No. 313 JULY 2012

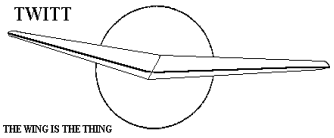
T.W.I.T.T. NEWSLETTER

This is a great photograph. Which one is the "mothership"?
Source: http://11even.net/2010/01/flying-on-the-wings-of/foto/

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., **1207** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, July 21, 2012, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - Southeast side of Gillespie).



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

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

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60oz/60	50.00	53.00	37.00

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

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PRESIDENT'S CORNER

The item below just came in from the Nurflugel group and I wanted to share it with you this month since it has some excellent video footage of a Horten type wing (PUL series??) flying in Germany. It is all in German so I am not quite sure what is being said, but perhaps one of our multi-lingual members can fill in some of the blanks on the video narrative.

From Koen Van De Kerckhove:

"I found for the first time this site. Wow! This one is not much known. Is about to change!

http://www.stuko.fh-aachen.de/index.php?option=com_content&task=view&id=15&Itemid=15

Video is in German. But sure go see 03:30!
Both PDFs at bottom are old articles with great pics and ...even a nice 3view! Thanks Norm, it was a old forum text of you that guided me towards the page."

I also heard from Bob Hoey who has made another successful flight of the Pegasus model and will have some video to share via the Internet in the coming days. Unfortunately, this issue has to go to press tonight so I won't have the link for you until next month.

There is always something interesting going on in the world of tailless aircraft so we will continue to bring it to you as it comes in.

Andy

LETTERS TO THE EDITOR

Andy,

On page 5 of the May issue you stated that you would be putting Paul's scanned and cleaned reproduction of the Horten Tailless Report into the "Members Only" section of the web site. I've not seen it appear there as yet and I'm eager to download it once it's available, so I'm hoping you just needed this gentle reminder to get it uploaded.

Thanks for all you do!

Bill & Bunny Kuhlman

(ed. – I found some time that evening to get to it but decided to send the file directly to them so they didn't have to bother with signing into the members only section. It is 7 megs but it seems to load quickly.

My next project from Paul was to post the Horten IV drawings he sent me on a disk, which has now been completed. These are the PDF versions but he also sent me TIFF versions that will eventually get posted. I was hoping they might be different than the ones we have in the archives, but upon comparison they were an exact duplicate so nothing new popped up. I have included a few examples on the following pages.)

Thanks so much. Excellent copy - best I've seen. I usually worry about attaching larger files to emails, but this came across just fine.

Posting the H IV drawings in digital form is a very good idea. That makes them accessible without the expense of paper reproduction.

Thanks again! Your efforts are appreciated.

Bill & Bunny

I have the 1/3 scale flying model of the Facet Opal built by Dean Winton, Scott Winton's brother. In perfect condition, as it was when I bought it from Dean in around 1990. Anybody interested in purchasing it? I live in Arizona, USA.

I will take some good pictures when I return home next week. I have not flown it in ten years. The engine is an OS .61 pumper with only about two hours run time since new. I ran the engine about a year ago.

Neil Pivar
<neilpivar@q.com>

(ed. – I have included the photo that came with the original message not knowing if I would get the other ones in time for this issue. If anyone is interested, drop him a note at the e-mail address.)

(ed. – I have included the note from John to let everyone know that there has been a problem with obtaining plans or material from Rol Klingberg. Paul Spatrisano had tried to follow-up with Rol by e-mail and also had no return, so it is safe to say this is not a viable option if you become interested in the Klingberg wing.)

Andy,

Just wanted to bring you up to date on the ordering of flying wing plans from a Mr. Rol Kingberg. Having sent a check to him and a letter asking about the order, and still not hearing from him, I have cancelled the check I sent to him and am sending him a letter stating as such. Of course without saying, there is nothing TWITT can do about this, and I am just letting you know what has transpired. Don't know if any others have had any problems with this person or not, but I am really disappointed to not be able to get these plans.

Thanks for your help also in this matter. Have a very Happy Fourth of July.

John Patten

Hi Andy,

Finished the Pegasus model, but have not yet flown it. (Waiting for the desert winds to ease off a bit.) It will be air-launched from a mother ship just like the bird models.

I have retained a running dialogue with Max on email. Depending on how the machine flies, I will send you that whole file and you can extract what you might want for the newsletter.

Very light weight -- 15 oz, ready to fly.

Bob Hoey

(ed. – I have included the picture Bob sent along with this message. It always amazes me just how fast he can design and build unusual models and then make them work. It will be interesting to see if he can get this to fly reasonably well. I am looking forward to the results.
This just in from Bob.)

Made one short flight on the Pegasus this morning. Flew in between steady, high winds, and gusty, convective winds that is the usual morning sequence. Flight was a resounding success!!

