No. 291 SEPTEMBER 2010

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


BAE System Corex (Latin for Raven), UK First flown: 2004(?) Role: Technology Demonstrator for low observables technology. Description: An apparently large flying wing UAV resembling the defunct Darkstar program in layout. The fuselage has a generic stealthy appearance with air intake for the single (small) turbofan above the nose. The wings are long and less stealthy appearing with bulky control surface actuators. The wing form is typical of high altitude, low speed long endurance platforms leading to speculation that the design is most likely related to a Global Hawk type role. Source: http://www.abovetopsecret.com/forum/thread194940/pg1

**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., **1009** means this is your last issue unless renewed.

**Next TWITT meeting: Saturday, September 18, 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).**

TWITT
THE WING IS THE THING

## 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.

### T.W.I.T.T. Officers:

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**Editor: Andy Kecskes**
**Archivist: Gavin Slater**

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Members only section: ID – **20issues10**
Password – **twittmbr**

Subscription Rates: $20 per year (US)
$30 per year (Foreign)
$23 per year US electronic
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| 48oz/48 | 40.00 | 42.00 | 30.00 |
| 60oz/60 | 50.00 | 53.00 | 37.00 |



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

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## PRESIDENT'S CORNER

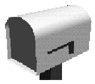
By the time you receive this I will have returned from the Experimental Soaring Association Western Workshop at Mountain Valley Airport in Tehachapi, CA. The program was full of great speakers on a number of different topics covering a great many aspects of aviation both past, present and future. If you live in the western US and don't attend this event at least once every couple of years, you are missing out on a lot of great information and the chance to talk with some of the innovative thinkers in the aviation world. If you life in the east, there is also a smaller version held at changing locations in the May/June time period. Unfortunately, there is no such event in the central area due to very little participation of ESA members in the middle of the country.

This issue finished up the Northrop lecture series, so I will start looking through our material and see what other piece of history I can do in a series.

This issue also has some good stuff from the Mitchell U2 world that is applicable to any type of aircraft design. It provides some clarification on how you might want to register your project with the FAA. Then there is information from the Nurflugel bulletin board that is more in line with our modeling members with some theories on the installation of split elevons on flying wings. There is even some first hand experiences that might help you decide on what method to use when thinking of how to make your next model a little more unique.

Enjoy the reading.

Andy



## LETTERS TO THE EDITOR

August 4, 2010

Time to renew my annual membership. Enclosed please find $30 to extend my membership for one more year.

Congratulations for your work on getting along with the TWITT Newsletter. It has been great to read the newsletter every month. I look forward to a lot of great flying wing information, discussion and new projects.

Artur Goncalves
Portugal

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August 15, 2010

Find my check for $20 to cover dues for another year to TWITT. Keep up the good work. I know it is very difficult at times.

John Patten
Jackson, LA

*(ed. – These were the only two letters that came in since the last issue. I appreciate the encouragement on the newsletter publishing and yes it does get difficult at times depending on the amount of material I can find that would be of interest to the majority of your members. My thanks to those of you who have contributed material over the years and I hope more of you will share your research or pet projects with us in the future.)*

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*(ed. – This is not a flying wing, but I owe Larry the extra exposure for this item since I didn't get it published in a previous issue of Sailplane Builder.)*

**HP-14 Kit**. Uncompleted, but basic all metal 18m wings, fuselage and V tail are assembled. For experienced sheet metal mechanic or builder to complete. Possible good match for small turbine engine above center section. 40:1 L/D. Enclosed tilt trailer. $5,000. Larry Nicholson, Calcutta, OH, 330-385-7040.

*(ed. – The following is the last installment of the technical paper from the 1940's that were sent to us by Steve Torpey in Bakersfield. My thanks to Steve.)*

## "The Development of All-Wing Aircraft" by J. K. Northrop

Royal Aeronautical Society Journal (Vol. 51, #438) June 1947 (RFD# 117122)

### FUTURE POSSIBILITIES.

Turning now to future possibilities, it seems that considerable further aerodynamic refinement can be made over that already accomplished in all-wing types. Particularly if turbo-jets are used as the motive power, the minimum parasite drag may be reduced to .008 or less. This value is obtained by subtracting the drag of propeller shaft housings, gun turrets and other military protuberances from the XB-35 configuration and assuming an improved degree of aerodynamic smoothness of the aerofoil section. Boundary layer removal and the use of somewhat thinner wing sections may further appreciably reduce this figure.

