Plarg's Canard Aviator Notes

## -Gear Up Landing:

-------- Original Message --------

Subject: [c-a] Re: COZY: Deadly 180 after takeoff

Date: Mon, 17 Sep 2012 11:38:17 -0400

From: Richard Hughes <richardhughes260@gmail.com>

To: canard-aviators@yahoogroups.com, cozy\_builders@googlegroups.com

With a big aluminum horse shoe, there is no damage on a gear up. This was an intentional gear retraction after landing at RR with 3 people in a Cozy III to stop after a brake failure. http://youtu.be/Q0v29\_2bRu0

## -GRT HXr:

-------- Original Message --------

Subject: [c-a] GRT HXr 10.4

Date: Tue, 2 Oct 2012 17:29:27 -0500

From: Matt Kwiatkowski <matt@kwiatkowski.com>

To: canard-aviators@yahoogroups.com

...any feedback on this PFD unit? I was a planning a Dynon install till I saw the "complete" package price including engine probes for 7K. Full synthetic horizon, all Primary flight and engine instruments, GPS and options to expand to autopilot (just add servos) ads b options etc. but a 7K entry point for a comprehensive day night VFR+ engine package seems to good to be true. ...

http://www.grtavionics.com/Default.aspx?id=66

Matt Kwiatkowski N213MK Long EZ

-------- Original Message --------

Subject: Re: [c-a] GRT HXr 10.4

Date: Tue, 2 Oct 2012 18:02:52 -0500

From: <berkut13@berkut13.com>

To: <canard-aviators@yahoogroups.com>, "Matt Kwiatkowski" <matt@kwiatkowski.com>

A RV-7A buddy next door just upgraded his HX to the HXr and it’s OUTSTANDING! He’s running a dual AHRS, one HX and one HXr screen. Flying IFR with it now. Great stuff!

James Berkut/Race 13

## -GUMPS:

-Charlie McDougal Feb 2012: G= Gear Down, U= Undercarriage Down, M= Make SURE the Landing Gear is Down, P = Put the ### $$$$ Gear Down!, S = See? The gear is Down!!!!!

-Thomas Mann Feb 2012: Gas, Undercarriage, Mixture, Prop, Safety (i.e. seatbelts, etc.).

## -GW vs. Takeoff Distance:

-------- Original Message -------- Subject: Re: [c-a] How gross weight and take off distance are calculated

Date: Wed, 25 Apr 2012 07:55:53 -0600

From: Burrall L Sanders <craftsman@freeflightcomposites.com>

To: canard-aviators <canard-aviators@yahoogroups.com>, Randel Livingood <randel.livingood@yahoo.com>

...Congratulations ... acquiring... Cozy.  Alex and his Cozy III ...important ... canard community ... long time.  ...

If I remember correctly, Alex operated from a dry lake bed.  Not many have done that.  ...

...  performance can be adequately calculated.   ...should be derived from real world testing.  ...predictions by talking to someone with a Long eze equipped and of equal weight as your Cozy.  ... get you close if they have properly and thoroughly tested their Long-Eze.  The CozyIII if built to plans has the same wings, canard and landing gear as a Long.

 Burrall [www.freeflightcomposites.com](http://www.freeflightcomposites.com)

-------- Original Message -------- Subject: Re: [c-a] How gross weight and take off distance are calculated

Date: Wed, 25 Apr 2012 07:35:55 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: Burrall L Sanders <craftsman@freeflightcomposites.com>

CC: canard-aviators <canard-aviators@yahoogroups.com>, Randel Livingood <randel.livingood@yahoo.com>

...might want to put yourself and the plane thru the AC 90-89A process including a fresh weight and balance. ...good outline for first flight in an experimental aircraft. .... omit some of the tests in your case, but ... good introduction to the airplane and ... boat load of confidence knowing what the climb rates, takeoff/landing distance and stall speeds at various weight & balance are.

...Tim Andres

-------- Original Message -------- Subject: Re: [c-a] How gross weight and take off distance are calculated

Date: Wed, 25 Apr 2012 07:49:51 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Tim Andres wrote:  
> Im thinking you might want to put yourself and the plane thru the AC 90-89A process including a fresh weight and balance...  
  
... best freaking advice for someone new to a homebuilt aircraft that I've ever heard. There are a few written  
guidelines for canards out there (one really good one put together by Terry Yake, IIRC), but actually going through at least an abbreviated Phase I period set of testing is terrific advice.  
  
...takeoff distances, Burrall is absolutely correct, you need to determine that experimentally - you won't calculate it accurately from first principles. ... CAN calculate it, ....experimentally verify ... for accuracy. ...CG will have a large effect on takeoff distance - as much as weight, in my experience with a COZY.  
  
With respect to MGW - the builder sets that when certificating the aircraft. If Alex certificated it at 1600 lb (and I don't know what Nat recommended for an O-320 COZY III) then that's what you're restricted to unless you put it back in Phase I and test to a higher MGW. If you're asking where the 1600 came from, remember that the  
Long-EZ was designed as a 5G aircraft at 1325 lb (IIRC), and the COZY III is effectively a Long-EZ from a structural standpoint. If you fly at 1600 lb., that makes the aircraft a 4.2G aircraft (not quite Utility category level, but more than Normal category). But that's only a rule of thumb, and there may be other parts of the aircraft (Landing gear, in particular) that may not be up to the challenge of the higher MGW.  
Marc J. Zeitlin

-------- Original Message -------- Subject: [c-a] Re: How gross weight and take off distance are calculated

Date: Fri, 27 Apr 2012 01:51:04 -0000

From: ezburton <ezburton@me.com>

To: canard-aviators@yahoogroups.com

...You should absolutely go weigh your plane before you start testing and you will see why... There are several factors to takeoff and landing performance which are gross weight and power related.

   1) Acceleration Distance

   2) Vstall in Ground Effect

   3) Vstall in Free Air

   4) Stopping Distance

..acceleration distance ... factors: Aerodynamic Drag, rolling friction and Thrust.  Only the rolling friction is a function of the gross weight... the Drag and Thrust are functions of speed and density... but have the same profile every time for a given plane & technique.  So the only variable (that you can control) which affects the takeoff distance is the weight for two reasons; the rolling friction (mu x Weight) and the speed at w hich you have to which you have to accelerate in order to takeoff (which affects the drag and thrust).

The takeoff speed is based on the free-air 1G stall speed + some margin.  I say the free air stall speed because you have to be able to climb out of ground effect without stalling.  If you have ever tried to pull a plane off the ground at heavy weight and have it settle you know why...  So you first have to establish the idle power stall speed in the takeoff configuration (NLG down & SB retracted).  The stall speed may be extrapolated from any known speed & weight to any other weight by multiplying the original stall speed by the square root of the weight ratio;  Vstall = Vstall old x sqrt (Wnew/Wold) for a 1 G straight ahead stall.  A margin of 1.2 to 1.3 Vs would be a good lift off speed target (don't forget that the stall speed increases at 1/cos(Bank Angle), so 1.2 only gives you about a 30 degree bank angle ).

Lastly, the brake energy (kinetic energy) is given by; KE = 0.5mV^2.  So your stopping distance is going to increase at the square of the velocity for a given weight.  So if you reject the takeoff at the rotation, your balanced field length is going to dramatically increase due to the higher speed & weight - a double gotcha. One other thing you might consider is the climb out.  That is approximately ROC = TAS  x (Thrust - Drag ) / Weight.  Or essentially, excess thrust divided by weight.  You can't do much about the excess thrust... it is what it is.  But seeing that you are in Colorado, this may be more of a factor for you as a 10% increase in weight results in a 10% decrease in rate of climb.

I think it is important to also consider the off-field landing for the higher gross weights and density altitudes, as the survivability may be decreased (again the kinetic energy is increasing at the square of the stall speed...  KE = 0.5mV^2).  So even if you land at stall speed, you and the plane will have absorb much more energy.

For landing, it is typical to have a landing speed of at least 1.3 Vstall (in the landing configuration) to provide the minimum margin for banking, gusts, etc.

Here are some real world numbers from my plane.....

I have recently completed Phase 1 Testing of my baggage pods, and in the process I increased the maximum gross weight by 100 lbs.  For my Long EZ (O-320, 150 HP, Catto 3 Blade and heavy duty Cleveland brakes) at 1750 Lbs and standard day sea level, my nose off speed was 63 KIAS and my lift off speed was 75 KIAS.  Take off distance was 1800' +/- 100',  with 100' to 200' additional for obstacle clearance.  Landing distance was 1700' with an approach speed of 75 KIAS on final.  With the pods on, it gets a little uncomfortable at max weight and 75 KIAS in gusty / xwind conditions and if the runway is long enough, I will pad by 5 Knots.

Coincidentally, the Rutan POH 1400 lb lines match my 1650 lbs (max gross weight without pods) performance with my engine / prop combination.

...db LGEZ N506DB

-------- Original Message -------- Subject: Re: [c-a] Re: How gross weight and take off distance are calculated

Date: Thu, 26 Apr 2012 19:31:08 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

ezburton wrote:  
> The acceleration distance has a couple of factors: Aerodynamic Drag, rolling friction and Thrust. Only the rolling friction is a function of the gross weight... the Drag and Thrust are functions of speed and density... but have the same profile every time for a given plane & technique. So the only variable (that you can control) which affects the takeoff distance is the weight for two reasons; the rolling friction (mu x Weight) and the speed at which you have to which you have to accelerate in order to takeoff (which  
 affects the drag and thrust).  
  
While all this is true, there's a missing third reason that weight is an issue. The thrust doesn't change with weight, but since F=ma, if F stays constant (thrust) and m goes up, then a goes down. In other  
words, you accelerate more slowly not only because the rolling friction is higher (which is actually a pretty small effect) but because you're accelerating more mass. A COZY MKIV at 1500 lb. will  
accelerate at approximately 0.25 G's, whereas at 2000 lb. it will accelerate at approximately 0.2 G's. Since D=1/2\*V^2/a, holding V constant (for rotation speed) a decrease of 20% in acceleration will  
result in a 25% increase in takeoff distance. Since the V has to increase with the higher weight as well (as stated above), the takeoff distance increases even more that this predicts.  
  
This is all a first order approximation, not considering drag during acceleration (and if you hold the elevator down prior to rotation, the drag can be not insubstantial).  
  
These are the major reasons for weight affecting takeoff distance, not the rolling friction.  
Marc J. Zeitlin

-------- Original Message -------- Subject: [c-a] Re: How gross weight and take off distance are calculated

Date: Fri, 27 Apr 2012 22:59:35 -0000

From: ezburton <ezburton@me.com>

To: canard-aviators@yahoogroups.com

Marc,  
  
F in your equation is not thrust, it is the net thrust and it isn't constant with speed.  
  
The way I was thinking of this is;  
  
Sum Longitudinal Forces = F = Drag + Thrust + Rolling Friction = m x a  
  
Since the thrust and drag are the same for a given speed & density altitude as you progress down the runway, the only thing that is weight dependent is the rolling friction term. The acceleration is actually the result, not the input. Of course the acceleration is slower due to the higher mass (just divide the mass to the other side of the equation and a 10% increase in weight yields a 10% decrease in acceleration).  
  
Having to drive out to a higher V LOF (1.2 Vs) combined with the slower acceleration is what ultimately increases the takeoff distance. Next time I will carry the derivation slightly further.  
  
And I do think that the rolling friction is substantial at the high weight... pushing my airplane around at this weight takes a noticeable extra effort (and not just to overcome static friction). Make sure you have properly inflated tires, or its a real bear and will affect the distance.  
  
I do agree that technique is important and one of the bigger benefits I have found is to point the nose off the centerline to avoid having to use brakes to counter the torque at the low speeds. Once above 20 kts on a no xwind day the rudder effectiveness is sufficient to maintain heading - aircraft with non-hidden rudder bellhorns I understand have even more authority.   
  
The other problem in technique is that once the nose is off the ground, you may have to hold some nose down stick to not let the plane takeoff until the rotate speed. This caused me to crow-hop down the runway (increasing the distance) instead of a clean lift off. Still perfecting that one.  
  
db  
BTW, 0.2Gs is a lot of acceleration. I calculate less than 1400' distance at your 2000 lbs.... you must have a lot of HP. I only get like .15G at 1750 lbs. I suspect that the acceleration is not constant, which is (I think) what this equation assumes.

-------- Original Message -------- Subject: Re: [c-a] Re: How gross weight and take off distance are calculated

Date: Sat, 28 Apr 2012 07:54:38 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

ezburton wrote:  
> Since the thrust and drag are the same for a given speed& density altitude as you progress down the runway, the only thing that is weight dependent is the rolling friction term.  
  
Well, except for the "m" itself, yes :-).  
  
> ... The acceleration is actually the result, not the input.  
  
Agreed.  
  
> ... Of course the acceleration is slower due to the higher mass (just divide the mass to the other side of the equation and a 10% increase in weight yields a 10% decrease in acceleration).  
  
Bingo - that's all I was getting at. You didn't mention the inertia issue in your first message, so I wanted to bring it up. I believe that this, along with CG position, are the largest two factors in takeoff distance at a specific DA.  
  
> Having to drive out to a higher V LOF (1.2 Vs) combined with the slower acceleration is what ultimately increases the takeoff distance.  
  
Agreed 100%.  
  
> And I do think that the rolling friction is substantial at the high weight... pushing my airplane around at this weight takes a noticeable extra effort (and not just to overcome static friction). Make sure you have properly inflated tires, or its a real bear and will affect the distance.  
  
While certainly true that it takes MORE effort to push the plane around, even at 2000 lb. weights, I think that we're talking maybe 40-50 lb. on flat ground to get the plane to move, and once it's moving maybe a bit less. So that would be less than 20% of the total thrust provided when starting the takeoff roll. At first, all the thrust goes into acceleration, then as speed increases, into overcoming drag as well.  
  
> ... aircraft with non-hidden rudder bellhorns I understand have even more authority.  
  
Not if the hidden belhorn installation is done correctly to get full rudder motion as prescribed in the plans.  
  
> The other problem in technique is that once the nose is off the ground, you may have to hold some nose down stick to not let the plane takeoff until the rotate speed.  
  
Don't raise until you reach takeoff (rotation) speed. The aircraft creates a lot more drag when at a positive AOA (induced drag), so will accelerate more slowly when the nose is off the ground than it will  
when the nosewheel is still rolling.  
  
> BTW, 0.2Gs is a lot of acceleration. I calculate less than 1400' distance at your 2000 lbs.... you must have a lot of HP. I only get like .15G at 1750 lbs. I suspect that the acceleration is not constant, which is (I think) what this equation assumes.  
  
I was using 0.2G as an example of the calculation methodology, and based it on a gross estimate of static thrust. You're correct that it's not constant and probably lower than that - the point of the exercise was the fact that more mass lowers acceleration values, not what the exact values are. The 0.15G average that you posit is probably closer to the true average value, I agree.  
  
I think we're in about 95% agreement here - maybe just some issues about the exact magnitude of the rolling resistance (which would be relatively easy to measure with a fish scale [for BIG fish]).  
Marc J. Zeitlin

## -Gyro Repair:

-------- Original Message --------

Subject: Re: [c-a] Rebuilding a VSI

Date: Sun, 19 Aug 2012 18:43:48 -0400 (EDT)

From: trcsmith <TRCSmith@aol.com>

To: ezcopilot@fairpoint.net, canard-aviators@yahoogroups.com

Try The gyro house "TGH" at the Auburn CA airport "KAUN" http://www.tghaviation.com/aboutus.asp

Tom Smith A&P Long-EZ N12TS Cell-707-592-0869 KVCB KJ6PZN

## -Headsets:

-------- Original Message --------

Subject: [c-a] Re: What type of head set?

Date: Mon, 20 Aug 2012 01:33:14 -0000

From: punkertfc <mr.jadkowski@gmail.com>

To: canard-aviators@yahoogroups.com

...encourage ... modifying a headset with C.E.P.s (http://www.cep-usa.com/current/id40.htm). .... years on my helmet when flying helicopters ... installed ... kits (a CEP900-K04A) into my David Clarks .... only solution I've ever seen that brought the noise level down into my comfort zone while flying helicopters with the doors off, and is quieter and clearer than any ANR headset I've ever tried.

... C.E.P.s are a set of earplugs with small speakers that plug into a jack that you install in your headset or helmet. ... noise attenuation of wearing ear plugs under your headset ... very clear intercom and radio. ... radio volumes can be turned way down ...

...Alek

-------- Original Message --------

Subject: Re: [c-a] What type of head set?

Date: Sun, 19 Aug 2012 20:20:00 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

... worked for a year for Bose on the older Series X headsets, ... buy the very best attenuating headsets you can, no matter how loud your particular airplane is (...they're all WAY too loud). ANR is almost always better than passive, and some of the in-ear headsets are as good as the ANR headsets. ... everyone's head and ears are different, ... all good headset MFG's will give you a 30 day try-out period. Take advantage .. get 2 or 3 of what you think will work and fly with them all. Keep the one that's the quietest and most comfortable for you and return the others. ...Protect your hearing.

-------- Original Message --------

Subject: Re: [c-a] What type of head set?

Date: Tue, 21 Aug 2012 09:49:13 -0400

From: Nick Ugolini <unick3@gmail.com>

To: Jay Foss <jdfoss@live.ca>

CC: Canard group <canard-aviators@yahoogroups.com>, COZY Mailing List <cozy\_builders@googlegroups.com>

On Sun, Aug 19, 2012 at 1:18 PM, Jay Foss <jdfoss@live.ca ... best type of active noise headsets is the Bose A20 with blue tooth ....best for noise cancellation and low frequency response ... music in flight. ... as good as any home stereo headset.

... passive systems, ... can handle ear plugs (a lot of people can't), then the Clarity Aloft is the best.

... like the passive systems, but find them too expensive for what you are buying. ... You can make your own Clarity Aloft style headset if you check out my website or google for "Cupless headset". ...the ultimate in quiet flying..... I am now using a combination of both technologies ... I love it. I use the Shure earbuds which physically block noise but still allow you to hear ATC and terrific music and then I use the Bose A20 over them for the active noise reduction over the ear and the mic functionality.

...active noise reduction makes my ears feel like they have pressure on them...

Nick Ugolini

-------- Original Message --------

Subject: Re: [c-a] What type of head set?

Date: Tue, 21 Aug 2012 09:10:35 -0500

From: <berkut13@berkut13.com>

To: <canard-aviators@yahoogroups.com>, "Cozy List" <cozy\_builders@googlegroups.com>

... bit odd with the new Bose ... music input is ONLY via direct wire, no Bluetooth. The BT wireless connection is only good for making phone calls. No such restriction with the Lightspeed Zulus – BT for calls or music. ...Both do a fine job with the noise, but BT music from the iPhone is great.

-James Berkut/Race13

-------- Original Message --------

Subject: Re: COZY: Re: [c-a] What type of head set?

Date: Tue, 21 Aug 2012 07:34:25 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

... everyone's head and ears are different and react slightly differently to each set of headsets. Maybe there's a tiny air leak around your ears, maybe it's just the way the Bose put pressure on your head, maybe the earbuds actually relieve some pressure - we found a LOT of variability in reaction to headsets when testing. Maybe the

earbuds do a good job of cancelling out the frequencies that you're particularly sensitive to, that the ANR cannot cancel.

ANR works only in low frequencies - generally best at 200 Hz or lower. ...because the wavelength is longer, and the spacial displacement between your eardrum and the microphone in the earcup (since the mike can't be ON your eardrum) is less meaningful. At higher frequencies, the displacement causes the phase cancellation to

be less accurate....

...Marc J. Zeitlin

## -Headset Jacks:

-------- Original Message --------

Subject: Re: [c-a] Mic and Phone Jacks Location(s)

Date: Thu, 7 Jun 2012 11:24:42 -0500

From: <berkut13@berkut13.com>

To: Canard Aviators <canard-aviators@yahoogroups.com>, Mike Scovel <ezdriver@sbcglobal.net>

http://www.berkut13.com/interior/intior28.jpg ...old pic during construction ...location has worked well over the years. Same in the back.



-------- Original Message --------

Subject: [c-a] Re: Mic and Phone Jacks Location(s)

Date: Thu, 07 Jun 2012 11:53:18 -0600

From: Steve Stearns <steve@tomasara.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Mike Scovel said:

> I'm thinking in Pilots head rest. If so how did you run the wires? Pics would be deeply appreciated.

Mike, I have them on the right side of the pilots head rest in my LongEz. The only downside of which I'm aware is that they are annoyingly in the way when I use a mirror to read the fuel sight gauge

on the right side. If they were mounted on a different angle instead of normal to the side of the head rest (which I might do later...), it would be less of a problem.

My wires run from inside the head rest, through the top of the seat into the right strake. While in the strake compartment they move forward and are aluminum taped to the ceiling of the compartment. I have a conduit that runs just below the longeron from the strake forward through the panel and the wires run through it. The mic signal wires run in one shielded cable and the earphone signal wires run in a separate cable (which is also shielded but for no real purpose). From my perspective, it's best not to run the Mic and corresponding earphone signal wires together in the same cable...

Steve Stearns

-------- Original Message --------

Subject: Re: [c-a] Mic and Phone Jacks Location(s)

Date: Thu, 07 Jun 2012 15:18:40 -0400

From: Ken Miller <kenezmiller@optonline.net>

To: Mike Scovel <ezdriver@sbcglobal.net>, Canard Aviators <canard-aviators@yahoogroups.com>

\*You want to install them where the wires won't be all over you. I mounted the front ones in the headrest on the right side down low. I also used helicopter headsets because they use a coiled cord. For the backseater, I put the jacks at the very back of the right armrest near the spar facing upward. This way the cords go behind your head and not forward.\*

\*\*

\*Ken\*

## -High DA Operations:

-------- Original Message --------

Subject: [c-a] Safe High Density Altitude Takeoff Procedures

Date: Sun, 15 Jul 2012 17:30:28 -0700 (PDT)

From: FlyingTiger <flyingtiger05@yahoo.com>

Reply-To: FlyingTiger <flyingtiger05@yahoo.com>

To: Al Wick <alwick@juno.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

...last 26 years flying out of high altitude airports ... home base of Truckee, CA ... 5900' ... seek a good mountain flying course before flying into these altitudes and I don't mean purchasing a video from Sporty's. ... tips: 1. Depart early ... temperature swings of 60F are not uncommon ...

2. Don't fly at night in single engine aircraft...this country is extremely unfriendly to engine out night landings.

3. Be careful of your weight. Stay as light as possible if its hot...three stops with light fuel in the mountain country works better than one hole in the ground.

4. Lean the engine at engine start then lean it again at full runup just before departing.

5. If something doesn't feel right something is wrong...trust your intuition!

6. If for some reason your plans change due to mechanical problems forget about departing that day and plan for the next day. Stress on pilots flying in the mountains is a major killer.

7. Make sure your airspeed indicator is accurate and fly the same airspeeds on departure and arrival as you do at sea level (the ground speed will look different because the air is thinner but the airspeed over the wings is exactly the same...NEVER ADD A FEW KNOTS FOR SO CALLED SAFETY.

8. Check your brakes and keep them working at maximum efficiency...in canard aircraft drop the nose as a brake and have that on your Emergency Procedures Checklist....don't have one...YOU BETTER PRINT ONE AND USE IT.

9. Check winds on arrival and use the runway that favors the wind...many pilots are in their graves because the see a big long runway and favor that instead of the shorter one when the winds are clearly favoring the shorter runway...optical illusions are exaggerated in the mountains...it gets worse in high mountain deserts.

10. Fly the Airplane!

11. Fly the Airplane!

12. Fly the Airplane!

Tim LoDolce VEZE N26FM aka RACE62

-------- Original Message --------

Subject: [c-a] Re: Safe High Density Altitude Takeoff Procedures

Date: Mon, 16 Jul 2012 05:39:20 -0700

From: Al Wick <alwick@juno.com>

To: <canard-aviators@yahoogroups.com>

CC: cozylist <cozy\_builders@googlegroups.com>

...learned from Carl Denk. ... BEFORE you take off, you look at runway and find a landmark that represents mid point. If I don't achieve 52 mph by that point, ABORT,ABORT, ABORT! (52mph is 70% of takeoff speed on my plane). ... passenger, have them count the blue runway lights. These are placed at 200 ft intervals. This is a very accurate way to know when to abort. For example, your abort point might be two runway lights past that runway intersection. My takeoff spreadsheet tells you abort speed, number of runway lights, total runway needed. ... at your home field, pick the midpoint each flight. Glance at airspeed at that point. Make a decision to abort occasionally, pretending you didn't achieve 52mph. ... training ....

-Al Wick

## -Hoses:

-------- Original Message --------

Subject: [c-a] Hose Material Choice - Fuel and Oil

Date: Tue, 10 Jul 2012 07:33:57 -0700 (PDT)

From: Rock Braud <rnbraud@yahoo.com>

Reply-To: Rock Braud <rnbraud@yahoo.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>, Cozy List <cozy\_builders@googlegroups.com>

...asking the group for the conventional wisdom concerning fuel and oil line ...

... archives and ... websites ... what I have come to. ...both fuel and oil Stratoflex 111 hose with 300 series fittings. Since the hoses will be covered in firesleeve and will be firmly secured with Adel clamps I don't see the need for nice shiny SS braid. However, it seems from the images the Stratoflex 300 series are aluminum which are of concern to me. ...Stratoflex 111 and 300 series fittings are A-OK?

....crazy, go with Aeroquip Teflon hose and steel re-usable fittings and don't turn back?

...Although Teflon lined hoses seem to be the best choice, there seems to be some disagreement whether teflon is actually better than rubber. ...Rock N. Braud, II Cozy Builder - Rigging the Engine!!!

-------- Original Message --------

Subject: [c-a] Re: COZY: Hose Material Choice - Fuel and Oil

Date: Tue, 10 Jul 2012 07:58:23 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Rock Braud wrote:

> For both fuel and oil Stratoflex 111 hose with 300 series fittings.

Uggghhh.

> Since the hoses will be covered in firesleeve and will be firmly secured with Adel clamps I don't see the need for nice shiny SS braid.

The SS braid is not for "shinyness". The SS braid (on something like Aeroquip 666 hose) is there as a structural support for the teflon liner. The object is to have a hose that is impervious to the fuel or

oil running through it and will not deteriorate over time. Synthetic rubbers (as in the 111 hose) do deteriorate. The SS is a structural member of the hose, not an aesthetic one (unlike the fake SS braid

hoses used by some folks on cars to dress up their radiator lines without actually spending the big bucks for real SS/teflon hoses).

> Stratoflex 111 and 300 series fittings are A-OK?

OK? Sure, they're OK. But you'll be replacing them every few years and if \_I\_ had them, ***I'd always be concerned with the state of the rubber inside, which I wouldn't be able to see due to the firesleeve.***

> Are you crazy, go with Aeroquip Teflon hose and steel re-usable fittings and don't turn back?

Personally, I ***go with 666 hose, permanent fittings and integral silicone firesleeve. Looks great, lasts forever,*** obtained from a hose shop that pressure tests the lines before shipping them. Expensive as

hell - probably about $500 for an engine's worth of hoses for fuel and oil. But by the time you get through with all the fittings for the 111 hose and the firesleeving, you'll end up spending a couple hundred $$$. And standard firesleeve can absorb oil at the ends the integral silicone cannot.

> P.S. Although Teflon lined hoses seem to be the best choice, there seems to be some disagreement whether teflon is actually better than rubber. Any thoughts?

In what universe would there be disagreement as to whether teflon resists solvents and other liquids such as oil, fuel, and fuel additives (such as ethanol) better than synthetic rubber? The question isn't whether it's "better" - the question is only whether the "betterness" is worth the extra cost. To me, it is - to others it may not be.

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: Hose Material Choice - Fuel and Oil

Date: Tue, 10 Jul 2012 10:06:57 -0500

From: Ryszard <ryszardzadow@att.net>

To: <marc\_zeitlin@alum.mit.edu>, "cozylist" <cozy\_builders@googlegroups.com>, "canard" <canard-aviators@yahoogroups.com>

Summit Racing, JEGs, Earls or any of those places. Aeroquip TFE hose and fittings.

http://www.summitracing.com/search/?keyword=Teflon%20hose&dds=1

Ryszard

-------- Original Message --------

Subject: [c-a] Re: COZY: Hose Material Choice - Fuel and Oil

Date: Wed, 11 Jul 2012 19:20:28 +0000 (UTC)

From: Joe Person <ezejoe@comcast.net>

To: Rock Braud <rnbraud@yahoo.com>

CC: marc zeitlin <marc\_zeitlin@alum.mit.edu>, cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

...may or may not apply (depending on "newer technology" updated polymers, design features, etc.), but for many years, numerous manufacturers' (aerospace) service instructions have repeated the caution that Teflon hose assemblies should be re-installed in a manner such that any existing "set" in the hose (i.e. existing bends, etc.) not be altered upon re-installation, if said hose assembly has been in service for some time. Bends in the hose may take a set (due to environmental effects like heat, material "creep" that is intrinsic to many polymers under continuous load, etc.) such that bending a hose opposite to any set it has taken may increase likelihood of kinks, etc.

...Joe Person

-------- Original Message --------

Subject: [c-a] cool tools

Date: Fri, 14 Dec 2012 23:03:47 +0000

From: Bill Allen <billallensworld@gmail.com>

To: Canard Aviators <canard-aviators@yahoogroups.com>, Cozy Builders

<cozy\_builders@googlegroups.com>

...cool tool for anyone who has wrestled with aeroquip hoses;

http://www.hotrodhotline.com/koul-tools-available-3-different-kits

and see the demo on;

http://www.youtube.com/watch?v=VWUpCU0zWNk

Bill Allen LE N99BA FD51 CZ4 G-BYLZ EGBJ

## -HP vs. Thrust:

------- Original Message -------- Subject: Re: [c-a] HP versus Thrust

Date: Tue, 27 Mar 2012 06:45:14 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

A. Musa wrote:  
> If one was to replace a 160 HP engine on a Long-Ez with a turbofan  
> engine, what will be the thrust of the turbofan to get the same  
> (or approximate) performance numbers from the aircraft.(Forget fuel  
> consumption please)  
  
Depends on whether you're talking about trying to match takeoff performance or cruise performance. Piston/propeller engine/prop combinations lose thrust as the airspeed increases - maximum thrust is  
generally obtained either statically (for relatively low speed, non CS prop systems) or (for our canards) at about 30-40 mph IAS when the prop unstalls.  
  
Turbofans generate approximately constant thrust at a given altitude no matter what the IAS. If you match the takeoff thrust of the piston engine, you'll be WAY overthrust for cruise, and conversely, if you match the cruise thrust, you'll be underthrust for the takeoff condition (one reason why jets tend to have long takeoff rolls in comparison with similar weight prop planes).  
  
At any rate, a Long-EZ in cruise at 170 kts (~86 m/sec) at 8500 ft. at 75% power will require about 120 HP, or 90 kW. Assuming that the prop is about 80% efficient, that means that ~96 HP or 72 kW is actually producing thrust. Since thrust = power/velocity and we know the power and the velocity, we can calculate the thrust. This works out to ~190 lb (837 Nt). So that's the approximate cruise thrust (this should match up with a flat plate drag area of about 1.5 sq-ft or so, as a check).  
  
Takeoff thrust will probably be in the ~400 lb region - maybe higher, especially if you have a climb prop.  
  
So if you could find a turbofan with somewhere in the 300 lb. thrust range, that would be a reasonable compromise - you'd lose some takeoff performance but pick up cruise, especially up high. Of course,  
without mentioning the thing you didn't want to mention, your range goes to crap due to TSFC.  
...

Marc J. Zeitlin mailto:[marc\_zeitlin@alum.mit.edu](mailto:marc_zeitlin%40alum.mit.edu)

-------- Original Message -------- Subject: Re: [c-a] HP versus Thrust

Date: Tue, 27 Mar 2012 13:53:16 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Gianni Zuliani wrote:  
> If we talk of Long-Ez required THP vs. speed, you should check CP  
> 28, pag. 6 (Rutan's table). There you find that your estimate is a  
> bit pessimistic (about +20%)...  
  
Yeah, I was 1/2 asleep this morning when I wrote this. Gary Hertzler also pointed out some numerical inaccuracies. This table shows that I was underestimating the efficiency of the prop (as Gary pointed out -it's closer to 85% than 80%), and the power required is lower than I estimated at 8500 ft since IAS <> TAS.  
  
So if we recreate my #'s with a power required of 94 HP rather than 120 HP (since we're at 8500 ft, not SL) and 85% prop efficiency, then we'd get #'s for thrust produced from the resulting 80 HP at the prop  
of about 160 lb. in cruise. Static thrust from COZY MKIV's with cruise props has been measured at somewhere in the 450 - 500 lb. region, so that's where I got the ~400 lb, maybe 450 lb. static thrust  
from an O-320. A measurement would have to be done to be sure of the static thrust, since there's no drag/work being done against which to analyze. Thanks to Gary and Gianni for the corrections.  
Marc J. Zeitlin -------- Original Message -------- Subject: Re: [c-a] HP versus Thrust

Date: Wed, 28 Mar 2012 18:25:18 +0200

From: Gianni Zuliani <gz@comgz.com>

To: Canard-aviators <canard-aviators@yahoogroups.com>, Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

...If you want to calculate your output power and power required for level flight of your Ez type (including Cozy) you might want to try the attached spreadsheet. It works for my Stag-Ez because it is confirmed at each flight, like this one:

<http://www.youtube.com/watch?v=6yeRMm-BB_Y&feature=channel>

 Gianni Zuliani Long-Ez >> Stag-Ez >> Stag-EzR <http://www.comgz.com/stag-ez.htm>

-------- Original Message -------- Subject: [c-a] useful info

Date: Sat, 14 Apr 2012 19:56:30 +0100

From: Bill Allen <billallensworld@gmail.com>

To: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

... all info is in the archives, but sometimes it's useful just to have it again. While I was having a tidy up in my files, I came across this post from Gary Hertzler ...

"*I find that a much better way to determine % power is with the "rule of 48  
Take your rpm and divide by 100, add manifold pressure and compare this value with 48.*

*Each one point above or below 48 is worth 3.3% power above or below 75% power.*

*For an easy example 2400 rpm and 24" mp plugged into the formula gives 48 or 75% power  
(2400/100 + 24 = 48) .*

*I like to fly high and at a low power setting to conserve fuel. I typically see 2300 rpm and 16" mp which equals 39 (2300/100 + 16=39) . Subtracting that from 48 = 9.*

*9x3.3 = 30. (round figures)*

*And finally 75% - 30% = 45% power.*

*This is a rule of thumb calculation but something that you can do quite rapidly while setting up your cruise. I will also do this same thing during a cruise climb. Bykeeping my power setting below 75% I can lean aggressively and not be concerned about damaging my engine.*

*Give it a try. With today's fuel prices, a little conservativeflying can go a long way to savings on your fuel bill and also prolongs engine life."*

...

Bill Allen

-------- Original Message -------- Subject: [c-a] Re: COZY: useful info

Date: Sat, 14 Apr 2012 12:54:52 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Bill Allen wrote:  
> I find that a much better way to determine % power is with the  
> rule of 48. Take your rpm and divide by 100, add manifold pressure  
> and compare this value with 48.  
  
I first heard this "rule of thumb" a few years ago and ever since have been attempting to determine it's theoretical (or heuristic) derivation. Haven't been able to find anything. If anyone knows where it derives from, I'd be interested in hearing about it.  
  
I believe that this rule, first of all, would only apply to engines that make their maximum power at 2700 RPM (a small set, in the grand scheme of things). For a Lycoming O-360, at 2700 RPM and 29 in MAP (SL), you get about 100% HP. Well, that's about right. And at 8500 ft., with a MAP of ~21 in and RPM of 2600, you get about 71 - 72% power - that matches up well with what my engine monitor tells me. OK, so with 2700 RPM engines, this seems to work OK - close enough for government work, although I would like to know where it came from.  
  
With a Subaru engine in a COZY MKIV (think Keith Spreuer), cruise at 8500 ft. might be 4800 RPM at 21 in. MAP. Well, this formula isn't going to work worth a crap. Same with rotary engines that might turn slower than 2700 RPM max.  
  
At any rate, when promoting this "rule of thumb", we should just be careful to say that it's an approximation for aircraft engines that develop their maximum power at 2700 RPM.  
Marc J. Zeitlin

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Sun, 15 Apr 2012 07:04:17 +1000

From: Tony Rothwell <tony13rothwell@gmail.com>

To: Bill Allen <billallensworld@gmail.com>

CC: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

...On that rule of "48" I think the actual number varies with your engine - on the Mooney M20J I flew whilst building, the figure was 47 then apply the rule but on the IO-320-D1B in my Cozy, I think the 75% figure is around 46, varies a bit with altitude but it is a great rule once you have the starting number sorted out.  Not sure why this is but somebody who is a clever engines guru suggested it depends on the ratio of bore to stroke.

Would be great to have an explanation for it if anyone knows the underlying rationale????

Tony

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Sat, 14 Apr 2012 14:26:28 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Gianni Zuliani wrote:  
> can you explain how you factor density altitude in your rule?  
  
It doesn't, directly, and doesn't need to, because you're using MAP.  
  
> According to my O-320 power chart, with 24" and 2400 I get 120 Hp  
> (75%) at 1000 Ft. , but 127 Hp (79%) at 5000 Ft. (exceeding the  
> magic 75% "safety" threshold ..) and 137 Hp (86%) at 12000 Ft.  
  
Except that you can't get 24" at 12K ft. unless you've got a turbocharger. This formula only assumes MAP's that you can actually get. It's also a "rule of thumb" and is only close to the right number - it's NOT exact. But if it gets you within 5%, it's not doing too badly, especially if you don't have an engine monitor with a power map for your engine, or a fuel flow meter.  
  
Tony Rothwell writes:  
> Not sure why this is but somebody who is a clever engines guru  
> suggested it depends on the ratio of bore to stroke.  
  
Eh - extremely indirectly, in that the "squareness" of the engine affects the RPM's it will run at, but that's can't be the root derivation...  
  
There's got to be some relationship based on torque being linearly related to MAP within a reasonable RPM range, but for the life of me I can't derive it... Since power = torque x RPM, you'd think that MAP and RPM would be multiplied, not added, but...  
Marc J. Zeitlin -------- Original Message -------- Subject: Re: [c-a] useful info

Date: Sat, 14 Apr 2012 15:11:48 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: Bill Allen <billallensworld@gmail.com>

CC: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

14.9 X fuel flow works pretty good for LOP operation and, I believe standard 8.5 C/R. Jon Dembs and I stumbled across that one from Jon Deacons IIRC. It seems to pretty accurate. ...

Tim. andres

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: useful info

Date: Sat, 14 Apr 2012 16:35:40 -0700 (PDT)

From: Gary Hertzler <hertzler@yahoo.com>

Reply-To: Gary Hertzler <hertzler@yahoo.com>

To: Bill Allen <billallensworld@gmail.com>, "marc\_zeitlin@alum.mit.edu" <marc\_zeitlin@alum.mit.edu>

CC: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Unfortunately I can't help with the derivation of the "rule of 48".  This rule of thumb was passed along to me by an EZ flying buddy Jim Gabrick.  After checking it out with several of the naturally asperated horsepower-rpm-MP curves published by the aircraft engine manufactures, I found it to be reasonably accurate and therefore useful in determining safe leaning operation.  I'm sure that somewhere there is a good explaination.

For those of you that fly O320s here is a good chart to more accurately determine percent power and also fuel flow, but if you apply the "rule of 48" to these numbers you will find it to be accurate.  A quick check shows it to be within 3% power.  Not bad for a rule of thumb.

<http://www.reaa.ru/yabbfiles/Attachments/fuelcons.pdf>

Gary Hertzler Vari Eze N99VE

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: useful info

Date: Sun, 15 Apr 2012 14:44:53 +1000

From: Tony Rothwell <tony13rothwell@gmail.com>

To: Gary Hertzler <hertzler@yahoo.com>

CC: Bill Allen <billallensworld@gmail.com>, "marc\_zeitlin@alum.mit.edu" <marc\_zeitlin@alum.mit.edu>, cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Searching around on the web I found the Lycoming Owners Manual for all 320 Cu In engines at:

<http://www.7ts0.com/manuals/lycoming/320/O-320-IO-320-AIO-320-LIO-320_OM.pdf>

(And yes, so far as I know that IS the latest edition!!)

And for those with the 360 Cu In engine it is all here:  
           <http://www.7ts0.com/manuals/lycoming/360/O-360-HO-360-IO-360-AIO-360-HIO-360-TIO-360_OM.pdf>

Trying to read the rather poor quality graphs in the 320 manual I reckon that with ISA conditions at 5000 ft the 75% power magic number is as low as 46.2 for the O-320 B&D series at 5000 ft, and as high as 48.7 for the IO-320 A series at the maximum altitude at which you can get 75% which reportedly is 8200 feet for that engine.

So despite my earlier post, the 48 does appear pretty good for all the 320's.  Somebody else can do the work for the 360's.

Tony

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Sun, 15 Apr 2012 04:53:52 -0000

From: vjdslk <vjdslk@surewest.net>

To: canard-aviators@yahoogroups.com

This is from John Deakins......I always run LOP and the formula below matches up with my GRT "HP percentage" tables.....  
  
"When ROP, mass airflow determines HP, therefore %HP.  
%HP = 100 - (((Max RPM - RPM)/100)\*2.5+(Max Map-Map)\*3.5))/100  
  
"When LOP, fuel flow determines HP.  14.9 X FF = HP produced"

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Sun, 15 Apr 2012 11:57:46 +0200

From: Gianni Zuliani <gz@comgz.com>

To: Canard-aviators <canard-aviators@yahoogroups.com>

...using the original Lycoming power chart for O-320 (my engine), it's not difficult to find out that pressure altitude (or, better, density altitude) DOES matter in calculating horsepower.  
  
It matters to the extent of exceedind by 4% the 75% threshold, which was the common reference mentioned by Bill for no-worry aggressively leaning. In other words, if you use 2400x24" numbers at SL, you are a "prudent leaner" and you cannot harm your engine; if you keep the same numbers at 5 KFt. or beyond (which is possible with a good intake, no turbocharge) you should pay attention to be LOP on ALL your cyls. or you might harm those cyls running at peak temps.  
  
As far as my mentioning of keeping 24" MAP at 12KFt, that was at exclusive use of Bill, who is installing a turbonormalizer on his O-320 .. as everybody should know by now ;-). How is this project going, Bill?  
  
As far as deriving HP from fuel flow (when properly LOP), I'm glad that somebody else has confirmed: if you read liters/h multiply by 4 and if you read gallons/h multiply by 15. Much easier then exotic and complicated  
formulas ..if you have a fuel flow meter, of course, but this is a MUST nowadays if you fly in Europe.  
Gianni Zuliani

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: useful info

Date: Sun, 15 Apr 2012 07:03:08 -0400

From: Harley <harley@AgelessWings.com>

To: Tony Rothwell <tony13rothwell@gmail.com>

CC: Gary Hertzler <hertzler@yahoo.com>, Bill Allen <billallensworld@gmail.com>, "marc\_zeitlin@alum.mit.edu" <marc\_zeitlin@alum.mit.edu>, cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

...I don't have a 320, I backed up a page and found all the manuals I could ever use for my O-235. For a list of all the manuals they have in the Lycoming line, go here: [www.7ts0.com/manuals/lycoming/](http://www.7ts0.com/manuals/lycoming/) and choose your flavor.  
And for Continentals, go here: [www.7ts0.com/manuals/continental/](http://www.7ts0.com/manuals/continental/)  
The only other manuals I saw there were for the Piper PA28 and training courses and advisory circulars for aviation structures (Navy training...including ejection seats!)  
Harley

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Mon, 16 Apr 2012 13:46:14 +0200

From: Gianni Zuliani <gz@comgz.com>

To: Canard-aviators <canard-aviators@yahoogroups.com>, <marc\_zeitlin@alum.mit.edu>

...I think you won't be able to find a linear relationship between MAP and torque.

Consider that MAP results from the difference between atmospheric pressure (DA), eventually partialized with throttle, and a value which is proportional to RPM (pistons' movement produces suction), therefore inversely proportional to torque (at constant power).

Therefore torque is inversely proportional to (DA-MAP).

At the end, since power = torque x RPM x 6.28, you find that power is inversely proportional to (DA-MAP).

So, at constant RPM and DA, an increase in MAP produces higher HP.

At constant RPM and MAP, a decrease in DA also produces higher HP.

This is coherent with what I had previously stated, i.e. DA has to be factored for HP calculation, along with RPM and MAP ...

Gianni Zuliani

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Mon, 16 Apr 2012 07:40:53 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Gianni Zuliani wrote:  
> I think you won't be able to find a linear relationship between MAP and torque.  
  
And I think you think that I'm trying to defend this approximate "rule of 48" that kind of works for standard 2700 RPM max. aircraft engines. I'm not. I'm just trying to understand on what principles it may be   
based.  
  
> Consider that MAP results from the difference between atmospheric  
> pressure (DA), eventually partialized with throttle, and a value  
> which is proportional to RPM (pistons' movement produces suction),  
> therefore inversely proportional to torque (at constant power).  
  
That makes no sense. MAP and torque are proportional, not inversely proportional. If they were inversely proportional, torque would rise to infinity in a vacuum or at closed throttle. That has not been my (or anyone else's, including yours) experience. It would also mean that at full throttle, torque would be zero. Also not true.  
  
Since your premise is incorrect, the rest of the argument is also.  
  
At any rate, I based my comments on this paper: <http://eaa691.org/Tech%20Notes.html>  
  
Tech Note #5 - Calculating Aircraft Performance. At the bottom of page 2, it explicitly says that torque is proportional to MAP of a specific range of RPM, and shows a graph to that effect for a Continental A-65.  
  
With respect to your desire to bring DA into account, it's certainly a factor, since it affects the MAP, but for a GIVEN MAP, DA doesn't matter (at least to the extent of this "rule of 48"). If you've got a MAP of 21", then it doesn't matter if that's at 2000 ft. or 8000 ft. DA - the rule gives you APPROXIMATELY the right power estimation for a small subset of all engines.  
  
I don't like this rule, I don't understand this rule, and I'm not defending this rule - I'm just trying to understand it's derivation. It's fairly obvious that there are better and more accurate methods for determining power output from an engine, and fuel flow (if BSFC is known) is one of them. But this was brought up as a topic (something  
I'm beginning to regret greatly - thanks, Bill :-)), so I was trying to understand it.  
Marc J. Zeitlin -------- Original Message -------- Subject: Re: [Probable Spam] [c-a] Re: COZY: useful info

Date: Mon, 16 Apr 2012 08:07:31 -0700

From: Keith Spreuer <keith@airstarts.com>

To: marc\_zeitlin@alum.mit.edu,cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

At 12:54 PM 4/14/2012, Marc J. Zeitlin wrote:

With a Subaru engine in a COZY MKIV (think Keith Spreuer), cruise at  
8500 ft. might be 4800 RPM at 21 in. MAP. Well, this formula isn't  
going to work worth a crap. Same with rotary engines that might turn  
slower than 2700 RPM max.

But I due use a formula derived in the same manor. My peak power is at 5300 rpm and peak MAP is of course 30 (29.92 normally aspirated) so I take my actual RPM \* actual MAP an divide by 5300\*30 and that is % power.   
  
That being said, it does not account for mixture or timing. Non optimum mixture could change this No?  
Keith

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Mon, 16 Apr 2012 18:52:42 +0200

From: Gianni Zuliani <gz@comgz.com>

To: Canard-aviators <canard-aviators@yahoogroups.com>

Maybe I was not able to explain myself clearly, but I doubt. I never meant to say that torque is inversely proportional to MAP: that would be foolish. What was written clearly in my post, go back and read it again. If you are lazy, I'll report here again:

*Therefore torque is inversely proportional to (DA-MAP).*

*At the end, since power = torque x RPM x 6.28, you find that power is inversely proportional to (DA-MAP).*

where DA is atmospheric pressure. Is that so difficult to understand?

So, how do you justify your somehow offensive way of presenting my contribution? 1/2 asleep this morning?

I presented a theory which, for those who care to consider and check w/o prejudice, is confirmed by my (or anyone else's, including yours) experience. It actually means that at full throttle, torque and power are at maximum because it's when MAP is high and difference (DA - MAP) is minimum.

Or, when throttle is closed and you read low MAP, then (DA - MAP) is high and power is low.

I' d consider offensive to anybody's intelligence to insist in further clarifications ..

I just want to add that this is my way of correlating Power with RPM and MAP for our engines: I may be wrong, but someone has to show me why, possibly in a scientific way.

Finally, dear Marc, I expect your apologies for your misunderstanding/misrepresenting.

Gianni Zuliani

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Mon, 16 Apr 2012 10:14:49 -0700

From: Keith Spreuer <keith@airstarts.com>

To: Gianni Zuliani <gz@comgz.com>, Canard-aviators <canard-aviators@yahoogroups.com>

This sound mostly to be a language issue Gianni. DA stands for Density Altitude NOT atmospheric pressure. MAP of course is Manifold pressure. It is not clear to me what (DA-MAP) means. Since you say DA is atmospheric pressure then this the difference between free air pressure and MAP. So for instance at idle on a std day I would have atmospheric pressure of 29.92 and a MAP of something very low say 10". So the difference would be 19.92 and at full throttle it would be near zero So yeah that would be inversely proportional but I have no earthly idea why you would want to relate power to that difference. It's very difficult to have a technical discussion when terms and language are not the same.  
Keith

-------- Original Message -------- Subject: Re: [c-a] useful info

Date: Mon, 16 Apr 2012 10:16:22 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Gianni Zuliani wrote:  
  
> Maybe I was not able to explain myself clearly, but I doubt. I  
> never meant to say that torque is inversely proportional to MAP:  
> that would be foolish.  
  
I agree.  
  
> What was written clearly in my post, go back and read it again. If  
> you are lazy, I'll report here again: /Therefore torque is  
> inversely proportional to (DA-MAP)./  
  
Nice editing. In the previous sentence, you state:  
  
"Consider that MAP results from the difference between atmospheric pressure (DA), eventually partialized with throttle, and a value which is proportional to RPM (pistons' movement produces suction), therefore inversely proportional to torque (at constant power)."  
  
This clearly implies that you believe that MAP is inversely proportional to torque. I'm glad that you do not actually believe this.  
  
I'm not going to argue with you about this - if you can't see that the formula is for a give MAP, regardless of DA, I can't help you. Obviously it's not perfectly accurate - that's why it's called a "rule of thumb", not "the answer".  
  
> Finally, dear Marc, I expect your apologies for your  
> misunderstanding/misrepresenting.  
  
I am sorry that you cannot understand the point I am trying to make about this stupid "rule of 48".  
Marc J. Zeitlin -------- Original Message -------- Subject: Re: [c-a] useful info

Date: Tue, 17 Apr 2012 14:32:41 +0200

From: Gianni Zuliani <gz@comgz.com>

To: Canard-aviators <canard-aviators@yahoogroups.com>

I have digged out Deakin's article I was referring to: this author is well respected, the subject is not thoretical philosophy and his verbage is pretty simple, but I might have misunderstood, Keith .. please let me know, in case:

<http://www.avweb.com/news/pelican/182081-1.html>

Just for clarification to someone who still might care to follow this discussion:

A - After I first asked Bill Allen how could density altitude be factored in "rule 48", I dropped and forgot that topic, having a better way to figure out my power output instantly, via fuel consumption ... and assuming my engine is healthy. B - The contribution I then wanted to offer meant to be a suggestion to someone who seemed to struggle to find a mathematical relationship between torque and manifold pressure.

C - Given that we don't have a torque meter on our panels, it would be useful to relate torque to MAP. So I proposed a formula that seemed coherent with above Deakin's writing, normal experience and available power charts, within a limited MAP range. D - The proposed formulation was misunderstood and badly dismissed by someone who didn't care to read my post correctly; moreover, having used symbol DA for atmospheric pressure generated some confusion in someone .. my fault, apologies.

Anyway, the story of my experimental and innovative formulation ends here: I believe that, although reasonable, it is difficult to handle and valid only in a narrow range of values. Maybe it was because in the past week I was relegated at home and my experimental pulsions were otherwise frustrated.

Gianni Zuliani

## -IFR Rating:

**-Christial von Delius May 2012:** ASA books of questions had EVERY question and answer.

**-Robert Swarner May 2012:** I used [Sheppardair.com](http://Sheppardair.com/) **.**

## -iPAD / Tablets:

-Tim Andres Feb 2012: Foreflight's display of VFR sectionals is a little sharper than WingX. (Foreflight) seamlessly transitions to TAC when zoomed into an area that has one, it seems easier to navigate and costs $25 less (than Wing X). WingX displays your position on airport diagrams so you can clearly see exactly which taxiway you are on (included in the basic subscription). ....The WingX terrain feature is (beneficial). The (WingX) flight planning page nicely incorporates the winds aloft into your plan, allowing you to see which altitude is best and allowing easy selection of East/West/VFR/IFR altitudes, and I find I can get to the in flight info I need like runway length or comm freqs from WingX a little easier than from the EFIS, Garmin, or FF. Runways are displayed with extended center lines and RWY headings. The split screen option is handy for displaying a sectional on one side and maybe and airport diagram or approach plate on the other.

I have found I go to WingX more often than FF after using both. Graphic display of TFRs for example are now on both aps.

I'm using the "Dual" Bluetooth GPS with the Ipad and that has worked perfectly so far, except you can't use both aps at the same time, one or the other must be turned off as it will only link with one at a time.

As for inflight readability of the IPad, it could be brighter and is not as easy to read as the 430 or the GRT equipment. But with otter box iPad case folded up so the pad is facing me while on my knees it's very readable, no problem. -------- Original Message --------

Subject: Re: [c-a] iPad apps and GPS

Date: Wed, 13 Jun 2012 17:20:39 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: Slick Ric <bkut540builder@yahoo.com>

CC: canard-aviators <canard-aviators@yahoogroups.com>

We are using Wing X and Dual GPS. Great combination. AOPA has a great free app: AOPA FlyQ FltPlan.com is a good app for flight planning. Also FlightAware. If you fly IFR, 10-15 minutes after filing your IFR flight plan, you can see on FlightAware the route ATC will give you. So you are prepared if there are changes in the routing from what you filed originally.

-------- Original Message --------

Subject: Re: [c-a] iPad apps and GPS

Date: Wed, 13 Jun 2012 15:46:58 -0700

From: Henry Hallam <henry@pericynthion.org>

To: krwalsh@alum.mit.edu

CC: canard-aviators@yahoogroups.com

I use SkyCharts Pro - $20 one time, free updates. And, though I don't particularly recommend this for everyone, I rooted my iPad and use "BTStack GPS", allowing me to use my Android cellphone as the GPS source: http://www.addictivetips.com/mobile/how-to-share-gps-from-an-android-phone-to-an-ipad-guide/

-------- Original Message --------

Subject: Re: [c-a] iPad apps and GPS

Date: Thu, 14 Jun 2012 00:01:50 -0600

From: Christian von Delius <alpineglobalprivate@gmail.com>

To: Richard Hughes <richardhughes260@gmail.com>, Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

...I use Avilution Maps on my Motorola Xoom 32gb with built in GPS-TOTALLY awesome and the best.

I flew from San Diego to Kalispell, Montana (home) 1750 miles in my VariEze. Works SO awesome. The Garmin GPSMap 275 is useless next to my Xoom with Maps. We were over Visalia, CA with a 5k thick haze and you could see the ground somewhat, but there was no way to see the airport much less locate it and it was a snap to find with Avilution. And flying under low ceilings, finding airports with direct mode, and just getting airport info when arriving it works great. And the built in GPS works fine with the canopy. It worked in a Piper Warrior too. And I have it on my Motorola Droid X phone for backup and it works great too.

-------- Original Message --------

Subject: Re: [c-a] iPad apps and GPS

Date: Thu, 14 Jun 2012 07:06:39 -0400

From: Len Morris <lenemorris@gmail.com>

Reply-To: lenemorris@gmail.com

To: Slick Ric <bkut540builder@yahoo.com>

CC: canard-aviators <canard-aviators@yahoogroups.com>

...I have 150 hours navigating soley by iPad, a Dual GPS and Foreflight. ...I had a little trouble when it got down to 20 Degrees F with the Dual GPS unit. It will shut down in colder temps I put it under my hat or on my chest for a while to warm it up, then it would work again.

-------- Original Message --------

Subject: Re: [c-a] iPad apps and GPS

Date: Fri, 15 Jun 2012 18:02:41 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: schreiner <schreiner@cytherean.org>

CC: lenemorris@gmail.com <lenemorris@gmail.com>, Slick Ric <bkut540builder@yahoo.com>, canard-aviators <canard-aviators@yahoogroups.com>

...been using weathermeister ...Love it. Everything you need for flight planning including a terrain profile, comprehensive WX, Sat images and route fuel prices via AirNav all in one place.

-------- Original Message --------

Subject: Re: [c-a] Re: Fwd: RE: Anywhere Map aircraft icons

Date: Tue, 19 Jun 2012 17:40:32 -0700

From: Al Wick <alwick@juno.com>

To: Canard Aviator <canard-aviators@yahoogroups.com>

...had a guy recently describe how Anywhere saved his butt. Lost engine power, was able to use glide circle info to make safe decision.

-------- Original Message --------

Subject: Re: [c-a] Re: Fwd: RE: Anywhere Map aircraft icons

Date: Wed, 20 Jun 2012 13:26:18 +0000

From: Chris Barber <CBarber@TexasAttorney.net>

To: Christian von Delius <alpineglobalprivate@gmail.com>

CC: Jim Evans <jevansez@gmail.com>, Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

I haves really liked Anywhere Map over the years on an IPaq ...and a net book. The new version for IPad & Android, "Freedom" was NOT ready for prime time when released at S&F. However, they have steadily improved it over the last few months. The fonts are too small to easily read on the IPhone and you can't change the font, but is great on the IPad. Yes, the Cones of Safety are a favorite feature.

-------- Original Message --------

Subject: Re: [c-a] iPad apps and GPS

Date: Fri, 15 Jun 2012 18:02:41 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: schreiner <schreiner@cytherean.org>

CC: lenemorris@gmail.com <lenemorris@gmail.com>, Slick Ric <bkut540builder@yahoo.com>, canard-aviators <canard-aviators@yahoogroups.com>

I've been using weathermeister for a few months. Love it. Everything you need for flight planning including a terrain profile, comprehensive WX, Sat images and route fuel prices via AirNav all in one place. Tim Andres

-------- Original Message --------

Subject: [c-a] Warning, Out-of-date WingXPro7 TFR boundry depictions

Date: Wed, 27 Jun 2012 11:14:36 -0600

From: to tu <totucomm@gmail.com>

To: canard-aviators@yahoogroups.com, cozy\_builders@googlegroups.com

While checking on a local TFR with WingX Pro 7, ...wasn't matching what was showing on the FAA's Graphical TFR website (which also says isn't to be relied on as the final authority, you're to call 800-wx-brief). I got WingX to match the FAA website by doing Tools -> Download Databases and then let it run for Weather, Airport, AOPA and Document databases. ...WingX auto-update functionality won't always be as timely ...

-------- Original Message --------

Subject: [c-a] PIREP: iPad 3, Dual GPS, Foreflight Pro, Otterbox cover

Date: Sat, 30 Jun 2012 15:23:06 -0700 (PDT)

From: Slick Ric <bkut540builder@yahoo.com>

Reply-To: Slick Ric <bkut540builder@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

... iPad 3 is incredible. The screen resolution is astonishingly clear ...Could it be brighter? Yes.

...problem? No. ...will not get 8 hours of battery life with the app locked on and screen at

full brightness. More like 5 hours. Dual GPS. Amazing piece of technology for $99.95. ...actually picked up enough satellites to get a position fix from the basement! I always had a lock on at least 10 satellites during my flying with it.

http://www.amazon.com/Electronics-XGPS150A-Universal-Bluetooth-Receiver/dp/B006M49G80/ref=sr\_1\_2?s=electronics&ie=UTF8&qid=1341094669&sr=1-2&keywords=dual+gps

Or: \*http://preview.tinyurl.com/82ehhgk\*

Foreflight Pro. Not a steep learning curve to use. ...also downloaded the owners manual ...reference material ... can do your flight planning from the maps page and file and brief via email. ...Conformation and briefing was received via email within a minute or two. ...can rubberband your flight plan to include other waypoints on the fly. Airports page has everything on it, frequencies, runways, approaches, hours of operation, etc. AFD material .... Foreflight Pro offers Geo-referenced approach plates ...display the 100LL prices. Fuel prices are color coded from green (least expensive) to red (most expensive) this proved to save us some $$$ on our trip. Just 26 NM from Columbia fuel was $4.99 a gallon instead of $6.19 at O22.

Otterbox Defender cover ...black one for $49.95 ...colored $89.95. ...ABS plastic cover with silicone rubber backing and a third snap on cover ...front cover doubles as a stand ...2 different angles http://www.amazon.com/OtterBox-Defender-Series-iPad-Generation/dp/B007IV7KRU/ref=sr\_1\_11?s=electronics&ie=UTF8&qid=1341094827&sr=1-11&keywords=otterbox+defender

Or: \*http://tinyurl.com/7m3kfp2\*

\*I am never going to use a paper chart again.\*

Ric Lee Sandy, Utah

-------- Original Message --------

Subject: Re: [c-a] IPAD

Date: Fri, 6 Jul 2012 18:34:45 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com

...On a recent Fly-in to Sun River Oregon, ...at altitude apparently with very hot air, more than one -3 overheated and quit. ...friend, .. same thing in a -2 noticed extreme heat but no shut down. ...

Rich

In a message dated 7/6/2012 8:39:30 P.M. Pacific Daylight Time, schreiner@cytherean.org writes: The ipad shutdown issue at high ambient temperatures has been seen with ipad 1 and 2s as well. Marine H-1 pilots use them, but it is known to not leave them sitting in a hot cockpit during the day.

RJ Schreiner Long EZ N24ND

-------- Original Message --------

Subject: Re: [c-a] IPAD

Date: Sat, 7 Jul 2012 10:14:55 -0400 (EDT)

From: Regrot@aol.com

To: schreiner@cytherean.org

CC: canard-aviators@yahoogroups.com

...been told that 95 F is the magical number.. Above that and IPADs will shut down.. I had a shutdown coming out of Mojave, CA on a 100 day. ...approximately 4500 ft did it come on line.. ...Nothing is more disconcerting than losing your "charts" with no paper backup.. ...had my HP PDA with Anywheremap that kept on ticking..

Torger T. Long-EZ 606TT Fullerton, CA.

-------- Original Message --------

Subject: RE: [c-a] IPAD

Date: Tue, 10 Jul 2012 17:25:25 -0700

From: Dick Rohaly <n528dr@ca.rr.com>

To: <ARGOLDMAN@aol.com>, <canard-aviators@yahoogroups.com>

...my -3 drop out during a flight using Foreflight. ...Foreflight support group ...said to keep it out of direct sunlight and out of a case. ...allow heat to dissipate, ...Lesson learned: don’t rely on only that one form of navigation. ...expensive anti-glare film. ...definite improvement in reading the screen during daylight flying as long as it was kept away from direct sunlight. ...seemed to interfere with my wet compass. ...

Dick Rohaly

-------- Original Message --------

Subject: [c-a] Re: Pads and more questions

Date: Tue, 21 Aug 2012 13:22:52 -0400

From: Alek Jadkowski <mr.jadkowski@gmail.com>

To: canard-aviators@yahoogroups.com

I have used just about every piece of moving map software available for Android ... finally settled on AnywhereMap. .... I prefer AnywhereMap because it has a vector map, and an obstacle database (handy in a helicopter). .... working hard on development and are often releasing new features. ...runner up was Naviator, which I think is the easiest to use in the cockpit because of it's split screen format, ... hasn't been any development on it for a while and it lacks a lot of features I'd like to see. None of the software has ADS-B or XM weather support, but they are all "close" ....

... form factor goes, I'm using a Samsung Tab 8.9 ... as large as I'd want to go for kneeboard .... 16/32 gb of onboard memory goes a long way when you're loading the thing up with plates and charts. Some of the software out there won't use a micro SD card...

Alek

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: Glide ratio - was: Ballistic rescue parachute

Date: Thu, 13 Sep 2012 14:21:48 -0500

From: Thomas Mann <tmann@n200lz.com>

To: Robert Hall <oceanartscasino@yahoo.com>, Bulent Aliev <bulent.enginegear@gmail.com>, <GREILICH@aol.com>

CC: <kdcameron37@aol.com>, <Keith@airstarts.com>, <mike.lafleur@sbcglobal.net>, <canard-aviators@yahoogroups.com>

IxNay on the Samsung Galaxy. If you are going Android, get the ASUS Transformer Infinity. Twice as bright.

-------- Original Message --------

Subject: [c-a] Dual coming out with ADS-B receiver

Date: Sun, 4 Nov 2012 08:41:44 -0800 (PST)

From: Slick Ric <bkut540builder@yahoo.com>

Reply-To: Slick Ric <bkut540builder@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

...new product coming out from Dual. http://xgps170.dualav.com/

Ric Lee

-------- Original Message --------

Subject: Re: [c-a] Mini iPad

Date: Tue, 6 Nov 2012 17:06:12 -0500

From: Nick <unick3@yahoo.com>

To: canard-aviators@yahoogroups.com

...I used flight programs extensively while flying around the country and each has its advantages. These are the major differences I found:

Flight Plans.

Foreflight: is best for pre-filing flight plans. You can set the exact time of filing and the system will send it to DUATS when you tell it to.

WingX: You can pre file, but it is very limited. Pre-file is only allowed for fixed time such as 1,2, 4 hrs, etc. You can enter a "time" but then I called support he didnt know exactly what "time" it meant on their own program... Z, local, local with daylight saving? When I suggested changes, that would make it easier to use, like rotary wheels which is the standard for IOS or displaying the whole flight plan for review prior to filing (instead of snippets of the plan), he told me "we dont want to look like Fo reflight". WTF, do whats best for the customer to make it work for them.

Weather,

Foreflight is best for pre-flight weather planing. The maps are better, has built in fuel pricing, show the weather better, etc

Saved flight plans

Foreflight much easier to see, review, recall and understand.

Approach plates

I liked Foreflight better as they seem a bit clear

File Size

WingX has a smaller foot print on the ipad (less memory) and the downloads of approach plates and airport data is smaller.

Flight planning

WingX (it has the ability to follow airways). You put the starting point, end point and it will add all the VORs on the route. The flight planning is easier on WingX, but saving them and recalling them sucks (saved flight plans). Planning for days in the future and saving your work to recall in the future is easier with Foreflight.

Connecting to ADB-B receivers

Definitely WingX which which follows the industry protocal standard. Foreflight wants to to you to buy their proprietary receiver.

Overall,

I DO WingX for lots of little things like split screen, the "radar altimeter" feature, having the AIM, E6B calculator, etc as pdf's, . It seems that WingX is more ...advanced... then Foreflight, but with the lack of attention for flight planning, flight savings, filing and weather, Foreflight is more polished and useful in this area.

Which do I use?

Presently I use Foreflight. I am hoping that WingX improves a few critical and important areas which is important to me before I go wholly move over to WingX. I WISH I could use WingX exclusively, but weather and filing are too important to me at this poin t to give up Foreflight. Eventually, I will move over to WingX, but not now....

