



COZY / PLANS BUILT AIRCRAFT

Soup to Nuts*?

Marc J. Zeitlin

September 14th, 2021

~8:00 PM – ~9:00 PM

Virtual Forum Tent – Somewhere In The Ether

* With apologies to Bernard Kliban

What Will I Talk About?



- ***Standard Introduction for the Newbies*** (~15 min.)
 - *Who Am I?*
 - *What's a COZY MKIV?*
 - *Why a COZY MKIV*
 - *COZY MKIV Plans*
 - *COZY MKIV Cost / Time To Build / Completions*
 - *COZY MKIV Support*
 - *COZY MKIV Parts Vendors*
 - *How Many COZY's Under Construction / Flying?*
 - *How Does Composite Construction Work?*
- ***Travelogue – What Can You Actually Do In This Plane?*** (~10 min.)
 - *Climb Performance*
 - *Cruise Performance*
 - *Easy Day Trip*
 - *Go Visiting #1*
 - *Go Visiting #2*
 - *Go Visiting #3*
 - *Long Cross Country*
- ***Miscellaneous Topics*** (~15 min.)
 - *Aircraft Design Margin Usage*
 - *Flight Testing Methods*
 - *Common Modifications*
 - *Major*
 - *Minor*
 - *COZY Performance Modifications*
 - *COZY Recommended Modifications*
 - *COZY Discouraged Modification*
 - *COZY Safety Issues for builders / 2nd owners / buyers / non-builders*
- ***Transition into a Canard Aircraft*** (~5 min.)
- ***Super Long Range COZY III*** (~5 min.)
- ***Questions and Answer – until done (ANY topic)***

Who The Heck Am I?



- Biography / Resume'
 - <http://www.mdzeitlin.com/Marc/bio.html>
- Built Quickie Q2
- Built COZY MKIV #386, N83MZ – ~1750 flying hours
- Started / Administer Unofficial COZY Builders Web Page and COZY Mailing List (~730 members)
- As **Burnside Aerospace**:
 - <http://www.burnsideaerospace.com>

I provide engineering consulting and canard A&P services (Pre-Buy, Pre-Sale, Condition Inspection, Builder Assist, Modifications, Upgrades, etc.) – also affiliated with Freeflight Composites in Co. Springs, CO.
- I provide **UNOFFICIAL** technical support for **COZY** (and other canard) aircraft to all builders, flyers and prospective builders

What's a COZY MKIV?



- Aircraft Type
 - Canard pusher – big wing in rear, small wing in front, engine in rear
 - Composite Construction – fiberglass, epoxy, foam, wood, metal
 - 4 place, or 2+2, or 2 + LOTS of baggage
 - Efficient, fast, long distance cruiser – have traveled over 1000 NM/leg and from Tehachapi, CA to Cleveland, OH in daylight – will show some representative flight maps
- History of the COZY MKIV
 - Designed by Nat Puffer as a derivative of Burt Rutan/RAF's Long-EZ
 - First as a side-by-side two seater in mid-80's
 - Next, added single rear seat (kept Long-EZ rear end, spar and wings)
 - Evolved from 3-place to current 4-place MKIV in early 1990's – rear end modified to be similar to Defiant landing gear/firewall structure; canard airfoil updated
- COZY/canard aerodynamics
 - [2005 Nat Puffer's OSH Presentation](#)
 - [2019 Columbia Fly-In - Canard Aircraft Aerodynamics](#)

Why a COZY MKIV?



- You want to **BUILD** an airplane
- Use-Model – your comparison indicates a COZY is the type of aircraft you want to fly – shouldn't be because “ooohhh, that's a cool looking plane”
- Economics – a COZY MKIV can be flown for less than renting a C-172 with fewer fuel stops in less time
- Carrying Capacity – you need more than 2 seats, or 2 seats and LOTS of baggage space
- Safety Features – you want a canard's stall/spin resistance
- Composites – you like the build materials
- Don't mind the performance restrictions – no grass / short fields

COZY Plans Availability



- Cozyaircraft Corp.
owned by ACS since
2004
- Plans available through
ACS
- Many plans sets available
from ACS, as well as
from the aircraft's
designers
- [Aircraft Spruce Kit/Plans](#)



<http://www.aircraftspruce.com>
Vendor Display Building "A" at
OSH

COZY MKIV Cost / Time To Build / Completions



- Low End - \$35K to \$50K
 - High time engine (maybe auto conversion)
 - Good scrounging
 - Minimum instruments - VFR only
- Mid-Range - \$50K to \$75K
 - Some prefab (not much)
 - Rebuilt engine
 - High end VFR - Low end IFR panel
- High End - \$75K to \$120K
 - Lots of prefab components / paid help
 - New Lycoming Engine
 - Complete latest IFR stack panel
- Build Time:
 - 1,500 hours (lots of prefab parts)
 - 5,000 hours (lots of customizations)
 - 3,000 hours (Median)
- Completion Rate:
 - General Plans-Built Aircraft - ~10%
 - COZY MKIV - ~20%
- Partially completed projects (part of the 80% - 90%) can speed things up, IF you trust the previous build quality

Built from plans – **NOT A KIT!!!** This means you can customize your spend rate, as well as what you spend money on. Cost control is completely up to you, your desires, needs, and ability to pay

COZY Support Methods



- **Un-official Builder/Flyer support from me (my contact info on last slide)**
- Freeflight Composites (Ryan Goodman)
 - <http://www.freeflightcomposites.com/>
- COZY Newsletter archives
 - <http://www.cozybuilders.org/newsletters/>
- COZY Mailing List
 - http://www.cozybuilders.org/mail_list/
- **Unofficial COZY Builders Web Page (UCBWP)**
 - <http://www.cozybuilders.org/>
- Canard Aviator's Mailing List
 - <https://canardzone.groups.io/g/canard-aviators/>
- CSA Newsletter (mandatory for all canardians)
 - http://www.cozybuilders.org/ref_info/other_news.html
- Other builder's web pages (links from **UCBWP**)

COZY Parts Availability



- ACS, Wicks, etc. for most composite & standard aircraft materials (other composite sources available – check compatibility)
- Two main vendors provide metal (fabricated/welded/cast) parts:
 - CG Products
 - <http://www.cozygirrrl.com/aircraftparts.htm>
 - EZ Noselift
 - <http://www.eznoselift.com/>
- Other part vendors for pre-fab composite parts and other miscellaneous items – see:
 - <http://www.cozybuilders.org/newsletters/suppliers.html>
 - http://www.cozybuilders.org/newsletters/na_suppliers.html

How Many COZY's?