A maximum trimmed lift coefficient of 1.9 for the all-wing configuration seems attainable by methods already suggested and possibly may be further increased by judicious use of boundary layer control in combination with turbo-jet power plants. It is our opinion that the ratio of $C_{lmax}$, to $C_{dmin}$ may be increased to a value of 235 within the not-too-distant future from our present actual achievement of about 130. In contrast, the years of intensive development of the conventional types already passed promise an improvement of less magnitude within a comparable time. In our judgment a trimmed maximum lift of 2.8 vs. a minimum drag of .020 seems reasonable to expect for large, long-range transport and bombardment aircraft of conventional type.

These estimates are, of course, completely arbitrary and controversial. However, if one cares to assume their validity, the following conclusions may be reached, based on methods and calculations used in the early part of this paper.

The total minimum profile drag of the all-wing aeroplane in terms of the conventional will be from 40 percent to 59 percent. The power required by the all-wing to maintain the same cruising speed as the conventional will be from 70 percent to 80 percent and, conversely, the maximum range of the all-wing, at the cruising speed of the conventional aeroplane, will be 143 percent to 125 percent. The maximum range of the all-wing aeroplane at its best cruising speed will be 158 percent to 130 percent of the conventional, and the most economic speed will be from 125 percent to 115 percent faster.

Under high speed conditions corresponding to full power of reciprocating, turbo-prop or turbo-jet engines, where the induced drag is assumed to be 20 percent and the parasite drag 80 percent of the total, the power required to drive the all-wing aeroplane at the speed of the conventional aeroplane will be 52 percent to 67 percent and, conversely, the range will be 192 percent to 149 percent of the conventional aeroplane. The maximum speed of the all-wing aeroplane at comparable powers will be 124 percent to 114 percent of its conventional counterpart. These values are superimposed on those of Fig. 4, in Fig. 22 (next page), to give an idea of what possibilities for improvement appear reasonable in the next few years.

Different assumptions of comparative maximum lift and minimum drag values can be made to suit individual opinion, but it is believed that any reasonable assumptions will always result in an advantage to the all-wing configuration of such magnitude as to fully warrant whatever trials and tribulations may be associated with its development.

**POSSIBLE SUPERSONIC APPLICATIONS**

So far in this discussion we have purposely avoided transonic and supersonic considerations. This neglect is possibly a reasonable one when discussing commercial ventures, in view of the cost of higher and higher speeds. A reasonable degree of sweepback, such as is required in the type of aircraft under consideration, will permit speeds up to about 500 m.p.h. without involving great compressibility drag increases. For military aircraft, however, we cannot ignore the sonic "barrier" and its implications, and it is a reasonable assumption that sooner or later improved fuels will permit higher and higher operational speeds, even in commercial aircraft.

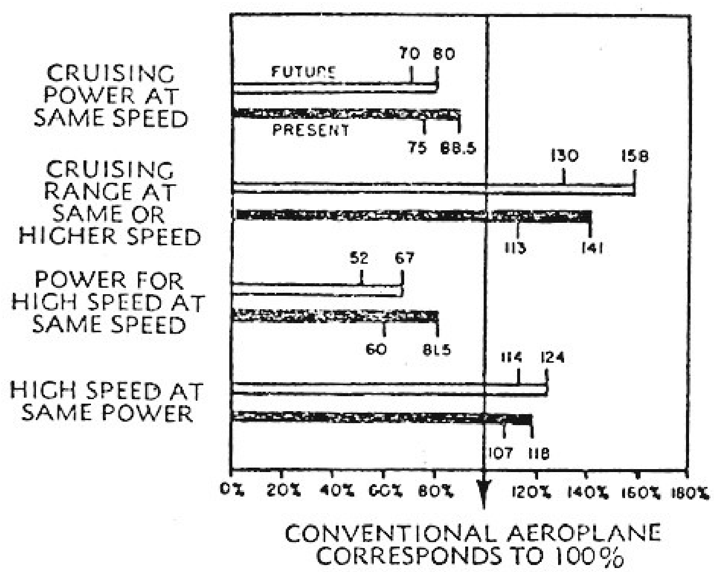



Fig. 22.
Graph of performance characteristics of all-wing aeroplane.