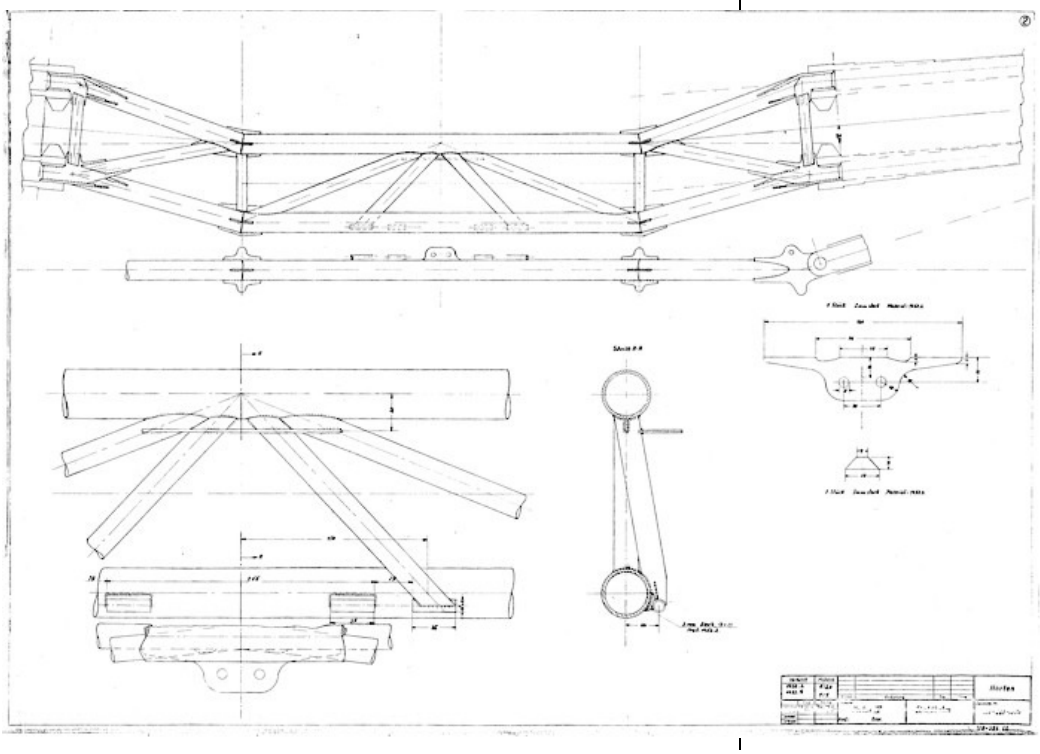
Captive flight was normal except for a requirement for nose-up trim on the mothership. Launched at about 300 feet and launch was clean. I was using high rates and the airplane responded quite well in both pitch and roll. Needed a little nose up-trim for normal flight and response was a bit sensitive, but it flew nicely. The glide angle was surprisingly good; quite flat, like a normal glider. Didn't try any stalls, but did do turns in both directions and had good control. Made a gentle landing with NO damage.

Unfortunately, there were no cameras at the flying site, but we'll get some videos next time and try to post on YouTube or somewhere.

If the wind stays down, may try again tomorrow, 4th of July.

Congratulations, Max!!
Looked a lot like your XPlane video!

Bob



The Flying Blank Group Threads

When I was a teenager, I became aware of the EPB-1 Plank. It was a source of inspiration, being minimalist and unconventional. I think, on the one hand, that Al Backstrom was just another designer, and on the
other hand he was for me a kind of icon for design. What I would have called a Zen approach. So this email is meant to be a kind of tribute to Al Backstrom (and his surviving wife). I had the chance to send an email to Mr. Backstrom days before he died, thanking him for his contribution and the inspiration his minimalist plank design added to my life. He was kind to respond with his usual direct and minimal approach. We stand on the shoulders of others, and what we have is the plans, the inspiration, and a few short articles that he had written. I was just reading his article, "a plank for today". Here are a few sentences that mean something to me. There is an under-standing of aerodynamics plus his experience which you can see here. I would be

interested to hear a response from anybody about these or anything
regarding the EPB-1 plank, however trivial. I think I have touched on many of these issues, but mainly a strange silence ensues. In any case, thanks Al Backstrom for giving us the Plank.

"I feel that a small simple sailplane of acceptable performance can be designed using the plank layout, but not by copying the original closely. The short span made the span loading higher than desirable and produced a minimum sink rate that is not acceptable today. Secondary problems included inadequate approach control and a small cockpit.

Performance flight tests conducted at Mississippi state college showed a *lower minimum drag coefficient and a lower span efficiency factor* than the design estimates. The former allowed good high speed L/D and the latter adversely affected the minimum sink rate.