- > 2000 Rutan Derivative Canard Aircraft flying (VariViggen , V.E., L.E., Defiant, Berkut, E-Racer, SQ2000, Velocity, COZY III, COZY MKIV)
- ~ 300 - 400 flying COZY's all over the globe
- ~1700 COZY MKIV plans sold
- ~ 600-800 actually under construction
- ~5 new COZY MKIV first flights per year

- These numbers are **ALL ESTIMATES** – real stats are hard to come by – but in any case, a **PROVEN** design

How Does Composite Construction Work?



- Use strong/stiff materials on outside
- Use lightweight materials on inside
- Optimize weight
- Structure is Fiberglass
- Core is foam (multiple types)
- Matrix is epoxy (some aircraft use Polyester or Vinylester Resin)
- No molds required – all parts fabricated on flat table or simple jigs
- Wings, winglets and canard “hot-wired” from foam with templates to form core shape

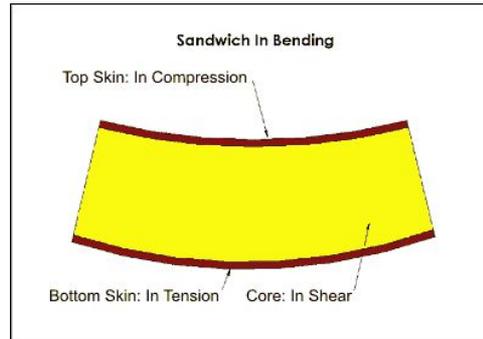


Figure 1

<u>Single Skin - t</u>	<u>Sandwich - 2t</u>	<u>Sandwich - 4t</u>
Weight: 1	Weight: 1	Weight: 1
Strength: 1	Strength: 6	Strength: 6
Stiffness: 1	Stiffness: 12	Stiffness: 48

Figure 2

From “boatdesign.net”



From Dave and Lynn Schilder

What Will I Talk About?

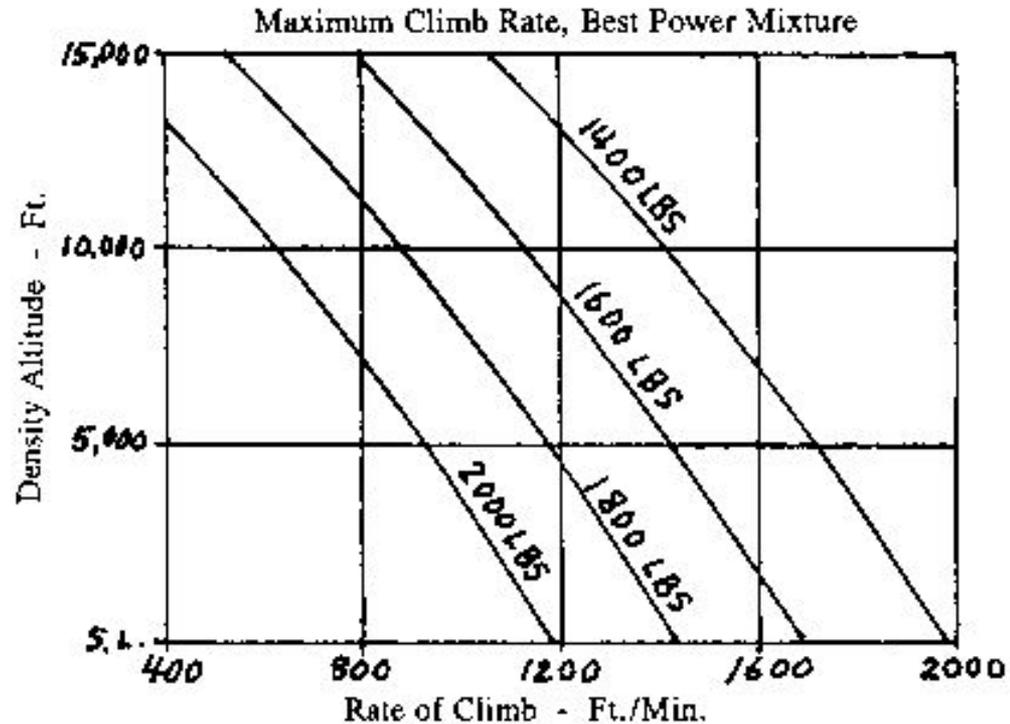


- *Standard Introduction for the Newbies* (~15 min.)
 - *Who Am I?*
 - *What's a COZY MKIV?*
 - *Why a COZY MKIV*
 - *COZY MKIV Plans*
 - *COZY MKIV Cost / Time To Build / Completions*
 - *COZY MKIV Support*
 - *COZY MKIV Parts Vendors*
 - *How Many COZY's Under Construction / Flying?*
 - *How Does Composite Construction Work?*
- *Travelogue – What Can You Actually Do In This Plane?* (~10 min.)
 - *Climb Performance*
 - *Cruise Performance*
 - *Easy Day Trip*
 - *Go Visiting #1*
 - *Go Visiting #2*
 - *Go Visiting #3*
 - *Long Cross Country*
- *Miscellaneous Topics* (~15 min.)
 - *Aircraft Design Margin Usage*
 - *Flight Testing Methods*
 - *Common Modifications*
 - *Major*
 - *Minor*
 - *COZY Performance Modifications*
 - *COZY Recommended Modifications*
 - *COZY Discouraged Modification*
 - *COZY Safety Issues for builders / 2nd owners / buyers / non-builders*
- *Transition into a Canard Aircraft* (~5 min.)
- *Super Long Range COZY III* (~5 min.)
- *Questions and Answer – until done (ANY topic)*

Travelogue - Climb Perf.



