

T.W.I.T.T. NEWSLETTER



Wing center section. Note idler fitting resting on plywood and look at torque tube installation. I did not slit the PVC torque tube guides as per plans because they were plenty tight anyway.

Source:

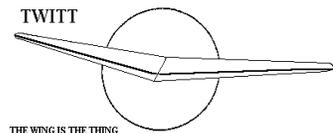
<http://www.kohlerandlewis.com/WebPage/joesu2.html>

T.W.I.T.T.

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



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

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis.

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Wt/#Issues	FRG	AUSTRALIA	AFRICA
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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 is dedicated to the Mitchell U-2 group since I haven't been spending much time relating some of their issues to the general populace. There are several threads included in this string of messages that cover things that are of general interest but there are other items that may be more specific if you live in Canada. However, it does relate to the same types of problems experienced between USA builders and their interaction with the FAA.

I am hoping for a very special translation to be available by next month and I think everyone will really enjoy it. Can't say more right now so stay tuned.

On a personal note, I finally was able to make the first flight in my restored Schweizer 1-26. This has been delayed due to FAA issues, annual inspections and weather, but on Sunday, May 4th it happened at Warner Springs, a local glider port in the mountains east of San Diego.

It lasted 1 hour 40 minutes and reached a height of 7,500', which was 700' higher than my tow release, which was one goal of the flight. I was trying to go over 2 hours to match what my father had done in December 1963 when he flew it the first time after a one year rebuild from an accident by the former owners. Didn't make the time, but had a really good time in the time supported by the lift.



LETTERS TO THE EDITOR

Bird Model followers, Johnny Armstrong (a fellow model builder) has been kind enough to add to his website several segments that relate to the research that I have been doing over the last 20 years on R/C bird models. The website is:

<http://johnnyarmstrong.com>

In the upper right hand corner, click on "R/C Gliding Birds". On this page there are three historical segments that might be of interest;

- In the upper right, click on "Bob Hoey's Bird Models - Short summary" for a short video clip.
- At the top of the page, click on "Raven AIAACComplete" the first technical paper presented to the American Institute for Aeronautics and Astronautics.
- On the left side, click on "Birds SFTEPDF" the most recent technical presentation to the Society of Flight Test Engineers.

Hope you enjoy this trip down memory lane. It's been fascinating and fun!!

Bob Hoey
<bobh@antelecom.net>

(ed. – This is well worth the time to go through the links, videos and documentation. We have published some of it over the years but now most of the important stuff is all here in one place. Thanks to Bob for passing the web site link along.)

Is there anyone in the group that has delta wing experience (Facetmobile, etc.) have problems with the aircraft not wanting to leave the ground and then suddenly leaping into the air and stalling?

The effect is very sudden, so quick that elevator or elevon control cannot respond fast enough to recover. I have heard some people mention this problem, i.e., the Atlantica crash et al. What is the solution?

Dave Barker
<david_barker@msn.com>
Phone 509 921 8980

(ed. – I am not an engineer but it would seem from the description that there was a problem in the angle of attack and elevator control. The AoA wasn't high enough to allow for a normal takeoff without excessive elevator and once applied the aircraft leapt into the air and over rotated. I am probably wrong so someone please chime in here and correct me with the real answer.)

Mitchell U-2 Discussion Group Threads

I am currently finishing my airplane and was wondering re air brakes / spoilers. I noticed some people have spoilers and some don't and was wondering if it is necessary to have air brakes? I was originally thinking of using my rudders as brakes and by deploying both rudders at the same time as air brakes? I don't really want to install spoilers and wondering if it is necessary to have air brakes or if the plane will fly fine without them. My concern was that with its glide ratio that you may want a way to slow down if you coming in too fast - most planes you can side slip but I don't even know if slipping is an option with this plane.

I appreciate your time to reply and offer feedback. Thanks

Ryan Derot

The rudders are air breaks. They are deployed independently to yaw the plane or together to steepen the glide slope.

Norm Masters

Ok so spoilers not needed. My rudder pedals are joined to nose gear steering therefore not allowing the rudders to activate simultaneously. Can I run a separate cable to the rudders to a lever and then when lever is pulled both rudders are activated together or what do you recommend? Or would you just use them individually and go from right to left etc?

Can the U2 sideslip like other planes or no?

Ryan

Aren't the rudder pedals attached to the nose wheel steering arm by springs? Those springs allow you to pull on both rudder cables simultaneously.