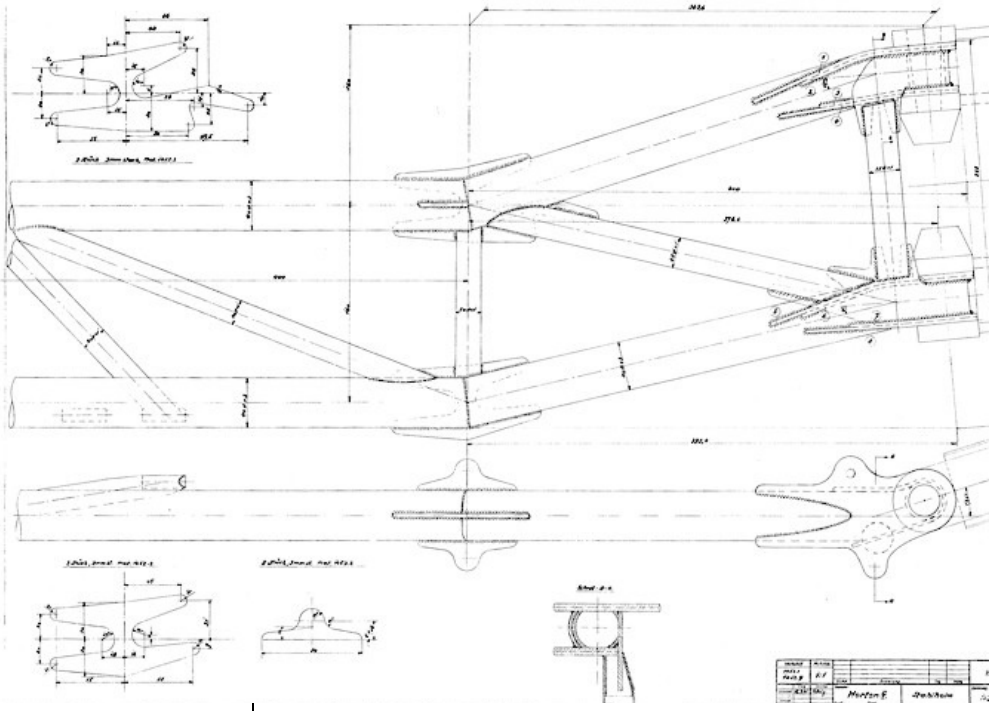
In designing a plank for general soaring today, I would start by using a span of about 33 feet. An empty weight of 150 to 200 pounds should be targeted. A wing loading of about 4 lb per square foot is reasonable.

To simplify construction, the ship would be designed in three sections, i.e. the pod and two wing panels. The aerodynamic chord would be extended in the elevon area. The increase in chord in the elevon area will produce better lift distribution at higher Cl in addition to reducing the required deflection angles for a given Cl.

Instead of a pure cantilever wing, I would use a semi strut braced arrangement. This would consist of a short strut that has about a 45 deg angle with the horizontal. This provides a very significant reduction in the maximum wing bending moments.

To obtain directional stability, a central fin would be used. The upper section of the fin can be designed to split to provide drag for approach control. This drag force will produce a nose moment that can serve to reduce minimum flying speed but will require pilot awareness."

Those are a few sentences from the article found in the group files. When we were getting the plans, I looked at the people and wondered who these guys were, what they wanted to build, what did they know about aerodynamics, and structures. It would be nice to hear three words even from these curiously silent folks about the plank, flight, design, nostalgia, whatever.....



Tommy, I don't know how you ever found the Plank, but it was nice you put up the forum. That end of the video where you sit by your hang glider, giving us the thumbs up, that makes it.

Max Perrault
<MGPerrault@AOL.com>

Max:

To simplify construction, the ship would be designed in three sections, i.e. the pod and two wing panels. Instead of a pure cantilever wing, I would use a semi strut braced arrangement. This would consist of a short strut that has about a 45 deg angle with the horizontal.

Al was right on with this comment and I've said it all along too.

Tommy Thompson
<soar8hours@yahoo.com>

Tommy:

You are right about the struts, and having the mindset to redesign. That is why I brought it up, because we have the tendency to just follow the plans where Backstrom has clearly outlined what should be done.

Extended chord at the elevons. Keep the weight to a minimum use a drag brake that raises the nose use a central rudder, as far back as you can put it have the wings come apart keep the airfoils really clean (build technique) and streamline the pilot increase span and or span efficiency

Max

How would you design the drag brake to raise he nose?

Tommy

Two ways that I know of: A split flap hinged at 40%c on the lower surface will produce a positive pitching moment and some lift. Watch this AV-36 land.

http://www.youtube.com/watch?v=O1z4hj5K02g

An air-brake on the top half of the fin will also produce some positive pitch.