Nick Ugolini

-------- Original Message --------

Subject: RE: [c-a] Nexus 7 vs 10

Date: Sat, 24 Nov 2012 15:55:30 +0000

From: Thomas Mann <tmann@n200lz.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>, mnmcouillard <mnmcouillard@yahoo.com>

If you are looking for a tablet to run your moving map software using Android, I would spend the extra bucks and get the Asus Infinity 700 tablet. It has the IPS+ display which is twice as bright as the Nexus and 50% Brighter than the new iPad.

T Mann

-------- Original Message --------

Subject: Re: [c-a] Nexus 7 vs 10

Date: Sat, 24 Nov 2012 14:56:11 -1000 (HST)

From: Bruce Hughes <ezcopilot@fairpoint.net>

Reply-To: ezcopilot@fairpoint.net

To: mnmcouillard <mnmcouillard@yahoo.com>

CC: canard-aviators@yahoogroups.com

... tried to use a 10" ipad. ... size and difficulties with Apple and BestBuy turned me off. ForeFlight was very nice to return my $. I have a 7" Samsung Galaxy II with AnywhereMap. ... 8GB but I added 32GB more as a plugin. ... "settings" has a control over ... set the "cut-off" time. ...30 min is the maximum you can get. Not good. ... AnywhereMap is fairly good but ... impression that the computer guys that wrote it were never in an airplane when the engine coughed or failed. If you are not THOROUGHLY familiar with the tablet, you will lose 3000' before you can get a good idea of the best place to land. Not good. I still have not learned to set up a flight plan with 2 or more waypoints. ... could be simpler. ...background color ...strange compared to a sectional ... lot of settings I don't use. Don't have a VOR for example. Don't need airways. I have to pick it up to really read it but younger eyes may do OK. Bruce Hughes

## -Impossible Turn:

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: Deadly 180 after takeoff

Date: Mon, 17 Sep 2012 16:51:27 -0500

From: Thomas Mann <tmann@n200lz.com>

To: <canard-aviators@yahoogroups.com>

...link for the “Impossible Turn” Training video.

http://www.aopa.org/training/articles/2011/110519impossible\_turn\_practice.html?WT.mc\_id=110520epilot&WT.mc\_sect=tts

...

-------- Original Message --------

Subject: RE: [c-a] Re: COZY: Deadly 180 after takeoff

Date: Mon, 17 Sep 2012 19:40:46 -0400

From: Ken <kenezmiller@optonline.net>

To: 'Nick U' <unick3@gmail.com>, 'Canard Aviators' <canard-aviators@yahoogroups.com>, 'Cozy Builders' <cozy\_builders@googlegroups.com>

... landing gear is there to do two basic things: Make the airplane controllable on the ground and protect the fuselage from damage.

... extensive testing on emergency scenarios ...My conclusions are as follows (Nomex suit on):

As soon as I rotated and positive rate of climb was established, I retracted the nose gear. The sooner the better. I stayed in ground effect for a couple of seconds to build energy as the gear retracted. During this time, I made a slight turn right or left a few degrees depending on the traffic pattern. As I climbed out, I used maximum angle climb, not maximum rate. This gave me the optimum altitude as soon as possible. The reason for turning is to give me a lesser turn angle back to the runway.

Now. Here is the kicker. Maximum altitude as soon as possible can be a double edged sword. If you have an engine out at low altitude like you experienced and you turned back too abruptly, you would have overflown the airport completely. Some luck and some skill apply. One needs to learn how to trade altitude for energy or vice versa. And do it repeatedly.

Having said all that, here is my opinion on what happened with your engine out, and what could have happened:

You landed gear up and stopped short of the end of the runway by 200 feet. Had you put your gear down, you would have rolled off the end of the runway and the result could have (would have) been worse or much worse. There is no way you could have used brakes to stop in the distance you had after touchdown with the nose gear down. Count your luck stars that you did retract your gear and didn’t try to lower it. You had some good luck there, Nick. You had some fuselage damage, but lived to fly another day. Your EZ took good care of you..

Ken Miller

------- Original Message --------

Subject: re: [c-a] Re: Deadly 180 after takeoff

Date: Tue, 18 Sep 2012 14:40:51 -0400

From: Thomas Mann <tmann@n200lz.com>

Reply-To: tmann@n200lz.com

To: canard-aviators <canard-aviators@yahoogroups.com>

Does anyone remember the demo Dick Rutan did with the Long-EZ where he shut down the engine when he crossed the numbers, did a 360 and landed on the same runway?

## -Instructors:

-John Fisher: Possible for signoff ... dual-configured (full dual controls)Long EZ (SoCal)--Santa Ynez. Eric Cobb did the work.

- Tom Staggs: EZs with rudder pedals in back –used to do TPS instruction

-Victor Taylor CFII--CFII that has flown and instructed in canards over 26 years

-------- Original Message --------

Subject: [c-a] Canard instructors

Date: Thu, 13 Dec 2012 13:40:19 -0800 (PST)

From: Slick Ric <bkut540builder@yahoo.com>

Reply-To: Slick Ric <bkut540builder@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

EAA has published a list of Letter of Deviation Authority (LODA) here: http://www.eaa.org/govt/loda.asp

Not a single canard approved instructor is listed.....

Ric Lee

-------- Original Message --------

Subject: [c-a] Re: Canard instructors

Date: Fri, 14 Dec 2012 12:39:54 -0700

From: Steve Stearns <steve@tomasara.com>

To: ezcopilot@fairpoint.net, "canard-aviators@yahoogroups.com"

<canard-aviators@yahoogroups.com>

...to have appropriate insurance coverage for you, the aircraft and the instructor you have to do the wrong checkout. I.e. go through Velocity school or some other similar ...Then you are still not checked out in your longEz. ...insurance companies... less than helpful ...

However, as has been pointed out on this forum before (by Ryzsard IIRC) the only checkout procedure approved by the aircraft designer and one-time plans provider is that which is documented in the manual. I followed it (no shortcuts) without any problems. I recommend the same. The gist is back-seat time (thanks Ion) and being current in two dissimilar aircraft (my T-cart and a Cherokee 180) and then, step-by-step, moving toward first flight in your own aircraft.

...Steve Stearns Boulder/Longmont, Colorado

## -Instrument Panel

-14CFR Part 23, FAA Advisory Circular (AC) 23-1311-1B



Code of Federal Regulations

Sec. 23.1321



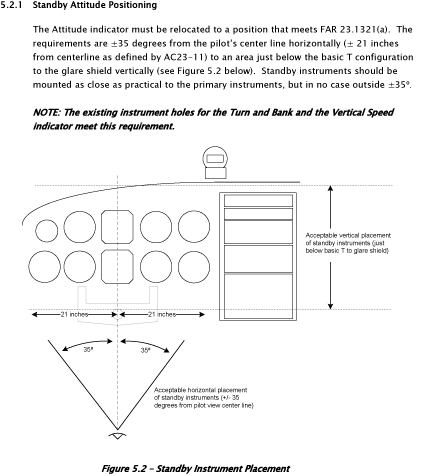
Sec. 23.1321

|  |  |
| --- | --- |
| Part 23 AIRWORTHINESS STANDARDS: NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES | |
| Subpart F--Equipment | Instruments: Installation |

Sec. 23.1321  
  
Arrangement and visibility.  
  
(a) Each flight, navigation, and powerplant instrument for use by any required pilot during takeoff, initial climb, final approach, and landing must be located so that any pilot seated at the controls can monitor the airplane's flight path and these instruments with minimum head and eye movement. The powerplant instruments for these flight conditions are those needed to set power within powerplant limitations.  
(b) For each multiengine airplane, identical powerplant instruments must be located so as to prevent confusion as to which engine each instrument relates.  
(c) Instrument panel vibration may not damage, or impair the accuracy of, any instrument.  
[(d) For each airplane, the flight instruments required by Sec. 23.1303, and, as applicable, by the operating rules of this chapter, must be grouped on the instrument panel and centered as nearly as practicable about the vertical plane of each required pilot's forward vision. In addition:]  
(1) The instrument that most effectively indicates the attitude must be on the panel in the top center position;  
(2) The instrument that most effectively indicates airspeed must be adjacent to and directly to the left of the instrument in the top center position;  
(3) The instrument that most effectively indicates altitude must be adjacent to and directly to the right of the instrument in the top center position; and  
(4) The instrument that most effectively indicates direction of flight, other than the magnetic direction indicator required by Sec. 23.1303(c), must be adjacent to and directly below the instrument in the top center position; and  
(5) Electronic display indicators may be used for compliance with paragraphs (d)(1) through (d)(4) of this section when such displays comply with requirements in Sec. 23.1311.  
(e) If a visual indicator is provided to indicate malfunction of an instrument, it must be effective under all probable cockpit lighting conditions.  
  
Amdt. 23-49, Eff. 03/11/96

-Douglas Olson Dec 2011: For backups I found this definition:

 FAR 23.1311 (a)(5) requires that independent secondary instruments be installed for Attitude, Airspeed, Magnetic direction indicator (whisky compass is OK). These must be within the pilots center field of view (see fig 5.2 below). In most cases the existing instruments can be re-located to meet this requirement. The backup Gyro Horizon must be a vacuum driven unit. If the backup Horizon Gyro is electric, it must be interfaced to a standby battery or to an independent DC bus being driven by an alternator independent of the Aspen EFD1000.



-------- Original Message --------

Subject: [c-a] OK guys, let me have it! Critique my panel

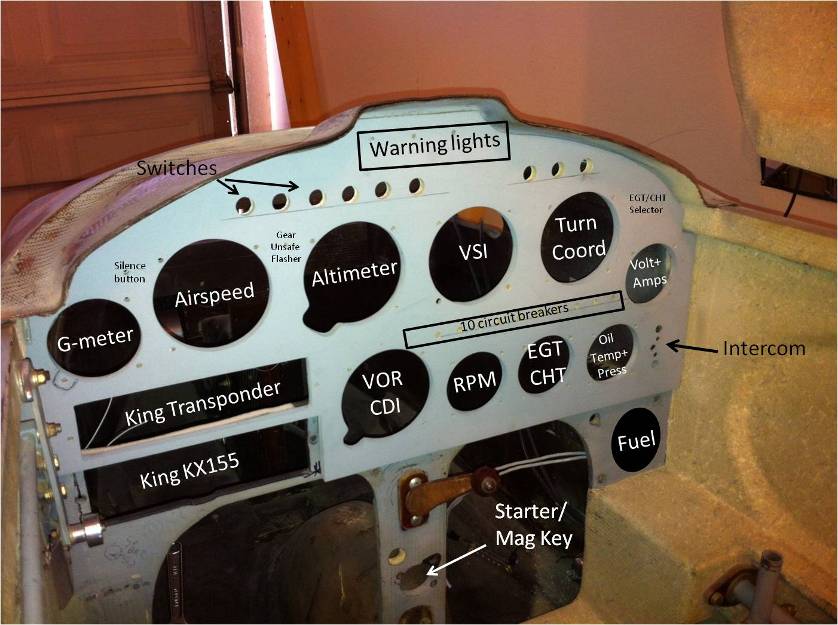
Date: Tue, 23 Oct 2012 19:23:40 -0700 (PDT)

From: Dave Anderson <usaf\_david@yahoo.com>

To: canard-aviators@yahoogroups.com

... new panel for my Long EZ. ...

Richard "Dave" Anderson



-------- Original Message --------

Subject: Re: [c-a] OK guys, let me have it! Critique my panel

Date: Wed, 24 Oct 2012 10:44:15 -0400 (EDT)

From: trcsmith <TRCSmith@aol.com>

To: usaf\_david@yahoo.com, canard-aviators@yahoogroups.com

1. A Magnetic Compass, It's also one of the basic instruments required by 14 CFR part 91 for both VFR andIFR flight.

2. Place the circuit breakers on the lower area of the panel.

3. Place the engine interments on the right side on the panel Up and down.

4. Loose the g meter.

5. RPM far upper right and Pressure gauge then Fuel underneath it.

6. Move the Key switch

...

Tom Smith A&P

-------- Original Message --------

Subject: [c-a] Panel

Date: Wed, 24 Oct 2012 16:34:59 -0400

From: Ken Miller <kenezmiller@optonline.net>

To: 'Canard Aviators' <canard-aviators@yahoogroups.com>

...stick is custom made by moi…

Ken



-------- Original Message --------

Subject: RE: [c-a] Panel

Date: Wed, 24 Oct 2012 14:08:09 -0700

From: Jerry Hansen <jerry-hansen@cox.net>

To: 'Ken Miller' <kenezmiller@optonline.net>, 'Canard Aviators' <canard-aviators@yahoogroups.com>

…and mine ….



-------- Original Message --------

Subject: Re: [c-a] Panel

Date: Wed, 24 Oct 2012 14:29:31 -0700 (PDT)

From: Douglas Olson <doug.olson@att.net>

To: Canard Aviators <canard-aviators@yahoogroups.com>

...mine too....



-------- Original Message --------

Subject: Re: [c-a] Panel

Date: Thu, 25 Oct 2012 08:29:59 -0700 (PDT)

From: patrick yoshikane <p1prototypes@yahoo.com>

Reply-To: patrick yoshikane <p1prototypes@yahoo.com>

To: Ken <kenezmiller@optonline.net>

CC: 'Canard Aviators' <canard-aviators@yahoogroups.com>



-------- Original Message --------

Subject: Re: [c-a] Panel

Date: Thu, 25 Oct 2012 12:19:08 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com

...

mine on the table ... paper printouts ... program called "one mile up" ...DXF file for the water-jet cutting. ... company that I used, had problems with small holes (screw) and I had to drill them myself....Many of these breakers are for the EFI and the electronic ignition system. I could have put the breakers/ fuses etc in the rear, or omitted them all together... but if there is a problem, knowing what and where, while I am in the air, can help me make better decisions ...

Rich



-------- Original Message --------

Subject: Re: [c-a] Panel

Date: Thu, 25 Oct 2012 15:18:09 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: ARGOLDMAN@aol.com <ARGOLDMAN@aol.com>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

The CNC water-jet that did mine was able to make the corners nearly square, a very small radius, and even the anti-rotation tabs on the 1/4" mini switches are there, as well as some -4 screw holes. ...I'm told the LASER machines will do even better, but leave slag on the back side. I'd suggest powder coat over paint. I think it is much more durable.

...Tim Andres

-------- Original Message --------

Subject: Re: [c-a] Panel

Date: Fri, 26 Oct 2012 03:14:36 -0600

From: Christian von Delius <alpineglobalprivate@gmail.com>

To: trcsmith <TRCSmith@aol.com>, Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

...I created a directory under photos called 'Instrument Panels' where everyone can upload a good photo to share ...

http://groups.yahoo.com/group/canard-aviators/photos/album/252528182/pic/list

-Christian

-------- Original Message --------

Subject: Re: [c-a] Panel

Date: Fri, 26 Oct 2012 09:41:31 -0600

From: R Martinson <N6lk@aol.com>

To: Christian von Delius <alpineglobalprivate@gmail.com>

CC: trcsmith <TRCSmith@aol.com>, Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

...can't resist. .. "static" ..shots ..nice ...what about some real world shots?



-------- Original Message --------

Subject: Re: [c-a] Panel

Date: Fri, 26 Oct 2012 09:58:02 -0600

From: Burrall L Sanders <craftsman@freeflightcomposites.com>

To: <canard-aviators@yahoogroups.com>

...one under construction



-------- Original Message --------

Subject: Re: [c-a] panel

Date: Fri, 26 Oct 2012 10:39:05 -0600

From: R Martinson <N6lk@aol.com>

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

Instead of trying to blow everyone away, why don't we get some postings of minimal panels that get the job done just as well? Not everyone has the resources to be able to install the newest, most expensive gadget in their airplane (although I agree they are nice) but may want to get out there and fly anyway.

Here's an example:



-------- Original Message --------

Subject: Re: [c-a] panel

Date: Fri, 26 Oct 2012 12:48:29 -0500

From: Matt Kwiatkowski <matt@kwiatkowski.com>

To: R Martinson <N6lk@aol.com>

CC: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

...my old panel. Upgrading to GRT ...

Matt Kwiatkowski N213MK



-------- Original Message --------

Subject: Re: [c-a] panel

Date: Fri, 26 Oct 2012 14:00:17 -0700 (PDT)

From: curtis martin <n97mr@yahoo.com>

To: R Martinson <N6lk@aol.com>, Matt Kwiatkowski <matt@kwiatkowski.com>

CC: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

...here is the panel in 12LZ Curt Martin and David Fife



-------- Original Message --------

Subject: RE: [c-a] Would you use these switches/CB's?

Date: Wed, 24 Oct 2012 09:23:01 -0500

From: Charles McDougal <pc12charlie@gmail.com>

To: 'Dave Anderson' <usaf\_david@yahoo.com>, <canard-aviators@yahoogroups.com>

... Joe Lacour’s panel in N97EZ ...one of the nicest layouts ...I liked having a manifold pressure gage and think you might find this more useful than a G meter. ...installed an Electronics International UBG16 engine analyzer. I don’t think I could ever own an airplane without one again. ...

C. McDougal



Others posted at http://groups.yahoo.com/group/canard-aviators/photos/album/252528182/pic/list:



-------- Original Message --------

Subject: [c-a] In flight partial panel.

Date: Fri, 26 Oct 2012 13:39:21 -0700

From: Elwood Johnson <ejandlinda@earthlink.net>

To: n6lk@aol.com <n6lk@aol.com>, canard-aviators@yahoogroups.com

CC: trcsmith <TRCSmith@aol.com>

Look at those numbers. Keep building/flying.



-------- Original Message --------

Subject: Re: [c-a] panel

Date: Sat, 27 Oct 2012 07:03:37 -0700 (PDT)

From: Slick Ric <bkut540builder@yahoo.com>

Reply-To: Slick Ric <bkut540builder@yahoo.com>

To: Lou Stedman <stedmanlou@roadrunner.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>, Burrall L Sanders <craftsman@freeflightcomposites.com>

...With the mean time between failure about a factor of 10 over steam gauges, I'll take the electronic ones any day... our 1998 Katana, ... 3rd rebuild of our attitude indicator in 1500 hours. ..enough ...to buy a Dynon D10A!

Ric Lee ...

-------- Original Message --------

Subject: [c-a] Varieze Panel Upgrade Montage

Date: Sat, 1 Dec 2012 03:35:09 -0700

From: Christopher Woodard <cnlwoo@gmail.com>

Reply-To: cnlwoo@gmail.com

To: canard <canard-aviators@yahoogroups.com>

My panel rebuild project is nearing completion so I'm sharing a montage I created and uploaded to YouBleub.

http://youtu.be/RsuR7Npdxbc ....

Chris N75EZ

## -Instrument Panel (Material):

-------- Original Message --------

Subject: Re: [c-a] material

Date: Sun, 11 Nov 2012 21:17:00 -0600

From: vance atkinson <nostromo56@tx.rr.com>

To: mulqueen@aol.com

CC: canard-aviators@yahoogroups.com

.[0]90 aluminum....

vance atkinson



## -Instrument Panel Access:

-------- Original Message --------

Subject: [c-a] Access hatch question/confusion-Long EZ

Date: Tue, 9 Oct 2012 21:39:45 -0500

From: Dave Anderson <usaf\_david@yahoo.com>

To: canard-aviators@yahoogroups.com

....original builder made the entire section of fuselage over the instruments as a separate piece (see pic). ....



-------- Original Message --------

Subject: Re: [c-a] Access hatch question/confusion-Long EZ

Date: Tue, 09 Oct 2012 20:28:58 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

...Amazingly enough, after 32 years of flying, Mike M. JUST installed an access panel in his LE as you describe, to get access to the top of his instrument area. ...Personally, I'd go a different route, as it would give a lot more access area and not have exposed screws. Borrow a set of COZY MKIV plans and use the technique there to make the fuselage top removable, with hinges along the longerons with pins facing aft and screws in a flange from the top into F-28. For the LE, you could use 3 screws rather than 5. The only downside is that you have to remove the canard to get at the screws unless you also fabricate a removable canard cover.

Marc J. Zeitlin

-------- Original Message --------

Subject: RE: [c-a] Access hatch question/confusion-Long EZ

Date: Wed, 10 Oct 2012 04:12:25 -0400

From: Ken <kenezmiller@optonline.net>

To: 'Dave Anderson' <usaf\_david@yahoo.com>, canard-aviators@yahoogroups.com

...When you roll the airplane, there is significant torsional loads imposed in that area. I got this straight from Burt many years ago. It is best to glass that on permanently. You can make an access panel if you want, and it’s not hard to do but it has to be closed out properly. Contact me off list and I’ll tell you how to do it.

The Cozy’s make this panel removable with piano hinge. I don’t subscribe to this but it apparently works and I haven’t heard of any problems. .... The back of the instruments are accessible when you remove the canard. My EZ was exactly like the one in your picture. This keeps water out of your instruments if your canopy leaks (which it will).

-------- Original Message --------

Subject: Re: [c-a] Access hatch question/confusion-Long EZ

Date: Wed, 10 Oct 2012 08:35:20 -0700 (PDT)

From: Tom Jewett <jewett\_tom@yahoo.com>

Reply-To: Tom Jewett <jewett\_tom@yahoo.com>

To: Dave Anderson <usaf\_david@yahoo.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

...I have a similar set up on my 1986 O-235 Long. Now ... 1500 hours. I built an aft facing flange on F28 of BID (5 plies if memory serves me correctly). The flange joins the F28 bulkhead via a flox joint (betwen the front and aft glass faces of the bulkhead) and laps 1.5 inches onto the longerons. Nut plates are mounted to the bottom of the flange. The removable top piece is built with glass to glass close-outs and 2 extra plies of BID all around . AN 3 fasteners secure the removable panel to the flange across its front edge. 2 AN3 fasteners secure the aft corners through the longerons with AN nuts and large washers.This feature has made maintenace chores very easy (translation = "saved my bacon" several times). ... I have noticed no elangation of the bolt holes. I would do it again in a heartbeat, and if so I would add threaded inserts for fasteners in the longerons between the IP and F28.

Tom Jewett Long EZ N35TM Morrison, CO

-------- Original Message --------

Subject: Re: [c-a] Access hatch question/confusion-Long EZ

Date: Thu, 11 Oct 2012 02:08:58 GMT

From: jschuber@juno.com <jschuber@juno.com>

To: jewett\_tom@yahoo.com, canard-aviators@yahoogroups.com

If you install any metal fittings in the wood longerons be sure to seal the inside of the longeron wood with epoxy. If it isn't sealed, the metal will condense moisture and eventually rot the wood and corrode the metal. That has happened and continues to happen to a lot of canopy hinge bolts. It has also been the subject of ADs on wood spar airplanes where steel bolts have penetrated the wood spar. Terry Schubert

## -Insurance:

-------- Original Message --------

Subject: [SARL-Racers] Re: Insurance for racers

Date: Wed, 18 Jul 2012 03:59:42 -0000

From: Chris <c40murphy@msn.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

... happy with Jenny at Nation Air for over 10 years. ...Chuck Conour at AViation Insurance Inc sponsors our Pitts Special I should mention him too. Chuck is a pilot and all around aviation nut.

Chris M. -------- Original Message --------

Subject: Re: [SARL-Racers] Re: Insurance for racers

Date: Wed, 18 Jul 2012 14:38:31 -0700 (PDT)

From: loneeagleswa@yahoo.com

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com <SARL-Racers@yahoogroups.com>

... Ladd Garner...with Falcon for several years ...gone out on his own several years ago. ...in Dallas around Addison Airport. ...from an aviation family (Lefty Garner - White Lightning - P-38) and he flies himself..... has worked hard to get my premiums down, and keep them down...... Here is his link .... http://www.lgainsurance.com/

Blue Skies .... Alan

-------- Original Message --------

Subject: [SARL-Racers] Insurance for racers

Date: Mon, 16 Jul 2012 07:39:04 -0700

From: Bob Mills <rvmills@sbcglobal.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

Last year's ...Falcon... $1700, including Reno. This year...$2700, with a $1500 add for Reno. ...did ... claim ... FOD damaged prop blade this past year ($5,600) ...

....changing brokers to Angie at Cannon ... probably done racing...bummer!

Bob Race 43

-------- Original Message --------

Subject: Re: [SARL-Racers] Insurance for racers

Date: Mon, 16 Jul 2012 08:01:24 -0700 (PDT)

From: Stan <cafmustang@yahoo.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com <SARL-Racers@yahoogroups.com>

... great luck with Frank Kimmel. He flies, warbirds and experimentals, and has gotten me much better rates than anyone else. 800-647-9397

stan

-------- Original Message --------

Subject: Re: [SARL-Racers] Insurance for racers

Date: Mon, 16 Jul 2012 08:17:02 -0700 (PDT)

From: James Robinson <jbr79r@yahoo.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com <SARL-Racers@yahoogroups.com>

...Joe Ruck at AIR (Aviation insurance resources) ...

James Robinson Glasair lll N79R

-------- Original Message --------

Subject: Re: [SARL-Racers] Insurance for racers

Date: Mon, 16 Jul 2012 10:16:56 -0700 (PDT)

From: Tim Bovee <boveetim@yahoo.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

...underwriter is more important than the carrier for our insurance needs. Cannon Aviation Insurance (a carrier) is/was a Reno race sponsor and knows racing. ... written my policy through U.S. Specialty Insurance Co (an underwriter) for 13 years and the "racing" has been covered at no cost for quite a while. Cannon has shopped my policy to other underwriters, US Specialty is not the cheapest, but the others always want extra for racing. I cannot say enough good about Cannon as a carrier, just great people.

-------- Original Message --------

Subject: Re: [SARL-Racers] Insurance for racers

Date: Mon, 16 Jul 2012 13:11:21 -0500

From: jcbarnes411@sbcglobal.net <jcbarnes411@sbcglobal.net>

Reply-To: SARL-Racers@yahoogroups.com

To: James Robinson <jbr79r@yahoo.com>,SARL-Racers@yahoogroups.com <SARL-Racers@yahoogroups.com>

...Jenny Estes at Nationair.

-------- Original Message --------

Subject: [c-a] Insurance FYI

Date: Tue, 4 Sep 2012 12:05:10 +0100

From: Bill Allen <billallensworld@gmail.com>

To: Canard Aviators <canard-aviators@yahoogroups.com>, Cozy Builders <cozy\_builders@googlegroups.com>

... just renewed with Falcon Insurance for $815. ..."specs"; $40k Ground not in motion with zero deductible

[$]1m combined single limit liability subject to $100k/passenger

Medical payments limit $10k P1 & pax

...Bill Allen LE160 N99BA FD51

## -Key Chain Cameras:

-------- Original Message --------

Subject: [c-a] Was GoPro Hero, now excellent KeyChain cams

Date: Sat, 21 Jul 2012 13:26:34 -0600

From: to tu <totucomm@gmail.com>

To: canard-aviators@yahoogroups.com

... got a GoPro HD Hero2 ... aware ... 'keychain cams' ... excellent quality video (and audio), ...called 'keychain cams' ....originally produced to be put on your keychain. ...rapidly evolving ... latest models are known as #11, #16, and #18 and are well evaluated and documented by guys in a radio-control airplane forum. Here's links for evaluation threads for these.

#11 - http://www.rcgroups.com/forums/showthread.php?t=1362692

#16 - http://www.rcgroups.com/forums/showthread.php?t=1556994

#18 - http://www.rcgroups.com/forums/showthread.php?t=1627189

Tom

## -Landing Lights:

-------- Original Message --------

Subject: Re: [c-a] Last call-landing light (Long EZ)

Date: Sun, 23 Sep 2012 19:53:34 -0500

From: Ryszard <ryszardzadow@att.net>

To: Ken <kenezmiller@optonline.net>, Charlie McDougal <pc12charlie@gmail.com>

CC: Dave Anderson <usaf\_david@yahoo.com>, <canard-aviators@yahoogroups.com>

... they work well albeit a pita to clean the lenses.. oh and eeeeeverthing that falls into the nose winds up down there. ... pics show, they can double as gun ports.

Ryszard



-------- Original Message --------

Subject: Re: [c-a] Last call-landing light (Long EZ)

Date: Sun, 23 Sep 2012 18:22:06 -0700 (PDT)

From: Walter Gee <n85kw@yahoo.com>

To: Dave Anderson <usaf\_david@yahoo.com>, Elwood Johnson <ejandlinda@earthlink.net>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

... landing light in the speed brake. You can leave all that landing light hardware in the hanger. The light will project out for landing when you are pitched up for a landing and then project right out in front of the nose during taxi. It has worked for me the last 25 years but I do not do a lot of night flying any more either.

Walter Gee N85KW

-------- Original Message --------

Subject: Re: [c-a] Last call-landing light (Long EZ)

Date: Sun, 23 Sep 2012 22:07:33 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com

While speed brake mounting seems like a great idea, in days past, the landing light was used only for landing. Now it is used for recognition and possible bird repellant. If it is in the speed brake, when approaching an airport, you will only be able to use it for a very small amount of time in the pattern. The brake will effect the cooling. IMNSHO, keep it off of the landing brake.

-------- Original Message --------

Subject: Re: [c-a] Last call-landing light (Long EZ)

Date: Sun, 23 Sep 2012 22:12:46 -0400

From: S. Ramirez <simon@synchdes.com>

CC: canard-aviators@yahoogroups.com

Another reason to keep the landing light off the landing brake is for night take offs. You do NOT want the landing brake on for this phase of flight. My LEZ has a swing down door to the back and right of the front wheel strut. It swings down on its dedicated panel.

Simon Ramirez Oviedo, FL USA

-------- Original Message --------

Subject: Re: [c-a] Last call-landing light (Long EZ)

Date: Sun, 23 Sep 2012 22:19:35 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: Walter Gee <n85kw@yahoo.com>

CC: Dave Anderson <usaf\_david@yahoo.com>, Elwood Johnson <ejandlinda@earthlink.net>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

One big drawback is that you'll never be able to use it [landing brake landing light] in cruise as a recognition light. That's the most often used by me when ATC calls for traffic ahead.

Buly

-------- Original Message --------

Subject: Re: [c-a] Last call-landing light (Long EZ)

Date: Sun, 23 Sep 2012 20:29:25 -0600

From: Rick Hall <rickh@zggtr.org>

To: Dave Anderson <usaf\_david@yahoo.com>

CC: canard-aviators@yahoogroups.com

Landing light isn't required unless you're hauling passengers (at night) ... I recall there's space in the wing-strake area for a light, both sides. It's barely outside of the canard width, and could be baffled to prevent glare/reflection off the canard if you so desire. And this location provides a bunch of separation if you add a wig-wag function too. On the Cozy, this is about BL 70. ... LED's ...'ve come a long ways ... Small, low current, and almost no heat.

Rick

-------- Original Message --------

Subject: Re: [c-a] Last call-landing light (Long EZ)

Date: Sun, 23 Sep 2012 23:35:49 -0400

From: David K. Fife <aircrafttips@yahoo.com>

To: Rick Hall <rickh@zggtr.org>

CC: Dave Anderson <usaf\_david@yahoo.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

How about the nose of the wheel pants? No reflecting on canard. Well, how about 6 LED's, heat sink, lens and bulkhead weighing 4.5 oz a side and using only 2100 ma per side. Great recognition lights, taxi, landing, wig wag and I might add the tower says they see us 5 miles away in the day time. Come to RR and see them on N12LZ. Just our take on lights. Kits might be in the future.

Dave Fife 3D Composite Aircraft Parts 248-505-8176 Long EZ N12 LZ

-------- Original Message --------

Subject: [c-a] Landing light Placement Statement Retraction

Date: Fri, 5 Oct 2012 08:52:08 -0700

From: Dale Martin <Niceez@gmail.com>

To: SW Harmon <sharmon32@juno.com>, canard-aviators <canard-aviators@yahoogroups.com>

...thinking about my post about extending a Landing Light on the sides of the nose and without testing that on a proven Cozy or LEZ ,,,,, I retract that statement until it is tested. Reason ... possible interference of airflow to the canard as it the nose is raised to flare. ... perfect example of which NONE OF US SHOULD EVER DO WITHOUT TESTING ... Never recommend something you have not tested ...Burt's original design works fine with the least complication. ...I do like Tony's lower winglet lights but temperature is a concern in that area and can be solved...

Dale http://www.long-ez.com

-------- Original Message --------

Subject: [c-a] Re: Landing light in speed brake pictures? LEZ

Date: Thu, 4 Oct 2012 10:44:53 -0700

From: Dale Martin <Niceez@gmail.com>

To: canard-aviators@yahoogroups.com

...I am removing a landing light from a landing brake right now on a clients EZ. It DOES disturb the air on the bottom of the plane enough to interfere with the smooth flow of air into the air inlet ....(it protrudes at an angle from the landing brake).

... if you choose to alter the floor of the aircraft to accept the flush mounted lights ... taking away from some... crash integrity of the fuselage ...light housings ... under the passengers legs ...

...You would do better to build the light flush towards the nose ...weight forward is far better than weight aft. ...you may consider using a "pop-up" or "pop out" light similar to the older Corvettes so the drag will only be present when you need it at lower ...

Dale http://www.long-ez.com

-------- Original Message --------

Subject: [c-a] Re: Landing light in speed brake pictures? LEZ

Date: Thu, 4 Oct 2012 12:01:40 -0600

From: TJ Johnson <misbehaved@gmail.com>

To: canard-aviators@yahoogroups.com

My Eze was built with the landing light in the speed brake. ...it had been removed and the brake patched over before 25TB .... good indication of how useful they found it.

TJ PIK20 N202PK VariEze N25TB Glasair II FT in progress

-------- Original Message --------

Subject: Re: [c-a] Re: Landing light in speed brake pictures? LEZ

Date: Thu, 4 Oct 2012 23:28:02 GMT

From: SW Harmon <sharmon32@juno.com>

To: Niceez@gmail.com, canard-aviators@yahoogroups.com

...My landing light is in my speed brake. ... flush with the bottom of the plane and the cover on the inside makes a nice footrest for the right side passenger it is off set so it misses the nose gear. ... Steve

-------- Original Message --------

Subject: Re: [c-a] Re: Landing light in speed brake pictures? LEZ

Date: Thu, 4 Oct 2012 19:31:22 -0700

From: Dale Martin <Niceez@gmail.com>

To: SW Harmon <sharmon32@juno.com>, canard-aviators <canard-aviators@yahoogroups.com>

...I also can turn mine on in the hangar when pointed straight down ... a go around at night would mean retracting the LB. Things to think about. ...IF - you should ever loose your Comm and need to get the towers attention ...

Dale

-------- Original Message --------

Subject: Re: [c-a] Re: Landing light in speed brake pictures? LEZ

Date: Fri, 5 Oct 2012 13:19:40 +1000

From: Tony Rothwell <tony13rothwell@gmail.com>

To: Dale Martin <Niceez@gmail.com>

CC: SW Harmon <sharmon32@juno.com>, canard-aviators <canard-aviators@yahoogroups.com>

...I regard my wingtip 'landing lights' as being the best I have come across in GA for moving around the airport at night. I have a standard belly mounted landing light and very rarely lower it or turn it on. The wingtip lights are just narrow beam domestic 12 volt halogen downlights in the lower winglets with an acrylic ... heat the plastic in an oven and shape it over the bottom of the lower winglet so it fits inside a cutout of the upper part of the lower winglet. ... attached photo. ... I would like to try two of those clever and outstandingly bright LED bicycle headlamps (1600 lumens) ... suspect the beam might be too wide compared to the halogen spotlights. ...

Tony VH-COZ



-------- Original Message --------

Subject: Re: [c-a] Re: Landing light in speed brake pictures? LEZ

Date: Fri, 5 Oct 2012 13:44:16 +1000

From: Tony Rothwell <tony13rothwell@gmail.com>

To: Elwood Johnson <ejandlinda@earthlink.net>

CC: Dale Martin <Niceez@gmail.com>, SW Harmon <sharmon32@juno.com>, canard-aviators <canard-aviators@yahoogroups.com>

... This one has been flying for 14 years... over 1500 hours flight time and these lights are used day and night ....

Carve out the foam so the bulb is well clear, then put a little square of fibrefrax in back to be certain. Mount a very thin Aluminum plate between the 'vertical' faces of the winglet, with a suitable hole cut in it for the bulb. Attach the bulb with three #6 or #8 bolts. You can aim the bulb by simply twisting the aluminium. When changing bulbs over the years, I have removed the fiberfrax just to have a look and there is no sign of melted foam and no sign of discolouration of the winglets either so NO - they DO NOT GET TOO HOT - even with 50 Watt 7 Degree bulbs. Further it is NOT in the critical winglet attach area; it is way forward of any of the heavy layups. (There is nothing critical about the lower winglet attach anyway.)... proven installation which works just fine.

Tony

-------- Original Message --------

Subject: [c-a] Re: Last call-landing light (Long EZ)

Date: Mon, 24 Sep 2012 07:38:44 -0700

From: Dale Martin <Niceez@gmail.com>

To: canard-aviators@yahoogroups.com

... The stock plans landing light placement does work well. ... I would consider recessed light in the canard cover fairing and make plexiglass lens to retain the compound curve of the fairing. A bit more work but it may enable you to install more than one light to aim for taxi and on for the landing flare. I would probably install 3 so I could angle the left side and right side lights out at 20° to see the taxiway turn offs better at some airports. Facts: The landing light can be extended at 160kts ... side note: The landing light needs to illuminate at least 2500 of runway or it is almost useless at night. ... only way I was given enough warning to go around when a herd of elk decided to cross a runway just as I started the flare. Pick the airport carefully when a night is planned.

Dale

-------- Original Message --------

Subject: Re: [c-a] Re: Last call-landing light (Long EZ)

Date: Tue, 25 Sep 2012 08:18:27 +1000

From: Dave Berenholtz <335dave@gmail.com>

To: canard-aviators@yahoogroups.com

I made a rubber boot (RTV and cloth really) and RTV'ed it over the light with just a slit for the moving bracket and wire. ...greatly reduced the increased wind noise when the light is extended. The extra noise in the Bose may well be different frequencies that the headphone doesn't filter very well.

Dave VH-JZE

-------- Original Message --------

Subject: Re: [c-a] Landing light in speed brake pictures? LEZ

Date: Thu, 4 Oct 2012 13:22:35 -1000 (HST)

From: Bruce Hughes <ezcopilot@fairpoint.net>

Reply-To: ezcopilot@fairpoint.net

To: Dave Anderson <usaf\_david@yahoo.com>

CC: Greg Norman <gnorm76@gmail.com>, Bulent Aliev <bulent.enginegear@gmail.com>, canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

... Working plastic is simple but not as simple as you say. ...very good discussion in Tony Bingelis book (blue one) "Aircraft Construction Methods" on pages 192-197. ...use an oven at 250 degrees. ... does say 340 on another page. ... too hot, ... bubbles that do not go away ...3 dim. ... much more difficult but can be done....

Bruce Hughes

-------- Original Message --------

Subject: Re: [c-a] Landing light Placement Statement Retraction

Date: Fri, 5 Oct 2012 11:43:23 -0500

From: Ryszard <ryszardzadow@att.net>

To: SW Harmon <sharmon32@juno.com>, canard-aviators <canard-aviators@yahoogroups.com>, Dale Martin <Niceez@gmail.com>

... This is the best place for landing lights on our airplanes. ... pain to make ... no drag ... no moving parts... biggest challenge ... heat... with powerful LED bulbs ...no longer a problem.

Ryszard



-------- Original Message --------

Subject: Re: [c-a] Landing light Placement Statement Retraction

Date: Sat, 6 Oct 2012 23:13:53 GMT

From: SW Harmon <sharmon32@juno.com>

To: ryszardzadow@att.net, canard-aviators@yahoogroups.com

... landing lights in the nose...might be the perfect place but man are they butt ugly ... Simple and elegant. Steve

-------- Original Message --------

Subject: [c-a] LED Lights

Date: Tue, 6 Nov 2012 20:36:44 -0500 (EST)

From: mulqueen@aol.com

To: canard-aviators@yahoogroups.com, Q-LIST@yahoogroups.com

...for us DIY guys ...interesting in making our own LED landing lights. http://tinyurl.com/dyftmp4

JackM Veze

-------- Original Message --------

Subject: Re: [c-a] LED Lights

Date: Tue, 6 Nov 2012 23:35:26 -0700

From: Christian von Delius <alpineglobalprivate@gmail.com>

To: mulqueen@aol.com, Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

...82mm reflector & lense

http://www.ebay.com/itm/190607745652?ssPageName=STRK:MEWNX:IT&\_trksid=p3984.m1439.l2649 100w LED array http://www.ebay.com/itm/1x-Square-100W-White-8900LM-9500LM-6500K-COB-LED-SMD-Lamp-Light-Bulb-45-m-Chip-/121010781533?pt=LH\_DefaultDomain\_0&hash=item1c2ccdfd5d testing for use as a landing light.

-Christian

-------- Original Message --------

Subject: Re: [c-a] LED Lights

Date: Wed, 7 Nov 2012 20:16:30 -0700

From: Christian von Delius <alpineglobalprivate@gmail.com>

To: Tony Rothwell <tony13rothwell@gmail.com>, Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

...100w heatsinks are fanned and only a bit bigger than the housing. http://www.ebay.com/itm/New-Aluminum-Heatsink-With-Fan-For-50W-100W-LED-Light-Cooling-DC12V-/290699466190?pt=LH\_DefaultDomain\_0&hash=item43af09d5ce

-Christian

## -Latch (Spring Latch):

-------- Original Message --------

Subject: Re: [c-a] Re: Latch for Cowl Oil Dipstick Door

Date: Tue, 28 Aug 2012 08:44:14 -0500

From: <berkut13@berkut13.com>

To: <canard-aviators@yahoogroups.com>, "Cozy List" <cozy\_builders@googlegroups.com>

http://www.crracing.com/custom-built-products/hartwell-latches ...Hartwell latch is great for oil door installs and works well with the “U” hinge and a opening spring. I have one similar on mine.

James Berkut/Race 13

## -(Lights) Strobe Lights:

**-**Wayne Hicks Mar 2012: ...Warning from Whelen..."WARNING! – Strobe light power supplies are meant to be used, not remain in an inactive state. Use them at all times this improves their proper functioning. Any strobe light power supply that has been out of service for long period of time is subject to failure because the electrolytic condenser loses the polarity formation. A strobe light power supply not having been used for one year or longer is vulnerable to failure. In this case it is recommended you disconnect all flash tubes and start operating the system on a voltage this is reduced 25% for 10-15 minutes before putting the power supply into normal service. This will prevent overheating of the condenser while they reform. If the power supply, after a long period of non- use is operated at full voltage immediately, there is an excellent possibility that the condenser will become overheated and fail."

<http://www.wattco.net/infopdf/STROBETROUBLESHOOTINGGUIDE1.pdf>

-Henry Hallam Mar 2012: unnecessary with modern electrolytics.

-Burall Sanders Mar 2012: ...Whelen strobe...modern...? it is necessary as I have had to send in three units because they died while in storage, none since I started using the power up technique I mentioned earlier..   Aero-Flash is the same way. My own strobes are modern...all LED and no separate power supply and associated  capacitors.

## -(Lights) Strobe Light Power Supply Conditioning:

-Burrall Sanders Feb 2012: ...power supplies for the Whelen and similar types have capacitors that will lose their charge during long term storage.  When ...simply powered up, they will often just burn out the capacitors.   I always do the following when first powering up a power supply that has been stored for more than a year without being turned on.   ...taught this by an EE. ...charge the capacitors as slowly as possible. ...turn the power switch on and then off as quickly as you possibly can, ...repeat that two or three times, then power it up for about a second and turn it back off.  Then the unit is ready to power up normally. It works most every time.  I have had the method fail, but was able to send it in to the manufacturer who repaired it for free.

## -Lightspeed Ignition:

-------- Original Message --------

Subject: [rvsqn] lightspeed ignition

Date: Fri, 10 Aug 2012 11:31:08 +0100 (BST)

From: Ray Harper <raydharper77@yahoo.com>

Reply-To: rvsqn@yahoogroups.com

To: rvsqn@yahoogroups.com <rvsqn@yahoogroups.com>

...observations on this link:

...lightspeed ...18 years without problems with the coils ...coils are mounted on the firewall ...original practise. ... may be ... lack of vibration (...certainly receive on the engine) is significant. ...HT leads have a finite life (Claus recommends 250 hours). The HT pulse is much bigger than with a magneto, it happens twice as often, and the NEW leads have a 'reluctance' with kills the Radio interference. ... leads are on the way out they will start to transmit Radio frequency and you will, increasingly, hear breakthrough on the radio though the engine will run perfectly well. Claus, at Lightspeed sells the leads, caps and crimping tool to replace them. Alternatively you can obtain the bits from MSD ignition. It's significantly cheaper to buy a bulk roll of 100' of lead.

Ray

-------- Original Message --------

Subject: RE: [rvsqn] lightspeed ignition

Date: Fri, 10 Aug 2012 23:46:55 +0100

From: Jerry Parr <redkite22@hotmail.com>

Reply-To: rvsqn@yahoogroups.com

To: rvsqn <rvsqn@yahoogroups.com>

...only problem ...Lightspeed on the RV-6 ...co-ax link breaking down between the black box and the coils. Happened twice and resulted in intermittent excessive mag drop.

Jerry Parr RV-12, G-TWLV

-------- Original Message --------

Subject: [rvsqn] coil

Date: Sat, 11 Aug 2012 17:03:31 +0100

From: John Michie <johnmichie@homecall.co.uk>

Reply-To: rvsqn@yahoogroups.com

To: rvsqn@yahoogroups.com

...recommend Sprint Manufacturing in Warminster. Coil ordered online about midnight thursday, ...arrived saturday morning...all 4 CDI plugs now firing.

John

-------- Original Message --------

Subject: Re: [SARL-Racers] Lightspeed EI, hi-comp, LOP

Date: Thu, 12 Jul 2012 08:33:04 -0700 (PDT)

From: James Robinson <jbr79r@yahoo.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com <SARL-Racers@yahoogroups.com>

I have hi comp pistons with dual plasma llls with crank sensor, cold air induction and gami injectors. ...run LOP at 12 gph at 225kts at 12000 ft. With the cold air ram induction I can't run as LOP as I use to be able to do, but ...developing more manifold pressure.

James Robinson Glasair lll N79R Spanish Fork UT U77

-------- Original Message --------

Subject: Re: [SARL-Racers] Lightspeed EI, hi-comp, LOP, added Turbo rails

Date: Thu, 12 Jul 2012 11:02:17 -0500

From: Mark Frederick <f1boss@gmail.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

You have the go-fast Common Problem! Turbo injectors tied into the air inlet will solve the LOP problem; you will be using 'upper deck' pressure to feed the screens on the injectors. You are getting flow reversal at the injector screens due to your 'too efficient' inlet design. This good problem is common with the go-fast crowd, who set up their inlets for ram recovery. The upper cowl pressure is lower than the inlet pressure, allowing the injectors to bleed backwards. EZ fix indeed. A better fix is to set up pitot inlets on each side, feeding the upper deck rails - this might be easier.

Mark

## -Lightspeed & 10:1 Pistons:

-------- Original Message --------

Subject: [SARL-Racers] Lightspeed EI and 10-1 pistons

Date: Wed, 11 Jul 2012 19:07:21 -0700 (PDT)

From: Jeff Barnes <jcbarnes411@sbcglobal.net>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

***....***Just got an overhauled engine w 10-1 pistons, hot cam etc. Now re-installing my Plasma III. Engine mag is set to 25 btdc on the MAG from respected builder who says that is best timing for max HP.

Lightspeed manual says for engines set to 25 btdc, set crank to TDC #1, turn hall effect until light comes on/off, your done. ... But Lightspeed manual says 25btdc is usually for "standard" engines, and 20btdc is usually for compressions 8.7:1 or higher. ... Klaus. .... cant read me the manual, that why he wrote it. ...

Jeff Barnes, RV6 O360, slick and Plasma III

-------- Original Message --------

Subject: RE: [SARL-Racers] Lightspeed EI and 10-1 pistons

Date: Wed, 11 Jul 2012 21:37:15 -0500

From: Dave Adams <long83dt@charter.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

I’m running a plasma III and a Slick mag with 9.7:1 pistons. I’m very happy with it except that the high energy spark is rough on spark plugs. ... switched to iridium electrode plugs on the EI and hope for better plug life.

25 degrees is too much advance for a high compression engine. With that much advance on a 10:1 compression ratio engine, you’ll have little or no detonation margin. Use Klaus’s recommended 20 degrees advance. The same goes for the mag too.

I don’t like the hall effect pick-ups. There have been too many problems with them and the ignition timing is at the mercy of the gear lash/play in the accessory case and therefore you will have inconsistent timing like you do on a mag. It would be better to convert to the direct crank sensor pickup.

In any case, use a timing light per Klaus’s procedure in the manual. You can get by with rotating the hall effect unit until the light goes on/off, but that won’t be as accurate as using a timing light.

Dave Adams

-------- Original Message --------

Subject: RE: [SARL-Racers] Lightspeed EI, hi-comp, LOP

Date: Wed, 11 Jul 2012 19:49:04 -0700 (PDT)

From: Jeff Barnes <jcbarnes411@sbcglobal.net>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

...old engine, std pistons, I was aggressive LOP almost all the time, great mileage, great plug life ***(Iridiums from the start as Klaus recommends)***, engine looked good inside when being overhauled.

...Jeff Barnes

-------- Original Message --------

Subject: RE: [SARL-Racers] Lightspeed EI, hi-comp, LOP

Date: Wed, 11 Jul 2012 21:59:26 -0500

From: Dave Adams <long83dt@charter.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

That’s the way that Klaus AVERAGED 60.3 MPG at 164 MPH in the 2008 Fuel Venture competition was by running LOP and running dual Plasmas. I still have a carb so I have a tough time getting all four cylinders LOP. When I do, the engine isn’t making much power. Fortunately the cylinder that runs the hottest CHT on my engine (#4) is also the first to peak when leaning. When I lean it out LOP, the CHT falls off nicely. At altitude I can run lean and get 45 MPG (statute) at about 165 MPH. Don’t be worried about going LOP when the power is low enough.

Dave

-------- Original Message --------

From: Wired Calvin <wiredcalvin@yahoo.com>

Subject: Re: [c-a] Lightspeed EI and 10-1 pistons

To: "Jeff Barnes" <jcbarnes411@sbcglobal.net>

Date: Wednesday, July 11, 2012, 10:01 PM

Set it to 25 if you want, but be ready to pull the power back if you get bad fuel, lower octane fuel or any octane related fuel issue. .... I've done it and when it detonates then things start happening quickly. ... Klause ... not a bad guy ...pushed for time sometimes. He's convinced setting your mag timing with a buzz box is not always accurate and doing so may set your timing off up to 3 degrees, so your 25 degree timing job may really be 28. ....run a timing light and check it. You will have to have a dedicated wire with no shielding on the mag to do that. He says to pull back the shield on a test harness then put your old harness back on when you are done. Dave 622 EZ

-------- Original Message --------

Subject: [SARL-Racers] Re: Lightspeed EI and 10-1 pistons

Date: Thu, 12 Jul 2012 03:27:22 -0000

From: Brian C <carroll4212@aol.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

IO-360 parallel valve with 9:1 pistons. Emag/Pmag combo with auto plugs timing set at 25\*. Ram Air feeding a AFP injection FM-200. Vetterman 4 pipe system. It seems to run pretty good, estimated 190hp. I did have a cooling issue last year but plenum work and outlet baffle have dropped them to acceptable levels.

-------- Original Message --------

Subject: RE: [SARL-Racers] Re: Lightspeed EI and 10-1 pistons

Date: Wed, 11 Jul 2012 20:58:25 -0700

From: Bob Mills <rvmills@sbcglobal.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

...My IO-540 has 10:1 CR, ... one Slick mag and one Electroair EI. ... LSE was installed and timed per the LSE manual, as is the Electroair now. In both installs the crank sensor was used (no choice on a 6 banger, I believe). The mags were timed at 25 degrees when I bought it, and have always been set there, by both A&P/AI gents that help me with the condition inspections (both are familiar with experimentals and high compression). .....running LOP for the last few years on X-C flying, ... WOT/2100 RPM at 10.5K will yield 185 KTAS at 9gph. .... only do that at/above 8500', or backed off on the power lower ... races I stay well ROP, and am still trying to figure out how to lean to best power ... races ... Reno, I see 390-400 CHT, and 1380 ish EGT (a couple EGTs run a little hotter...low 1400's). .... 1020 TTAFE, ... still very strong, good compressions, ... not borescoped it, ... indications are good so far. ....

Bob Race 43

-------- Original Message --------

Subject: RE: [SARL-Racers] Lightspeed EI and 10-1 pistons

Date: Wed, 11 Jul 2012 21:00:58 -0700

From: Red Hamilton <redswing@mcn.org>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

...We run 10:1 with dual P III crank trigger; also have the pot that can retard or advance the timing on the fly. The base timing that works best for us is about 28 BTC at FT down low; you have to watch the temperatures and react timely if CHT starts going up. Our cam is stock Lycoming so you might be able to use more ignition timing depending on your cam; ...high alt cruise, you can easily run LOP and advance the timing even more; you/must/ have good instrumentation to take advantage of this or you could melt your engine, as Klaus would say.

....your results may be different so be careful.

Red

-------- Original Message --------

Subject: Re: [c-a] Lightspeed EI and 10-1 pistons

Date: Thu, 12 Jul 2012 07:08:12 -0400

From: Nick Ugolini <unick3@gmail.com>

To: Jeff Barnes <jcbarnes411@sbcglobal.net>

CC: Wired Calvin <wiredcalvin@yahoo.com>, canard-aviators@yahoogroups.com

I put 10:1 in a EZ I worked on, and the main problem I had was overheating of the engine which was strongly influenced by advanced timing. On my EZ I went up to 9.1:1 from 7:1 reduced the timing to his recommendation (in the book) and saw no change in CHT's.

....Nick Ugolini

-------- Original Message --------

Subject: RE: [SARL-Racers] Re: Lightspeed EI and 10-1 pistons

Date: Thu, 12 Jul 2012 08:59:24 -0700

From: Bob Mills <rvmills@sbcglobal.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

....original install was the Plasma I, and pre-dated my ownership ...only failure I had initially was one half of one coil failing at about 500 hours TTAFE ...Replaced that coil and all was well for another 100 hours or so. ... started having intermittent issues of rough running and bad mag drops (rough on EI-only). ...Replaced every component in the EI except the box and crank sensor (plugs, wires, coils, RG-400 from box to coils, etc). Problem persisted. ... one run-up and temp-reading run, the problem disappeared, and could not be duplicated. Was told it could have been a wet plug. With good run-ups and running well, I flew it for six months, then back came the problem. Less intermittent this time, but it would go away when things warmed up more...usually. ... Sent box back again, and this time was told it was in fact in the box, and the problem would go away when the box warmed up on the bench, or when the box was pressed on the side of the case. ...cause could not be isolated due to its transient nature on the test bench, so the box was returned. ...10 years old, and well out of any kind of warranty (understandably). To replace the Plasma I with a Plasma III, I needed the new brain box and a new crank sensor, but the cost for those two items alone, plus what I had already replaced, added up to several hundred over what a new Plasma III would cost out of the box. ...The Electroair came highly recommended ... Electroair was very nice to work with. ...doing the due-diligence to earn STCs for their systems ... sold all the LSE parts and bought the EA, and it has worked flawlessly since ... Both are great systems. ... run-ups and performance with each would be hard to distinguish differences ... now, it appears the substantial STC development costs have driven up prices at EA. ...

... websites, ...

Electroair: http://electroair.net/

Lightspeed Engineering: http://www.lightspeedengineering.com/

Bob Race 43

-------- Original Message --------

Subject: RE: [SARL-Racers] Re: Lightspeed EI and 10-1 pistons

Date: Fri, 13 Jul 2012 21:03:21 -0500

From: Dave Adams <long83dt@charter.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

....To be more clear for those that have not studied this, if your goal is to optimize power output from your engine, you want to advance your ignition timing at any given operating parameters (such as WOT when racing). Whether considering advancing the timing on the ground or in the air (if you have the option as presented with the Plasma III) the best option is to advance the timing as far as you can without causing:

·detrimental detonation–.... bad day

·Problematic CHTs and/or Oil temps

.....

The Lightspeed Plasma III ignition provides a means to vary the ignition timing from the “stock” value. I have advanced the timing in-flight at high power (I decided to quit that) and mostly when I’m up at high altitude and low power (above say 12K’). The only thing that I have used to stop advancing the timing at high altitude is to note the varying EGT reading and stop advancing there when I note the EGT starting to wander around. ...

When advancing the timing on my high altitude tests, I noted slightly higher RPMs, and CHTs, and lower EGTs. That indicated to me (what I had read upon researching), better power output that was reflected as higher CHTs and RPMs. The lower EGTs indicated that the fuel energy was being turned into higher engine power output (RPM) and therefore higher engine temps (CHTs), with lower waste energy out the exhaust (lower EGTs).

Dave Adams Long EZ N83DT Race 83

-------- Original Message --------

Subject: RE: [SARL-Racers] Lightspeed EI and 10-1 pistons

Date: Thu, 12 Jul 2012 10:40:32 -0700

From: Dennis Collins <luscombepilot@hotmail.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL yahoo group <sarl-racers@yahoogroups.com>

I'm running dual plasma III, high compression with hall effect pickup in an O-235. I've run the timing as per Lightspeed recomendations (20 degrees). Double check the timing with an automotive timing light as Klaus recommends. ...the hall effect sensor has issues. Not only from gear lash, but the PC style DB-9 plugs for the wiring literally wear out from engine vibration, causing extra ignition sparks, sensing too high RPM (and thus too far spark advance). Klaus knows about the issue, but I don't think he has the bandwidth to engineer a new plug. He'll sell you a new board for not too much money that you can replace in your existing hall effect case. I'd use the direct crank case sensor, but it gets mounted in the same position as the electric MT prop contacts I'm using, so I can't. Everything else with the EI has worked great for several years now.

Dennis

-------- Original Message --------

Subject: Re: [c-a] Lightspeed EI and 10-1 pistons

Date: Thu, 12 Jul 2012 19:35:55 +0100

From: Bill Allen <billallensworld@gmail.com>

To: Jeff Barnes <jcbarnes411@sbcglobal.net>

CC: Wired Calvin <wiredcalvin@yahoo.com>, canard-aviators@yahoogroups.com

...same setup; ie Lycon 10:1 pistons, + one LSE & one slick mag. Lycoming settings are 25 BTDC for mags. LSE instructions clearly state 20 BTDC for 10:1 pistons. That's to improve the margin of protection against detonation at high power settings. I bought Klauses' variable timing device so that I could use 20 BTDC for takeoff (just where you don't want detonation to melt a piston) and allow me to reset 25 BTDC in cruise below 75% (I use the 'Rule of 48') where the risk of detonation is slight. However, I had the engine shop do a dyno run on the engine after rebuild with the standard hi-comp pistons and the 25 BTDC timing. Then when I decided to go with the Lycon 10:1 pistons, I had them re-run the dyno test with the recommended timing of 20 BTDC. The engine put out less power with 10:1 pistons and the timing retarded to 20 BTDC. ....

Bill Allen LE160 N99BA FD51 CZ4 G-BYLZ EGBJ

## -Load Limits (Nz):

-------- Original Message --------

Subject: Re: [c-a] Varieze load limits

Date: Thu, 8 Nov 2012 13:25:43 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

To: Canard Aviators <canard-aviators@yahoogroups.com>

....report on the issue is available here:

http://www.cozybuilders.org/Canard\_Pusher/RAF\_inspection.pdf

...clear and concise....TWO independent failures, one cause by poor construction technique and one caused by corrosion of the wing fittings.

The plane was based at three airports ... no-one would consider them to be "marine" environments. ...

This makes the internal corrosion of the aluminum parts of the wing attach fittings in the VE even more worrisome for those that did not alodine their fittings, as salt spray cannot be easily blamed for the corrosion.

Burt and Mike were NOT able to come up with any solution to repairing damaged/corroded VE wing attach fittings - basically, if you have any corrosion or damage per the inspection techniques listed above, your only real choice is to replace the wings and spar.

> I have found that my VEZE is very strong.

Well, sure - it hasn't broken, but that doesn't tell you when it might break. How many G's do you pull when at MGW (the MGW the designer set, not that the builder set)? If you have corrosion cracking, how many more times can you do that before the cracks grow catastrophically?

Burt is extremely clear in the document referenced above that: "If you find absolutely no indication at all of any corrosion in your wing attach fittings, you may return your Vari-Eze to flight status with the following limitation: Never exceed 2.5 “g” positive, or 1.5 “G” negative in flight. Install a placard in plain sight on the instrument panel, with these words clearly shown. Also change all reference to flight at more than 2.5 ”G” in your owner’s manual, to read 2.5 ”G” maximum allowable in-flight loads."

As builders/owners of these aircraft, you are of course free to disregard the advice of the guy who designed the planes that you're trusting your lives to, but that seems less than optimally intelligent.

## -Long EZ from scratch:

-------- Original Message -------- Subject: Re: [c-a] Newby build time question

Date: Mon, 16 Apr 2012 04:49:47 -0700 (PDT)

From: Don <wildskyboy@yahoo.com>

Reply-To: Don <wildskyboy@yahoo.com>

To: Tony Babb <tonybabb@alejandra.net>, 'Barbara and Roch LaRocca' <rocbar@live.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

...It is going to take several times longer than you expect. You will most probably rebuild several parts. I suggest you read through the plans completely before starting then go through the Canard Pusher newsletters and make annotations in the plans of all the changes. Then go through many of the chapters in the archives of this forum. I also suggest you thoroughly research each chapter, look for references on the internet etc. Why? Well things change. The foam specified in the plans is no longer available and has been replaced by others. The uni-glass specified for the canard and wing spars is now only available in a thinner form so you need a different layup schedule, the landing brake specified in the LE plans is actually the Verize specification and will be too small. Research, research and more research. I think I spend as much time or more researching each part as building the part. Then stick as closely to the plans as possible because every time you think you are smarter than Burt it will come back and bite you.

There are a few changers that are highly recommended: electric landing (speed) brake, electric nose gear, extended nose, brake cylinders mounted in the nose.

...Don

-------- Original Message -------- Subject: Re: [c-a] Newby build time question

Date: Tue, 17 Apr 2012 07:49:59 -0700

From: Bob Holliston <bob.holliston@gmail.com>

To: Harley <harley@agelesswings.com>

CC: Ken <kenezmiller@optonline.net>, Tim Andres <tim2542@sbcglobal.net>, Dave Anderson <usaf\_david@yahoo.com>, canard-aviators@yahoogroups.com

I probably spent 400 hours on my 1st. LongEZ fairing in the raw glass. ...The 2nd EZ took about 250 hours to fair in. My advi[c]e ...finish ALL of the bodywork before doing ANYTHING else like engine or panel. Get it over with. It's the only part of building that's not fun and the part that hangs most people up. Bob LongEZ NX666DV.

-------- Original Message -------- Subject: Re: [c-a] Newby build time question

Date: Tue, 17 Apr 2012 11:37:10 -0400

From: Ken Miller <kenezmiller@optonline.net>

To: Harley <harley@agelesswings.com>, Bob Holliston <bob.holliston@gmail.com>

CC: Tim Andres <tim2542@sbcglobal.net>, Dave Anderson <usaf\_david@yahoo.com>, canard-aviators@yahoogroups.com

...advise finishing your wings out to the winglet mount laminate area before mounting the winglets. Take them all the way to primer!!!

-------- Original Message -------- Subject: Re: [c-a] Newby build time question

Date: Tue, 17 Apr 2012 17:53:39 -0400

From: Harley <harley@AgelessWings.com>

To: Dave Anderson <usaf\_david@yahoo.com>

CC: Ken Miller <kenezmiller@optonline.net>, Bob Holliston <bob.holliston@gmail.com>, Tim Andres <tim2542@sbcglobal.net>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

I installed the engine, so I could fit the cowl, then removed it. The instruments holes I cut before I painted the inside. I did fill the fuselage as soon as I finished it. But other than that, I had completed the entire plane before doing all the hard, un-enjoyable, work!

-------- Original Message --------

Subject: [c-a] New Builder question

Date: Sun, 22 Jul 2012 17:52:50 +0000

From: Jay Foss <jdfoss@live.ca>

To: Canard group <canard-aviators@yahoogroups.com>

.... set of actual plans that lay out how to make the firewall 2" wider effectively giving the back seat passenger more room. The plans layout the firewall as well as the back seat bulkhead, the canopy and the landing gear mounting location... thoughts ...? ...

Jay

-------- Original Message --------

Subject: Re: [c-a] New Builder question

Date: Mon, 23 Jul 2012 11:20:12 -0600

From: Jerome Peck <flynrev@sbcglobal.net>

To: Jay Foss <jdfoss@live.ca>

CC: Canard group <canard-aviators@yahoogroups.com>

...I have the change - glad I did it, but the back seat is still tight. Be aware that this also involves a change on the engine mount and cowling.

Jerry Peck Long EZ N12NC

-------- Original Message --------

Subject: Re: [c-a] New Builder question

Date: Mon, 23 Jul 2012 14:55:25 -0400

From: Ken Miller <kenezmiller@optonline.net>

To: Jerome Peck <flynrev@sbcglobal.net>, Jay Foss <jdfoss@live.ca>

CC: Canard group <canard-aviators@yahoogroups.com>

It's not so much the width of the firewall. It's the shoulder room that is the killer. Widening the fuselage helps, but what I did fixes the problem and gives the back seater unlimited room. I moved the aft baggage bulkhead back to the spar. Anyone wanting the drawings just email.

Ken

-------- Original Message --------

Subject: Fwd: [c-a] Fwd:

Date: Wed, 17 Oct 2012 17:49:30 -0700



From: Bob Holliston <bob.holliston@gmail.com>

To: canard <canard-aviators@yahoogroups.com>

The latest from the man!

1327 South State St., Airport,   
 *Ukiah, CA., 95482   
 Phone 707-462-2939 Fx 462-3424 e-mail:* [fthrlite@pacific.net](mailto:fthrlite@pacific.net)  
 Larry Lombard Michael Dilley

LONG EZ PARTS PRICE LIST

January 30, 10

COMMENTS DESCRIPTION QTY. PER PRICE

AIRCRAFT EACH Main Landing Gear Strut 1 558.00 Nose Gear Strut 1 92.00

Engine Cowl Glass Top & Bottom Set 1 520.00

Cowl Inlet 1 86.00

Wheel Pants 3,5 x 5 set 1 239.00

Wheel Pants 500 x 5 1 275.00

NG 30 Cover 1 33.00

Pre Cut Foam Cores Canard 1 257.00

\*Pre Cut Foam Cores Wing & Winglets 1 1483.00

Leading Edge Fuel Strakes (NOT AVAILABLE) 1 599.00

Strut Cover SC 1 33.00

Nose Wheel Cover NB 1 33.00

Sump Blister SB 2 33.00

Requires cowl modification NACA Inlet 1 81.00

Carb. Air Box Kit 1 215.00

Baggage Pod Set 1 557.00

Nose Bumper Rubber 1 17.00

Space Saver Panel 1 64.00

E-Racer nose gear 1 107.00

A check or money order is required to process orders.

Orders are filled by postmark date.

California residents add 7.25% sales tax..

All Truck orders shipped freight collect..

We’ve negotiated a 50% discount with Fed-EX Freight (Viking Freight)

Substantial delivery fees are incurred for residential delivery.

Please include a telephone number, a mailing and a street address.

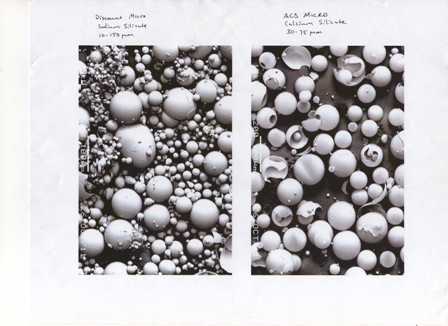
Please allow 30 days for delivery, we will expedite when possible.

