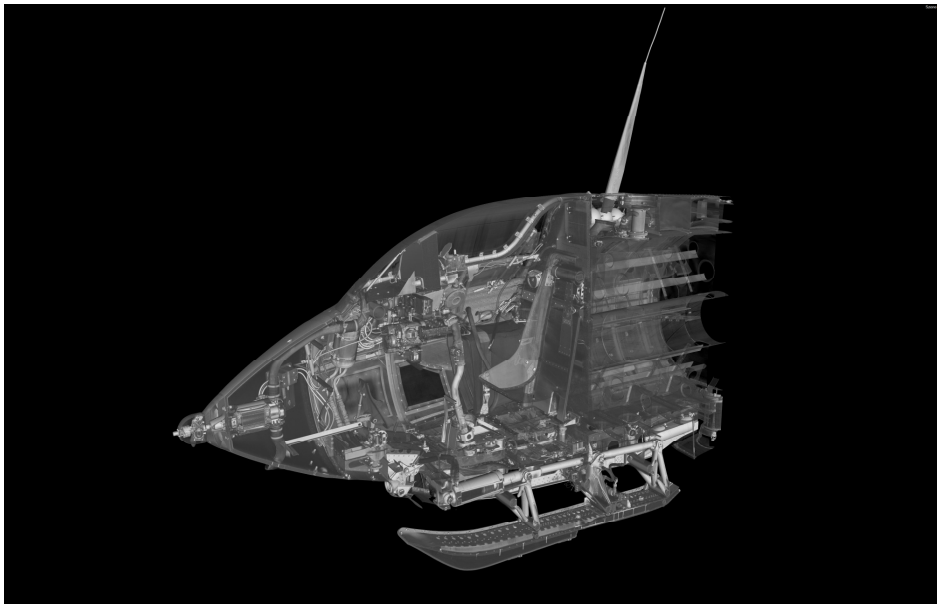
No. 392 MAY 2019

T.W.I.T.T. NEWSLETTER



"Abbildung (Picture): Fraunhofer IIS, EZRT/Deutsches Museum"
https://www.deutsches-museum.de/presse/presse-2019/me-163/#c137989
See page 2 for more information on this project.

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

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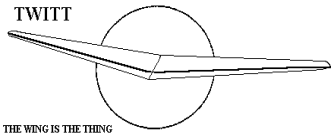

THE WING IS THE THING (T.W.I.T.T.)

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. 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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Wt/#Issues	FRG	AUSTRALIA	AFRICA
1oz/1	1.75	1.75	1.00
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Gatherings are held on the third Saturday of every odd numbered month, 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

My thanks to Reinhold Stadler for an unusual article and in getting permission to provide a sample image of a 3-D scan of the 163.

We also had some Nurflugel material this month on propulsion systems that could be used by flying wings.

The last part of this issue is the continuation of Al Bowers' induced drag slides. If nothing else comes in I think I can finish the slides next month.

My apologies for skipping last months' issue but my lower back troubles made it hard to sit at a computer terminal for any amount of time. It s getting better but still has some healing to go.

Andy

LETTERS TO THE EDITOR

Dear Andy,

This news may be of interest to the flying-wing and tailless community. The Deutsches Museum in Munich, Germany, got their Me 163B scanned!

The Museum has published this news, which includes first pictures. I have added one of them, and asked for permission to publish it in the TWITT newsletter. This was granted, but they ask that you add as reference "Abbildung (Picture): Fraunhofer IIS, EZRT/Deutsches Museum" together with the link to the news (the published information is in German language):

https://www.deutsches-museum.de/presse/presse-2019/me-163/#c137989

The scan was performed by the "Fraunhofer-Entwicklungszentrum Röntgentechnik (EZRT)" of the Fraunhofer IIS institute in Fürth, close to Nuremberg, Germany, in their XXL-CT-facility. The institute together with the museum has published a short and very interesting video on YouTube.

Data will now be analyzed and will be available to public in 2020, when the aerospace collection of the Deutsches Museum in Munich will be reopened.

The picture that I included is a first outcome of the scan activity, showing the front section, but the whole aircraft was scanned. I think, this is the first time that an aircraft is investigated this way. Alone the first picture shows technical details, that were not accessible up to now and help to understand the technical layout and variant of this aircraft. A new tool available for scientific investigation...

The Deutsches Museum in Munich has set a milestone in technical and historical research.

With kind regards

Reinhold Stadler

Nurflugel Threads

I found this interesting. Do you?
Regards. Salut +
Jose Gros-Aymerich
E-28033 Madrid, Spain

Thrust Component-Lift in Tractor Aircraft

The problems found with the Boeing 737 Max has made most pilots aware there can be a significant thrust component of lift acting at the engine attachment. This lifting occurs in all tractor engine aircraft. The amount of lifting depends on the particular engine mounting. However, even the small trainer aircraft have some lift occurring at the engine attachment.