Norm Masters
<ibratiger62@yahoo.com>

The split rudder has the challenge of both articulating for yaw and drag deployment. Using the top half is perhaps a solution but the area may not be much for path control. 40% split flaps work well on my RC planks but they don't seem to raise the nose. But they will increase the lift to some extent. With elevons you are losing %30 - %40 lift and the small split flaps wont make up for it. The Plank had a dismal maximum lift coefficient of 0.75, partly due to separation at the canopy and partly due to elevons.

I was also simulating the low aspect ratio bird tail that you can raise to 90 deg. This would be my first choice in simplicity. No extra lines to hook up when you put the wings on. A drag brake something like this is seen on the carbon dragon.

I was leaning toward full span elevons to solve the notch in lift distribution from half span elevons, and to increase the roll rate. This notch was a contributing factor to the low span efficiency and probably one reason Backstrom suggested longer elevon chords. Then the bird tail for glide path control and trim with added benefit of longitudinal damping. Deflections on the elevons must not lead to partial stall of one wing during a turn or bad pitch changes ensue. I was going for all moving wing tips in the end which can be a part of the mass and aerodynamic balance of the elevons.

Max

I am not in favor of messing with the airfoil section and disrupting the airflow with a hinged flap. I'd have to think some more about this one.

Tommy

Max;

Do you think doing full span ailerons on the wings and the bird tail / center section for the elevator is a
favorable idea?

Tommy

Tommy:

Full span ailerons and a central elevator on a bird tail; What I like is the greater tail moment, better drag situation, and isolating the functions of aileron and elevator. But a lot depends on the proportions....

One thing I've wondered about is if there is a kind of aileron differential with elevons as you pull back the stick. Also there is no question that as soon as the wing stalls the nose will drop....

There is probably a significant drag penalty using a short width bird tail elevator. If you are thinking hang glider, you might think of using some weight shift. For a narrow tail I was thinking of full span elevons, and then using the bird tail for drag brake, maybe some trim, and whatever damping. I've heard more than one tumble story.

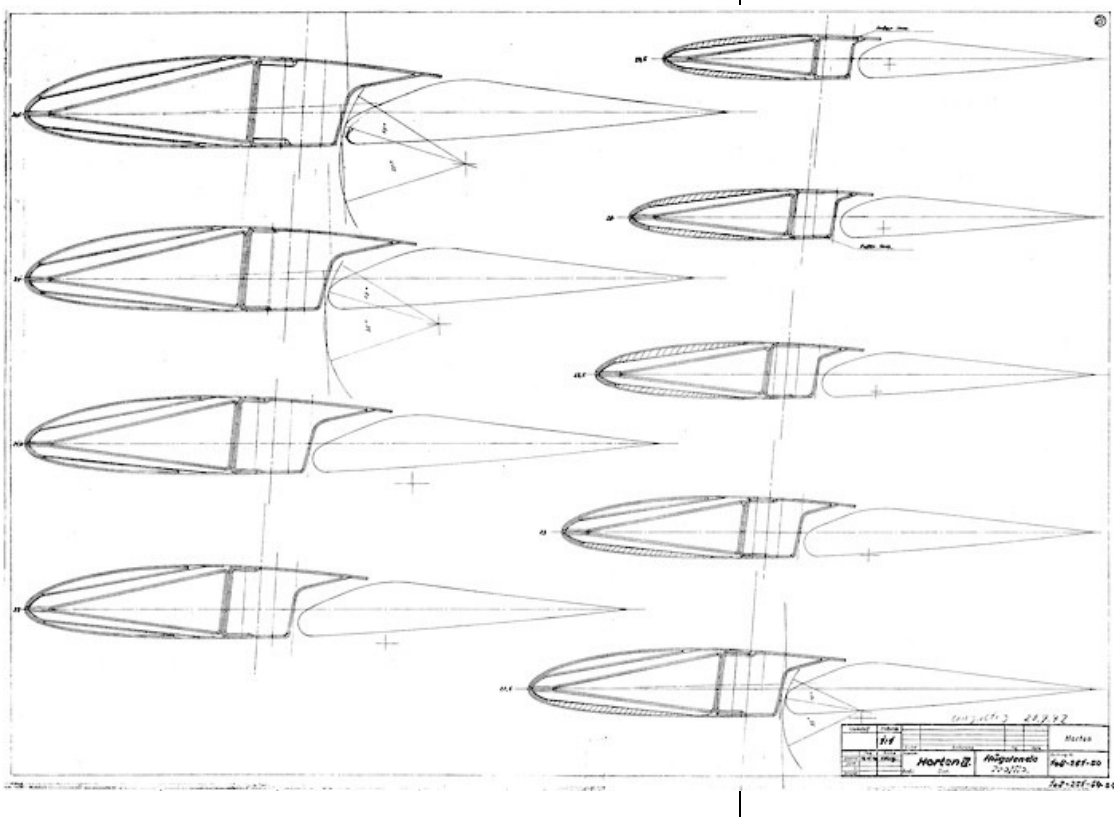
If the tail is wide enough, possibly along with the lifting body concept, then the elevator there seems ideal. I have the best flying in the sim with that configuration.....it can achieve an excellent lift distribution for minimizing induced drag. Beyond the Fauvel/ Marske planform. A lot depends on how much airfoil reflex you start with and how much static