We will discuss questions regarding our products by phone or mail..\*

\*Items must be shipped by truck..

## -Micro:

-Greg Norman Feb 2012: There was a great report awhile ago ... about the hazards of inhaling micro. This inspired me to dig up and scan an old photo of mine taken on a microscope. It started when a friend of mine bought a big drum of discount micro from a local distributor. I tried a sample and mixed it with epoxy for a cosmetic fill. I noticed it took a lot more micro to get the same consistency I was used to using. I was concerned of weight and other possible misgivings so I took it to work for analysis and comparison with ACS purchased micro. I found the discount micro was Sodium Silicate at 10-150 micrometers (or .00039 - .0059 inches). The ACS micro we buy is Calcium Silicate at 30 - 75 micrometers ( or .0012 - .0029 inches).



## -Night Vision:

**-**Henry Hallam <henry@pericynthion.org>, Fri, 6 Apr 2012 20:17:26 -0700: <http://stlplaces.com/night_vision_red_myth/>

Unaided night vision even now in the 21st century is still the subject of some controversy.

For those just looking for an executive answer as to what supplemental lighting should be used to reduced the recovery time back to night vision (dark adapted or scotopic) here it is: a fully dimmable white light! This of course is a very incomplete answer but so are the answers red or blue-green and you should know why.

Lets start with red, specifically what I will call the red light myth.

I believe the myth started in the photographic darkroom.

Until about 1906 most photosensitive material (plate, film, and paper) was not very sensitive to red. Some of these orthochromatic materials are still used. This allowed these materials to be dealt with for a short time under a relative bright red light because the human eye can see red if the level is bright enough. The fact that L.E.D.s (having a number of advantages over other light sources) were economically only available in red for some time has also help to perpetuate this myth.

As more research about the eye was done it was found that the structure responsible for very low light vision, the rods, were also not very sensitive to red.

It was assumed then that like film you could use red light, which is seen by the red sensitive cones (there are also blue and green sensitive cones to give color vision), without affecting the rods.

It takes a while for true night vision to be recovered. About 10 minutes for 10%, 30-45 minutes for 80%, the rest may take hours, days, or a week. The issue is the chemical in the eye, rhodopsin - commonly called visual purple, is broken down quickly by light. The main issue then is intensity; color is only an issue because the rods (responsible for night vision) are most sensitive at a particular color. That color is a blue-green (507nm) similar to traffic light green (which is this color for a entirely different reason). It would seem that using the lowest brightness (using this color) additional light needed for a task is the best bet to retain this dark adaptation because it allows rods to function at their best.

Unfortunately there are a number of drawbacks using only night vision.

Among these are:

* The inability to distinguish colors.
* No detail can be seen (about the same as 20/200 vision in daylight).
* That nothing can be seen directly in front of the eyes (no rods in the center of the retina), you must learn to look about 15-20° off center.
* Only motion can be detected well, therefore you may have to learn to move your eyes to detect something that doesn't move.
* Objects that aren't moving appear to move (autokinesis). This has probably led to a number of plane crashes.

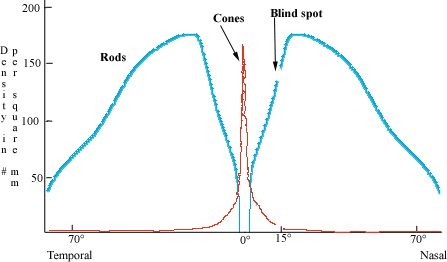
If you need to see directly in front of you or see detail you need red. Like many myths the red light myth has some basis in fact. The red truth?

Why red? The center 1.5% of your retina (the fovea) which provides you with most detailed vision is packed almost exclusively with red sensitive cones.

This is the same area that has no rods and is responsible for the night blind spot. There are fewer total green sensitive cones than red. The number of blue sensitive cones is very small compared to green and red.

Which is just as well since the lens in the human eye cannot focus red and blue at the same time. And using green really only changes perceived brightness because of the way the signals are processed in our neural pathways. Unlike a digital camera, more pixels, in this case, doesn't give us more detail.

Chart showing the distribution of rods vs cones. Note the absence of rods in the center and the absence of both about 15° away from the the center toward the nose where the optic nerve passes.



At first glance the tendency would be to pick the hue of red at which we are most sensitive (566nm) which would make sense except for the real reason: we don't want to involve the rods. The reason is the rods share the neural pathways with the cones so that you have this fuzzy image overriding the detailed one. This effect disappears at slightly higher mesopic levels which is why white is a good choice for most tasks. Many people look at the numbers for sensitivity for rods and cones and forget that in most cases the numbers have been adjusted so that rod peek sensitive matches cone peak. Rods are in fact sensitive well into the infrared (not too useful except to know that light you can barely sense can adversely impact your night vision). The key then is finding a hue that we can have at a high enough intensity that we can see the detail we need without activating our rods to the point were they obscure that detail. Most source say this should be nothing shorter than 650nm. Experimentation shows a L.E.D. with a peek around 700nm seems to work best (perceived as a deep red). Note that red may be fatiguing to the eyes.

Conclusions:

* No matter what your color choice it must be fully adjustable for intensity.
* If you need the fastest dark adaptation recovery and can adjust to the limitations, or everyone in your group is using night vision equipment then blue-green.
* If you must see detail (reading a star chart, or instrument settings) and can lose peripheral vision[(see note 1)](http://stlplaces.com/night_vision_red_myth/#note1), then a very long wavelength red at a very low level. Red really only has an advantage at very low levels (were the night blind spot is very obvious).
* A general walking around light so that you don't trip over the tripod, knock over equipment or bump into people, then blue-green with enough red added to get rid of the night blind spot, or maybe just use white. Blue-green at higher brightness also works very well and at a lower intensity than white.
* If you need to see color and detail then likely the best choice is the dimmest white light for the shortest amount of time.
* If you are in the military you must follow their rules; hopefully they will have a good course in unassisted night vision.
* If you are a pilot and say you only fly in the day, you should be aware of the problems of night vision and should consider a basic (ground) course in night flying.
* If you wonder why no one else has drawn these conclusions look at the dashboard of most cars. The markings are large, the pointers are large and an orange-red (a compromise, for certain "color blind" persons) and at night it is edge lit with blue-green filtered fully intensity adjustable light.

For Best night vision:

* Be sure you are getting enough vitamin A or its precursor beta-carotene in your diet (needed for the visual purple).
* Green leafy stuff is best followed by vegetables that have an orange color. Yes that includes carrots but spinach or dark leaf lettuce are better. It is possible to get too much vitamin A especially as a supplement.
* Keep up your general health. Smoking is also very bad for night vision, as are most illegal drugs and some prescription drugs.
* Keep your blood sugar level as even as possible. No meal skipping. Six small meals are better than three large meals. For carbohydrates favor starches (potatoes, rice, and bread) over simple sugars (sweets, alcohol).
* Use dark neutral gray sunglasses, that pass no more that 15% in full sun, when outside during the day.

True night blindness is rare. Most of what people call night blindness is either a lack of vitamin A in the diet or a failure to understand the night blind spot.

Cataracts, even minor ones, increase the effects of glare at night and the eye's lens does yellow and passes less light as we age which may contribute to what some call night blindness.

Note: The red filtered light at the intensity most people use is likely decreasing night vision much more than a properly dimmed white or blue-green light would!

Note: There are day blind spots also but are in a different position in each eye so are less of a problem.

Note: Blue-green (also called cyan, turquoise, teal and other names) as used here is NOT the combination of two colors but is a single particular hue. I use the most common name for that hue.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mil-STD 1472F 5.8.2.2 (table XVI) display lighting** | | | | |
|  | | Brightness of markings | |  |
| Condition of use | Lighting Technique \* | cd/m2 | foot-lamberts | Brightness Adjustment |
|  | | | | |
| Indicator reading, dark adaptation necessary | Red flood, indirect, or both, with operator choice | 0.07-0.35 | (0.02-0.1) | Continuous throughout range |
|  | | | | |
| Indicator reading, dark adaptation not necessary but desirable | Red or low-color-temperature white flood, indirect, or both, with operator choice | 0.07-3.5† | (0.02-1.0) | Continuous throughout range |
|  | | | | |
| Indicator reading, dark adaptation not necessary | White flood | 3.5-70 | (1-20) | Fixed or continuous |
|  | | | | |
| Panel monitoring, dark adaptation necessary | Red edge lighting, red or white flood, or both, with operator choice | 0.07-3.5 | (0.02-1.0) | Continuous throughout range |
|  | | | | |
| Panel monitoring, dark adaptation not necessary | White flood | 35-70 | (10-20) | Fixed or continuous |
|  | | | | |
| Possible exposure to bright flashes, restricted daylight | White flood | 35-70 | (10-20) | Fixed |
|  | | | | |
| Chart reading, dark adaptation necessary | Red or white flood with operator choice | 0.35-3.50 | (0.1-1.0) | Continuous throughout range |
|  | | | | |
| Chart reading, dark adaptation not necessary | White flood | 17-70 | (5-20) | Fixed or continuous |
|  | | | | |
| \* Where detection of ground vehicles or other protected assets by image intensifier night vision devices must be minimized, blue-green light (incandescent filament through a filter which passes only wave lengths shorter than 600 nm) should be used in lieu of red light. | | | | |
|  | | | | |
| † Possible error in original, read as: 0.07-0.35, likely occurred when converted to metric. | | | | |

**This is intended only as an overview, no warranty of this information is expressed or implied**

[Update 17 Nov 2003] I find new myths are springing up. Such as blue-green L.E.D.s are emitting two colors of light. This is a mis-understanding of the color name and that this is the most accepted name for this one color. Another is that blue improves night vision. While at somewhat higher levels it, of course, is stimulating the rods. It is not an optimum color. Another long standing myth is that human visual perception is based on three colors when it is really based on four. The rods are usually ignored because many people believe, wrongly, that at the brightness at which we perceive color the rods are no longer providing our brains with any information. In fact the perception of brightness is highly influenced by the rods well into the photopic (bright light) range of vision. Fluorescent lamp manufacturers have used this knowledge for a long time. "Cool White" lamps have an additional amount of green phosphor added to make us "see" them as being brighter! Of course the whole subject of color vision and the variances thereof (wrongly called "color blindness") will require a number of new pages even in synopsis form.   
A point I forgot to cover is that to help preserve night vision in one eye the other may be closed or covered if you know your are about to be exposed to a brighter light, such as from a oncoming vehicle. For normal observation both eyes should be kept open. If it is difficult to concentrate on the desired image the eye not being used may be covered but not closed. Closing affects focus and possibly accuity.  
  
[Update 14 Dec 2003] A very important point barely mentioned in the original is that human peripheral vision is almost completely rod based! The implication then is that we cannot see color at the edges of our vision. If you think we can, try this simple experiment. You will need a small assortment of color cards (try sheets of construction paper) and someone to assist you. Sit looking straight ahead while your assistant, about 6 to 10 feet away, slowly moves a random color card into the margin of your vision. Now, while still looking straight ahead, what color is is the card?   
  
This is the second most important factor that has been ignored in the design of outdoor lighting, the first being glare! However this [study](http://stlplaces.com/cgi/redirect.cgi?http://dmses.dot.gov/docimages/pdf66/133155_web.pdf) (in pdf), at the U. S. Dept. of Transportation, is a subjective study of blue tinted headlamps.  
  
[Update 23 Jan 2004] A few random notes to be better integrated into this document later.  
Luminances are approximate and will vary with the individual and conditions.  
Vision luminance rage 1 \* 10-6 to 1 \* 106 cd/M2  
Rods luminance rage 1 \* 10-6 to 1 \* 103 cd/M2 (may still play a roll above this range)  
Cones luminance rage 1 \* 10-3 to 1 \* 106 cd/M2  
Explain "Purinke shift"  
20/20 vision is the ability to resolve 1 minute of arc at 20 feet.  
Discuss Ricco's Law.  
Discuss afterimages.  
  
  
Saw the yahoo search string: "Do color blind people have better night vision?", which is an interesting question. Those with the genetic factor shifting the L (red) cones toward green are accepted as usually having better twilight vision, however the only place I've seen a suggestion of improved night vision is in the Wikipedia!

References *(all external links open in new window -* ***Not responsible for the content of any outside links****)*

* ["Dark Adapted"](http://stlplaces.com/cgi/redirect.cgi?http://www.adpartnership.net/DarkAdapted/index.html) - a program for setting the gamma of your computer display to help preserve night vision (Win and Mac) and your choice of color  
  (note: price is right and better than just placing a filter over the screen, although the right filter (in addition) might help in special very low level work)
* [Light and Dark Adaptation](http://stlplaces.com/cgi/redirect.cgi?http://webvision.med.utah.edu/light_dark.html) - Webvision - John Moran Eye Center - University of Utah
* [Vision and the Eye](http://stlplaces.com/cgi/redirect.cgi?http://www.phys.ufl.edu/~avery/course/3400/gallery/gallery_vision.html) - Physics Dept. University of Florida
* [The LED Museum](http://stlplaces.com/cgi/redirect.cgi?http://ledmuseum.home.att.net/) - Craig Johnson, host
* [An Adaptation Model](http://stlplaces.com/cgi/redirect.cgi?http://www.cs.utah.edu/~shirley/papers/ferwerda96.pdf) for Realistic Image Synthesis. by Ferwerda, Pattanaik, Shirley, Greenberg. SIGGRAPH '96 Conference
* [Simulation](http://stlplaces.com/cgi/redirect.cgi?http://www.cs.berkeley.edu/~efros/java/vision/vision.html) of Human Visual Response at Varying Levels of Illumination (requires java, good simulation but does not show blind spot and loss of accuity is not as much as it should be)
* [Radiometry and photometry FAQ](http://stlplaces.com/cgi/redirect.cgi?http://www.optics.arizona.edu/Palmer/rpfaq/rpfaq.pdf) - Optical Sciences Center - University of Arizona (.pdf Acrobat)
* [SCOTOPIC LUMINOUS EFFICIENCY](http://stlplaces.com/cgi/redirect.cgi?http://www.4colorvision.com/files/scotopiceffic.htm) FUNCTION OF THE HUMAN RETINA from PROCESSES IN BIOLOGICAL VISION
* [Chapter 8](http://stlplaces.com/cgi/redirect.cgi?http://atiam.train.army.mil/portal/atia/adlsc/view/public/297163-1/fm/3-04.301/ch8.htm) Principles and Problems of Vision in [FM 3-04.301](http://stlplaces.com/cgi/redirect.cgi?http://atiam.train.army.mil/portal/atia/adlsc/view/public/297163-1/fm/3-04.301/toc.htm) - Aeromedical Training for Flight Personnel - U. S. Army
* [NIGHT VISION in MILITARY AVIATION](http://stlplaces.com/cgi/redirect.cgi?http://www.brooks.af.mil/web/af/courses/amp/AMP_Online/amp_Eye_lectures/UNV7.doc) - USAF School of Aerospace Medicine
* [Mil-STD 1472F](http://stlplaces.com/cgi/redirect.cgi?http://hfetag.dtic.mil/docs-hfs/mil-std-1472f.pdf) DoD Design Criteria Standard - Human Engineering (.pdf Acrobat) [link changed 04/06/2004]
* [Human visual pigments:](http://stlplaces.com/cgi/redirect.cgi?http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=6140680&dopt=Abstract) microspectrophotometric results from the eyes of seven persons. - Dartnall HJ, Bowmaker JK, Mollon JD. - National Institute of Health
* [Visual pigments](http://stlplaces.com/cgi/redirect.cgi?http://www.jphysiol.org/cgi/content/abstract/298/1/501) of rods and cones in a human retina - JK Bowmaker and HJ Dartnall - The Journal of Physiology
* [Tetrachromacy](http://stlplaces.com/cgi/redirect.cgi?http://www.iscc.org/aic2001/abstracts/poster/Gavrik.doc) of Human Vision: Spectral Channels and Primary Colors - Vitali V. Gavrik - Inter-Society Color Council (.doc word file)
* Advances in Photoreception: Proceedings of a Symposium on Frontiers of Visual Science (1990) especially “Photosensitivity of Primate Photoreceptors” which can be read online free at [Nat'l Academies Press](http://stlplaces.com/cgi/redirect.cgi?http://books.nap.edu/books/0309042402/html/31.html#pagetop) (note graph on page 34)
* [Basic data](http://stlplaces.com/cgi/redirect.cgi?http://cvrl.ucl.ac.uk/basicindex.htm) (but all normalized to a peek value of 1) from Color & Vision database at the Institute of Ophthalmology in London

Pages referencing this:

* [Gammatron](http://stlplaces.com/cgi/redirect.cgi?http://gammatron.novarese.net/2003/11/12.html)
* from time to time on [CandlePower Forums](http://stlplaces.com/cgi/redirect.cgi?http://www.candlepowerforums.com/) such as [this thread](http://stlplaces.com/cgi/redirect.cgi?http://www.candlepowerforums.com/ubbthreads/showflat.php?Cat=&Board=UBB3&Number=410525).
* mentioned on a German [astronomy forum](http://stlplaces.com/cgi/redirect.cgi?http://forum.astronomie.de/phpapps/ubbthreads/showthreaded.php?Cat=&Board=astro&Number=137838&page=0&view=collapsed&sb=5&o=&vc=1)
* mentioned on [The Astronomy Connection](http://stlplaces.com/cgi/redirect.cgi?http://observers.org/) [mailing list](http://stlplaces.com/cgi/redirect.cgi?http://observers.org/tac.mailing.list/2004/Apr/0049.html)
* mentioned on [Astronomy 201 Course from February 2004](http://stlplaces.com/cgi/redirect.cgi?http://www.nhastro.com/courses/Astro201-Feb2004.htm)
* mentioned on [CouldyNight's astronomy forum](http://stlplaces.com/cgi/redirect.cgi?http://www.cloudynights.com/ubbthreads/showflat.php/Cat/0/Number/300567/page/0/view/collapsed/sb/5/o/all/fpart/1) and [this thread](http://www.cloudynights.com/ubbthreads/showflat.php/Cat/1,2,3,4,5,8,9,10/Number/251900/page/0/view/collapsed/sb/5/o/all/fpart/1) as well.
* mentioned on [Pontchartrain Astronomy Society's astronomy forum](http://stlplaces.com/cgi/redirect.cgi?http://www.pasnola.org/phpBB2/viewtopic.php?t=907)
* a link from the [BMW E28 Enthusiasts Forum](http://forums.mye28.com/e28/messages/107830.html)
* and as part of the [Charleston Fishing](http://www.charlestonfishing.com/forum/topic.asp?TOPIC_ID=19419) forum

-------- Original Message -------- Subject: Re: [c-a] night vision

Date: Sun, 8 Apr 2012 21:39:37 -0600

From: to tu <totucomm@gmail.com>

To: Izzy Briggs <INBRIGGS@yahoo.com>

CC: jean <gene0812@verizon.net>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

Here's another write-up that speaks well to that. <http://www.jet-jobs.com/samples/magsample/04_feb/lighting.html>

Tom Tugan

|  |
| --- |
| **Part II: The effect of lighting color on night vision**  **Subheads:** [Red vs. White](http://www.jet-jobs.com/samples/magsample/04_feb/lighting.html#red) \* [Vision Considerations](http://www.jet-jobs.com/samples/magsample/04_feb/lighting.html#vision) \* [Aircraft Options](http://www.jet-jobs.com/samples/magsample/04_feb/lighting.html#aircraft) \* [Night-Vision Devices](http://www.jet-jobs.com/samples/magsample/04_feb/lighting.html#night) \* [Panoramic Displays](http://www.jet-jobs.com/samples/magsample/04_feb/lighting.html#displays) **Sidebars:** [Optimizing Night Vision](http://www.jet-jobs.com/samples/magsample/04_feb/lighting.html#opt) [*by Clarence E. Rash*](http://www.jet-jobs.com/samples/magsample/04_feb/lighting.html#author) |
| **D**ark adaptation is the process by which the eyes adapt for optimal night visual acuity under conditions of low ambient illumination. The eyes require about 30 to 45 minutes to fully adapt to minimal lighting conditions. The lower the starting level of illumination, the more rapidly complete dark adaptation is achieved. If dark-adapted eyes are exposed to a bright light source (searchlights, landing lights, flares, etc.) for a period in excess of one second, night vision is temporarily impaired. Exposure to aircraft anti-collision lights does not impair night vision adaptation because the intermittent flashes have a very short duration of less than a second.  The debate over the merits of red lighting vs. white lighting has persisted for years, ever since the search for new methods of crew-station lighting began during and after World War II. While red lighting often was used in military planes at the time, pilots were sometimes required to wear red goggles for a certain period of time before embarking on nighttime sorties. These precautions for night adaptation were thought necessary because pilots needed to be able to spot enemy aircraft after departing from inadequately lighted airports and navigating most often by vision, rather than by instruments.  **RED vs. WHITE**  During his work with film development in the late 1930s and early ‘40s, H.K. Hartline, a physician and physiologist, found that he adapted well to darkness under red lighting conditions. Later, working for the U.S. Navy, Hartline demonstrated that red-lighted instruments were readable at low-light levels. Some of his other work with the human retina had shown that the rods are almost totally insensitive to red. As a consequence of his recommendations, the U.S. Army and U.S. Navy began using red light in their cockpits in the 1940s.  To produce red lighting during an era when incandescent lamps were the primary light source, the light from the lamps was filtered. However, this increased the cost of the lighting, generated heat in the instrument panel, and prompted manufacturers to question whether there really was an advantage to using red lighting in place of white lighting.  Hartline’s conclusions, though, have been supported by numerous other studies on dark adaptation. For instance, a 1982 U.S. Army report compared the effects of red lighting and blue-white lighting (which uses a blue filter to compensate for an incandescent lamp’s tendency to turn yellow as it is dimmed) on dark adaptation under operational conditions. According to the report, “under conditions of total or nearly total darkness, red lighting preserves visual sensitivity for outside viewing to a greater extent than does blue-white lighting. This is true even when instrument lights are set at the low levels ... at which (U.S. Army) aviators normally set their instruments.”  Regardless, the report also said that with a full moon illuminating a clear sky, the difference between the two lighting schemes “vanishes.”  Other studies have examined the advantages of white light. In a 1987 book, Frank Hawkins cited a number of advantages, including that white light reduces eye fatigue, improves instrument and display contrast, provides better illumination in thunderstorms and daylight, and permits effective color coding. In red light, the color coding on some aeronautical charts and some flight instruments disappears—that is, the information is readable, but color differentiation among symbols cannot be seen.  The American Optical Association said that red lighting on the flight deck requires more focusing power than white light or blue-green light for near objects to be observed clearly. This may cause difficulty, especially for pilots in their 40s and older with presbyopia—the most common age-related change in vision—in which the eyes become less able to focus on nearby objects.  Nevertheless, red lighting became the standard for military aircraft and some non-military aircraft, and functioned well until the introduction of night-vision goggles (NVGs), multicolored CRT displays, and active-matrix LCD displays, which were found to be incompatible with red lighting.  **VISION CONSIDERATIONS**  Studies determined that ambient red lighting does not provide true dark adaptation, but instead provides color adaptation. In the human eye, the retina is the inner layer of the eyeball that contains photosensitive cells called rods and cones. The retina functions similarly to the film in a camera: to record an image. The cones are located in higher concentrations than rods in the central area of the retina known as the macula, and exact center of the macula has a very small depression called the fovea that contains cones only. Cones are used for day or high-intensity light vision and are involved with central vision to detect detail, perceive color, and identify far-away objects.  Rods, meanwhile, are located mainly in the periphery of the retina—an area about 10,000 times more sensitive to light than the fovea. Rods are used for low-light intensity or night vision and are involved with peripheral vision to detect position references including objects (fixed and moving) in shades of grey, but cannot be used to detect detail or to perceive color. The rods and cones adapt to the red wavelengths; consequently, the pilot may have difficulty discriminating between some colors on the color display. Partly to address this issue, the U.S. Air Force decided to use blue-white lighting on its flight decks, but blue-while lighting on an instrument panel requires about 30 percent more lamps, which requires a bigger power supply, which in turn requires more weight, which decreases useful load. So, until the advent of multi-function displays (MFDs) in the 1980s, most commercial aircraft use unfiltered white lighting to reduce costs. **AIRCRAFT OPTIONS**  In the early 1990s, the Aerospace Lighting Institute suggested the following guidelines for selecting a lighting system based on color:  If the primary visual task is inside the flight deck, consisting of monitoring display instrumentation and controls, and the outside visual task of scanning for other aircraft takes a secondary role (without compromising safety), then a lighting system comprised basically of white lights is recommended; If the primary visual task is scanning for lights and other aircraft (but night-vision devices are not being used), then a lighting system comprised basically of red lights is recommended; and, If night-vision devices are required for flight, then both white light and red light are prohibited. A blue-green lighting system has been found to be effective in military aircraft.These basic guidelines, although useful, have been difficult to apply because of the use of MFDs in aircraft with glass cockpits. Today’s airliners generally utilize unfiltered white light at crew stations for both panels and instruments (except flat-panel displays). For example, all current Boeing airplanes use unfiltered white light. Pilots are able to dim area lighting and instrument lighting to “appropriately low levels to allow sufficient dark adaptation for nighttime operation,” Dr. Alan Jacobsen, technical fellow, flight deck engineering with Boeing Commercial Airplanes, said. Those levels were determined by human factors evaluations, Jacobsen explained. The aircraft also are equipped with storm lighting “in which the flight deck lighting can be driven to fairly bright levels with the flip of a switch” to counter the loss of dark adaptation resulting from lightning flashes, he added. John Lauber, vice president for safety and technical affairs at Airbus, said that his company also uses unfiltered white light on the flight decks of its aircraft. “[Using red light to protect] night vision may have been important at one time,” Lauber said, “but is probably not so significant now, with modern lighting systems, both airborne and ground-based.”  The U.S. Air Force uses blue-white incandescent light for both panels and instruments (except flat-panel displays) at crew stations that do not require utilization of a night vision imaging system (NVIS). A blue filter sometimes is placed over incandescent lamps to compensate for a yellowing that occurs when they are dimmed. The U.S. Navy and U.S. Army use red incandescent lighting for both panels and instruments (except when flat-panel displays are used) in aircraft where an NVIS is not used. In aircraft in which an NVIS is used, blue-green NVIS-compatible lighting is used. The blue-green lighting is required because an NVIS has a spectral sensitivity that favors the red end of the electromagnetic spectrum, including both the red region of the human visible spectrum and the invisible infrared region. A blue cutoff filter that prevents virtually all blue light from being seen enhances this characteristic.  Modern corporate aircraft have white electroluminescent (EL) panels and incandescent instrument lighting (except when flat-panel displays are used). Most smaller general aviation aircraft are equipped with incandescent post lighting for instruments and post lighted indicia (plates) for legends and circuit breaker panels.  **NIGHT-VISION DEVICES**  For years, military aviators have operated at night using night-vision-viewing devices with image intensification. The better known of these night-vision aids consists of a pair of image-intensifier tubes mounted in a binocular configuration on a helmet. While using this system the pilot looks through it to view the outside world and looks beneath and around it to view flight instruments. Originally called NVGs and later the aviator’s night-vision imaging system, the device now is referred to as NVIS.  The military used night-vision aids for ground operations during the late 1960s. Aviation-developed NVGs have been used in military aircraft since the 1970s and now are being used in civil aviation—both in rotary-wing and fixed-wing aircraft—especially in law enforcement and emergency medical services (EMS) operations. While not likely to become an option for airline pilots, the U.S. Federal Aviation Administration (FAA) issued the first supplemental type certificate in January 1999 to authorize use of night-vision devices by civilian EMS helicopter operators. Using NVIS for night flight provides the flight crew with improved methods of orienting the aircraft and avoiding terrain and obstructions. Disadvantages, however, include reduced depth perception, neck strain, fatigue, a decrease in visual acuity, absence of color discrimination, and a reduced field of view.  Image intensifiers amplify reflected or emitted light so the eye can more readily see a poorly illuminated scene. These devices depend on the presence of a minimum amount of light to produce a usable image. This is analogous to using a microphone, amplifier, and speaker to allow the ear to more easily hear a faint sound. The intensified image resembles a black and white television image but in shades of green (caused by the selected display phosphor) instead of shades of gray. Using the principle of image intensification, an NVIS multiplies (amplifies) the few photons present at low ambient light levels into a larger number seen by the user. The multiplication factor is typically 6,000 to 8,000.  The use of an NVIS on the flight deck presents lighting designers with a dilemma. The primary purpose of air NVIS is to allow the pilot to see the outside world. An NVIS has an automatic gain control that reacts to the ambient light level, so if the ambient light level decreases, the gain control increases the multiplication factor; if the ambient light level increases, the gain control decreases the multiplication factor.  The dilemma is that an NVIS must respond to the ambient lighting level outside the flight deck, but cannot differentiate between light (photons) originating outside the cockpit (the desired response) and light originating inside the cockpit (i.e.. light from the display instruments). Therefore, the lighting designer must illuminate the cockpit with light that will allow the pilot to clearly view the instruments through the NVIS, but that will not cause the NVIS to lower its performance in amplifying the low-light scenes outside the aircraft.  The military has attempted to overcome this problem by developing a blue-green (no red) lighting system that uses the unique spectral response of NVIS. The blue-green light is visible to the human eye beneath the NVIS—allowing the pilot to view the instruments—but is virtually invisible to the NVIS and does not adversely affect performance. The pilot can optimally perform both the required internal visual tasks and external visual tasks.  Until the recent introduction of alternative light sources, flight deck lighting consisted totally of incandescent lamps. A substantial part of emissions from these lamps is in the near-infrared region of the electromagnetic spectrum—the most sensitive portion of the NVIS response. The acceptable blue-green lighting system was achieved by the use of special filters capable of blocking almost all of the red and infrared energy of the incandescent lamp.  The blue-green lighting scheme was a satisfactory solution to the main function of crew station lighting (visibility of dials, switches, and other items); nevertheless, red warning lights and yellow caution lights remain an additional NVIS lighting challenge. To retain the color function of these lights, they cannot be made completely compatible with an NVIS.  If an NVIS is used, the pilot’s eyes usually function in the low photopic-mesopic region of vision. After the NVIS is removed, complete dark adaptation is regained in just three to five minutes. This is because the average light levels associated with NVIS do not completely bleach the eye’s rhodopsin.  **PANORAMIC DISPLAYS**  Although glass cockpits retain a few dedicated instruments requiring separate lighting, LED light sources or EL light sources increasingly are replacing traditional incandescent lamps.  Newer light sources also are being developed, including the organic (carbon- based) light-emitting diode (OLED), which consists of a series of organic thin films between two conductors. Bright light is emitted when electrical current is applied, in a process called electrophosphorescence. OLEDs, which could be available on flight decks within three years and could become commonplace within a decade, are self-luminous, require no backlights, and will provide high luminance and low-power displays that are only thousandths of an inch thick. OLEDs also have the potential to be used as flexible displays that can be bent, twisted, or rolled into various shapes. Lighting specialists believe that OLEDs may someday make panoramic flight deck displays a possibility.  The types of lighting used on the flight deck differ according to a number of factors, including the requirements of the human visual system and the purpose of the flight. The color of flight deck lighting, and its intensity, should be chosen to ensure that flight crewmembers are always able to obtain information from instrument panel displays and navigational charts and to perform other visual tasks.   |  | | --- | | **OPTIMIZING NIGHT VISION** | | Regardless of flight deck design, the following actions can help ensure that lighting is optimized for night flying: Ensure that all aircraft lighting (both interior and exterior. and including dimming controls) is functioning properly prior to flight; If a night flight is planned, wear sunglasses during the day (15 percent light transmission is recommended). This will increase the rate of dark adaptation and improve night-vision sensitivity; Avoid bright lights for 30 minutes immediately before a night flight; Just before takeoff, after the eyes have adapted to darkness, adjust the instrument lighting level so that all displays are readable. Use the minimum setting required to preserve dark adaptation levels while maintaining the ability to see outside the flight deck; If a map light or utility light must be used, keep the light as dim as possible and use it for the briefest possible period; Because dark adaptation is an independent process in each eye, close one eye when being briefly exposed to a bright light (for example, while reading a map). This protects that eye and eliminates the need for re-adaptation; and, While flying an aircraft near storm clouds, increase the level of instrument lighting to its maximum level in anticipation of lightning flashes. *— Rash & Manning* | |

## -Nose Access Panel:

-------- Original Message --------

Subject: [c-a] Hidden fastener nose access door.

Date: Mon, 24 Dec 2012 11:52:27 -0800

From: Bob Holliston <bob.holliston@gmail.com>

To: canard <canard-aviators@yahoogroups.com>

Here's the slickest way to do it. Two s/s 1/8" dia. welding rods go through the panel, then through the access door for avionics, then through the canard cover, then into the nose door. Pull the rods back 1/2" to open the (hinged) nose door or pull them all the way out to access the avionics door. The rods go through nyloflo tubing all the way. I've done four EZ's like this. The only downside is if you forget the canard bolts. it might just fly. For awhile.

Bob LongEZ NX666DV.



-------- Original Message --------

Subject: [c-a] Re: Hidden fastener nose access door.

Date: Tue, 25 Dec 2012 12:08:41 -0800

From: Bob Holliston <bob.holliston@gmail.com>

To: canard-aviators@yahoogroups.com

Bill, to make the doors water tight: First of all, the ends of the nylaflo tubing can't move at all. Pic. # 1 shows the ends. Drill a 3/16" hole thru a piece of wooden dowel, slip it over the nylo and glass in place. This is 1/16" before it goes into the door. Then lay down a bead of silicone caulk down the center of the door flanges, cover with saran wrap, close the doors and insert the rods. After setting up it makes a perfect seal. Upholstry: I'll get some pic's this week. In the seatbottoms there is 2-3 layers of crashfoam then 2" of normal foam over that. I cut everything out and took it to a local upholstry lady. Don't know what she would charge as I traded her for a formica job in her kitchen. (I'm a carpenter.) In the 4th pic. you can see a split about 6" long in the left side. This is so I cad pick it up and look thru a hole in the thigh rest. On the back of the retract. landing light is a mirror which can be adjusted so I can see the position of the speedbrake and/or if the engine is on fire.

Bob LongEX NX666DV.

## -Nose Wheel:

-Ken Miller Jan 2012: Service every inspection if not sooner.  I always wash it down with AvGas or mineral spirits, polish the post, and then lube it up with heavy grease.  I also modified the Oilite bearings, removing the old ones that only have about 3/8 inch bearing surface and replace them with one inch units.  -Jim Evans Jan 2012: I drilled and install a grease fitting on the casting not only for the nose gear but also the gear pivot bearings and the top of the strut. -Nick Ugolini Jan 2012: In my case (sticky nose wheel action) it was because the oil lite bearing was being squeezed on the Al of the fork and the AL of the mount casting. I tried greasing it often but the it  
would always start sticking again. The Al is somewhat soft sticky type metal under pressure (requiring  
lots of grease) so I obtained another disk of oil lite (like what is installed on your plane) from Jack Wilhelmson (www.eznoselift.com) for a few $$ and placed it on top of the existing oil lite bearing.  I had 2 oil lite bearings instead of one.  The two bearing pressed on each other providing a much better surface for rotation than the oil lite trying to rotate against Al under high clamping pressure.

-Terry Schubert Jan 2012: Another important part of shimmy prevention is to be sure that the nose fork pivot shaft sits vertical or tipped slightly - top aft. If it is tipped top forward at all the chances of a divergent flutter increase greatly. That angle can momentarily occur during a hard landing or rough runway when the shock strut spring compresses more than normal.

## -Nose Gear:

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Wear pattern of my Wilhelmson nose gear jack

Date: Wed, 21 Mar 2012 17:50:12 -0400

From: Jack Wilhelmson <eznoselift@gmail.com>

To: Elwood Johnson <ejandlinda@earthlink.net>

CC: Bulent Aliev <bulent.enginegear@gmail.com>, Neil Clayton <harvey4@earthlink.net>, cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

The Keyway wear shown in Neil's picture is normal for older units. It will not ever cause a failure of any kind. We added a small wear shoe to the keyway to enlarge the wear area in 22008. The keyway is there to keep the lower tube from turning due the small amount of friction in the bearings. No matter how much wear is there the keyway will still keep the lower tube from turning. We changed it because some users insisted that they wanted it fixed for strictly cosmetic reasons. We also will upgrade any unit with the new later change that reduces the wear for shipping charges only no matter how old the unit. The amount of wear is related to the load on the nose lift because more load means more friction force. I have explained this to Neal and some other users a long time ago. Jack Wilhelmson [www.eznoselift.com](http://www.eznoselift.com)

On Mar 20, 2012, at 9:03 PM, Neil Clayton <[harvey4@earthlink.net](mailto:harvey4@earthlink.net)> wrote:

Take a look ...grub screw is carving it's way through the side of the anti-rotation keyway slot.

Instinct tells me it's gonna ...bite me one day. Has anyone had one of these units (Thompson Saginaw?) apart?...

Neil

<IMG\_2353.jpg>

 -?????I have a bolt through the strut where the NG-3 attaches exactly in the middle, side to side. I believe this is a useful safety feature in the case of flox disbond, and does not detract from the strength of the strut. With respect to Chad Wilhelm's comments about the MKNG-15 casting attach to the lower end of the strut, I do not recommend ANY bolts, fore/aft or side/side there, but DO recommend "bulbing" the end of the strut and recessing the socket in the MKNG-15 to prevent NKNG-15 departure in the case of flox bond failure.

Jack Wilhelmson [www.EZnoselift.com](http://www.EZnoselift.com). Feb 2012: The NG3A  and NG4A have a tooling hole in the bottom of them. This hole is not for a bolt to fasten the parts to the strut. It is used in the manufacturing process and nowhere in the instructions is it described for a bolt.

Wright Nose Lift: Contact Robert  and Valerie Harris at: http://www.ezjetinc.com/wright\_nose\_lift.php

-------- Original Message -------- Subject: Re: FW: [c-a] Retractable gear

Date: Fri, 23 Mar 2012 07:46:48 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Dennis Purduski wrote:

> Wasn’t the original intent of the nose down parking position to allow easier access?

No. The original intent of the retractable nose gear was to combine the lower drag and higher speed with the need to keep the plane from tipping over backwards with no front seat pilot/passenger in place. The easier access was a byproduct, not a requirement.

> ...I have thought about moving the main gear aft... ...

Do NOT do this. The main gear position is set by the takeoff requirement to be able to rotate at a reasonable speed. Moving the main axles rearward will substantially increase the weight the canard needs to lift while on the ground and increase the takeoff rotation speed. This is not a good idea.

I know of a well-known Long-EZ whose gear was moved rearward by two inches to allow it to sit on the ground without grazing while no-one's in the front seat. The pilot (who has flown MANY EZ's) says that his aircraft has a noticeably longer ground roll than the other LE's he's flown, and that's even with an O-360 in it. He does NOT recommend this modification.

Marc J. Zeitlin

-Ric Lee Mar 2012: ... A "professional" builder mounted the main gear backwards in an early Berkut.  It was flown for a while before this nifty fact was discovered and it had the longest take off roll/airspeed  
before it would rotate of any Berkut.

-------- Original Message --------

Subject: Re: [c-a] Thrust from winglets

Date: Fri, 08 Jun 2012 22:04:20 -0000

From: Silvereagle <dndnhrd@gmail.com>

To: canard-aviators@yahoogroups.com

...Front gear leg The Jack Wilhelmson NG6 stops wandering and brake use on long taxying....

-------- Original Message --------

Subject: [c-a] Re: vari-eze nosewheel fork

Date: Mon, 9 Jul 2012 06:25:50 -0700 (PDT)

From: Stan Susman <stanpfa@pacbell.net>

Reply-To: Stan Susman <stanpfa@pacbell.net>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Jim Emons of Chino make a very sound fork or entire assembly at a good price, 909 239 2706 is his cell, and it doesn't take a message. Pumbaa

-------- Original Message --------

On Tue, Aug 28, 2012 at 7:20 PM, Ken <kenezmiller@optonline.net

<mailto:kenezmiller@optonline.net>> wrote:

...installed the Whilhelmson unit on a Cozy and found that it still had some play!!!

On Wed, Aug 29, 2012 at 7:10 PM, Jack Wilhelmson <eznoselift@gmail.com <mailto:eznoselift@gmail.com>> wrote:

...The NG6A is set up for preload on the tapered roller bearings. So if you installed it and still had play, then the following things should be checked:

1. The AN5 bolt should be torqued to limit torque (150 inch lbs).

2. After torquing the AN5 bolt. Check for clearance between the ends of the bearing cones and the inside of the aluminum pads on the inside of the NG30s. There should be zero clearance. If there is clearance then shim washers may be needed to take up this clearance.

3. Check for structure damage of the NG30s, and nose gear strut.

Jack Wilhelmson EZnoselift.com

-------- Original Message --------

Subject: [c-a] NG6A Free Play

Date: Wed, 29 Aug 2012 21:38:00 -0400

From: Ron Springer <ron228rj@gmail.com>

To: canard-aviators <canard-aviators@yahoogroups.com>, cozylist <cozy\_builders@googlegroups.com>

...I had a similar issue with free play of the improved NG6A ... The two bearings are pressed into the NG6A on their outside diameter. This should be a tight fit. The drawing provided with the NG6A even states that it should be an interference fit (requiring cooling and heating of parts). On the NG6A that I received, the NG6A had been machined too large and there was slop around outside of the bearings. This had been solved prior to my receiving the part by the use of adhesive to make a tight fit. ...the adhesive failed on one side. ...substantial motion down by the wheel. ...

Ron Springer

-------- Original Message --------

Subject: [c-a] Re: COZY: NG6A Free Play

Date: Wed, 29 Aug 2012 22:19:10 -0400

From: Jack Wilhelmson <eznoselift@gmail.com>

To: Ron Springer <ron228rj@gmail.com>

CC: canard-aviators <canard-aviators@yahoogroups.com>, cozylist <cozy\_builders@googlegroups.com>

...You need to send the NG6A back to us and we will replace it.

Jack Wilhelmson EZnoselift.com

-------- Original Message --------

Subject: [c-a] Re: YouTube Video NG inspection

Date: Tue, 28 Aug 2012 14:18:38 -0700

From: Dale Martin <Niceez@gmail.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

... short video ...maintaining (inspecting) the Nose Gear for lateral movement.. I have fixed 14 of these in the last 12 months...

http://www.youtube.com/watch?v=YYz9LZID124

We use larger bushings in the NG6 to solve this but the ultimate solution is to install the Wilhelmson NG6A. ...problem free after the NG6A is installed "correctly." ...Dale

---------------------- Original Message ----------------------------

\*From:\* to tu <totucomm@gmail.com>

\*To:\* canard-aviators@yahoogroups.com

\*Sent:\* Sunday, October 14, 2012 5:13 PM

\*Subject:\* [c-a] Re: Original Rutan LEZ bow vs Featherlite

Disregard, turns out the bow I'm looking at was produced by somebody called 'Lombardi'. Not interested.

On Sun, Oct 14, 2012 at 4:02 PM, to tu <totucomm@gmail.com <mailto:totucomm@gmail.com>> wrote:

Is anyone familiar with any differences between an original Rutan LongEz main-gear bow vs Featherlite's. ...

Tom

-------- Original Message --------

Subject: Re: [c-a] Re: Original Rutan LEZ bow vs Featherlite

Date: Mon, 15 Oct 2012 21:38:59 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

CC: canard-aviators@yahoogroups.com

...Larry Lombard \_IS\_ Featherlite.

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] Re: Nose Gear Fork

Date: Sat, 17 Nov 2012 16:18:17 -0500

From: Harley <harley@AgelessWings.com>

To: Gary Hunter <gluegaru@earthlink.net>

CC: canard-aviators@yahoogroups.com

...Jack Wilhelmson still supplies one...with the recommended belleville washer shimmy damper already installed. This is the one that I replaced my original with, as I am sure many others here have.

www.eznoselift.com/index.php/price-list

Look down the page a ways for part number\*NG401A

Harley Dixon

-------- Original Message --------

Subject: [c-a] Re: Nose Gear Fork

Date: Sat, 17 Nov 2012 16:54:28 -0800 (PST)

From: Stan Susman <stanpfa@pacbell.net>

Reply-To: Stan Susman <stanpfa@pacbell.net>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Jim Emons in Chino makes a very strong and nicely done nose wheel assembly, And I'll bet it's less money then others. The good news is that Jim is a genuine aero engineer and the bad news is he claims he doesn't want to be bothered with the internet at this time so here 's his cell # 909-239-2706

Stan (Pumbaa)

## -Nose Gear Doors:

-------- Original Message --------

Subject: Re: [c-a] Nose Wheel Doors

Date: Tue, 9 Oct 2012 04:21:27 GMT

From: SW Harmon <sharmon32@juno.com>

To: keith@airstarts.com, canard-aviators@yahoogroups.com

The two pieces used to cover the nose wheel hole are kind of a challenge. ... had to move them approximately 1/4" apart so that when the nose wheel swivels they don't catch on each other. ...made my first set out of aluminum like the plans said to do they kept bending and catching on stuff and each other so I made another set out of fiberglass. 6 layers if I remember right. ... STeve

-------- Original Message --------

Subject: Re: [c-a] Nose Wheel Doors

Date: Tue, 9 Oct 2012 16:12:12 +1100

From: Tony Rothwell <tony13rothwell@gmail.com>

To: SW Harmon <sharmon32@juno.com>

CC: keith@airstarts.com, canard-aviators@yahoogroups.com

For the same reasons as Steve (bending Aluminum), I remade mine out of 0.016" stainless steel. Put a slight bend along the "vertical" center line and they will sit right up close against the fuselage when the gear is retracted.

...Tony

-------- Original Message --------

Subject: [c-a] Re: Nose Wheel Doors

Date: Wed, 10 Oct 2012 19:45:48 -0000

From: gilbert\_drieux <gilbert.drieux@dbmail.com>

To: canard-aviators@yahoogroups.com

... http://youtu.be/Ov8QULRrg1c

Gilbert.

-------- Original Message --------

Subject: Re: [c-a] Re: Nose Wheel Doors

Date: Wed, 10 Oct 2012 17:13:16 -0600

From: R Martinson <N6lk@aol.com>

To: gilbert\_drieux <gilbert.drieux@dbmail.com>

CC: canard-aviators@yahoogroups.com

http://www.youtube.com/watch?v=K3-QPnscM8s

Rob R Martinson VE - N6LK LE - N4281X Evergreen, CO

-------- Original Message --------

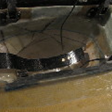
Subject: Re: [c-a] Re: Nose Wheel Doors

Date: Wed, 10 Oct 2012 19:00:48 -0500

From: Thomas Mann <tmann@n200lz.com>

To: <canard-aviators@yahoogroups.com>

Here’s mine.



-------- Original Message --------

Subject: Re: [c-a] Re: Nose Wheel Doors CAUTION!

Date: Wed, 10 Oct 2012 19:47:50 -0500

From: Ron <rongowan@yahoo.com>

To: n6lk@aol.com, gilbert.drieux@dbmail.com

CC: canard-aviators@yahoogroups.com

Several years back, leaving OSH, I had a cross wind t/o. Using an electric retract and a nose wheel that wasn't lined up made a mess out of my doors. I had to land a half hour away because engine temps were climbing. The damaged doors were screwing up the airflow into the NACA inlet.

Ron Gowan Long EZ N320HA

## -Nose Construction:

-Bill Allen May 2012: ...Berkut nose to my LongEz ...allowed .... battery forward by 12".  Most ... Ezs ... pushing ... aft end of the CG envelope, ... really hurts to stick lead in the "plans" nose after spending 3 years being obsessive about weight.... also allows more room for other things ... such as a cabin heater, oil, tools, heated pitot.  <http://www.longezpilot.com/PG10%20Nose%20Extension%20_2.htm>

-------- Original Message --------

Subject: [c-a] Nose

Date: Tue, 7 Aug 2012 13:20:42 -0700 (PDT)

From: Dave Anderson <usaf\_david@yahoo.com>

To: canard-aviators@yahoogroups.com

...nose on the project I bought. ...not 'pointed' but more round. ...Will it work?

Richard "Dave" Anderson



-------- Original Message --------

Subject: Re: [c-a] Nose [html][bcc][faked-from][mx]

Date: Tue, 07 Aug 2012 21:15:00 -0400

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: Dave Anderson <usaf\_david@yahoo.com>

CC: canard-aviators@yahoogroups.com

...post from some years back. An aerodynamics guy was asked about the best shape for the nose. He asked, "is it intended to go supersonic?" ..."no" ... "something about the shape of a basketball will be Ok. ... For many of us, appearance is an issue. ... It's your opinion that will count.

David Froble

-------- Original Message --------

Subject: Re: [c-a] Nose [html][bcc][faked-from][mx]

Date: Wed, 08 Aug 2012 16:37:16 -0000

From: dr0von0pico <dr0von0pico@yahoo.com>

To: canard-aviators@yahoogroups.com

... Sharp leading edges get separated flow at lower angles of attack than round ones. Even at an AoA of zero, the round bodies are better. Check out page 3-12 of Hoerner's Fluid Dynamic Drag.

Andres Pico

-------- Original Message --------

Subject: Re: [c-a] Nose [html][bcc][faked-from][mx]

Date: Wed, 8 Aug 2012 13:41:32 -0600

From: Burrall L Sanders <craftsman@freeflightcomposites.com>

To: <canard-aviators@yahoogroups.com>, <ARGOLDMAN@aol.com>

I read that a subsonic nose should not be pointed. From above it should look like a basketball and from the side a softball. ...Mine ... 219 mph average over a 125 nm course with 12 turns. ...234 mph TAS flat out straight and level.

Burrall



-------- Original Message --------

Subject: [c-a] Pitot tube

Date: Tue, 07 Aug 2012 15:53:16 -0500

From: vance atkinson <nostromo56@tx.rr.com>

To: usaf\_david@yahoo.com, Canard Aviators <canard-aviators@yahoogroups.com>

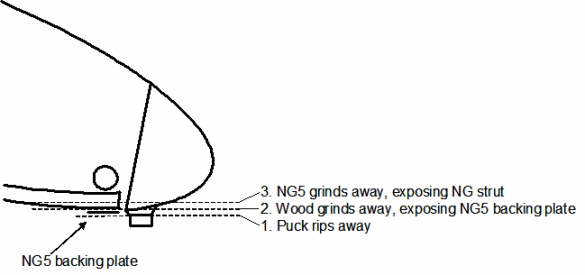
The nose shape you have will work fine, I have seen several in different shapes and they have no penalties for leaving as is. If you want to get your pitot tube out of the dirt you can mount it like I did in the top of the winglet. Nylaflow tubing connects it and runs from the winglet to the channel where the nav light and antenna coax lays and then into the spar and up the side of the fuselage to the Airspeed indicator. Works fine, with no penalit[ies] and lightweight.

Vance Atkinson



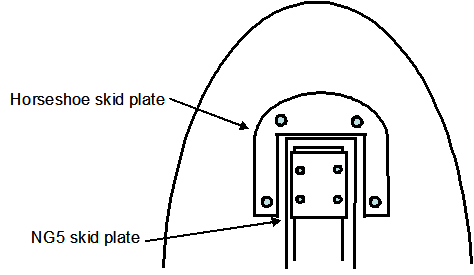
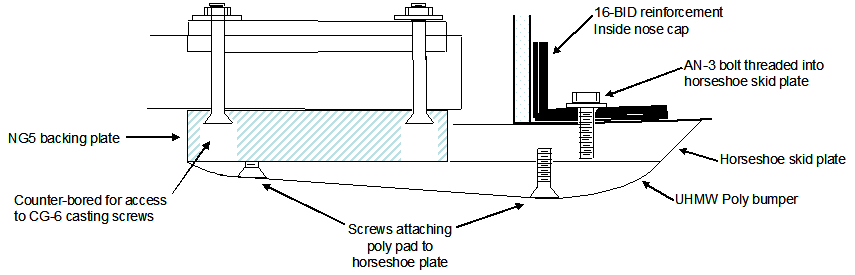
## -Nose Skid Plate/Puck:

-Wayne Hicks Jan 2012: ... study pictures of a gear-up landing ... four conclusions ... (1) asphalt is the best sandpaper ever made! (2) the plans-built nose puck doesn't do diddly; (3) there's nothing substantial enough to protect the NG5 backing plate, screws, and nose gear strut from being irreparably damaged; and (4) it's true, "there are those that have and those that will." Let's look at the dynamics of the gear-up landing. The nose puck either departs the airplane immediately or gets ground away completely within the first few feet of the skid. The wood puts up a good fight, but it doesn't last long. The asphalt grinds away the bottom skin and urethane foam in the blink of an eye. As the skid continues, the F0 and NG30 bulkheads are ground down. The NG5 backing plate makes contact with the asphalt as the plane slides to a stop. If you're lucky and its a short skid, only some of the backing plate is ground away and there's still enough of the screw heads still holding the backing plate to the nose gear strut. If you're unlucky and it was a long skid, the backing plate is gone, the screw heads are gone, and the nose strut was grounded down big time. The damage is done and you're not flying home today. In fact, you'd be lucky enough to be capable of taxiing to a hangar to effect repairs.



If you're going to fly away from a gear up landing, the nose gear strut must stay attached to the NG6 nose casting and the structural integrity of the NG5 backing must be maintained. The only way for THAT to happen is to keep the screws and the backing plate from ever making contact with the asphalt. If there's no damage to the backing plate, there won't be any damage to the screws. But lose the backing plate, it's a good bet the screws are gone, too.

So I made a nose bumper of my own design. As shown below, it features a primary, horseshoe-shaped skid plate under the nose cap and a thicker NG5 backing plate. The primary plate is made from 3/8th-inch-thick aluminum plate, which should survive an extended skid. It is bolted from inside the nose cap and alongside the NG30s. I bought one of those white plastic cutting boards at Walmart. I'm told the material is Ultra High Molecular Weight (UHMW) PolyEthylene (PE), or some other high density PE. I shaped a piece of it to fit over the primary plate. It is held onto the skid plate with screws. Although its job is to be the "rubber bumper" for parking nose down, it will provide the initial (and most likely "brief") skid protection as well. The NG5 backing plate was made from thicker aluminum, too. The screws are counter-sunk deeper into the material so that the material above the screw heads is sacrificed during a prolonged skid. These diagrams are not to scale, but the other pictures should convey the idea. Note that the primary plate is threaded and is bolted from the inside. In this manner, the plate stays attached even as the plate is ground away! Same idea for the NG5 backing plate.



-Wayne Hicks Jan 2012: Recalls a story of a guy that used a wheel (also allowed aircraft movement when engine started). -Wayne Hicks Jan 2012: I installed the aluminum plate so that my nose will SURVIVE a skid without damaging the nose gear strut. I want my plane to be flyable after a nose up landing. I know of 3 pilots who had gear up landings with this nose skid design. Two had no damage at all and simply flew home. One had minor cosmetic damage. -Curt Smith Jan 2012: The idea, in the beginning with the Varieze, was to have something that didn’t slide easily because most EZ’s didn’t have a(n electric) starter...with hand starting you wanted something that “gripped”, even though the plans-specified half-a-hockey-puck slid pretty easily. I always chocked the mains on mine, but did have the experience once of being in a hurry and didn’t. The ramp was wet and when it started I had to make a dash for the wing tip. Now not many of us hand-start so the purpose of the skid is to..skid in the event of a gear up landing. I’ve had one of those when my gear wouldn’t come down due to a micro switch failure and busted manual gear extension stud. Boy, that thing comes down with a bang and, unless you have something beefy there, it really tears things up. So, if you’re building, keep that in mind. I think the big aluminum skid plate is the way to go because it seems a gear-up is a matter of “when”, not “if”. Wayne has the right idea. Mine happened 1000 miles from home and I held my breath all the way home hoping my jury-rigged repair would hold upon return (it did).

-James Redmon Jan 2012: Don Burton Q: I thought the Berkut was electro-hydraulic? If the nose gear isn't down... don't you have a bigger problem? Ans: Most Berkuts eliminated the hydraulic cylinder for the nose gear and the manual override valve to isolate it on the ground (a really bad idea in the first place).  In its place, an electric actuator was installed just like the EZ/Cozy...creating a “dual” system.  The gear can be operated together or separately.

-Nick Ugolini Jan 2012: A word of caution about using an AL skid plates. AL grinds off easily  
and produces lots of heat.. On my first gear up, after grinding off a large flat spot on my nose,  
the tarmac easily ground off the AL plate holding my nose strut on, resulting in a loss of the nose strut attachment. Replaced the AL strut plate with a SS plate which results in excessive heat when it ground down (2nd gear up). SS like AL produces lots of heat when abraded (try cutting or grinding AL). I would ONLY fly with a 1/8" steel plate holding the nose strut on with "hard face" welded on to it. The hardened surface prevents abrasive action thus reducing the effects abrasive heating, and prevents the grinding away of the attachment screws on the strut. Grinding down the nose is not too big a deal....but losing the attachment of the nose strut to the plane will ground you for a few days. My nose bumper is backed with a nose skid made of Lignum vitae (iron wood) the hardest wood available (1.5 times as hard as maple). The reason? After the bumper is gone, the wood will grind off WITHOUT producing excessive heat and it is an extremely hard dense material. My current bumper is a recycled 5x5 aviation tire. It survived my 3 gear up (stripped gear on the nose mechanism). Hopefully I am done with gear ups as I replaced the mechanism and my addle brain with a Wilhelmson nose lift (with an automatic extension).

-Don (wildskyboy@yahoo.com) (Long EZ) Jan 2012: I made my skid using a piece of Titanium bar which I machined in half length ways and rounded the ends to minimize drag. I specifically used Ti as it transmits heat very poorly and is light weight being just under 3 oz. The 3 attachment bolts are positioned in counter sunk holes so they have about 1/4" of clearance. I also have a parking brake installed next to the instrument panel which will have a warning light on when activated and power is on. Obviously if the brakes (Matco triple puck) fail on landing I hope I can get on the grass as this skid will provide minimal friction.

\*\*\*Nose gear up in event of brake failure on landing (single or dual)--technique to get stopped. \*\*\*

- Tom Smith  A&P Long-EZ N12TS Jan 2012: \*\*Consider: If you notice brake failure before the rudder authority quits get airborne and pump fast/hard. It may come back. ...mine have done it twice and pumping fast worked.

-Chrissi & Randi [www.CozyGirrrl.com](http://www.cozygirrrl.com/) Jan 2012: We used Kevlar for about a 12" area under the nose with successive layers each 1" smaller. It will turn into a fur-ball when it hits the asphalt and need to be entombed in BID to repair it. We knew that going in.

-Dave Adams Long EZ N83DT Race 83 Jan 2012: I used an old 18 wheel truck tire...cut the rubber down leaving a tear drop shape on top of the steel belts...left the steel belts sticking out (approx) 1/4" all around the tear drop for a flange to glass it.  ...inadvertently "tested" it twice...have not had to replace the truck tire piece, but did have to do cosmetic touch up to the damage around (it).  -Greg Norman Jan 2012: Maybe someone could design.... nose skid that has spring dampening for structural damage prevention ...skid installed in a socket ...that could be replaced... ... if some are having this issue repeatedly, lock the nose gear down and leave it there.

-Greg Norman Jan 2012: Saw a nose skid "wheel" from in-line skates at RR once. No stopping power though.

-Bob Holliston Jan 2012: After a prop failure on takeoff at about 200' AGL I pulled the mixture and did a teardrop 180 to a downwind landing. Since there was going to be less than 1000' of runway remaining, the last thing I did before touchdown was raise the nose-gear. (I'm going to stick with the manual system as long as my back holds up, because if I had had an electric retract I would have been screwed.) So, the resulting skid-mark was 845' long and stopped 45' short of the end of the runway. The damage was minimal. I've done a half dozen or so nose bumpers and here's how I do it: A teardrop shape 3/4" thick piece of rubber truck tire. (Remember this is supposed to be a chock so you don't want it to skid easily.) That piece is hollowed out in the center 3/8" deep for a piece of 2 1/2" X 2 1/2" aluminum 3/8" thick. (I did one with steel but alum. has more friction and makes no sparks.) Inside the nose above that go 8-10 layers of Kevlar which is way abrasive resistant and spreads the load which is considerable. Anyway after that record setting skid, starting at around 100 MPH, there was still some aluminum left. It took about 3 hours to repair the damage.

-Bulent Aliev Jan 2012: (A) nose bumper (could be) designed with some shock absorbing qualities to take the edge of a sharp impact... help with reducing the damage.... like a miniature version of a track leaf spring?

- John McWaiter Feb 2012: Retracting the nose gear should be in everyone's bag of tricks as an emergency procedure. In an incident many years ago, Myself and several other EZ drivers were flying search and rescue sorties in Mexico (Gus Sabo).  In one particular sortie, ...one of the EZs was slowly losing power.  ...flying wing for the crippled EZ, ...straight in approach with ZERO chance of a go around.  ...runway was gravel with a small cliff on the very end with boulders and very large rocks. The EZ touches down long and fast, and I knew he was not going to be able to stop.  I kept hollering on the radio; "Retract your nose gear, retract your nose gear, retract your nose gear". ...The EZ disappears in a cloud of dust, and as it clears I see the plane sitting less than 50 ft from the cliff.  ...greeted with a crying (yes, literally) "Thank you thank you thank you"..   He said all he could see was the rocks coming up fast and never thought about retracting the nose gear.

-------- Original Message --------

Subject: Re: [c-a] Gascolator's and Nose Bumper

Date: Mon, 19 Nov 2012 08:09:08 -0500

From: Harley <harley@AgelessWings.com>

To: Mike Scovel <ezdriver@sbcglobal.net>

CC: Canard Aviators <canard-aviators@yahoogroups.com>

...as far as the "metal stand mounted on the fork" that you are mentioning, if this is it (in the lower right corner of the photo):



it is actually the support foot of Jack Wilhelmson's nose wheel retractor/extender. ... not a nose bumper.

In addition to that foot, I use a nose bumper that serves double purpose. It's one of these: www.mcmaster.com/#standard-vibration-damping-mounts/=k8bivb

It has a steel plate that mounts to the nose (even though it has bolt holes, I floxed and faired it in and painted it). The hole in the rubber is actually a threaded sleeve that I use for tie downs (bought a 3/8" threaded eye bolt that just screws in and out when needed). It was handy to use to hold the plane down while working on it as well. I got the idea for it when we replaced some hopper mounts on the Desenex foot powder line at work...brought the unused extras home with me when we sold the product and didn't need them anymore. I figured it could do the job, since four of these were used to suspend a thousand pound, vibrated hopper over the packaging line for years without problems.

Harley Dixon Long EZ N28EZ

## -(Slick) Nose Tire:

http://www.long-ez.com/custom-parts.html

**-Oil Temps Low in Cold Wx:** -??? Dec 2012: Many people block off part of their oil coolers. ... remember to remove the blocks in higher OATs. -Nick Uglolini Dec 2011: Jack Wilhelmson and I installed his cabin oil heat system he had low oil temp problem (cabin heating system in addition to the external cooler (piped in series) caused his oil temps to fall to 130 f or less in the cold weather ops) (initially *assessed* as an improperly functioning vernatherm). Jack elected to block off part of his external oil cooler to raise engine oil temp. This is a bit  
troublesome to do as you have to remember to adjust it for each flight depending on OAT. We easily installed a Perma-Cool 106 Automotive Oil Thermostat in line with the external cooler.... Jack's problem was solved for MUCH less cost than a replacement Lycoming vernatherm. For about 8 years, ...used one in my oil cabin heat system (and a few others I installed) and the thermostat always maintains my oil temp at no less than 185F in all flight regimes even when OAT is at 10F (the lowest I have seen). Although the price has gone up a bit to $60 (from the old $35 at Summit Racing), it is still reasonable and very easy to install. Here is one site, although you might find it a bit cheaper....  
<http://www.alamomotorsports.com/pmc/Cat_page14.html>

-Marc Zeitlin Dec 2011: "Perma-Cool"-- I'll take a look at the installation and see if I can implement that easily or if I'd just rather block off part of the cooler during the winter.

- Bill Kastenholz Dec 2011: I built a slide on top of the oil cooler which I can control from the pilot's seat.  In past years, I have attached some insulation to the front face of the sump. -Stephen Wolpin Dec 2011: Omega tell-tale temp strips on the sump verify the accuracy of my oil T gauge.  Van's has an interesting guillotine-like register cover, cable operated, that I will be mounting on the cooler exhaust to allow better control of oil T in the broad range of OAT between 80f and +/- 20f.

## -Oil Blow By:

-Terry Schubert Mar 2012: ....a couple easy ways to check for blow by. Perhaps the easiest is to simply look at the oil color after about 10 hrs of operation, it should still be light in color.  If it gets BLACK and like tar at about 15 hours, then blow by is a good probability.  Run a compression check to see if air is leaking by the rings and /or remove the oil dip stick and insert a cork with a penetrating  hose to the pitot port of an air speed indicator. Run the engine.  If the air speed show more than 100 mph pressure, then you are probably due for some cylinder work. Lycoming's min safe quantity is about 2.75 qts on my 320.  I assume the 360 is the same.  The extra oil carried to show full on the dipstick was offered to allow the Lycoming max certified consumption of 1hr/qt oil to not run the engine out of oil befor e it ran out of fuel. I run my IO-320 between 5-6 qts all the time.  When above 6, oil consumption increases.  My oil does not get dark indicating minimum blow by and during compression checks no air is heard by passing the rings.

-Ken Miller  Mar 2012: Lycomings produce copious amounts of blowby in the first thirty minutes of flight until the rings, cylinders, and all the dissimilar metals normalize.  During this time, the oil is frothed up and blown out the crankcase vent after crawling up the accessory gears like a monkey climbing a tree.  Lycoming approves running the engine on as little as two or three quarts ... no problem ... running no more than six and letting it go down to four-four and a half before adding oil.  -Christial von Delius Mar 2012: ... OAT of 10\*F and 5,000' msl... breather tube full of ice from the oil separator high on the firewall, down the LH side and under the LH cylinders in the 'cold' section.... NACA duct was freezing the combustion blowby gases moisture, being exacerbated by the copper nipple (temp. conduction at exit) that served as the pass through on the LH lower aft cowling, with what little bypass flow freezing in the rest of the 3' overboard (0.625") rubber hose. This caused the crankcase pressure to be exhausted through the dipstick cover along with nearly all the oil.

... I have since modified the tube and added razor slits to relieve the pressure. ...slits relieved the pressure successfully with only minimal oil loss. ...quite cold here at altitude during the winter. ...I got rid of the oil separator because of its location ...found a better one ...smaller ...and can be located above the cylinders in the warm section, which should completely eliminate all overboard oil discharge, with no possibility of freeze-up.



-Burral Sanders Mar 2012: [Response to Christian von Delius oil loss] search ...canard pusher newsletters ...find the one that tells you how and where to put a “whistle notch” in your crankcase vent line that will vent the crankcase even if the end of the tube freezes over.  ...There has, I believe, have been planes lost to [ice in the breather overboard vent]. -Bill Allen Mar 2012:  ...if one wants to know what the in-flight oil level is, this will give you a readout;  <http://www.propgov.com/dip_page/index.html>

-Marc Zeitlin Mar 2012: Not exactly the same thing (doesn't tell you the level, just when  
you've dropped below 4 qts in an O-360, but ... <http://www.aircraftspruce.com/catalog/inpages/lowoil.php>  
  
...cheaper. Could probably be wired into some switch indicator in an EFIS, too, maybe with an alarm, if you didn't want the separate light.

