in turn is glued AND bolted with 2 extra AN3 bolts at the bottom of the bracket. Actually, some vertical stringers were added between the 2-cap strips of the spar to accommodate the AN3's. So, in other words, the new AN3 bolts go through the spar but under the cap strip.

The shocks which is a combination of a spring and a shock came from a Yamaha 125 cc motocross. I was taking off in the old days from a cows pasture so it was bumpy, but the main problem was to 'clear' the cows before landing!!! Too much stress in the spar going across the bumps so the first thing I had done was to put big wheels like on a wheelbarrow. It really helped, after that I switched to the shocks and was able to revert to smaller wheels.

Also, since you are on the heavy side, I think you MUST do the fiberglass part in the back of the spar, it can be done without removing the Ceconite, also check the thickness of the brackets that holds the outboard wings...The fun part with the U-2 is that there is ALWAYS something to fine tune!!!

Guy

Hi Carl;

I don't have a U2 but fly a P-Swift and I just wanted to comment that you are on to something there not only with taxiing but when you try to operate from a grass strip especially a bumpy one you can get the nose wheel popping up on the takeoff run prematurely.

You might try to prepare for this with some down elevator but don't do it! If you do hit a big bump it will surely overpower the short coupling arm and limited effectiveness of the elevons and the nose will rise and if you are above the stall speed your craft will climb and then the elevons will do their work pushing the nose down and it will bounce again, this time worse! All within a fraction of a second!! It happened to me and luckily I got the stick back in time to avoid the third cycle with my heart in my throat.

Before my first flight I had read that one way to be sure you have enough flying speed with the Swift was to hold a little down elevator till the mains lift off. It might be fine on a paved strip but I found out the hard way not to do it on grass with a flying wing. They are just too pitch sensitive.

Now I deal with this (it doesn't always happen as the field is pretty smooth) so that I hold the controls at neutral and if I get bumped into the air at low speed I lower the nose afterward and allow the craft to accelerate kind of like the short field T/O technique.

Best regards

Joe Street
jstreet@ecemail.uwaterloo.ca

Hi Joe

Thanks for sharing your experience. You really have a good point there.

What you describe happened to me with my Mitchell wing B10. The first time, I smashed the nose and the tubing in the cage. After that, I learned to avoid it but it happened some times even after that on bumpy grass fields. I finally managed to handle it, however.

It must be nice to have a Powered Swift! Like a modern, lightweight and foldable version of the Mitchell wing B10.

Carl

Hi all,

I have moved the CG further back by changing batteries, which decreased the weight at the nose cone by 2 kg.

The calculations now told me that the CG is very close just in front of the wing spar.

I taxied out on the runway, accelerated and lifted off at a noticeably lower speed than before (now around 60 km/h). The ship now felt more easy on the stick and I did not have to keep it as much to the back as before. At the same time I noticed that the it had become more pitch-sensitive. I was not prepared for this, so I had trouble keeping the flight level. I actually made a couple of hard bounces before finally landing. (the wind was 90 degrees from the side, and much stronger than I thought before starting, so I decided to call it a day)

Encouraged by the lower take-off speed, I calculated that an additional kg of lead on the engine mount would bring the CG exactly to the middle of the wing spar.

After having mounted this extra kilo of lead, I weighed the nose-wheel with me sitting in the ship.

The scale showed 7.6 kg, which is roughly 15 pounds. This is supposed to give a correct CG, according to a rule-of-thumb given by the Mitchell wing factory many years ago. (My take-off weight, however, is much higher than this general rule assumes).

I also mounted a bungee cord in the cockpit to mark the stick position with ailerons 5 degrees up, according to Guys advice.