stability. I would first decide what practical width you feel you could live with for travel and man handling. If its going to be a two or three foot width to the fuselage /bird tail, then elevator function must be from elevons or combined with weight shift. Pity you don't play with x-plane, we would have a new level of communication. (Will, chime in)

My way would be to simulate the design until it flew great there, then build a sizable RC model. This is of value if you fly RC. Or maybe someone would take interest in it and build one. Note that neither Fauvel or Backstrom nor Marske prototyped in large models and they all got away with it.

Using programs like AVL, one can actually quantify pretty well the losses incurred from half span elevons, if there was some motivation to go that way. Take a look at Backstrom's sketch for a wing with extended elevons and ask what exactly are the things you like about the plank in the first place.

I would be drawing up structures and cockpit concepts. Decide early on about the power issue. It would be great if there was participation from the silent majority, they must have their skills from which all will benefit. Eventually I may post some sketches for possible layouts and structures.



I would not give up the idea of sweep and wing tip fins.

The Plank; potentially good but potentially not good.

Max

In a hang glider weight version, between 8 and 14 HP would be good, which means two 4 to 7 HP engines. I

don't find particularly satisfying solutions using the gas engines. I'm not an engine man, so its someone else's field. I see some hobby gas engines that are really cute and light, about 1 lb per HP. I see prices around $500 and up for those. Little screamers I suspect and there may be a whole gearbox issue. There is a really nice looking four stroke...6 HP. Neat radial looking thing. Two of those with off the shelf hobby props and you have a really interesting rig. Neat sound.

But the electric is coming along and is exploding on the scene. Power to weight is very good, endurance is the problem but flight times of over an hour are happening now. Again

you can access the hobby world and there are several ultralights with electric installations. See the electric Lazair for instance. (Previous page.)

http://www.rcgroups.com/forums/showthread.php?t=1412424

The last wing in the cascade is the one with the elevon and is larger in chord...about two feet wide x 8 feet in span. The other feathers are all equal and are fixed. I think borrowing a simple foam cut and vacuum bag technique from the model world would work well for these. There is a bamboo surfboard that weighs 6 pounds. Beautiful finish, larger than a feather, takes the pounding seas. I only mention it for the poetry of it, but anything from wood veneer to carbon/ Kevlar could work, even ribs and model aircraft covering. For a hang glider version, every single thing must be as light as possible, so build techniques may be different than an ultralight version. There are two huge root ribs that hold thin Lexan windscreens and provide crash protection...a step up from the hang glider world. There is a double tetrahedron root structure that goes to the catamaran like ribs that hold the feathers. These fat hull like ribs appear to require only very thin walls to carry the torsion from feather bending moment, but this remains an interesting engineering problem. Someone running a finite element program would be much appreciated.

I have only done some ballpark calcs for feasibility, so no hard figures as far as weight goes, but you can make a good estimation by looking at the bending moment, spar heights etc and comparing with existing aircraft. I don't see why a 65 lb to 85lb hang glider can't be made, with some careful design effort. Using advanced materials and design, the weight could probably be 55 lb. Just the bolts on a regular HG weigh in the neighborhood of 5 lbs. Everything adds up, that's the problem. The weight I'm generally using is 165 lb ultralight airframe with 80 lb of engines. The hang glider version with 8 hp shows super STOL. The ultralight with 26 hp is super STOL. There is much to design yet. I think a powered hang glider is in the realm of possibility. Another option is a remote control winch. Existing ones are quite expensive though.

An EPB-1 plank could be simple compared to your Fokker, but the one from the plans takes some 650 hours if I remember. It is why I promote a creative effort to redesign the structure, and perhaps at the same time, improve the handling.

Max

Since we are talking about electric power for light UL aircraft,

1. How much HP required for an electric engine.
2. It's weight .
3. Cost.
4. The weight & cost of a battery.

I see in the article you mentioned this builder states:

Two 10 kw Turnigy CA120-70 motors with 32-12 props reconfigured to WYE terminations.

Two JetiSpin OPTO 300 controllers.

96 pieces of Zippy 5000 mah cells arranged in 6 packs of 16s4p each.