- Sea Level
 - Depending upon Gross Weight, propeller, CG, IAS, can get 1000 to 2000 fpm climb rate
- 6K ft Density Altitude
 - 800 to 1500 fpm climb rate
- 12K ft Density Altitude
 - Depending upon Gross Weight, propeller, CG, IAS, can still get over 400 fpm climb rate at MGW
 - At lower weights, can get to high teens / low 20K ft. altitude to take advantage of winds



Note: Data for 180 hp Lyc 0-360 with 3-blade 64 x 76 Performance prop.

Can get over mountains – don't have to fly low or worry about terrain – can get high quickly – avoid heat, turbulence

Travelogue - Cruise Perf.



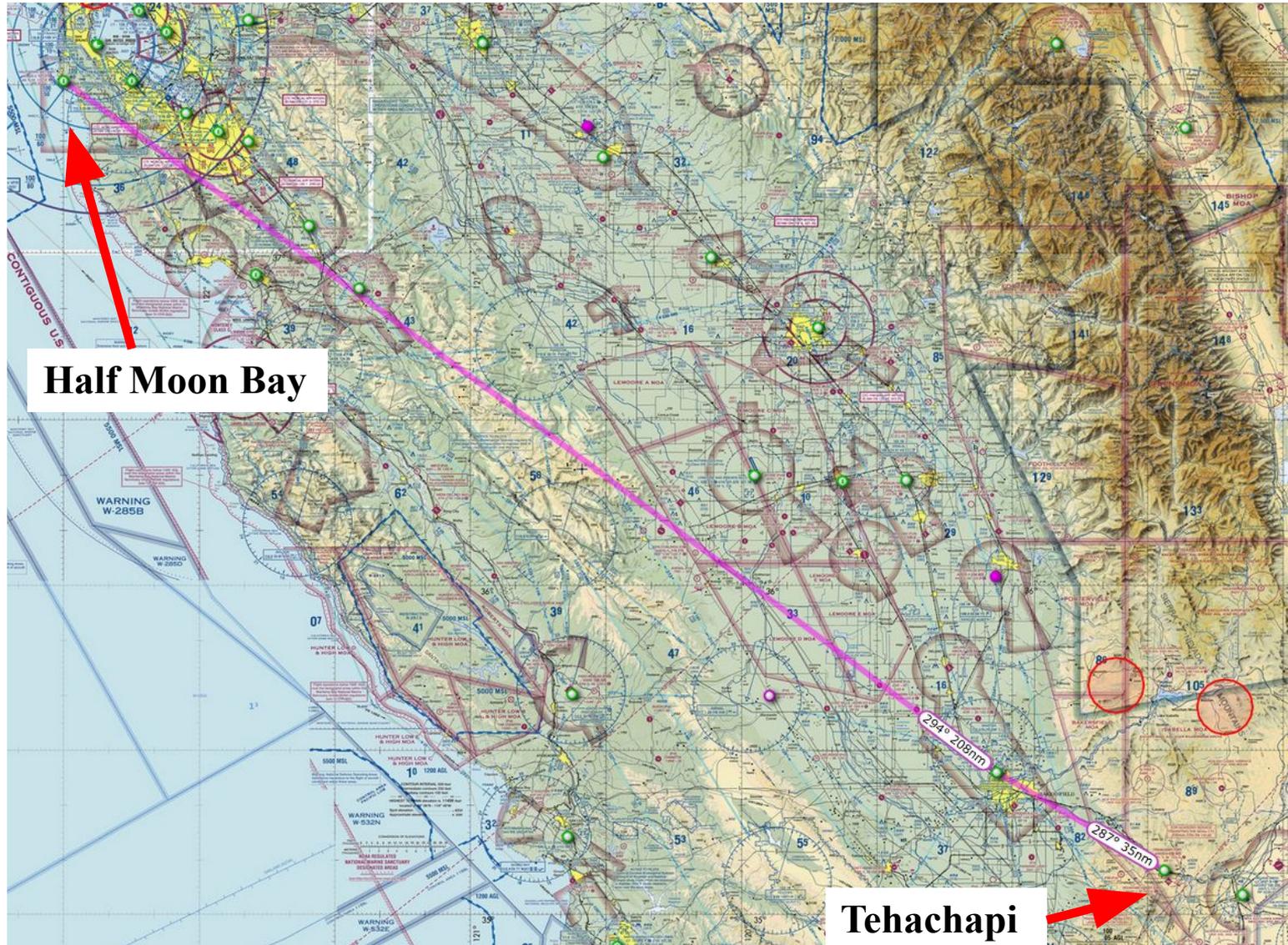
- My Configuration:
 - 180 HP
 - Hertzler 2-blade Prop (very common, along with Catto 3-blade)
 - Wheel Pants / Gear Leg Fairings
 - 2570 RPM - 2600 RPM – 60% - 74% Power depending upon altitude
- Achieve consistent 165 – 170 KTAS (192 – 196 mph)
(numerous other COZY MKIV's report the ~ same)
- 7,500 ft Density Altitude
 - Fuel Burn – 8.8 gph – 19 Nm/gal (22 mpg)
(about the same as my old Subaru Outback on the highway at 65 mph - twice as good as my Ford F-350 Diesel)
- 13,500 ft Density Altitude
 - Fuel Burn – 7.7 gph – 21 Nm/gal (25 mpg)
- Range
 - Well over 1000 NM (1150 miles)
 - Well over bladder range
 - Endurance over 6 – 7 hours