Anyway; Now when believed I was ready to make a higher flight, I decided to do one more check inside the wing. I put a small lamp in through the inspection hole under the wing, just close to the main wheel. On the left side I discovered a big vertical crack in the plywood of the spar. It is situated between the wheel fastener and the left wing tank. (Pekkas inspection holes saved my life)

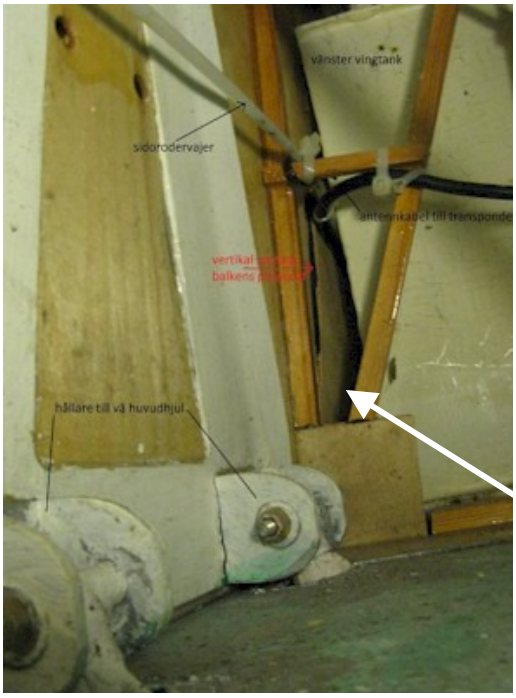
This crack was probably caused by the same incident that happened when the guys, from whom i purchased the plane, were transporting it on a trailer. (the trailing edge of the wing was cracked just behind the crack in the spar, as it happens).

So now my U2 is grounded until further. I will consult the experts at the local EAA chapter about how to proceed.

I suspect I will have a busy winter, repairing this bird. In the mean time, I will have to dream with the help of the photos and videos...

Carl

(ed. – Here is a photo Carl posted of where the crack is located. It may be hard to see, but it is the dark vertical line shown by the arrow.)



I just received some unique photos, never published before, taken in august 2008 by the well known aerial photographer and airplane magazine editor Freddy Stenbom. Mr Stenbom sadly deceased in cancer shortly after this event. The photos were given to me by his son, with permission to publish them as long as it is on a non-profit basis. Copyrights are owned by Alltom Hobby, Sweden.

These photos are some of the very last he shot. They are sensational, because it is a very rare occasion with a B10 and U2 flying together. This air-to-air photo session was arranged by myself, Tibor and Freddy.

My B10 is scrapped since August 14 this year and Tibor's U2 is still in the hangar without any attempts from his side to repair it.

You can see these photos in the Photos section, album "B10 & U2...".

Carl Hyllander

(ed. – Here are a couple of photos from the many that were posted on the U-2 site.)

Is a Mitchell Wing an Appropriate Aircraft for a New Pilot?

Hi everyone,

I follow the discussion group here but have never flown anything. I'd like to know how challenging is a Mitchell wing to fly? Is it a design that is relatively safe for a beginner to learn on?

Karl
karl@countsfamily.com

Karl,

Simple answer: NO! There R plenty of ultralight planes that are much safer although you can kill yourself in any airplane, it just takes a few more stupid mistakes to do it.

The purchase form for the U-2 even says: "I understand that building & flying a U-2 can result in my death."

Note to those reading my reply: The U-2 is extremely pitch sensitive. Until it is fully trimmed out you have to be extremely careful because of the narrow CG range.

Stan
stantell_mesa@hotmail.com

Hi Karl

My friend Tibor learned (with my assistance) to fly his U2 after only having had 30 hours of flight training in a Eurocub (3-axis LSA trainer).

It was very close he crashed it at his third landing. Remember; it has no shock absorbers in the gear.

Also, on his 4:th or 5:th flight, he stalled it when trying to fly at 60 km/h and he went into a steep dive with no control. He was lucky; the U2 regained flight speed by itself and he regained control at 400 feet altitude and could live to tell about it.

In short; Don't fly the U2 (or the B10) without a lot of flight training with an instructor in other light aircraft.

Carl Hyllnader

So---where's the payoff? Does the flying thrill justify learning to master the idiosyncrasies of the aircraft? Does it do anything better than a comparable machine? Or is it simply the WOW factor?

Another question Guy can probably answer: Is the U2 an honest-to-goodness motorglider? Many prospective builders are attracted by the idea of a "poor man's" motorglider, which the original literature claims the U2 to be.