Six of FMAdirect PL8 v2 chargers, each one running off two 12v 900 watt Dell Poweredge 6650 power supplies wired in series to get 1800w at 24v.

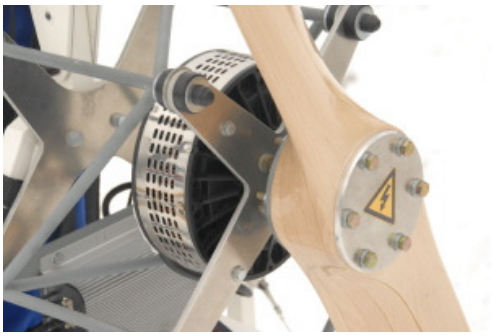
Which basically means nothing to me since I'm not into electric technology.

Electric power is a very novel idea.

Tommy

Here are two promising electric resources

http://www.e-motor.fr/welcome.php



http://www.enstroj.si/Electric-products/emrax-motors.html

But the prices are not on the website, one would have to write them

If you could get it to work, two $500 electric motors from the hobby industry and $500 to $2000 worth of batteries. You need a speed controller and a recharge system, wiring, some gauges.

You can step up to $1200 per engine....these are in the range of 10 hp, so again you would use two. If you have a single engine I would put it in back like Backstrom's powered aircraft. Then you need twin rudders

For a hang glider its interesting that Dale rewound his $500 dollar motor and got 13 hp out of it. This is something like a 7 lb motor. Add 20 lb of batteries and you are self launch. You may find wholesale laptop or other battery deals. Batteries will keep improving for a while. Costs may come down. Electric engines have also been improving.

It would help tremendously to have someone into electrics spearheading the way since the devil is in the details.

Max

The issue of power is daunting. But this is true for gas as well. But people have already made great strides figuring out what works and what does not. In other words, follow in the footsteps. The e Lazair is a perfect example of this. Reading some of that build thread made me realize how tired I am of trying to make systems work. There are turnkey electric systems but the prices are not cheap. There is plenty of good information to DIY but it requires endless hours of tinkering. It's too bad. I was hoping for a minimalist approach where you might not even need a speed control, just full on or off.

There is the electric Cri Cri, and this new design by Columban Electric is here! My friend makes his own batteries and recharges them in air by wind milling the props. Whew, got to hand it to him.

Here is another electric Lazair from England

747 watts equals one horsepower. The hobby electric motors that Dale was first using seem to cost only about $500 each. After rewinding he got 13 HP out of one motor. It seems fantastic...but I guess he suffered over heating. I haven't read all 36 pages of the thread, but as all things seem to go, he upgraded to engines that cost around $1200 + each. For batteries, he also gave up on the hobby batteries but I see he expects to invest $5000 for one-hour flight time. This amount of batteries weighs about 90 lb. I think some people are using laptop type batteries and some cheaper prices could be had. My idea was to only have 15 minutes flight time, to get to altitude and then soar, hopefully getting the in-flight recharge happening. The price for hobby batteries would be around $500 for this and weigh 20 lb. The motor weight is around 6lb each. So say 25 lb per side for a motor, prop and battery pack and this would go nicely with the structure there on the Pegasus. You could see two grand for hobby components for a bare minimum electric launch but some how this climbs to 5 or 10 thousand in the end. Tragic. There MUST be a cheap and simple propulsion solution. I once calculated the thrust of gluing the entire surface with flies but it wasn't enough.

The only way I could see to make this work is a community effort, or if there is a Hercules. I know one of these guys, a super accomplisher, and it's a continual source of amazement.

Max

Mitchell U-2 Bulletin Board Threads

(ed. – I thought this thread was a good one since everyone can use the knowledge for both modeling and making parts for the "real" project that will fly some day. This first message started the discussion and I tried to weed out some of the less informative stuff.)

Can someone please tell me the simplest way to make a hotwire cutter for foam, so many sites show different ways but i have no clue on how to make a very simple foam wire cutter. Can someone

share with me the easiest way for someone with no electronic knowledge. Please and thank you.

Ryan Derot

Buy a Feather-Cut. If you don't want/need the gravity feed then just buy their hot wire and bow and electricity source. This is proven stuff.

http://www.acp-composites.com/acp-FoamCuttingEquipment.pdf

Doug Hoffman

Go to Home depot and buy a few pieces of oak. The long one serves as the backbone of the bow. Two shorter pieces are drilled for a pivot bolt at the center. Choose the length of these pieces depending on the
depth of the foam you need to cut. Drill the ends of these pieces perpendicular to the pivot bolts and in line with the backbone of the bow and put eyebolts in these to attach the cutting wire on the bottom and on the top another length of wire with a turnbuckle at the one end to adjust tension on the wire.