To determine if your aircraft acts as a tractor mounted engine versus a pusher engine, just trim in level flight to hands-off. If the engine is a tractor, the nose will rise with added thrust and reduced thrust will allow the nose to go down. If the engine is pusher, the nose will go down with increased thrust and rise with decreased thrust.

I have seen no explanation published for this lifting but want everyone to know for over 15 years I have been arguing for it to be added to basic flight training. For anyone interested in what is happening and how it can even cause stall, I have my complimentary e-book in which I explain how to maneuver an aircraft by taking advantage of knowing how this thrust component-lift works.

Taking advantage of thrust component-lift makes flight control so easy, I have flown complete flights from start of taxi to landing roundout without touching the control wheel. For your complimentary e-copy, just respond to bob@safe-flight.net.

Best Regards

Bob Reser

There are actually a number of factors involved, some of which involve the tractor/pusher question, but some of which do not.

With regard to propeller driven aircraft, a prop does act like a little combined vertical+horizontal fixed surface, and its effect on stability and flight trim depends on whether it is ahead of or behind the C/G. Note, it is not a matter of tractor/pusher, you could have a tractor prop mounted behind the C/G. Like a stab and fin mounted on the nose, a prop ahead of the C/G is destabilizing in both pitch and yaw, while behind the C/G it increases static stability in pitch and yaw.

The duct of a high-bypass turbofan has some straightening effects that tend to reduce this effect. However, the duct itself acts like a flying surface, and could in fact end up with more of this effect than the effects of the rotating fan (which is a large propeller) itself.

Note, the above is an effect on STABILITY, and it is influenced by RPM, but it is NOT a function of power setting. By itself it is not increased or decreased directly by the amount of power.

I suspect what you are noting is not the result of tractor or pusher, but rather is a matter of whether the thrust line is above or below the C/G. Regardless of where along the length of the airplane the propulsor (jet, propeller, rocket, a set of oars, or whatever) is mounted, if the thrust line is below the C/G, adding power will tend to raise the nose and reducing power will have a nose-down effect. This is well known and is often covered in flight training. This effect is quite pronounced on the Boeing 737, with its low-mounted engines. When cutting power in the landing flair, increasing amounts of "up" elevator are required as the throttle is reduced, just to hold the pitch attitude constant. Failure to do this would result in a very hard landing! Note, this is the result of thrust, not lift.

Likewise, a thrust line above the C/G (such as the pylon-mounted engine on a Lake Amphibian) has a nose-down effect when you add power. On the Lake, adding power too quickly, with insufficient airspeed during a water takeoff could drive the nose under the water, even with full up elevator. It also limits how much more power can be installed in that aircraft, and the size of the propeller. Raising the pylon to allow for a larger prop diameter to efficiently absorb the increased power from a bigger engine raises the thrust line, increasing the nose-down effect. Note, on the Lake they do have the horizontal tail mounted high, in line with the propeller, so the increased prop wash on the tail with increased power does help mitigate this effect, but it does not eliminate it.

Changing the thrust line angle can help this, if the engine is sufficiently ahead of or behind the C/G, so you can make the thrust line pass through the vertical location of the C/G. However, on planes like the Boeing or the Lake, where the power plant is nearly on the lengthwise location of the C/G, there is no practical thrust line angle that can achieve this. Planes like that are pretty much stuck with the trim change effects of power, unless they can get help from secondary effects such as the effect of propwash on the tail. I did exactly that on a radio-controlled model of the Curtiss-Wright CW-1 "Junior" I designed. Mounting the motor with a +4 degree thrust line angle caused the prop wash to hit the horizontal tail from above, creating a nose-up effect that almost completely cancelled out the nose-down effects of the high-mounted motor. The net effects of power increase on pitch trim in that model were almost negligible.

Don Stackhouse

There's also thrust line in relation to the center of drag. That would usually amplify how thrust doesn't line up with CG. Eg., a twin with the left engine out has a thrust line that doesn't line up with CG, or with the drag of everything to its left.

Eg. 2, A Corsair has its CG a bit below its thrust line, somewhere between the mass of its big engine and those extra low wings. But the drag at low speeds is lower yet, vertically close to wingtip level and their vortex drag. So for both reasons, on suddenly applying power at low speeds I'd expect its nose to drop.