Dave Gingerich
dgingerich@cox.net

It's span squared load suggests that it is but just barely. The airfoil section has the potential to be laminar to 40% if care, and a lot of elbow grease, is paid surface finish. Also a set of fairings would be a good idea but Wolfgang Ule's plane is the only one that I've seen with much obvious attention to parasite drag. A 3 blade folding prop would also be good. $$$

Norm Masters
libratiger62@yahoo.com

Nurflugel Bulletin Board Threads

Devil Ray Delta

G'day. This is one of my test models, video was taken on its maiden flight and we were still tweaking it.

http://www.youtube.com/watch?v=_Cd0lFPyP4I

Cheers Tom C
rotax618@yahoo.com.au

(ed. – Although there is the video I couldn't find any pictures of the model to include here. However, there was a outline drawing of the model available and I have included it below.)

It is a model of the Facetmobile, not quite a lifting body, but it flies
very well.

Bruno De Michelis
msmprod@optusnet.com.au

The Mk2 model on Youtube is no Facetmobile, It is my improvement on the Facetmobile. Mk1 was a faithful reproduction of the Facetmobile, it didn't fly well at all - it was stable enough but it had a very poor L/D, and settled alarmingly when power was reduced.

Mk2 and a later Mk3 fly very well, in fact they won several model aircraft competitions flying against conventional aircraft of the same weight and power.

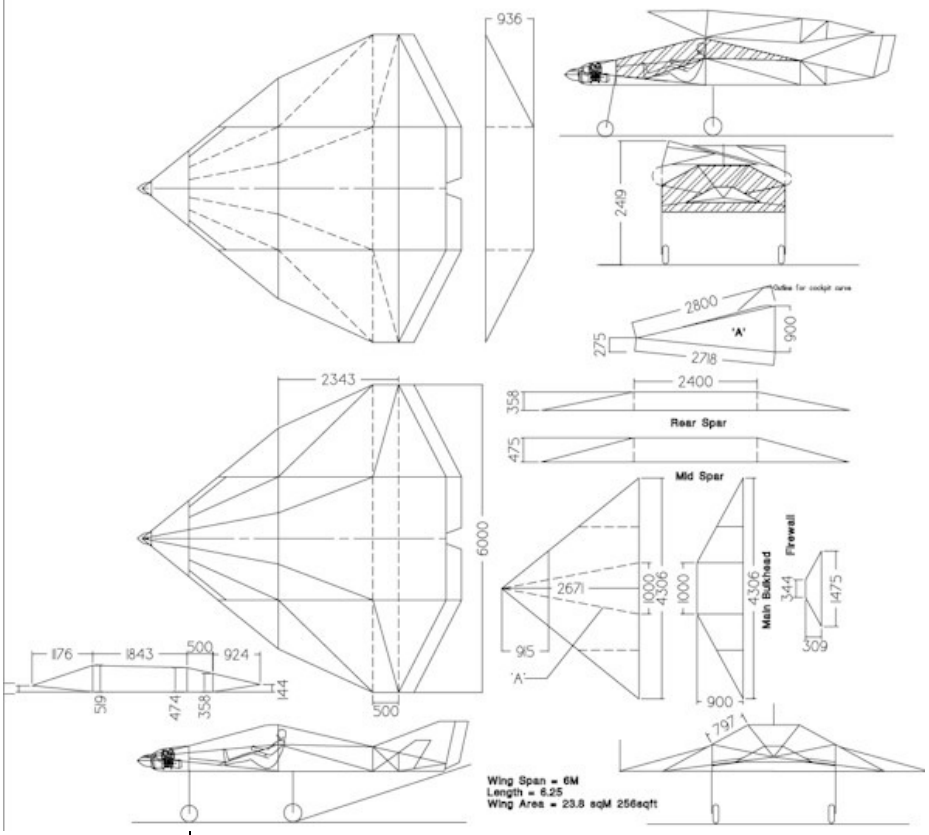
We plan to build a Mk4, 1/3 scale of a full sized single seat prototype. Depending on the results we will go ahead and construct the prototype, all of the design work is complete and I have gathered much of the airframe material.

We have learned much from the models including CG limits and all conditions and attitudes of flight.

Cheers Tom C

My comment, Tom, was based on close similarity. I did not and I do not mean to be overcritical. My compliments: you seem to have fixed most of Barnabie's problems. Could you post a video of the MK3 flying, please?
Thank you in advance.

Cheers from Bruno



I couldn't resist posting a picture in the Photo section. Jim hasn't yet flown it but any day now.