Get a variac and a low voltage transformer to power the bow. DO NOT run the bow directly from the variac as it is an autotransformer and can result in mains voltage on the bow if there is a fault. Isolate the variac from the bow with a low voltage, say 12v transformer capable of say 10A. This can be found in an old 12v battery charger or so.

Connect the primary of this transformer to the variac and put the wire bow in series with the 12v secondary. Start with the variac on low and increase until the wire is hot enough to sizzle when applied to the foam.

Using this method you have an economical and very flexible setup that can be tailored very easily to working with different setups. Always ensure good ventilation when cutting foam. The fumes are poison.

Joe Street

Hi Ryan, I did one exactly as Joe's, I used a 220/12V 1000VA transformer (I am French) and I use stainless steel safety wire 0.6 mm diameter.(+-0.025 inch) it works well and it's rather cheap.

Claude Bouzerand

Any non-conductive material will do for the bow. Just a few hours ago we were blocking out some blanks for a model with a bow made from PVC pipe. It's light, cheap, and stiff enough if you use a fairly large diameter but not so easy to make pivoting joints.

It's important to get the wire pretty tight so that it doesn't sag as you pull it through the foam. Right now we're just relying on the springiness of the pipe to tension the wire. It actually seems to be adequate but I'll have to check the leading edge. We'll probably build a better bow for the longer cuts that we'll have to do for the full sized wing.

A simple H-brace, like a bucksaw, is great for tensioning the wire. You don't really need a turnbuckle. Lots of guys use a strong spring and gust squeeze the ends together while they tie the ends of the cutting wire to the rings. The bow in this video is the spring tensioned H-brace type:

http://www.youtube.com/watch?v=GWF1XwrgjD4

Norm Masters

Two things first.

One: The only foam safe to cut with a hot wire is styrene (Styrofoam). Urethane foam releases cyanide gas, just like the bucket below the chair in the gas chamber.

Two: Whatever your power source you want an isolation transformer between it and the cutter, as others have noted here.

Cutters: The easiest is is to use a piece of 2 X 2 and two pieces of 3/4" conduit about 18" long. With a spade bit drill a hole at each end of the 2 X 2 so that the holes are canted outward 5 to 10 degrees (these cutters are so cheap make several for different size jobs). Make sure the holes are a snug fit on the conduit. Drill the conduits on each end for a 1/4" bolt. Plug the conduits into their holes in the 2 X 2 and string .030 safety wire using the 1/4" bolts to clamp it as well as providing your electrical connection point. Twist the conduits to tension the wire. Use electrical tape to provide an insulated handhold on each conduit (as well as running the connection wire lamp cord is cheap).

Power supply: A variac is the cadillac, just don't forget that isolation transformer. A model maker buddy of mine used a dimmer switch for a cutter to do model

wings. It worked, but he was cutting beaded styrene foam. If you use a plug and socket to make it easy to connect / disconnect a cutter from the power supply DO NOT use a wall plug type (I used the type for room air conditioners) so that some yoyo doesn't plug the cutter directly into the wall.

Foam: Don't use Styrofoam insulation board, it's soft, it WILL get dented while handling and you'll not find the dent until you pull the peel ply. What you want to use is large cell foam like that used for flotation billets. Making wings: Perfect cores make perfect parts. Hot wires stretch and sag while cutting. Always start at the leading edge and work toward the trailing edge. If you're really a nitpicker, make two sets of templates, one set an 1/8 to 1/4" larger around the periphery and one to size. Cut with the larger and sand to finish with the smaller. Peel ply everything and use paper towels as a bleeder ply. Your parts will be lighter, smoother easier to bond to, and you'll save hours without a bazillion pinholes to fill.

Rick Girard

Hi Ryan. Have you seen these websites?

http://hotwirefoamcutterinfo.com

http://www.jacobs-online.biz

Some good stuff on both sites about power supplies. Also, the model aircraft fraternity seem to be at the cutting edge (pun intended) of this technology

I have just invested in a ready made cheap 30V/5A DC power supply off fleabay (www.fleabay.net/).

Jono

Yea I did thanks
Made my cutter, works awesome :)

Ryan

(ed. – I think that pretty well say is all for this thread.)

Nurflugel Bulletin Board Threads

Designing landing gear for a flying wing is tricky. A tri-gear set for high ground incidence means an extreme flare on landing is absolutely necessary to prevent nose-gear-first runway contact. Should this happen a lot of bad things may follow - the nose will be bounced into the air or the pilot will lose directional control.

OTOH, if the ground incidence is set low, the FW may not have enough elevator authority given the short elevator arm to lift the nose gear to achieve a takeoff AoA. Sometimes this means the aircraft will accelerate until the elevator suddenly has enough effect to "pop" the nose off the runway leading to a PIO.