Amphioxus-Philip

Ducted fans, even more effective than classic props, lacks though need of energy, difficult installation and are pretty noisy. Look at some videos.

czech B10 Mitchell with ducted fan:
https://www.youtube.com/watch?v=3_iSNO3QC10

czech LSA replica of L-39 - UL 39 Albi:
https://www.youtube.com/watch?v=swB3TDBpNOY
https://www.youtube.com/watch?v=-XZa4mmWFXo

russian PJ-II Dreamer
https://www.youtube.com/watch?v=DbCjncm1-0M

Jeri

I believe ducted-fans are more effective at slower speeds. And, as speed increases the propeller overcomes the ducted-fan efficiency. Good example is in the guy who put one on a Long-EZ. He finally gave up after several years, and switched to a prop driven. I forget his name, but you can look it up on the Homebuilders Forum. Also, take a look at this site:
http://www.rotaryeng.net/Examples2.html

Regards,

Norm Parmley

After several steps of development, I may be about to crack the code on the propulsion issue.

After all, I can't afford two jet engines.

But I think I can still pack two stacked fans in parallel tubes in a way that would work well enough for flight.

That said, I'm wanting to put this unit, such as it is, in a Wing. What comes to mind immediately is the Horten, of course.

But what would be far more marketable, leaving the aero debate out of it, would be a scale B-2.

An Experimental Homebuilt B-2. Scaled down, of course. Looks like it would lend itself to 2 or more seats more easily than the Horten.

So what I'm looking for is some input. I can get most of the lofting and surfaces and just scale them. But I'm being told that scaling is not especially accurate. In fact, I've been told I'd be ahead to take it from clean sheet. Okay, I've been told many things.

But these opinions are from people that haven't actually BUILT much of anything. Nor are they exactly 'wing people' or aerodynamicists.

I don't see the big problem with a scaled size, but I'd like to know what you folks think.

Larry S.

Dear Larry: If you built a scaled down B-2 how would you power it? Providing enough thrust to carry the wing structure and two people would require quite a bit more thrust than two Dyanajet ramjets. You could look at a Williams turbojet as those are pretty small...just sayin..

Rich Nunn

There is a "fighter" project on the Russian EAA site REAA.RU. It looked interesting using ducted fans. I would suggest looking at using Mazda rotary engines. They give a lot of power for a small package. Plus, there are several projects out there using them in a ducted fan fashion

Good luck with the project.

Regards,

Norm Parmley

Rather than completely disclose what I think are clever adaptations about power plants and vanes, just allow me the thought that maybe this will work when I scale the power plant up and the airframe down.

My 2000 lbs of thrust, while not huge, is respectable in the homebuilt sized fleet. So that's my design point for thrust. (2 X 1000).

If you're saying that's not enough thrust, then sure, I'm back to the drawing board. But I'm not going to buy jets..

Larry S.

Dear Larry..That sounds ambitious using just fans..speaking of fans, how much thrust does a Cessna 150 or 172 have at say 2000RPM? If that sized aircraft carrying two people does well with that particular engine/prop combination, you might have a bunch of overkill with a ton of thrust. I don't believe that either of those two aircraft have anything even close to that. Just saying.. Thanks,

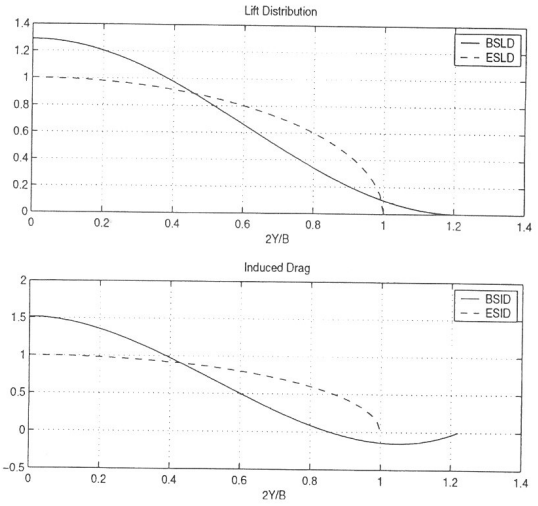
Rich Nunn

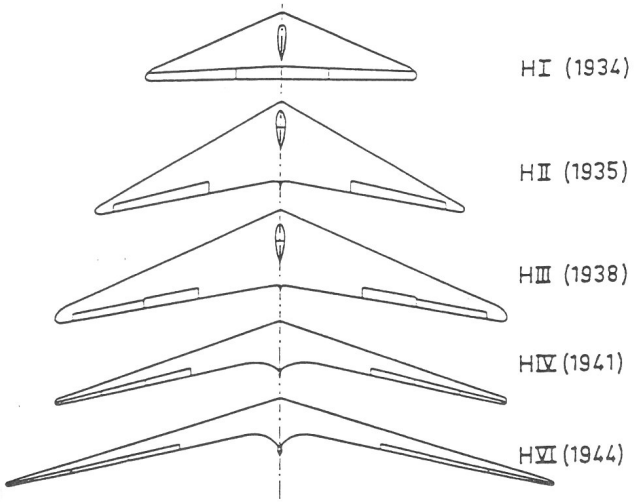
2 seat light planes might have about 3-400lbs of thrust with a fixed pitch prop unless it's a STOL setup. 2000lbs is a huge number.