Norm

I haven't flown a U2 but I know that on a SWIFT flying wing the rudders are only marginally effective for glide slope control. I am considering Aeriane's add on spoiler kit. I would set it up so you can steer the wheel with your heels and apply the rudders independently with your toes.

Joe Street

Can anyone recommend a supplier to buy a canopy from, I wanted to buy from Todds Canopies but he does not reply to emails, his voicemail is full and the odd time he answers his phone he always says he will reply to emails and never does. So we wondering if there is anyone or anywhere else to look at getting a canopy.

Ryan

I am French and new to this discussion group. I intend to get into the construction of U2. I made a request by e-mail to "mitchellwing@earthlink.net" to buy the building plans but I do not have answers. Someone tell me what contact is still valid? thank you good day

Pleroux

You have the correct web-address, go there to "Products", at this place scroll down and click on "Plans", a new page shows up. Here you have the choice between B10 and U2 plans, choose what you require (if not living with the USA click on the price for "international"), Next step: Click on the shopping cart, this will lead you to a payment site (check first that you have the correct number of plans, otherwise the sum could be higher than expected), On the payment site you have the credit card or PayPal option, choose the method you like best and transfer the money.

If you don't trust the chose PayPal, in this case you are secure to get either the plans or the money back, but Miss Avalon is an nice lady, doing the best for our community. International you pay 280 dollars (about 205 Euros).

Have fun and enjoy. Feed back what you did and how it worked out.

With my best regards

Karl Senn

Thank you for the answers. I followed the advice of Karl, I ordered through PayPal plans. I hope all goes well
By waiting I read the messages from this group and consults with pictures of your achievements good day

Pleroux

Are you living in or near France? It could be of benefit to you as there is a builder in France that has parts of an unfinished project for sale (due to job reasons). Do you have a name?
Greetings

Karl

Maybe they're old questions, apologies if they have been asked before. I'm Shawn from Washington, recently interested in gliders but definitely smitten by the U2. Looking at the photos uploaded, there seem to be a lot a variations. The cover shot of the Fisher U2 led me to the U2 fan base, but I see many different forms, building methods and other construction solutions. I see "Tom's Build" where he apparently engineered a Chromalloy chassis and wooden spring type landing gear, or Bernard's all wooden beauty and again Dave Brown's robust looking aft cage and motor mount. Is the design so flexible or undefined that so many variations come out of the same plan set? I don't own a set of plans yet, so maybe I should buy first and ask later... As far as room goes, is the U2 capable of carrying a 6'6" meaty pilot?

How much real estate does a build take up, with wings attached? It doesn't look like anyone is building in a single car garage...

Does anyone know of a U2 builder in Bellingham, WA? He posted something in 2012 on another site. He's close to me and I would love to see a real U2 up close.

Thank you, look forward to learning more!

S. Duffee

Note 3: If registering a basic ultra-light aeroplane under option (c) the following minimum useful load (Mu or Wu) calculation shall be carried out: For a single place aeroplane $Mu = 80 + 0.3P$, in kg; where P is the rated engine power in kilowatts ($Wu = 175 + 0.5P$, in lb.); where P is the rated engine power in Brake Horse Power How does this formula work with the u2?

Ryan

It works the same with the U2 as any other Canadian registered ultralight. So if you have a 45kw engine then your minimum useful load is going to be 93.5kg. The useful load includes fuel, oil, humans, and anything you want to take along which isn't part of the aircraft design, ie baggage, water, sunscreen, navigation equipment etc. 93.5kg ain't much. Hopefully the design gross is more than that. With an ultralight you don't have to perform a climb test at max gross. If you weigh the empty aircraft and then subtract that value from the claimed gross weight the number must be larger than the value you calculated from the formula. You should claim a gross weight that gives you a safe margin for takeoffs on those heat wave days given the available power.

Joe Street

Any idea what it would be for a Rotax 377 is a 35 hp (26 kW),

In relation to the U2 and its useful load based on above engine? This is what I am using on my U2. Is the useful load calculated based on wing area and kw?

Thanks

Ryan

As it says in the ultralight transition strategy this is the sole responsibility of the builder. I don't think it is appropriate for you to be asking anyone on this list to figure this out for you. In fact there may be liability concerns for anyone who did so. Read that document I just referenced and understand it.