I see some difference in oil temps ... at 4 qts. vs. 6 qts., ... not a huge difference - maybe 10 deg F max.? I've always used the oil pressure as an indicator of whether there was oil in the sump, ...temps would probably go up a LOT if you ever got down to 2 qts ... I'd never fly with 2 qts in the sump on purpose... Of course, by the time the pressure went to zero, it's too late to save the engine - maybe an oil level switch is a reasonable thing as an early warning device.

-Stephen Wolpin Mar 2012: I installed one of the Aircraft Extras oil level sensors (the unit Marc has indicated ...)... The unit proved to be unsuitable for that environment. I mentioned the event to the manufacturer and he was not all that interested. Perhaps since then he has changed the material for the float.

-Bill Allen Mar 2012: [Response to Stephen Wolpin] I've had the "skinny dipper" for 8 years with no problems and installed it after having read many instances of un-noticed oil loss leading to forced landings. I recall in one early CP write-up it was a fatal, and several others were lucky not to have been.

-Bruce Hughes Mar 2012: ...why not add a spare oil tank high enough to allow a gravity feed to the engine. When the sensor says that you are low on oil, the spare oil tank could supply a couple of quarts to get you to an airport. We have a spare sparkplug for each cylinder and two fuel tanks, why not a spare oil tank?

-Dale R Cozy MKIV #497 Mar 2012: [For an oil level sensor]. Try a nearby import salvage yard ... Every Mazda rotary engine has one in its oil pan. They work.  
  
- Torger T. Long-EZ 606TT Mar 2012: I also installed an Aircraft Extras oil level sensor on my Long-EZ 0-320E2D. It only lasted a few hours. I dissected it ...nothing more than a reed switch actuated by a magnet in a "bobber" that slides up and down a shaft. In my opinion it is really not a robust design for the environment it has to operate in. I contacted Aircraft Extras and they were surprised it did not last but also mentioned another fellow had an issue on his Long-EZ. Don't ask me why, but I "bit the bullet" and bought another one. When I received it I had to rewire it because they had changed the system to a normally closed switch or vice versa, and the bobber was a different color. Well it didn't last long either so I sent it back and they were nice enough to refund my money for the second one. I personally would not recommend installing one on a Long-EZ. Maybe on RV's they are okay?? ... IMHO...weak link in the design is the reed switch. If the engine hits a frequency that causes the switch to resonate it will quickly burn out the contacts. ...did notice the LED on the dash flickering at higher RPM's. Definitely a clue.  I did try rotating it 90 degrees and that didn't help.

-Bill Allen Mar 2012: I rejected the "low oil level warning" device as I wanted something that would provide a quantitative readout in flight so as to give advance notice (and hence more time to choose other options) of lowering oil consumption, rather than something that enunciates impending failure.

It's interesting to see the oil level after engine start goes down about a quart as that's what is being circulated around the internals. I also fitted a chip detector (which is standard fitment on all R22 helicopter installations) -  to gather as much info as possible on key indicators.

-Ryszard Mar 2012: I use TotalSeals. I don’t recommend them to those that aren’t really into their engines. -Tim Dolce (flyingtiger05) Mar 2012: ...tried most everything and found very little stopped the blow-by and some actually made it worst (one type of top rated air oil separator). ...rechecked everything after the new rebuild with nearly all new parts on my O290D2. ...everything stock with minor exceptions ... wanted most ...reliable engine and one with more HP than most ...most days at or above 6000 feet ...inhospitable territory...  The rings are always the culprit but they were and still are tight. 78's and 79's on all four cylinders even to today.  If I took off with 8 quarts, which is recommended by the engine manufacturer it would blow out 2 to 3 quarts within the first 20 minutes.  So I reduced the amount of oil to 5 quarts and that helped quite a bit. ...got rid of all the air oil separator junk and added an addition oil breather line and that was and still is my so called fix. ...found that at full power settings I needed to back off the power just as soon as I got to a safe altitude after take-off and that helped immensely.  I did all the little razor slit (cut) in one of the breather hoses to prevent hose blockage breather starvation. ...at lower density altitudes on take-off ...had to back off the power early to prevent dumping the oil out the breather hoses... Is this "THE" answer...NO but it works for me until someone can show me a better way that actually is proven to work.

## -Oil Cooler Lines:

-------- Original Message -------- Subject: Re: [c-a] Oil Cooler Hose

Date: Fri, 30 Mar 2012 08:26:38 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>, cozylist <cozy\_builders@googlegroups.com>

Greg Norman wrote:  
  
> ....install my oil cooler in the nose of my plane. Any suggestions as to best use hose or aluminum tubing to transfer oil to and from the front?  
  
...suggest using either 3003-0 or 5052-0 AL tubing. Way lighter than the 666 or 601 hose, and WAY lighter than steel. Since the maximum oil pressure is in the 100 psi range, and even the 3003-0 tubing at   
5/8" diameter has a working pressure of 305 psi (way higher for the 5052-0, if you want larger diameter), you've got a very large safety factor.  
  
Even the 3/4" dia tubing, with a .035" wall, will have a stress of only ~3 ksi in it - not an issue for the 5052-0 tubing. And 10 ft. of it weight less than a lb.  
  
> ... Any insulating tips as well?  
  
Don't bother. Since you're trying to get heat into the cabin, why waste weight trying to keep heat from leaking into the cabin?c  
Marc J. Zeitlin -------- Original Message -------- Subject: Re: [c-a] Oil Cooler Hose

Date: Fri, 30 Mar 2012 13:49:16 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com, cozy\_builders@googlegroups.com

Your choice, as long as integrety is maintained. Aluminum is the lightest, it will transfer some of the heat into the cockpit and needs to be insulated by foam or that reason. 666 is rather heavy, steel heavy again--

The important thing to remember is that there must be a flexible link between the engine and the tubes going forward to accommodate the engine movement in the mount.

 Rich

-------- Original Message -------- Subject: Re: COZY: Re: [c-a] Oil Cooler Hose

Date: Fri, 30 Mar 2012 17:52:47 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Bulent Aliev wrote:  
> You should take into account the linear expansion of the al. tubing.  
  
Yep.  
  
> Going from subzero to 180-200F, I bet 10' tubing will expand a  
> lot?  
  
About 0.3" for 200F delta. As long as there are some bends in the  
tubing and/or flex lines at one end (to the engine for sure, and  
probably the cooler as well) it should be fine.  
  
--   
Marc J. Zeitlin mailto:[marc\_zeitlin@alum.mit.edu](mailto:marc_zeitlin%40alum.mit.edu)

-------- Original Message -------- Subject: Re: Re: [c-a] Oil Cooler Hose

Date: Fri, 30 Mar 2012 09:21:57 -0700

From: Al Wick <alwick@juno.com>

To: canard <canard-aviators@yahoogroups.com>, cozylist <cozy\_builders@googlegroups.com>

Oops. Oil cooler in nose, flexible line would be needed at engine end. Not oil cooler end. al

----- Original Message ----- From: Al Wick To: canard ; cozylist Sent: Friday, March 30, 2012 9:13 AM

Subject: COZY: Re: [c-a] Oil Cooler Hose

<suggest using either 3003-0 or 5052-0 AL tubing

Sounds good. Also usually best to terminate tubing with flexible hose at oil cooler end. This avoids stress concentration. Likewise, use ties every 6 inches or so on the tubing to control frequency response of long tube. Without ties, tube turns into "S" shape while flying. You'd have to see it to believe it.  Al Wick

## -Oil Cooler Louver & Pitch Change:

-------- Original Message -------- Subject: [c-a] Oil Cooler Louvers and quiz

Date: Sat, 07 Apr 2012 22:15:03 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

...installed ...louvers over my oil cooler to restrict air flow through the cooler ...object ...to raise the oil temperature if ...too cool in the winter. See: <http://tinyurl.com/827nyls> ...description and pictures...  
  
...from oil temperature control standpoint, it worked great. ...OAT's ...44F - 50F and altitudes ...7500 - 9500 ft., at 2600 RPM ...70% power ...able to regulate the oil temperature from about 165F to about 200F by changing the amount of airflow through the cooler. When wide open, it seems to not affect the airflow through the cooler at all (which is what I was shooting for).  
  
...using the (unused) old carb heat cable from the Brock throttle quadrant (that went dormant when I installed fuel injection) to control the louvers, and they're spring loaded open (since that's the safest position).  
  
...found ...strangest phenomena ...When I pull the cable to shut off the airflow to the cooler, the pitch trim changes and the nose of the airplane pitches up a very small but noticeable amount. Conversely, when I push the cable forward to open the louvers and allow air to flow through the cooler, the nose of the plane pitches down ever so slightly.  
  
...Marc J. Zeitlin mailto:[marc\_zeitlin@alum.mit.edu](mailto:marc_zeitlin%40alum.mit.edu)

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Oil Cooler Louvers and quiz

Date: Sun, 08 Apr 2012 12:28:03 -0500

From: vance atkinson <nostromo56@tx.rr.com>

To: stephen wolpin <swolpin@earthlink.net>

CC: marc\_zeitlin@alum.mit.edu, Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

...assuming the exhausting gases are exiting the BOTTOM  of the cowl as the original LEZ plans call for, and that air comes from the main NACA inlet and runs around inside the cowl 'till if finds a hole to exit.  Nats plans call for it exiting the top of the center hump in the cowl which are plainly not where Marc has his cooler.   
  
 Since he doesn't show the new arraignment with the cowls in-place I assumed the set up is like the LEZ.  
  
...20 some years ago we found out if you cut holes in the top of the cowls above the cylinders ( to aid cyld cooling) the air rooster tails straight up and then back to disturb  either or both the airflow over the fuselage/propeller to the tune of an astounding 10 kts.    
vance

-------- Original Message -------- Date: Mon, 09 Apr 2012 06:38:08 -0500

From: vance atkinson <nostromo56@tx.rr.com

Think of oil cooler opening like the trim thrusters on the space capsule ...

vance

-Marc Zeitlin Apr 2012: ...suggestions on what could be causing the pitch trim change when opening and closing the Oil Cooler Louvers. ...collation of the different suggestions ...no particular order...:  
  
1) Thrust from air flow down out of oil cooler creates pitch down moment when louvers open - eliminated when louvers closed.  
a) Kevin Gill  
b) Terry Schubert  
c) Jack Mulqueen  
d) Stephen Wolpin  
e) Vance Atkinson  
f) Tom Robson  
  
Analysis: This was obviously a popular view - the air jetting out of the oil cooler was creating force pushing the aft end of the aircraft upward, needing nose up trim. When the louvers were closed, this jet   
stopped and the nose would pitch up a bit. I did a ROUGH calculation of the amount of force that the air jetting from the oil cooler could produce, and assuming airflow from oil cooler mass flow graphs vs.   
pressure difference, along with air density and cross sectional area of the oil cooler, I estimated APPROXIMATELY 0.1 - 0.2 lb. of up-force generated by the air jet. Since the canard is about twice as far from the CG as the oil cooler, the canard would need about 0.05 - 0.1 lb. of up-force trim delta to compensate for the change.  
  
Neither I nor the aero guy at work thought that it would be possible to notice a change of less than 1/10th lb. of up-force at the canard.  
  
So I think that we can dismiss the "jet" idea as being the cause of the trim change, at least from the standpoint of the jet producing up-force.  
  
2) Pressure distribution change on aft end of fuselage (cowl). Louvers open, static pressure increased near oil cooler exit, louvers closed, pressure decreases and gives pitch up.  
a) Gordon Alling  
  
Analysis: The first sentence is promising - it is probable that the airflow exiting the oil cooler is either affecting pressure distributions on the lower part of the cowl aft of the cooler, or on the cowl as a whole through influencing the NACA scoop air spillage.  
  
However, it's not clear what mechanism might cause the static pressure changes in the directions that Gordon postulates, without more information - I think that combining this explanation with (8) and (9)   
could be helpful - see below.  
  
3) Drag increase caused by airflow out of oil cooler - drag aft of CG causes aircraft to rotate about pitch axis.  
a) Jerry Schneider  
  
Analysis: It certainly makes sense that airflow out of the cooler perpendicular to the airflow would create drag. But it's the vertical position of the crag that would create pitch up or pitch down moments,   
not the horizontal position. Only if the drag was created below the CG would the nose pitch down. The oil cooler is either on or above the vertical CG position, so I don't believe that drag from the air exhaust could be the cause of the pitch trim change.  
  
4) Change in airflow from cooler causes change in airflow into propeller, causing pitch change due to prop loading differences from top to bottom.  
a) Ken Cameron  
b) Izzy Briggs  
  
Analysis: It's difficult to determine what the magnitude of this might be, or the mechanism for it. Can't rule it out, but seems unlikely.  
  
5) Force across oil cooler from air blockage on top. Have pressure difference across cooler that's higher when louvers closed than when louvers open.  
a) Clark Taylor  
  
Analysis: Interesting idea. I have not measured static pressures in the cowl with the louvers open or closed, so it's POSSIBLE that the static pressure inside the cowl is higher when closed then when open,   
but it's more likely that there's not a large difference across the cooler in either case - one way just has airflow and the other doesn't. But remember, the static pressure inside the cowl act both up and down on the inside of the cowl, so should have no NET force on the aircraft in either direction.  
  
I'm very skeptical that this could be the mechanism for the trim change.  
  
6) Heat in oil cooler exhaust air lowers density of air inflow to prop, causing thrust loss at top of rotation (similar to #4).  
a) Robert ?  
  
Analysis: Same as (4) - given the uneven and turbulent airflow into the prop disc in any case, it's hard to discern what the mechanism might be for this effect, or to determine it's magnitude. Again, can't rule it out, but seems unlikely.  
  
7) Lack of air jet from oil cooler exhaust causes disturbed airflow over bottom of wing, reducing lift, shifting center of lift forward and causing pitch up. Oil cooler exhaust smooths out flow aft of exhaust, increases lift and shifts Cl rearward, causing pitch down.  
a) Tom Tugan  
  
Analysis: One would expect (although expectations are generally to be avoided) the opposite of this description - one would think that lack of air flow perpendicular to the free stream out of the oil cooler   
would allow UNDISTURBED airflow, and that an air Jet out of the cooler would disturb the airflow, rather than smoothing it out. Drag measurement testing of engine exhaust flow into free streams seems to support the standard expectation, rather than this opposite view.  
  
Seems very unlikely.  
  
8) Air jet from oil cooler exhaust changes airflow over bottom of cowl, causing lift differences.  
a) Mike ?  
  
Analysis: combine with (2) and (9) - see below  
  
9) Drag from extra airflow into NACA scoop when louvers open causes pitch down moment (since NACA is below CG).  
a) Ken Miller  
  
Analysis: combine with (2) and (8). The basic idea in combining these three ideas, all of which postulate airflow changes over the bottom of the cowl and/or NAC scoop interactions, is that the closing of the   
louvers decreases airflow out of the oil cooler. This lessening of the engine compartment exit size forces air spillage from the NACA scoop.  
  
Ken's view that this decreases drag down low, causing the pitch up, seems unlikely - I would expect (there's that word again) that spillage from the NACA would increase drag, not decrease it. In any   
case, given that the speed difference of the airplane was not noticeable, any drag difference must have been very small - in the low single digit lbs at most. It's difficult to imagine that the drag difference from NACA scoop spillage one way or the other is the mechanism, but I DO believe that Ken is correct that there is NACA scoop interaction.  
  
Here's what we (Aero guy and I) think is going on (and it's just a hypothesis, like the rest of these):  
  
A significant portion of the air flowing into the cowl through the NACA scoop exits the scoop through the oil cooler, as it's a relatively low resistance pathway. How much? Well, the oil cooler intake area is maybe 1/2 of the area of the NACA scoop, so depending upon the exact resistance of the airflow paths, it could be 1/4 - 1/2 of the total airflow through the NACA. In any case, shutting off the exit of the cooler means that less air is able to enter the NACA scoop, so there's significant spillage around the NACA entrance. This spilled air changes the airflow over the underside of the cowl (as a number of you posited might be happening for various reasons) and this changed airflow causes major separation on the lower cowl. The separated airflow results in lower pressures on the lower cowl, leading to a pitch-up moment, since the cowl is aft of the CG.  
  
His suggestion was to tuft the lower cowl, fly with a chase plane, and have them take pics of the tufts with the louvers open and then closed, to see if this is occurring. Maybe I'll try that.  
  
...interesting phenomena, no matter what's causing it. It's also interesting that it doesn't seem to affect drag in any substantial way, although it seems to be affecting lift enough to be noticeable.  
  
Airplanes are strange and complex things, and this only reinforces the notion that changing things aerodynamically can have unintended consequences. In this case, it certainly seems benign, but not all   
changes are...

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Followup - Oil Cooler Louver Pitch Trim Change

Date: Tue, 17 Apr 2012 12:21:53 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Tom Tugan wrote:  
> ... What I question is whether the other airflows within the  
> cowling is sufficiently restricted and whether the cowling exit  
> around the propeller hub is already at flow capacity so that the  
> amount of air that had previously passed thru the small spaces  
> between oil cooler fins wouldn't simply find its way out the exit  
> around the prop hub once the louvers were closed.  
  
The two paths for air entering the cowl through the NACA scoop are:  
  
1) through the oil cooler and out into the free stream below the strake  
2) through the cylinder fins, around the baffles, and into theplenum above the cylinders and then out the aft opening.  
  
The two largest resistances are the fins and the cooler, in some relationship - I'm GUESSING the cooler, when open, passes 1/3 of the air coming in the cowl and the fins pass 2/3. The plenum above the cylinders and the opening at the rear have (again, a guess) far less flow resistance, given their much larger cross-sectional area.  
  
Since the cooler and the fins are in parallel, then if one or the other is closed off, all the flow through the cowl would have to pass through the other. But since the resistance hasn't changed, and the pressure in the cowl hasn't changed substantially (it's set by the amount of air passed by the NACA scoop and it's pressure recovery),  
then the flow through the remaining path won't change (much). So it's not that the cowl exit is choked - it's far larger than it needs to be to pass the required flow. It's the fins that are choked and are restricting the air flow through the cowl.  
  
> ... In the situation of Marc closing his oil cooler louvers, I'm  
> guessing that all or most of the air that was going thru oil cooler  
> finds its way out the main exit rather than spill over the NACA  
> inlet and pull the lower cowl downward.  
  
While certainly possible, I don't think this is what's going on, due to the fact that that air that was going out the cooler would now have to pass through the cylinder fins, but can't due to the pressure not being any higher.  
  
I think that it's far more likely that the 1/3 (or somewhat less) of the total airflow that USED to be going through the cowl is now spilling out of the NACA scoop.  
  
The tuft testing of the lower cowl would determine whether this is or isn't the case. We'll see if I ever get to that   
Marc J. Zeitlin mailto:[marc\_zeitlin@alum.mit.edu](mailto:marc_zeitlin%40alum.mit.edu)

-Oil Temps High: -In cruise the oil slowly continues up to the 225-235F range and stays.

-Original oil cooler was an 8 row PosiTech.

-Changed it to a 7 row S/W—no joy

-Now have a 10 row Aero Classic—no joy

-Installed a dedicated baffled oil exit in lower cowl—no help

-Installed a dedicated outside air source to shrouded cooler and dedicated exit with no improvement—Last weekend oil in cruise topped at 237F

-Ck’d all cowl/engine baffling for leaks

-Ck’d timing for EI and mag and reset to engine tag and manual w/ timing light

-Ck’t temp probe for accuracy

-Ck’d two vernatherms for proper operation and switched them

-Ck’d for proper gasket on B&C filter adap.

-Removed B&C adap. and replaced with original stock non filter vernatherm adap.

-Ck’d to see that oil cooler was hot to the touch after flight and had no air pockets.

-Check the thickness of the vernatherm gasket. A thick gasket keeps the vernatherm from seating properly and allows oil to bypass the cooler and go back to the engine without being cooled.

-Vernatherm is expensive to replace.

-Single wire senders (relying on sender's attachment to the engine as a ground, like for Dynon, I believe) or double wire senders with one wire grounded somehow in the engine compartment (like in my case, at the beginning) are prone to inaccurate readings on the ground, as per Zeitlin's recent reporting. Even worse, may happen sometimes (happened to me) for whatever reason (which I'd relate to a grounding problem, anyway) that senders like in point A can read OK on the ground with engine not running (by candy thermometer comparison), but read 20° F higher with engine running (like in flight, generally). Since I wired sender's ground to the instrument directly and exclusively, my oil readings are OK both with engine running and not running.

-What size oil lines are using? Hope they are 1/2" ID and not 3/8". 1/2" has almost 45% bigger cross section (more flow). Hose size DOES matter as well as fitting Sizes.

- Dimensions of the (dash) Fittings:  
-A - 8 (dash 8) fitting elbow (90°) - AN822-8  is says it is 1/2" Tube and 3/8" Pipe.  To understand the 1/2" Tube I.D. is  0.390"  
 3/8" Pipe I.D. is 0.408"    
 If we check the dimensions of a - 6 (dash 6) AN822-6 fitting;  
 This fitting come in 3 (Three) different pipe fitting sizes:  
 AN822-6  
 AN822-6-2    Add "D" suffix to any for Aluminum.  
 AN822-6-6  
 All of the above use the 3/8" TUBE size which I.D. dimension is 0.280" to 0.290"  but, see below for Pipe fitting size dimensions;  
 -6-2D = 1/8" Pipe - 0.1875"  
 Most will use -8 oil lines and -6 fuel lines on installations up to 225 to 275HP.  
 -Some reports of positive results with the AV Blend additive. - By a huge margin, most oil cooling problems are all related to having enough delta P across the cooler.

-Can oil flow area around the inlet to see if air is actually entering the cowl or if it is bypassing it.

-I bit the bullet and mounted a second cooler in the wing root per plans in series with the one in the aft baffle.  The second was a ten row Stewart Warner.  After that, I could take off in 100 degree temps, climb to 10.5K and not see higher than 210 on the clock.  All of a sudden I was running too cold in cruise, so I removed the one in the aft baffle.  It now ran right at 185-190 in cruise all the time.  Oh, did I also mention my CHT’s all lowered a couple of degrees, too? The key is getting the air out of the cooler.  I think the air is just too dirty behind that prop to pull the air out.  I used the formula Dick used on the Voyager on the aft engine oil cooler by using a reverse scoop that extended into the airflow about two inches and covered the forward 1/3rd of the cooler rows when viewed directly below the opening, no more, no less. Later I mounted the cooler cantilevered off the wing on a Garolite plate with upper tube supports so I didn’t have to fuss with separate fasteners for the cooler, just a seal. Another key is to use only a S/W cooler.  The PosiTech is useless, the Aero Classic is better but not as good as the SW.  Also, a 7 row is simply not enough cooler for the 320 no matter where you put it.

- 1) Obtained a few of the thermistors that Grand Rapids uses in their two wire oil temperature senders (as you may remember, I've had THREE - yes, count 'em, THREE GRT senders die since the week prior to OSH, none lasting more than about four hours. GRT acknowledges the defective senders but does not, as of a couple of weeks ago, have a fix). Using the last failed brass sender housing, I:  
 a) drilled out their epoxy potted thermistor  
 b) soldered wires to the leads and installed heat shrink tubing over the wires and the thermistor for strain relief  
 c) potted the thermistor at the bottom of the brass sender housing well with red high-temperature RTV (the RTV did not touch any metal other than the brass housing interior)  
  
I then had a GRT Equivalent sender, but potted my way, rather than theirs, and NOT using their batch of thermistors. We'll see how long it lasts...  
 2) Bought a candy thermometer at Save-Mart  
 3) Removed the Dynon single wire oil temperature sender that I've been using since I got the Dynon engine monitor and that I'd been trying to replace with the GRT's that kept dying.  
 4) Wired an extension so that I could use the senders 5 feet away from the engine/aircraft  
 5) Heated a can of used motor oil with a heat gun, while stirring with the candy thermometer and alternately suspending one and then the other oil temperature sender in the heated oil.  
 6) Take data for each sender in comparison to the (supposedly accurate) candy thermometer  
 7) Cleaned the can and filled it with water, which I then boiled (to calibrate the candy thermometer and senders with a KNOWN temperature - the boiling point of water at 4000 ft. altitude is about 204.8 F - call it 205 F). I took a few data points in water.  
  
Results:  
The results were illuminating, to say the least. I should (in retrospect, obviously) have done this sooner.  
  
The candy thermometer read within 1 degree of 205F in boiling water, and within 1 degree of 83F in the hangar. I can thusly assume that the candy thermometer is accurate (enough).  
  
The GRT Equivalent sender, with my installed thermistor, read between 5 and 8 degrees COLDER than the candy thermometer, although there was a slow increase with time, approaching the candy thermometer's temperature. I attribute this difference to the large thermal mass of the brass sender hex head, which is NOT submerged in the hot oil/water, and to the insulating properties of the red RTV surrounding the thermistor. The average temperature error was about -6 degrees F. This should be better, and if it's a function of my installation methodology, using RTV rather than a higher thermally conductive epoxy as GRT does, maybe their senders do a better job. I can test that when I finally get a replacement from GRT after they determine their failure root cause and fix it.  
  
The stock Dynon sender, however, was ridiculously inaccurate - reading between 10 deg F HIGH at low temps (156 F when the candy thermometer read 146 F) to 26 deg F HIGH at high temps (256 F when the candy thermometer read 230 F). Really? 26 degrees off? I can live with 230F at the end of a long, hot day climb. But I can't live with 256F.  
  
The implication here is that any belief that I had a high temperature issue when flying with the Dynon sender (99.9% of my flying over the past 4 years) was incorrect, at least to the tune of about 20F - 25F.  
  
I have installed the GRT Equivalent sender and will fly with it for a while and see how things go, just to validate these results. I do need to keep track of the fact that it will read about 5F LOW, so the oil temp will be a bit higher than I think it is.  
  
What's the lesson here? Even if you get equipment from reputable (and very good) vendors like Dynon, there's still the possibility that there's a subtle problem with the equipment, and you (I) shouldn't be   
hesitant to suspect it and check it out. With the GRT senders, the failure was obvious - they read 15F no matter what the oil temp was, and that clearly wasn't the case. But the Dynon read something believable (but wrong).  
  
If I'm lucky, my oil temps are now a bit higher than I'd like but perfectly acceptable.  
  
One other take-away from this is that if you've got oil temps that are low and you think everything's OK, it might be a good idea to test the sender at the water boiling temp to ensure that it's not reading 25F   
low for you.

-There have been a LOT of GRT oil temperature sender failures.

-Try to minimize # of 90 deg fittings. -Using 90° fittings is not as important as it may seem.  Hydraulics does not care that much about turns and bends however, it does cause turbulence. As a technique and practice, we always use straight steel fittings in the accessory case and the oil cooler when possible and any bends are accomplished with the hose fitting.  We have less sealing problems with steel and accept the small weight penalty for a robust and durable part.  We only use SS Teflon Hose with integral fire sleeve and the hose fittings are weeping bends in SS instead of a hard 90° bend inside a AN822 fitting.  Reason for this are easy of installation.  It is simple to install and torque a straight fitting and we find we have more room to get a wrench on the hose nut when oriented this way.   We try to order hose with a bend type (45°or 90°) fitting on one end and a straight fitting on the other.  *Dale @* [***http://www.long-ez.com***](http://www.long-ez.com)

-2 inch hose to the cooler is way to small.  When Nat Puffer built the first 4 place cozy with the 0360 Lyc he placed the cooler outlet on the top of the cowl about 2 -4 inches aft of the fire wall.  Cooled very marginally.  He added a 3 inch duct to it and it was better.  He added a 4 inch duct and problem solved

-Multiple accounts of Dynon oil Temp sensors failing. -Checkout the Garmin sensors for oil pressure, etc that are used with their G3X system. link is   
<http://www8.garmin.com/aviation/pdfs/G3X_sensor_kits_pricing.pdf> The oil pressure transducers are Kavlico piezoelectric sensors. These are three wire units (2 for power one for an analog signal) that are beautifully made, reputed to be very reliable, and yield smooth, consistent, repeatable outputs. too bad these senders are not compatible with Dynon or GRT. -Single wire senders MAY fluctuate a lot on composite aircraft due to the grounding issues. You need a dedicated sensor ground to get a stable signal.

-From Marc Zeitlin, Sep 2011: Discovered single wire Dynon thermistor based sender was reading WAY high - up to 25F - 30F at the high end of the scale and 15F high when the oil was merely mildly hot. Modified sender (using the same thermistor as GRT but with own modified installation of it in the housing) it now reads 5F LOW throughout the temperature range of interest (100F - 250F) of actual oil temperatures (now typically never exceeds 209F (204F indicated) in the climbs and stabilized between 179F and 189F in cruise, with OAT's of approximately 55-60F at altitude). Did NOT have an oil temperature problem, but HAD and oil temperature SENDER problem.

-------- Original Message -------- Subject: [c-a] Oil Cooler Louvers and quiz

Date: Sat, 07 Apr 2012 22:15:03 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

...So I installed some louvers over my oil cooler to restrict air flow through the cooler (don't ask, if you haven't been following along on the years long oil temperature saga - it's all in the archives and on the web pages :-) ). The object is to allow me to raise the oil temperature if it gets too cool in the winter. See:  
  
<http://tinyurl.com/827nyls>  
  
for a description and pictures of the system both open and closed.  
  
Today's flight to Half Moon Bay afforded an opportunity to test this system, and from a oil temperature control standpoint, it worked great. With OAT's ranging from 44F - 50F and altitudes from 7500 - 9500 ft., at 2600 RPM and about 70% power I was able to regulate the oil temperature from about 165F to about 200F by changing the amount of airflow through the cooler. When wide open, it seems to not affect the airflow through the cooler at all (which is what I was shooting for).  
  
I'm using the (unused) old carb heat cable from the Brock throttle quadrant (that went dormant when I installed fuel injection) to control the louvers, and they're spring loaded open (since that's the safest position).  
  
However - I found about the strangest phenomena with this thing, and maybe someone out there's got an idea as to what's going on. I've got some theories, but none that are particularly satisfying. I'll hold off on biasing anyone and just state the phenomena.  
  
Remember the setup - the third Brock throttle quadrant cable, which runs aft through the center console, through the firewall, and up to the cooler is not attached to anything else, other than with a couple   
of tie-wraps to keep the cable flapping in the breeze. The oil cooler is attached to the lower cowl and exhausts air out the bottom, with a ramp in front of the exit.

Here's the deal. When I pull the cable to shut off the airflow to the cooler, the pitch trim changes and the nose of the airplane pitches up a very small but noticeable amount. Conversely, when I push the cable forward to open the louvers and allow air to flow through the cooler, the nose of the plane pitches down ever so slightly.  
  
WTF? The stick, pushrods, canard and elevator are dead stock - there's nothing pitch related aft of the sticks or near the firewall. The manual pitch trim is installed (but never used - it's just set to max elevator TE down) and I have a "Strong" pitch trim system on the pilot's fuselage side that's attached to the pilot's side pushrod.  
  
The throttle and mixture cable DO move a tiny bit when the louver cable lever is manipulated, but I do not notice ANY RPM change when moving the louver lever and the pitch trim change is immediate - it's   
not caused by any airspeed change, nor do I see any elevator motion when moving the louver lever. The trim change is minuscule - it's easily re-trimmed by a tiny blip on the electric trim switch, but it IS different.  
  
Again, WTF? How can oil cooler louvers affect pitch trim? Like I said, I've got one or two (not particularly well thought out or satisfactory) theories which I'll describe later, but I'd be very interested to hear what other folks think of this. It makes very little sense to me.  
Marc J. Zeitlin



-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Oil Cooler Louvers and quiz

Date: Sun, 8 Apr 2012 11:10:53 -0700

From: Bob Holliston <bob.holliston@gmail.com>

To: canard-aviators@yahoogroups.com

I downloaded the pic's of the louver setup and low and behold, it is very similar to the one I made. Except: Mine has 4 louvers instead of 3. Also the louvers are carbon over high density foam with an airfoil shape mainly to fair in the rotating rods. So my question is: When I open the louvers is that lift going to try to pitch me over, or should I turn'em upside down for more climb? Bob LongEZ NX666DV.  -------- Original Message -------- Subject: Re: [c-a] Re: COZY: Oil Cooler Louvers and quiz

Date: Wed, 11 Apr 2012 10:20:44 -0400 (EDT)

From: trcsmith <TRCSmith@aol.com>

To: marc\_zeitlin@alum.mit.edu, cozy\_builders@googlegroups.com, canard-aviators@yahoogroups.com

...For maximum service life, maintain the following recommended limits for continuous cruise operation:  
a. Engine power setting — 65% of rated or less.  
b. Cylinder head temperatures — 400˚ F. or below.  
c. Oil temperature — 165˚ F. — 220˚ F.

.....pulled from a new copy off of Lycomings web site. ...

Tom Smith  A&P Long-EZ N12TS

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Oil Cooler Louvers and quiz

Date: Wed, 11 Apr 2012 09:49:41 -0700

From: Keith Spreuer <keith@airstarts.com>

To: Ryszard <ryszardzadow@att.net>,<marc\_zeitlin@alum.mit.edu>, cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

I tend to agree with Ryzard here but then I'm don't consider myself and anywhere near a engine lube expert. Where I depart is that pressure (measured at the gage) is not the only criteria. Suppose to exaggerate the point you had extremely viscous oil from being cold. Exaggerate that to the point of being like grease. To try and pump that thru the system would indicate extremely high pressure but there would be virtually no flow to the bearing journals. What you need is adequate pressure at the journal, this is what creates the film separation between the metal surfaces. So what I'm saying is that you can have oil that is too cold and lots of pressure measured at the pump but very low pressure at the journal due to flow restriction from the viscosity. I don't think Lycoming's recommendation is based on evaporating the moisture but keeping the viscosity in the right range so that the proper pressure is developed at the bearing.   
Keith

-------- Original Message -------- Subject: [c-a] Oil temp and condensation

Date: Wed, 11 Apr 2012 15:20:25 -0400

From: Hicks, Wayne <wayne.hicks@zeltech.com>

To: Keith Spreuer <keith@airstarts.com>, Ryszard <ryszardzadow@att.net>, "marc\_zeitlin@alum.mit.edu" <marc\_zeitlin@alum.mit.edu>, cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

A Lycoming factory chief technician gave a seminar at the Va Festival of Flight ...emphasized that 180 oil temp is the magic number that ensures the oil is in the 210-200 degree range elsewhere in your engine.  He said one of the worst things you can do to your engine is to take off, do a couple of touch and go’s, and roll back into the hangar.  L. Wayne Hicks

-------- Original Message -------- Subject: [c-a] Oil Temperatures and Condesation

Date: Wed, 11 Apr 2012 20:42:04 +0100 (BST)

From: Mike Tooze <miketooze@btinternet.com>

Reply-To: Mike Tooze <miketooze@btinternet.com>

To: canard aviators <canard-aviators@yahoogroups.com>, cozylist <cozy\_builders@googlegroups.com>

...based on my experience with my O-235 powered Vari Eze. I find that there is no need for an oil cooler. My flying environment reaches to the South of France in summer. Equiv. to S.Cal? UK and Scandinavia winters can get reasonably cold too. So my Vari uses no oil cooler as such. The oil *is* cooled by airflow around the sump and rest of the engine via updraft air from my NACA scoop. Exit is by flush outlets in the lower cowl just behind the rear cylinders. Thus the TE of the cowl is ‘sharp’ with no traditional Eze outlet either side of the prop. I see oil temps in the 140 to 220F range corrected with a gauge calibrated for 70F. I normally use a viscostatic oil, Shell 15W50. No 'cooler' saves considerable mass to the rear of the aircraft, requires no oil hoses etc. and, more importantly, reduced risk of oil circuit failure. (oil filter is integral-engine mounted) Whatever you think of my arrangement I think there is an angle we are missing on this topic. –At low temperatures, i.e. cold starts, the only thing propelling the oil from the sump to the oil pump *inlet* is Atmospheric Pressure. So, thick, viscous oil has to pass the sump filter and up a 3/8" scavenge tube before the pump takes over. Just about 14 psi. This point is not covered in the Lycoming literature as far as I am aware. And that’s not counting any air leak at the scavenge tube to timing case gasket. Other Lycos may differ. My hunch, people don’t like hunches, is that some springtime engine failures may be due to over-hasty starts in winter conditions, the results not affecting things till the main flying season. So some viscosity but not such as to starve your oil pump on start-up. And about moisture. Isn’t there an AD for direct drives regarding pitting corrosion inside the crankshaft?

FWIW Mike Tooze (previously signed as Mike Plastic)

-------- Original Message -------- Subject: Re: [c-a] Oil temp and condensation

Date: Wed, 11 Apr 2012 15:55:17 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: cozy\_builders@googlegroups.com, canard-aviators@yahoogroups.com

Understand this comes form one adverse to pistons.

The moisture that gets into oil, with operation, comes from more than the atmosphere with the cooling of the engine, under certain circumstances only. desert climes don't make much of a difference.

Unless my chemistry is correct, there are many products of combustion, the major two are CO2 and H2O.

Because of incomplete combustion there are numerous other noxious products.

With those piston ring thingies, there is blow-by, in which combustion bi-products  escape from the combustion chamber into the innards, bypassing the rings to mix with the oil that is splashing and misting throughout the "lower" part of the engine. (not just in the oil galleries). If the water in this blow-by is not eliminated (by the hot oil or by changing it) the dreaded "C" disease will start--Corrosion, independent of outside humidity, or lack thereof. Detergents in the oil keep many of the other products of combustion in suspension, in the oil necessitating changing of oil, probably more than the shearing of the oil molicules themselves. That's probably why, with an oil filter, oil change intervals can be extended.

Granted., most of the water, of combustion,  leaves through the exhaust (notice water issuing forth from exhaust pipes on cars in the colder climes (winter) until the exhaust system gets warm enough not to condense the vapor).

 Blow-by really blows!!!

 Rich

-------- Original Message -------- Subject: [c-a] oil temp at alt.

Date: Wed, 11 Apr 2012 15:51:48 -0500

From: Vance Atkinson <nostromo56@tx.rr.com>

To: Cozy Builders <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

in Sept 1989 I left Tucson for Dallas with my 0320 pwd Cozy for an altitude as high as the plane would go. Unfortunately, the higher I went the stronger the head wind. So I quit at 23,000' and slowly came down to a more reasonable altitude.  
  
During the climb at 8500' my oil temp was 204 F and OAT was +13C.... at the top of climb ,23,000' (and level for about 15 min) oil temp was 182 F and OAT was -18C.  
  
I have notice however flying in the winter at cruise around 10,000' my oil temps reduce below the vernatherm setting of 180F, to about 160 to 165F. This would indicate no oil to the cooler and the engine is not producing enough heat and not enough warm air coming into the cowl, so the oil continues to cool.  
  
Sometimes during a descent from 10,000 ft in the winter, the oil will get down to 135 to 140F. But of course when we taxi back in, it has warmed up another 30 degrees or so.  
  
Cylinder heat also shows a correlation with oil temps, IE. higher cyld temps, higher oil temps........lower cyld temps, lower oil temps. Cylinder temps help drive oil temps. I have a 9 row oil cooler.  
Vance Atkinson.

-------- Original Message -------- Subject: [c-a] Re: COZY: oil temp at alt.

Date: Wed, 11 Apr 2012 13:12:35 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Vance Atkinson wrote:  
> I have notice however flying in the winter at cruise around  
> 10,000' my oil temps reduce below the vernatherm setting of 180F,  
> to about 160 to 165F. This would indicate no oil to the cooler ...  
  
That's not correct - on a Lycoming O-360/O-320, the Vernatherm shuts off return flow to the engine when the oil's hot and when the oil's below the VT temperature, it allows flow back to the engine. There is NOTHING that shuts off flow to the oil cooler, and flow through that flow path is ALWAYS possible, so even when cold, there is some oil flowing through the cooler.  
  
This is done to ensure that the oil cooler warms up as the engine warms up, and that you don't smack the cooler with hot oil when it's filled with cold oil which may restrict flow.  
  
Doesn't change the overall description of what Vance is talking about, but I just wanted to indicate that part of the reason that the oil will drop below 180F (VT temp) is that the oil is ALWAYS being cooled by the cooler to some extent (which I why I wanted the louvers to shut the airflow off.  
  
> Cylinder heat also shows a correlation with oil temps, IE. higher   
> cyld temps, higher oil temps........lower cyld temps, lower oil  
> temps. Cylinder temps help drive oil temps. I have a 9 row oil  
> cooler.  
  
Absolutely so.  
Marc J. Zeitlin mailto:[marc\_zeitlin@alum.mit.edu](mailto:marc_zeitlin%40alum.mit.edu)

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: oil temp at alt.

Date: Wed, 11 Apr 2012 18:13:46 -0500

From: Vance Atkinson <nostromo56@tx.rr.com>

To: canard <canard-aviators@yahoogroups.com>, Cozy Builders <cozy\_builders@googlegroups.com>

My bad, I didnt state it that clearly .. The oil passing through the oil temperature control cavity goes either through the oil cooler or to the crankcase passages, depending on the oil temperature.  So when the engine is cold the oil is flowing to either route.  When the oil gets hot and the VT is doing its job, the oil only goes to the oil cooler.  If the venatherm  leaks, oil bypasses the oil cooler.  
Vance Atkinson

-------- Original Message -------- Subject: RE: [c-a] Re: COZY: oil temp at alt.

Date: Wed, 11 Apr 2012 19:33:28 -0400

From: Ken <kenezmiller@optonline.net>

To: 'Vance Atkinson' <nostromo56@tx.rr.com>, 'canard' <canard-aviators@yahoogroups.com>

...  There is \***pressure**\* everywhere in the system during operation no matter what the temp is, just limited or very little flow through the cooler until the vernitherm’s spring heats and expands, closing off the route directly to the oil galleys inside the engine.  It is diverted to the oil cooler port at full flow.  This operation happens gradually as the oil temp rises, so it’s not like a trap door.  This is why a cooler hose will leak immediately if it is not tight.                The vernitherms are set at 180F, and that is right at the pump before the oil circulates through the engine.  Ken Miller

-------- Original Message --------

Subject: [c-a] High Oil Temperatures

Date: Tue, 04 Sep 2012 15:36:24 -0000

From: Rick <rglos721@yahoo.com>

To: canard-aviators@yahoogroups.com

I just ran across this Lycoming bulletin on high oil temp. It confirms much of what Marc Zeitlin has said in earlier discussions....

http://www.airwolf.com/Articles/ArticlesOilFilterKitsHi-Temp.pdf



## -Oil Filter Mount:

- Terry Schubert May 2012: I've got the popular filter mount that Jim Price designed and is sold by B&C. It works very well, has no hoses to change or leak and the oil pressure comes up on the gage pronto!

-------- Original Message -------- Subject: [c-a] Re: COZY: Remote Oil Filter location/orientation

Date: Tue, 8 May 2012 11:55:07 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: Keith Spreuer <Keith@airstarts.com>

CC: Rock Braud <rnbraud@yahoo.com>, Cozy Builders <cozy\_builders@googlegroups.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

I don't see what is the attraction of a remote installation? I have 90 degree adapter and the oil filter is mounted upright. Hardly get any oil spill when changing it. Buly

-------- Original Message -------- Subject: [c-a] Re: COZY: Remote Oil Filter location/orientation

Date: Tue, 8 May 2012 08:59:17 -0700 (PDT)

From: John Gleason <highlndragon@yahoo.com>

To: Rock Braud <rnbraud@yahoo.com>, Cozy Builders <cozy\_builders@googlegroups.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>, Keith Spreuer <Keith@airstarts.com>

If you mount it upside down or sideways punch a hole in the top and just crack it loose while still hot. It will come loose easier when hot.

Let the oil drain out of it (overnight works well). Then put a bit of tape over the hole to stop any residual as you unscrew it.

JRG

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Remote Oil Filter location/orientation

Date: Tue, 8 May 2012 12:31:33 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: cozy\_builders@googlegroups.com, canard-aviators@yahoogroups.com

Actually there is a tool, available at spruce, although somewhat costly-- probably available at an automotive house at a fraction of the cost, which is specific for punching the hole. It does so by a screw type punch so you don't have the worry about overstresing the filter mounting by banging on it.



## -Oil Miser / Oil Separator:

-------- Original Message --------

Subject: [c-a] CG Products Oil Miser Report

Date: Mon, 3 Sep 2012 17:44:50 -0400

From: Jerry Schneider <jerryskipschneider@gmail.com>

To: Cozy Builders Cozy Builders Forum <cozy\_builders@googlegroups.com>, canard Aviators <canard-aviators@yahoogroups.com>

... purchased the Oil Miser (http://www.cozygirrrl.com/miser.htm) . ...Previous to it's installation, I had no separator. After each 6 quart oil change, the IO-320 I have on my Cozy would promptly blow about 1.0 quarts overboard.... I installed the Oil Miser ....pleased to report after 2 flights with over 7 qt.s in the sump, I'm seeing NO oil on the prop and no decrease in oil level in the sump. So nice to see a product work as advertised.

...Jerry Schneider Cozy MKIV N85TT http://jerskip.com

-------- Original Message --------

Subject: Re: [c-a] CG Products Oil Miser Report

Date: Mon, 03 Sep 2012 14:55:53 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: Cozy Builders Cozy Builders Forum <cozy\_builders@googlegroups.com>, canard Aviators <canard-aviators@yahoogroups.com>

...filling a Lycoming to more than 6 qts. will blow the excess overboard in a couple hours.

> I installed the Oil Miser ...2 flights with over 7 qt.s in the sump, I'm seeing NO oil on the prop and no decrease in oil level in the sump.

I have one as well and it's very good at keeping oil from exiting the breather and getting on the prop or the cowl. HOWEVER, I do NOT return the oil to the sump - I collect it in a plastic container strapped to the engine mount. If you take a look at the oil that ends up coming out of the breather, there's a substantial amount of crap in it - I wouldn't want to put that back in my engine.

I'd recommend (assuming that you're returning the oil to the sump) to collect it for a while instead and look at it, and then decide whether you want that moisture, foam, and who knows what back in your engine.

Far easier to never fill the sump higher than 6 qts - unless you're burning a quart every 2 hours (amazingly, still within Lycoming's limits) you won't run out of oil on a flight.

Marc J. Zeitlin

-------- Original Message --------

Subject: [c-a] CG Products Oil Miser Report

Date: Mon, 03 Sep 2012 15:24:09 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Someone reminded me of this quote from the SacSkyRanch website: "3. Air/Oil separators are like hooking a line up to your anus and piping it back into your mouth. Excuse the crude analogy but who wants the water, acids and other combustion residuals pumped back into ones engine."

This was one of the main reasons that I collect the stuff from the separator rather than returning it to the engine, as well as being able to see exactly how much throughput is going out the breather.

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] CG Products Oil Miser Report

Date: Mon, 3 Sep 2012 18:28:44 -0500

From: Ryszard <ryszardzadow@att.net>

To: <marc\_zeitlin@alum.mit.edu>, "cozylist" <cozy\_builders@googlegroups.com>, "canard" <canard-aviators@yahoogroups.com>

<Air/Oil separators are like hooking a line up to your anus and piping it back into your mouth>

That’s ridiculous. Airplane engines have been using air-oil separators since Jesus started flying and the return oil hasn’t killed anything yet. John as SacSkyRanch is a great guy with a lot of experience, but it’s his “opinion... one mechanic is just that, on opinion. ....

Ryszard

-------- Original Message --------

Subject: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Mon, 03 Sep 2012 15:12:41 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozy\_builders@googlegroups.com, canard <canard-aviators@yahoogroups.com>

....I find that I collect about 4 - 6 oz of oil in my oil separator plastic bottle collector in about 35 hours between oil changes. ...prop filthy after every flight, ...clearly not ....too much oil being blown out of the breather tube, as long as I keep it below 6 qt. total. I agree that if you're blowing a quart or two every few hours while the sump has LESS than 6 qt. in it, there's something to look for, and the separator can mask that diagnosis IF you return the oil to the sump. As long as you collect the oil, you know exactly how much is coming out the breather and how much is getting burned.

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: COZY: Re: [c-a] CG Products Oil Miser Report

Date: Mon, 3 Sep 2012 18:21:04 -0400

From: Jerry Schneider <jerryskipschneider@gmail.com>

To: marc\_zeitlin@alum.mit.edu

CC: Cozy Builders Cozy Builders Forum <cozy\_builders@googlegroups.com>, canard Aviators <canard-aviators@yahoogroups.com>

...I'm guessing my #3 has a bit of blow-by, as evidenced by the slightly lower compression numbers in that cylinder, but it's still within specs.

> I'd recommend (assuming that you're returning the oil to the sump) to

> collect it for a while instead and look at it, and then decide whether

> you want that moisture, foam, and who knows what back in your engine.

...might be appropriate IF the separator were mounted far enough away from the engine to allow the crud (for the lack of a better term), you speak of to condense.

I posit, if you mount the separator close enough to the engine, to keep things hot enough to prevent condensation of the crud , those vapors would be discharged overboard, and the oil would be returned to the sump, sans crud. In that light, I have given serious thought to insulating the separator to decrease external cooling of the device. I understand this is done quite routinely in the automotive racing arena.

In my installation, the separator is located less than 6 inches from the crankcase outlet. Yours may differ, which may account the crud you see in your installation if it is mounted further from the case. In any case, I'll be insulating it in an effort to eliminate any possibility of crud condensation.

Jerry Schneider Cozy MKIV N85TT

-------- Original Message --------

Subject: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Mon, 3 Sep 2012 22:31:43 -0400 (EDT)

From: CozyGirrrl@aol.com

To: tony13rothwell@gmail.com

CC: jerryskipschneider@gmail.com, marc\_zeitlin@alum.mit.edu, cozy\_builders@googlegroups.com, canard-aviators@yahoogroups.com

..."Some" Lycomings have a screw-in plug above the oil level on the sump, but do not count on it. Otherwise on the #4 (port side, towards firewall) valve cover, firewall facing part of valve cover and as low as possible without it tilting down, add a 1/4" barbed hose fitting. The 1/4" drain/return line must go in a constant downhill slope to the barbed fitting without any loops, dips or other deviations from a downhill slope.

Chrissi & Randi

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Mon, 3 Sep 2012 21:40:33 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: Jerry Schneider <jerryskipschneider@gmail.com>

CC: marc\_zeitlin@alum.mit.edu <marc\_zeitlin@alum.mit.edu>, cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

...test currently underway, before and after oil analysis on my Antisplat-Aero separator (works great by the way) ... I believe any moisture that condenses and is recirculated will get another "at bat" to exit the engine if it's operated for a descent amount of time. ...local A&P showed me two Bonanzas in his shop with separators draining back to the sump, said he's never seen one plumbed otherwise.....On another note, he also sells a check valve that can be used with the separator that will put the crank case under a partial vacuum, Allan claims 8 hp on a 0-360 form dyno testing. I've been studying this and may install one this winter. If so I'll report the results.

Tim Andres

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Tue, 4 Sep 2012 07:03:57 -0600

From: R Martinson <N6lk@aol.com>

To: Elwood Johnson <ejandlinda@earthlink.net>

CC: Tim Andres <tim2542@sbcglobal.net>, Jerry Schneider <jerryskipschneider@gmail.com>, "marc\_zeitlin@alum.mit.edu" <marc\_zeitlin@alum.mit.edu>, cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Wes Gardner, a legendary VariEze builder, sold a set up like this 25 years ago.

Rob

-------- Original Message --------

Subject: Re: [c-a] COZY: CG Products Oil Miser Report

Date: Tue, 4 Sep 2012 18:29:31 -0400

From: Nick Ugolini <unick3@gmail.com>

To: Cozy builders group <cozy\_builders@googlegroups.com>, "canard-aviators@yahoogroups.com Aviators" <canard-aviators@yahoogroups.com>

...I installed one of earliest the Cozy Girls oil separators on my plane for testing, ...already had one of those real expensive M20 from ACS (...looks identical)... easy swap out.

...left the Mizer installed ...found they both worked equally as well....great thing ... CG Oil Mizer is $150 cheaper than the M20 and MUCH better built. ... the CG mizer is definitely the one to go for.

Nick Ugolini

-------- Original Message --------

Subject: RE: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Tue, 4 Sep 2012 16:11:39 -0700

From: Jorgen Skovbjerg <skovbjerg@razzolink.com>

To: 'Tim Andres' <tim2542@sbcglobal.net>, 'Jerry Schneider' <jerryskipschneider@gmail.com>

CC: <marc\_zeitlin@alum.mit.edu>, "'cozylist'" <cozy\_builders@googlegroups.com>, "'canard'" <canard-aviators@yahoogroups.com>

Fundamentally, we have 3 components exiting via the breather outlet of the crank case:

- Air of atmospheric composition which we do not care about

- Oil in form of micro droplets

- Water in vapor phase

...function of the separator is to slow the oil droplets down, round them up into large drops and let them exit through the bottom of the separator (and back to the engine) all while the water is kept in vapor form and let to exit the aircraft together with the aforementioned air. When this functions correctly, there will be no water in the oil and there will be no acid of any kind either. Even if there are sulfor components suspended in the oil they will pose no threat to the engine. When people report collecting ugly crud in a collection bottle from underneath the oil exit of the separator, it is because they are collecting crud which under normal circumstances would have vented overboard. This happens because with such set-up, they feed oil and water vapor into this collection bottle and let the water vapor condense in the bottle. In the normal set-up water vapors will vent overboard and not return to the case, and they will certainly not condense there.

Jay Skovbjerg Cozy III

-------- Original Message --------

Subject: Re: [c-a] COZY: CG Products Oil Miser Report

Date: Wed, 5 Sep 2012 06:30:24 -0400

From: Jerry Schneider <jerryskipschneider@gmail.com>

To: marc\_zeitlin@alum.mit.edu

CC: 'cozylist' <cozy\_builders@googlegroups.com>, 'canard' <canard-aviators@yahoogroups.com>

...not sure about where your, or Vance's unit is specifically mounted, ... one thing I'd like to offer for thought.

If the separator is not maintained at at a high temperature, there may be a likelihood of water vapor (and crud) condensing in it (bad). Most ... installations ... updraft cooling ... relatively cool air ... mounted on or near the firewall ... further from the optimum from the crankcase vent. (The closer to the vent, the less chance of cooling the vapor.) ... to be on the safe side, I'm gonna insulate mine as well. Attached is a pic of my installation. ....

Jerry Schneider



-------- Original Message --------

Subject: [c-a] oil/air sep

Date: Wed, 05 Sep 2012 07:15:13 -0500

From: vance atkinson <nostromo56@tx.rr.com>

To: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

...I have dis-obeyed the queens rules.... Mine is not mounted as close to the engine as possible, its mounted on the firewall as this picture shows of my air/oil separator. Chrissie warned me it would be less efficient in this position.

vance atkinson



-------- Original Message --------

Subject: Re: [c-a] COZY: CG Products Oil Miser Report

Date: Wed, 05 Sep 2012 07:43:55 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozy\_builders@googlegroups.com, canard <canard-aviators@yahoogroups.com>

... opportunity to test this :-). For the next 20-40 hours of flight, drain the output of the separator into a container, rather than returning it to the engine and we can see whether your setup will be different from mine and Vance's (my separator is mounted on the firewall, very similar to Vance's).

-------- Original Message --------

Subject: [c-a] Air/oil gook photo

Date: Wed, 5 Sep 2012 19:21:13 -0700 (PDT)

From: DON JONES <djonesdnd@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

...photo I made back in 06 of the gook that accumulated in my blow by collector between oil changes. Same stuff that was coming out of my air/oil separator that was in place before I made and installed this collector. I simply emptied it at each oil change on my 0-200 VariEze.

Don Jones Berkut FG



-------- Original Message --------

Subject: Re: [c-a] oil/air sep

Date: Wed, 5 Sep 2012 06:18:44 -0700

From: Elwood Johnson <ejandlinda@earthlink.net>

To: vance atkinson <nostromo56@tx.rr.com>

CC: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

...I don't have the oil/air separator. .. get a little oil on the prop if I put in eight qt. at change. ... at 7 qt. i don't see any oil on the prop. My sump vent is out the rear near the top center line of the cowl. Several flying canards here have similar setups...

EJ Johnson N36EJ S. Calif.

-------- Original Message --------

Subject: Re: [c-a] oil/air sep

Date: Wed, 05 Sep 2012 17:33:19 -0000

From: Silvereagle <dndnhrd@gmail.com>

To: canard-aviators@yahoogroups.com

I have been using this for about 150 hrs. Works great

http://www.aircraftspruce.com/catalog/eppages/slimeftr.php

Silvereagle

-------- Original Message --------

Subject: RE: [c-a] CG Products Oil Miser Report

Date: Thu, 06 Sep 2012 05:32:45 -0400

From: Ken <kenezmiller@optonline.net>

To: 'Thomas Mann' <tmann@n200lz.com>, canard-aviators@yahoogroups.com

...If you want to know what the [crud] looks and tastes like, run your engine on the ground for five minutes then let it cool down for an hour. Pull your dipstick and look in the cap. That’s the crud. It’s a mixture of water, oil droplets, acids, and carbon that is a byproduct of combustion that blew past the rings while the engine was coming up to temperature. What you see there is what is also up in the top of your engine and on the cam. That’s why you don’t want to ever run your engine in the tiedowns and not go flying for at least 30 minutes to get the moisture burned out of the oil.

It takes a few minutes at full power for the rings to fully seat and everything to normalize because the tolerances are so loose on an aircooled engine. During that time, the blowby is high and the moisture carries unburnt fuel vapors and all that other “crud” out of the engine.

On my Long, I could tell when the crankcase pressures dropped after takeoff. My fuel pressure would read normal for a few minutes, then drop down to less than 2 lbs for almost exactly 45 minutes, then return to normal. My theory is that this is because the diaphragms of the engine driven fuel pump are open to the crankcase. High bypass pressures caused the pump to have some backpressure. What’s weird is that this would not happen if I was flying out West and departing from a higher elevation airport. Only from sea level.

Ken

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Tue, 04 Sep 2012 23:20:30 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: 'cozylist' <cozy\_builders@googlegroups.com>, 'canard' <canard-aviators@yahoogroups.com>

Jorgen Skovbjerg wrote:

> When people report collecting ugly crud in a collection bottle from

> underneath the oil exit of the separator, it is because they are

> collecting crud which under normal circumstances would have vented

> overboard....

What would make Vance, Dennis and my setups be more "normal", so that we don't get the "crud" which seems to collect (in small quantities, given the small quantities of blow-out oil that we all report)? What is abnormal about our setups, in which our engines run perfectly normally, with no abnormal venting of oil through the crankcase vent, on long trips (as Dennis, Vance and I have all reported)?

> ... In the normal set-up water vapors will vent overboard and not

> return to the case, and they will certainly not condense there.

And yet, they do. How do we explain that?

Listen. We have three reports of "crud" collecting from different oil separators. We have at least three people (and one respected A&P who's written books about aircraft engines) that don't want to put the crud that they have collected back in to their engines, either on short or long flights, no matter what the theory about "burning it off" says.

We have a few people that return the oil to their crankcase, and say that they suffer no ill effect from it. Possibly so. But since those people do not collect their oil from the separator, they do not know whether or not they're returning crud (water, acid, other byproducts) back to their engine. Maybe they're fine and their engines will last as long as those that do not do so - I certainly do not have the evidence to tell them they're wrong. As Ryszard says I usually demand - show me the data. I don't have it, and I don't know that anyone does (or will).

But I do know that it's easier to collect 4 oz. of oil in a bottle attached to the oil separator than it is to plumb it back to the engine, and I never have to even think about whether I'm returning stuff to the engine that may be bad for it. I empty it when I change the oil - it takes an extra 15 seconds.

YMMV, Caveat Emptor, etc.

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Wed, 05 Sep 2012 07:43:43 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozy\_builders@googlegroups.com, canard <canard-aviators@yahoogroups.com>

Phillip Johnson wrote: > ... What I do see is that if crud is being carried out through the

> oil/air separator then surely there is a huge amount of crud being

> passed back to the crankcase in the general oiling circulation path

> of the engine.

Maybe - your logic could be correct, or we could also believe that the vapor in the crankcase has a different composition (due to the very different boiling points and vapor pressures of the oil and water and acids) than the liquid does. Since only the vapor goes out the crankcase vent, it would make sense that the vapor could easily carry a different composition of materials. In that case, the assumption that the same percentage of "crud" is in the liquid in the crankcase would not be correct - the vapor may have the vast bulk of it, and we MAY be removing it by draining it into a container from the separator.

Or not, as you surmise - we have no data either way, either from the air/oil separator MFG's or from the folks that don't like what they see from the drainage. But the theory could go either way.

> ... The oil air separator is not some kind of exotic oil filter.

True, but the crankcase \_is\_ a liquid/vapor separator, by definition.

> Surely a large part of the water contribution comes from the suck

> back of the general environment when the engine cools.

That may very well be the case (along with combustion gas residue, which has water and acid in it). But the question isn't where it comes from, but how it's removed. \_IF\_ draining the separator only gets rid of a

tiny bit of the "crud", then it makes no difference if the oil is returned to the sump or not. But if draining the separator gets rid of the bulk of the "crud", then it may very well make a difference.

All I'm saying is the jury is out - neither the facts nor the theory "prove" things one way or the other (yet).

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Wed, 05 Sep 2012 07:51:24 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: 'cozylist' <cozy\_builders@googlegroups.com>, 'canard' <canard-aviators@yahoogroups.com>

Ryszard wrote:

> ... what we have is hundreds of thousands, if not millions, of internal

> combustion engines that use air oil separators (airplanes aren’t the

> sole users) that return the oil to the sump...

Automobile engines, which are water cooled and have much tighter fitting components than the air-cooled engines that we use are not directly analogous. Plus, the oil that we use is different - it does not have the same types of additives (and we're specifically instructed NOT to use auto oil). If there were millions of air cooled, flat four auto engines with air/oil separators using our type of oil (did VW bugs?) then I'd concede the point.

> ... and then we have a relatively FEW people that collect the dribble because collecting dribble makes them “Feeeel” better.

No, we do it because the answer isn't obvious (yet). Unlike some people, I regard myself as a scientist and I allow facts to change my opinions - if facts are presented that show that I'm incorrect, I'm perfectly happy to change my opinion on a matter (and have many times).

Show me an analogous situation, or some research that indicates that air/oil separators can't damage the engine and I'll change my tune. Until then, I'll do what's easier.

...Marc J. Zeitlin

-------- Original Message --------

Subject: [c-a] Re: COZY: CG Products Oil Miser Report

Date: Wed, 05 Sep 2012 09:00:47 -0600

From: Steve Stearns <steve@tomasara.com>

To: marc\_zeitlin@alum.mit.edu, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

...New question: The CPs make lots of mention of issues with frozen crankcase vent tubing and the need to put in a spring, add a whistle hole, inspect before flight on cold days etc. Is there a related implication when you have added an oil separator?

Steve Stearns Boulder/Longmont, Colorado N45FC O235 Longeze

## -Oil Pressure:

-------- Original Message -------- Subject: [c-a] Lycoming oil pressure settings

Date: Tue, 24 Apr 2012 14:38:38 +0100

From: Bill Allen <billallensworld@gmail.com>

To: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

...Lycomings' tendency to have valve problems, ...some experts have attributed to low oil flow to the rocker-box. ... Read; <http://egaa.home.mindspring.com/new.htm>

...education of how the oil systems works, ...flow diagrams etc which are helpful in understanding.

I've run my IO-320 D3G at the "new" (1998) upper limit since overhaul 400hrs ago. My understanding is that since it's installed in an experimental aircraft, it has lost its certified status and thus I can set the pressure where I believe is best.

...Bill Allen LE160 N99BA FD51

## -OshKosh Gouge:

-------- Original Message --------

Subject: [c-a] Fifth? Annual Oshkosh Early Birds Spaghetti Bash

Date: Wed, 6 Jun 2012 22:38:53 -0400 (EDT)

From: CozyGirrrl@aol.com

To: canard-aviators@yahoogroups.com, cozy\_builders@googlegroups.com

... Randi & I along with ...volunteers will host the Fifth Annual Early Birds Spaghetti Bash at Osh on Tuesday evening from 5PM till the fun runs out. ...will put out another notice a couple of weeks before Osh for RSVP's ...

-------- Original Message --------

Subject: RE: [SARL-Racers] Looking for a roof over my head at Oshkosh

Date: Sun, 24 Jun 2012 10:50:16 -0500

From: Dave Adams <long83dt@charter.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

...dorm room ...call them at 920-424-3226.

-------- Original Message --------

Subject: [c-a] Canard/Cozy Dinner

Date: Wed, 27 Jun 2012 13:37:23 -0500

From: Daryl Lueck <cozypilot@hotmail.com>

To: Canard <canard-aviators@yahoogroups.com>

Once again, the Canard/Cozy Builders dinner ...at Robbin's Restaurant on Omro Rd just north of the airport ...Friday July 27th. ...cocktail hour (cash bar) beginning at 5:00 pm unit 6:00pm... buffet dinner and normal project updates and door prizes beginning at 6:00pm. We're usually done by 9:30 or so. ...around $18-$20 ... if you know you'll be there, please send me an email (off list) for the counts...

Daryl and Kim Lueck Cozy IV N797DL

-------- Original Message --------

Subject: [c-a] Two week flying Vacation - Part 5

Date: Thu, 09 Aug 2012 11:14:33 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

...did the Ripon - Fisk high approach (I will never do the 90 kt. low approach again - 135 kts is just about right in order to adjust for faster OR slower aircraft who cannot follow directions). ...

Marc J. Zeitlin

## -Paint:

-James (Berkut/Race 13 [www.berkut13.com](http://www.berkut13.com)) Nov or Dec 2011: In researching my paint scheme for the Berkut, found a paint system technology that will allow a gloss black to be applied to just about any composite technology, produced by Akzo Nobel and is called Solar Heat Reflective paint, keeps the surface temps below 150F. .  info:

<http://www.anac.com/brochures/akzonobel_solar_heat_reflective_coatings.pdf> Currently, the black is the only one developed, tested, and FAA certified.  The paint is custom order and is not readily in US distribution.  -Watch out for metal elements in paint that may affect antenna performance. -------- Original Message --------

Subject: [c-a] New LongEZ Paint

Date: Mon, 12 Nov 2012 21:48:39 -0700

From: Christopher Woodard <cnlwoo@gmail.com>

Reply-To: cnlwoo@gmail.com

To: canard <canard-aviators@yahoogroups.com>

Delivered Nov. 12th. 2012, a "stretch" LongEZ paint job. Gene Kear's 300th aircraft paint job.

http://youtu.be/k2pvJWhraCg

-------- Original Message --------

Subject: RE: [c-a] New LongEZ Paint

Date: Wed, 14 Nov 2012 04:37:19 -0500

From: Ken <kenezmiller@optonline.net>

To: 'Hicks, Wayne' <wayne.hicks@zeltech.com>, cnlwoo@gmail.com, 'canard' <canard-aviators@yahoogroups.com>

AC-45-2D states:

|  |  |  |
| --- | --- | --- |
| Experimental aircraft—exhibition, amateur-built, and light-sport aircraft with a maximum cruising speed of 180 knots or less | 3 inches (with exceptions as shown in Table 3) | (1) On both sides of the fuselage between the trailing edge of the wing and the leading edge of the horizontal stabilizer, or (2) On both sides of the vertical tail surface. |

This can be interpreted.  We have two (2) “vertical tail surfaces”.  When my DAR inspected my airplane, we had a discussion about placement, which was on the inside of each winglet at the tip.  When we did a walk around, I pointed out that you could see my N-numbers from directly in front and directly behind the airplane, which is not possible when the numbers are on the outside.  Technically, we have one number on the inside of each winglet, but the requirement to be seen from both sides of the airplane is met.  In fact, there is literally no position all the way around the airplane that the N-number is not visible unlike any other aircraft.  I don’t know about anyone that has shed light on any other restriction on placement. Ken

-------- Original Message --------

Subject: RE: [c-a] New LongEZ Paint

Date: Wed, 14 Nov 2012 08:12:40 -0500

From: Dan <dan@dmt.net>

To: Ken <kenezmiller@optonline.net>

CC: 'Hicks, Wayne' <wayne.hicks@zeltech.com>, cnlwoo@gmail.com, 'canard' <canard-aviators@yahoogroups.com>

But 45.21.c2 says no ornamentation 45.25.b1 If displayed on the vertical tail surfaces, horizontally on both surfaces, horizontally on both surfaces of a single vertical tail or on the outer surfaces of a multivertical tail. However, on aircraft on which marks at least 3 inches high may be displayed in accordance with § 45.29(b)(1), the marks may be displayed vertically on the vertical tail surfaces.