Travelogue – Easy Day Trip



~6 hour
Drive

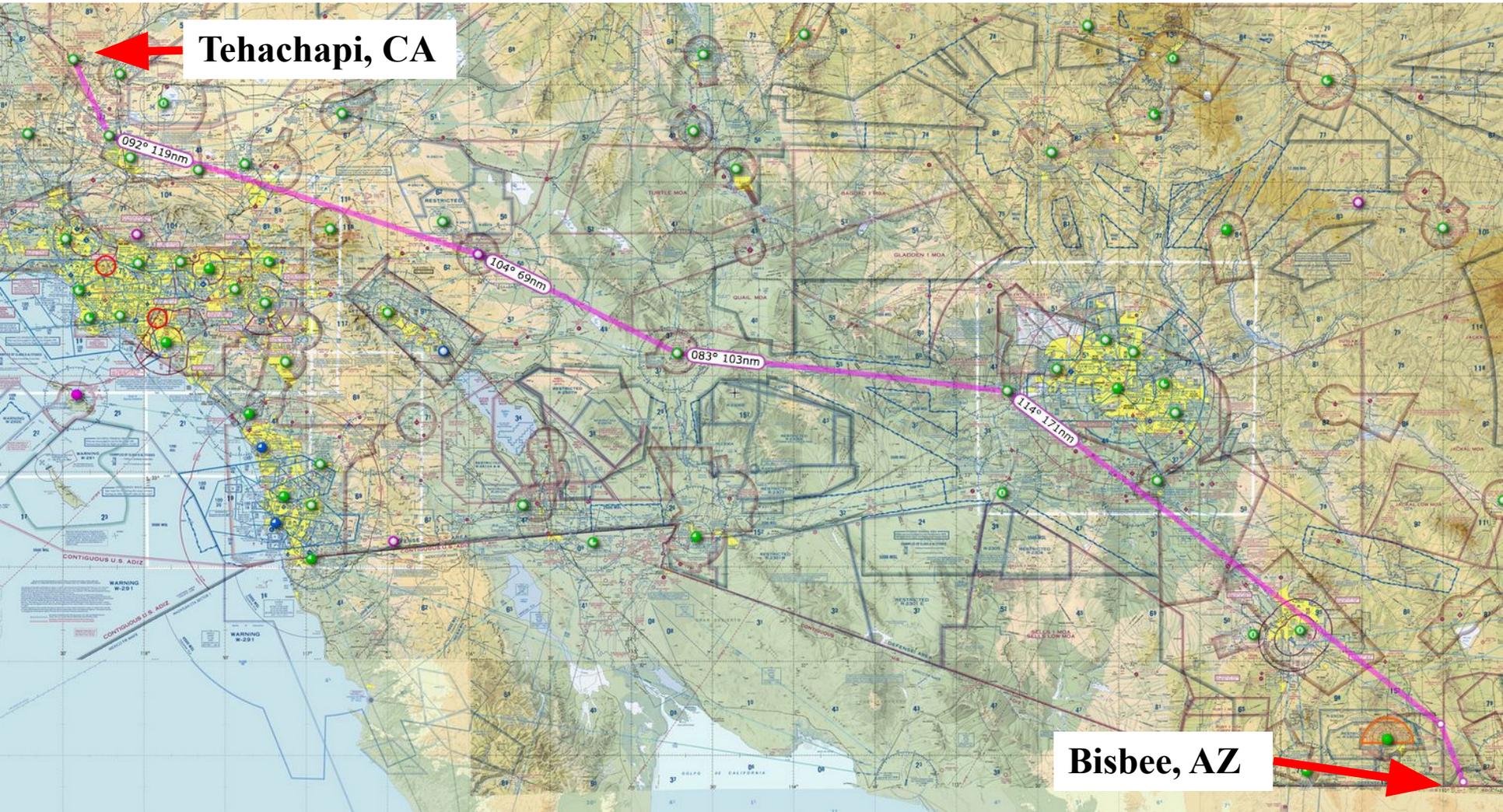
1.3 hour
flight



Travelogue – Go Visiting #1



~11 hour drive becomes 3.2 hour flight



Tehachapi, CA

Bisbee, AZ

Travelogue – Go Visiting #2



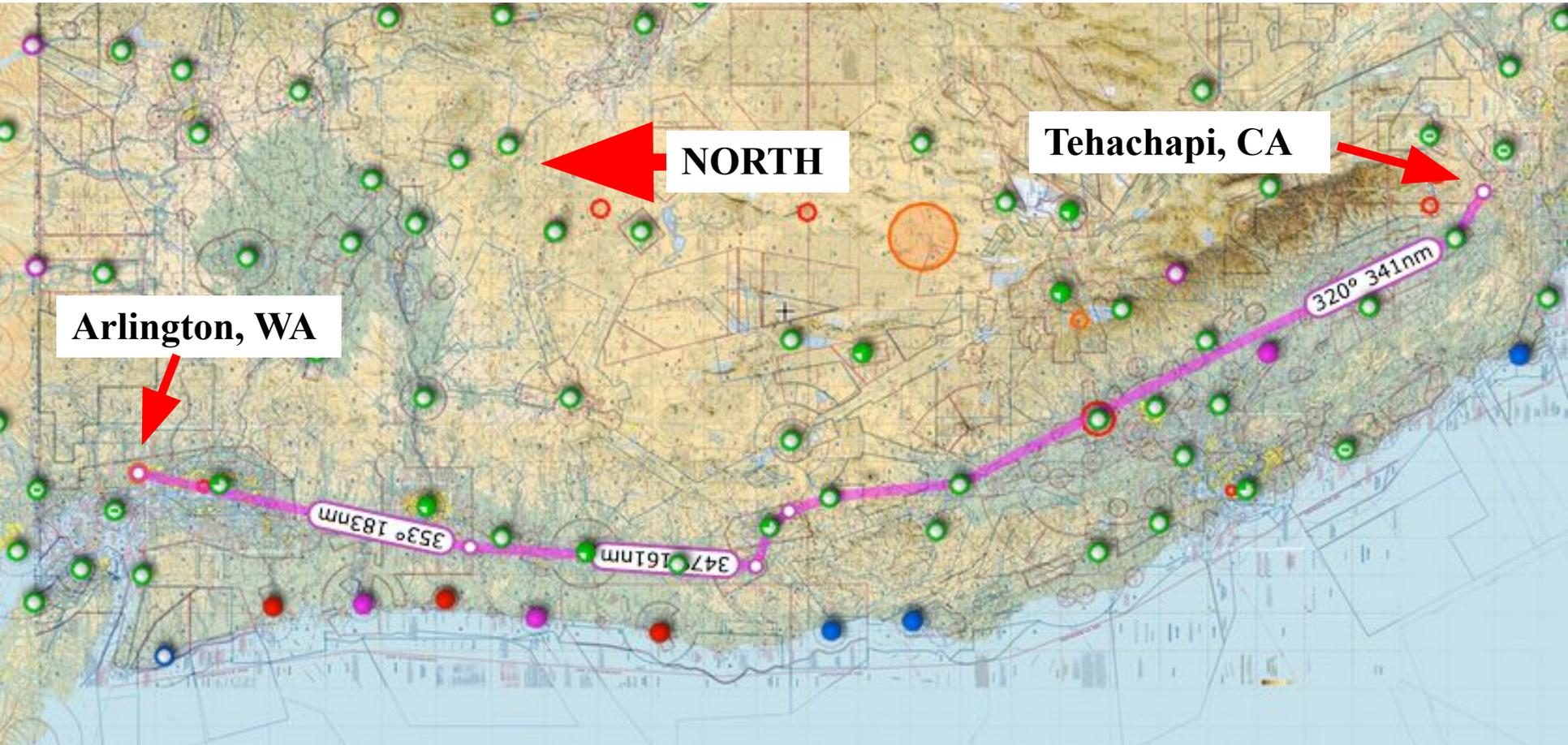
~16 hour drive becomes 4.5 – 5.5 hour flight