Canadian registered ultralight. So if you have a 45kw engine then your minimum useful load is going to be 93.5kg. The useful load includes fuel, oil, humans, and anything you want to take along which isn't part of the aircraft design, i.e. baggage, water, sunscreen, navigation equipment etc. 93.5kg ain't much.

Hopefully the design gross is more than that. With an ultralight you don't have to perform a climb test at max gross. If you weigh the empty aircraft and then subtract that value from the claimed gross weight the number must be larger than the value you calculated from the formula. You should claim a gross weight that gives you a safe margin for takeoffs on those heat wave days.

$80 + 0.3 \times 45 = 93.5$. And I did explain the difference between empty weight and gross so you would understand the terminology in a way that you could then apply it to your own situation. But then you just wanted an answer and I am not going to give you that. Please go and figure it out. These formulas have been on Transport Canada's website for years. You might want to choose some other experts to refer to than the ones you listed.

Joe

All you said is if someone has a 45kw engine the useful load is 93.5kg - you never said where you got the useful load figure from or how to calculate it. Then you went on to talk about the design gross, there is not much info available on the u2 except that its empty weight should be 350 lbs and then 350 lbs for fuel and pilot.

I past both those formulas and info you sent to an engineer friend of mine who has built 18 planes and gliders, fabricated his own folding prop, recently passed faa inspection of his u2 and he has never heard of any of these formulas you mentioned and would not know how to calculate them. So gosh darn it I wonder what he will do on those hot days re gross weights and figures. I also passed the formulas passed pilots at the airline I work for, of which a few fly ultralights and another friend who is a 777 instructor as well as built 2 planes and they have never heard of this or understand it - not to mention mechanics, AME.

Guess that makes both an engineer and me idiots So perhaps before you be an ass try to explain a little clearer or teach a person how to use the formula and then they have learnt.

How do I figure out what the design gross is?

I understand the formula now :-)

$80 + 0.3 \times 26 = 87.8$ kg

Obviously this is a very low figure to account for fuel and me. Would I take the gross weight - actual weight to get the difference and the difference must be greater than the 87.8 kg to be safe to fly?

Does this also mean for example if the gross weight is lets say 700 lbs, and the empty weight is 380 lbs that you can safely take 250 lbs in weight of fuel and pilot or how do I figure out this.

Obviously I am a little concerned or am I misunderstanding the formula - is it saying that I can only take 87.8 kg in fuel and pilot weight and if over that the plane is flying over the safe limit? Cause the standard weight for a male is listed 200 lbs in summer and 206 lbs in winter which already is above the figure?

Please help

Ryan

The formula you guys are kicking around bottoms out at 80 kg for a 0 kw engine. Early U-2s flew with tiny engines, with rather bizarre and aerodynamically dirty mounts to get the cg where it belongs.

Having built, but not flown one, I would characterize it as a somewhat, but not highly refined design. The builder/operator is an experimenter, not a consumer of a highly refined design.

Dave G.

Do you have any idea of what the maximum take off weight should be for the u2, on the website it states 350 lbs empty and 350 lbs for payload.

Based on the formula it states that for my plane with a Rotax 377 that I can only have 87 kg which makes it almost unflyable as 6 gallons of fuel alone is 50 lbs and that leaves around 140 lbs of weight for pilot and avionics.

Any help you can give with help me out, very frustrated as I am now concerned I may not be able to fly my plane and spent all this time and money for nothing :-)

Does that make each of us like a test pilot and we will not know how the plane will perform or fly until we take the leap?

What is your planes empty weight? What engine do you have in yours? When do you think you will fly your plane?

Ryan

In Canada as a basic ultralight you are allowed a gross weight of 544kg. The formula allows a pilot weight of 80kg and a fudge factor that they decided for fuel allowance based on 30 percent of your engine power. This is a minimum. As the builder you tell them what the gross weight of your aircraft is. From:

<https://www.tc.gc.ca/eng/civilaviation/standards/general-recavi-ultralight-ultransitionstrategy-basic-2492.htm>

So 350empty +350 useful load means the gross weight is 700lb. If the pilot allowance is 175lb then that leaves another 175lb for fuel, oil and other stuff. Man I swore I wasn't going to figure this out for you. But then I feel like an ogre for trying to force you to go and read. You gotta spend time researching this stuff it's all online and in books. This list is for the stuff that isn't, like "guys the drawings don't seem to show enough detail on XYZ how did others here do it?" or I modified the design because I wanted to do this or hopefully not " I think my way of doing this is better" which usually just means I found a way to make this plane heavier.