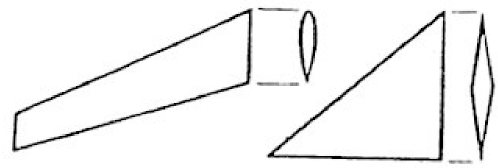
Based on present knowledge of supersonic flight, it will always be more difficult to carry a given payload for a given range at supersonic speed because of the additional wave drag encountered at these speeds. At transonic or comparatively low supersonic speeds, a plain swept-back wing appears to be one of the best possible configurations, provided that sufficient volume is available within the wing. Since the flow normal to the leading edge is subsonic over almost the entire wing surface, subsonic aerofoils with reasonably good subsonic flight characteristics can be used at these speeds. The all-wing design eliminates wing - fuselage interference as well as adverse interference between the tail surfaces and wing or body.

At higher supersonic speeds the problem of providing adequate volume is more difficult because of the fact that more and more fuel is required for a given range and that the percentage of thickness of aerofoils suitable for such use is much less than that same factory for subsonic flight. Save for one compensating factor, this problem of volume and size might well rule out the all-wing aeroplane for supersonic use, and certainly does limit its usefulness for low altitude flight. However, an attractive field of operation exists at very high altitude where air densities are low and therefore wing areas must be comparably great if suitable lift coefficients are to be maintained. If we design a frankly supersonic aeroplane to fly at, say, a Mach number of 1.6, with supersonic diamond-section aerofoils, the maximum cruising lift coefficient will probably be no greater than .15, and the corresponding loading must be held to 40 lb. per sq. ft.

The above figures are based on assumed operation at 60,000 ft. and an air density ratio of .094. Such an aeroplane might likewise be suitable for landing and take-off at low altitude, in view of its comparatively light wing loading, which would eliminate the necessity of high-lift devices. The practicability of the design depends on the relative density of the air at the altitude selected for cruising operation. If a sufficiently high altitude is chosen it seems quite possible that adequate volume can be secured in the wing in spite of its small thickness ratio, by using low aspect ratio planforms approaching the triangular.

**DEVELOPMENT OF ALL-WING AIRCRAFT**

Figure 23 (next page) shows comparative data on two wings having the same physical depth at the root and identical wing areas. The conventional wing is of a type already proved practical for all-win- aeroplanes. The delta wing has thickness ratios suitable supersonic flight, identical thickness and only slightly reduced volume. It should be quite suitable for all-wing aircraft of reasonable size. From the aerodynamic point of view it appears that with the delta wing it is possible to eliminate a substantial portion of the wave resistance and thus realize fairly favorable lift-drag ratios at supersonic speeds.



| Type | Conventional | Delta |
|---|---|---|
| THICKNESS AT ROOT | 1 | 1 |
| TAPER RATIO | 2:1 | ∞ |
| THICKNESS RATIO | 15% | 7½% |
| ASPECT RATIO | 8 | 4.5 |
| ROOT CHORD RATIO | 1 | 2 |
| SPAN RATIO | 1 | .75 |
| VOLUME RATIO | 1 | .833 |

Fig. 23.
Comparison of subsonic and supersonic all-wing aeroplanes.

It is gratifying to those of us who have been working on all-wing projects for years to recognize the increased interest in the type evidenced in Germany toward the end of the war, and more particularly in England and Canada in recent years. For many years we received scant encouragement and often seriously questioned our own judgment, as well as our ability to achieve a successful solution to the many problems involved in the development of this type. The goals and rewards have always seemed well worth attainment, however, and I believe accomplishments to date have justified the effort required.

I hope this discussion may provide encouragement and incentive to those in Great Britain who have pioneered all-wing aeroplanes and that these projects, both here and in the United States, may profit by each other's mistakes and successes, thus bringing the two countries to the forefront in this important phase in the development of air transport.

The President, Sir Frederick, Handley Page: After the Wilbur Wright Lecture they did not have a discussion, although Mr. Northrop had given them all a great deal about which to think. He would ask Dr. Roxbee Cox to propose, and Mr. Rowe to second, a vote of thanks. He had great pleasure in calling upon Dr. Roxbee Cox to do this, as he had been Vice-President during the past year in charge of the technical activities of the Society, and at the Council Meeting, that day he had been elected President for the ensuing year.