Btw, fans don't have to be that loud. Just as it is with model size fans, some are loud and some are very quiet.

Steve Clasen

Horten Applies Prandtl's Theory

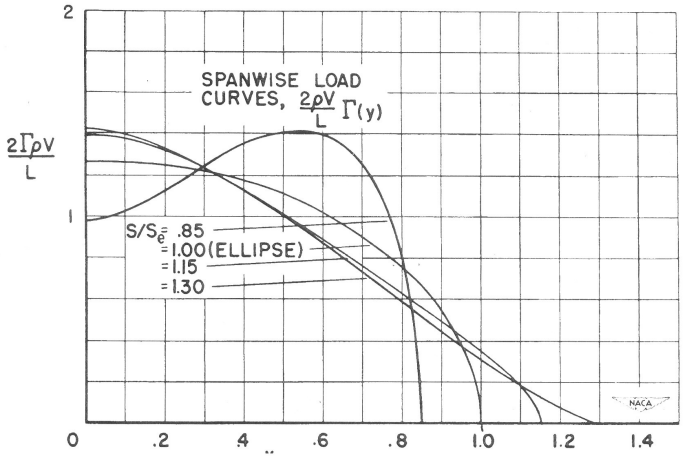




Horten Sailplanes

- Horten Spanload (1940-1955)
  induced thrust at tips
  wing root bending moment

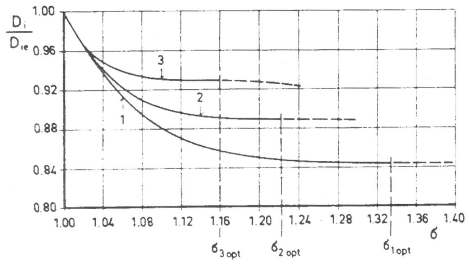
Jones Spanload



- Minimize induced drag (1950)
  Constrain wing root bending moment
  30% increase in span with 17% decrease in induced drag

- "Hence, for a minimum induced drag with a given total lift and a given bending moment the downwash must show a linear variation along the span." $y = bx + c$

Klein and Viswanathan

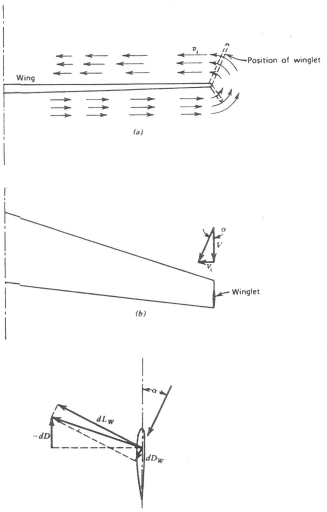


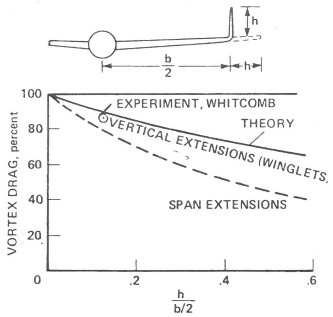
- Minimize induced drag (1975)
  Constrain bending moment
  Constrain shear stress
  16% increase in span with 7% decrease in induced drag

- "Hence the required downwash-distribution is parabolic."
  $y = ax^2 + bx + c$

Winglets

- Richard Whitcomb's Winglets
  - induced thrust on wingtips
  - induced drag decrease is about half of the span "extension"
  - reduced wing root bending stress





AVAILABLE PLANS & REFERENCE MATERIAL

VIDEOS AND AUDIO TAPES

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

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 Robert Hoey's presentation on November 20, 1999, covering his group's experimentation with radio controlled bird models being used to explore the control and performance parameters of birds. Tape comes with a complete set of the overhead slides used in the presentation.

Cost : $10.00 postage paid in US
$15.00 foreign orders

FLYING WING SALES

BLUEPRINTS – Available for the Mitchell Wing Model U-2 Superwing Experimental motor glider and the B-10 Ultralight motor glider. These two aircraft were designed by Don Mitchell and are considered by many to be the finest flying wing airplanes available. The complete drawings, which include instructions, constructions photos and a flight manual cost $140, postage paid. Add $15 for foreign shipping.

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