It gets more complicated if the pilots weight is well forward of the CG as this will cause the aircraft to fall over on its tail as the pilot exits the cockpit. Think of Rutan's Vari-Easy where this problem led to parking the airplane with the nose gear retracted.

There are several complicated work arounds. The main gear can move fore and aft to provide ground stability with an empty cockpit and the nose strut can have a variable extension - long for takeoff and short for landing.

It also helps to have the gear legs as short as possible to get the CG as low as possible. Think B2. This option may be limited if propeller clearance is an issue. FW's with tall gear and high CG have tumbled onto their backs. It's also critical for all three struts have very little rebound - bouncy gear is a BIG problem.

Bildan

Is that why Marske's wings have such large elevators next to the center section?

Rich Nunn

No, Jim's designs rest on a main wheel and nose skid. Anyway, a larger elevator won't fix a gear problem.

Bildan

I came by a picture from 1927 Meccano magazine Cover
http://meccano.magazines.free.fr/img/1927/2704/2704_fc1.jpg

Article about Capt. G.T.R. Hill's Pterodactyl:
http://meccano.magazines.free.fr/img/1927/2704/27040290.jpg

http://meccano.magazines.free.fr/html/1927/2704/27040291.htm

Rudder as air brake. Clown of the air - movements were a demonstration of the machine's remarkably safety

Enjoy, I know I did!

Stilgar Arrakis

AVAILABLE PLANS & REFERENCE MATERIAL

Tailless Aircraft Bibliography

My book containing several thousand annotated entries and appendices listing well over three hundred tailless designers/creators and their aircraft is no longer in print. I expect *eventually* to make available on disc a fairly comprehensive annotated and perhaps illustrated listing of pre-21st century tailless and related-interest aircraft documents in PDF format. Meanwhile, I will continue to provide information from my files to serious researchers. I'm sorry for the continuing delay, but life happens.

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Books by Bruce Carmichael:
Personal Aircraft Drag Reduction: $30 pp + $17 postage outside USA: Low drag R&D history, laminar aircraft design, 300 mph on 100 hp.
Ultralight & Light Self Launching Sailplanes: $20 pp: 23 ultralights, 16 lights, 18 sustainer engines, 56 self launch engines, history, safety, prop drag reduction, performance.
Collected Sailplane Articles & Soaring Mishaps: $30 pp: 72 articles incl. 6 misadventures, future predictions, ULSP, dynamic soaring, 20 years SHA workshop.
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Capistrano Beach, CA 92624 (949) 496-5191

VIDEOS AND AUDIO TAPES

(ed. – These videos are also now available on DVD, at the buyer's choice.)

VHS tape containing First Flights "Flying Wings," Discovery Channel's The Wing Will Fly, and ME-163, SWIFT flight footage, Paragliding, and other miscellaneous items (approximately 3½+ hours of material).
Cost: $8.00 postage paid
Add: $2.00 for foreign postage

VHS tape of Al Bowers' September 19, 1998 presentation on "The Horten H X Series: Ultra Light Flying Wing Sailplanes." The package includes Al's 20 pages of slides so you won't have to squint at the TV screen trying to read what he is explaining. This was an excellent presentation covering Horten history and an analysis of bell and elliptical lift distributions.
Cost: $10.00 postage paid
Add: $ 2.00 for foreign postage

VHS tape of July 15, 2000 presentation by Stefanie Brochocki on the design history of the BKB-1 (Brochocki,Kasper,Bodek) as related by her father Stefan. The second part of this program was conducted by Henry Jex on the design and flights of the radio controlled Quetzalcoatlus northropi (pterodactyl) used in the Smithsonian IMAX film. This was an Aerovironment project led by Dr. Paul MacCready.
Cost: $8.00 postage paid
Add: $2.00 for foreign postage

An Overview of Composite Design Properties, by Alex Kozloff, as presented at the TWITT Meeting 3/19/94. Includes pamphlet of charts and graphs on composite characteristics, and audio cassette tape of Alex's presentation explaining the material.
Cost: $5.00 postage paid
Add: $1.50 for foreign postage

VHS of Paul MacCready's presentation on March 21,1998, covering his experiences with flying wings and how flying wings occur in nature. Tape includes Aerovironment's "Doing More With Much Less", and the presentations by Rudy Opitz, Dez George-Falvy and Jim Marske at the 1997 Flying Wing Symposiums at Harris Hill, plus some other miscellaneous "stuff".
Cost: $8.00 postage paid in US
Add: $2.00 for foreign postage

VHS of Robert Hoey's presentation on November 20, 1999, covering his group's experimentation with radio controlled bird models being used to explore the control and performance parameters of birds. Tape comes with a complete set of the overhead slides used in the presentation.
Cost : $10.00 postage paid in US
$15.00 foreign orders

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