Dr. Roxbee Cox (President-elect of the Society, Fellow): There was nothing more inspiring than a record of high endeavor; nothing more impressive than the logical development of a great thought from a picture in the mind to an achievement in the solid. That was what they had heard in the 35th of the Wilbur Wright Memorial Lectures, and that was why this lecture must rank with the finest in that remarkable series.

Mr. Northrop was not the first to have the vision of the all-wing aeroplane, Mr. Stephenson was not the first to have the vision of the steam locomotive. But they both had a gift more precious than priority in vision, the gift of being the right men at the right time to turn the vision into successful reality.

Mr. Northrop's timing was, in fact, almost uncanny. Not only did he produce swept-back wings at a time when scientists agreed that swept-back wings were the things to produce; he also brought his child to maturity at a time when the only power plant which could give it aesthetic perfection—and indeed minimum drag—reached maturity as well. All that remained now was to get rid of the wheels.

There were some who believed that an aeroplane should have the maximum of body with the minimum of wing—a mere projectile. There were others who believed it should have the maximum of wing with the minimum of body. To concentrate on the body was gross. But to aim for wings was to be on the side of the angels.

He proposed that they accord to Mr. Northrop a most sincere and hearty vote of thanks, with admiration in their hearts for his great ideas and magnificent accomplishments.

Mr. N. E. Rowe (Vice-President of the Society, Fellow) seconded the vote of thanks. He had had the pleasure of meeting Mr. Northrop in America on two occasions. On both those occasions he had been particularly impressed both by the energy and knowledge of Mr. Northrop and by his personality. He was never too busy to talk to anybody who was interested in all-wing, aircraft. He was a man of great personal kindness and modesty and was always most generous with information which would be of any assistance to others.

He had given them that night a magnificent statement of the aeronautical difficulties, which had been encountered and how they had been overcome. No doubt at some later stage he would describe

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**Mitchell U2 Bulletin Board Threads**

*(ed. – This was an unusually long exchange on different ideas about how to register an aircraft as either a motor glider or a sailplane.  There is some very interesting information that might be a starting reference point for our project.)*

There are two U-2s regestered with the FAA as gliders the rest are listed as powered aircraft. Does anyone know anything about these aircraft or the subject of registering a U-2 as a glider? The U-2 is on my short list of possible self launch gliders that can be plans built. The other question is will these U-2s thermal.

Tim
planzcycle@yahoo.com

I intend to register mine as a powered glider. The best info I can point you to on doing this is on the Sonex Website
http://www.sonexaircraft.com/aircraft/motorgliderdefinition.html
Can't tell you anything about thermalling it. I'll let you know in a few years when I finish the build!

Andy Gamache
andyomigosh@juno.com

You should be able to register the U-2 that you build as either a glider or aircraft (even a Light Sport), but not both. If you already have your glider license then all you will need is a self-launch endorsement. If not registered as a glider then you will at least need a Sport Pilot license. Witness the Moni, which is registered either way. It is up to you as the builder. If you have any question about this I strongly suggest you contact your DAR to confirm before you start building.  "The maximum weight to wing span squared (w/b2) does not exceed 3.0 kg/M2 (0.62

lb./ft.2)." This only applies to type certified aircraft, not to experimental homebuilt like the U-2.

Doug Hoffman
glidedog@gmail.com

I am an experienced Glider Pilot flying out of the High Desert of Southern California.

The soarability of a sailplane is largely a function of its sink rate, generally a function of both wing area and weight (loading). The more modern laminar flow sections high aspect ratios mainly help L/D or glide angle.

The wingspan of the U2 is pretty modest. However, with the help of a folding propeller, a skilled glider should be able to thermal soar one in reasonable lift. The Schweizer 1-26 glider has low aspect ratio ~12M wingspan, and around 170 fpm sink. However, they can be soared quite well largely due to their high maneuverability and slow minimum sink speed (<40 knots).

As I doubt that the U2 was type approved as a Sailplane, it would have to be registered as Experimental. Great thing about a Glider PPL is that Self Launch is only an Endorsement of Launch Method (like getting a Winch Launch add on) in your Log Book. As many Gliding Clubs Instruct for free, this is often a cheaper route to learn to fly if you are not already a licensed pilot. Even with Single Engine PPL, you can not fly a Glider in the US; it is separately licensed.

Hope that helps!

Andy Coles
andydcoles@verizon.net

Doug, all, There is NO way to register anything as an E-LSA anymore unless it is built from a qualifying S-LSA. See FAR 21.191 i (1-3).