45.29.c :

(c) Width. Characters must be two-thirds as wide as they are high, except the number “1”, which must be one-sixth as wide as it is high, and the letters “M” and “W” which may be as wide as they are high.

(d) Thickness. Characters must be formed by solid lines one-sixth as thick as the character is high.

(e) Spacing. The space between each character may not be less than one-fourth of the character width.

45.25.b2 says they can be vertically on a vertical tail surface. "(1) If displayed on the vertical tail surfaces, horizontally on both surfaces, horizontally on both surfaces of a single vertical tail or on the outer surfaces of a multivertical tail. However, on aircraft on which marks at least 3 inches high may be displayed in accordance with § 45.29(b)(1), the marks may be displayed vertically on the vertical tail surfaces."

-------- Original Message --------

Subject: Re: [c-a] New LongEZ Paint

Date: Wed, 14 Nov 2012 07:56:31 -0800

From: Bob Holliston <bob.holliston@gmail.com>

To: canard-aviators@yahoogroups.com

Also, two more things: If the aircraft is a copy of a 30 (or more) year old design (like all EZ's) you can display two inch high numbers instead of three inch numbers. (They're hard to read from thirty feet away.) And you can add an X following the N and remove your "experimental" sticker. ...I keep all that stuff in my plane with the paperwork in case I get rampchecked. I'll try to retrieve it later today. BTW, the X after the N requires no change in paperwork . How cool is that?Bob LongEZ NX666DV.

## -Paint Gear:

-------- Original Message --------

Subject: [c-a] Re: COZY: Looking for a good paint gun

Date: Tue, 9 Oct 2012 12:23:55 -0400

From: Nick Ugolini <unick3@gmail.com>

To: Canard Aviators <canard-aviators@yahoogroups.com>, Cozy Builders <cozy\_builders@googlegroups.com>

...When I painted my plane on the gear using a gravity gun with paint bags. ... adaptor which fits inside the cup of ANY spray gun and is basically a zip lock bag using a plastic nipple which goes into the suction hole and bag..You put the paint in the bag, close it and paint. The gun sucks the paint out of the bag at any any angle (even upside down). ... makes cleanup a bit easier since you just throw out the bag and the cup stays clean. Eventually, I just used their adaptor and some cheap heavy duty zip lock bags. What I liked best is the name... the EZ liners!

http://www.eastwood.com/e-z-liner-gravity-cup-bag-10.html

or 3M

http://www.homesteadfinishingproducts.com/htdocs/3m\_pps.htm

Nick Ugolini

## -Paint on Canard Effect:

-Shirl Dicky Feb 2012: Shortly after ...40 hrs ...on my new Varieze ...doing slow flight and stall testing.  ...bad half snap (roll) when at minimum airspeed, high AOA, full aft stick and some rudder input.  Very repeatable.  Put me right on my back and required a split 'S' to recover.  Very disconcerting for a new pilot in an A/C that was not supposed to stall.  At the time the A/C was equipped with 'wing cuffs' per RAF recommendations. ...fly to Mojave to have the A/C evaluated by Burt.  Burt asked Dick and Mike to go fly the A/C.  Both flew the plane and although they did not do the full 'half snap' they nibbled at it verifying the problem and returned.  They declared that it was badly aft of CG and I said that it was not...  ... detailed measurement of the A/C while on jacks.  They dropped the reaction points to the floor for measurements and then weighed the A/C.  With all the data in hand, Me, Burt, Dick and Mike gathered in a conference room and Burt did the calculations...  Before he made the final key stroke he looked up at Dick and asked him where he thought the CG was.  Dick said '104" at least' (102.2" is max aft limit).  He then asked Mike where he thought the CG was.  Mike said 'no, way farther aft than that'...  Then he looked at me and said, where do you think the CG is?  My answer was; 101.2".  Burt then pressed 'enter' on the calculator and looked in disbelief at what he saw...  The CG was within .2" of my answer, well within CG limits. .... back out the A/C to try to figure out how this could happen.  It was Dick that began feeling along the Canard leading edge and the beautiful new paint work on the surface.  It consisted of 'hockey sticks' with three long points running the full length of the canard in the forward 5-20% of the cord...  These were taped lines with a very distinct 'trips' several thousandths of an inch thick...  Burt said, go home and sand those off and tell me what it does. I did as told and the stall went away.  **This is where the newsletter recommendation to avoid paint discontinuities on the canard came from back about 1981.**   I only had one other 'half snap' event with the A/C several years later.  I was doing some practice aerobatics for a fly-in the next day at Pinedale, Wy.  I entered a loop at 1500' AGL (approx. 8500' MSL) and I was slightly below my target entry speed.  By the time I reached the top of the loop inverted, my airspeed dropped to 'I don't know how slow' and the A/C did the old half snap...  The good news was that I ended right side up...  Easiest recovery I ever made but very disconcerting...  At the time the A/C had the cuffs removed and vortalons added and all the paint trips removed. These were not spins, they were aggravated canard stalls that were made worse with any rudder input which induced the roll.

## -Performance Data:

-------- Original Message --------

Subject: [c-a] Cruise numbers for Long-EZ

Date: Fri, 30 Nov 2012 10:34:50 -0600

From: Charles McDougal <pc12charlie@gmail.com>

To: <canard-aviators@yahoogroups.com>

CC: <joe1@kineoptics.com>

... My VariEZE with a stock Continental O-200, P51 scoop, and baggage pods was a solid 155 knot airplane on about 6-7GPH. ... Joe Lacour ... beautiful EZ, he claimed cruise at 170 knots on about 7GPH. ...It actually did cruise close to 170 KTAS on around 7-8GPH. Amazing. It had a high compression 0-320. ... changed out the Great American prop with a Hertzler and performance improved a little. ... The cruise numbers I got were at 2500 RPM, and other guys were reporting 155-160 knots.

One issue ...when discussing speed, ...is the fuzzy knowledge that some pilots have about the difference between true, indicated (or calibrated), and ground speed. ... “ Hey, that’s a nice looking \_\_\_\_\_, What kind of cruise performance do you typically see?” ... “Well, we were doing about 180 all the way back from Oshkosh this year.” ... could mean 180mph groundspeed ... true airspeed in knots, or anything in between. ...

... Occasionally, I would try a speed run when the opportunity a rose, cool morning, smooth air, just me and about 20 gallons of fuel in the airplane. I always got close to 200 knots true. ...

...So why was N97EZ so fast?

·First, it was light and not nose heavy. Those times when I was l loaded with tools (heavy) in my nose baggage compartment it felt like I lost 10 knots. Nose is heavy, canard needs more lift, flies at a higher AOA, creates more drag.

·Also, 97EZ had very stout and long chord landing gear bow fairings, as well as very tight wheel fairings. These two items make a huge difference in speed. Drag at the wheels or the gear legs, (also the gear to fuselage point), create a downward pitching moment, once again requiring nose up elevator, higher AOA, more drag, and loss of speed.

·Third, the cowlings were pretty special; very tight, very gradual cylinder bumps, and narrowing to a fairly small exit and exhaust opening with a slight flair at the trailing edge to help accelerate the cooling air. Of all the amazing workmanship that Joe and Della did on this airplane, these cowlings were among the most amazing in my book. They were carbon fiber and weighed about three pounds each. You could pick them up with a thumb and one finger. The bottom cowling had no big angle change aft of the NACA duct air inlet because Joe modified the sump to allow mounting the Ellison TBI on the aft surface of the sump instead of underneath. All this not only reduced drag but also helped to smooth airflow into the propeller, a crucial element in getting the most power from a pusher configuration.

·The navigation lights were enclosed with a blown acrylic or plexi fairing that continued the curvature of the wingtip as if there was no winglet, and of course, internal rudder bellhorns. A lot of people have poo poo’ed the importance of these ultra slick wingtips, but I have my suspicions that they contributed a few knots to the top end.

·And of course the engine was putting out a few more ponies due to the higher compression, and eventually the Electronic ignition I installed.

I am leaving out the super smooth finish of the wings and fuselage as we take that for granted. ...

...to compare the performance of the Mooney with my EZ. ...up high the Mooney delivers really great efficiency, but the fuel burn during climb is pretty high. ... I have seen 150 knots true on about 7.9 GPH. Or you can go 165-170 KTAS on around 12 GP H. I usually fly at a normal cruise 23/2400 or so on around 10GPH. ...used to fly KMFE to KBTV with one fuel stop (once we went KMFE to KDAY nonstop in 6 hours), on about 75 to 80 gallons of avgas, total flight time around 8-9 hours. In the Mooney we do it with two stops, on around 100 gallons, in around 10 flight hours. Benefits of the Mooney are 4 seats, good load hauling capabilities (Zachary the dog rides in the back seat), fairly good short field performance if you know how to land it, and solid IFR performance ...

Charlie McDougal

-------- Original Message --------

Subject: Re: [c-a] Cruise numbers for Long-EZ

Date: Sat, 1 Dec 2012 11:03:16 +0100

From: Gianni Zuliani <gz@comgz.com>

To: Canard-aviators <canard-aviators@yahoogroups.com>, Charles McDougal

<pc12charlie@gmail.com>

...Respectfully disagree and report my opinion and experience below.

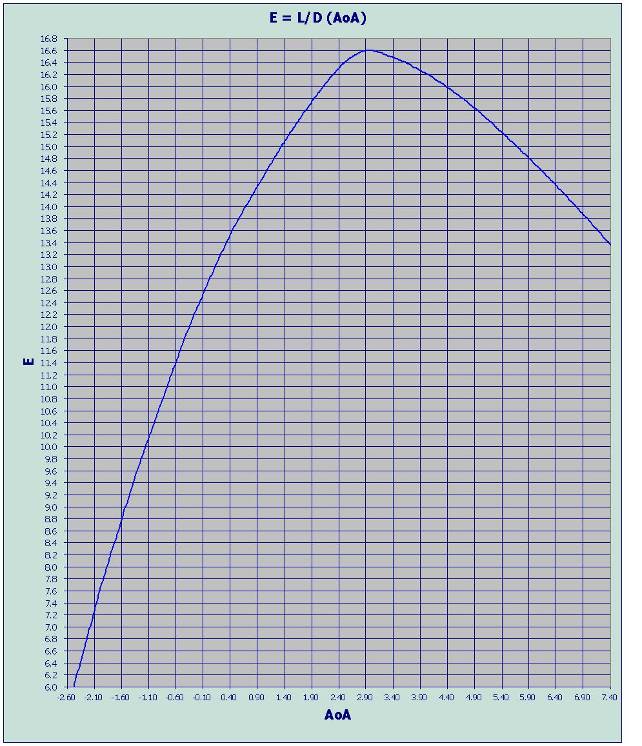
While it's true that forward CG (nose heavy) shaves some knots (less than ten), it's not true that with forward CG it flies at higher AoA: just the opposite.

Same power applied, same DA and weight, you get max speed with rear CG and higher AoA.

Max a/c efficiency (around 16.5) in our canards is at around +3° AoA, as far as I understand.

See attached plot, as per my tests and calculations for my Stag-Ez.

Max speed is at around -2.4° AoA (depending on CG) with E = 6.3



...Gianni Zuliani

Long-Ez >> Stag-Ez >> Stag-EzR

http://www.comgz.com/stag-ez.htm

http://www.youtube.com/watch?v=6yeRMm-BB\_Y&list=UL

-------- Original Message --------

Subject: RE: [c-a] Cruise numbers for Long-EZ

Date: Sat, 1 Dec 2012 10:19:04 -0600

From: Charles McDougal <pc12charlie@gmail.com>

To: <canard-aviators@yahoogroups.com>, <gz@comgz.com>

CC: <joe1@kineoptics.com>

...my remarks are originating in my somewhat rudimentary pilot knowledge of aerodynamics, as well as about 2000 flight hours in the Vari and Long. For years I observed the effects of weight, CG and canard contamination on performance. Let’s focus on CG and canard contamination. If I was flying my airplane in stable straight and level flight at a constant speed and power setting in smooth air, for arguments sake let’s assume the following.

·Altitude – 3000MSL

·Temperature and barometric pressure – Standard

·RPM – 2400

·KIAS – 160

... then Ryszard flies over the top in one of his jump planes and lowers 50 lbs of lead shot on a steel wire into my nose. ...I open my emergency fuel dump and release exactly 50 LBS of fuel. So in effect we have moved 50 lbs from the fuel station to the nose station. What happens? The canard was producing X lift and now the actual balance of the aircraft requires it to support something in the range of X + 50. ...the airframe will no longer be in equilibrium, the nose will drop, and we will begin to lose altitude. We desire equilibrium however, so we add aft elevator pressure. This deflects the elevator, which effectively changes the chord line of the canard airfoil, increases angle of attack, and therefore lift. The airplane is once again in equilibrium…..but wait. The higher angle of attack required of the canard to produce the extra 50 lbs of lift also produces more drag. So if we maintain the previous power setting (with a fixed pitch propeller), we will see a slight reduction in rpm as well as a decrease in indicated airspeed. If we want to achieve our previous airspeed we must add power, and if there is sufficient power available we can do this.

Conclusion: Forward CG requires more lift from the Canard, we make additional lift by increasing the AOA, this increases induced drag, causing either a loss of airspeed, a descent, or the requirement to add energy to the equation by burning more fuel in order to prevent either of these outcomes.

Flying through clouds in the EZ is much the same. Let’s say I am at a low cruise of 150 knots in level flight on an IFR flight plan, but currently in the clear. I enter an area of dense cloud and experience a fairly dramatic loss of lift on my GU canard. Without immediate intervention in the form of aft elevator control input, the airplane will lose altitude. So I add sufficient elevator to compensate .... Attitude is slightly nose high to keep VSI at zero, wings are level to maintain heading, which is stable, and wooops…airspeed is down to around 135 KIAS. Now how could that be? Canard contaminated makes less lift, I need to maintain altitude which means I need to adjust lift, which I do by increasing the angle of attack of the canard, this creates a lot of additional induced drag, so I will either choose to fly at the lower speed (better for my wood prop) or add more thrust to overcome the additional drag.

Both these examples tell me that a forward CG requires a higher angle of attack, which makes more drag, which causes the airplane to fly slower, or requires more fuel to make it go as fast as it might with the CG in a more AFT location. This is why the freight aircraft 747 and 777 like to load towards the aft CG. Better performance. When flying the Citation V (and previous other citations) I can tell when the boss is coming up from his second-from-the –back seat to visit. The airplane will lose 20 to 40 feet of altitude while flying on the autopilot as he moves forward in the cabin. During the M20J CAFÉ foundation races, I am told that as soon as the aircraft was enroute, the guy in the right seat would go back to the baggage compartment. Why, AFT CG, lower AOA, faster speed due to less drag.

...

Charlie MCD www.flighttrainingcoalition.com

-------- Original Message --------

Subject: Re: [c-a] Cruise numbers for Long-EZ

Date: Sat, 01 Dec 2012 08:44:39 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

-------- Original Message --------

Subject: Re: [c-a] Cruise numbers for Long-EZ

Date: Sat, 01 Dec 2012 08:44:39 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Gianni Zuliani wrote:

> While it's true that forward CG (nose heavy) shaves some knots (less

> than ten), it's not true that with forward CG it flies at higher

> AoA: just the opposite.

Charles McDougal wrote:

> Conclusion: Forward CG requires more lift from the Canard, we make

> additional lift by increasing the AOA, this increases induced drag,

> causing either a loss of airspeed, a descent, or the requirement to

> add energy to the equation by burning more fuel in order to prevent

> either of these outcomes...

> Both these examples tell me that a forward CG requires a higher

> angle of attack, which makes more drag, which causes the airplane to

> fly slower, or requires more fuel to make it go as fast as it might

> with the CG in a more AFT location...

So you're both right. Charlie with respect to the canard, and Gianni with respect to the main wing. Using Charlie's weight shift example of 50 lb. of fuel to the nose from the tanks - while it is absolutely true that the canard must deflect the elevator and operate at a higher AOA to produce the lift required of it with more weight on it, what you forgot was that the main wing now has to produce LESS lift - 50 lb less, to be exact. Since it's producing less lift, the AOA will be lower (all else being equal). Now, there'll be some adjustment of AOA's all around due to the lower speed caused by the higher trim drag of the canard/elevator, but the idea is the same - there's some equilibrium point for the airplane that, as the CG moves forward, involves the canard having a higher AOA and the main wing having a lower AOA. If you take the <absurd> extremes:

1) move the CG aft far enough so that NO weight is on the canard and all is on the main wing (yes, the airplane will be wildly unstable and susceptible to deep stalls, but we're talking about AOA only here), the canard will need a zero-lift-line AOA (no lift produced) and the main wing will need a higher AOA due to carrying ALL the weight.

2) now do the opposite - move the CG far enough forward so that NO weight is on the main wing and all is on the canard (yes, I know the plane can't fly like that because the canard isn't large enough, but the important thing is the thought process). Now the MAIN WING is at a zero-lift-line AOA (no lift produced) and the canard is at a very high AOA to carry all the weight.

So you're both right - Charlie talking about the canard and Gianni talking about the main wing.

Gianni Zuliani wrote:

> Same power applied, same DA and weight, you get max speed with rear CG and higher AoA.

Absolutely correct, since the overall trim drag for the aircraft is lower.

> Max a/c efficiency (around 16.5) in our canards is at around +3° AoA, as far as I understand.

I'm not sure what AOA you're measuring here or how you measured it. Max Cl/Cd for the Eppler airfoil occurs at an AOA of about 9 degrees - see:

http://cozybuilders.org/ref\_info/Roncz\_GU\_Eppler\_comparison.pdf page 3. The canard and rest of the airplane will lower the number from 135, obviously, but the AOA shouldn't change much, since the Eppler

dominates over the canard airfoil, be it Roncz or GU (and the main wing airfoil is what you'd be measuring in any case).

Not a big deal - it all depends on what you were referencing to get the AOA.

The other thing is the L/D ratio - I'd be very surprised if you actually get an L/D as high as 16.5. I assume that you measured this with the engine at idle - there's substantial thrust produced at low speeds (max. L/D will occur somewhere around 85 kts., depending upon weight) which will confound the measurements. Ken Brimmer did some glide tests in his COZY III with the prop stopped and measured L/D's around 13-14, and although I did not do a scientific test when my prop departed (no residual thrust from the hub) I calculated somewhere in the 13-14 range as well. 16.5 would be exceptional.

> Max speed is at around -2.4° AoA (depending on CG) with E = 6.3

Again, the AOA reference point is the question here. The L/D ratio of 6.3 seems about right - for an 1800 lb. plane, that would imply that the engine is producing about 275 lb. of thrust in cruise. Certainly the right order of magnitude.

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] Cruise numbers for Long-EZ

Date: Sun, 2 Dec 2012 20:15:30 -0700

From: Curt Boyll <curt@vigilanceaero.com>

To: canard <canard-aviators@yahoogroups.com>

....Gary, Klaus, Rob, et al have taught us ... significantly reduced drag in all other areas through intentional efforts, and some increase in thrust by using the correct prop.

Curt Boyll VEZ 1JK Boulder, CO

-------- Original Message --------

Subject: RE: [c-a] O-320 Long EZ cruise

Date: Fri, 30 Nov 2012 08:16:14 -0500

From: Ken <kenezmiller@optonline.net>

To: 'austwoodez' <austwood@hotmail.com>, canard-aviators@yahoogroups.com

Your “cruise” speed is up to your checkbook and your left hand. If you run WOT (wide open throttle) on a properly pitched prop for that type of operation, the engine [O-320] should turn about 2680-2700, with a true airspeed at 170-175 knots and 8 GPH running 100 rich of peak. Lots of guys like to lope the engine along at 24-2500 rpm to “save” the engine and use less fuel. I’m not one of those guys. If you do that, then your cruise speed will drop to the 155 knot range and 6-7 GPH. Still not too shabby, but in a long cross country, that equals more time in the air. If you do the math, the fuel saved will be mostly offset by the longer block time. There are other airplanes out there that will do 220 (190kts) at WOT. They are few. Understand that these engines are designed to run WOT to TBO. When you pull the throttle back, you disrupt even flow through the intake runners and can cause uneven fuel flow to each cylinder and uneven EGT/CHT’s. My Long used to run within 100 degrees F EGT’s and within 20 degrees span between CHT’s. When I pulled the throttle back, all that went haywire.

Ken

-------- Original Message --------

Subject: Re: [c-a] O-320 Long EZ cruise

Date: Fri, 30 Nov 2012 06:15:16 -0800 (PST)

From: FlyingTiger <flyingtiger05@yahoo.com>

Reply-To: FlyingTiger <flyingtiger05@yahoo.com>

To: austwoodez <austwood@hotmail.com>,

"canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

... You will find there is very little "BS" when it comes to Rutan designed aircraft types and that includes the Cozy clan (they are all from Burt's genius). ...First I built and fly a VariEze. ... On Rutan's debut at OSH in I believe 1978 he broke the distance and speed record for this size design flying non-stop from Mojave, CA to Oshkosh, WI. ...

Not too long after the VEZE's introduction the LongEZ was designed. It feels and flies exactly like a slightly larger VariEze but it is a tad slower but not by much. ... If you don't mind burning 9 to 10 GPH and cruising in the 175 to 185 KT area you can't find a better airplane than the LongEZ. With 52 gallons on board you do the math.

Tim LoDolce VEZE N26FM aka Race62 Truckee Tahoe

## -Physiology Stuff:

-------- Original Message -------- Subject: Re: [c-a] keep a good lookout

Date: Sat, 14 Apr 2012 11:22:43 -0600

From: to tu <totucomm@gmail.com>

To: Canard Aviators <canard-aviators@yahoogroups.com>, Cozy Builders <cozy\_builders@googlegroups.com>

...That's a good demonstraton of vision peculiarities. but I've not heard of the "keep your head on a swivel" phrase.   For those who forgot or never learned,  over here the practice for VFR traffic scans uses a combination of two different techniques.  1)  'Sweep the horizon',  this is primarily for the closer and easier to see traffic.     Supplement with

2)  'Sweep with Stops'.   As you move your eyes across the horizon, pause every 20 degrees or so.   This helps discover traffic thats more distant or difficult to see as a result of their movement. Tom Tugan, former CFI

On Fri, Apr 6, 2012 at 9:54 AM, Bill Allen <[billallensworld@gmail.com](mailto:billallensworld@gmail.com)> wrote: During my constant quest for or education and recreation, I came across this site which explains the physiology for the reason to "keep your head on a swivel"

<http://www.msf-usa.org/motion.html> and there's more on the 'Troxler effect' here;  [http://en.wikipedia.org/wiki/Troxler's\_fading](http://en.wikipedia.org/wiki/Troxler%27s_fading)

Bill Allen

-------- Original Message --------

Subject: Re: COZY: Re: [c-a] Visual Acuity

Date: Fri, 08 Jun 2012 08:02:52 -0400

From: Harley <harley@AgelessWings.com>

To: Hicks, Wayne <wayne.hicks@zeltech.com>

CC: 'berkut13@berkut13.com' <berkut13@berkut13.com>, 'canard-aviators@yahoogroups.com' <canard-aviators@yahoogroups.com>, 'cozy\_builders@googlegroups.com' <cozy\_builders@googlegroups.com>, 'curt@vigilanceaero.com' <curt@vigilanceaero.com>

My eyesight was poor enough that I was wearing the variable focus lenses (and later contacts...multifocal contacts, with two prescriptions in one eye, and two different prescriptions in the other!) and still needed an additional set of glasses! ...doctor told me .. might be needing cataract surgery ...options available, specifically Crystalens...cataract replacement lenses (called intraocular lenses - IOL) ...

As well as clearing up your vision, as the normal IOL surgery does, cataract lens replacements can only correct for distance OR close up. Usually, one still needs glasses....

... Crystalens is something new. ... hinges that embed in the eye muscles, and after a short training period, your eyes can again focus like they did when you were younger! And that is just what happened to me. Since the day after I had those "installed" in December of 2004, I have never needed glasses or contacts for any purpose. I can read the fine print on small drug bottles, and can see the whiskers on a mosquito flying over. ... my vision was 20/25 in the left eye and 20/20 in the right...first time since I was 40! Accommodating IOLs are expensive, but in my opinion, it was worth it to be able to stop juggling glasses and contacts and have near 20/20 all the time.

www.crystalens.com/us

Harley

## -Pitot Static Troubleshooting:

-------- Original Message -------- Subject: [c-a] Pitot/Static System Schematic

Date: Wed, 18 Apr 2012 22:16:41 -0000

From: niftyyak50 <niftyyak50@yahoo.com>

To: canard-aviators@yahoogroups.com

...Push the go fast lever forward today and got ZERO airspeed. I have a GRT EFIS and standby and both were tango uniform. Took her back to the hangar and looked as much as I could to see if there was any blockage...no jolly.   
  
All the documents that came with this airplane are still be looked for by the UPS CSI team. (Yeah, they lost a 12 x 12 x 12, 24 pound box). Can anyone make some suggestions....  
Tim

-------- Original Message -------- Subject: Re: [c-a] Pitot/Static System Schematic

Date: Wed, 18 Apr 2012 17:07:24 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: niftyyak50 <niftyyak50@yahoo.com>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Yeah, it's much more likely a leak than a blockage. Make up a little manometer and see if it holds 2-3" of water pressure.

Be careful not to go much over that and to keep the water out.

Go after the plumbing with soapy soapy suds if needed but you probably have a gross leak if it read zero. My guess is you stuck your hands in behind the panel somewhere and knocked a fitting loose. If you've been working in there that's a good place to start.

Once you find it you probably should test it as above, you might have other fittings leaking that could cause an error.

I think technicaly youre suppose to have it retested by a pitot static guy after you touch it.

HTH

Tim Andres

## -Pitot Tubes:

-------- Original Message --------

Subject: Re: [c-a] Close-up of pitot tube

Date: Sun, 9 Sep 2012 11:27:16 GMT

From: jschuber@juno.com <jschuber@juno.com>

To: usaf\_david@yahoo.com, canard-aviators@yahoogroups.com

...I'd not leave more than 1/4" extending beyond the nose profile. When parked nose down in the grass, folks invariably stand on the pitot tube and a longer tube will sooner or later be found bent and collapsed at 90 degrees during pre-flight inspection.

Terry Schubert

-------- Original Message --------

Subject: Re: [c-a] Close-up of pitot tube

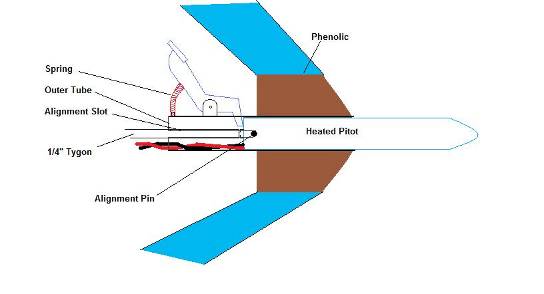
Date: Sun, 9 Sep 2012 09:25:44 -0500

From: Thomas Mann <tmann@n200lz.com>

To: <canard-aviators@yahoogroups.com>, "Dave Anderson" <usaf\_david@yahoo.com>

..... or you could put in a retractable heated pitot like I did. Photo & text link:

<http://forum.canardaviation.com/showthread.php?t=4559&highlight=pitot>.



7/8th inch tubing for the the pitot to slide into from behind (inside) the nose. The 1/8th inch plate on the rear of the pitot matches up to a partial bulkhead and a 35 degree rotation locks it in place. The slot area lides under a 1/4 bolt head and the other 1/4 inch diameter hole locks it in place via a spring pin.

23 Sep 2012: Photo of pitot tube from Long EZ N24ND



-------- Original Message --------

Subject: [c-a] Pitot

Date: Sun, 28 Oct 2012 10:34:22 -0400

From: Ken Miller <kenezmiller@optonline.net>

To: 'Canard Aviator' <canard-aviators@yahoogroups.com>

... anyone wanting to eliminate the pitot in the point of the nose... just installed on a Long-EZ ...the tubing out and faired it in with micro....under the canard so no one can break it off or step on it, and rainwater can’t get in.

Ken



-------- Original Message --------

Subject: Re: [c-a] Pitot

Date: Sun, 28 Oct 2012 08:22:02 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: 'Canard Aviator' <canard-aviators@yahoogroups.com>

...While out of the way, I would be worried about it being inaccurate. That's not in clean air, but in an area of accelerated air, with both static and dynamic pressures that are not particularly representative of the free-stream.

I'll be very interested to see the calibration curves of this pitot-static systems when the plane gets back in the air - if accurate readings can be obtained from this location, it would make a nice option (says the guy that put a 2" gash in his thigh last weekend walking past his COZY MKIV pitot probe in the hangar).

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] Re: Pitot

Date: Sun, 28 Oct 2012 23:07:55 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Donald Bates wrote:

> The pitot measures total pressure, i.e., flow stopped in the tube.

> You can put the pitot anywhere in the free flow outside the boundary

> layer and it will have the same total pressure everywhere.

If that were the case, why do aircraft in flight test use a long probe to put the pitot tube far away from the flow field around the aircraft? Independent of where the static port is... Maybe if you can guarantee that the entrance to the pitot tube is perpendicular to the streamlines what you say will be correct, but since we don't know what the flow field looks like in arbitrary spots on the airframe, using a known stagnation point (the nose) is certainly the safest bet on pitot positioning.

I would guess that in Ken's case, the pitot should NOT be pointing directly along the aircraft's longitudinal axis, but would probably have to be aligned parallel to the fuselage side, or something close to it.

If you used a nose mounted pitot, but cut the tip at some angle other than perpendicular to the flow, you'd get inaccurate readings. This is one reason why the IAS is inaccurate at low speed and high AOA - it's not aligned with the local flow field anymore.

> ... Where your static port is located is what is important.

That's for sure. But the pitot position matters as well, else folks wouldn't go to the trouble of using long probes to get the pitot out of the flow field when flight testing to determine CAS.

Marc J. Zeitlin

-------- Original Message --------

Subject: RE: [c-a] Re: Pitot

Date: Mon, 29 Oct 2012 12:14:01 -0400

From: charles beard <charliebeard6111@gmail.com>

To: <marc\_zeitlin@alum.mit.edu>, "'canard'" <canard-aviators@yahoogroups.com>

I mounted a heated Piper pitot blade on the fuselage side under the canard to "protect" it from damage. I have compared the IAS using it with the IAS using the standard pitot in the tip of the nose (same IAS indicator). The side pitot reads a few knots lower which I am guessing is due to the air being parted by the nose, resulting is less pressure. I use the nose pitot for the backseat AS which gives me a slight IAS safety factor up front.

Charlie Beard LongEZ N60CV

-------- Original Message --------

Subject: Re: [c-a] Re: Pitot

Date: Mon, 29 Oct 2012 17:11:34 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

To: Al Wick <alwick@juno.com>

CC: canard <canard-aviators@yahoogroups.com>

... If the pitot tube is in a stagnation point area (as on the nose of these aircraft) then it will work fine no matter how long it is. In fact, many folks have used glider type pitot probes that are buried in a large recess in the nose. In fact, that may make the pitot less susceptible to off axis directional issues. But whether long or short, your pitot will be somewhat less accurate when in a slip or at high AOA's, since the entrance to the probe will not be perpendicular to the flow.

...in flight testing, especially with aircraft that can substantially affect the flow field more than a few inches away from the surface of the aircraft. In those cases, a long probe that ensures the pitot is in the free stream at an appropriate angle is necessary when attempting to calibrate AS to within a knot or so.

...

## -Plans:

-------- Original Message --------

Subject: [c-a] Re: Plans

Date: Sun, 30 Sep 2012 17:56:38 -0700 (PDT)

From: T Dalton <azpilot2000@yahoo.com>

Reply-To: T Dalton <azpilot2000@yahoo.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Terf CD http://www.dragonaero.com/RAFCDROM.htm

-------- Original Message --------

Subject: Re: [c-a] is the LONGEZ alive?

Date: Sun, 07 Oct 2012 08:27:04 -0400

From: Harley <harley@AgelessWings.com>

To: Dustin <cozyrotary@gmail.com>, CSA <Canard-aviators@yahoogroups.com>

You can build any type of airplane you want...but, Rutan would like you NOT to call it a Long EZ if it is not made from his registered plans and the Canard Pusher newsletters.

...cannot build a Long EZ from the TERF CD by itself, as it does not include any of the full size wing, canard and bulkhead templates. Also the plans themselves are complete copies of the original plans (without the templates), but scaled down so that the full size drawings of the smaller parts in them are also no longer to scale. But, there are full size copies of the plans and the templates floating around (the Open EZ, for example, is a full set of the original Long EZ plans to full size, including all templates, ... when you print ...full size... dimensional lines ...so you can confirm the size).

There are also complete sets of original plans available from time to time on eBay, Barnstormers, Trade-A-Plane, etc. But even with original plans, I don't think that RAF issues serial numbers anymore (it did not come with the plans, you had to request it after you purchased the plans).

Harley Dixon Long EZ N28EZ

-------- Original Message --------

Subject: Re: [c-a] is the LONGEZ alive? [html][heur][bcc][faked-from][mx]

Date: Sun, 07 Oct 2012 00:55:12 -0400

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: canard-aviators@yahoogroups.com

...The serial number of the plans is meaningless. A builder is solely responsible for building and licensing a homebuilt. While the FAA asks for a serial number, the builder can use any serial number he desires. One reason for not copying plans is so that the designer gets compensated for each person using his design. But ... there is no more plans being sold, so no loss of income to the no longer existing RAF. The terf CD does not have the patterns for the templates for the wings and canard and such. Not saying such isn't available. Copies could be had from anyone with plans who feels comfortable with distributing the patterns. Never checked to see if the plans had a copyright notice. Personal opinion, Bert Rutan is finished with the Long EZ. If he's abandoned the design, then it might be argued that it's in the public domain. It could also be argued that it isn't...

David Froble

## -(POH) Pilots Operating Handbook:

**-Thomas Mann Mar 2012:** <http://canardaviation.com/cozy/Long-EZPOH.pub>

-Terry Schubert Mar 2012: Look at EZ.org downloads.

-Pour Foam: -Bruce Smith Jan 2012: Less messy way of applying pour-foam. <http://www.wind-lock.com/cat-56-1-33/Foam_Guns.htm> and from page 20 of the PDF catalog: <http://www.wind-lock.com/cat-45-1-22/Foam2Foam_Adhesive.htm>

-Terry Schubert Jan 2012: Be careful and check if this is the foam that NEVER gets hard.  Many insulation foams stay soft , making them useless for our hard core sandable application.

- Al Wick Jan 2012: I always appreciate when people share stuff like that. I've stolen lots of ideas over the years. Pour foam is just a place holder so you can cure fiberglass in VERY non structural area. I thought Terry's warning of making sure it cures to solid was timely.  You heard the stories of foam that kept expanding long after glassing? That's easily solved by making large hole inside foam before glassing...that way it will prefer to expand into that big hole. Likewise you can crumple up newspaper, THEN pour the foam. Lot's of tricks too with applying just a little bit of pressure on it during cure. The tiniest pressure changes size of holes...makes for smooth surface after you sand the stuff. -Bulent Aliev Jan 2012: The worst places finish wise are the ones I used pour foam. It changes dimension for a long time. Would not use it again.

**DATE: October 11, 2012  
TIME: 2:00 PM, EST**

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| --- | --- |
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## -Propellers:

-Isaac Solomon Nov 2011: The pitch at a radial distance r from the center of the prop is 2\*pi\*r\*tan(theta)where theta is the blade angle at that position. The pitch that is usually quoted is the one at 3/4 of the distance to the tip of the blade.

-Marc Zeitlin Nov 2011: For 4.5 years, I've been flying with Belleville washers on prop bolts for a more robust, maintenance-free solution to using a wood core prop. I've developed an instruction manual, parts list, and setup spreadsheet that I've distributed to a number of folks that are flying with them (about a dozen) or are in the process of installing them (about 30). At this point, I believe that there's enough historical experience to make the information widely available to anyone that's interested. At the urging of James Redmon, who's recently run into two situations where propellers almost departed aircraft (his own Berkut and the Stagger-EZ), I've created a web page at: <http://www.cozybuilders.org/Prop_Bolt_Bellville_Washer/> where you can access the "Prop Loss" presentation, the "Belleville Washer" presentation, and can download the instructions (in PDF format) and the Washer Selection spreadsheet (In Excel format). All questions, comments, suggestions or comments are welcome. If you don't have Excel, I'd be happy to assist with the correct usage of the belleville washers.

-Jon Dembs Nov2011: After Marc's failure, Craig Catto has said many times not to place a fiberglass bulkhead between the prop and extension.

-Gilbert Drieux Nov 2011: DON'T use composite BETWEEN the prop and any extension ! see: <http://www.berkut13.com/spinner2/spinfail05.jpg>

-David Froble Nov 2011: the lesson is, don't put fiberglass and resin between the prop and the extension/hub. FRivtion, heat, degradation, and then the prop bolts are no longer tensioned ....

-James Redmon Nov 2011: Main lesson is to PERFORM REGULAR PROPELLER MAINTENANCE. Never let it get to the point where RTC Epoxy Tg is challenged. Once it progresses to that point it doesn't matter what's between the prop and extension.

-Marc Zeitlin Nov 2011: What I'm EVENTUALLY hoping to achieve: mount full size spinner to crushplate, rather than to a backing plate between the prop and the prop extension. This will allow to totally decouple the prop mounting from the spinner mounting. The little skullcap spinners already do this, but I want to do it with a full size hershey kiss spinner and a single quarter turn fastener. -Jack Wilhelmson Nov 2011: If glass or carbon epoxy between the wood prop and the prop hub is  
 a hazard, what about the glass or carbon epoxy layers on the propeller?

-Marc Zeitlin Answer Nov 2011: The issue isn't the glass or carbon fibers, it's the low temperature  
epoxy. Gilbert took a stab at estimating temperatures of the prop extension (and I think that in normal use, his estimate of 160F-180F is way too high - I can always put my hand continuously on the prop  
extension after landing, and that's below 140F, so I'd be very surprised if the extension (and drive flange) ever got above 140-150F). So this temperature, if that's real, is close to if not higher  
than the Tg of most of our room temp. curing epoxies. IIRC, both Catto and Hertzler use higher temperature curing epoxies on their props (they should correct me if I'm wrong, and point out what  
temperature range they design for) so the Tg is higher than normally achieved with the RT epoxies. The second problem is what happens if there's ever any relative motion between the prop and the flange, with a RT epoxy spinner baseplate between. Once relative motion starts, the heating of the base-plate is tremendous, and it will get soft quickly with a RT epoxy, which will then compress and cause the bolts to lose tension quickly, exacerbating the situation. At least with a high temp epoxy, the base-plate (and/or prop itself) won't compress any more than it already is. It's the RT epoxy that's the issue, not the fibers. If a high temp cure epoxy is used to fab the spinner baseplate (as James Redmon is using for his NXT spinners) then these problems don't exist, because the epoxy will not get soft.

-Rich Argoldman May 2012: ...just committed IVO (with a magnum 3 blade). ...bolts holding the blade have to be periodically re-torqued (more so in the beginning as the plates sink into the blades), ...thoughts about using bellville washers to mitigate ...frequently re-torque ...??  
  
-Marc Zeitlin May 2012: Along with all the other folks that seem to think that the IVO is a bad idea (for structural attachment reasons), I'll also chime in that from an aerodynamic standpoint, it's hard to imagine a worse propeller shape and/or pitch changing arrangement. There are far more efficient  
props out there. Belleville installations are designed for wood props that rely on the friction of the prop hub against the prop flange (or prop extension flange) to transmit the torque to the propeller from the engine. It sounds, from the descriptions of others, that this is NOT the mechanism by which IVO props accept torque from the engine, in which case the Bellevilles aren't going to do anything. But if I'm wrong, and the IVO DOES rely on the friction for torque transmittal, then the Bellevilles will be a useful methodology for maintaining the required friction force. I do NOT have a recommended solution for the IVO prop, however, and I do NOT recommend just pulling something out of one's posterior with respect to choosing which washers to use - it's an engineered solution, not "TLAR".

-Rich Argoldman May 2012: FYI, The Ivo does depend on friction between what they call the 'motor plate' on one side of the flattened root of the blade and another plate on the other side, both knurled. ...compressed into and around each blade by...bolts, ...The holding action is, indeed the crushing force created by these...The crush plate closest to the engine is then bolted to the engine flange. When the prop is initially assembled and torqued ...procedure where it is run, retorqued, run ...imbedding ...knurled plates into the prop roots. ...after a short time, the necessity to retorque (from a physical standpoint) stops or reduces significantly. ...seems obvious...to me, that if ...disassembled, ...the orientation of the blades and the knurled crush plates must be kept aligned, ...and that when reassembled (to get the male and females of the knurl and indentations to line up) and  the same technique as with the fresh blades (multiple torquage until stabilization) must be applied. Looking over the accident ...on the way back from S&F a while ago ...earmarks of this not being followed. ...

- David Froble DFE Ultralights, Inc. May 2012: ...I'm not a fan of the Ivo props. ...dissatisfaction is with the method used to hold the blades, which doesn't leave much margin for error. ...there is no substitute for proper torque of the bolts holding the blades, and whatever schedule is mandated should be followed, or even more often. Regardless, my understanding of the bellville washers is that they take up "small" amounts of unexpected slack, should such occur. Of all the props on the market, I feel that the Ivo props are in the greatest need of such flexibility.

-------- Original Message -------- Subject: [c-a] Re: IVO prop experience

Date: Fri, 01 Jun 2012 17:15:10 -0000

From: paul\_lee\_sq2000 <abripl@gmail.com>

To: canard-aviators@yahoogroups.com

You had an IVO on a O-320? IVO does not recommend their prop on any Lyco/TCM four banger. But that's good news that IVO can stand the torque pulses.  
  
The in-flight adjustment is the only reason I had the IVO. It could do 2600 take-off AND 180+KIAS cruise. I have a couple fixed pitch that can do neither.  
  
--- In [canard-aviators@yahoogroups.com](mailto:canard-aviators%40yahoogroups.com), "lisnion" <lisnion@...> wrote:  
>  
> I flew the first 220 hours in my Long EZ in front of an IVOprop. It worked great but had a few new tricks compared to a fixed wood prop. I didn't have the in-flight variable pitch feature but really liked having the ground adjustable pitch for flight testing. They got a bad rep for pusher applications that I don't think is deserved. It seemed that every failure I heard about had some unanswered questions. I do know that the IVOprop blade shape and twist is a compromise. When I upgraded to a Hertzler "silver bullet" everything--climb, cruise, take-off distance, and CG got better. Inflight variable pitch would be great, but not worth the CG hassle on my ship.  
>   
> Ion  
> 0-320 Long EZ N110EZ 1015 hrs.

-------- Original Message -------- Subject: Re: [c-a] Re: IVO prop experience

Date: Fri, 1 Jun 2012 13:24:08 -0400

From: Brian Alley <n320wt@yahoo.com>

To: paul\_lee\_sq2000 <abripl@gmail.com>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Whirlwind make a good ground adjustable Prop for Lycomings. See   
<http://www.whirlwindpropellers.com/ga/index.html>

Brian Alley [carbonfibercomposites.net](http://carbonfibercomposites.net)

-------- Original Message -------- Subject: Re: [c-a] Re: IVO prop experience

Date: Sun, 3 Jun 2012 15:34:49 -0500

From: ns1jab@basol.net

To: Henry Hallam <henry@pericynthion.org>

CC: paul\_lee\_sq2000 <abripl@gmail.com>, canardlist <canard-aviators@yahoogroups.com>

You must have spoke with someone not fully aware of their product line.  I have a Whirlwind 150P 3 blade composite constant speed on my IO-360-C1C powered Cozy 4.  It's a beautiful prop.

 John Basol N204TF

-------- Original Message -------- Subject: Re: [c-a] Re: IVO prop experience

Date: Sun, 3 Jun 2012 21:24:25 -0700

From: Henry Hallam <henry@pericynthion.org>

To: ns1jab@basol.net

CC: paul\_lee\_sq2000 <abripl@gmail.com>, canardlist <canard-aviators@yahoogroups.com>

I did ask specifically about props for my airplane, so maybe they just don't have any suitable for an O-200 in pusher config.  
Henry

-------- Original Message -------- Subject: Re: [c-a] Re: IVO prop experience

Date: Mon, 04 Jun 2012 23:18:03 -0500

From: Kevin Baker <flykb@verizon.net>

To: ns1jab@basol.net

CC: Henry Hallam <henry@pericynthion.org>, paul\_lee\_sq2000 <abripl@gmail.com>, canardlist <canard-aviators@yahoogroups.com>

...contacted Whirlwind today... I have a 200HP IO360 and here is their response..

==================================  
....

 Unfortunately we can not help you with your project. Our only pusher is our 150 Series and it is only for 165 hp IO-320’s. 200 hp is too much for it.  ...

-------- Original Message -------- Subject: [c-a] Prop experience

Date: Sat, 02 Jun 2012 00:15:21 -0000

From: lisnion <lisnion@yahoo.com>

To: canard-aviators@yahoogroups.com

...Gary Hertzler busted me for this too. I should have said 'high performance prop'.   
  
Caution: acronyms approaching!  
  
I started flying my Long EZ with a Lyc 0-290-G and an IVO 2 blade prop. For the first flight I set the pitch for a static of 2600 rpm for best climb as I'd heard that all canard pushers have temp problems early on. Mine was no exception but would still climb at 1/4 throttle. After the first 20 hours or so I couldn't get above about 170 mph indicated at full throttle no matter how I set up the pitch. I always do Wide Open Throttle speed run tests at 10K ft Density Altitude-which is the lowest DA I can consistently hit all year in Colorado. I decided to chop an inch off each blade tip and that got me up to 180 WOT, and called it good with that.   
  
I replaced the IVO with a Warnke 'air claw' and loved it. The "almost constant speed prop" feature really works. I had the Warnke pitched a little too coarse for the 0-290 'cause I was already shopping for a narrow deck 0-320 to replace the 0-290 down the road. As I recall the Warnke would static at 2450 rpm and the 0-290 would top out at 185 mph indicated at 2650 rpm, straight & level and WOT. The prop would unload at low speed and the take off performance weren't bad (I always test this in Leadville- a 20 minute hop from home).  
  
I finally got the 0-320 a few years later and found the Warnke was pitched just right for it after all. I go by the rule of thumb that the prop is about right for cruise if the RPM top out at 2900 WOT on a speed run and the Warnke did just that. Static with the 0-320 was up to 2600 rpm & take-off performance was great. That combo would climb at 1500 fpm at 10K DA too! A speed run would give about 193 mph.  
  
I heard so many great things about Hertzler's Silver Bullets that I bought one of those and love it too. The HSB statics at 2350 rpm & maxes out at 203 mph at 2900 rpm WOT. With the HSB I gave up 250 fpm of climb rate but got another whopping 10 mph in cruise and top speed. I fly high in the mountains almost every flight so I'm unwilling to trade more fpm for mph. I like to think the cost savings of being able to get stinkin' high quickly makes up for the lost top end speed. Of the three props the HSB is the overall winner but the Warnke's ability to unload is still very intriguing. I think the HSB does this to some extent too.  
  
The IVO was recently traded to a buddy with a turbo Subie Defiant project where it's ability to 'eat stuff' should be useful. The Warnke is in a FEDEX-ready box as insurance.  
Ion 0-320 Long EZ 1056 hrs.

-------- Original Message -------- Subject: [c-a] Prop info

Date: Mon, 4 Jun 2012 15:28:36 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: Cozy Builders <cozy\_builders@googlegroups.com>, canard-aviators <canard-aviators@yahoogroups.com>

Here is something interesting from Whirlwind web site, about us with 4 cyl engines:

*Recommended Non-Continuous Operating Ranges*

Some of our propellers, depending on the application, follow industry standards *recommending*that continuous operation between 2,050 - 2,300 RPM and 2,600 - 2,700 RPM be avoided when used on **Lycoming and similar four cylinder aircraft engines.**

This *recommendation* is because the four cylinder engines produce torsional vibrations on each power pulse (ignition firing).  These vibrations are transferred from the crankshaft through the propeller hub to the propeller blades.  Extensive research conducted by propeller manufacturers has demonstrated that these vibrations at engine speeds between 2,000 - 2,300 RPM and greater than 2,600 RPM can cause increased vibratory stresses in the propeller blades and in some cases this torsional vibration can be close to the blade’s resonant frequency.  Blades vibrating at their resonant frequencies can be stressed beyond their design limits and could result in limited or complete failure.  This phenomenon is a greater concern with aluminum propeller blades because of their lower natural resonant frequency.  The natural dampening, high natural resonant frequency and high fatigue resistance of composite blades makes the likelihood of destructive failure less probable, but without additional extensive and difficult testing the RPM concerns recognized by the industry can not be ignored.  Furthermore, flywheel dampening and / or crankshaft counterbalancing can mitigate the torsional vibrations but not eliminate them completely.  It is only prudent to avoid operating in these critical RPM ranges whenever possible.

Additionally, many aircraft engines used in kit planes and experimental aircraft undergo aftermarket modifications to increase their performance, essentially making every engine unique.  Additional horsepower amplifies the torsional vibrations resulting in even greater stresses on the propeller blades and therefore may increase the likelihood of propeller blade damage.  Any review of type certified propellers will show that the certification is always specific to very particular engine (manufacturer / horsepower / ignition) and airframe combinations, and use of the propeller on modified engines or airframes will nullify the certification.

I always cruise at 2450-2550 RPM. That gives me average 160K on the GPS at 7GPH LOP.

Bulent "Buly" Aliev

-------- Original Message -------- Subject: Re: [c-a] Re: IVO prop experience

Date: Mon, 4 Jun 2012 15:29:39 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com

So now we have some anecdotal evidence on both sides of the story.   
  
Yes, the Ivo may be an aeronautical disaster and blade twisting not the best situation, but the real proof (assuming the prop, ivo or others stays together) is attempting to compare one prop/design an other, or attempting to compare one manufacturer of a fixed prop with another, or even comparing props of the same manufacturer with each other, is in the flying.  
  
To my understanding, there are three major variables which determine the effectiveness of any prop:  
1 diameter  
2 pitch (and ability to change in flight)  
3 efficiency  
  
Diameter is a fairly easily controlled variable  
  
Pitch, not so much, unless the propeller is made in a mold and each copy is essentially identical the the others.  
Additionally the actual pitch stated from one manufacturer can not necessarily be compared with with the actual pitch that stated by another, or the actual pitch from propeller to propeller from the same factory (wooden props are hand finished).  
  
To further complicate the comparison, the efficiency of a propeller is variable manufacturer to manufacturer and type to type.  
  
So what's a person to do to get some real information from all of the "stuff" out there with respect to propellers.  
  
Assuming similar safety-- there is only one set of factors with which you can compare them.  
  
All props are a compromise. Fixed props can be pitched for climb or cruise, some can vary their pitch slightly to give an "almost constant speed" effect but this change is limited.  
  
Variable pitch props can, at the pilots discretion change the pitch from the cockpit in an attempt to allow a fine pitch for takeoff enabling the engine to produce maximum HP and to coarsen the pitch for cruise. (constant speed props control the pitch as a function of selected RPM  
  
About the only way to props of various manufactures and types is where the rubber hits the road (or blade hits the air)  
  
To further add to the confusion I have not heard much quantification of the increase/decrease in performance going from one prop to another except better/worse etc. I have seen RPM statements etc, but no real comparison, at least that I can grasp  
  
So I would like to suggest a way of better comparing props that really means something rather than "This prop or that Prop was so much better/worse when I switched."  
  
Prop 1, description ie length manufacturers stated pitch, blades  
         TO run FT  
         Best rate of climb FT (various altitudes)  
         Best cruise speed FT (various altitudes)  
         Landing distance  
  
Prop 2,3,4------  
Same data as above using the same variables (altitudes, temp, etc)  
  
With a constant speed or variable pitch, do the same. You will not be able to measure the pitch, however.  
  
With the various props there will most likely be a difference between both the climb rates and the cruise speeds.  
If you are concerned about running at FT, get high enough to where that is not a concern but max power will be equal.  
  
Only then, and imperfectly so, can you get some idea of one prop vs another. You can also get some idea (and help others) of what pitch prop is good for your mission. (Put an over pitched prop in there (within reason) and you may get great cruise speeds, however you may need a JATO to get off of your field. Put an under pitched prop on and you will jump off and your cruise speed will be doggy.  
  
The reason I suggest looking at the landing distance is that the drag of the prop (determined by the pitch) acts like a speed brake.  With a variable or CS prop, you generally land in fine pitch for 2 reasons, 1 if you have to go around you will have max power available and 2 it creates more drag which shortens the landing distance.  
  
I for one am interested to see what kind of cruise speed is sacrificed for the increased climb rate as provided by variable props, be they IVO or other manufacturers, and the real difference between the variable, with it's complexity, and those props of the fixed persuasion.  
  
This comparison, of course, is only valid on a specific aircraft, but analysis of data from various aircrafts will possibly yield some real knowledge and be helpful to all of us.  
  
Because we are comparing the same airframe and engine, the only difference is the propellers. The actual numbers obtained don't matter, but the percentages of improvement or degradation may speak volumes.  
Rich

-------- Original Message -------- Subject: Re: [c-a] IVO prop experience

Date: Sun, 03 Jun 2012 23:20:08 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Chris Barber wrote:  
> Pardon my ignorance, but what makes the IVO not so good aerodynamically?  
  
The shape of the blades and the way that they adjust the pitch. Other than that, they're fine :-).  
  
> .... What factors make it less aerodynamic? Are the compromises made to allow adjusting the pitch the way it does cause the issue?  
  
Partly. All CS props are compromises - they can't be great climb props AND great cruise props, because the pitch distribution has to change (not just the pitch) in order to be optimized for different speeds. In regular CS props, the whole blade rotates, but the pitch distribution is optimized for one airspeed, and it's less optimal either faster or slower than that. Less "less optimal" than a fixed pitch prop at an airspeed off it's optimal one, but less optimal, nonetheless.  
  
The IVO's method of changing pitch makes this "less optimal" business worse, since it does change the pitch distribution, but in the wrong direction as airspeed changes.  
  
But the shape of the blades is also non-optimal - while they somewhat resemble well shaped blades, such as Catto or Hertzler, they're too rectangular - the chord distribution could be better.  
  
> I have found the folks at IVO quite responsive. If known shortcomings are apparent it seems it would behoove them to address them.  
  
As long as there isn't a safety issue, performance is just something that the customers are willing to live with less of. I've never heard anyone say that they replaced an IVO with something else and gotten worse performance. Every aero guy I speak to thinks that they're ingenious, but not very efficient props.  
Marc J. Zeitlin -------- Original Message -------- Subject: [c-a] Re: IVO prop experience

Date: Tue, 05 Jun 2012 02:45:07 -0000

From: paul\_lee\_sq2000 <abripl@gmail.com>

To: canard-aviators@yahoogroups.com

IVO prop efficiency. My comments relate to aircraft engine experience and not to auto - conversion engines.  
  
It was mentioned that the IVO twisting is the wrong way for aerodynamic shape. That is only partially true for minority of the time. The IVO blades from the factory come in proper decreasing pitch for about 75% of the outer length. The inner part has a twist that is not the best shape but it probably matters less. Te IVO neutral (untwisted) shape is pretty good for mid cruise range (I believe I hit the neutral spot near 160KIAS at 2500rpm). When pitching down for takeoff the IVO twist is in the right aerodynamic shape. It is only when pitching high beyond the neutral cruise point that the shape is less efficient. Nevertheless it gives an extra 20KIAS. And even if I didn't use the higher cruise I would be happy for the extra takeoff thrust that a fixed pitch cruise prop does not have.  
  
Again, this is all academic since most us fly engines that do not qualify for the IVO - including me with a TCM IO-360 instead of the Franklin I used to have.

-------- Original Message -------- Subject: Re: [c-a] Re: IVO prop experience

Date: Wed, 06 Jun 2012 07:50:50 -0400

From: John Slade <jslade@canardaviation.com>

To: 'Canard Aviators' <canard-aviators@yahoogroups.com>

Here's another exception.  
Perhaps the IVO is slightly less than optimum in all configurations. I wouldn't know. I've never used full power for take-off, climb or cruise. Excess power is a great solution for reduced efficiency . All of what Marc says is probably true, but I wouldn't trade getting to safe return height before I run out of land ahead distance for any amount of reduced fuel consumption, and I'd bet that my cost per mile is MUCH less than a lycoming with a fixed pitch prop simply because my gas costs $3.60/gallon. Last time I measured fuel usage on a short trip (that   
involved more climbing than cruising) I got just over 7gph. Add to that the advantage of being able to reduce unwanted thrust on final by going to fine pitch, and the IVO's a winner for me.  
  
I have a performance prop in my basement. It cost me over $2600. Since I got the IVO it has only been on the plane once, and that was when I trashed a blade with a heavy landing and needed to move the plane while   
I was waiting for a replacement blade. BTW - the replacement blade cost about $300. A full set of three is around $1000.  
  
Very happy with my IVO.  
John Slade Turbo Rotary Cozy, N96PM

-------- Original Message --------

Subject: Re: [c-a] Turbo Rotary Velocity First Flight

Date: Tue, 12 Jun 2012 12:37:49 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com

...A few words about controllable props, settings, and IVO.

With a standard c/s prop, there are two positions that cannot be violated. ie: finest and coarsest pitch. These are physical limits placed by the mechanical construction of the prop. In a hydraulically controlled propeller, there is an adjustable fine pitch stop. This is done by a screw/spring type mechanism on the governor. The purpose of this is to prevent over-revving the propeller. You can hear this constantly being abused by too rapid advancement of the throttle where the propeller goes past this point after which the governor, now catching up gets the pitch to the point where the engine does not over-rev. (over-revving a prop can be quite damaging due to the centrifugal (centripetal) force placed on the hubs.

Now to the IVO.

The IVO is an electrically controllable pitch prop (they have a device which makes it C/S about which there is mixed reviews.) The nature of the prop is such that the pitch can be changed by the pilot (toggle switch) unrelated to the rpm or power produced by the engine.

The IVO also has stops built in for fine and course pitch. These are in the form of a series of washers, settable by the owner/operator, the last one of which is plastic one which compresses as the adjusting mechanism (worm driven) gets to the end of the travel for which the prop is set either coarse or fine. The electronic mechanism of stopping the blade from twisting before destroying the mechanism is rather primitive, but effective. When the pitch changing mechanism gets to the limit, the resistance to movement increases (due to the plastic washers) and the electric motor driving the blade twist, as motors do as their load increases, draws more current until the circuit breaker blows before self destruction happens. Some people hook an ammeter in the circuit to indicate when the stop is reached. I believe the constant speed attachment does this automatically. There are some electronic circuits that have been published, on the web, to address this problem also.

So the IVO's inflight pitch is adjustable from the cockpit and max coarse and min fine pitch set on the ground.

It is up to you (us) to set these appropriately so that the propeller will function properly with the engine chosen.(without paying much attention to them once set.)

The propeller should also function in such a way so as not to require specific ongoing attention, or a co-pilot, during times of more workload such as on takeoff or go-around.

Now I don't know what kind of waste-gate you have on you turbo. Waste gates are the mechanisms responsible for diverting exhaust gasses to the turbos. For those non-turboofiles, there are basically three types, fixed automatic and manual.

The fixed will take some of the exhaust gasses and pass them through the turbo using a fixed aperture in the exhaust system and is not controllable or disconnectable by the pilot. The amount of exhaust gas that goes to the turbo is dependent on the amount of exhaust gasses produced that are not allowed to bypass the turbo via the fixed slot. The early Seneca's II had this. Since the amount of gases to the turbo was a product of the engine power, on takeoff, there was a problem of over-boosting. This required vigilance in terms of throttle control and close watching of the MP gauges, in addition to all of the other things that one must consider during takeoff, etc. Popoff valves do help to prevent over-boosting, however they do lag a bit and are ,IMNSHO, safety items and should be on every turbo or super system.

The next two types fall into the Controllable waste gate category. Here the exhaust gases, rather than due to a specific opening being diverted to the turbo, there is actually, in effect a butterfly valve type device (not exactly) which when activated, closes the normal exhaust path and diverts it to the turbo. Obviously, these are controlled either directly or indirectly from the cockpit and the amount of gases that go to the turbo is variable.

Now the manual waste gate is controlled by a cable with which the pilot can select the amount of boost requested. for example, the Turbo Twin Comanche had 4 (count em) throttles. The two standard throttles on the quadrant and two verniers mounted on the quadrant, just below. The way these were operated was to start with the "turbo" throttles all the in, full throttle for takeoff and as nature takes away manifold pressure as we ascend, the turbo throttles were backed out spinning the turbos and making up for the lost MP. Going down, of course you reduced the turbo throttles first.

The last, the automatic waste gate does the same thing as the turbo throttle cables, but the waste-gate position is driven, usually by hydraulics and automatically determines the position of the gate based on several factors. It is not controllable by the pilot, except possibly to turn it off completely.

So what the hell does this all have to do with the Propeller?

Well, the fine pitch of the propeller should be set to the position that will allow the engine to produce maximum RPM (that you have decided gives max hp/or torque) This RPM should happen at full throttle. If you are turboing on T.O. the power produced will be greater than if you don't turbo on t.o (determined by the type of waste-gate you have and how you use it.)

If you look at store bought aircraft, the governors are set for T.O. power.

The IVO can be set to produce max rpm on the ground (full power). As you trundle down the runway, the angle of attack to the prop will change and you may (will) need to increase pitch to keep from over-speeding.

What you can do is to, using an approximate setting (stop washers in place, finer than necessary for safety), take off, and when you feel comfortable, establish a climb (what you want to do at T.O), Full throttle, fineness the prop to give you the TO RPM that you want. Your turbo should be engaged if that, if you have a control, to the extent that you want for your normal takeoffs.

Do not touch the twist of the prop and land. You will then be able to measure the number of stop washers you need to place, in the prop hub so that when you select finest pitch, it is appropriate for max TO power, without even looking at MP or RPM, except to do a check.

If the IVO C/S does indeed work (hall effect RPM sensor and many adjustments) then you want to set up your Static at max RPM since as you trundle down the runway and the prop blade angle of attack lessens, the system will automatically coarsen the prop, keeping the same TO RPM like the real boys.

Now to the other side of the equation-- the coarse pitch. In Hydraulic props, there is no stop other than the mechanical of the prop. The ivo gives you the ability to set this stop. Their recommendation is to set the course stop so that you can achieve just a little climb with full coarse setting. (they talk about this in their less than stellar documentation). The failure mode of the IVO is that you cannot change the pitch and the last set pitch is the one you have. Thus they suggest, just a little climb at the max cruise power, of your choice. ...

Rich

-Prop Extensions/Spinners: - James (Berkut/Race 13 [www.berkut13.com](http://www.berkut13.com)) Pressure recovery spinners: <http://www.berkut13.com/ntxspinner.htm>

-Marc Zeitlin Dec 2011: Answering Roch LaRocca, eracer N382RB question on prop extensions: Theory says ... to get the prop as far back, away from the turbulent air behind the cowl as you can (long extension). Practically, unless you want to pay a LOT of money to have the extension and crankshaft flange machined to match, an 8" extension is about as long as you can have without too much run-out. Racers sometimes run 10 or 12" extensions to get the prop further away from the cowl, but they spend the $$$. Also, too long an extension on our planes will put the prop tips very close to the ground on rotation and landing and will also move the CG rearward (props weigh something and you're moving it back). Long extensions cost more, too. More metal, more machining, harder to fabricate. Personally, if you're installing an O-360 (eracer), I'd recommend an 8" extension.

-Wayne Hicks Dec 2011: The longer the prop extension, the shorter diameter prop you have to run (lest you risk contacting the prop with the runway when rotating for takeoff and landing).  Second, the longer the prop extension, the more risk there is with out of balance conditions due to manufacturing of the extension itself.

 An 8-inch extension seems to be the best compromise. And whatever you do, get a Saber extension.  Absolutely the best.

-Charles McDougal Dec 2011: ...Knows a guy..... Anomalous crank shaft breakage (in flight, at night...) adamantly maintained that my eight inch extension was to blame.

-Marc Zeitlin Dec 2011: If (the) crank flange wasn't dead nuts perpendicular to the crank axis,  
with essentially zero run-out, he may be right. If there's substantial run-out then you WILL be putting very large bending loads on the crankshaft. The engine was designed for a prop to be on the flange,  
not 4", 8" or 12" further away. This is why I stated that with long extensions, extra care must be taken to have no run-out. So he MAY be right--hard to say that he IS. Unless you're doing high pitching or yawing rate aerobatics, the only thing that could cause large loads on the crank from the extension is  
the run-out. There is certainly merit to the notion that the extensions CAN cause problems if they're not installed properly. Solid or hollow (crank shaft) is not particularly relevant - the center of the crank adds almost no strength or stiffness to the crank, so unless there's a crack started by the drilling process, that won't matter. It's fairly obvious, given the # of 8" extensions out there and the lack of endemic crankshaft failures that this is not a common failure mode, although the longer the extension, the more careful one must be.

-Bill Allen Dec 2011: I would note that on the PA30 TwinCom (IO-320s) I fly, the distance from the crankshaft flange to the prop hub is about 8" and the weight of the 2 blade metal CS prop is far in excess of any 2 blade wood prop that we would use on our Ez/CZs. ...when choosing an extension many years ago, and the above comparison gave me some comfort.

-Ken Miller Dec 2011: Not only do some 360 installs have at least eight inches of prop hub extension, but also have a 40 POUND constant speed propeller hanging off it.  I’ve maintained aerobatic aircraft for 20 years.  320-360-540’s pulling 10 positive and 6 or 7 negative with a metal or composite props and doing snap rolls all day long.  Not one shaft failure (or) engine blowing up. Your 8 inch extension and a 12 pound propeller is not going to bend or break your Lycoming.

## -Prop Bolts / Bellville Washers:

-Marc Zeitlin Dec 2011: Moving from dry to wet climate (long term transition) you may damage the wood fibers, but the prop won't come loose. Wet to dry will cause the prop to come off if the bolt torque  
isn't checked (in the standard installation). For those folks skeptical of bellevilles for whatever reason, what we would really want (if not using bellevilles) is stretchier bolts. With AN bolts, using AN-4's (1/4") on a 7" diameter drive flange would  
be a factor of 4 better than the AN-8 (1/2") prop bolts, as they have 1/4 the area and would be 4 times as stretchy and still have the same compression force on them without yielding. But you can't get AN-4  
lugs and/or AN-4 size holes in the props we use, and for some reason, AN-8's are used for the O-360's.