Travelogue – Go Visiting #3



~17.5 hour drive becomes 5.5 hour flight

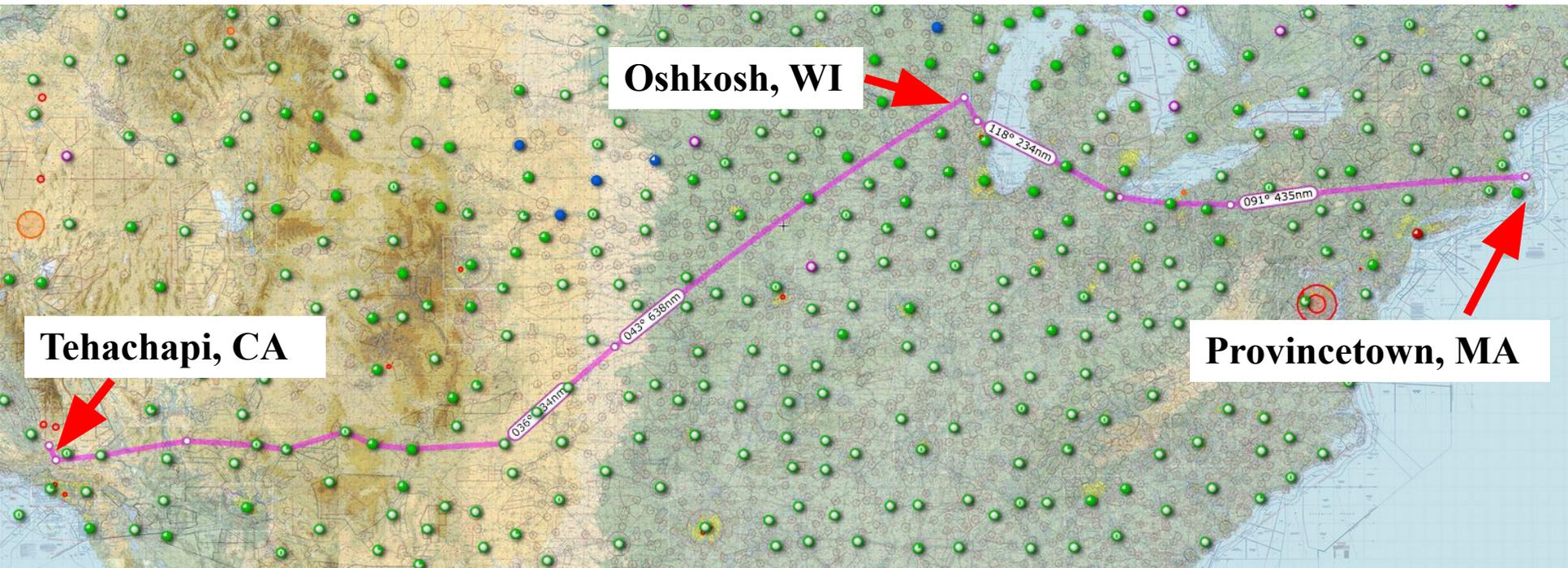


Why does North have to be up?

Travelogue: Long Cross Country



- ~46 hour drive becomes 16 hour flight over 1.5 - 5 days – can be done with only 2 stops, if desired
- Tehachapi to Oshkosh Door to Door (on-airport) takes about the same time as driving to LAX, flying commercial from LAX to Appleton, WI and taking bus from Appleton to OSH – can get to OSH in 10 hours of flying with one 1 hour stop



What Will I Talk About?



- *Standard Introduction for the Newbies* (~15 min.)
 - *Who Am I?*
 - *What's a COZY MKIV?*
 - *Why a COZY MKIV*
 - *COZY MKIV Plans*
 - *COZY MKIV Cost / Time To Build / Completions*
 - *COZY MKIV Support*
 - *COZY MKIV Parts Vendors*
 - *How Many COZY's Under Construction / Flying?*
 - *How Does Composite Construction Work?*
- *Travelogue – What Can You Actually Do In This Plane?* (~10 min.)
 - *Climb Performance*
 - *Cruise Performance*
 - *Easy Day Trip*
 - *Go Visiting #1*
 - *Go Visiting #2*
 - *Go Visiting #3*
 - *Long Cross Country*
- *Miscellaneous Topics* (~15 min.)
 - *Aircraft Design Margin Usage*
 - *Flight Testing Methods*
 - *Common Modifications*
 - *Major*
 - *Minor*
 - *COZY Performance Modifications*
 - *COZY Recommended Modifications*
 - *COZY Discouraged Modification*
 - *COZY Safety Issues for builders / 2nd owners / buyers / non-builders*
- *Transition into a Canard Aircraft* (~5 min.)
- *Super Long Range COZY III* (~5 min.)
- *Questions and Answer – until done (ANY topic)*