Per i (1) the expiration date has passed, there is no provision for using this option now. Even the form that was used for this option, when it was available, (Form 8050-88A) has expired.

Per i (2) is for those building from a kit of a qualifying S-LSA. An RV-12 is an example here since Vans did create the S-LSA that qualifies your aircraft to be certificated as E-LSA.

Per i (3) is for demoting, as it were, your S-LSA back to E-LSA. Say you get tired of paying for conditional inspections, don't want to pay the $4000 dollars to get an LSARM, light sport aircraft repairman maintenance, ticket, but you can afford to get the LSARI , light sport aircraft repairman inspection, ticket by taking the 16 hour, weekend course. This is an N number specific license to work on your airplane only. This is a one way street for the aircraft that can NEVER be reversed.

So where are we, then? The only licensing available to builders is E-AB, experimental amateur built, per FAR 21.191 g. Glider is a category of aircraft within the amateur built rules, it is not a separate certificate.

For those who elect to register their aircraft, i.e. anyone who is going to complete it and actually fly it legally, the process begins with making the decision whether to request a specific N number or to let the FAA assign one. Information about what numbers are available can be searched from the FAA N number database, but beware all caveats since a number could show up as available but be in process for someone else. Once a number is reserved get form 8050-3 from your local FSDO (Flight Standards District Office).This is a three part form and cannot be obtained online. After mailing it per instructions to the FAA you will get an Aircraft Registration document from the FAA.

Note: this registration will be reported to your state and local taxing authority so do not be surprised when somewhere down the road you get a request for taxes owed in the mail. This will happen EVEN IF YOU NEVER FINISH THE AIRCRAFT. Once a registration is in the system it WILL show up on the tax rolls. In 1983 I got an N number and registration for a project that I ultimately did not complete. In 1985 or 6 I got the request for taxes owed from the State of Washington. A simple letter informing them of the projects status and returning the registration card to the FAA with appropriate boxes checked resolved the issue and no assessment was ever made against me.

However, horror stories abound, particularly in certain counties in California of huge tax bills being received based upon God knows what rules an regulations with the county auditor's office.

Next you will need form 8050-88 along with receipts for materials, kits, etc. This is explained on the form and online at FAA.gov. This is a one part form that can be downloaded in .pdf format.

The last form required is 8130-6 "Application for U.S Airworthiness Certificate". This is a tricky one because it covers all applications and has a variety of boxes requesting information. When information is requested from the Registration Certificate it must be recorded EXACTLY as it appears on the Registration. Say your aircraft is registered to Ronald Smith as owner. If you put Ron Smith on the 8130-6 your application will be rejected.

Once all forms have been received back from the FAA as required, and 8130-6 is ready, you can write a letter requesting an inspection to get your airworthiness certificate issued. This inspection can be done by the FAA, free but there's always a wait, so it is usually advised that you get the letter to your FSDO at least 6 months in advance, or by a DAR, less wait but costs $200 to $600 depending on the DAR. If you go this route make sure theDAR has the correct function code for your the type of certificate you are requesting. Function code 47 is for experimental amateur built certificates, function code 48 is for light sport (now only useful for those who fall under FAR 21.191 i (2) Building an RV-12 is an example here since Vans did create the S-LSA that qualifies your aircraft to be certificated as E-LSA.

If you should get a DAR with the wrong function code your money will be gone and your paperwork is worthless.

I have put four aircraft through the system, so far, so I have some experience. You can get a package from EAA for $15 or so that has all the instructions, forms for the E-AB process. If you want to save time, this is the way to go.

Hope this helps.

Rick Girard
LSARM #3178721
jindoguy@gmail.com

However, you *can* fly the U-2 with just a Sport Pilot license. So it really doesn't matter in this case.

Regards,

Doug Hoffman

True, I was just talking airplanes, not airmen. :-}
Rick Girard

Although the span squared divided by gross weight requirement may not apply to experimental home builts, like the U-2, the U-2 can be built light enough to have a w/b^2 less than 0.62 with an average size pilot so it does meet that definition of a motor glider. With a folding prop and some attention to sources of parasite drag it should be an okay, but by no means stellar, soaring machine. Why not register it as a glider? By doing so you significantly reduce your contact hours with government bureaucrats. You won't need a PPL to fly it and you can self certify the medicals as long as you haven't ever been judged medically unfit to fly.