-Marc Zeitlin Dec 2011: ....more accurate information on Craig Catto's 2 and 3 blade props with respect to hub stiffness for the Belleville spreadsheet. If you have a copy of the spreadsheet, please download Revision "I" from: <http://www.cozybuilders.org/Prop_Bolt_Bellville_Washer/> and delete any previous versions you might have. If you have a Catto propeller, you will notice that the new revision will recommend approximately 1/4 more bolt turns than previously for proper washer compression and flange pressure. What's important is the recommended "Total Washer Compression" - if that's correct, you don't need to change anything.

-Harley Dixon Long EZ N28EZ Dec 2011: For anyone looking for the belleville washers from Solon Manufacturing (Marc, Gary Hertzler recommended), (I found) that Solon won't sell to an individual... (but) Fastenal is one of their distributors. Here at one of their Rochester stores, cost was $1.76 each.   
The Solon part number (as Marc and Gary recommend for AN6...3/8" bolts) is 620125177.  Fastenal's SKU is 12616-00177. ( [www.fastenal.com](http://www.fastenal.com) ). -Marc Zeitlin Dec 2011: ...updated the instructions and spreadsheet for belleville washer.... added a "Safety Margin Graph" (that) shows you how much better two belleville washers are over no belleville washers, and how much better four washers are over two washers. You can change your prop hub shrinkage/growth to see what happens to YOUR installation with humidity changes. ... also added a 5/16" washer solution.... If you're already using bellevilles, you will likely see very little difference (the spreadsheet MIGHT recommend slightly more compression than before), but you might be interested in going through it and ensuring that you have the latest version (for) your next condition inspection.... download these two files at: <http://cozybuilders.org/Prop_Bolt_Bellville_Washer/index.html>

-Marc Zeitlin Dec 2011: Question: Recommended service interval? Ans: The only "service" needed is to measure the distance between the large area washers to determine if there's been any shrinkage or expansion of the prop hub. If you originally had X, and now you have X+/- 0.005", or even X +/- 0.010" (and you use four washers), you don't need to "DO" anything. The new graph in the spreadsheet shows exactly how much has changed with a given amount of hub movement, and since almost all of the hub   
movement is taken up by washer movement (only a tiny bit in bolt stretch) your washer motion is a very good indicator of hub growth or shrinkage. There will be some variability in the measurement - it's impossible to have perfect repeatability - but trends are clear, and small changes are not important. This is the beauty and robustness of the system. As far as interval goes, measure the compression of the washers every 3 months or so - keep a record and graph it to see if there's any trends. During my condition inspection, I generally take off the safety wire, loosen the bolts, and retighten them per the instructions. But I'm not sure that that's necessary, or whether it does more harm than good if the measurements are OK.  
  
-Al Wick Dec 2011: 1) A prop with no bellevilles is affected by how often you torque, weather, accuracy of torque wrench, fastener resistance etc. A prop with bellevilles is no longer affected by those items. That's a big deal. When you can say: "my plane is no longer affected by .......", you have big safety advantage. We need to seek these types of designs. 2)  Your safety is improved by increasing the distance from failure threshold. Before bellevilles, the distance was .007" or so. Now the distance is .037" or so. If you apply this concept to other canard features, then flying will be WAY safer. 3) Look at how many decades prop failures were blamed on "bad bolts"...... bellevilles have been around forever. We are hugely vulnerable to assumptions, tradition, stupidity.... -Marc Zeitlin Jan 2012: ... updated the Bellville Washer Installation Spreadsheet from Rev. J to Rev. K.   
..general reorganization - all the input fields are together at the top, output fields of most interest just below, updated a few of the fields to highlight in RED if something is out of range. Thanks to Nick Ugolini' suggestions, added a set of pictures of four "standard" belleville installations, as well as a   
dynamic "Pictogram" of YOUR particular setup that updates as you input data into the "# of Groups" and "Washers/Group" fields. Thanks to Matt Bunch for prodding me into updating the Wood Species   
database to include stiffness information for each species....more accurate for those using Oak, Birch (Sensenich)...Ash - Maple users will see little change in hub compression. While a second order effect, more accuracy is better. I've posted the updated spreadsheet Rev. K at:   
<http://cozybuilders.org/Prop_Bolt_Bellville_Washer/>

-Marc Zeitlin Apr 2012: ...updated the Propeller Bolt Belleville Washer installation instructions at:  
<http://cozybuilders.org/Prop_Bolt_Bellville_Washer/index.html> to Revision "H" and updated section 1.2 to more clearly describe what the user should do to determine appropriate propeller bolt lengths to   
use...  
[**Installation Instructions**](http://cozybuilders.org/Prop_Bolt_Bellville_Washer/2012_04_28-Belleville_Installation_Rev-H.pdf)**(Revision H)**

-Keith Spruer Apr 2012: I took my prop off Sat. to get ready for installing the Belleville system. ...noticed the torque was down to about 14 ft-lbs on by last check ...verses the 27 ft-lbs specified for my prop. ...all 6 bolts ...had indication of fretting where the bolt enters the drive lug about 1/2" away from the threads and over about a 3/4" span. ...appears ...working going on ...may have been not long before the prop took off. So this installation is coming none too early!

-Marc Zeitlin Apr 2012: ...Len Morris wrote ...interesting travelogue in the April issue of the CSA newsletter ...flying around the country ...and visiting Mexico. ...one comment Len made that I'd like to address from a safety standpoint. He mentioned that due to flying from Indiana to South Dakota (dry) to Dallas (wet) to Chihuahua (dry) over the course of three weeks, he was concerned over the torque of his prop bolts dropping and affecting his prop hub compression on his wooden B&T prop on his Varieze.  
  
I wouldn't have expected (with a decent finish on a wood prop) for even the most extreme humidity changes to affect the prop bolt torque in only three weeks, but Len states that the torque had dropped to 8 - 10 ft-lb. That's a HUGE difference in a short time, and is an example of just how much torque (and prop hub compression, which is what matters) can change in extreme circumstances. He tightened them back to 18 ft-lb and was good to go.  
  
I'll put in a plug for a belleville washer system here - if Len had this system on his propeller bolts, he would not have had to worry about his bolt torque, since instead of losing 1/2 of the compression on his prop bolts he would have lost closer to 10%, which would not be a worrisome amount. It's good that Len knew to check the torque (even after only three weeks) and that he caught it before there was a problem, but it would be better to not have to worry about the prop hub losing compression.  
  
At any rate, the belleville web page is at: <http://cozybuilders.org/Prop_Bolt_Bellville_Washer/> and I have no financial interest whatsoever in anyone's use of this system.  
  
As an aside, due to some advertising by a COZY mailing list member, SOLON MFG (the company that makes the belleville washers that I prescribe in the instructions) requested permission to link to the   
belleville washer web page - they really liked the <new, for them> application of their product. This, and other applications of their products can be seen at: <http://www.solonmfg.com/springs/applications.cfm> ...

-Tim Andres Apr 2012: The thing I really like about the Belleville washer system is that with a set of calipers I can check the clamp pressure on the prop in just a few seconds. If the prop hub swells or shrinks I can see it, no need to guess or remove the safety wire.  My Bellevile stack has changed <.003" in 50 hours now.

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Belleville Washers

Date: Tue, 17 Apr 2012 16:08:28 -0500

From: James.Redmon@tx.rr.com <james.redmon@tx.rr.com>

To: Keith Spreuer <Keith@airstarts.com>, Joe Person <ezejoe@comcast.net>

CC: canard Aviators <canard-aviators@yahoogroups.com>

Yup, no “L” (thin) spec for those large area 970 washers.  You can use some AN960-816L (thin) washers between the bellevilles and the crushplate to save some space – I did.

 James Berkut/Race 13 [www.berkut13.com](http://www.berkut13.com)

 -------- Original Message -------- **From:** [Joe Person](mailto:ezejoe@comcast.net) **Sent:** Tuesday, April 17, 2012 3:55 PM

**To:** [Keith Spreuer](mailto:Keith@airstarts.com) **Cc:** [canard Aviators](mailto:canard-aviators@yahoogroups.com) ; [cozylist](mailto:cozy_builders@googlegroups.com) **Subject:** [c-a] Re: COZY: Belleville Washers

  The last spec I have for AN970 washers (1984) shows no "L" suffix.  I suspect you have some other pseudo part - AN970s were originally intended for use on wooden aircraft structures and as such, I doubt they would have ever offered a "L" ("half-thickness") version.  
Joe Person

-------- Original Message -------- From: "Keith Spreuer" <Keith@airstarts.com>

To: "canard Aviators" <canard-aviators@yahoogroups.com>, "cozylist" <cozy\_builders@googlegroups.com>

Sent: Tuesday, April 17, 2012 1:11:58 PM

Subject: COZY: Belleville Washers

I know they make AN970-8L (thin washers) since I have one. But I would like to buy some more for my installation. I tried both Spruce and Wicks. Does anyone have a source for those.  
  
I bought botls 7/16" longer than without the Bellevilles but that is barely enough to get thread engagement. Geez the normal AN970-8 are 0.109" thick!!!  
Keith

-------- Original Message -------- Subject: [c-a] Re: COZY: Belleville Washers

Date: Tue, 17 Apr 2012 15:55:58 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Keith Spreuer wrote:  
  
> I bought longer prop bolts 1/2x7" but they are a little short still  
> if I use the 4 washer/bolt set up.  
  
That's surprising, but the instructions are clear that you need to determine appropriate bolt lengths by measuring the actual dimensions of YOUR prop hub, YOUR flange lugs, YOUR bolts and YOUR washer stack,  
and then insuring that you have enough bolt length without bottoming the threads. There are too many variables to be able to proscribe a bolt length.  
  
Personally, on MY installation on an O-360 with an 8" Saber prop extention, a 1/2" crush plate, a Hertzler prop, a 4-wsaher belleville stack, two AN970-8 washers AND a Saber hardened, thick AN960-8 washers under the bolt head, my 7" Saber bolts have MORE than enough thread engagement and do not bottom out when totally tightened with the bellevilles flat (NOT THE RECOMMENDED METHOD).  
  
But as you've found, YMMV, which is why I direct folks to measure everything.  
  
> ... Those AN970-8 washers really seem like over kill.  
  
They are, to some extent.  
  
> ... Any good reason not to use AN960-8 washers?  
  
Only because I use the large area washers as an easy way of measuring the amount of belleville washer compression - measuring the distance between the AN970's is an easy way of determining washer compression.  
  
> ... Only the crown of the Belleville will contact on the crush  
> plate and the bolt head anyway (only if really over torqued). I  
> suppose there is a small (nil) chance of flipping a washer inside  
> out but I think the risk is small. What do you think?  
  
I agree that the chance of the bellevilles inverting is small, but the AN970's do protect against that, too. There are some that are running the installation without the AN970's safely - as long as you have a way to measure belleville compression easily (so that you will actually do it on occasion), the use of the AN970's is up to you.  
  
You MUST have a steel flat washer (either AN970 or AN960) between the bellevilles and the crush plate or else the bellevilles will damage the AL crush plate.  
  
I would say that if the extra 0.1" is what's making the difference between usability and not, though, that getting bolts that are 0.5" longer is probably a more appropriate solution. Then you can decide whether to use the AN970's or AN960's.  
Marc J. Zeitlin -------- Original Message -------- Subject: Re: [c-a] Re: COZY: Belleville Washers

Date: Tue, 17 Apr 2012 16:08:28 -0500

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To: Keith Spreuer <Keith@airstarts.com>, Joe Person <ezejoe@comcast.net>

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-James Berkut/Race 13 [www.berkut13.com](http://www.berkut13.com)



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**To:** [Keith Spreuer](mailto:Keith@airstarts.com) **Cc:** [canard Aviators](mailto:canard-aviators@yahoogroups.com) ; [cozylist](mailto:cozy_builders@googlegroups.com) **Subject:** [c-a] Re: COZY: Belleville Washers

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Joe Person

-------- Original Message --------

From: "Keith Spreuer" <Keith@airstarts.com>

To: "canard Aviators" <canard-aviators@yahoogroups.com>, "cozylist" <cozy\_builders@googlegroups.com>

Sent: Tuesday, April 17, 2012 1:11:58 PM

Subject: COZY: Belleville Washers  
  
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I bought botls 7/16" longer than without the Bellevilles but that is barely enough to get thread engagement. Geez the normal AN970-8 are 0.109" thick!!!  
Keith

-------- Original Message --------

Subject: RE: [c-a] Bolt size [html][bcc][faked-from][mx] [html][mx]

Date: Thu, 04 Oct 2012 09:25:02 -0400

From: Ken <kenezmiller@optonline.net>

To: davef@tsoft-inc.com, 'Cannard Aviators' <canard-aviators@yahoogroups.com>

The prop is held in place totally by clamping pressure provided by the tension on the bolts. Only if the bolts loosen do they have any shear on them and then not for long. The “drive lugs” on the prop extension don’t really “drive” anything, they are there for alignment more than anything.

Every failure I’ve known or heard about in thirty years of doing this stuff was related to improper torqueing or improper maintenance of torque on wooden props, for instance when someone flies to the dry western states from costal areas and don’t check their prop torque. Ask Dick Rutan about that.

Ken

-------- Original Message --------

Subject: Re: [c-a] Props & Belleville Washers

Date: Sat, 6 Oct 2012 20:44:06 GMT

From: jschuber@juno.com <jschuber@juno.com>

To: sarodude@yahoo.com, canard-aviators@yahoogroups.com, cozy\_builders@googlegroups.com

...I've been running the Bellevilles for 3-4 years now and measure the deflection each 30 days. I operate in wet cool areas as well as AZ. They fix the worries about prop bolt clamping force! Make the mod! You'll be happier and you'll probably not find a lower cost maintenance fix.

Terry Schubert

-------- Original Message --------

Subject: Re: [c-a] Bolt size

Date: Mon, 08 Oct 2012 10:06:45 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: Canard Aviators <canard-aviators@yahoogroups.com>

...The 1/2" Saber bolts I use to hold my Hertzler prop on my O-360 engine prop extension stretch approximately 0.004" when tightened. All materials, no matter how stiff they feel, stretch or compress when a force is applied. It is the stretch of the bolts that apply the force to the prop hub to maintain the friction on the drive face.

The torque applied to the bolt is what will determine the stretch. 30 ft-lb (give or take) on the Hertzler prop (with bellevilles or not) will stretch the bolt the aforementioned 0.004". The stiffness of the thing being compressed (the metal prop vs. the wood prop) doesn't change the amount of bolt stretch for a given amount of torque - it just determines how far you have to turn the bolt in order to achieve that torque. With the metal prop, with a stiffness ~50 times higher than the wood prop, you'll turn the bolt 1/50th as far to achieve the torque required. This bolt stretch issue is exactly the reason to use Bellevilles on the prop bolts - they're far "softer" than the prop bolt and allow way more margin in hub shrinkage/expansion without crushing the hub or losing compression (and the prop).

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] Bolt size

Date: Mon, 8 Oct 2012 17:09:58 -0700

From: Kevin R. Walsh <krwalsh@gmail.com>

Reply-To: krwalsh@alum.mit.edu

To: chuck <ezflyr82@cox.net>

CC: marc\_zeitlin@alum.mit.edu, Canard Aviators <canard-aviators@yahoogroups.com>

On Mon, Oct 8, 2012 at 4:48 PM, chuck <ezflyr82@cox.net <mailto:ezflyr82@cox.net>> wrote:

Thinking more about this raises an additional question.

If it is the torque that determines the stretch (other variables

being constant - bolt material, size, etc) how do your compensate

for frictional effects of the bolt thread junction, bolt head and

bolt shaft?

First, torque does NOT determine stretch in the bolt, for all of the reasons you state. Tension in the bolt is related to the stretch by the modulus In answer to your question you can't, really. You can try to measure the running torque and subtract it from the measurement, or you can lube the joint to minimize the Coloumb friction, but then the desired torque value will change. Both are non-ideal.

It seems like these would affect the torque reading which would

therefore alter the amount of stretch you thought you were getting.

Wouldn't I get a different stretch for the same torque if the

threads were lubed, etc?

You are absolutely 100% correct. All of those things significantly change the stretch of the bolt. And this is why for critical bolted junctions that the actual preload of the bolt is usually measured on some other way, or the bolt is torqued in a different way. For example, on big-ends of connecting rods, it is customary to actually tighten to bolt to a defined stretch. You measure the bolt length un-torqued, then continue tightening and measuring until you meet a stretch specification. But this is only possible if you can reach both ends of the bolt throughout the procedure. Another way to do this is to tighten the bolt to a low torque value to take out any slop in the parts stack-up, then tighten a fixed number of degrees of rotation or # of flats on the bolt. This is usually done in conjunction with lubricating the bolt.

But this is also why the Belleville washer approach helps. You are squashing a (relatively) squishy set of washers with a known k-value, and in doing so you have a large displacement to measure to give you a known tension (stretch) in the bolt.

Kevin

-------- Original Message --------

Subject: Re: [c-a] Bolt size

Date: Mon, 08 Oct 2012 17:10:58 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: Canard Aviators <canard-aviators@yahoogroups.com>

chuck wrote:

> If it is the torque that determines the stretch (other variables

> being constant - bolt material, size, etc) how do your compensate for

> frictional effects of the bolt thread junction, bolt head and bolt

> shaft?

Very good. You've reached the state of thinking that allows you to realize exactly why using torque for determining how much force you're applying is brain damaged. There are SO many factors that affect the

measured torque that it's practically useless if you want any accuracy. Unless you have exactly the same environmental conditions every time you measure torque, you'll get a different number. In industry, if it's

important to know EXACTLY how much force you're applying when tightening a bolt, you either use a bolt with a strain gauge in it, measure the bolt length to determine stretch, or use Belleville washers.

This, my friend, is why I use Belleville washers on my prop bolts and why many others are starting to do so as well, and why I no longer care a whit about what the torque on the prop bolts is - I only measure bolt turns, which, due to the thread pitch, tells me exactly how much I'm compressing the washers, exactly how much force I'm putting on the prop hub, and exactly how much I'm stretching the prop bolts (not that I care about bolt stretch anymore, since they're NOT the determining factor in prop retention safety).

See:

http://cozybuilders.org/Prop\_Bolt\_Bellville\_Washer/

for the instructions, logic, and a spreadsheet on how to determine what to do.

Marc J. Zeitlin

-------- Original Message --------

Subject: [c-a] Bellville washers

Date: Sat, 15 Dec 2012 22:46:45 -0000

From: lisnion <lisnion@yahoo.com>

To: canard-aviators@yahoogroups.com

I'm just finishing up the annual inspection on my 0-320 Long EZ. I just checked the prop bolt torque per Marc Z's instructions. For grins I checked the torque required to turn the bolts once they'd been tightened the suggested 1 1/8 turns and voila! the torque required was 20-22 ft-lbs. Hertzler's instructions call for 24 ft-lbs for my prop / hub combination. Given the variation in torque vs. clamping force exerted by the bolts in the per plans setup, and the 150 hrs I've got with the bellvilles, it all seems to be working great.

Ion 0-320 Long EZ 1100hrs.

-------- Original Message --------

Subject: Re: [c-a] Bellville washers

Date: Sat, 15 Dec 2012 15:47:29 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

... I'm glad that it's working well for you. I'm also glad that you got consistent readings of torque vs. bolt turns.

But DON'T expect that to always be the case - I've seen variations of 50% on torque values at the same # of bolt turns (and hence bolt stretch/hub compression) and sometimes more. It's an interesting check, but if you had gotten different torque values, that would NOT mean that you should use a different # of bolt turns, nor that there was anything wrong with the hub compression. It would just mean that using torque to determine bolt stretch is an unreliable measurement methodology :-).

Marc J. Zeitlin

## -Prop Repair:

-------- Original Message --------

Subject: [c-a] Catto prop damage criteria?

Date: Wed, 21 Nov 2012 14:50:22 -0000

From: punkertfc <mr.jadkowski@gmail.com>

To: canard-aviators@yahoogroups.com

...Catto 3-blade on my Cozy, ... noticed a gouge in the back side of one of the blades....approximately 1/2" long, 1/16" wide, and the depth ... between 1/8" and 1/4". ...

Alek Jadkowski

-------- Original Message --------

Subject: Re: [c-a] Catto prop damage criteria?

Date: Wed, 21 Nov 2012 11:27:56 -0800

From: jhe <jhsniwe@earthlink.net>

To: punkertfc <mr.jadkowski@gmail.com>

CC: canard-aviators@yahoogroups.com

... photo of the damaged area and e-mail to Craig. ... Craig repaired some tip damage and I had it back in two weeks. ...

John

-------- Original Message --------

Subject: Re: [c-a] Catto prop damage criteria?

Date: Wed, 21 Nov 2012 12:34:08 -0700

From: Burrall L Sanders <craftsman@freeflightcomposites.com>

To: <canard-aviators@yahoogroups.com>, "punkertfc" <mr.jadkowski@gmail.com>

...little doubt that it is repairable. ... I had a 1 inch by 1 inch chunk gone from one of the three blades on my Catto prop. Wood, carbon and filler were all gone about two thirds of the way out the blade. I sent some pics of the damage to Craig Catto and he gave me a small lesson on fixing it which I followed and I am still flying the prop. Since then we have repaired several for customers....

Burrall Sanders

-------- Original Message --------

Subject: RE: [c-a] Catto prop damage criteria?

Date: Wed, 21 Nov 2012 15:41:18 -0500

From: Ken <kenezmiller@optonline.net>

To: 'punkertfc' <mr.jadkowski@gmail.com>, canard-aviators@yahoogroups.com

... get some JB Weld. Clean the cut out making sure there is no oil residue using a pick or fine file. Mix up the JB in a 100/100 ratio mixing very well. Using a putty blade, pack it into the gouge, making sure there are no voids. Leave the JB a little high and let cure overnight. Come back with a file or medium sandpaper and smooth it down. No worries.

Ken Miller

-------- Original Message --------

Subject: RE: [c-a] Catto prop damage criteria?

Date: Wed, 21 Nov 2012 15:44:36 -0500

From: Ken <kenezmiller@optonline.net>

To: 'punkertfc' <mr.jadkowski@gmail.com>, canard-aviators@yahoogroups.com

Oh yeah. Keep an eye on it every flight for a while, checking after each. I’m sure it’s fine, but check it anyway during preflight.

Ken

-------- Original Message --------

Subject: Re: [c-a] Catto prop damage criteria?

Date: Wed, 21 Nov 2012 17:56:48 -0500

From: Nick <unick3@yahoo.com>

To: Canard-Aviators Aviators <canard-aviators@yahoogroups.com>

...No big deal. Happens all the time and the damage you saw is extremely minor. Just clean it out, feather the sides just a bit and stick some flox or JB weld into the damaged area, and blend it back in. A good way to do it is to stick some metal foil tape (the AL type) over the area, cut it open where the damage is, then flock it. After it cures, you can sand the repair and bring it down to the existing finish without damaging the paint. Trust me you'll be doing repairs more often than you would like and you'll always find the damage on the flat side of the blade. BTW a good tip it so taxi with the belly board down. It helps with FOD. ...

Nick

-------- Original Message --------

Subject: RE: [c-a] Catto prop damage criteria?

Date: Thu, 22 Nov 2012 06:48:38 -0500

From: Ken <kenezmiller@optonline.net>

To: 'Brian Alley' <n320wt@yahoo.com>

CC: canard-aviators@yahoogroups.com

...I’ve owned about 7 or 8 (lost count) Catto props and sold/repaired/maintained many more over the last 20 years over tens of thousands of hours TT. ... consideration the size and description of the damage, ...exact same field repair on at least seven or eight Cattos in my shop or in the field with a 100% success rate.

... Catto has 18 plies of EGlass at the hub and has a wood core with 36 total on the 3-blade. It is could be used as a plow and has on a couple of occasions without significant damage to the blades .... Craig’s website states that the glass is “the” structural member of the blade but if you talk to Craig, he would also say it is actually “a” major structural member (semantics). The core is made from laminated maple and without the glass, it would suffice as a propeller on it’s own if the core was the dimensions of the finished propeller. High-quality laminated wood props are made of maple with no reinforcing fiberglass.

... If this prop was sheathed in carbon or made entirely of it, my answer would have been different. Carbon laminates are much more fragile in impact and would require a tapered structural repair ply by ply because carbon has a tendency to shatter longitudinally along the fibers for a distance outside the impact area. On jets, we require any carbon/composite damage to be sonically inspected to determine the perimeter of the damage because of this. ...

Ken Miller

-------- Original Message --------

Subject: Re: [c-a] Catto prop damage criteria? [bcc][faked-from][mx]

Date: Wed, 21 Nov 2012 16:38:31 -0500

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: canard-aviators@yahoogroups.com

The location of the damage is rather important. ...An in-the-field fix is rather simple with super glue and baking soda. Forms a hard repair that bonds to the wood. Files / sands down to match the surface, and really doesn't need any paint. A better fix probably would involve some epoxy, re-paint, and re-balance. ...

David Froble

-------- Original Message --------

Subject: [c-a] Prop Repairs

Date: Wed, 21 Nov 2012 13:02:58 -0800 (PST)

From: FlyingTiger <flyingtiger05@yahoo.com>

Reply-To: FlyingTiger <flyingtiger05@yahoo.com>

To: Ken <kenezmiller@optonline.net>, 'punkertfc' <mr.jadkowski@gmail.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

Burrall and Ken are both right. JB Weld is in my on board repairs bag where ever I travel. It's a MUST HAVE! ...I once had a Great American propeller with the first engine I installed on my VEZE. ... landing ...some guys directing landing traffic off the runway and onto grass.... guy jumps in front of my airplane madly waving me off the right side of the runway onto some grass. My thoughts ... someone had landed behind me and was overtaking me and I was about to be in a collision. I quickly stomped on the right brake which sent me sailing off the runway and....bang!...and a lot of shaking. I knew instantly what had just occurred. ...prop which was a two blade. One of the blades hit the edge of the asphalt knocking about an inch of the tip and leaving an eight inch crack right down the center of the blade. I called the only guy I trusted at the time who knew how to make propellers and got the instructions to fix it right on the spot. ...involved carefully cleaning the broken tip by sawing it off then measuring and carefully cutting the other blade down to the same length. applying JB Weld down the grove of the crack and allowing it cure over night. Next morning flew home like nothing ever happened except....I noticed an increase in RPM. Tim VEZE N26FM Truckee Tahoe

## -Prop Strike:

-------- Original Message --------

Subject: Re: [c-a] Re: AOA - prop strikes

Date: Thu, 15 Nov 2012 10:48:55 -0800

From: Keith Spreuer <keith@airstarts.com>

To: trcsmith <TRCSmith@aol.com>,gilbert.drieux@dbmail.com, canard-aviators@yahoogroups.com

Simple to avoid prop strikes. KEEP YOUR FREEKING SPEED UP. Honestly, never seen a runway that I needed to be that tight on for landing. Just carry 80kias (in a Cozy) and you will never have a strike.

Keith

## -Prop Tape:

-Paul Lee May 2012: You can save some money by buying 9' rolls from [www.tapecase.com](http://www.tapecase.com/p.2672.646/stainless-steel-foil-tape.aspx) Works out to about $3.5 per foot. They even sell the wider 3" stuff so you can protect more surface.

-Terry Schubert May 2012: While that tape may reduce erosion problems it comes with a performance cost.  The thickness of the tape creates a "step" in the propeller airfoil.  That gives a measurable decrease in propeller performance. Over the years, my tests have shown a 3-8 mph loss at 75% cruise settings.

- Nick Ugolini LongEZ N29TM May 2012: Ivo prop LE's are basically straight, and IF you have a perfectly straight LE, the material would work.  Unfortunately most props (Great american, Amar Demouth, Hertzler, etc) ...have curved leading edges ... the IVO tape will not work unless you have an IVO prop. ... you will lose a bit of speed but if you REALLY want LE protection, the easiest to install is urethane tape (such as the 3M wing LE tape or equivalent).  It will stretch a bit which allows it to lay flat on the blade and lasts for about 400 hrs. & nbsp. Cut it 18" long, 3/4" at one end and 1.5" at the other end.  Wrap the  narrow end at the tip with 1/4" on the flat part of the blade.  Pull it tight and it will curve nicely around the blade...takes 30 sec to install.  Copper foil (used for antennas) is my second choice as you can burnish it flat for the wrinkles you'll get installing it on a curved surface.  It really looks cool if you polish it too. Buying a prop with a cast in urethane LE (such as Hertzler) is the overall best choice for long term wear.

-Rysard May 2012: ...free online advice on.... myths and old wives tales about why you shouldn’t have to <sacrifice a few knots for maintenance and safety (and economy)>  read John Deakin and Mike Busch. <http://www.savvyaviator.com/>

-------- Original Message --------

Subject: Re: [c-a] Prop leading edge tape [html][heur][bcc][faked-from][mx]

Date: Sun, 15 Jul 2012 11:54:29 -0400

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: Chris Barber <CBarber@TexasAttorney.net>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Don't have any sharp corners. Round them off. ..... I'm not a big advocate of the tape. I've seen too many instances of it coming loose and causing problems. It's like adding "trouble" to your aircraft.

David Froble

## -Pushy Galore:



-------- Original Message --------

Subject: [c-a] 300 pound canard

Date: Tue, 30 Oct 2012 11:51:53 -0600

From: Christian von Delius <alpineglobalprivate@gmail.com>

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

... http://www.youtube.com/watch?v=0jXjYyxvDAU&feature=watch-vrec

...Christian

## -Pulse Oximiter:

-------- Original Message --------

Subject: Re: [SARL-Racers] Re: Serious question

Date: Tue, 19 Jun 2012 01:13:32 -0700 (PDT)

From: Tim Bovee <boveetim@yahoo.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

...I keep a pulse oximeter in the plane all the time. ...cannot fly over 8500 without my oxygen saturation going down effecting my mental acuity. $40 well spent... I use oxygen regularly and feel 100% after a long flight instead of ready for a nap.

## -Radios (Dual):

-------- Original Message --------

Subject: [c-a] Re: Radios

Date: Wed, 05 Sep 2012 15:27:20 -0000

From: aviationeyes <skyeyecorp@airpost.net>

To: canard-aviators@yahoogroups.com

...there are times when the 2nd com is a convenience... flight following...to monitor an underlying AWOS ...companion aircraft ... coordinate with the other plane...monitoring activity at your destination before flight following cuts you loose.

...decided to rig with one com/nav and one portable. The portable is lighter and cheaper...less space and you can use it out of the plane. ...dedicated set of mic/audio cables coming out of the audio panel to connect to the portable. ...audio panel will allow it to be seamlessly used through the ship's intercom and PTT system. If the audio panel/intercom craps out, I can always disconnect and use it all by itself. ...

Jose

-------- Original Message --------

Subject: [c-a] Re: Radios

Date: Wed, 5 Sep 2012 10:20:55 -0700

From: Dale Martin <Niceez@gmail.com>

To: skyeyecorp@airpost.net, canard-aviators <canard-aviators@yahoogroups.com>

...second radio come in really handy and because you can listen to more than one thing at a time it has the possibility to make us safer IF you have a discerning ear. ...to minimize the wires and connectors ... a radio that has the ability to monitor 2 frequencies at once. The Garmin SL40 Comm and the Garmin SL30 Nav/Com come to mind. ...not cheap, ... years of service and piece of mind. Both ...have a built in intercom which is another space saver and saves more weight. We recommend these to our clients because we have never had one problem with either type radio. I would rather have my portable ready for use with a full charge than have it dangling around the cockpit. ...the SL30 seems to be the one to make all the NAV systems in the glass panels "come alive" with the added feature it can monitor 2 NAV freq's at the same time as well.

Dale http://www.long-ez.com

-Radio Repairs: -------- Original Message --------

Subject: Re: [c-a] Good radio repair shop?

Date: Tue, 21 Aug 2012 13:44:08 -0500

From: Ryszard <ryszardzadow@att.net>

To: <canard-aviators@yahoogroups.com>, "Dave A" <usaf\_david@yahoo.com>

Islip Avionics. Ask for Fred.

-------- Original Message --------

Subject: [c-a] Re: COZY: Re: Narco Nav 122 repair shop?

Date: Wed, 5 Sep 2012 18:04:31 -0400

From: Richard Hughes <richardhughes260@gmail.com>

To: OldMster <sires.mark@gmail.com>

CC: cozy\_builders@googlegroups.com, Canard Aviators <canard-aviators@yahoogroups.com>

Check out http://www.islipavionics.com/

-------- Original Message --------

Subject: [c-a] Re: COZY: Re: Narco Nav 122 repair shop?

Date: Wed, 5 Sep 2012 19:49:15 -0700 (PDT)

From: Robert Hall <oceanartscasino@yahoo.com>

Reply-To: Robert Hall <oceanartscasino@yahoo.com>

To: Richard Hughes <richardhughes260@gmail.com>, OldMster <sires.mark@gmail.com>

CC: cozy\_builders@googlegroups.com <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

Anything can be repaired or restored, ...

First thing is the SERVICE manual for your specific instrument...

...circuit schematics, board layout and parts placement, component lists or specific direction for testing, diagnosis and repair in an orderly systematic fashion as intended by the manufacturer. Even the service manual may not be complete in this regard but it's usually the best place to start. In addition to that having another working example on hand to compare test values can be an excellent source of information, comparison of values, etc. though in many cases that's just not possible.

...extra "dead or alive" whole or partial units on hand is great for scavenging parts. ...purchased a Yokogawa WT110 digital power meter from eBay for $57 used with an error code, turns out nothing is wrong with the meter (that typically sells for $1200) ...input board clearly has numbers matching a WT130 (incompatable) so I am waiting patiently (for 7 or 8 months so far now) until I find the right board to replace. Yokogawa no longer has any stock (other than bezels and some minor items) as they have replaced both models with the WT200, ... may take a while to find the right board, ...luck (and persiverence) Care and precision must be used when attempting service to electronics or instruments, the use of small jewelers screwdrivers, pliers, etc. (I have Lindstrom, very nice)also soldering and desoldering equipment (I have Weller digital with a very expensive vacuum desoldering station).

I was setting up to produce custom fabricated single or double sided circuit boards for hobby (and possibly light production of kits) and even obtained some equipment for producing very basic semiconductors (diodes or transistor arrays only, optics are just too costly for microprocessors).

...I'm about 20 miles north of Port Orange, (ironic?) in Ormond Beach, and I'd be happy to take a look for the shipping cost. ...

Robert

-Radio Squeal: -James Redmond Dec 2011: It’s common for a radio to receive with a low voltage supply (dying battery), but when xmit is engaged the current demand goes up and the voltage drops even further...and it usually squeals when this happens.  ....could be a degraded (corroded) ground. ...to eliminate the variables:

- If flying alone, make sure that your OTHER headset is not Mic-to-Headphone (side tone back into the mic can cause simple audio feedback). - Swap headsets

- Reseat radio connectors

- Swap radios

- Check that the headset plug necks are isolated from common ground and each other (and music or aux jacks)

- Is your PTT switch ground isolated or shared?  If isolated, but sure that it is still isolated.

- Check antenna coax continuity, or rather lack of it – shield and center conductor should not connect

(unfortunately, we can’t check winglet antennas themselves unless you have a ham radio SWR meter handy)

- Physically check connectors and plugs for security – make sure a wire has not broken off the mic jacks or something

- Trace and check radio ground lines and clean contacts at ground connections – same reason as above, when current demand goes up, bad connections become more critical

-Ron Breukers Dec 2011: It could be the antenna going bad. If you have a high SWR (standing wave  
ratio) it can create feedback to the input. ...gradual worsening makes me think of this.

-Ken Miller Dec 2011: Start with your antenna ground.  If it is not secure, it will cause a feedback into your whole electrical system searching for ground.  There is about 7 watts of power being blown out of that antenna, so the ground is very important. Next, take your intercom out of the loop completely by turning it off and then transmitting.  There should be a fail-safe in the intercom to allow this, and if there isn’t, then I would get another intercom. Look at your PTT and how it is grounded.  You almost want to do a home run for it directly to the battery ground.  You can test it by borrowing someone’s headphones that have a PTT on the headset to bypass your stick.  If you have two PTT’s, does the same thing happen with both?  If they do, it’s not the pilot’s PTT.

-Rich ARGOLDMAN Jan 2012: Ground is a ground is a ground, however not all grounds are created equal. There is nothing wrong with remoting a ground under certain circumstances. The main problem is the phenomenon of ground loop.  Since all wires have resistance the magnitude of which is determined by the metal(s) used, the gauge of the wire and the length, at any given point of a grounding wire or combination of wires (chained) the resistance between a chosen point and the actual (-) of the battery can be different-- if the above characteristics are not identical. Ground loops can create all kinds of gremlins, especially in glass aircraft generally in the radio, sensors and audio. They can be almost impossible to trace. There is no problem with remoting a ground as long as all of the ground wires terminate at the remote point (best to use equal lengths of wire to the ground). If you, for ease decide to connect the odd ground directly to the battery, you have created a potential ground loop.

-Terrence E. Bartley Long EZ N425KT Jan 2012: I have a piece of ¾ inch ID copper tubing running from the nose to the firewall in my airplane.  There is a ground buss at each end attached to it.  I ran all the wiring inside the tube from nose to firewall.  No problems.

-Marc Zeitlin Mar 2012: A couple months back I posted a request for assistance with a radio squeal... when pushing the PTT button. ...received ...suggestions ...including:  
  
1) Get a new battery  
2) Check Battery voltage  
3) Check Antenna SWR  
4) Reseat all connectors  
5) Check with/without intercom  
6) Swap Headsets  
7) Check PTT switches L/R  
8) Check headset cords  
9) Turn off ELT  
10) Swap SL40 radio  
11) Check side tone setting in radio  
12) Check all grounds - look for ground loops and loose solder   
joints/connections  
  
...checked everything ...squeal was still there, but intermittent ...not just in the   
headset but was broadcasting as well - other folks could hear it. ...while looking at the wiring from my intercom to my radio, I noticed that the bracket that I had fastened to the side of the radio stack aluminum mounting structure to support the cantilevered intercom (...been there for ...10 years ...) was grounded to the stack structure. The radio was grounded to the stack, the stack was grounded, and the intercom was grounded separately. ...I might have a ground loop with the bracket touching the intercom case. ...piece of paper towel, ...between the intercom and the bracket so they could not make contact and tie-wrapped it back down. Voila' (or whalla, ...) - the last 4-5 flights ...squeal-free. Guaranteed to be the reason for the squeal? No, because I couldn't reproduce the squeal on cue and make it go away   
by insulating the interface. ...

## -Rain on Canard:

-------- Original Message --------

Subject: Re: [c-a] Rain on the GU Canard

Date: Mon, 3 Dec 2012 07:55:47 -0700

From: Burrall L Sanders <craftsman@freeflightcomposites.com>

To: <canard-aviators@yahoogroups.com>

Every time the canard gets wet my GU loses some lift requiring an increase in trim forces. For me its no big deal. I don’t fly my CozyIIIx in the clouds and do not mind trimming the elevator when required. I have landed the plane in moderate to heavy rain and two people up front with no issues. The Strong Pitch system has plenty of

power. I have tested it to forward the forward CG limit and verified adequate trim authority.

Burrall Sanders

-------- Original Message --------

Subject: Re: [c-a] Rain on the GU Canard

Date: Mon, 3 Dec 2012 10:42:58 -0500

From: Richard Hughes <richardhughes260@gmail.com>

To: Randel Livingood <randel.livingood@yahoo.com>

CC: cozy <canard-aviators@yahoogroups.com>

I used zigzag tape aft of the CG & that worked well

http://www.wingsandwheels.com/page28.htm

## -Rollover Structure:

-Steve Morse Nov 2011: The old RAF web page added a roll over structure REQUIREMENT to the Long-EZ (fiberglass hand layup design added to the canopy). RAF stated that the original head rest was never intended as roll over protection.

-Al Wick Nov 2011: Jack Morrison made a engine out landing in a soy-bean field back in 2001. He had a 7 inch wide cover on his nose strut and with it partially deployed used it like a skid. Once he had deployed it to a point where it would do some good, he pulled the breaker. Another mod that he came up with was a blended winglet--he continued the spar up into the winglet all the way to the tip. No guarantee to keep canopy clear of ground, but offers more protection to keep the airframe intact longer than the standard.

-Bob Holliston Nov 2011: The tubing is 1 3/8"x 3/16' wall alum. the plate is 3/16" alum. The welding is done after the carbon sock is slipped on in five pieces. Weighs about six lbs.



-------- Original Message --------

Subject: RE: [c-a] Anyone sell a pre-welded rollover structure?

Date: Tue, 4 Sep 2012 08:51:28 -0500

From: Dennis Purduski <dpurduski@howard-ind.com>

To: Dave A <usaf\_david@yahoo.com>, <canard-aviators@yahoogroups.com>

....Burrall Sandershelped me install my steel turnover structure. ...retrospect ...would have duplicated the Rutan headrest shape with the tubing. .... shape I chose presents a little more of a challenge for the GIB to get in/out.

http://freeflightcomposites.com/images/purduskyrollbar%2000018.JPG

Dennis Purduski Vari Eze N117EZ



-------- Original Message --------

Subject: Re: [c-a] Anyone sell a pre-welded rollover structure?

Date: Thu, 06 Sep 2012 02:12:46 -0000

From: Ezpilot <x24thepilot@yahoo.com>

To: RJ schreiner <schreiner@cytherean.org>

.... I handle glass cockpit installations, avionics, and other upgrades to Canard airplanes and am based at WHP in Southern CA. In the last year, I have subcontracted the fabrication of 2 welded roll bar structures on Long-EZs...difficult to sell something that is pre-fabricated and ready to drop in, do to varying dimensions of different Long-EZ canopies and fuselages. ...tack weld and then remove the roll-bar to do your final welds, I can make it pretty easy for you.

Chris Randall Builder/Pilot of Berk-EZ N8882E x24thepilot@hotmail.com

-------- Original Message --------

Subject: [c-a] rollbar

Date: Tue, 11 Sep 2012 08:37:37 -0700

From: Bob Holliston <bob.holliston@gmail.com>

To: canard <canard-aviators@yahoogroups.com>

Rollbar in a LongEZ, about 2 minutes long... http://pursuitofflight.com/longezrolloverst.html

## -RTV:

-------- Original Message --------

Subject: [c-a] Saran Wrap and RTV

Date: Fri, 14 Dec 2012 09:54:48 -0500

From: Harley <harley@AgelessWings.com>

To: CSA <Canard-aviators@yahoogroups.com>

I just finished a project ... apply RTV to some parts and clamp them in place until set. Wanting to not have the RTV stick to the clamps, and knowing that epoxy won't stick to saran wrap,...The RTV doesn't even begin to stick to the saran wrap, and when it was removed, I had a nice, tight, smooth finish ...will be closing the wing/strake gaps on my Long EZ, and planning on using the RTV method mentioned in the plans, I think I will use saran wrap on the spar to provide a non stick surface. This way, I won't have to do as Burt suggests (using a razor knife to cut the RTV) if (when) I remove the wings. ...

Harley Dixon Long EZ N28EZ

-------- Original Message --------

Subject: [c-a] Re: Saran Wrap and RTV

Date: Fri, 14 Dec 2012 16:50:32 -0500

From: Harley <harley@AgelessWings.com>

To: Steve Stearns <steve@tomasara.com>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

...RTVs cure properties...used it a lot in my working days to seal electronic components. RTV uses moisture to cure, not air...but, like all things, too much can be just as bad as too little. Ideally, humidity from 35% to 70% is

best, but if the humidity is too high or too low, it could take as long as 10 days to properly cure a thick layer.

We usually allowed 5-7 days to assure us of a good cure. ...

That was why I was glad to see that RTV won't stick to saran wrap. I can run a strip of saran wrap down the middle of wide tape, and use that as a dam to hold the RTV in place on the underside of the structure until

it cures. ... Around here, the RTV that gets into those tapered tips that are provided with the tubes usually cures solid enough to remove as a single piece (push out with a drill bit) in about a week, and also leaves a plug into

the tube about a 1/4 inch long.

Harley

## -Rudders:

-------- Original Message -------- Subject: Re: [c-a] Winglets & Rudders

Date: Sun, 03 Jun 2012 08:44:37 -0500

From: vance atkinson <nostromo56@tx.rr.com>

To: Randel Livingood <randel.livingood@yahoo.com>

CC: canard-aviators <canard-aviators@yahoogroups.com>

If you enlarge the moveable rudder, you risk being able to stall the airplane........

Vance Atkinson EAA Tech and Flt Advisor

-------- Original Message -------- Subject: Re: [c-a] Winglets & Rudders

Date: Sun, 3 Jun 2012 07:47:41 -0700

From: Elwood Johnson <ejandlinda@earthlink.net>

To: ARGOLDMAN@aol.com <ARGOLDMAN@aol.com>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

...tap the brakes to keep alignment DO NOT DRAG. Speed increases between taps.

EJ Johnson N36EJ S. Calif.

-------- Original Message -------- Subject: RE: [c-a] Winglets & Rudders

Date: Sun, 03 Jun 2012 11:31:20 -0400

From: Ken <kenezmiller@optonline.net>

To: ARGOLDMAN@aol.com, canard-aviators@yahoogroups.com

Rich said: >...If your runway is wide enough, start on the downwind corner of the runway, start your run as much into the wind as possible and when your rudders take effect have at it and straighten out. (kinda like crabbing to a landing in reverse, except your wheels are on the ground).<

I did just the opposite, lining up on the upwind side with the nose pointed slightly downwind. As you accelerate using no brake at all, the nose will weathervane into the wind. By that time you will have rudder authority to arrest the turn and rotate. EZ. This will give you a whole lot more time to gain airspeed.

Ken Miller

-------- Original Message -------- Subject: Re: [c-a] Winglets & Rudders

Date: Sun, 03 Jun 2012 18:47:56 -0400

From: S. Ramirez <simon@synchdes.com>

CC: canard-aviators@yahoogroups.com

...Another thing I do is point the airplane away from where I'm going to weathervane before I start the roll. As I roll, I use the brakes to keep me on the opposite side of the runway. As I gain speed, I start to weather vane, so I make an arc back to centerline. Usually by the time I get to centerline, I'm going fast enough to use rudder authority and keep it centered.

Simon Ramirez

-------- Original Message -------- Subject: Re: [c-a] Winglets & Rudders

Date: Mon, 4 Jun 2012 10:16:17 +0200

From: Gianni Zuliani <gz@comgz.com>

To: Canard-aviators <canard-aviators@yahoogroups.com>

Practical demonstration here. Look at the windsock: only a little tap on left brake after launch, then some rudder. LSZL is 2600' long @ 650'MSL.

http://www.youtube.com/watch?v=LG1da3hLbnU&feature=channel&list=UL.

Gianni Zuliani

-------- Original Message -------- Subject: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Mon, 4 Jun 2012 15:35:16 -0600

From: to tu <totucomm@gmail.com>

To: cozy\_builders@googlegroups.com, canard-aviators@yahoogroups.com

Over the weekend I had the opportunity to ask Mike Mellville a question I've had for a long time. The question was: "...what was the basis for deciding to give Asymetrical Airfoils and Incidence to winglets?" ...I believe this choice contributes substantial drag at cruise speeds and I'm not a believer that it's necessary for adequate directional stability. ...after looking at the vertical stabilizers of numerous twin-tailed aircraft and other than Rutan designs, I'm aware of only one other design that has this, the OV-10. ...Mike's answer was that it was part of the Whitcomb winglet design that Burt utilized in order to gain those Whitcomb efficiency claims. ... ...perhaps it worked out with the little winglets of the VariEze but when carried forward and sized up for the LongEz, Cozy and Berkut I've gotta wonder whether Whitcomb's work is still valid. ... Tom

-------- Original Message -------- Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence [html][heur][bcc][faked-from][mx]

Date: Mon, 04 Jun 2012 23:12:52 -0400

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: canard-aviators@yahoogroups.com

...I keep the good ones, and this one might answer your question.

...I figured I would take the time to educate you on some of the functions the winglets perform and how they do so. I'm not sure what you know about aerodynamics so if I sound like I'm patronizing your knowledge, \*please\* don't take it that way, I simply wish to inform. I thought you'd be surprised to find out just how much those giant fins you have on your Long-EZ are doing out there.

First off, let me say that you are 100% correct in your assumptions about the forces applied to the wing structure on the whole. The resultant forces of the winglets do resolve to a tension in the high-pressure surface of the wing (the lower side obviously), and of course if we're in tension on the bottom side, the top side of the structure must be feeling some compressive load. I'll give you an explanation of why this is the case and the function of the winglets as a whole. I'll try to be as detailed as I can but keep it relatively simple as well.

First and foremost, the reason the wing feels those forces is simply because the winglets on the Long-EZ produce lift. In fact, they produce a tremendous amount of it. I haven't done the precise lift calculations but cursory calculations indicate right off that you'd have a hard time accelerating your Long-EZ on the ground to a high enough speed to even lift off if you had a symmetric airfoil on the winglet (as opposed to the lifting airfoil we have). So the winglets on the Long-EZ pull inward toward the fuselage really hard. Much harder than you might imagine... Take notice of the substantial amount of glass applied when attaching them to the wing.

So let's get technical... Why all this force pulling inwards from the creation of lift? Why do we have these structures as opposed to just a longer main wing? Why are they angled inwards toward the wing? Why are they canted toward the nose? And so on.

The higher pressure air under a wing wants to spill around the wingtip to try to fill in the low pressure area on top of the wing. This flow results in a tip vortex trailing aft from the wingtip, like a horizontal tornado. You can see these vortices at the wingtips of a jet fighter during a high-lift maneuver in sufficiently humid air, or at the tips of an airliner's flaps during a landing approach in wet weather. The energy extracted continuously from the aircraft to make the air swirl like that is a direct result of the creation of lift and is dubbed 'induced drag'. These vortices are at their worst when we're trying to make lots of lift with relatively little airflow. This means that slow flight (low speed, low mass flow, high lift coefficient) is one of the worst cases. This also means that the intensity of the tip vortices will be highest at these kinds of flight conditions. The higher the intensity of these vortices, the higher the induced drag on the aircraft, and thus, a greater amount of wasted energy. If you trace back how your airplane is really flying, you get to one source of energy, the fuel in your tanks. Extracting every ounce of energy from that fuel in every respect is a challenge of aircraft design. So the more energy we waste on things like wingtip drag, the less energy for the airplane to use for other means. I won't go into it here but you can read about a coefficient that you can calculate that will tell you in general how efficient your aircraft is... this is known as the Oswald Efficiency Factor.

So back to winglets specifically, there are generally two families of winglets you'll find on aircraft today. Simply put, lacking many specifics of course, one family has the production of lift as one of its primary jobs, and the other does not. The winglet style on the Long-EZ is of the lift-producing family and was designed by Richard T. Whitcomb. Our winglets are hence called Whitcomb Winglets. A small historical fact, the first aircraft to ever fly with these winglets was Varieze N4EZ.

So we need to talk about "helix angle". If you understand the pitch of a prop, you're already familiar with it. Helix angle is one way to measure how far something rotates compared to how far it travels forward in the same time. The blade angle of a propeller blade is nearly the same (minus its efficiency effects and local angle of attack) as its helix angle. A wingtip vortex has a helix angle as well. This angle will be nearly parallel to the airplane's direction of flight when induced drag is low, but twist up into increasingly greater angles relative to the flight direction as we slow down or pull more "G".

If we have a significant amount of induced drag, and a correspondingly stronger tip vortex, then the flow at the wingtip will not be parallel to it, but rather at an inward angle on the top and an outward angle on the bottom. This is where the winglets come in.

If we park a lifting surface in the middle of this angled air flow, it will develop lift perpendicular to the angled air flow. The resulting lift will be angled forward, and the forward component of that lift will be producing thrust. The lifting surface (the winglet) will also be producing drag of its own, including both parasite and induced drag. So essentially, the winglets on the Long-EZ are producing lift not only due to their high-pressure-on-the-outside airfoil, but also due to the energy they are harnessing from the tip vortices. So the winglets, being an effective wall in the middle of the tip vortices, don't just waste the energy there, they utilize it for lift and thrust and in the end, you have a highly diminished vortex trailing behind the aircraft and that means lower induced drag at the tips.

But recall I said that the winglet makes drag of its own too... If the drag the winglet produces is less than the forward component of its lift, then there will be a net thrust applied from the winglet to the aircraft. Yes, your Long-EZ winglets actually provide some thrust to the aircraft! This thrust actually represents some of the energy in the tip vortex, harvested from the vortex by the winglet and given back to the aircraft. That's it. That's all there is to it, quite simple really.

Ok, now the catch... How do we maximize that thrust? This is where it gets complicated. Let me quickly define a couple of geometry terms I'll refer to. When I say "toe-in", I'm referring to the angle of the leading edge of the winglet with respect to the absolute tip of the Long-EZ's nose. So if you stared at the winglets from the FRONT of the airplane, the more of the "outside" of the winglet you can see, the greater the toe-in angle. I'll also refer to winglet "cant". The "cant" I'm referring to is the tilt inwards of the winglets toward the wing. If you look at a Long-EZ, you'll notice its winglets tilt inwards slightly (the top of the winglets point each other).

If you increase the angle of attack of the winglet by increasing the toe-in angle, then it makes more lift force (which should theoretically increase the forward component of that lift), but it also makes more drag of course. Depending on the specific situation, this could increase, decrease, or not change the net thrust of the winglet. It's going to depend on a lot of factors, including the flight condition.

The last item is particularly critical. Because the amount of induced drag, and the helix angle of the vortex decrease as you increase airspeed, the energy available for "harvesting" by the winglet decreases as you fly faster. Meanwhile, the parasite drag of the winglet is increasing. Eventually you get to a point where the total drag of the winglet is equal to the forward component of its lift, and at that point the winglet produces zero thrust. This is called the "crossover velocity". At airspeeds higher than the crossover velocity, the winglet adds to the aircraft's total drag and you'd be better off without it.

Thankfully, we don't have to worry about most of this with the Long-EZ since the aircraft is already superbly aerodynamically engineered. I just thought you'd find it informative. So I covered why the high pressure side is on the outside, and what the toe-in does for lift, but what about twist and cant?

The process of "unwinding" the tip vortex that the winglets perform is accomplished both because they are a physical wall in the way of the vortex, but also due to the effective aerodynamic twist of the airfoil. The orientation of the upper and lower winglets provide effective aerodynamic twist to assist in this function. I'll leave this alone unless you desire details.

As far as the "inward-cant" of the winglets is concerned, when you think about it, you might think they're detrimental to the design to some degree. If lift is created perpendicular to the airfoil body, and the winglets on the Long-EZ are canted slightly inwards, don't we end up with a slight portion of that lift pointing towards the ground (I.e. adding to the weight of the aircraft)? Yes, we do. However, it is entirely negligible, it's that small. Burt ran me through some quick calculations a ways back just to show me how negligible it is. So why do they point inwards at all then? They reduce the effective dihedral of the wing.

You know of course that the Long-EZ main wings have sweep to them and, duh, they have winglets. Adding wing sweep and a winglet to a wing both make the wing feel as if it has dihedral. Since they don't actually have dihedral physically, we call it 'effective dihedral'. When Burt designed the Long-EZ with a larger wing, he needed wingtip clearance for crosswind landings... Because of this, he needed to do away with the anhedral design of the Varieze. Think of the consequence... The Varieze's effective dihedral from both adding the winglet and from sweeping the wing is counteracted by the anhedral in the main wing surface. Reducing this anhedral to zero, as was done on the Long-EZ for tip clearance, would obviously bring the effective dihedral back up and make the craft more stable, however, more difficult to turn. So to reduce this effect as much as possible, Burt canted the winglets on the Long-EZ inward slightly.

So now you can run off and think about all that's happening out there on those fins. I think I've dragged you on long enough, but think about how the rudders on the Long-EZ might work given your knowledge of winglets now. They function differently than conventional rudders. Also think about what happens to roll rate if you cant the winglets outward instead of inward? Think about how changing the toe-in angle would seriously change things? Also think about my favorite modification that I still fail to agree with, cutting off the lower winglet...

If you think about what all those changes do, you'll better understand the function and design of the winglet. If you've got any questions, write me back privately, I'd be happy to respond however I can.

...Andy Amendala, Long-EZ

David Froble Tel: 724-529-0450

-------- Original Message -------- Subject: [c-a] Re: COZY: Winglets having symetrical airfoil and zero-incidence

Date: Mon, 04 Jun 2012 20:34:37 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Tom Tugan wrote: > Over the weekend I had the opportunity to ask Mike Mellville...

Can we please spell the guy's name correctly? It's "Melvill".

> ... what was the basis for deciding to give Asymetrical Airfoils

> and Incidence to winglets?" I explained that I believe this choice

> contributes substantial drag at cruise speeds and I'm not a

> believer that it's necessary for adequate directional stability.

With apologies to Joe Person, you're correct - the camber in the winglets is not for directional stability, since there are two that are opposing, so if the lift curve slopes are identical in slope, shifting them up by cambering the airfoil doesn't change the lift delta with beta (sideslip) angle.

And you're also correct that at the cruise speeds that we generally use, they are creating substantial lift and induced drag - probably noticeably more than they would if they were symmetric.

But...

> In short, Mike's answer was that it was part of the Whitcomb

> winglet design that Burt utilized in order to gain those Whitcomb

> efficiency claims.

Bingo. That was Burt's original intent. Whitcomb showed that at higher AOA's and lift coefficients, when cruising near max L/D, the winglets could increase the effective aspect ratio and lower total induced drag, thereby increasing overall aircraft efficiency. And when flying in those regimes, they do, although not as much as just

lengthening the wing does (at the cost of more weight than the winglets cost).

But with our canard aircraft, we HAVE to have winglets for directional stability, so Burt was trying to make them also provide higher efficiency at the speeds that a VW powered VE or an O-235 LE in economy cruise mode might attain. But few of us fly that slowly, so at higher airspeeds, where induced drag is a smaller percentage of the whole, they're not really effective at increasing efficiency. My guess is that they're a slight detriment, but that's just a guess.

> Hmmm, perhaps it worked out with the little winglets of the > VariEze but when carried forward and sized up for the LongEz, Cozy

> and Berkut I've gotta wonder whether Whitcomb's work is still

> valid.

It's valid in the correct flight regime, which is flying near max L/D speeds. Do that, and the winglets are reducing induced drag a little bit.

> 1) Yeah, they have salesmen too and gullible buyers with $$ who

> will take the word of salesmen's charts.

Please. There is a LOT of data showing 1-3% decreased fuel burn in identical aircraft except for winglets. It's NOT a marketing gimmick.

> 2) Images I've seen of the new Boeing 787 do not have these goofy

> winglets, blended or not.

Because aerodynamic analysis has progressed, and the sheared wingtips on longer wings (made possible by the use of composites to keep weight down) means that the winglets aren't quite as effective as making the wing longer.

> ... None of the Airbus airliners I saw and listened to had the

> winglets, only those little dart-shaped things.

Which are still winglets, although a slightly different type, but the purpose is identical. They both work.

One other LARGE reason not to change the airfoil to a symmetric one is structural - the attachment methodology for the winglets (in a stock configuration, not a blended, continuous spar configuration) ASSUMES

that the lift vector on the winglet will ALWAYS be inward. If you start putting outward force on the winglet, you'll break your winglet joint, as Tim Sullivan discovered three years ago. So changing to a symmetric airfoil would also require structural redesign and testing.

Marc J. Zeitlin

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Winglets having symetrical airfoil and zero-incidence

Date: Tue, 5 Jun 2012 02:02:25 -0400 (EDT)

From: N11TE@aol.com

To: marc\_zeitlin@alum.mit.edu, cozy\_builders@googlegroups.com, canard-aviators@yahoogroups.com

...years ago I had a long conversation with Dave Ronnenberg (sp?) about his design of the Berkut while at Sun'nFun. In particular, his opinion that the cant of the winglets on the Long (and, of course the Cozy) were causing increased drag and therefore he had the winglets on the Berkut angled out about 4" ~~at the tips~~ in order to minimize interference drag. From this, I assume that all Berkuts are built this way. Perhaps there is a Berkut builder on the list that can verify...

TomE

-- Original Message -------- Subject: Re: [c-a] Re: COZY: Winglets having symetrical airfoil and zero-incidence

Date: Tue, 5 Jun 2012 01:25:46 -0500

From: <berkut13@berkut13.com>

To: <cozy\_builders@googlegroups.com>, <canard-aviators@yahoogroups.com>

Actually, they were canted outward 4” along the TE for cosmetic purposes, and as a very minor sub-set, the intersection drag is reduced by a tiny fraction (although un-measurable in flight). Another theoretical result of that move was a slightly increased max (with rudder input) roll rate due to the slight reduction in horizontal stability...but that was never proven.

The only attribute of that mod that was ever substantiated is cosmetic. I did have a little success (2-3mph) top end gain with my winglet tip mod (span reduced, sheared, tapered, cuffed and washed out to zero) most likely from the span reduction. No quantifiable change in horizontal stability but the winglet area in front of the rudder was not changed. (details in the Performance Mods section of my website)

James Berkut/Race 13 www.berkut13.com

-------- Original Message -------- Subject: Re: [c-a] Re: COZY: Winglets having symetrical airfoil and zero-incidence

Date: Tue, 5 Jun 2012 08:52:56 -0500

From: Ryszard <ryszardzadow@att.net>

To: <marc\_zeitlin@alum.mit.edu>, "to tu" <totucomm@gmail.com>

CC: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

<..One other LARGE reason not to change the airfoil to a symmetric one is structural –>

And that has a lot of validity, but I believe there’s been more than one person that’s changed the airfoil shape of their VE winglets. Klaus I believe is one of them, Charlie Airesman and Jack Fehling maybe the others. None have had winglets come off yet.

Ryszard

-------- Original Message -------- Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence [html][heur][...

Date: Tue, 5 Jun 2012 10:41:55 -0400 (EDT)

From: CozyGirrrl@aol.com

To: davef@tsoft-inc.com, canard-aviators@yahoogroups.com

That's all good, well, but, except one thing... Steve Wright told us he put symmetric airfoil winglets on the Stagger Ez, with zero incidence. This would disprove much of what was stated as absolute below. ...

Chrissi & Randi

-------- Original Message -------- Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Tue, 05 Jun 2012 08:01:19 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>, cozylist <cozy\_builders@googlegroups.com>

CozyGirrrl@aol.com wrote:

> That's all good, well, but, except one thing... Steve Wright told

> us he put symmetric airfoil winglets on the Stagger Ez, with zero

> incidence. This would disprove much of what was stated as absolute

> below. If someone close to him knows different please speak up.

You can't prove a negative, but a search of the COZY and canard aviators mailing list archives lists a bunch of postings from Steve regarding rudder size and winglets in general, but no mention whatsoever of changing the airfoil of the winglet. You may be remembering this: Here's what he DID say, on 11/23/2002 on the C-A list:

"My Stagger EZ winglets are mounted parallel to BL-O in an attempt to reduce drag at higher speeds."

We'll never know what that actually meant, since he didn't say WHAT he was mounting parallel to BL-0 (chord line? Zero lift line? Something else?) or the effect that may or may not have had, since the rest of the aircraft is substantially different as well. What I can say is that the Stagger-EZ, with three seats and about the same engine (180 HP O-360) as my COZY MIV had about the same performance, both on the top end and in cruise. Very hard to compare without side to side runs, but my point is that if there was any difference in performance from the winglet incidence angle modification, it was small. While I have one very minor disagreement with Andy Amendala's winglet discussion, his explanation of the workings of the winglets (with respect to the Whitcomb aspect of it and the history of the design) is substantially correct.

Marc J. Zeitlin

-------- Original Message -------- Subject: RE: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Tue, 5 Jun 2012 09:08:12 -0700

From: Andy Amendala <winglet@live.com>

To: <marc\_zeitlin@alum.mit.edu>, <canard-aviators@yahoogroups.com>

I wrote that post when I was in college as an attempt to clarify (even for myself) how the winglets on our ships function while sharing what I believed to be correct for everyone's benefit since their seemed to be some major confusion on the topic. There are mistakes in that post that I've never taken the time to correct, but should. My understanding of winglets is much greater how and I should repost at some point with technical additions and vector diagrams. Anyway, just know that there are mistakes in that post and it isn't entirely correct.

I had a discussion with Steve Wright years ago at Oshkosh regarding his winglets. When I walked around the Stagger EZ, he had his rudders shimmed outboard 5 degrees or so - it was substantial. When I asked why he did that, he mentioned that the airplane did have "yaw stability issues" due to the reduced lift loads on the winglets as a result of their reduced AOI. I asked to him elaborate on "yaw stability issues" and all he would say is the airplane had a tendency to "hunt" for the center when disturbed in yaw. In other words, it didn't exhibit strong directional stability and took a larger number of cycles than desired to return to the neutral position after a yaw-wise disturbance. Apparently shimming the rudders greatly helped this issue.

I've since seen the Stagger EZ at Oshkosh years later and it's rudders were no longer shimmed. Whether he ever solved the problem, I don't know. What I do know is, these ships are tremendously efficient as it is and fly with the ball in the center with my feet flat on the floor even at the steepest bank angles. My family's Long-EZ has gone from Seattle to Chicago non-stop with plenty of fuel to head to Indiana and maybe beyond... I realize I'm wading into hot water with this statement but... why again are we discussing modifying such a well-refined design?

Andy

-------- Original Message -------- Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence [html][heur][...

Date: Tue, 5 Jun 2012 09:36:26 -0700

From: Bob Holliston <bob.holliston@gmail.com>

To: canard-aviators@yahoogroups.com

When I hotwired the winglets for my LongEZ I used a symmetrical top template (naca 0010) in an attempt at having less drag - more speed. The bad news is that I'll never know if it worked or not because the plane has never flown in any other configuration. I do know of at least one other guy (Berkut 13) who did it after the fact and reported positive results. Also my winglets are not canted in 4", they're straight up. I was concerned about reduced low speed stability but have seen no evidence of that. Since I used the stock bottom template they still try to fly inboard, just not as much. Maybe I could have left off a few of the (about 40) layers of glass that hold them on and saved a few grams. Bob LongEZ NX666DV.

-------- Original Message -------- Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence [html][heur][...

Date: Tue, 5 Jun 2012 12:07:32 -0500

From: <berkut13@berkut13.com>

To: <canard-aviators@yahoogroups.com>, "Bob Holliston" <bob.holliston@gmail.com>

To be accurate, I only changed the airfoil of the winglet tips (above the rudder) and sheared them slightly ahead of the top 2” of the rudder – concept idea stolen from Scott Carter but taken a little further and tested. There was no blending of actual winglet airfoils below the top of the standard HP rudder. This was mainly a cosmetic mod, and they do look really good on the Berkut. However, I did record a +2mph top end gain from them when tested (only 4-run compare)...but in reality, that could have just been measurement noise – it’s very difficult to get that granular with flight only testing. It was a good exercise in applied theory. The winglet intersections yielded much better consistent gains (avg +4kts), and measurable differences using yaw comparisons...and the CRAM (Clean Ram Air Mod) scoop was a home run in all flight regimes! Remember, testing is expensive, make it count.