Bill Daniels
BILDAN@COMCAST.NET

(ed. – The assembled pictures was provided by Bill. The other two pictures came from Jerry Gross as part of his report at the ESA Eastern Workshop on Jim Marske's progress.)

(ed. – Here is another link to Jim going through the building process: http://www.continuo.com/Marske/pioneer3/pioneeriii.htm)

Demon - But that vertical stabilizer needs to go also.

http://www.dailymail.co.uk/sciencetech/article-1315570/Unmanned-jet-aircraft-world-fly-flaps.html#ixzz10mG1btJE

Cheers Afe
ilafe@rocketmail.com

(ed. – Pictures and some additional information from the web site are included on the next page.)

The picture immediately reminded me of a one-off delta design based on the Dyke Delta with the designers permission), and called the Sting Ray (with the designers permission). I sure wish I could remember who built it... looked pretty good.

Michael B.
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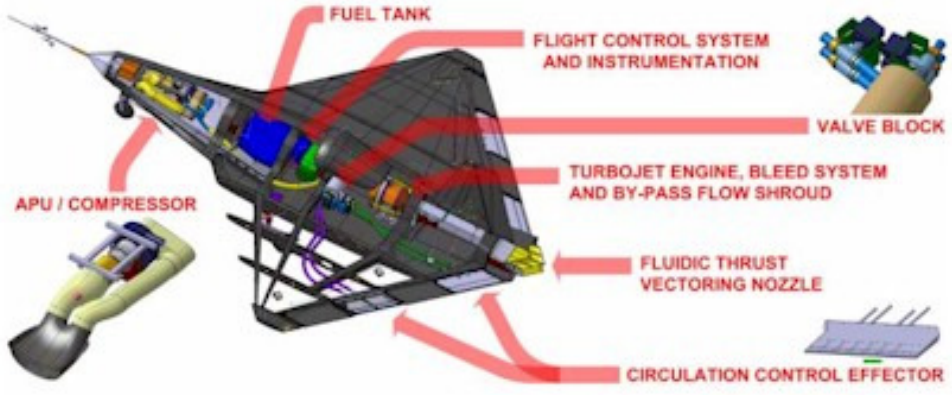
(*From the web site:* DEMON's trial flights were the first 'flapless flights' ever to be authorized by the UK Civil Aviation Authority.

All aeroplane wings have moveable sections called flaps. During takeoff and landing, the flaps are extended backwards and downwards from the trailing edge of the wings. This alters the shape of the wing, forcing the air to take a longer journey over the top of the wing and pushing the wing up, creating lift.

The jets on the DEMON aircraft work in a different way. The plane works by manipulating the air that flows immediately next to its skin, rather than changing its shape. Jets of air close to the trailing edge of the wing change whether the air moves away from or towards the wing. Sensors along the wing constantly monitor the airflow and can adjust the direction of the jets of air.

The DEMON has an eight-foot wingspan and



weighs just 200lbs. It can fly parts of its mission by itself but is not fully autonomous as it is still just an experimental vehicle.

The aircraft's shape is known as a 'blended wing-body' configuration.

The flapless system, developed around a concept called fluidic flight control was tested in wind tunnels and on models before the full-scale trials on DEMON took place.

While DEMON itself is not expected to become a production aircraft, a number of the technologies it contains are expected to end up in future aircraft designs.)

AVAILABLE PLANS & REFERENCE MATERIAL

Coming Soon: Tailless Aircraft Bibliography Edition 1-g

Edition 1-f, which is sold out, contained over 5600 annotated tailless aircraft and related listings: reports, papers, books, articles, patents, etc. of 1867 - present, listed chronologically and supported by introductory material, 3 Appendices, and other helpful information. Historical overview. Information on sources, location and acquisition of material. Alphabetical listing of 370 creators of tailless and related aircraft, including dates and configurations. More. Only a limited number printed. Not cross referenced: 342 pages. It was spiral bound in plain black vinyl. By far the largest ever of its kind - a unique source of hardcore information.

But don't despair, Edition 1-g is in the works and will be bigger and better than ever. It will also include a very extensive listing of the relevant U.S. patents, which may be the most comprehensive one ever put together. A publication date has not been set yet, so check back here once in a while.

Prices: To Be Announced

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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

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 $140, postage paid. Add $15 for foreign shipping.

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