Norm Masters
libratiger62@yahoo.com

OK.
Case 1) You build the U-2 and it does meet the requirement. What are you going to do different?
Case 2) You build the U-2 and it does *not* meet the requirement. What are you going to do different?
Answer: In either case, nothing.
So what is your point?

Doug Hoffman

I think my point was in the part you deleted. I'll try to be less ambiguous: By registering a U-2 as a motor glider you can reduce your contact hours with government bureaucrats and avoid the medicals as long as you haven't been denied a medical by a doctor.

Weather it's soarable or not is beside the point. It's just about reducing paperwork

Norm Masters

Actually, as a motor glider, you CAN be denied a medical and still fly.

Andy Gamache

Norman, The paperwork is the same no matter what you declare it to be on form 8130-6. It gets a Special Airworthiness Certificate as an Experimental Amateur Built. If you want to declare it a motor glider, fine, but all the paperwork is the same. I've attached the pdf file of form 8130-6 as well as the only document I could find in the FAA database that even mentions "motor glider".

Here is the applicable FAR for all of the Experimental certificates offered in the U.S. FAR 21.191 Experimental certificates.

Experimental certificates are issued for the following purposes:

(a) *Research and development. *Testing new aircraft design concepts, new aircraft equipment, new aircraft installations, new aircraft operating techniques, or new uses for aircraft.

(b) *Showing compliance with regulations. *Conducting flight tests and other operations to show compliance with the airworthiness regulations including flights to show compliance for issuance of type and supplemental type certificates, flights to substantiate major design changes, and flights to show compliance with the function and reliability requirements of the regulations.

(c) *Crew training. *Training of the applicant's flight crews.

(d) *Exhibition. *Exhibiting the aircraft's flight capabilities, performance, or unusual characteristics at air shows, motion picture, television, and similar productions, and the maintenance of exhibition flight proficiency, including (for persons exhibiting aircraft) flying toand from such air shows and productions.

(e) *Air racing. *Participating in air races, including (for such participants) practicing for such air races and flying to and from racing events.

(f) *Market surveys. *Use of aircraft for purposes of conducting market surveys, sales demonstrations, and customer crew training only as provided in 21.195.

(g) *Operating amateur-built aircraft. *Operating an aircraft the major portion of which has been fabricated and assembled by persons who undertook the construction project solely for their own education or recreation.

(h) *Operating primary kit-built aircraft. *Operating a primary category aircraft that meets the criteria of 21.24(a)(1) that was assembled by a person from a kit manufactured by the holder of a production certificate for that kit, without the supervision and quality control of the production certificate holder under 21.184(a).

(i) *Operating light-sport aircraft. *Operating a light-sport aircraft that (1) Has not been issued a U.S. or foreign airworthiness certificate and does not meet the provisions of 103.1 of this chapter. An experimental certificate will not be issued under this paragraph for these aircraft after January 31, 2008;

(2) Has been assembled

(i) From an aircraft kit for which the applicant can provide the information required by 21.193(e); and

(ii) In accordance with manufacturer's assembly instructions that meet an applicable consensus standard; or

(3) Has been previously issued a special airworthiness certificate in the light-sport category under 21.190.

So, I don't know where you are coming up with your information about motor gliders. Can you point me to the specific rule, FAR, anything other than myth, legend, and rumor?

Rick Girard

faa8130-6.pdf
Section II.4.6 Ultralight Operations.doc

If you see something wrong on this page: <http://www.sonexaircraft.com/aircraft/motorgliderdefinition.html> please explain it. w/b^2 of the U-2 is 0.58. The span efficiency (e) of swept 'wings is low but the criteria don't mention e just span and weight. The high, for a glider, span squared load and poor span efficiency mean that a U-2 will have higher induced drag than a comparable conventional sailplane but the high wetted aspect ratio means that it has the potential to have very low parasite drag. Some people may find that certifying as a glider is better for them, you may not, there's no argument here.

Norm Masters

So, I don't know where you are coming up with your information about motor gliders. Can you point me to the specific rule, FAR, anything other than myth, legend, and rumor?