James Berkut/Race 13

-------- Original Message -------- Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Wed, 6 Jun 2012 05:39:04 -0600

From: to tu <totucomm@gmail.com>

To: Ryszard <ryszardzadow@att.net>

CC: marc\_zeitlin@alum.mit.edu, canard <canard-aviators@yahoogroups.com>, cozylist <cozy\_builders@googlegroups.com>

You can see it in the http://tugantek.com/archmailv2-ca/search archives by searching SUBJECT for: long long reply It was posted back in 2003

Tom

On Tue, Jun 5, 2012 at 9:18 AM, Ryszard <ryszardzadow@att.net> wrote:

I didn’t get Andy’s post on winglets for some reason. Can someone please repost it. And if it’s only on the Cozy list then I know I can’t get those because “somebody” removed me from that list a few years ago...

Ryszard

-------- Original Message -------- Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Wed, 06 Jun 2012 07:23:10 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Tom Tugan wrote wrote:

> I'd like to know if Andy still stands by these points 100% :

> "cursory calculations indicate right off that you'd have a hard

> time accelerating your Long-EZ on the ground to a high enough speed

> to even lift off if you had a symmetric airfoil on the winglet (as

> opposed to the lifting airfoil we have)."

This was the one basic part of Andy's treatise with which I disagreed - his reasoning prior to this was sound, but I have no idea how he drew this conclusion from the previous declarations. This makes no sense, and isn't correct.

> "If the drag the winglet produces is less than the forward > component of its lift, then there will be a net thrust applied from

> the winglet to the aircraft. Yes, your Long-EZ winglets actually

> provide some thrust to the aircraft! "

This part is true, and is the basis of the overall drag reduction of the aircraft when using winglets at low IAS / high AOA / max L/D speeds. The lift vector of the winglet CAN point forward (due to the angle at which the tip vortex impinges) and therefore it can produce a forward component of lift, which results in thrust which is larger

than the total drag of the winglet.

Let me make clear that I don't believe that this ever occurs on our aircraft when we're anywhere near cruise speed - maybe at 90 kts IAS to 120 kts IAS it might be the case, but so small as to be impossible to measure.

But we're talking Whitcomb winglet theory here, and it clearly IS the case for the commercial jets that use winglets, as they have demonstrated lower overall drag with winglets, proving the analytical theories.

Marc J. Zeitlin

-------- Original Message -------- Subject: RE: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Wed, 6 Jun 2012 12:33:04 -0700

From: Andy Amendala <winglet@live.com>

To: <canard-aviators@yahoogroups.com>

To throw myself under the bus, as I'll gladly do when I'm wrong, I confess that I have absolutely NO idea why I said what Marc quotes below. That was a long time ago... I believe what I was after was something much different than what I said. Either way, it's a rubbish statement. The airplane would obviously come off the ground, whether it was controllable was questionable to me and the data I had at the time indicated it may not be.

As part of my study of aerodynamics and my obsession with the Long-EZ, I had done some basic stability analysis for a school project leveraging an app named VisualFoil that I'd used to create a blade element model of the Long-EZ. I'd refined the blade model to a full vector model as accurately as I knew how being new to CFD, FEM, ANSYS, etc. I then began to play with the configuration for fun. After all, I had access to tens of thousands of dollars worth of software for free.

What I found was that when I modified the winglets to use a symmetric airfoil and shifted their AOI to 0 (chord parallel to flight path), the airplane (at least based on the limited data I was able to get out of the cycles I could do in a reasonable timeframe on my desktop computer), indicated that even small sideslip disturbances would trigger short-period lateral-directional oscillations with very poor damping. Depending on the magnitude of the disturbance, the airplane demonstrated varying degrees of poor lateral-directional stability but no divergent behavior. I don't recall the matrix I fed the solver so I don't know offhand the atmospherics and pressures I provided.

I do remember this... when I modified the AOI of the winglets (symmetric airfoil, our Eppler 1230 mod, or otherwise), to always guarantee an inward-pointing lift vector even at maximum sideslip angles, the damping substantially improved to a reasonable number of cycles. The airplane demonstrated strong directional stablity with only minor excursions in roll due to dihedral effect. I believe the 'cant' angle I used was 0 for all my CFD inputs (winglet perpendicular to wing juncture).

CFD is an inexact science and is only as good as the model provided and data fed to the solver. Garbage in = Garbage out. It can only be truly validated in the blue yonder. So whether or not what I got out of my 'analysis' was valid or not is unknown. Yes, there are EZs out there flying with symmetric airfoils on their winglets, and plenty of sailplanes too. Whether or not these winglets always fly at a positive or negative AOA, I don't know. Of all the reading on winglets I've done, there is a common consistency amongst those that operate in the flight regimes our light experimentals and sailplanes do... the left vector changes greatly in magnitude and only minimally in direction and never transposes. In other words, the lift vector is either always facing inward or always facing outward and it's relative angle to the chord of the winglet shifts only minimally as the angle of attack of the winglet varies.

I am not a winglet expert, the aerodynamics of the Long-EZ are just a fascination for me. I appreciate all the interest in my oriignal post post and I realize it helped many people get a better picture of what's going on but it isn't without mistakes.

Andy

P.S. I have a 1/4-scale flying Long-EZ that I've built from scratch over the years that is entirely departure proof - our trademark pitch-porpoise behavior and all. The aero is remarkably similar to the full scale in terms of the airfoils, sweeps, slotted elevator, etc. however, of all the components I had the hardest time with, getting the winglets right proved very difficult. Everything I tried yielded an airplane that would go berserk when disturbed in yaw. It took months to fix. The solution? \*Symmetrical airfoils\* mounted at 5 degrees toe-IN AOI. So what do I know!!!

-johntoelaer <johntoelaer@yahoo.com>, Wed, 06 Jun 2012 19:36:32 -0000: ...first aircraft to fly with Whitcomb winglets was ...N7EZ...

Andy Amendala <winglet@live.com>, Wed, 6 Jun 2012 16:30:58 -0700: ...The other night ...in the shop working on my full scale winglet and I moved the rudder outboard to the angle I remember that Stagger EZ's rudders were shimmed outboard (by eye). It was closer to 10 - 15 degrees, not 5 as I originally said. Either way, pretty substantial...I probably have pictures of it in my Oshkosh archives...

-------- Original Message --------

Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Thu, 07 Jun 2012 07:41:01 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

David Williford wrote:

> ... I’m not exactly sure what points to reference, as I’m not the

> builder.

The first thing that folks seem to be interested in is the incidence angle of the winglet as a whole. If you reference BL-0 on the ground under the plane, then drop a vertical from the exact leading edge point of the root of the winglet where it attaches to the wing, you can measure what BL that's at (on a COZY MKIV, it's supposed to be BL-169). Then do the same for the trailing edge at the bottom of the rudder - see what BL that's on. On a COZY MKIV, they're on the same BL. That may or may not be so for the Stagger-EZ, given Steve's statement on the matter.

> ... In reference to them being a symmetrical airfoil, I believe

> they are.

I would be VERY surprised if that were the case. Again, Steve made reference to changing the incidence angle, but never any reference to changing the airfoil. I don't know what's making you think that, but you could quickly make a template that fit one side of the winglet and then see if it exactly matches the other side of the winglet at the same height. I'd bet a few bucks that they don't. I talked to Steve a great deal about his plane and never once did he mention airfoil changes.

> ... If you would like feedback on yaw, I have recent experience I

> could share if interested.

Having flown in the plane once with Steve at Rough River to investigate a small vibration he was having a while back, I can say that it flew exactly like my COZY. But if you have some anomalous yaw experiences, by all means share them.

Marc J. Zeitlin -------- Original Message --------

Subject: Re: [c-a] winglets

Date: Thu, 7 Jun 2012 08:48:52 -0600

From: to tu <totucomm@gmail.com>

Jack,

Speaking for the guy creating all the winglet noise here (me), no need for that test, I'd agree that cutting the winglets off EZ aircraft would lower efficiency. Even flat tip-plates would increase efficiency as well as some provide stability benefits. However, accepting and focusing on this part of Marc's earlier comment: "Burt was trying to make them also provide higher efficiency at the speeds that a VW powered VE or an O-235 LE in economy cruise mode might attain. But few of us fly that slowly, so at higher airspeeds, where induced drag is a smaller percentage of the whole, they're not really effective at increasing efficiency. My guess is that they're a slight detriment, but that's just a guess." This is now why I'm not a believer in Whitcomb's work for EZ aircraft. Marc is saying the full Whitcomb efficiency gains are not being realized on EZ aircraft, simply because they're being flown too fast. So my point is, as long as we're going to fly so fast, why not change the airfoil and toe-in to reduce the excessive drag they're probably creating. ( As long as directional stability is not being lost in the process)

To me the most interesting test is to find a symmetrical and zero aligned airfoil which will provide the directional stability, and see how it changes speed and efficiency. With fingers crossed, I'm expecting that it would help.

Tom

-------- Original Message --------

Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Thu, 07 Jun 2012 07:54:56 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Tom Tugan wrote:

> The Rutan & derivative canard aircraft have lots of fuselage ahead

> of CG, some more than others, and not much more than winglets to

> counter that forward fuselage. Using a thinner, zero-incidence,

> symmetrical airfoil apparently doesn't do the job, based on all

> I've been reading here. So the solution involves either toe-in

> and/or a thicker airfoil. Or so I'm thinking.

Statements like this are based on exactly zero evidence. We've heard some anecdotes about James Redmon's Berkut 13, which he's refuted. We've heard a vague oblique reference to Gary Hertzler's VE, which he's said nothing about. We've heard some conflicting reports about Steve Wright's Stagger-EZ, which are unsupported. We've heard statements about Klaus Savier's aircraft (who's VE I've seen numerous times and who's LE I saw at Tehachapi a couple of weeks ago when he was visiting the airport for lunch) and on which I've never noticed

any winglet airfoil changes (although Klaus admits that his LE had a different canard airfoil).

There's a saying that you can draw a line (meaning that you can extrapolate) through one data point in any direction you want. When you have zero data points, you can do even better, because you don't even have to anchor the line anywhere. Folks, we have ZERO evidence that changing the winglet airfoil would have either a positive or negative effect. We have exactly zero evidence that changing the incidence of the winglet would have either a positive or negative effect. It may do so, one way or the other, but there's no evidence for it. In every case mentioned, there are so many other changes to each aircraft that there is no "A" to "B" comparison to make.

As an engineer, I look at the "information" (and I use that word extremely loosely) presented so far and cringe at the notion that anyone might try to draw any conclusions whatsoever about a critical aerodynamic part of the aircraft.

Here's another meaningless data point for you - when Chris Esselstyn installed his blended winglets on his COZY MKIV (which, by the way, did exactly nothing to reduce the total drag of his aircraft, unlike Jack Morrison's blended winglets on his E-Racer), he also transitioned from the standard E-1230M airfoil at the root to a symmetric NACA 0010 (IIRC) at the tip. He did NOT change the incidence angle at the root. What conclusion can we draw from this regarding either incidence angle or airfoil shape? Zero.

When someone goes out and flies an otherwise identical aircraft with two different winglet airfoils, or with two different incidence angles (with the same airfoil) and reports back on yaw stability oscillation periods as well as airspeeds at identical power settings, then we'll know something about this. Or when someone does a full blown CFD study (less accurate, but might give some interesting info). Until then - nada.

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: COZY: Re: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Thu, 7 Jun 2012 15:40:49 +0000 (UTC)

From: Joe Person <ezejoe@comcast.net>

To: marc zeitlin <marc\_zeitlin@alum.mit.edu>

CC: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

Slightly less vague & oblique - From March, 1995 Sport Aviation, Page 43: "Keeping the weight down reduced the induced drag, but Hertzler's attention to the airframe drag goes far, far deeper than that. He found, for

instance, holding both rudders slightly out of line (they are independent on most canards) generated a noticeable drop in speed. He theorized the rudder displacement was making reflex that was already in the winglets much more pronounced and that apparently generated a sizable amount of drag. That being the case, Gary reasoned the reflex already in the winglet airfoils probably was generating drag all by itself.

The only way to find what effect all that reflex had was to remove it, so the final winglet airfoil Gary is now flying has a nearly straight curve from the point of max thickness to the trailing edge. This meant moving the trailing edge slightly inboard, but the net result was a speed increase of at least three mph. At the same time, however, he says his low speed stability was slightly compromised. Nothing is free in aerodynamics."

Less obliquely, and with stock VEZ upper winglets on me own VEZ.

Joe Person

-------- Original Message --------

Subject: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Thu, 7 Jun 2012 12:25:40 -0400

From: Ron Springer <ron228rj@gmail.com>

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

On Thu, Jun 7, 2012 at 11:40 AM, Joe Person <ezejoe@comcast.net <mailto:ezejoe%40comcast.net>> wrote:

> The only way to find what effect all that reflex had was to remove it, so

> the final winglet airfoil Gary is now flying has a nearly straight curve

> from

> the point of max thickness to the trailing edge. This meant moving the

> trailing edge slightly inboard, but the net result was a speed increase of

> at

> least three mph. At the same time, however, he says his low speed stability

> was slightly compromised. Nothing is free in aerodynamics."

Moving the TE slightly inboard results in toe-out like I just said in my last email. It's nice to be right!

Ron

-------- Original Message --------

Subject: [c-a] Winglets having symetrical airfoil and zero-incidence

Date: Thu, 7 Jun 2012 12:58:24 -0400

From: Ron Springer <ron228rj@gmail.com>

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

On Thu, Jun 7, 2012 at 12:50 PM, to tu <totucomm@gmail.com <mailto:totucomm%40gmail.com>> wrote:

> Yes Ron, it is good to be correct. But where did it say that the TE was

> moved sufficiently inboard to result in toe-out?

If you are starting out with no toe-in or toe-out, the LE remains fixed, and the TE is moved inboard by any distance, then there will be toe-out. Even if it moved 1 nanometer, there would be toe-out.

Ron

-------- Original Message --------

Subject: Re: [c-a] Winglets having symetrical airfoil and zero-incidence [html][heur][bcc][faked-from][mx]

Date: Thu, 07 Jun 2012 12:52:25 -0400

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: canard <canard-aviators@yahoogroups.com>

....I've reported this before, but since the subject has come up again, I'll repeat the reporting of my experiences.

Canard pusher, with winglets, swept wing, some dihedrial.

Experimented with some less draggy winglets. Turned the aircraft into a real twitchy bitch, no or very little yaw stability. Exact same aircraft with standard winglets, flew just fine.

Without attempting to get into the theoretical reasons, I'll leave that for Marc, I can say from actual experience that the drag at the wing tips is needed for yaw stability.

Now, for me, changing winglets is a matter of a small number of clevis pins. For a Rutan canard design the winglets are a bit more permanent. So unless you really want to test the idea of reducing drag, I'd suggest sticking with what has worked well for many others.

Note, the lack of yaw stability is an interesting experience. I think fear and terror might adequately describe it.

David Froble Tel: 724-529-0450

-------- Original Message --------

Subject: [c-a] Re: COZY: Winglets having symetrical airfoil and zero-incidence

Date: Thu, 7 Jun 2012 17:07:59 +0000 (UTC)

From: Joe Person <ezejoe@comcast.net>

To: to tu <totucomm@gmail.com>

CC: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>, Ron Springer <ron228rj@gmail.com>

"Straight curve" = no "cusp" - the VEZ main wing airfoil is the 1970's vintage GA(W)-1 (General Aviation Whitcomb) -1), now identified as the "LS(1)-0417" (with possible "tweak" by Burt), and the winglet airfoil appears to be is some varaint of the main wing airfoil (even greater camber than the main wing). Both airfoils have a cusp (slight undercamber) beginning at around 70% chord. Gary moved his winglet TE to effectively eliminate this cusp. See the VEZ main wing airfoil at:

http://www.ae.illinois.edu/m-selig/ads/afplots/ls417.gif

Joe Person

-------- Original Message --------

Subject: RE: [c-a] Thrust from winglets

Date: Thu, 7 Jun 2012 11:02:28 -0700

From: Andy Amendala <winglet@live.com>

To: <totucomm@gmail.com>

CC: <canard-aviators@yahoogroups.com>

While I find the discussion of modifying our winglet airfoils, changing the toe-in, cant, sweep, leading edge setback, etc. all very disturbing as there is aboslutely zero evidence to support the need to do anything of the sort, I will say that whether you agree with it or not, there is a thrust component of the lift vector.

A simple vector diagram will show you. Breaking the resultant lift vector perpendicular to the winglet into its constiuent components will reveal the thrust component. If I had the time, I'd draw a diagram. The component is not large and may in fact be immeasurable, precisely as Marc has indicated, but it IS there.

Tom, I don't follow your use of the word "moment" and don't understand your explanation. The existence of a propeller is irrelevant. With or without a propeller, the airplane is trading altitude for airspeed. As the wings move through the air, circulation effect yields pressure differentials that eventually lead to the tip vortices any airplane making lift creates. In a stable 1g glide, you're creating lift and therefore creating tip vortices. This is a three dimensional flow problem... if you break out the vectors, you'll find the lift vector is not entirely perpendicu lar to the winglet and is pointed slightly forward. It therefore by the laws of kinematics must contain a thrust-wise component. A meaningful one? No. But it's there. Anyway, I'm going to bow out of the winglet discussion. I rarely post here anyway because I find so much of the discussion disturbing as most of it revolves around changing things that there's no demonstrable need to change. I'll close with this and expect a bombardment of shit for saying it. Burt Rutan's hallmarks are without a doubt efficiency, simplicity, strength, and cost-effectiveness. I can only speak for the Long-EZ but that machine is about as refined as it gets. It flies so stably with such great efficiency, I could care less if the airplane goes 5 mph faster by making a change that has huge safety implications. I would remind you that Burt said and I quote "I set out to do the sweetest flying airplane I could do" when referring to the Long-EZ's development. Are we really questioning him? Not that he's infallible or should never be questioned, but I'm amazed routinely amazed at how many folks are so intensely focused on top speed that at least in my opinion, is meaningless. These machines were intended to be flown SLOWER. They're designed for efficient long-range cruising. 190 mph versus 200 mph is meaningless in my world. I've often asked people: if you could get there in a split second/blink of an eye rather than 5 hours, would you still fly? What'd be the point? The whole reason we build these damn things is to spend time in the sky, not get out of it as soon as possible. The winglets work, my advice would be: leave them alone. If you want to focus on fixing anything, make sure it's broken first....

Andy

-------- Original Message --------

Subject: RE: [c-a] Thrust from winglets

Date: Fri, 8 Jun 2012 09:39:53 -0700

From: Andy Amendala <winglet@live.com>

To: <totucomm@gmail.com>, <kenezmiller@optonline.net>

CC: <canard-aviators@yahoogroups.com>

... many don't believe me when I say we've flown that far non-stop. Our Long-EZ has a 150 HP O-320 installed. That engine, at least in my opinion, is the perfect size for the Long-EZ. Any larger just consumes another gallon or more per hour and yields only a marginal increase in climb and obviously higher temps.

Whether anyone chooses to believe it or not, the 1900-2100 mile trips we've taken in our EZ have been with the O-320 on it. The airplane regularly burns 3.2-3.5 gph at about 138 mph TAS. It's that speed (or near it) we use for endurance flying and handily matches up to the speeds flown by Dick Rutan for the 4800 mile endurance record in N79RA.

We regularly fly the thing at 2.7-3.0 gph turning 1650 RPM when we're just bombing around the airport. It's quiet, smooth, and the engine runs very cool. We're only doing about 115 mph at that burn but when you're just up staring at Mount Rainier and St. Helens for an hour, who cares, you're not really going anywhere and it's a lot easier on your engine.

We've heard plenty of people tell us there's no way we can get the fuel burn that low. I don't know what to tell you. If you ask the "experts", our Long-EZ should have no endurance. We seem to do everything 'wrong'. We pull the throttle and mixture handles back. That's the extent of our 'science' to low fuel burn.

- We're "heavy" in that our airplane weighs 1020 pounds empty.

- We have a Prince P-Tip propeller that everyone claims sucks.

- We have Melvill's old wheel pants that don't have a nice pressure recovery airfoil on them.

- Our main gear bow isn't faired.

- We have the P-51 cooling scoop. In addition to this, we have TWO additional small armpit scoops.

- We have the original Featherlite cowling.

- We use a bullet spinner.

Need I go on? It's hilarious to watch Gary Hertzler give presentations. We love Gary but what cracks us up is every picture he shows of what "not to do" are pictures of our airplane.

That isn't to say doing better on all the bullets I mentioned above, like fairing the gear, better wheel pants, armpit cooling, etc. wouldn't yield even MORE efficiency but I guess the point is - we're not sold that spending the time on all that is worth it. After all, Dick flew the endurance record with the stock gear bow, no wheel pants, a Featherlite cowl, a P-51 scoop ... sounding familiar? :)

Andy

-------- Original Message --------

Subject: [c-a] Re: COZY: Rudder cable rigging

Date: Tue, 04 Sep 2012 12:48:24 -0700

From: Keith Spreuer <keith@airstarts.com>

To: Rich Meyer <richhmeyer@gmail.com>,cozy\_builders@googlegroups.com, canard-aviators@yahoogroups.com

...The cable should have minimum slack so that you get rudder travel as soon as you press on the pedal. The brake adjustment is after that is set. The instruction on the brakes is that when hard on the brakes you get 4 to 4.5" at the TE bottom of the rudder. I disagree and say it ought to be min 4" before the brake action starts.

Keith

## -Rudder Springs:

-------- Original Message --------

Subject: Re: COZY: Re: [c-a] Bending the ends of springs - ideas?

Date: Sun, 15 Jul 2012 11:10:41 -0500

From: vance atkinson <nostromo56@tx.rr.com>

To: cozy\_builders@googlegroups.com, Canard Aviators <canard-aviators@yahoogroups.com>

...securing the plane I noticed the R/H rudder was deployed about half out, ... no sign of returning to its flush position. ... internal tension spring, in the winglet, had broke right where Al described in his last post, ... rust where the spring hooked on to the vertical winglet. ... 2000 hours ... 25 years. ... flew the plane ... with no spring attached. ...airflow will streamline it. ... EZ friends attempted to buy some springs ... but all of us had forgotten what size and tension ...

Vance Atkinson COZY N43CZ VEZ 3LV

On Aug 9, 2012, at 5:06 PM, GREILICH@aol.com <mailto:GREILICH@aol.com> wrote:

.... instructions for the hidden rudder bellhorns .... how to make a pair of rudder pedal return springs. ... installed the bellhorns ... made the springs ... can't for the life of me remember WHERE they things go. ... Phil Kriley Cozy #1460

-------- Original Message --------

Subject: [c-a] Re: COZY: Hidden rudder bellhorn instructions?

Date: Thu, 9 Aug 2012 17:52:08 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: GREILICH@aol.com <GREILICH@aol.com>

CC: cozy\_builders@googlegroups.com <cozy\_builders@googlegroups.com>, canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

You can put them anywhere you want IMO. They "yield" once the rudders hit the stops and will function anywhere in the cable. Most put them on the pedals I believe, but I can't see that it matters.

The firewall would work also.

Tim Andres

-------- Original Message --------

Subject: [c-a] Re: COZY: Hidden rudder bellhorn instructions?

Date: Thu, 09 Aug 2012 19:35:04 -0700

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com>

... have them in PDF format. ... will be putting them up on the COZYBUILDERS web site for general access in the near future. ....installed mine between the last firewall pulley and the wing root ... didn't have the room forward of the IP, ... they'll work anywhere between the pedal and the wing root.

Marc J. Zeitlin

## -Rhino Rudder:

-------- Original Message --------

Subject: [c-a] The Rhino Rudder

Date: Thu, 7 Jun 2012 13:49:08 -0700

From: Andy Amendala <winglet@live.com>

To: <canard-aviators@yahoogroups.com>

It's not the winglet discussion so I'll drop a post about it... this is merely meant to educational. The Rhino Rudder, while a neat idea, isn't very effective, blocks the pilot's field of view, and most of all - is ugly. ;-)

Having a vertical flying surface in front of the Cg such as a Rhino Rudder is not necessarily destabilizing. The Rhino Rudder tested on a prototype Varieze that was in a transitional state to becoming a Long-EZ was \_not\_ a destabilizing fin. It was tried as a means to further simplify the control system for what was becoming the Long-EZ.

If you meet the following conditions, it's possible to put a fin in front of the Cg, have it be usable for controlling yawing moments, and not be destabilizing.

1. The vertical fin must be an all flying surface. It cannot have a fixed component and a movable component, similar to our winglets or the horizontal on a C172.

2. The fin must be mounted on a loose or 'free' pivot. It must be able to skew without pilot input.

3. The aerodynamic center of pressure of the fin must be behind the centroid of the pivot.

If you satisfy these conditions, you get a fin that can be used to control yaw but will not destabilize the airplane. When the airplane sideslips, the fin will pivot and follow the relative wind rather than dragging the nose further in the direction of sideslip.

Neat? Yes. Effective? No.

Andy

## -Internal Rudder Bellhorns:

-------- Original Message --------

|  |  |
| --- | --- |
| **Subject:** | [c-a] Internal Rudder Belhorn Plans |
| **Date:** | Mon, 09 Apr 2012 20:30:24 -0700 |
| **From:** | Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu> |
| **Reply-To:** | marc\_zeitlin@alum.mit.edu |
| **To:** | cozylist <cozy\_builders@googlegroups.com>, canard <canard-aviators@yahoogroups.com> |

...Per Cedric Gould's suggestion, I've put the official RAF Internal Rudder Belhorn plans up on the COZYBUILDERS website at: <http://www.cozybuilders.org/ref_info/> under "Modifications".

-------- Original Message --------

|  |  |
| --- | --- |
| **Subject:** | Re: [c-a] Internal Rudder Belhorn Plans |
| **Date:** | Tue, 10 Apr 2012 08:58:26 -0700 |
| **From:** | stephen wolpin <swolpin@earthlink.net> |
| **To:** | marc\_zeitlin@alum.mit.edu |
| **CC:** | canard-aviators <canard-aviators@yahoogroups.com> |

Marc,  
Is that very hefty spring up located up front on the rudder pedal assuming that master cylinders are forward and not on the firewall, or just to limit the amount of force that can be applied to the circuit?  
  
I inherited my LongEZ with improperly designed internal belhorns that provided 55% of the required travel on tall rudders.  She was a pig going over the fence, controls light and ineffective (also, aileron circuit slop provided ±60% specified aileron travel to add significantly to the problem; I commented on this a long while ago and fixed the issue with spherical bearings).  The bird has master cyls in the original firewall location.  The hefty springs were located in the wingroot just before rudder cable enters the wing, allowing for braking.  The rudder cable conduits in the wing were never relocated as described in the pdf.  I determined that a tweaky pulley and push-pull rod mechanism installed in the winglet and attached to the floor of the previously amputated lower winglet (removable for inspection and maintenance) would give the proper 4.5" rudder travel -- to a hard stop -- with 2" of cable pull, allowing full rudders before the brakes engaged.  I have long since installed such and it has worked extremely well for some 12 years.  The hefty springs in the rear allow for this.  The cables forward of the firewall bellcrank were 3/32" and I left those as they were.  
Steve Wolpin

-------- Original Message --------

|  |  |
| --- | --- |
| **Subject:** | Re: [c-a] Internal Rudder Belhorn Plans |
| **Date:** | Tue, 10 Apr 2012 09:07:29 -0700 |
| **From:** | Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu> |
| **Reply-To:** | marc\_zeitlin@alum.mit.edu |
| **To:** | canard <canard-aviators@yahoogroups.com>, cozylist <cozy\_builders@googlegroups.com> |

stephen wolpin wrote:  
  
> Is that very hefty spring up located up front on the rudder pedal  
> assuming that master cylinders are forward and not on the  
> firewall...  
  
Yes. They're there to allow full pedal/brake motion after the rudder  
hits the positive stop of the belhorn contacting the inner aft corner  
of the recess pocket. If you have MC's on the firewall, the springs  
would have to be between the firewall belcrank and the rudder. I put  
my springs in the rear just because it was an easier place to install  
them, with the break in the rudder cable there anyway, since I have  
laydown cylinders in the nose.  
  
The spring needs to be between the pedals and the rudder, but NOT in  
the brake circuit.  
  
> ... or just to limit the amount of force that can be applied to the  
> circuit?  
  
It does that, but that's not what it's for. It allows for full rudder  
motion and THEN brake application, without further rudder motion  
(since the rudder's at the hard stop).  
  
--   
Marc J. Zeitlin mailto:[marc\_zeitlin@alum.mit.edu](mailto:marc_zeitlin%40alum.mit.edu)

-------- Original Message --------

|  |  |
| --- | --- |
| **Subject:** | [c-a] Internal Belhorns - was: How gross weight ... |
| **Date:** | Sat, 28 Apr 2012 09:18:33 -0700 |
| **From:** | Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu> |
| **Reply-To:** | marc\_zeitlin@alum.mit.edu |
| **To:** | canard <canard-aviators@yahoogroups.com> |

Tim Andres wrote:  
  
> ... what is the danger or down side of not limiting the rudders to  
> the plans specified deflection?  
  
The rudder will stall and lose effectiveness. You want at least 22  
deg. deflection to maximize effectiveness without stalling, and no  
more than 26 degrees to ensure that you don't go too far down the lift  
curve slope on the wrong side and lose inward lift.  
  
> ... Is it really possible to stall them?  
  
Sure, if they deflect too far. It's just a wing with a simple flap on  
it, and if you deflect the flap too far, it'll stall, just like the  
ailerons (or the elevator, although that's a slotted, not simple flap).  
  
> ... I had to flox little blocks of wood to limit my travel to the  
> (4.3"?) plans spec. More authority earlier would be great.  
  
The rudders on these aircraft are what they are. I don't know what  
you mean by "earlier"... I slip my plane very effectively all the  
time - I'm not sure how much more powerful I'd want the rudders to be.  
  
> In fact I now see why some have let the rudder cut out go all the  
> way to the top of the winglet. I wonder how much difference that  
> mod might make in crosswind takeoffs.  
  
I wouldn't expect it to make much difference. Control surfaces  
generally don't go to the end of the wing as the vortex in that region  
makes them very ineffective anyway. I doubt that a side-by-side  
comparison could tell the difference, all else equal.  
  
--   
Marc J. Zeitlin mailto:[marc\_zeitlin@alum.mit.edu](mailto:marc_zeitlin%40alum.mit.edu)

-------- Original Message --------

|  |  |
| --- | --- |
| **Subject:** | Re: [c-a] Hidden bellhorn rudders v standard |
| **Date:** | Sat, 28 Apr 2012 09:49:35 -0700 |
| **From:** | Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu> |
| **Reply-To:** | marc\_zeitlin@alum.mit.edu |
| **To:** | canard <canard-aviators@yahoogroups.com> |

Bill Allen wrote:  
  
> The setup for the hidden bellhorn has the rudder travel limit set  
> by the strength of a spring which is an essential part of the  
> system, and thus the actual measured rudder displacement as  
> measured on the ground, doesn't have the same relevance.  
  
Well, yes and no. I would argue that the springs in the system should  
be stiff enough so that they do NOT compress enough to effect rudder  
travel at speeds below 100 kts - i.e., when full rudder travel might  
be warranted for slips or landing/takeoff situations. They DO need to  
be compressible enough to allow pedal motion when the rudders are at  
the hard stops, but since legs/feet are pretty strong, the springs can  
be very stiff and still allow brake application with full rudder  
motion at the stops.  
  
So I would argue that rudder displacement is only limited by the  
springs (when at speeds where full rudder motion is required) if the  
springs aren't stiff enough.  
  
> ... ie; even if your rudders were moving out by 6" (for the sake  
> of illustration) it wouldn't mean that they would move this far  
> when actuated in flight (and "stall") since the amount of  
> deflection is limited by the spring.  
  
Again, this is a function of airspeed (force on the rudder) and spring  
stiffness. At low airspeeds, the springs can be stiff enough so that  
they're NOT the limiting factor, and then the ground displacement of  
the rudders would be functionally identical for the two cases (hidden  
and standard belhorns).  
  
If people are finding that they're not getting full rudder  
effectiveness even at low speeds with the hidden belhorns, the first  
thing I'd check is the stiffness of the in-line springs.  
  
--   
Marc J. Zeitlin mailto:[marc\_zeitlin@alum.mit.edu](mailto:marc_zeitlin%40alum.mit.edu)

-Safety Wire: -Harley Dixon Long EZ N28EZ: Excellent video (about 22 minutes):  
<http://youtu.be/OwFjUX6SaY8>  
  
Another Video more into using the wire twisting tools:   
<http://youtu.be/VC5MAlmiYvY>

## -(Shop) Heaters:

-Don (wildskyboy@yahoo.com) Feb 2012: (Consider) Never use(ing) a kerosine or an oil heater as they produce an oil residue on everything and your next layup will be a disaster. .... read that somewhere. \*\*\*Also seen in the West Systems Literature\*\*\*

-Marc Zeitlin Feb 2012: I used a kerosene heater to warm my shop (and then a propane heater to keep it warm) I found that a CO detector would light up after 15 minutes with the kerosene heater on, but would never light up from the propane heater. I did a lot of research into the ONE story that was making the rounds 15 or so years ago of a problem caused by a kerosene heater, found the principals involved and determined that there was NEVER any problem with layups or de-lamination attributed to a kerosene heater. It is just an old wive's tale that refuses to die. ...COZY searchable archives ... should be a record of the facts somewhere in there from the late 90's.

-Harley Dixon Feb 2012: ... unheated hangar, I used the frame from an outdoor screen enclosure and draped a couple of blue tarps over it.

## -(Shop) Sprayer, Non-Aerosol:

-------- Original Message --------

|  |  |
| --- | --- |
| **Subject:** | Re: [c-a] Spray Bottle For Mineral Spirits |
| **Date:** | Mon, 4 Jun 2012 10:44:54 -0700 |
| **From:** | jhe <jhsniwe@earthlink.net> |

...See website below. I have had many of these Milwaukee sprayers for the last 30 years and they all still work well. From Acetone, to Lacquer Thinner and WD-40. Fill them less than half full of liquid and you can spray the contents w/o having to recharge the air too often. ...local NAPA... or CarQuest. ...pricey; BUT, they work longer than it will take to build you[r] dream. ...  
<http://sureshotsprayer.com/history.html>

-------- Original Message --------

|  |  |
| --- | --- |
| **Subject:** | Re: [c-a] Spray Bottle For Mineral Spirits |
| **Date:** | Mon, 4 Jun 2012 22:49:49 -0500 |
| **From:** | <berkut13@berkut13.com> |
| **To:** | S. Ramirez <simon@synchdes.com> |
| **CC:** | <cozy\_builders@googlegroups.com>, "Cannard Aviators" <canard-aviators@yahoogroups.com> |

[**http://tinyurl.com/77xndee**](http://tinyurl.com/77xndee) **Good product.**

## -Seats:

-------- Original Message --------

Subject: RE: [c-a] long ez seat cushions

Date: Mon, 10 Dec 2012 13:15:56 -0800

From: Keith Spreuer <keith@airstarts.com>

To: LaRocca Family <rocbar@live.com>, "canard-aviators@yahoogroups.com"

<canard-aviators@yahoogroups.com>

Neat trick for shaping temperfoam too. You can actually sand it to shape with a high speed disk on a die grinder. I thought it was fun working with that stuff.

Keith

## -Smoke System:

-------- Original Message --------

Subject: Re: [c-a] Grove 125 Air Race Video

Date: Mon, 5 Nov 2012 10:33:46 -0600

From: <berkut13@berkut13.com>

To: <N6lk@aol.com>, "trcsmith" <trcsmith@aol.com>

CC: <canard-aviators@yahoogroups.com>, <cozy\_builders@googlegroups.com>

http://www.berkut13.com/berkut64.htm

Be sure to do the CG math for YOUR specific airplane before you start something like this..

-James

-------- Original Message --------

Subject: Re: [c-a] Grove 125 Air Race Video - smoke system

Date: Mon, 5 Nov 2012 22:05:30 -0600

From: <berkut13@berkut13.com>

To: <davef@tsoft-inc.com>, <canard-aviators@yahoogroups.com>

...I had very specific design goals in mind...no wimpy smoke...could not take up any usable storage or people space...simple switch operated...available at any time during any flight. I use it quite a bit for recognition and detection when working with traffic and location when joining up. Actually surprised how much I use it. BTW – the injectors are now available through Spruce.

-James

## -Soda Blasting:

-------- Original Message --------

Subject: [c-a] Soda blasting

Date: Thu, 26 Jul 2012 18:08:03 -0700 (PDT)

From: DON JONES <djonesdnd@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

... removed old finishes from your plane by soda blasting. What type of soda is used to remove paint from fiberglass and where do I get it?

Don Jones Berkut FG

-------- Original Message --------

Subject: Re: [c-a] Soda blasting

Date: Thu, 26 Jul 2012 21:42:36 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: DON JONES <djonesdnd@yahoo.com>

CC: canard-aviators <canard-aviators@yahoogroups.com>

...Check Nick Ugolini's web site. He did it and described the whole thing.

Buly

-------- Original Message --------

Subject: [c-a] Soda blasting

Date: Fri, 27 Jul 2012 11:38:13 -0700 (PDT)

From: DON JONES <djonesdnd@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>, Dale Martin <niceez@gmail.com>, bruce sinclair <ez\_workshop@yahoo.com.au>, Dennis Passey <dapslp@sbcglobal.net>

....number of e-mails asking me why I want to soda blast parts of my Berkut project,... answer. ... set of molded wings and they left the factory with jell coat. ... found .. anywhere flox was used to creat joggles and edges... large numbered voids, pin holes, and craters in some cases, which become covered over by the jell coal in the mold to finish process. ...block sanded the jell coat off the flying surfaces and used a sharp pointed blade to scrape suspect areas to open the voids and then fill them with micro. .. winglet surfaces are still in need of a thorough inspection as they show countless suspect spots. I need a process that will allow me to remove all the remaining jell coat to be absolutely positive that no voids exist between the glass and the surface. Soda blasting seemed like a perfect solution for removal without harming the structure. ....

Don

-------- Original Message --------

Subject: RE: [c-a] Soda blasting

Date: Sat, 28 Jul 2012 17:00:51 -0600

From: TJ Johnson <misbehaved@gmail.com>

To: canard-aviators@yahoogroups.com

...one of the Harbor Freight soda blasters ... discovered two really important things. First is that you can blast the glass hard enough to damage it, the second is that even in our really dry climate, it is hard to keep the air coming in dry enough to keep it from clumping in the tank. It does work though, and after just a short bit of practice, it is easy ...

TJ PIK20 N202PK VariEze N25TB Glasair II FT in progress

-------- Original Message --------

Subject: Re: [c-a] Soda damage

Date: Sat, 25 Aug 2012 11:19:13 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: ezcopilot@fairpoint.net

CC: DON JONES <djonesdnd@yahoo.com>, canard-aviators <canard-aviators@yahoogroups.com>

....environmentally friendly option: Dry Ice blasting... leaves nothing, but the material removed.

http://www.coldjet.com/en/information/what-is-dry-ice-blasting.php/index.htm

Buly

## -Spark Plugs:

-------- Original Message --------

Subject: [c-a] Spark plug heat range.

Date: Thu, 12 Jul 2012 19:20:05 -0000

From: paul\_lee\_sq2000 <abripl@gmail.com>

To: canard-aviators@yahoogroups.com

..found out ...the hard way. I have dual LSE ignition. On my prior Franklin 6A-350 I changed the pistons from 10.5 to 8.5 to burn mogas. One of the problems I had with the 8.5 pistons was bad carbon fouling on both plugs and pistons. After an hour of flight the power steadily diminished. And now with my new TCM IO-360 I noticed the same problem.

... problem was caused by wrong heat range plugs. ... Googled "plug carbon fouling". If you change compression make sure you get correct heat range plugs. Don't just get real "hot" plugs or it may ruin the engine. A too hot plug can act as a glow plug and cause detonation.

FYI Here are a couple useful links http://www.globaldenso.com/en/products/aftermarket/plug/spec/index.html

http://www.ngk.com/charglossary.asp?kw=Heat+range

-------- Original Message --------

Subject: [c-a] Re: Spark plug heat range.

Date: Fri, 13 Jul 2012 00:08:33 -0000

From: paul\_lee\_sq2000 <abripl@gmail.com>

To: canard-aviators@yahoogroups.com

LSE specified which plug when I bought the kit 8 years ago. But I changed the compression later. On http://www.lightspeedengineering.com/Products/Sparkplugs.htm the only plugs mentioning high or low compression difference are the W24EMR-C and W27EMR-C. ....

-------- Original Message --------

Subject: [c-a] Re: Slick Magnetos and Auto Plugs

Date: Tue, 16 Oct 2012 11:04:20 -0700

From: Kevin R. Walsh <krwalsh@gmail.com>

Reply-To: krwalsh@alum.mit.edu

To: Cozy Builders <cozy\_builders@googlegroups.com>, canard-aviators <canard-aviators@yahoogroups.com>

Thank you all for the suggestions on running auto plugs on a magneto, a Slick in my case. ... The recommendations for plugs were to use the solid-top versions of the NGK BR8ES #3961 or the Iridium version the BR8EIX #6747.

To be clear, I was asking about using auto plugs on the magneto side. I did receive a reply from Thomas at G3i Ignition with the following:

Hello Kevin,

Those plugs will work just fine , Those are medium heat range. The plug gap .022" - .024" The mag is capable of firing a much more air gap (etc. .030" or more). When doing R&D I did not see any power benefits above .024" - .026".

Thomas

Kevin

-------- Original Message --------

Subject: Re: [c-a] Slick Magnetos and Auto Plugs

Date: Tue, 16 Oct 2012 15:49:43 -0700

From: Kevin R. Walsh <krwalsh@alum.mit.edu>

Reply-To: krwalsh@alum.mit.edu

To: RJ schreiner <schreiner@cytherean.org>

CC: Cozy Builders <cozy\_builders@googlegroups.com>, canard-aviators <canard-aviators@yahoogroups.com>

On Tue, Oct 16, 2012 at 2:50 PM, RJ schreiner <schreiner@cytherean.org <mailto:schreiner@cytherean.org>> wrote:

What is the risk/reward with auto plugs on a magneto system?

... fair question. ... reward side ... costs and parts availability. ... cost ... auto plugs are clear winners. ...Champion REM37BY from Sacramento Sky Ranch is $27.24. ... 4-pack ... $109. ...auto plug ... NGK BR8ES, ... 10-pack ... $2.03 each, ...four ...$8.12. ... splurge on the iridium version, count on about 3 times the cost, ... for the price of one aviation plug, you get four iridium auto plugs. They are so cheap that when you change them at 50, or 100 hours, or at the condition inspection, you throw them in the trash and buy new. For aviation plugs you spend the time cleaning the lead gunk out of them and use them again. ... supply side, ...land ... rough engine ... weekend ... rural town, ... finding an aviation plug on a Sunday ... zilch. The chances of finding auto plus ... much closer to 100%.

...ignition harness .... replacement ... plug wires and caps. The kit from G3i cost me $169. A kit from Slick would have run somewhere between $250 and $350, ...cost advantage again to the auto plugs.

The risk side is driven by running a part in an environment that it was not meant to be run. Auto plugs are not meant to deal with leaded fuel. ... perhaps an increased chance of lead fouling. ... reports I have seen... low incidence problem... probably on par with the number of aviation plugs that also foul with lead deposits. I have heard reports from more than one person of the spark plug boot, particularly on the lower plugs, working loose and falling off. This is coupled with reports of the screw-on tops of the plugs becoming loose, arcing to the plug top, and also falling off. The latter problem is solved by using the solid-top version of the plugs, so there is no screw-on part to fall off. I don't have a particularly good solution to the plug hoods falling off, but ... I think this is solvable.

Plug harnesses for aircraft are typically grounded at BOTH ends of the high tension lead. Auto style harnesses are not. This may lead to ignition based noise in your radio. Some people report issues with this, and some do not. If it is a concern, Great Planes sells hoods for the plugs to solve this issue. http://www.greatplainsas.com/scspkplug.html I have not heard of anyone needing to go to this length when using a properly constructed auto harness.

...

Kevin

-------- Original Message --------

Subject: RE: [c-a] Re: Slick Magnetos and Auto Plugs

Date: Tue, 16 Oct 2012 17:58:51 -0500

From: Dave Adams <long83dt@charter.net>

To: 'canard-aviators' <canard-aviators@yahoogroups.com>

...I believe it is a mistake to gap your mag fired plugs that much and believe that it can lead to mag coil failure. I’ve heard very little discussion on this and invite other knowledgeable folks to jump in here.

I don’t think that Thomas fully understands your application in making his recommendation. He may not be familiar with how you should gap the plugs when they fire after the EI plugs that can have higher spark advance. If I understand you, you are running the same set-up that I am. I have one Plasma III and a slick mag.

With this set up and at higher RPM and lower manifold pressures, the Plasma advances the timing significantly. When the Plasma plug fires, it naturally starts the inter-cylinder pressure in the combustion chamber to rise rapidly. This naturally increases the pressure of the fuel mixture that is in the spark gap of the mag fired plug when it fires. The voltage required to create a spark is dependent on the plug gap and the pressure present in the gap. The higher the pressure, the higher the voltage that the mag has to develop to create the spark, because there are more molecules to ionize within the gap.

I had two mags fail on my Long before I read a post recommending that the mag fired plug be gapped at 0.012”. Since then I have had one mag failure, but the failure was not the coil in the mag.

Until someone can convince me otherwise, I’m going to keep gapping the mag fired plug at 0.012”. The mag is just a back-up anyway if you have an EI, so it won’t help power or efficiency much at all by gapping the plugs wider.

Dave Adams Long EZ N83DT

-------- Original Message --------

Subject: RE: [c-a] Denso sparkplugs

Date: Wed, 17 Oct 2012 21:32:38 -0500

From: Dave Adams <long83dt@charter.net>

To: 'vance atkinson' <nostromo56@tx.rr.com>, 'Canard Aviators' <canard-aviators@yahoogroups.com>

I switched to the ones that Klaus sells about 100 hours ago. ...you don’t have to gap them as often. My motivation was that I had to gap the Plasma III plugs too often before the switch.

Dave Adams Long EZ N83DT Race 83

-------- Original Message --------

Subject: Re: [c-a] Denso sparkplugs

Date: Wed, 17 Oct 2012 22:53:43 -0400

From: Drew Swenson <n171ml@yahoo.com>

To: Dave Adams <long83dt@charter.net>

CC: vance atkinson <nostromo56@tx.rr.com>, Canard Aviators <canard-aviators@yahoogroups.com>

Autolite386 on my electro air. Plugs are so cheap, i just throw them out when i change the oil.

-------- Original Message --------

Subject: Re: [c-a] Denso sparkplugs

Date: Wed, 17 Oct 2012 22:27:50 -0500

From: <berkut13@berkut13.com>

To: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>, vance atkinson <nostromo56@tx.rr.com>

[Denso iridium sparkplugs ... difference ...switching ...from regular automotive ones ...]

vance atkinson

Most definitely an improvement. They last much longer without electrode erosion thus don’t need re-gapping and seem to have much less tendency to fowl. Lov’em.

-James Berkut/Race 13

-------- Original Message --------

Subject: Re: [c-a] Denso sparkplugs

Date: Wed, 17 Oct 2012 22:35:50 -0500

From: <berkut13@berkut13.com>

To: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>, vance atkinson <nostromo56@tx.rr.com>

...almost 400 hrs on the same plugs, have not needed to re-gap at all.

-James

-------- Original Message --------

Subject: Re: [c-a] Slick Magnetos and Auto Plugs

Date: Thu, 18 Oct 2012 12:42:09 GMT

From: jschuber@juno.com <jschuber@juno.com>

To: schreiner@cytherean.org, canard-aviators@yahoogroups.com

...Auto plug reports go back more than 15 years in back CSA Newsletter issues. I had about 2000 hrs on Autolite 386's on my O-235 with Bendix mag & Electroair ign. I'd pitch them after every 500 hours but they were still running well then. I don't know how long they would run.

Terry Schubert

-------- Original Message --------

Subject: Re: [c-a] Slick Magnetos and Auto Plugs

Date: Thu, 18 Oct 2012 11:15:34 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: jschuber@juno.com <jschuber@juno.com>

CC: schreiner@cytherean.org, canard-aviators@yahoogroups.com

On regular automotive plugs, look at the center electrode. When the top of it started showing slope angle instead of being 90 degree, it is time to change them. I switched to Iridium plugs (Plasma III and P-Mag). So far I think they last better than the Platinum ones. ... you should run thread chaser tool inside the auto plug adapters every time. The thread closer to the combustion chamber, starts building up crud, and proper torquing the plugs is affected. I had a leaky plug, and turned out, I was torquing against fouled threads. You can buy spark plug thread chaser on ebay for about $8 or Advanced Autoparts

http://shop.advanceautoparts.com/webapp/wcs/stores/servlet/product\_x\_22984548-P\_x\_x#

and is dual for auto and aircraft plugs.

Buly

## -Speed Brake / Landing Brake:

-Ken Miller Dec 2011 (Seller of electric speed brake systems for 15+ years.  [www.long-ez.com](http://www.long-ez.com/)): The electric speed-brake system weighs less than the stock system and is much simpler.

-------- Original Message --------

Subject: [c-a] linear actuator.

Date: Mon, 26 Nov 2012 09:11:39 -0800

From: Bob Holliston <bob.holliston@gmail.com>

To: canard <canard-aviators@yahoogroups.com>

... trouble with their speedbrake linear actuator? ... first 2 I installed were Danaher by Motion Ind. and lasted 20 - 30 cycles each. The current one, an Accele # 6104t failed yesterday with around 200 cycles. I believe the fundemental problem is that there is (some) side load when fully extended and the unit is at it's most vulnerable position. I generally don't lower it above 100 MPH, but once accidentally extended it at 200 MPH and the L/A to S/B rod took a pernanent bend. ....

Bob LongEZ NX666DV.

-------- Original Message --------

Subject: Re: [c-a] linear actuator.

Date: Mon, 26 Nov 2012 15:21:22 -0500

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: Bob Holliston <bob.holliston@gmail.com>

CC: canard <canard-aviators@yahoogroups.com>

...I have Warner Electric actuator 6" throw for 400 hrs and never had a problem. You must have installation problem if the shaft is bending. I had to fix a Velocity that was bending the shaft on the same actuator as mine. ... shaft was extending and moving slightly forward... touching the opening in the floor and b[e]nding the shaft.

Buly

-------- Original Message --------

Subject: RE: [c-a] linear actuator.

Date: Mon, 26 Nov 2012 19:21:33 -0500

From: Ken <kenezmiller@optonline.net>

To: 'Mike Tooze' <miketooze@btinternet.com>, 'canard aviators'

<canard-aviators@yahoogroups.com>

1) To prevent accidental deployment, I supplied a momentary switch to lower the speedbrake.

2) The electric speedbrake system weighs less than the stock system.

Ken

-------- Original Message --------

Subject: Re: [c-a] linear actuator.

Date: Tue, 27 Nov 2012 11:57:17 -0800

From: Stephen Crouch <scrouch@isd.lacounty.gov>

To: Ken <kenezmiller@optonline.net>

CC: Mike Tooze <miketooze@btinternet.com>, canard aviators

<canard-aviators@yahoogroups.com>

It raises heck with updraft cylinder cooling in the down position. ...could be an emergency situation stuck in the down position with temps in the high 400F range. Those that rely on retraction on departure may be surprised with AB-normal engine operation. ....

Steve Crouch N180EZ SoCal KWHP

-------- Original Message --------

Subject: Re: [c-a] linear actuator.

Date: Tue, 27 Nov 2012 14:35:03 -0600

From: vance atkinson <nostromo56@tx.rr.com>

CC: canard aviators <canard-aviators@yahoogroups.com>

If you find your self in this position, REDUCE power to that which will just keep you going and make sure the mixture is full rich.

Vance Atkinson

-------- Original Message --------

Subject: RE: [c-a] linear actuator.

Date: Tue, 27 Nov 2012 16:49:52 -0500

From: Ken <kenezmiller@optonline.net>

To: 'Stephen Crouch' <scrouch@isd.lacounty.gov>

CC: 'Mike Tooze' <miketooze@btinternet.com>, 'canard aviators'

<canard-aviators@yahoogroups.com>

Of course you would not operate the speedbrake in the down position at high power settings with centerline cooling. I had wingpit cooling, which wouldn’t be affected either way. I had an enunciator light at center high panel that would illuminate when the SB was anywhere but stowed. ... checklist item to be “off” before takeoff. In the event of takeoff with the unit down, it becomes very apparent soon that the airplane does not like to climb. I did all the testing both intentionally and unintentionally. ... Cozy IV at our airport that took off with the speedbrake down, climbed out steeply and totally cooked his engine on one trip around the pattern. He had rebuilt his old O-360 himself and didn’t comply with a 40 year old AD to replace plastic pushrod tubes. They melted the engine got so hot. The kicker is that he didn’t have the electric one. He had the manual one. The big arm was sticking up gouging his forearm the whole time, but he still ignored it. No number of lights and buzzers can help those guys. .... I prefer a little bat switch to a big lever in a crowded cockpit.

Ken

-------- Original Message --------

Subject: [c-a] Landing brake control.

Date: Thu, 29 Nov 2012 15:47:42 +0000

From: Bill Allen <billallensworld@gmail.com>

To: Canard Aviators <canard-aviators@yahoogroups.com>, Cozy Builders

<cozy\_builders@googlegroups.com>

... remove the mechanical lever LB on my LE so I could mount my Transponder in he armrest to free up panel space. I fitted an electric unit.

I prefer the instant on/off of the plans mech setup over the 10 secs of so for the electric unit to deploy.

I don't use the LB for approach control as with proper planning of your approach it shouldn't be needed. Also, as has been said by others, the Ez types will sideslip sufficiently to achieve a normal steep approach.

The time you need the LB is on a short strip to minimise the 'float' phase of landing when in ground effect, where you can eat up distance (60mph = 88 feet per second) until you've got sufficient weight on the wheels to make the brakes effective.

I don't use my LB while taxi-ing 'to protect the prop from stones' as I have always thought that this is a great way to invite the brain-fart of taking off with it down, cooking the engine and/or worse.

Instead I have fitted a 'mudguard' to the nosewheel, which protects the prop from stones and negates the possibility of taking off with the brake down.

When I was installing the electric LB, a buddy of mine who is an electronics boffin, designed a PCB with microswitches etc which auto retracted the LB on full throttle. It worked well for years, but of late has become flaky, sometimes not wanting to do anything, sometimes not wanting to retract. That's what electronics tend to do.

If I was doing it again, I would instead install one of two "organic systems I have seen in the CSA newsletters.

1. A LB rocker switch n the panel directly ahead of the throttle, such that full throttle contacts the switch, retracting the brake.

2. A toggle switch mounted aft of the throttle, and connected to the throttle arm such that as the throttle is advanced it pulls the switch to the 'UP' position.

Both are simpler and have less possibility of introducing more failure mores than a PCB/relay electronic solution. IMHO.

...

Bill Allen LE160 N99BA FD51 CZ4 G-BYLZ EGBJ

-------- Original Message --------

Subject: Re: [c-a] linear actuator.

Date: Wed, 28 Nov 2012 11:55:28 -0800

From: Stephen Crouch <scrouch@isd.lacounty.gov>

To: Ken <kenezmiller@optonline.net>

CC: Mike Tooze <miketooze@btinternet.com>, canard aviators

<canard-aviators@yahoogroups.com>

...My belly board has a fool proof (?) paddle switch bumped by an adjustable nylon screw on the throttle arm. prior to this flight last week, I have left the brake down after landing until the next departure.

the theory was that the prop would be protected while taxiing and initial departure. However, ... the throttle did not push the switch properly-- my error. Climb was ok on a warm day, but within 90 seconds, the engine roughness got my attention. All cylinders showed 430-465F. ... raising the board and low power brought the temps down to 330-360F range--all was well again. ...

Steve Crouch N180EZ SoCal KWHP

------- Original Message --------

Subject: Re: [c-a] landing brake

Date: Fri, 30 Nov 2012 09:01:55 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

Ken <kenezmiller@optonline.net <mailto:kenezmiller@optonline.net>> wrote:

The landing brake will be of no use at all in the scenarios you

describe. It’s only use is to provide drag to give you a better

view of the future crash site. It does nothing to decrease landing

roll or steepen the approach. Your only tool to steepen the

approach is the slip, which the EZ does splendidly.

I will agree that the LB does not change the landing roll or approach speeds, but will disagree strenuously that it does not steepen the approach or assist in easing landings at fields with large obstructions at the end. ... the LB only increases the drag of the aircraft - it does not change the lift appreciably. In unaccelerated flight, lift is equal to weight, so the L/D ratio (glide ratio) of the aircraft is determined exclusively by the drag of the aircraft. In my COZY MKIV, with the LB up at an 85 kt. approach speed and a descent rate of ~600 fpm, my L/D ratio is ~14 (143 ft/sec / 10 ft/sec). If I extend the LB so that the drag increases by ~400 fpm for a total of 1000 fpm descent rate at the same speed, my L/D is now 143/16.7 = 8.5. Now, a 14:1 L/D converts to about a 4 degree glideslope, while an 8.5:1 L/D converts to about a 6.7 degree glideslope - far steeper. Of course, slipping can add another 500 - 1000 fpm descent rate depending upon how aggressively you're willing to slip, so in concert with the LB you can greatly decrease your L/D from 14:1 clean into the 5:1 range, or conversely a glide angle of 4 degrees to almost 13 degrees. Slipping is a wonderful tool, but the LB most certainly can (and does) modify the approach angle by itself or in concert with a slip.

Marc J. Zeitlin

-------- Original Message --------

Subject: [c-a] Landing Brake

Date: Sun, 2 Dec 2012 17:30:06 -0800 (PST)

From: john toelaer <johntoelaer@yahoo.com>

Reply-To: john toelaer <johntoelaer@yahoo.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

... cross country in my vari eze circa 1983 I landed at Rolla Missouri for gas. I didnt flight plan very good and landed on a gravel runway. The landing brake protected the prop except for some minor scratches not really dings. ... I deliberately took off with the landing brake extended. ...take off took a little longer. When the mains were off the ground I retracted the landing brake and noticed the acceleration. Don't remember any problem with CHT. I routinely use the landing brake to get into short fields ...

N51975 John T.

-------- Original Message --------

Subject: Re: [c-a] landing brake [heur][bcc][faked-from][mx]

Date: Fri, 30 Nov 2012 18:19:24 -0500

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

The landing brake (poor name) will indeed cause additional drag, and of course you will fly less than otherwise.

.... the electric acuator, and if it takes 10 seconds to deploy, well, you might be off the runway in less than 10 seconds. ....

...David Froble

-------- Original Message --------

Subject: Re: [c-a] Landing brake alteration idea

Date: Sun, 02 Dec 2012 11:53:43 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: canard <canard-aviators@yahoogroups.com>

Tim LoDolce wrote:

> ... The dive flaps were optimized to provide maximum drag for a given

> weight and area. These flaps were perforated with dozens of large

> (3"), circular holes.

> There is a specific theory behind this, as I recall having to do with

> the toroidal vortices generated behind the holes. I believe it may

> be covered in Hoerner's bible on drag, called (surprisingly enough),

> DRAG.

I don't have a copy of Hoerner handy, but this is available on the web:

http://www.aviation-history.com/douglas/sbd.html

which says:

"The perforated flaps developed on the BT-1 were retained to eliminate tail buffeting during diving maneuvers."

and:

"The Douglas Dauntless was a direct development of the Northrop BT-1. Early on, severe tail buffeting was encountered, which was eliminated by perforated flaps."

Also, from:

http://naca.central.cranfield.ac.uk/reports/arc/rm/2614.pdf

Page 6, section 3.4:

"The fluctuations were considerably reduced by each of the types of venting tried, chordwise slots giving probably the best result. (All the vented flaps had approximately the same drag. The drag of the solid flap

was about 15 per cent higher..."

This indicates that perforations are put into flaps on dive bombers to eliminate buffeting and pressure fluctuations, NOT to increase drag - in fact, drag is less with perforations (which shouldn't be a big surprise,

given that you're allowing some air to move through the surface). Apparently, eliminating the buffeting was important enough to warrant a drag reduction from the flaps.

...Marc J. Zeitlin

-------- Original Message --------

Subject: RE: [c-a] linear actuator.

Date: Thu, 29 Nov 2012 03:02:12 +0000

From: Thomas Mann <tmann@n200lz.com>

To: 'canard aviators' <canard-aviators@yahoogroups.com>

.... get a switch that plugs into the pitot line so the system prevents deployment at speeds that could cause damage (as well as automatically retract it.) It is not uncommon for canard drivers to leave the landing brake

deployed on takeoff to protect the prop from FOD thrown up from the nose wheel. At least that would allow the pilot the option where the throttle switch does not.

-------- Original Message --------

Subject: Re: [c-a] linear actuator.

Date: Wed, 28 Nov 2012 19:59:18 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: 'canard aviators' <canard-aviators@yahoogroups.com>

Ken Miller wrote:

> There is another way to idiot proof the system (until a better idiot

> comes along) is to put a microswitch in the retracted position and

> another on the throttle at full open...

So for a number of years I've had a schematic for a circuit that will raise the electric landing brake when the throttle is pushed forward and latch it there so that it won't come down even if the throttle is retarded until the switch is put into the up position and THEN to the down position. I take no credit for the circuit - it was designed by Frank Johanson. You can find it here:

http://cozybuilders.org/cad\_files/ under "Landing Brake Safety Interlock".

I've had it on my plane for about 8 years and it's saved me from taking off with the LB down about 3-5 times (out of about 800 takeoffs), even though I've got "LB up" in my takeoff checklist. .....

Marc J. Zeitlin

## -Speed Tape:

-Consider: 3M 471 tape

-------- Original Message --------

Subject: [SARL-Racers] Re: speed tape ?

Date: Mon, 16 Jul 2012 11:14:21 -0400

From: lklusmier@spirax.com

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

Here is what the glider people use. ....

http://www.wingsandwheels.com <http://www.wingsandwheels.com/> \*

Larry Klusmier Sales Engineer

-------- Original Message --------

Subject: [SARL-Racers] Re: speed tape ?

Date: Mon, 16 Jul 2012 10:43:33 -0700

From: Dr. Andrew Elliott <a.s.elliott@cox.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

...different tape suggestion. Scotch 88T, which is called "All Weather Telephone" tape. ...big improvement over the "Super 88" tape you can buy in Home Depot. ...telephone guys use it for outdoor line work. I have found that it is easy to work with, sticks well enough to unwaxed surfaces to be used for numbers (...only tested up to 160 knots), comes off pretty cleanly and is \*\*extremely\*\* UV and weather resistant. 8.5 mils thick. ...only available in black, but ... .75, 1 and 1.5 inch widths. ...not cheap, but widely available. 1.5" x 44' rolls are $4 by the case (90) and not much more in singles. Try dragosupply.com or butlercom.com. Also .... Mouser.com and ...local electric supply house.

Andy

-------- Original Message --------

Subject: RE: [SARL-Racers] speed tape ?

Date: Mon, 16 Jul 2012 07:01:16 -0700

From: Bob Mills <rvmills@sbcglobal.net>

Reply-To: SARL-Racers@yahoogroups.com

To: <SARL-Racers@yahoogroups.com>

...2" 3M 471 seems to be the best all-around (IMHO). Amazon ... best prices ... clear version of 471, ... yellows fast and leaves more residue than the colored tape (might be a sun thing). ...

...Bob Race 43

-------- Original Message --------

Subject: [SARL-Racers] Re: speed tape ?

Date: Mon, 16 Jul 2012 14:09:59 -0000

From: Mark <f1boss@gmail.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

....an area that will be more or less permanently taped, consider 3M "Rockblocker" material. Vince Frazier at www.flyboyaccessories.com has the stuff in 4" wide rolls, ... VERY tuff stuff, no yellowing or glue residue issues ... not cheap, so that's why I recommend it for more permanent applications. ...

Mark

-------- Original Message --------

Subject: [SARL-Racers] Re: speed tape ?

Date: Mon, 16 Jul 2012 14:13:13 -0000

From: Mark <f1boss@gmail.com>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com

...

http://www.uline.com/BL\_6092/3M-471-Vinyl-Tape?pricode=WI782&gclid=CNaX-ZawnrECFYTd4Aod\_DBvfw

Mark

-------- Original Message --------

Subject: Re: [SARL-Racers] Re: speed tape ?

Date: Mon, 16 Jul 2012 12:18:19 -0500

From: David Adams <long83dt@charter.net>

Reply-To: SARL-Racers@yahoogroups.com

To: SARL-Racers@yahoogroups.com <SARL-Racers@yahoogroups.com>

CC: SARL-Racers@yahoogroups.com <SARL-Racers@yahoogroups.com>

Wings and wheels ... "PVC Anti-peel Safety Tape" on page 28. ... very thin and sticks well. It does not stretch much to allow it to follow a curve.

Dave Adams Long EZ N83DT Race 83

## -Specs:

-------- Original Message --------

Subject: [c-a] spec checker site

Date: Fri, 21 Dec 2012 12:51:21 +0100

From: Bill Allen <billallensworld@gmail.com>

To: Canard Aviators <canard-aviators@yahoogroups.com>, Cozy Builders

<cozy\_builders@googlegroups.com>

If you've wanted to check what a "MIL" or "AN" or any other spec actually is, this site is useful;

http://www.everyspec.com/

Sometimes what the Catalogues claim is in error. On a structural application, it pays to check.

Bill Allen

## -Spraylat:

-...sprayable compound specially formulated as a strippable, protective coating for acrylic (Plexiglass) both flat and formed. -Jannie Versfield Jan 2012: To remove, use steam from a steam iron to humidify the spraylat. It will pull off easily.

- Reynaldo (Reystudio) Jan 2012: For me the best results was with ...Goof Off.

## -Springs / Bending Ends:

-------- Original Message --------

Subject: [c-a] Bending the ends of springs - ideas?

Date: Sat, 14 Jul 2012 17:56:20 -0400

From: Neil Clayton <harvey4@earthlink.net>

To: Cozy Builders <cozy\_builders@googlegroups.com>, canard-aviators <canard-aviators@yahoogroups.com>

... buy a tension spring, the ends are nicely bent into a ring by the original spring-forming machine. But if you want to change it's length, you're stuck with trying to re-create that nice ring on the newly cut end. Heating it to cherry red will make it ductile, but it'll also change it's springiness properties (and soften it and weaken it), so I'd like to do it cold. I've seen spring forming machines on Youtube .... magic... can anyone suggest a way to get a halfway descent shaped ring?

Neil

-------- Original Message --------

Subject: Re: [c-a] Bending the ends of springs - ideas?

Date: Sat, 14 Jul 2012 15:17:52 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: Neil Clayton <harvey4@earthlink.net>

CC: Cozy Builders <cozy\_builders@googlegroups.com>, canard-aviators <canard-aviators@yahoogroups.com>

Wooden dowel with a slot cut in the end will make the ring, the hard one is the "riser" section. Doing it without putting nicks in the wire is very hard, and I worry about my nose gear door spring breaking and going thru the prop.

Tim Andres

-------- Original Message --------

Subject: Re: [c-a] Bending the ends of springs - ideas?

Date: Sat, 14 Jul 2012 16:03:35 -0700 (PDT)

From: Izzy Briggs <inbriggs@yahoo.com>

Reply-To: Izzy Briggs <INBRIGGS@YAHOO.COM>

To: Tim Andres <tim2542@sbcglobal.net>, Neil Clayton <harvey4@earthlink.net>

CC: Cozy Builders <cozy\_builders@googlegroups.com>, canard-aviators <canard-aviators@yahoogroups.com>

.... I used a combination of vice and vice grips to get two loops bent at 90 degrees to the other coils (same gear door application). Two step process....1. Rotate or twist off two loops 180 degrees in the same plane as the other loops. 2. Bend the two-loop component 90 degrees to the spring. A safety "cable" from the spring to the fuselage as a protection against it going through the propeller if it breaks off. .... preflight inspection item. ....