Aircraft Design Margin Usage



- “Unfortunately in science what you **believe** is irrelevant” – **Bill Husa** (aircraft designer)
- August, 2011 **Sport Aviation** article by **Dick VanGrunsven** (designer of all RV aircraft) addresses overweight/overpowered aircraft as well as other modifications – specifically in response to an award winning RV-10 written up in Sport Aviation!
- A couple of quotes from Dick:
 - ...Any “penciled in” gross weight increase is just wishful thinking. **The laws of physics are not repealed by wishful thinking.**
 - **WHO OWNS THE MARGIN?**
It seems common practice among homebuilders to second-guess the factory engineers, particularly regarding gross weight increases. Because of all of the added features, empty weight creep erodes the aircraft’s useful load. The simple solution for the homebuilder is to “pencil in” a new gross weight limit. “It’s only 100 pounds (3.7 percent) more; how much effect can that possibly have?” Imagine this example: You are on a mid-size airliner with a gross weight of 270,000 pounds. Just before leaving the gate, the captain comes on the PA system and says: “We’ve overbooked more than usual today, so we’re going to assume that the factory engineers over-designed this airplane and allowed an abundant safety margin. We’re going to take off at 280,000 pounds instead. So move over, there are 50 more passengers coming on board.” Run the numbers; it’s the same over-weight ratio as simply pencilling in an additional 100 pounds to the gross weight of an RV-10.

Along with gross weight increases, some builders take the same liberties with horsepower increases and speed increases, betting their lives on the assumption that the airplane is designed with a huge margin of safety—it is really far stronger than it needs to be. This is not really true. **Certificated aircraft, and well-designed kit aircraft, are designed to withstand limit loads at specified maximum weights. During testing, they are subjected to ultimate loads, which are higher than design limit loads by a specified margin. Yes, there is a margin between the design and ultimate strengths. But that margin belongs to the engineer. He owns the margin. It is his insurance against the things he doesn’t know or can’t plan for, and the pilot’s insurance against human error, material variations, and the ravages of time.** Wise pilots respect this design safety philosophy and leave this insurance policy in effect by operating strictly within established limits.
- Emphasis in **red** MINE...

Flight Test Review



- **NOTE:**

- Flying around in circles for 40 hours at one CG is **NOT** flight testing, especially in a custom, plans built aircraft, no matter how many people **SEEM** to get away with it. You can write anything you want in the logbook – that doesn't change what the aircraft actually will **DO**



- Your airplane is **NOT** identical to any other airplane on the planet, and even if it has the same name as 200 or 2000 other aircraft, it needs to be flight tested as if it was the only one on earth

- **Purpose of Phase I Flight Testing period:**

Determine **ALL** performance characteristics of airplane at **ALL** corners of the attainable performance envelope and known air mass characteristics

- Calibrate Pitot Static System – CAS vs. IAS (**MUST** understand difference between IAS / CAS / TAS / GS)
 - Corollary – **MUST** understand difference between Indicated Altitude / DA / PA and how to calculate
- Takeoff / Rotation performance / airspeeds
- Climb/Cruise performance
- Descent performance – gear/landing brake retracted, extended
- Landing performance / airspeeds
- Stalls / Accelerated stall (more than 1G – performed in 15, 30 45, 60 degree banked turns)
- Deep stall susceptibility / resistance (at rear CG limit)
- Static and Dynamic pitch stability (stick fixed / stick free)
- Lateral stability (spiral, Dutch Roll, Roll/yaw coupling)
- Flutter susceptibility (stick / pedal raps)

- **Performance Envelope Includes:**

- Forward, Mid, Aft CG
- Max Gross Weight (per placard), Middle Weights, Light Weights
- Full, Mid, Low Fuel
- Speeds from V_s (aft CG, min weight) to $V_{ne}+10\%$
- Altitudes from SL to Service Ceiling (or max desired altitude)
- **ANY AND ALL** maneuvers that may be attempted in Phase II
- Phase II flight is restricted to flight envelope expanded in Phase I

Flight Test Review (cont.)



- **Flight Test Guidelines:**

- AC90-89B – EXCELLENT FAA guide
- EAA Flight Test Guide
- COZY POH recommendations
- Aerocanard Flight Test guidelines
- Kevin Walsh's Canard Flight Test Protocol
- Use a Test Pilot if not completely capable and current
- Should take **AT LEAST** 35 hours to perform all required tests – if you're think you're done after 10 - 25 hours, you **haven't done enough testing!!**

- **CG Determination:**

- CG is even more critical for canard aircraft, with relatively small CG ranges and deep stall susceptibility
- Need **ACCURATE** empty CG – implies accurate weighing
- Bathroom scales are **NOT** accurate enough – need/use calibrated aircraft scales
- Can weight with ballast / passengers / pilot for more accurate station information
- Use accurate spreadsheet / calculations to determine flight CG – see sample on **COZYBUILDERS** web page
- Use weights (lead, steel, sandbag, water container) at appropriate station to set CG during testing
- Two stretched COZY's had substantial stability issues early in flight test due to incorrect CG range determination – one crashed fatally

- **Flight Test Procedures:**

- No friends, observers, family – only required test crew – don't need pressure to perform
- Be ready to cancel **ANY** test and **ANY** flight for **ANY** reason if everything is not "just right" (weather, physical condition, aircraft readiness, airport issues, etc.)
- Going in assumption is that the flight will **NOT** happen - only if everything is exactly right do you fly
- Have a planned and practiced "test card" for each flight – plan **EVERY** flight completely – all actions and all coms – do not deviate except in an emergency
- Sample test cards available from other builders – shown on next slide

- Start testing in **CENTER** of CG range
- Start testing at light weights
- Slowly add weight and move forward and aft within CG range
- Start with mild maneuvers
- Start with short flights – 20 - 30 minutes
- Runway flights OK if have **LONG** runway
- Gear stays down on first few flights
- Need to be able to hold airspeeds to within 1 - 2 kts.
- Need to be able to hold altitude to within ~10 - 30 ft.
- Need to document everything – take notes, record audio, run video camera, EFIS memory – whatever works for you – you **WON'T** remember everything

Flight Test Review (cont.)



Example First / Second Flight Test Card – Controls / Slow Flight:

GPS: Set to FIT area - 12 mile range

Radio: Fitchburg traffic, Experimental N83M(ike)Z(ulu) departing runway XX to the west – Fitchburg.

Throttle: Full - Check for 2300 - 2400 RPM static

Accelerate: To 75 - 80 mph and rotate

Climb: 100 mph straight out to 1000 ft.