Joe

You got it! Welcome to experimental aviation.

It was several years ago, and the story is pretty complicated. The guy I was building it for died, and I sold it for his estate.

We had reached the stage where we had determined that there was absolutely no hope of meeting the Part ?? empty weight. Mr. Mitchell was a competent engineer, and I think he designated a maximum gross weight and load factor in the literature. I would treat max gross as the magic number. Gross minus empty equals useful. Anything over gross cuts into the load factor.

Dave G

Somewhere in my dusty memory, is the fact that the U2 doesn't really fall into any specific category. Rather it comes out to only fit into the EXPERIMENTAL CATAGORY, as described by the FAA and EAA. This says to me all the calculations are

moot. Being Experimental, you the builder, set the parameters, and are also the test pilot of a design that originally flew, but still could use a lot of tweaking, to fly well. The modified Wortman airfoil, (modified by Mitchell, w.o. computer analysis at that time) leaves room for interesting improvements. It was also my understanding, (from a lot of reading) that the small engine put on the original prototype, (that also had no rudders) was to try and make it fit into the ultralight category but with retractable gear it became disqualified anyway. I do plan on building one of these later down the road, bigger engine, retractable gear, different airfoil, different fuselage, (a lot of tweaks in design) different airfoil on elevons, etc. And make a pattern for Todd's canopies to can make a new canopy. So realizing the U2 is an orphan, never improved upon, yes, we builders are doing development as well as being test pilots. If one reads all the files, particularly by Hitbull you will learn mountains and understand what I'm talking about. Welcome to the world of experimental aircraft.

Austin

In Canada there is no experimental category. There is amateur built and there is ultralight. Amateur built needs a CofA, inspections and has to conform to the standards. Ultralight simply has a limitation of 544kg max gross and a stall speed of 39kts indicated. You do what you want pursuant to Part 1 subpart 101 but if you want to use section C then there is the minimum useful load calc which is quite frankly a barest minimum scribble that says there is a chance a heavy underpowered design can get off the ground as it seems to me. See here:

Although the manufacturer of a Basic Ultra-light Aeroplane is not required to meet any criteria with respect to standards of materials, workmanship or the continuing "fit for flight" status of their product, it is strongly recommended that, in the interest of safety, Basic Ultra-light Aeroplane manufacturers use "aviation accepted" design criteria, materials and practices.

/*Prospective purchasers of Basic Ultra-light Aeroplane kits should be aware that kit manufacturers and part suppliers are bound by no legal requirements under the Aeronautics Act. It is strongly recommended that owners and prospective owners of Basic Ultra-light Aeroplanes avail themselves of the information and services provided by the recreational aviation

industry, schools and the ultra-light aviation community.

Joe

You know Joe, usually it's the US of A that usually fucks everything up and over complicates simple things so all the politicians can have a say. Somehow we let Canada screw up this one all by themselves. You can be sure we won't let that happen again. "Hitbull's" plane is for sale there in Canada, and I never asked him what category his plane is in. Do you know?

Austin

I don't know the registration marks on Hitbulls plane but if you do it is easy to look it up. I guess you are right. The ultralight story in Canada is pretty twisted. I've heard a lot of complaints about what the LSA regulation did down south though. The amateur built category is pretty much as was described for the experimental category of the US though. The thing is with an ultralight you don't have to prove anything. You give it a gross weight anywhere between (empty+Mu) and 544kg and then it's all in your hands. U built it U fly it. I think the only reason they threw the Mu calc in was because an AULA (advanced ultralight aircraft) is allowed a passenger so they were worried about their liability there. You don't even have to do a climb test in an ultralight. I just changed the prop on my Pietenpol which I registered as amateur built although it can be flown as an ultralight (just to add confusion) so now I have to load it to gross and prove it climbs over 100ft/m at gross with the new prop in order to have a valid CofA. If it doesn't then I have to revise my gross accordingly. There is nothing like this in ultralights. There are lots of ultralights out there that would never get off the ground at their registered gross. I don't think TC cares.

There are four Canadian registered U2's. They are all registered as ultralights. Go to the link below. In model name type U2 and search. Go to page 15 of the results

<http://wwwapps2.tc.gc.ca/saf-sec-sur/2/ccarcs/aspscripts/en/quicksearch.asp>

Joe

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.

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 \$250 US delivery, \$280 foreign delivery, postage paid.

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