Izzy

-------- Original Message --------

Subject: [c-a] Re: COZY: Bending the ends of springs - ideas?

Date: Sun, 15 Jul 2012 09:06:21 +1000

From: Chris Byrne <jack.byrne@bigpond.com>

To: Neil Clayton <harvey4@earthlink.net>

CC: Cozy Builders <cozy\_builders@googlegroups.com>, canard-aviators <canard-aviators@yahoogroups.com>

To cut it, use a chisel and any solid steel surface. Use the same chisel and using just hand pressure wedge it into the coil two loops from the end, this will pry them apart from the main body of the spring slightly. Now that a gap has been created get a small piece of 90 degree angle (steel or AL) on a bench and force the gap in the spring onto the angle using the angle to spread the previously created gap. If need be, use some pliers to adjust the angle. You should be able to do this without creating any nicks in the spring. All of the springs on my Cozy have been created tis way including the rudder return springs.

Works very well.

-------- Original Message --------

Subject: Re: [c-a] Bending the ends of springs - ideas? [html][bcc][faked-from][mx]

Date: Sat, 14 Jul 2012 19:22:40 -0400

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: canard-aviators <canard-aviators@yahoogroups.com>

...find some spring mfgs, and see if they have a stock spring that might fit your needs. The ends can be open or closed loop, center loop or side loop. ... I got a decent price for custom, in quantity. Was Ok, as I wanted several hundred. ... range of standard in-stock springs was impressive.

http://www.leespring.com/

David Froble

-------- Original Message --------

Subject: Re: [c-a] Bending the ends of springs - ideas?

Date: Sun, 15 Jul 2012 07:03:56 -0700

From: Al Wick <alwick@juno.com>

To: Neil Clayton <harvey4@earthlink.net>

CC: Cozy Builders <cozy\_builders@googlegroups.com>, canard-aviators <canard-aviators@yahoogroups.com>

...most (every?) springs on your modern car are compression style. Hmmm. Thought there'd be more extension springs. [older cars].... All sorts of extension springs. Why so few extension springs on modern cars? Two main reasons.

1) Extension springs fail way more often than compression springs. During construction, those two 90 degree bends induce stress way higher than seen on compression spring. As a result, when extension springs fail, it's at that 90 degree bend. If the material alloy or heat treat isn't ideal, then it will eventually fail in that area.

2) When an extension spring fails, the ends fly apart. Spring force goes from 10 lbs. to 0 lbs. However, when compression spring fails, spring force goes from 10 lbs to 7 lbs. So it keeps on ticking. Much better failure mode.

You don't say what you are using the spring for. I've seen some guys design canopy latch with extension spring. Oh no! Spring fails, canopy flies open! Regardless, if you are using extension spring on airplane, it's likely a mistake. The cool thing is, \*you can usually convert spring to compression style and have much safer installation\*. I attached pic of the concept.



.... If you are concerned about any item hitting prop, ... Put a loop of safety wire around the item, then LOOSELY attach the other end of safety wire to fuselage. So the safety wire has no stress on it until the component fails. I did this with my exhaust system. Did the welds myself (ugly). WHEN these welds fail, the exhaust will slide back into the prop. ... Now when it fails, it takes the easy path and falls to bottom of cowl. Every few months I verify that the unstressed safety wire is still there. .... Al Wick

## -Starter for Lyc 540:

-------- Original Message --------

Subject: [c-a] Starter for Lyc 540

Date: Sun, 19 Aug 2012 22:21:47 -0400

From: Joachim Grenestedt <jog5@lehigh.edu>

To: canard-aviators@yahoogroups.com

... opinion about starters for a high compression Lyc 540 (10:1 pistons)? ...present starter has difficulties cranking this beast. ...

Joachim

-------- Original Message --------

Subject: Re: [c-a] Starter for Lyc 540

Date: Sun, 19 Aug 2012 23:18:37 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: Joachim Grenestedt <jog5@lehigh.edu>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Get B&C

Buly

-------- Original Message --------

Subject: Re: [c-a] Starter for Lyc 540

Date: Mon, 20 Aug 2012 05:34:26 -0500

From: vance atkinson <nostromo56@tx.rr.com>

To: Joachim Grenestedt <jog5@lehigh.edu>

CC: canard-aviators@yahoogroups.com

Get a B&C !!! Its the Best..... Ive had one on my Lycoming since 1987 with nary a fail, and its been abused plenty.

Vance Atkinson COZY N43CZ (2400 hrs)

-------- Original Message --------

Subject: Re: [c-a] Starter for Lyc 540

Date: Mon, 20 Aug 2012 07:40:03 -0500

From: Ryszard <ryszardzadow@att.net>

To: <canard-aviators@yahoogroups.com>, "Joachim Grenestedt" <jog5@lehigh.edu>

... Acroduster, I’m cranking an IO-540 with a B&C. ...Odyssey 850 battery is 16 feet from the starter, and wired with #4 Fatwire. To crank that Vari-eze I’ve also got a B&C that’s 14 feet from the Odyssey batter, also using #4 Fatwire. They both work great and I can’t envision an better, lighter setup.

## -Strake Windows:

23 Sep 2012: Photos of Long EZ N24ND Strake Window



-------- Original Message --------

Subject: Re: [c-a] Glass for strake windows

Date: Mon, 8 Oct 2012 12:30:14 -0400

From: Jim Evans <jevansez@gmail.com>

To: Dave Anderson <usaf\_david@yahoo.com>

CC: canard-aviators@yahoogroups.com

Acrylic is fine. Lexan scratches too easily. Use 1\4" thickness.

Jim

-------- Original Message --------

Subject: Re: [c-a] Glass for strake windows

Date: Mon, 8 Oct 2012 09:41:10 -0700

From: Kevin R. Walsh <krwalsh@gmail.com>

Reply-To: krwalsh@alum.mit.edu

To: Jim Evans <jevansez@gmail.com>

CC: Dave Anderson <usaf\_david@yahoo.com>, canard-aviators@yahoogroups.com

Plexiglas is one trade name for clear acrylic. Lexan is one trade name for clear polycarbonate.

You want Plexiglas (acrylic) NOT Lexan (polycarbonate). And 1/4" is WAY overkill for the side windows. We used 1/16" and it is plenty. maybe 1/8" if you're feeling like 1/16" is too thin, but you don;t need much there. Unless a peregrine falcon manages to t-bone you mid-air, you don't need to have impact resistance for a bird-strike.

-------- Original Message --------

Subject: Re: [c-a] Glass for strake windows

Date: Mon, 8 Oct 2012 10:45:41 -0700

From: Kevin R. Walsh <krwalsh@gmail.com>

Reply-To: krwalsh@alum.mit.edu

To: Jim Evans <jevansez@gmail.com>

CC: Dave Anderson <usaf\_david@yahoo.com>, canard-aviators@yahoogroups.com

...difference ... strake windows ... bottoms of the strakes for the GIB ...side windows ... in front of the strakes, allowing the pilot to see laterally and down. For the side windows, I believe 1/16" acrylic is plenty. It is what we used on our plane. For strake windows that potentially have to survive a ham-fisted cargo handler dropping heavy objects, perhaps 1/8" or thicker is appropriate.

-------- Original Message --------

Subject: RE: [c-a] Glass for strake windows

Date: Mon, 08 Oct 2012 18:51:06 -0400

From: Ken <kenezmiller@optonline.net>

To: 'Dave Anderson' <usaf\_david@yahoo.com>, canard-aviators@yahoogroups.com

... only reason not to use \*Lexan is that it’s soft and if you scratch it, you can’t polish it out. “Acrylic” is the generic term for \*Plexiglass, which is a trade name. \*Lexan on the other hand will never shatter and is used in bank teller windows as it is bullet resistant. I use \*Lexan for a lot of stuff like templates and electrical buss hoods. It can be bent in a bending brake like aluminum. Great stuff.

Ken

## -Structural Adhesive:

Recommendation for installing aluminum boots/talons on eracer: Ideally use 3M DP-460 (a structural adhesive does a fantastic job bonding composite to aluminum).  Berkuts) have used structural epoxy and a little flox to bond them on for years with a ply of glass BID as a “sock” to insulate the carbon from the aluminum and also installed (4) –4 AN machine screws through the talon/gear leg.

## -Sticks:

-Nick Ugolini Dec 2011: Custom stick making: http://nickugolini.com/Website/Joystick/Joystick.htm

[www.shapelock.com](http://www.shapelock.com)

-------- Original Message --------

Subject: [c-a] Re: stick grip

Date: Thu, 01 Nov 2012 21:48:14 -0000

From: gilbert\_drieux <gilbert.drieux@dbmail.com>

To: canard-aviators@yahoogroups.com

...I used a Ski-stick ergonomic handel (right hand...). Light "modification" on top to place the PTT's push button.

Gilbert. VE F-PMPZ / LFPK

-------- Original Message --------

Subject: Re: [c-a] Re: stick grip

Date: Thu, 1 Nov 2012 16:32:28 -0600

From: R Martinson <N6lk@aol.com>

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

I use this one:

http://www.tostenmanufacturing.com/catalog/aircraft-grips/cs-8-aircraft-grip.html

Rob VE - N6LK aka Race 66 (sold) LE - N4281X Evergreen, CO

-------- Original Message --------

Subject: [c-a] Stick Grip

Date: Fri, 2 Nov 2012 09:37:33 -0700 (PDT)

From: Slick Ric <bkut540builder@yahoo.com>

Reply-To: Slick Ric <bkut540builder@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

...spin off of CH Products. http://www.tostenmanufacturing.com/aboutus/

About Tosten Manufacturing LLC... originally a division of CH Products ...experimental aircraft business for over 10 years...sticks are ergonomic and ambidextorous by design...

Ric Lee

-------- Original Message --------

Subject: RE: [c-a] stick grip

Date: Thu, 1 Nov 2012 20:22:24 +0000

From: Thoma Mann <tmann@n200lz.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>, trcsmith <TRCSmith@aol.com>

...JD at InfinityAerospace.com...

-------- Original Message --------

Subject: RE: [c-a] stick grip

Date: Thu, 1 Nov 2012 14:36:37 -0700

From: LaRocca Family <rocbar@live.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

I made this one out of a piece of 2 x 4. No very expensive.

Rock L. ERacer N382RB



-------- Original Message --------

Subject: RE: [c-a] stick grip

Date: Thu, 1 Nov 2012 22:47:53 +0000

From: Thoma Mann <tmann@n200lz.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>, trcsmith <TRCSmith@aol.com>

Here’s a link to the military style grips (hos) http://www.infinityaerospace.com/infgrip.htm

-------- Original Message --------

Subject: Re: [c-a] stick grip

Date: Thu, 1 Nov 2012 22:39:12 -0500

From: Juan Rivera <longezrivera@yahoo.com>

To: SW Harmon <sharmon32@juno.com>

CC: TRCSmith@aol.com <TRCSmith@aol.com>, canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

I used a stick from Ch products. Www.chproducts.com ...not too expensive ...I would buy it again

-------- Original Message --------

Subject: Re: [c-a] stick grip

Date: Fri, 2 Nov 2012 08:59:51 -0700 (PDT)

From: Slick Ric <bkut540builder@yahoo.com>

Reply-To: Slick Ric <bkut540builder@yahoo.com>

To: Juan Rivera <longezrivera@yahoo.com>

CC: canard-aviators <canard-aviators@yahoogroups.com>



## -Super hydrophobic product (??Snake Oil??):

-Bill Allen Dec 2011: Super hydrophobic product: claims that even ice won't stick to it...

<http://www.youtube.com/watch?v=uSHLqowYqjU&feature=related>

(??) remove the need for VGs on the GU canard/Roncz would do better(??)

-Bill Allen Dec 2011: I don't know if this "nanotec coating" is similar to "Never-Wet", or just another Rain-X clone, but it is available;  <http://www.nanotec-usa.com/id1.html> and their comparison of two Jeeps on the same trail showed that it worked to the extent seen; <http://www.youtube.com/watch?v=e_kOrP6WF-I>

## -Temp Tapes:

-------- Original Message --------

Subject: Re: [c-a] telltemps

Date: Tue, 20 Nov 2012 21:55:39 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

Reply-To: marc\_zeitlin@alum.mit.edu

To: Canard Aviators <canard-aviators@yahoogroups.com>

...Google: temperature labels

Marc J. Zeitlin

-------- Original Message --------

Subject: RE: [c-a] telltemps

Date: Wed, 21 Nov 2012 04:23:48 -0500

From: Ken <kenezmiller@optonline.net>

To: 'Canard Aviators' <canard-aviators@yahoogroups.com>

http://www.mcmaster.com/#temperature-indicating-labels/=k99t1r

Ken

-------- Original Message --------

Subject: Re: [c-a] telltemps

Date: Wed, 21 Nov 2012 11:38:25 GMT

From: jschuber@juno.com <jschuber@juno.com>

To: billallensworld@gmail.com, canard-aviators@yahoogroups.com

...They sell at welding supply shops here under the name of Tempil labels. ...available in different temperature ranges. They are also available as Tempil Sticks which look like large Crayons for indicating higher temps.

The mfg address is shown in the picture.



Terry Schubert

-------- Original Message --------

Subject: Re: [c-a] telltemps

Date: Wed, 21 Nov 2012 06:25:48 -0700

From: Dale\_R <dale.rog@gmail.com>

CC: canard-aviators@yahoogroups.com

They also make a brush-on version called "Tempilaq"

\* 43 different temperature ratings from 175°F to 1900°F (79°C to 1038°C)

\* Reliably accurate – melts within ±1 percent of rated temperature

\* Easy to apply quick-drying fluid

\* Non-flammable for maximum safety and unrestricted shipment

Before I got a high-temp oven, I used it for noting the drawing temperature.

Dale\_R COZY MkIV #0497

-------- Original Message --------

Subject: Re: [c-a] telltemps

Date: Wed, 21 Nov 2012 10:07:33 -0500 (EST)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com

http://www.mcmaster.com/#temperature-indicating-labels/=k9e6w6

Rich

## -Tires:

\*From:\* DON JONES <mailto:djonesdnd@yahoo.com>

\*Sent:\* Monday, June 25, 2012 11:47 AM

\*To:\* canard-aviators <mailto:canard-aviators@yahoogroups.com>

\*Subject:\* [c-a] tire and tube question

Question for ...Matco W51LT brake assemblies. What tire and tube combo...? I just discovered that the Lam 8 ply tires and tube combo doesn't fit. Looks like the 90 degree elbow on the tube isn't designed, long enough, for the wheel.

Don Jones Berkut FG

-------- Original Message --------

Subject: Re: [c-a] tire and tube question

Date: Mon, 25 Jun 2012 13:12:32 -0500

From: Thomas Mann <tmann@n200lz.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

...Michelin 5.00 x 5, 6 ply (120 MPH) with matching Michelin tubes.

-------- Original Message --------

Subject: Re: [c-a] tire and tube question

Date: Mon, 25 Jun 2012 11:12:24 -0700

From: Keith Spreuer <keith@airstarts.com>

To: canard Aviators <canard-aviators@yahoogroups.com>

...using the Goodyear tire and heavy duty tube and they work fine. Rarely add air.

-------- Original Message --------

Subject: Re: [c-a] tire and tube question

Date: Mon, 25 Jun 2012 19:30:02 -0500

From: Thomas Mann <tmann@n200lz.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

Here’s the link. http://www.infinityaerospace.com/Brakes.PDF Michelin tubes are noted for holding air well.

-------- Original Message --------

Subject: Fw: [c-a] tire and tube question

Date: Tue, 26 Jun 2012 07:52:09 -0700 (PDT)

From: DON JONES <djonesdnd@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>

...Talked to Matco this morning ...slight machining difference in the wheel that accepts Lamb tires and tubes. Matco ask me to send the wheels in for exchange, nice people.

Don Jones BERKUT FG

-------- Original Message --------

Subject: Re: Fw: [c-a] tire and tube question

Date: Mon, 9 Jul 2012 04:20:10 -0700 (PDT)

From: DON JONES <djonesdnd@yahoo.com>

To: RJ schreiner <schreiner@cytherean.org>

...after doing research on the 8 ply Lambs for user problems and having flown Lambs on my VariEze for 27 years with no problems, ...considerably less expensive than the aviation tires and tubes...However, the aviation tubes do hold air longer than the Lamb tubes. The Lambs are smaller, which is good in helping keep the wheel pants a bit smaller as well, less cross section = less drag. ...

Don

## -Transponder Antenna:

-------- Original Message --------

Subject: [c-a] Transponder antenna

Date: Wed, 21 Nov 2012 18:33:38 -0700

From: R Martinson <N6lk@aol.com>

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

I have a AAE (Advanced Aircraft Electronics) dipole transponder antenna which works well sometimes and sometimes not. I get complaints from ATC mostly when I am flying away from their antenna ... I have it mounted inside the cockpit on the left side just behind the rudder/brake pedal. I had the exact same set up in my VE and got the same complaints and just lived with it (for years). ...

Rob

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Wed, 21 Nov 2012 17:45:01 -0800

From: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

...I have a homemade $5 Jim Weir transponder antenna mounted forward of my rudder pedals in the nose, with the bulb of the antenna hard against the outer skin of the lower nose. I have a similar issue with radar reception IF the radar antenna is directly behind me.

It's not the antenna - it's the water bag in the pilot's seat and the metal aft of the firewall. They're line of sight from the transponder antenna to the radar antenna, and they attenuate the signal.

The only fix would be to move the antenna to somewhere that a conductor (water bag or metal engine) is not in between the two antennae. Lower winglet, sticking out lower out of the fuselage, etc. I'm willing to live with it where it is - although it's mildly annoying at times, it's never been a major issue.

Marc J. Zeitlin

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Wed, 21 Nov 2012 20:59:29 -0500

From: Bulent Aliev <atlasyts@bellsouth.net>

To: Marc J. Zeitlin <marc\_zeitlin@alum.mit.edu>

CC: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

I have my "stubby" antenna (eBay) sticking down from the floor with 10" diameter aluminum ground plane. Works fine and no complaints from ATC at any heading.

Buly

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Wed, 21 Nov 2012 18:02:23 -0800

From: Tim Andres <tim2542@sbcglobal.net>

To: R Martinson <N6lk@aol.com>

CC: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

... installed mine (in the nose just aft of BL-0) the collective wisdom I gleaned at the time was that at least a small portion of the antenna needs to be outside the hull. I know glass is transparent etc etc, but Jon Dembs had recently resolved his same-as-your problem by just moving it down a bit so it protruded. So following his lead my B&C antenna's ground plane is on the floor and after passing thru nose structure I have ~< 1" protrusion. Just misses the ground with nose fully retracted. Works perfect to date. ...

Tim Andres CZ MK IV 140 hrs

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Wed, 21 Nov 2012 22:08:49 -0500

From: Nick <unick3@yahoo.com>

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

I agree with Tim, the glass is supposed to be transparent to the transponder signal but for years I was plagued by weak transponder reception. ...notably ... 30 miles out and flying into the Washington DC restricted area when descending or turning.. ... I tried replacing the transponder wire with RG400 (supposed to be better)... no affect. During my bi-annual transponder certification 3 years ago, I barely passed the power output test and decided the issued needed to be resolved. I moved the transponder antenna (the rod and ball type) outside the fuselage. I was told by the Garmin reps the ground plane needs to be much larger than the round disk type I was using. To quote them "As big as possible". I used conductive paint I found to make the ground plane. I have been successful using CuPro-Cote (from http://www.lessemf.com/paint.html) to create large ground planes. It has extremely low resistance and you basically paint on your ground plane on as large an area as possible. In one EZ, I painted the entire cabin floor front to back with conductive paint and top coated it with Zolatone. The resistance of the ground plane was less than 1 ohm no matter where it was tested. The conductive paint was key in allowing me to install the NavWorx ADS-B receiver (which requires at least 6 sq ft of ground plane) and the transponder antenna (both using the same ground plane). With that bird, I was never lost by ATC either. Anyway, after moving the antenna to outside the fuselage on my bird, and painting about 3 sq ft of ground plane, amazingly I have NEVER been lost by ATC. Last years bi-annual certification was passed with no issue. At 1500 ft, 30 miles from Charleston Airport, approach could pick the bird up without a problem which never would have happened with my old installation. My next transponder installation will be using the same paint but I'll be going to the external blade type antenna to reduce drag on the airframe.

Nick

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Wed, 21 Nov 2012 21:51:23 -0800

From: JDembs <vjdslk@surewest.net>

To: R Martinson <N6lk@aol.com>

CC: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>

... I had the exact same problem as Rob mentions when I copied Marc’s location on the copilot side. I am using the cheap BB and rod antenna with the small ground plane Jim Wier suggests. I think it is a 5” diameter but don’t have my notes here. All I did was stick the BB and about 1/2” of the rod through the floor of the nose and I haven’t had a complaint in 3 years. You don’t need a large ground plane.

Jon Dembs Cozy 973

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Thu, 22 Nov 2012 00:22:49 -0600

From: <berkut13@berkut13.com>

To: Yahoo Canard Aviators group <canard-aviators@yahoogroups.com>, R

Martinson <N6lk@aol.com>

Original install:

http://www.berkut13.com/berkut30.htm#transponder



Now moved to inside the intake expansion scoop:

http://www.berkut13.com/perfmod/cram/cram19.jpg



Both work fine, no complaints. I operate out of a towered airport under

DFW class B airspace and inside the Mode C veil.

-James

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Wed, 21 Nov 2012 22:22:57 -0800

From: Elwood Johnson <ejandlinda@earthlink.net>

To: JDembs <vjdslk@surewest.net>

CC: R Martinson <N6lk@aol.com>, Yahoo Canard Aviators group

<canard-aviators@yahoogroups.com>

...My antenna is the same [cheap BB and rod antenna] ...mounted it to the left in front of the back seat. the weir ground plane sit on the floor and the end of the antenna (AN4) sticks thru the floor about 2inches. Good strong signal and no complain or problems. Cost about 1.00 ...

EJ Johnson N36EJ S. Calif.

-------- Original Message --------

Subject: RE: [c-a] Transponder antenna

Date: Thu, 22 Nov 2012 07:21:50 -0500

From: Ken <kenezmiller@optonline.net>

To: 'Bulent Aliev' <atlasyts@bellsouth.net>, "'Marc J. Zeitlin'"

<marc\_zeitlin@alum.mit.edu>

CC: 'Yahoo Canard Aviators group' <canard-aviators@yahoogroups.com>

...The stubby needs to protrude it’s length out into the airstream for better performance. The ground plane can be inside the skin. ...

Ken

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Thu, 22 Nov 2012 07:32:53 -0800 (PST)

From: Tom Jewett <jewett\_tom@yahoo.com>

Reply-To: Tom Jewett <jewett\_tom@yahoo.com>

To: R Martinson <N6lk@aol.com>, Yahoo Canard Aviators group

<canard-aviators@yahoogroups.com>

...I have a 4.5" square aluminum ground plane and a 1/8" wire/end ball antenna mounted to the outside

of the fuselage (ground plane is outside the fuse too) just below the fuel valve. I use RG 400 coax (total length about 3 feet.) Since replacing my old Terra I have had no ATC complaints.

Tom

-------- Original Message --------

Subject: Re: [c-a] Transponder antenna

Date: Thu, 22 Nov 2012 06:27:29 -1000 (HST)

From: Bruce Hughes <ezcopilot@fairpoint.net>

Reply-To: ezcopilot@fairpoint.net

To: R Martinson <N6lk@aol.com>

CC: canard-aviators@yahoogroups.com

...A dipole must be the correct length with the "feed" in the center. I have a 1/4 wave antenna labeled "Cessna". It has to have a ground plane, unlike the dipole. Of course the ground plane on Cessnas is the entire aluminum mass. I mounted an aluminum plate on the underside just below the passenger's right armrest (in front of the seat belt attachment). ...About 30% of the area of the plate sticks out in the airstream but the plate is thick enough, I hope, to not vibrate (in which case I may need some JB weld for my propeller). It has never flown. I think it will work.

Bruce Hughes

-------- Original Message --------

Subject: [c-a] Antenna

Date: Mon, 26 Nov 2012 14:02:33 -0800

From: Elwood Johnson <ejandlinda@earthlink.net>

To: canard-aviators@yahoogroups.com

... I have the R S T designed one on my Long ez. If you want a copy of the RST drawing to make this antenna let me know. It will cost you about 1.50 to make not including cable.... works great and there is several places on the Long where it can be placed. I have my ant. ground plane on the floor in just in front of the back seat and to the left. I drilled a hole just big enough for the rod to go thru and it stick out about 1 3/4 inches. Well away (left) from the NACA scoop. This is the only ant. outside of the fuselage.

EJ Johnson N36EJ S. Calif.

-------- Original Message --------

Subject: RE: [c-a] ELT Antenna Ground Plane help needed

Date: Tue, 11 Dec 2012 17:27:38 -0500

From: Ken <kenezmiller@optonline.net>

To: 'Kevin Short' <ceufan@yahoo.com>, canard-aviators@yahoogroups.com

You can use aluminum screen door material. It doesn’t have to be solid.

Ken

-------- Original Message --------

Subject: Re: [c-a] ELT Antenna Ground Plane help needed

Date: Tue, 11 Dec 2012 20:44:04 -0500

From: Nick <unick3@yahoo.com>

To: ARGOLDMAN@aol.com

CC: canard-aviators@yahoogroups.com

The conductive paint worked great in two airplanes so far. It was used for the transponder and ADS-B (which requires min of 6 sq ft of ground plane). For a connection point (small ground plane for transponder) between the first and second coats, I sandwiched a a patch of adhesive antenna copper foil with a soldered on a ground wire. For a HUGE ground plane (ADS-B), I painted the entire bottom of the plane with the paint, ran a strip of copper foil down the length of the plane on the port side to act as a ground, then painted on a second coat. After the surface dried, I did a resistance check between the ground and any point on the surface. All locations measured less then 2 ohms. It was then top coated with zolatone.

Nick

-------- Original Message --------

Subject: Re: [c-a] ELT Antenna Ground Plane help needed

Date: Wed, 12 Dec 2012 03:49:37 -0000

From: Walt <sabrewalt@yahoo.com>

To: canard-aviators@yahoogroups.com

If the screen is being used as your ground plane, you do NOT want to connect it to your antenna. A ground plane is used as an RF offset to the antenna. You want to connect the coax shield to the screen and the coax center wire to the antenna itself. You must keep the antenna and the screen electrically isolated.

Walt WB5NFW

## -Transporting Long EZ:

-------- Original Message --------

Subject: Re: [c-a] Transporting a Long EZ Project... what's the best setup?

Date: Fri, 15 Jun 2012 09:10:46 -0700 (PDT)

From: Henry Herbert <indycanard@yahoo.com>



-------- Original Message --------

Subject: [c-a] Berkut 49 progress report

Date: Tue, 7 Aug 2012 05:31:30 -0700 (PDT)

From: Slick Ric <bkut540builder@yahoo.com>

Reply-To: Slick Ric <bkut540builder@yahoo.com>

To: canard-aviators <canard-aviators@yahoogroups.com>



-------- Original Message --------

Subject: [c-a] Florida to Oregon via Fire Truck

Date: Fri, 17 Aug 2012 22:02:05 -0700

From: Joe Dubner <jdubner@yahoo.com>

Reply-To: Joe Dubner <jdubner@yahoo.com>

To: canard-aviators@yahoogroups.com



-------- Original Message --------

Subject: Re: [c-a] Re: LongEz travel luggage

Date: Tue, 02 Oct 2012 13:43:00 -0400

From: Harley <harley@AgelessWings.com>

To: aviationeyes <skyeyecorp@airpost.net>, CSA <Canard-aviators@yahoogroups.com>



## -Travel Kit:

aviationeyes wrote:

> Alternator belts have been mentioned often in the recent "emergency travel kit" postings. Out of curiosity, has anyone had a belt break and fly off in flight in their pusher? ...

-------- Original Message --------

Subject: Re: [c-a] Alternator belt flying off [bcc][faked-from][mx]

Date: Fri, 23 Nov 2012 09:03:29 -0700

From: Burrall L Sanders <craftsman@freeflightcomposites.com>

To: <davef@tsoft-inc.com>, <canard-aviators@yahoogroups.com>

Yep, I had one fly off my Cozy engine a couple years ago. Before the belt broke completely and left the flywheel it flailed around in the cowl and left marks that indicated it had hit the cowl and engine and left rubber all over the place but did no real damage. I surmised that it had been too loose and the flight it happened was a flight where I was doing a maximum rpm test and because it was too loose the centrifugal force spun stretched off the pulley and then trashed it. I heard and felt it and even guessed what it was and then it was confirmed a few minutes later when the low voltage warning sounded. I would not be too concerned about damage to the plane unless you use an electronic ignition with the crankshaft position sensor mounted under the flywheel, then I would be very concerned, particularly if you have a dual electronic system.

Burrall

-------- Original Message --------

Subject: [c-a] emergency tool list

Date: Thu, 22 Nov 2012 07:27:50 -0800 (PST)

From: Tom Jewett <jewett\_tom@yahoo.com>

Reply-To: Tom Jewett <jewett\_tom@yahoo.com>

To: Steve Stearns <steve@tomasara.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

...I carry:

Wiring diagrams.

A spare alternator belt safety wired to the engine case so I don't have to remove the prop to install it.

A spare main and nosegear tube, but not the tires. - I should probably include a tube repair kit.

Super glue.

Plug cleaning tools.

Away from home I have removed cowls, plugs, wheel pants. temporarily fixed a broken throttle cable, removed and weld repaired exhaust stacks, ...... I try to go prepared to do anything I can imagine.

It is a bit scary when you add up all the weight! My survival gear and emergency tools weigh in at about 40 lbs!

...Tom Jewett

-------- Original Message --------

Subject: Re: [c-a] emergency tool list

Date: Thu, 22 Nov 2012 10:49:00 -0500 (EST)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com

Don't forget Duct tape!!!!! With that you can forget a lot of the other stuff

Rich

-------- Original Message --------

Subject: [c-a] Travel Thought revisited...

Date: Thu, 22 Nov 2012 07:55:43 -0700

From: Steve Stearns <steve@tomasara.com>

To: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

...revisiting a topic we touched upon back to 2009. What should be carried (in my case in a LongEz) to be appropriately prepared so-as to avoid getting stuck out somewhere while on a trip? My first cut for a list is below. ... interested in suggestions on what's not worth the weight/space to carry. Traveling Tool and Parts kit:

JB-weld (or something else, Gary?) - to repair prop dings

Sandpaper - to repair prop dings

Packaging Tape - for sealing seams

Mini-Right angle tools etc. - for pulling mag

Tools for pulling cowl.

Tools for pulling canard.

Tools for pulling or charging battery

Fuses.

Multi-Meter.

Safety Wire and pliers.

Tools for resetting prop bolts (uses belleville washers)

Spare wire, terminals and crimp tool

Tools for repairing a flat tire (inc. cotter pins, mini-jack?)

Spare nose wheel

Spare main gear tubes

tools for filling O2 (which I still imagine myself having some day...)

Needle nose pliers (just cause...)

Tools for pulling the plugs

Thumbdrive with all my as-build drawing, the plans, CPs etc.

Spare alternator belt?

Steve Stearns

-------- Original Message --------

Subject: Re: [c-a] Travel Thought revisited...

Date: Thu, 22 Nov 2012 09:03:57 -0700

From: R Martinson <N6lk@aol.com>

To: Steve Stearns <steve@tomasara.com>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Depends on your plane. I have had to do the following field repairs:

Flat tires, nose and mains

Broken nose fork (found someone in CSA that loaned me one)

Damaged main tire (required new tire which I found at a go kart shop but had multiple options of someone willing to fly one to me)

Damaged wheel pant

Damaged prop

Oil tank leak (my own design)

Stuck valves (multiple times)

Broken oil line (that was scary)

fouled spark plug

So far I have never been stranded more than one day. The most important tools are the telephone, the Central States phone list and a credit card. Most tools are available at any airport where you land and if you land somewhere other than an airport then it won't matter what is in your emergency kit or your kit just got much larger (those who have experienced this please chime in). That said, your most basic tools are handy so you don't have to go borrow everything (screw driver, pliers, etc) and it makes you look like you know what you are doing. People at airports are usually more than willing to help and in fact look forward to the opportunity since they have probably experienced being stranded themselves and want to pay back (or know that the day will come and they want to pay forward).

Rob

-------- Original Message --------

Subject: Re: [c-a] Travel Thought revisited...

Date: Thu, 22 Nov 2012 09:28:28 -0700

From: R Martinson <N6lk@aol.com>

To: canard-aviators@yahoogroups.com Aviators group <canard-aviators@yahoogroups.com>

CC: Steve Stearns <steve@tomasara.com>

I should have added that I have been with fellow fliers that have had the following issues to deal with:

broken voltage regulator

departing prop, crush plate, prop bolts and spinner (like lost in flight)

And with the above, were not delayed more than 8 hours. Sometimes you just live right!

Rob

-------- Original Message --------

Subject: Re: [c-a] Travel Thought revisited...

Date: Thu, 22 Nov 2012 08:31:43 -0800

From: Tim Andres <tim2542@sbcglobal.net>

To: R Martinson <N6lk@aol.com>

CC: Steve Stearns <steve@tomasara.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

... I have a small cardboard box that fits in my spar. ...I keep a verneer caliper for checking my prop, a nose tube & tire, oil, spare batteries, a few ties, safety wire etc. Emergency kit is a signal mirror, 2 MRE's, matches and some bottled water. ... lacking a first aid kit ...good knife ... Every owners manual, schematic, or install manual for the plane is on the iPad, along with the cozy builders access list. iPhone is tethered to the pad as well for web access.

Tim Andres

-------- Original Message --------

Subject: Re: [c-a] Travel Thought revisited...

Date: Thu, 22 Nov 2012 08:35:56 -0800

From: Bob Holliston <bob.holliston@gmail.com>

To: canard-aviators@yahoogroups.com

I carry a roll up tool bag (5 lbs.) that includes a couple of spark plugs, safety wire, tape, JB weld, etc. ... loaned the bag out many more times than I used it. Also, ... custom soft suitcase that fits behind the passenger's head and doubles as a headrest ( alighnment pins in the longerons for the canopy, so no arrow stock.) Inside that is: A spare main tire and tube, oxygen hose for refilling from welding bottles, rags, Pledge and a bunch of other stuff. A nose tire is wedged into the C/C spar. In 2000 + hours I've never had a flat main, but one flat nose. Bob LongEZ NX666DV

-------- Original Message --------

Subject: Re: [c-a] Travel Thought revisited...

Date: Thu, 22 Nov 2012 12:44:07 -0500

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: Steve Stearns <steve@tomasara.com>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

Spare spark plugs. I also have a spare main inner tube in a zip lock bag with talcum powder in the bag. Tire valve tool to be able to bleed the inner tube fast.

Buly

-------- Original Message -------- Subject: RE: [c-a] Travel Thought revisited... Date: Fri, 23 Nov 2012 07:24:57 -0500 From: Ken <kenezmiller@optonline.net> To: 'Steve Stearns' <steve@tomasara.com>, canard-aviators@yahoogroups.com ... How are you going to air up the tire you changed? Ahhh.. A can of fix-a-flat. Saved my bacon a couple times.

I had a complete nose wheel assembly with tire and tube aired up ready to install. I bought the new Gerdes wheel and used the old stock wheel for my spare.

New mag gasket.

Spark plug and socket. Put the plug in the socket upside down and tape it to protect the cathode.

Alternator belt: Never had to replace one on the road. Every time you pull the prop, pull the belt and turn it inside out and see if it has splits. If so, replace.

JB weld is perfect for repairing dings. Fill the gash, then tape over it with some duct tape to cure. Minimal sanding.

Roll of paper towels, cotton cloths and a can of Lemon Pledge. Perfect for cleaning the bugs off the airplane including the canopy. It fills minor scratches in the canopy and leaves a coat of lemon oil on the surface so the bugs don’t stick next time.

If you use the Bellvilles, you shouldn’t need a torque wrench. Takes up a ton of room and is heavy. Optional.

From the bath store, get a (preferably folding) shower enclosure squeegee. Great for wiping the heavy dew/grime off your airplane in the morning at the fly-in.

Fuses? I recommend all circuits protected with resettable circuit breakers. But if you insist on using automotive……. Remember there is a reason for the fuse to blow. Resist the temptation to put a higher value fuse in there to get it home. That’s another reason I don’t like auto fuses.

If you use Camlocs on anything, carry a few spares. They have a tendency to shoot out of their socket and land in the grass two airplanes away. I know. I’ve seen me do it.

Selection of nuts and washers, AN3’s and 4’s.

Gorilla tape. If you smash a wheel pant you can tape it up to get home.

Ken

## -Throttle Cable:

-------- Original Message --------

Subject: Re: [c-a] Looking for Cablecraft cables

Date: Sun, 18 Nov 2012 00:42:12 -0800

From: JDembs <vjdslk@surewest.net>

To: <canard-aviators@yahoogroups.com>, "Ron" <rongowan@yahoo.com>

I purchased mine from Van’s aircraft.....you can order custom lengths. Prices are reasonable.....

http://vansaircraft.com/cgi-bin/store.cgi?ident=1353056504-236-663&browse=controls

Jon D.

-------- Original Message --------

Subject: [c-a] cable craft

Date: Sun, 18 Nov 2012 06:13:56 -0600

From: vance atkinson <nostromo56@tx.rr.com>

To: RON GOWAN <rongowan@yahoo.com>, Canard Aviators <canard-aviators@yahoogroups.com>

...I got mine here.

HYDRADYNE HYDRAULICS LLC

Contact Us <http://www.hydra-dyne.com/contact/request\_a\_quote.php>

2710 SE Loop 820

Fort Worth, TX 76140 United States

Heres the cable you want (blue max) and the rest of you builders if your looking at cables.

http://www.cablecraft.com/products\_control\_cables\_pushPullBlueMax.html

Vance Atkinson

-------- Original Message --------

Subject: Re: [c-a] Looking for Cablecraft cables

Date: Sun, 18 Nov 2012 08:15:47 -0500

From: Nick <unick3@yahoo.com>

To: canard-aviators@yahoogroups.com Aviators <canard-aviators@yahoogroups.com>

CC: Ron <rongowan@yahoo.com>

...I purchased mine from the local boating supply store. ... nothing more than standard push pull cables used on boats and you can get any length (1 ft increments) with 10x32 threaded ends. ...different grades depending on the flexibility ...

Nick Ugolini

-------- Original Message --------

Subject: RE: [c-a] Looking for Cablecraft cables

Date: Sun, 18 Nov 2012 14:20:50 -0500

From: Ken <kenezmiller@optonline.net>

To: 'Ron' <rongowan@yahoo.com>, canard-aviators@yahoogroups.com

... www.cablecraft.com <http://www.cablecraft.com/>

Cablecraft wasn’t spec’d in the Long plans. I found them many years ago and they make the best cables available anywhere. ............boat cables are not near the quality of Cablecraft. They’re as expensive, too.

Ken

-------- Original Message --------

Subject: Re: [c-a] Looking for Cablecraft cables [heur][bcc][faked-from][mx]

Date: Sun, 18 Nov 2012 09:06:54 -0500

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: canard-aviators@yahoogroups.com

... http://www.push-pull.com/

David Froble

## -Throttle in Rear Seat:

-Terry Schubert Dec 2011: I used stiff lawn mower throttle cable to act as a push pull cable for the throttle setup in my back seat.  The front seat unit still drives the engine directly and the back seat unit piggy backs off the front quadrant. Look in the (CSA) index for articles on how to make the install.  I remember of at least 3 articles over the years.

## -Throttle Quadrants:

-------- Original Message --------

Subject: Re: [c-a] Throttle Choices

Date: Wed, 12 Dec 2012 15:24:04 -0600

From: vance atkinson <nostromo56@tx.rr.com>

To: Dave A <usaf\_david@yahoo.com>

CC: canard-aviators@yahoogroups.com

Try these guys...... Good selection and will make a custom one for you at a reasonable price.

Vance Atkinson

-------- Original Message --------

Subject: Re: [c-a] Throttle Choices

Date: Wed, 12 Dec 2012 15:19:06 -0700

From: Burrall L Sanders <craftsman@freeflightcomposites.com>

To: <canard-aviators@yahoogroups.com>, "Dave A" <usaf\_david@yahoo.com>

... pic of a Van’s throttle quad we installed in a Long. They are quality and reasonably priced. You would have to change the cable to push pull.

Burrall



-------- Original Message --------

Subject: Re: [c-a] Throttle Choices

Date: Wed, 12 Dec 2012 17:21:24 -0800

From: Timothy Lumpp <tlumppy@me.com>

To: Nick <unick3@yahoo.com>, canard-aviators@yahoogroups.com

http://www.eznoselift.com

-------- Original Message --------

Subject: Re: [c-a] Throttle Choices

Date: Thu, 13 Dec 2012 10:09:15 -0800

From: Kevin R. Walsh <krwalsh@gmail.com>

Reply-To: krwalsh@alum.mit.edu

To: Timothy Lumpp <tlumppy@me.com>

CC: Nick <unick3@yahoo.com>, canard-aviators

<canard-aviators@yahoogroups.com>

You might also try Mark Frederick of Team Rocket. He makes a beautiful 2 or 3 lever quadrant ... We adapted one for our Cozy Mk-IV. It does not have a protruding friction screw, it is a recessed nylock nut.

https://picasaweb.google.com/lh/photo/eA9esF8iSkdicqyBgTohI9MTjNZETYmyPJy0liipFm0?feat=directlink

We custom-made the handle, and also have a matching mixture lever that lines up with it that is currently out to be anodized red.



-------- Original Message --------

Subject: [c-a] Throttle Choices-Friction knob solution

Date: Fri, 14 Dec 2012 00:26:51 -0000

From: lisnion <lisnion@yahoo.com>

To: canard-aviators@yahoogroups.com

...I am a real machinist, I can do this knob thing for you if you like. See if you can find something from MSC I can modify easily. I can order it since I order from MSC at least once a week ...Failing that, figure out what you want and I can make it. I hate getting X-mass presents I don't want so I don't give 'em, I try to give things people can really appreciate. If this works out you have to pass the favor on.

Ion 0-320 Long EZ, 1100 hrs.

## -Titanium Work:

-------- Original Message --------

Subject: [c-a] Re: Titanium frame fabricators for FHC

Date: Tue, 27 Nov 2012 16:05:04 -0000

From: besmith51 <bsmith51@gmail.com>

To: canard-aviators@yahoogroups.com

Try: http://www.supraalloys.com/

Bruce Smith

-------- Original Message --------

Subject: Re: [c-a] Re: Titanium frame fabricators for FHC

Date: Tue, 27 Nov 2012 08:16:25 -0800 (PST)

From: michael skorija <skorija@yahoo.com>

Reply-To: michael skorija <skorija@yahoo.com>

To: besmith51 <bsmith51@gmail.com>, "canard-aviators@yahoogroups.com"

<canard-aviators@yahoogroups.com>

very expensive, i have a titanium step. You can do it then have it welded by any local shop that welds Titanium,

make sure you find the proper alloy, talk to local welding shops for local sources and correct alloys. cut, grind and then give to welder.

mike

-------- Original Message --------

Subject: Re: [c-a] Titanium frame fabricators for FHC

Date: Tue, 27 Nov 2012 08:49:33 -0800 (PST)

From: Slick Ric <bkut540builder@yahoo.com>

Reply-To: Slick Ric <bkut540builder@yahoo.com>

To: Izzy Briggs <INBRIGGS@YAHOO.COM>

CC: canard-aviators <canard-aviators@yahoogroups.com>

... Revolution Bicycles ... titanium frame for a mountain bike that is made in Colorado.

... phone number of Revolution Bicycles is (801) 233-1400. ...work on the frame was flawless.

Ric Lee

-------- Original Message --------

Subject: Re: [c-a] Titanium frame fabricators for FHC

Date: Tue, 27 Nov 2012 08:58:48 -0800

From: Henry Hallam <henry@pericynthion.org>

To: Izzy Briggs <INBRIGGS@yahoo.com>

CC: canard-aviators <canard-aviators@yahoogroups.com>, Cozy Builders

<cozy\_builders@googlegroups.com>

A friend of a friend runs this place in Alameda, CA: http://www.hirschfeldfab.com/

He does excellent work and helped me with my rudder pedals a while back.

Henry

-------- Original Message --------

Subject: [c-a] Titanium fabricators

Date: Wed, 28 Nov 2012 15:36:34 -0000

From: lisnion <lisnion@yahoo.com>

To: canard-aviators@yahoogroups.com

My favorite Titanium welder is Stan at Advanced Alloys in Longmont, Co. 303-702-1997. I quit welding my own exaust systems after I found him. I can also hook you up with a local (to me) machine shop if Stan can't cover the machine work. I know it's better to work with your local guys but a good recommendation is a close second.

Ion Production Manager DFM Engineering Inc.

## -Trim:

-------- Original Message --------

Subject: [c-a] Re: COZY: Roll Trim

Date: Mon, 01 Oct 2012 15:31:34 -0700

From: Alex <astrong@verizon.net>

Reply-To: Alex <astrong@verizon.net>

To: Keith Spreuer <Keith@airstarts.com>, cozylist <cozy\_builders@googlegroups.com>, canard Aviators <canard-aviators@yahoogroups.com>

...20 years I have flown my COZY III ... I have not used my roll trim, even on occasion with one tank almost MT. ...very stable in roll and ... Nav Aid wing leveler does the trick. For additional input on roll trim, check out Pilot report on my web site. http://strongpitchtrim.com/

PILOT REPORT

I installed an electric roll trim system in my plane when I built it. In hindsight (after 80 hours of flying) I wouldn't bother. It is used so infrequently that it is not worth the expense. The electric pitch trim on the other hand (I have a Strong unit) is worth its weight in gold. I wouldn't have it any other way. Mark Beduhn Cozy IV N494CZ, SPT#029

Alex

-------- Original Message --------

Subject: [c-a] Re: COZY: Roll Trim

Date: Mon, 1 Oct 2012 16:17:42 -0700

From: Tim Andres <tim2542@sbcglobal.net>

To: Keith Spreuer <Keith@airstarts.com>

CC: cozylist <cozy\_builders@googlegroups.com>, canard Aviators <canard-aviators@yahoogroups.com>

I used the Hanka spring outlined elsewhere, and the Firgelli L-12 actuator. They have a L-12 model that matches almost exactly the specs on the Ray Allen unit, it's the size/shape of a Sharpie, cost about $80. I mounted it to the bellcrank inside the wing root with the included bracket, the other end of the spring attaches to the push tube out board of the quick disconnect with an Adel clamp with the rubber removed. The clamp is pop riveted to the tube to prevent slipping. A Ray Allen relay deck may be needed also to allow reversing depending on how you wire it. Works just fine, mine is a little too sensitive and I need to sand the spring one day. You won't need much stroke or force, very little will do it.I do use it, although not much. ... Tim Andres

-------- Original Message --------

Subject: Re: [c-a] Re: COZY: Roll Trim

Date: Tue, 02 Oct 2012 07:49:30 -0700

From: Keith Spreuer <keith@airstarts.com>

To: Alex <astrong@verizon.net>, cozylist <cozy\_builders@googlegroups.com>, canard Aviators <canard-aviators@yahoogroups.com>

... flying the IV now over 500 hrs with no roll trim and your right the wing leveler is fine almost all the time. ...fair amount of formation ... In my plane I do notice it takes some force when the fuel load is un even. Definitely not a necessity but might be nice.

Keith

-------- Original Message --------

Subject: [c-a] Re: COZY: Trim Relays

Date: Wed, 3 Oct 2012 22:40:41 +0100

From: Bill Allen <billallensworld@gmail.com>

To: Keith Spreuer <Keith@airstarts.com>

CC: cozylist <cozy\_builders@googlegroups.com>, canard Aviators <canard-aviators@yahoogroups.com>

...Jack Wilhelmson makes one; see http://www.eznoselift.com/index.php/price-list

<< Electronic Trim Controller. ... designed especially for aircraft that have a large difference between cruising speed and landing speed where trim adjustment is very sensitive at cruise and much less sensitive at landing. ...could be used on any experimental aircraft ... 12 volt dc motor driven actuator such as Thompson, Firgelli, Strong, etc. Uses SPDT stick mounted miniature switches with pilot switch priority, Trim motor pulse width modulation(PWD) adjustable speed control, full speed moto start pulse, full speed trim after adjustable time delay on low speed, and inputs for trim control from a auto pilot (Trio Avionics or others) with pilot trim priority. In use the pilot can adjust the trim with great precision by holding the trim switch down for anything less than two seconds (adjustable from .5 to 4 sec). If the switch is held greater than 2 seconds the PWM cuts out and the trim motor goes into full speed allowing the pilot to get full trim quickly as is often needed during landing. During auto pilot operation the auto pilot automatically adjust the trim for the least need for correction by the servo. However, if the pilot wishes to override the auto pilot he can do so without disengaging the auto pilot.>>

Bill Allen

-------- Original Message --------

Subject: [c-a] Roll Trim

Date: Tue, 02 Oct 2012 05:00:49 -0500

From: vance atkinson <nostromo56@tx.rr.com>

To: Cozy Builders <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

I used a MAC servo ( a used one I got for free) and it works fine. The spring attaches to the aileron rod at the same place the auto pilot servo attaches. .. eyelet in the servo arm so the spring wouldnt wear an egg shaped hole in the end. The pad ... is made from is about 5 BID and bonded to the spar face. System works good and cleans up the instrument panel by using a single 3 position spring loaded switch.

Vance atkinson



## -Tug:

-------- Original Message --------

Subject: [c-a] EZE-Tug

Date: Sat, 8 Dec 2012 09:42:31 +0200

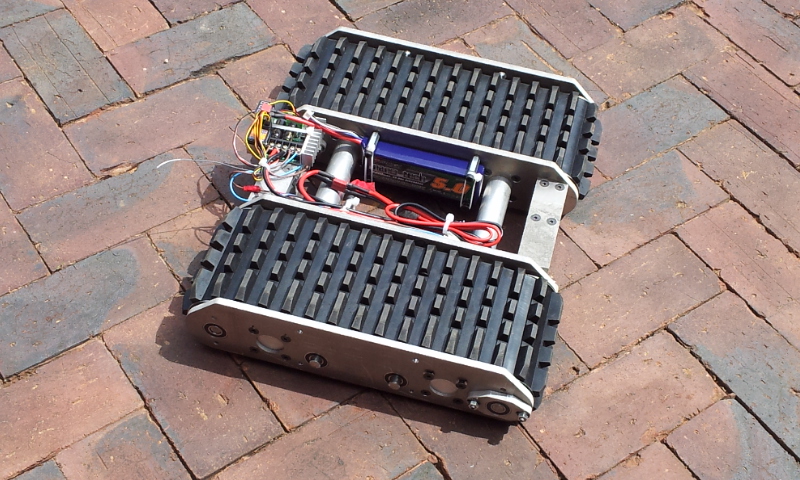
From: Jannie Versfeld <jannie@go-realty.co.za>

To: <cozy\_builders@googlegroups.com>, "'canard'"

<canard-aviators@yahoogroups.com>

...Here is my EZE-Tug. Pushing my Cozy in and out of the hanger ...has risk for damage .... ... 8 degree incline from the paved taxi way and from the taxi way to my hanger is about 90 feet and I have to contend with some rough grass and turf. My EZE-Tug makes for effortless stowing in the hanger. I am still to make the Lazy-Susan turntable where the nose bumper will fit is and rest on the EZE-Tug. The Tug can cover 40 feet a minute and is good to tow 3300 lbs canard (if they ever get there) over any terrain at a maximum incline of 10 degrees. The EZE-Tug has two planetary/d c motor drives controlled by an electronic speed controller for tank steering. Each of the two drives are capable of 35 ft/lbs torque. I use a 2.4ghz RC transmitter such as the RC car fanatics use. This has to interference on avionics. Two 5000 MaH Lithium Polymer batteries power the Tug for about 30 minutes at full power. The Tug weighs in at 30 lbs and together with the weight of the nose gives excellent traction. Attached is a photo. I will update more later with a video when completed.

Jannie Versfeld Cozy MKIV O-540 South Africa



-------- Original Message --------

Subject: RE: [c-a] EZE-Tug

Date: Mon, 10 Dec 2012 14:27:22 +0200

From: Jannie Versfeld <jannie@go-realty.co.za>

To: 'RJ schreiner' <schreiner@cytherean.org>

...I will most probably supply it at $1800

Jannie

## -Vari EZ Video w/ Burt:

-------- Original Message --------

Subject: [c-a] USA VariEze on Discovery UK

Date: Thu, 22 Nov 2012 16:18:53 -0700

From: JP Anderson <johnand@hwy2.com>

To: canard-aviators@yahoogroups.com

My friend builder/pilot Joe Person is featured in the following video along with his VariEze and our other friend and hero Burt.

http://www.discoveryuk.com/web/how-we-invented-the-world/videos/?video=how-we-invented-the-world-amazing-winglet-trick

John Anderson VariEze N117PJ Havre, Montana

## -Vaccum Pump:

-------- Original Message --------

Subject: [c-a] Vac Pump

Date: Sun, 22 Jul 2012 08:45:30 -0400

From: Nick Ugolini <unick3@gmail.com>

To: COZY Mailing List <cozy\_builders@googlegroups.com>, Canard Aviators <canard-aviators@yahoogroups.com>

... replaced the wayward vac pump which failed ... less than hour of work, ... picture ... after close to 1000 hrs the pump vanes are still looking really good with very little wear (cleaning helps), ... may have been ... shear spool was aged and it failed. ... replaced the spool a few years back (same pump) and it worked well for many more hundreds of hours. ... a new shear spool would have put the pump back in service. ... ordered an extra spool for my travel kit and would recommend caring one to those who still have vac systems. It could save you from buying a new pump if yours fails.

Nick Ugolini, Charleston, SC LongEZ-N29TM (2590 hrs)



## -Voltmeter:

-------- Original Message --------

Subject: RE: [c-a] Ammeter

Date: Thu, 25 Oct 2012 08:48:20 -0400

From: Ken <kenezmiller@optonline.net>

To: 'Kerry Fritz' <kclongez@hotmail.com>, eznoselift@gmail.com, bulent.enginegear@gmail.com

CC: usaf\_david@yahoo.com, 'Canard Aviator' <canard-aviators@yahoogroups.com>

...Nominal charge is 13.8-14.2 or thereabouts. The new RG batteries like the 13.8. 16 volts will kill radios.

-------- Original Message --------

Subject: [c-a] Charging over-voltage protection

Date: Fri, 26 Oct 2012 13:36:26 -0000

From: lisnion <lisnion@yahoo.com>

To: canard-aviators@yahoogroups.com

I remember (maybe from the plans?)the call for a ZENER DIODE in the charging circuit. It's supposed to cut the charging circuit if the voltage goes over 14.5 vdc or so. I've never had that problem so I don't know if my ZD works. Mine runs at 14.1 vdc.

Ion

## -Voltage Regulator:

-------- Original Message --------

Subject: Re: [c-a] Ammeter

Date: Thu, 25 Oct 2012 08:36:20 -0400

From: Len Morris <lenemorris@gmail.com>

Reply-To: lenemorris@gmail.com

To: Kerry Fritz <kclongez@hotmail.com>

CC: eznoselift@gmail.com, bulent.enginegear@gmail.com, usaf\_david@yahoo.com, Canard Aviator <canard-aviators@yahoogroups.com>

...I had the old Ford style voltage regulator in my Cozy. It failed allowing voltages to go up to 18 volts. I replaced with another mechanical and it was better, but was going as high as 15.3 volts. I replaced the mechanical with the equivalent electronic voltage regulator and now I consistently see 14.3 volts.

...Len Morris

## -Vortilons:

-Ken Miller Nov 2011: Interestingly enough, when Burt came up with vortilons, they gave the airplane an even better nose down tendency on approach at the same airspeed in the Long-EZ.  If you don’t believe me, remove yours and fly.  -------- Original Message --------

Subject: [c-a] landing speeds

Date: Sat, 4 Aug 2012 17:15:09 -0700

From: Bob Holliston <bob.holliston@gmail.com>

To: canard <canard-aviators@yahoogroups.com>

I flew my LongEZ for a year and a half before I got around to installing the vortilons and fences. My landing speeds (lightly loaded) were 75 - 79 MPH IAS every time I looked. Now they're between 65 - 70 every time. ...noticed Klaus's LongEZ is devoid of these enhancements also but said they're going on shortly. Bob LongEZ NX666DV.

-------- Original Message --------

Subject: Re: [c-a] Current supplier of vortilons?

Date: Wed, 15 Aug 2012 16:48:02 -0700 (PDT)

From: J.D. Walker <jdwalker706@yahoo.com>

To: canard-aviators@yahoogroups.com, Dave Anderson <usaf\_david@yahoo.com>

You are the supplier - build yourself a set........

JD

-------- Original Message --------

Subject: [c-a] Re: Current supplier of vortilons?

Date: Thu, 16 Aug 2012 14:11:26 -0000

From: dr0von0pico <dr0von0pico@yahoo.com>

To: canard-aviators@yahoogroups.com

...This post assumes you are talking about vortilons (leading edge devices) and not vortex generators (little triangular looking things that are usually more mid-chord-ish).

Rutan first experimented with vortilons for the Long EZ with the Roncz canard. After he had success with them he expanded the recommendation to the Long EZ with either canard. Then after an accident he expanded the 'mandatory' recommendation to both the Varieze and the Long EZ. See CP's 42,47, and 68. CP 42 actually has a diagram of one. Aerodynamically speaking, at cruise they don't do anything and create very little drag. As alpha (the AoA) increases, they convert the increasing spanwise flow into vortices that help keep the flow attached to the aft end of the wing, increasing main wing lift and keeping the ailerons useful- this is exactly what you want to help avoid the dreaded "deep stall" of the main wing. I suppose if you wanted to engineer something else like vortex generators (which are much different looking than vortilons) or full-chord wing fences, you could... but vortilons by themselves are one of those "free lunches," much improved safety with very few drawbacks, plus Rutan did all the engineering already for you! Also, vortilons are relatively easy to make, even for someone with zero composite experience .... Most of the canards out there have vortilons.

Andres Pico

## -Vortex Generators:

|  |  |
| --- | --- |
| Date: | Mon, 26 Mar 2012 08:16:53 -0700 |
| From: | Bob Holliston <bob.holliston@gmail.com> |
|  |  |

Why not make your own? I made some for the Piper wings on my Kingfisher amphibian. Take 2 layers of scrap carbon and scoosh into a Tee shape with 3' long 1x2's covered with visqueen and peelply on the base. After cure trim with a table saw then cut'em to length with a chopsaw. To use them you round one end off, pull the peelply off the base ane glue'em on. I got a little carried away and ended up with a coffee can full, about 400. Cost? 'Bout a buck.

|  |  |
| --- | --- |
|  |  |
|  |  |

Date: Mon, 26 Mar 2012 11:35:37 -0400

From: Harley <harley@AgelessWings.com>: ...flush, suspended ceiling in my shop, ...cutoffs of these Ts left over.  It was suggested that I use them to make my VGs.  ..., 1 inch by 1 inch and up to 10 feet long. Cut to VG length, then trim the upright shape with a pair of tin snips.  Attach with white RTV. ...(real cheap) at Lowes... ...I believe they are PVC [not vinyl]...



-------- Original Message --------

Subject: Re: [c-a] Re: Current supplier of vortilons? [bcc][faked-from][mx] [html][bcc][faked-from][mx]

Date: Wed, 15 Aug 2012 23:34:47 -0700 (PDT)

From: Bruce Sinclair <ez\_workshop@yahoo.com.au>

Reply-To: Bruce Sinclair <ez\_workshop@yahoo.com.au>

To: davef@tsoft-inc.com <davef@tsoft-inc.com>, canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

http://abianconi.hypermart.net/Vortex.htm

-------- Original Message --------

Subject: RE: [c-a] Re: Current supplier of vortilons? [bcc][faked-from][mx]

Date: Thu, 16 Aug 2012 13:41:15 +0000

From: Chris Barber <CBarber@TexasAttorney.net>

To: Bob Holliston <bob.holliston@gmail.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

.... vortex generators (VG's), Velocity Inc sells them. ... IIRCthey were around $200. They provide a template too, but, alas, for a Velocity. .... In the past Velocity has been happy to help non Velocity folks, but I guess that could vary depending upon who you get a hold of.

Chris Barber Houston KEFD Velocity SE w/rotary

-------- Original Message --------

Subject: Re: [c-a] Re: Current supplier of vortilons? [bcc][faked-from][mx]

Date: Thu, 16 Aug 2012 10:11:39 -0400

From: Bulent Aliev <bulent.enginegear@gmail.com>

To: Chris Barber <CBarber@texasattorney.net>

CC: Bob Holliston <bob.holliston@gmail.com>, "canard-aviators@yahoogroups.com" <canard-aviators@yahoogroups.com>

You can buy a kit specific for CZ: http://www.pnwaero.com/cozy\_mark\_iv.htm

... aluminum and made to Jim Price's recommendation. I have them for 6 years now and have not lost one yet. Friend of mine bought the Velocity ones and I installed them .... Nylon type material and nothing sticks to them. .... started losing one or two every time he flew...

Bulent "Buly" Aliev Cozy Mk-IV N484BD

-------- Original Message --------

Subject: Re: [c-a] Re: Current supplier of vortilons? [bcc][faked-from][mx]

Date: Thu, 16 Aug 2012 10:53:16 -0400 (EDT)

From: ARGOLDMAN@aol.com

To: canard-aviators@yahoogroups.com

If you are going to apply vortex generators it is imperative that you apply them to both the \_canard and wing\_ TOGETHER!!! If on the canard alone, there is a good chance that you can enter a deep stall without the ability to recover. Now if you are using them to counteract the wetness effect on the GU airfoil, that's a different story. The VGs used, on the canard, are placed considerably further back on the flying surface. Don't confuse them

Rich

-------- Original Message --------

Subject: Re: [c-a] Re: Current supplier of vortilons? [bcc][faked-from][mx]

Date: Thu, 16 Aug 2012 08:09:28 -0700

From: Elwood Johnson <ejandlinda@earthlink.net>

To: ARGOLDMAN@aol.com <ARGOLDMAN@aol.com>

CC: canard-aviators@yahoogroups.com <canard-aviators@yahoogroups.com>

My suggestion to NEW GUYS is to stay away from VORTEX GENERATORS until you know what the hell you are doing.

EJ Johnson N36EJ S. Calif.

-Aerodynamic Flo Fences: -http://www.lightspeedengineering.com/KlausInfo/Flowfence.htm -Span wise flow characteristics of swept wings are well understood and often treated with flow correcting devices. Most commonly they are installed on top of the wing and rarely behind or below. Airliners do not have them since they have fully articulating trailing edges. The following text only applies to the Vari Eze wing directly and other swept wings indirectly. While span wise flow still exists on trailing edges of un-swept wings, it is so small that restricting flow fences would probably not have a significant benefit. On swept wings flow fences should not be installed on aileron control surfaces since this loads them up to the point that roll authority is all but lost. In an effort to reduce approach and landing speeds of Light Speed Engineering's Vari Eze, span wise flow fences were installed on the trailing edge and flight tested. The overall change in low speed performance was remarkable. It was immediately noticed that take- off distance is reduced 10-15% climb rate is improved 20% and most noticeably approaches can be flown at least 10-15% slower resulting in a significantly shorter landing distance, nearly 30% less. There was no measurable decrease in top speed. The configuration of the airplane tested had the standard 3 Vortilons on each wing leading edge with three roughly equally spaced flow fences between the outboard end of the aileron and the winglet. The shape of each fence does not appear to be critical but it is believed that it is important that they exist on top of, behind and below the wing surface to completely isolate the section outboard of the fence from any span wise flow that is developed inboard of it. Span wise flow on swept wings at high angle of attack around the trailing edge redevelop in a short span thus several fences are more beneficial. Technically speaking the slope of the CL/alpha curve of the main wing is increased especially in the +5 to +14 deg AoA region. Max AoA at equal flight conditions was reduced by 2.2 deg. from 16.2 down to 14 deg. Vmin is not noticeably reduced since it is elevator limited. Due to the higher main wing C/L generated at max AoA the elevator is more loaded even though max alpha is reduced. The increased pitching moment loads the elevator to stall at a lower deck angle. The only negative observation is a reduced roll response at the lower speeds, probably due to lower dynamic pressure.



-Bill Allen Nov 2011: Tom Staggs has wing fences fitted to his LE; see  <http://mysite.verizon.net/res7yblj/id2.html> Andreas Christou published a detailed flight test on wing fences on VE N13VB--should be in the archives.... I have them on my LE160 (along with VGs) and have tested this combination throughout the entire range of weights (up to 1850 lbs) and CG on N99BA with no adverse effects found.

-Tim (Flying Tiger) Nov 2011: I have trailing edge fences--copied Klaus'. Found an immediate increased response at slower airspeeds in all landing configurations...crosswinds included. At one point I decided to start removing the leading edge Vortilons to the point I no longer have any installed. The trailing edge fences do the job of both...at least on my VEZE.

-------- Original Message --------

Subject: Re: [c-a] Thrust from winglets

Date: Fri, 08 Jun 2012 22:04:20 -0000

From: Silvereagle <dndnhrd@gmail.com>

To: canard-aviators@yahoogroups.com

...Trailing edge fences... I find a single trailing edge fence 3" outboard of the aileron improves low speed handling especially on landing approach....

-------- Original Message --------

Subject: [c-a] Those wing fences are cool but what do they do?

Date: Tue, 2 Oct 2012 21:32:42 -0500

From: Ryszard <ryszardzadow@att.net>

To: Terry L Schubert <jschuber@juno.com>, Canard Aviators <canard-aviators@yahoogroups.com>

CC: Jim Evans <jevansez@gmail.com>, Ron Scarbro <ron\_scarbro@hotmail.com>

A lot of people at RR asked questions about the inboard wing fences. In a previous oil flow test I saw a large separated area that motivated me to install the inboard fences ... not visible is the nearly parallel flow near the fence since it blends in with the unpainted surface. ...What’s going on in the aileron root area, well that’s another story.

Ryszard



-------- Original Message --------

Subject: Re: [c-a] Those wing fences are cool but what do they do? [html][heur][bcc][faked-from][mx]

Date: Wed, 03 Oct 2012 20:08:18 -0400

From: David Froble <davef@tsoft-inc.com>

Reply-To: davef@tsoft-inc.com

To: canard-aviators@yahoogroups.com

...I believe that in the past the fences on canard aircraft was something developed by Klaus Savier ...Vari-eze ... significant improvement. Landing speeds of up to 10 MPH slower. Retention of aileron authority to much lower speeds. The Vari-eze wings have anhedrial. The wings slope down, are lower at the tips than at the root. What I've read is that the benefits found on the Vari-eze are not as apparent on other canard aircraft.

A swept wing has spanwise flow, not just a straight front to back flow. The purpose of the fences was to prevent spanwise flow, or at least to reduce it. Spanwise flow reduces the effectiveness of ailerons. Bad. Causing the air to flow more front to rear allows the ailerons to perform as expected. Good....

David Froble

## Water Landing:

Terry Schubert Mar 2012: **IF** you elect to land in water, experience has shown that **extending the nose gear is very important** to having an easier landing with less damage and less threat of roll over.

Bill Allen Mar 2012: ... There are many documented cases of water landings which resulted in no injury and the pilot simply having to sit in the floating "canoe" and await assistance - there was  even one on youtube. ...