Check: CHT / Oil Pressure

Climb: Climb checklist - 100 mph IAS gentle turn to west area to 3000 ft.

Level: 3000 ft.

Throttle: 2200 RPM or to 135 mph (do not exceed 140 mph IAS)

Radio: Fitchburg traffic, Experimental N83M(ike)Z(ulu) maneuvering at 3000 ft. 3 miles west
Fitchburg

Controls: Check rudders - 5 degrees yaw - return to S&L (check control pressures, stability, engine gauges)

Controls: Check elevator - 3 degrees up/down pitch – return to S&L (check control pressures, stability, engine gauges)

Controls: Check roll - 5 degrees roll left/right increasing to 20 degrees - return to S&L (check control pressures, stability, engine gauges)

Radio: Fitchburg traffic, Experimental N83M(ike)Z(ulu) maneuvering at 3000 to 5000 ft. Fitchburg

Climb: 100 mph, max throttle, to 5000 ft. (clouds allowing)

Approach: Practice approach - use descent/landing checklist - to 4000 ft. (check control pressures, stability, engine gauges)

Approach: Same to 3000 ft. (check control pressures, stability, engine gauges)

Trim: Check trim response - pitch and roll

Radio: Fitchburg traffic, Experimental N83M(ike)Z(ulu) maneuvering at 3000 ft. Fitchburg

Climb: 100 mph, max throttle, to 5000 ft. (clouds allowing)

Level: 135 mph at 5K ft., two clearing turns, stabilize speed, altitude, heading

Throttle: Reduce to 900 RPM - hold altitude with trim/stick - check control inputs (pitch, roll, yaw) throughout slowdown

Pitch: Note nose bobbing at ~70 mph (If no nose bobbing at 65 mph, drop nose and increase speed)

Throttle: Increase power to maintain altitude at nose bob speed

Roll: Note roll/yaw response during nose bobbing
(Check engine gauges)

Radio: Fitchburg traffic, Experimental N83M(ike)Z(ulu) descending from 5000 ft. to pattern altitude Fitchburg

Common Modifications - Major



Description	Pros	Cons	Notes
Remove Lower Winglets	Aesthetics to some	Decrease rear CG range limit – deep stall susceptibility	Nat Puffer - mandatory to have LW's on COZY MKIV
Raise Canopy 1" – 2"	More headroom	Slightly more drag	Nat Puffer Approved
Widened Canopy	More head/shoulder room	Slightly more drag	Aerocanard Style
Forward Hinged Canopy	Major safety improvement	More complex/heavier	Cosy Classic style
Long-EZ type strake shape ("Cozygirrrl")	Elbow room	Can't install fuselage side windows	Cozygirrl style
Original Length Canard	Better performance at very forward CG's	Requires CG range modification	Nat Puffer Mandatory to cut 6" from original length
Retractable Main Gear	Slight speed increase	Extreme complexity and increased failure probability	Nat Puffer – not recommended
High Capacity Brakes	Useful braking capability	Matco slightly heavier – Beringer lighter & more \$\$\$	MATCO or Beringer?

Common Modifications - Minor



Description	Pros	Cons	Notes
Electric Nose Gear	Easier to raise nose – can raise with passengers – saves old folk’s backs	Slight weight increase	Nat Puffer Approved
Electric Landing Brake	Saves weight, space, lower failure rate	None	Nat Puffer Approved
Move Landing Lights	Remove air entry to cockpit	Time to design / install	
Hanging Rudder Pedals	Gives free floor space for heels	Complex / heavier than plans	Velocity style – might be a few flying
Eliminate Fuselage Access Door	Fix air/water ingress	Have to have other method of opening from outside	
Main Gear Leg Fairings	Small speed increase	Time to install	
Nose Wheel Doors	Reduce air ingress to cabin / noise reduction	Slight complexity	
Fuel Injection	Better fuel distribution – better economy from LOP operation	Cost	
Electronic Ignition	Greatly increased efficiency	Unless using Pmag, need backup electrical system	Don’t recommend Pmags
Electric Pitch Trim	Easier to use	Time to design / install	
Fuselage Side Windows	Greatly increased visibility	Time to design / install	
Canopy Seal Improvement	Better weather sealing / heating efficiency	Time to design / install	

Performance Modifications



- Wheel Pants (size / design) - 8 to 12 kts
- Main Gear Leg Fairings - 3 to 5 kts
- Retractable Landing Gear - 0 to 20 kts
- Cowling/Cooling
(airflow / boat-tail / exhaust) - 0 to 15 kts
potential
- Winglet Intersection Fairings - ~1 to ~4 kts
- Electronic Ignition - 5% - 10% fuel efficiency
- Fuel Injection - 5% - 10% fuel efficiency

- Appropriate VG's (per **Mark Beduhn's** installation):
 - Decrease landing speed - 7 to 10 kts
 - Decrease top end speed - 1 to 3 kts

My Recommended Modifications



- **Safety:**

- Forward Hinged Canopy - Inadvertent in-flight canopy opening danger mitigation
- High Capacity Brakes - Aborted Takeoff capability
- Engine Monitor / Sensors - Automatic Warnings of issues
- Prop Bolt Belleville Washers - Retain prop / reduce maintenance
- “Bulb” Nose gear strut attach - Retain nose gear in case of NG-2 or flox failure
- Appropriate VG’s
(per **Mark Beduhn’s** install):
 - Claimed decrease landing speed - 7 to 10 kts
 - Decrease top end speed - 1 to 3 kts

- **Performance:**

- Wheel Pants (size / design) - 7 to 12 kts
- Main Gear Leg Fairings - 3 to 5 kts (see Curt Smith’s 2008 OSH Presentation)
- Electronic Ignition - 5% - 10% fuel efficiency gain
- Fuel Injection - Allows better leaning for efficiency and temps; 5% - 10% fuel efficiency gain

- **Comfort:**

- Nose Lift - Helps old backs
- Fuselage Side Windows - Greatly assists downward visibility, especially for short people
- Fuselage access door elimination - Stops air / water leakage
- Electric Landing Brake - Simpler / lighter / more reliable than manual system
- Electric Pitch Trim - Ease of use
- Raised Canopy - Head room
- Improved Canopy Seal - Heater works better