Okay, now I see your misunderstanding. The key words here (in the Sonex ad, and FAR 21.17 are *type certificated*) This is what Cessna, Beechcraft, and Lear Jet do. The testing and documentation are beyond anything a person building a U-2 can do or would want to, for that matter. It's interesting that Sonex even mentions this since not a single airplane in their inventory is type certificated, otherwise they could sell finished airplanes rather than kits. Just look at what is required for type certification per 21.17

21.17 Designation of applicable regulations.

(a) Except as provided in 23.2, 25.2, 27.2, 29.2, and in parts 26, 34 and 36 of this subchapter, an applicant for a type certificate must show that the aircraft, aircraft engine, or propeller concerned meets,

(1) The applicable requirements of this subchapter that are effective on the date of application for that certificate unless,

(i) Otherwise specified by the Administrator; or

(ii) Compliance with later effective amendments is elected or required under this section; and,

(2) Any special conditions prescribed by the Administrator.

(b) For special classes of aircraft, including the engines and propellers installed thereon (e.g., gliders, airships, and other nonconventional aircraft), for which airworthiness standards have not been issued under this subchapter, the applicable requirements will be the portions of those other airworthiness requirements contained in Parts 23, 25, 27, 29, 31, 33, and 35 found by the Administrator to be appropriate for the aircraft and applicable to a specific type design, or such airworthiness criteria as the Administrator may find provide an equivalent level of safety to those parts.

(c) An application for type certification of a transport category aircraft is effective for 5 years and an application for any other type certificate is effective for 3 years, unless an applicant shows at the time of application that his product requires a longer period of time for design, development, and testing, and the Administrator approves a longer period.

(d) In a case where a type certificate has not been issued, or it is clear that a type certificate will not be issued, within the time limit established under paragraph (c) of this section, the applicant may,

(1) File a new application for a type certificate and comply with all the provisions of paragraph (a) of this section applicable to an original application; or

(2) File for an extension of the original application and comply with the applicable airworthiness requirements of this subchapter that were effective on a date, to be selected by the applicant, not earlier than the date which precedes the date of issue of the type certificate by the time limit established under paragraph (c) of this section for the original application.

(e) If an applicant elects to comply with an amendment to this subchapter that is effective after the filing of the application for a type certificate, he must also comply with any other amendment that the Administrator finds is directly related.

(f) For primary category aircraft, the requirements are:

(1) The applicable airworthiness requirements contained in parts 23, 27, 31, 33, and 35 of this subchapter, or such other airworthiness criteria as the Administrator may find appropriate and applicable to the specific design and intended use and provide a level of safety acceptable to the Administrator.

(2) The noise standards of part 36 applicable to primary category aircraft.

Now, if you read further down the page it talks about how to fill out form 8050-88, just as I outlined in my original email.

Also, further down the page it says:

*All other application paperwork is filled out the same whether the aircraft is a glider or not.* Which means you're going to fill out 8050-3 to get an N number, 8050-88 to prove you own it, and 8130-6 to get your glider certificated as an Experimental Amateur Built aircraft, just like I said in my original email. If you don't believe me, call your local FAA FSDO, ask for an inspector and get him to tell you what you need to do to get an airworthiness certificate for an aircraft you're going to build.

Rick Girard

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### Nurflugel Bulletin Board Threads

Talking about things circa 1997....Wasn't that the summer that Future Flight had its going out of business sale? Anyway, I scored a Thermal Thing and a Sport Wing back then.

And after making a false start on the Sport Wing about 10 years ago, I got a real start a few days ago.

Back then, I toyed with putting a Horten type washout in the thing, but the jig scared me away, looking too weird and too severe.

This time I was thinking embedding the engine right behind the root spar to bring the CG ahead without nose weight. I decided not to try it because I was thinking that I was gaining complexity and not really losing weight since I would have to run a shaft back and probably have a pillow bearing to hold up the propeller. Plus ducting for the engine cooling would probably negate any aerodynamic improvements.

So the Sport Wing will probably be built pretty much per instructions.

Except... I was toying with splitting the elevons and doing some funky mixing. Any opinions on this? Should I keep the elevons as is? Thanks!

Doug Halverson
dholverson@cox.net

I would seriously reconsider building it with the Horten twist. I have the original (6 ft.) "Klingberg Wing", not the "Sport Wing", but if it's anything like the version I have (where the top edge of the building jig was linear), the adverse yaw (which is among the worst I have ever seen in any airplane, model or full-scale) couples with the sweep, and almost completely erases the roll response. It's one of the worst handling planes I have ever flown, literally a hazard to itself and anything near it.