Modifications I Discourage



- Carbon Fiber Structure
 - Cost, need for vacuum bagging, change stress flow (if you're not a composite structural engineer, don't do this – reference Burt's comments on the issue)
- Retractable Main LG
 - Cost, complexity, maintenance
- Constant Speed Propeller
 - Cost, complexity, maintenance – only if absolutely need takeoff performance increase
- Eliminating Lower Winglet
 - CG range/deep stall margin loss
- Keep original Canard Length
 - Moves CG range forward - only OK in very specific situations
- 6.00x6 wheels/brakes
 - Unnecessary, heavy; changes ground incidence
- Downdraft Cooling
 - No evidence of better cooling performance – difficult implementation
- Fuselage Stretch
 - Aerodynamic stability and deep stall between Main Wing / Canard implications – needs analysis/testing to be safe
- Nose Stretch ahead of Canard
 - Same issues as Fuselage Stretch
- Fuselage Widening
 - Same issues – a number are flying, but until test data is published, I will continue to discourage

Safety Issues for Builders / Flyers / 2nd Owners / Buyers / Non-Builders



- **Full Presentation:**
 - See 2013 Columbia presentation “**Holy Crap - you actually have been FLYING that thing?**” (available on Cozybuilders web page)
 - Numerous examples of poor build quality
- **Builders:**
 - Pay attention to the plans – read 3 times, build once
 - If Burt/Nat (or any designer) says something’s important, mandatory, or critical, **DO IT RIGHT!**
 - If you did it wrong, fix it or do it **OVER!**
 - At all points in the build, ask yourself **truthfully:**
 - “**Do I know more about this plane than the designer?**”

The answer will almost always be:

 - “**NO – NO, I do not**”
 - Document anything discrepant for future use/owners
- **Flyers:**
 - Keep track of any changes to the aircraft that may in any way affect safety – i.e., repaint (control surface balance), additions, modifications, etc.
 - Re-rig if there are **ANY** question
 - Test all changes
- **Purchasers/New Owners:**
 - Ask a lot of questions
 - Investigate **ALL** safety related issues
 - Hire qualified type-knowledgeable inspector for pre-buy inspection
 - How to know who’s “qualified”?
 - Just because someone is an A&P, or even a type builder/repairman, does not assure knowledgeable inspections and careful work
 - Use published **Condition Inspection** criteria for pre-buy inspection
 - Use **AC43.13-1B** and **CFR Part 43 Appendix D** criteria for pre-buy inspection
 - Perform **FULL** Phase I flight test regime after acquisition to verify flight characteristics
 - **Caveat Emptor**

What Will I Talk About?



- *Standard Introduction for the Newbies* (~15 min.)
 - *Who Am I?*
 - *What's a COZY MKIV?*
 - *Why a COZY MKIV*
 - *COZY MKIV Plans*
 - *COZY MKIV Cost / Time To Build / Completions*
 - *COZY MKIV Support*
 - *COZY MKIV Parts Vendors*
 - *How Many COZY's Under Construction / Flying?*
 - *How Does Composite Construction Work?*
- *Travelogue – What Can You Actually Do In This Plane?* (~10 min.)
 - *Climb Performance*
 - *Cruise Performance*
 - *Easy Day Trip*
 - *Go Visiting #1*
 - *Go Visiting #2*
 - *Go Visiting #3*
 - *Long Cross Country*
- *Miscellaneous Topics* (~15 min.)
 - *Aircraft Design Margin Usage*
 - *Flight Testing Methods*
 - *Common Modifications*
 - *Major*
 - *Minor*
 - *COZY Performance Modifications*
 - *COZY Recommended Modifications*
 - *COZY Discouraged Modification*
 - *COZY Safety Issues for builders / 2nd owners / buyers / non-builders*
- *Transition into a Canard Aircraft* (~5 min.)
- *Super Long Range COZY III* (~5 min.)
- *Questions and Answer – until done (ANY topic)*

Transitioning Into a Canard Aircraft



- Canard just another aircraft – not magic
 - Flying is **SIMPLE** – just think at the plane – side stick is easy, from either side
 - Generally takes about 5 minutes for new pilot to get comfortable keeping the blue up and the green down
 - Aircraft are pitch sensitive, but not “twitchy”
 - Takeoffs: PIO’s common on first few, then learn to not overcontrol rotation
 - Landings are where most training goes – I find that it takes 5 – 20 landings for new pilot to become comfortable with sight picture and lack of standard “flare”
- COZY is excellent transition aircraft for all Rutan Derivative Canards (VE, LE, COZY, Berkut, etc.) Right seat is good for standard tandem planes with right side stick and with full dual controls, new COZY pilots can transition in left seat
- There are a few CFI’s with COZY’s who do training – not easy to find, but they’re out there – you have to be willing to travel to them
- Many COZY pilots (myself included, but **many** others) will give transition flights (**not** training – we’re **not** all CFI’s) for those that cannot get a CFI – some times, insurance companies will allow this for coverage
- Find people near you – the canard community is tight and will support new owners/pilots with flights and advice

Super Long-Range COZY III



- Damon Meyer – N22AZ
- Planning on round-the-world record time flight
- Modifying plane for range, safety and capability
- Testing for performance understanding
- Has Mechanical Fuel Injection & one Electroair EI/one P-Mag
- Dynon Skyview, Garmin 430, Dynon D6 backup EFIS
- Installed new Instrument Panel
- Installed removable (15 min.) Aux. tanks
- Installed Fuel Level Senders – all four tanks
- Replaced Nylaflo Brake lines with SS/Teflon & AL hard lines
- Installed Gear Leg Fairings
- > 3,000 NM Range
- > 30NM/gal efficiency
- > 20 hr. Endurance
- Holds Ontario, CA to Portland, ME speed record, set in early July – 2258 NM nonstop (100 NM longer than Hilo, HI to Mojave, CA)



September 14th, 2021

COZY / Plans Built Aircraft

Page 33

Questions? (& Answers)



- Email: marc_zeitlin@alum.mit.edu
- Phone: (978) 502-5251
- Websites: <http://www.cozybuilders.org>
<http://www.burnsideaerospace.com>