Also, the original butted the upper and lower balsa D-tube skins against the aft faces of the diamond-shaped balsa leading edge strip. It's virtually impossible to trim the lower skin to precisely fit the leading edge strip without taking the wing off the jig, which risks losing control of the twist. I recommend planing off the thickness across the flats of the leading edge strip by the thickness of the sheeting, so the skins lap over the leading edge strip and get trimmed at the forward edge, where you can see what you are doing.

As far as split elevons, the plane desperately needs some sort of rudder control (such as, but not limited to, split elevons) to combat the adverse yaw. I would definitely add them. I would never consider flying mine again without adding them. You might try getting some

1" x 1/32" basswood, or some 1" x 1/16" and then taper the aft edge on what will be on the inside (between the upper and lower elevons) to make a new trailing edge system in the same space that was occupied by the old balsa one. Use diagonal ribs in the new elevons for torsional rigidity.

On the prototype of our Roadkill Series XB-35 we used ailerons outboard and elevators inboard. We had the split ailerons rigged so that on the down-going aileron the upper and lower surfaces stayed together (the lower surface was spring-loaded against the upper surface, and the aileron servo drove just the upper surface). On the up-going aileron a tab at the inboard end of the lower aileron surface caught the outboard end of the elevator, so that only the upper aileron surface could move up, which automatically applied rudder on that side. It worked very well, but if I was doing it again, I would just put in an extra servo and have independent rudder control.

Servos today are small enough that you could probably install a servo inside each elevon to handle the splitting for rudder inputs. However, for flutter reasons it would be better to have the servo mounted ahead of the hinge line, so it acted as a mass balance for the elevon.

Don Stackhouse
djaerotech@windstream.net

What would you think of drag rudders?
I'm toying with the idea of a clamshell that pops open near the wing tip.

Doug Halverson

I think the Horten style drag rudders would be easier to construct, and give finer control of lateral movement. Differential ailerons will also help dramatically.

robnurflugel@gmail.com

Guys, forgive me if I offer some observations from one who has flown both types.

The trailing edge clamshell drag rudders like those on the B2 operate in a thick boundary layer area so don't produce much effect until they extend into clean airflow. I'm sure this is why you see them both extended during low speed flight. To a pilot is seems like a really big central "dead zone" although I'm sure the B2 flight control computers take care of this.

The most common Horten-type drag rudders are essentially differential spoilers located immediately ahead of the elevons. They are also in a deep boundary layer plus the turbulence they create rattles the elevons alarmingly. To a pilot, this seems like an impending stall.

I've been very interested in the drag rudder design seen on the Ho VII. Pictures of it are on pages 123 and 125 of the book "Nurflugel". These are panels which slide span-wise out of the wing tip opening a large hole in the wing.

The portion which slides out beyond the tip immediately encounters clean airflow as it starts to open eliminating the "dead zone". The hole in the wing this produces also must create enormous drag. Rudy Opitz told me pilots were ecstatic about this rudder design but hated all the others. He couldn't understand why it was only used on the HO VII.

BILDAN@COMCAST.NET

Hmm, looks like something more doable in metal, like cabinet drawer slides but that might be a bit difficult in wood, given the thinness of the section, not to mention the weight of the mechanism that far out at the wing tip. I have a Klingberg wing kit and plywood jig that has been laying around for a number of years waiting for a better idea. When I picked it up I had thought of using those drag rudders illustrated are on pages 123 and 125 of Nurflügel with a telescoping sliding tube arrangement but on my mock-up a simulated wind load would jam it up so it's still gathering dust. Sigh!

"These are panels which slide span-wise out of the wing tip opening a large hole in the wing. The portion which slides out beyond the tip immediately encounters clean airflow as it starts to open eliminating the "dead zone". The hole in the wing this produces also must create enormous drag. Rudy Opitz told me pilots were ecstatic about this rudder design but hated all the others. He couldn't understand why it was only used on the HO VII."

Dennis
Denoferth@aol.com

I think industrial ball bearing slides are a good place to start looking. No doubt it will require some clever innovation to make it work right but I think it could be done in wood as was the case with the HO VII.

BILDAN@COMCAST.NET

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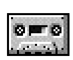

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Cost: $8.00 postage paid
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**VHS** tape of Al Bowers' September 19, 1998 presentation on "The Horten H X Series: Ultra Light Flying Wing Sailplanes." The package includes Al's 20 pages of slides so 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
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**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.

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