

Cozy 540 RG



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1:45 PM – 2:05 PM

Forum Tent 02 – GAMA Pavilion

Goals: Something Different



- Greater performance
- Faster cruising and top end speeds
- Greater climb rate
- Roomier – more storage area
- Cleaner – more aerodynamic, improved efficiency
- Greater range
- Ability to minimize weather exposure thru performance enhancements

Major Changes



- IO-540 Lycoming engine (260 HP)
- Fully retractable landing gear
- Fuselage stretch (12”)
- Increased fuel capacity (75 gallons)
- Carbon fiber utilized for construction
- Custom Turtleback, Upper Cowling, Lower Cowling

Engineering Logic



Power plant:

More H.P. utilizing proven 6 cylinder Lycoming power plant reliability.

Pros: Increased speed, improved climb rate, smoother running operation, good dependable track record.

Cons: Initial cost, operation costs, rebuild and repair costs, extra weight.

Design considerations: Fuselage stretch, Weight and Balance adjustments for additional 110 lbs. Induced “G” loads.

Retractable Gear



- Pros: Increased speed, shorter travel times, greater range, reduced drag, increased efficiency, greater economy, good looks.
- Cons: Added complexity, added cost, required maintenance, added installation time, NACA scoop unusable - alternate cooling required.
- Design considerations: Installation engineering, fuel capacity, fuselage sump tank, down draft engine cooling.

Speed and Induced “G” Loads



Pros: Higher performance (200 kt cruise, 250 kt VNE).

Cons: Greater “G” loads, additional materials cost.

Design considerations: Carbon fiber center section spar caps, main wing spar caps, main wing skins. Localized strengthening reinforcements.

Required Building Additions



Pros: Faster, roomier, performance enhanced, climb rate, efficiency.

Cons: additional engineering, added building time, scratch built components.

Design considerations: Turtle back, Opera windows, cowling set, retractable main gear, strakes, sump tank, fuel capacity.

Performance



- 200 kt economy cruise, 10 -11 GPH @ 6000'
- 200 kt economy cruise, 8 - 9 GPH @ 18,000'
- Climb rate - up to 3000' FPM
- Max speed - 270 MPH
- Range - 1500 SM
- Empty weight - 1333 lbs
- Gross weight - 2333 lbs



Flight Characteristics



- Identical mannerisms as Cozy III, Cozy MK4
- Stall proof
- Spin proof
- Predictable
- Efficient
- Fast



Flight Testing and Envelope Expansion Data



- The CG range is 95.5 - 100.36 (normal operation range)
- The first stall series was conducted with 25 lbs ballast in the passenger leg area which provided a CG of 100.24
 - Power off stall, 53 kts, and 16 degrees fuselage attitude
 - Partial power stall, 49-50 kts, and 18 degrees fuselage attitude
 - Full power stall, 45 kts, 20 degrees fuselage attitude
 - No indications of any instability or deep stall conditions

Flight Test Data (cont.):



- The next series was conducted moving the ballast to the co-pilot seat area which provided a CG of 100.57; this is aft of the original envelope (99.5-100.36) and I was exploring new territory
 - Power off stall, 50 kts, and 13 degrees fuselage attitude
 - Partial power stall, 44 kts, and 15 degrees fuselage attitude
 - Full power stalls were not conducted
 - Indications of an initial deep stall condition were more prevalent... the fuselage angle was less than at forward CG test results when the stalls occurred
 - Flight instability was present with a slower recovery from each stall test and further aft CG testing may have proved a deep stall condition
 - With the 24 gallon of fuel in the main tanks and 11 gallons in the sump tank the fuel would have been pooling ahead of the main spar or in the aft of the main tanks causing an even further aft CG condition

Flight Test Data (cont.):



- Any comments are welcome and further testing at this or further aft CG condition will not be explored.



Future New Build or Design Change Considerations



1. Induction and oil cooling inlet – provide larger inlet opening on lower cowling for more induction inlet air and oil cooler air volume.
2. Main landing gear – provide heavier main gear legs for increased strength and weight, install larger wheel wells for using 600x6 tires if needed, modify hydraulic cylinder to eliminate cable slack when gear is down and locked. Install push to start momentary button to jump start hydraulic pump.
3. Nose gear – move pivot point 2.5” further forward to accommodate a longer nose gear strut and instrument panel clearance. Provide longer nose gear strut to maintain positive incidence with main gear using 600x6 tires. Add heavier lay-up schedule “S” glass and “E” glass wraps to strut. Install heavier nose gear spring.

Future Considerations (con't.)



4. Turtle back – enlarge firewall and turtleback head and shoulder area for additional room.
5. Front seats – provide Stagger-EZ seating configuration for additional front seat loading, shoulder room and leg room. Front seat co-pilot seat offset will allow a greater front seat maximum weight. Move front pilot seat back 1” further back for added leg clearance.
6. Top cowling – air inlets for cylinder head cooling, smaller outlet area for drag reduction. Individual exhaust pipes for performance increase. Cowl access like the Stagger-EZ.
7. Canopy – thicker canopy material for bird strikes, complete canopy seal with overlapping lips on the outer side-entry side and inner side- passenger side.
8. Cockpit ventilation – install eye ball vents for summer temperatures.
9. Wing to winglet drag reduction blend.

Future Considerations (con't.)



10. Ailerons – increase overall length by 12” and depth by 1” for improved roll rate and roll control at low speeds.
11. Winglet airfoil change for increased performance, like Klaus Savier’s Vari-Eze.
12. Nose access door seal, stepped groove weather proofing.
13. Strakes – move inner wall bulkhead out enough for an oxygen cylinder.
14. AHRS, voltage regulator, EIS – move to under passenger front seat storage area for servicing while in flight.
15. Rudder pedals – move fulcrum point to top and position further forward for needed operational room.
16. Fuselage sump tank, decrease volume and move forward to provide recline clearance for rear seat passengers.
17. Fuel system – install aircraft grade fuel selector valve, install locking fuel caps.

Future Considerations (con't.)



18. Electrical system – provide dual buss bars for back up in case of electrical failure, second battery if necessary.
19. Cowl flap doors – install for additional full power take off and climb cooling.
20. Nose compartment – install dedicated area for nose ballast or tool kit, tie down hardware, exhaust stack plugs, etc.
21. Cockpit area – provide map and chart storage areas under instrument panel, center arm rest storage area.



Retractable Gear Kit



Cozy Retractable Gear Parts List (7-13-2007)

<u>Description</u>	<u>Quantity</u>
1. Gear legs	1 set (one RH, LH)
2. Wheel wells	1 set (one RH, LH)
3. Leg wells	1 set (one RH, LH)
4. Over Center Linkage Assembly	1
5. Pulley Holders	2
6. Pulleys	2
7. Pulley Bracket Assembly	1
8. Cable Assemblies	2
9. Bronze Flanged Bushings	6
10. Dump (Bypass valve)	1
11. Gear Switch	1
12. Hydraulic Pump	1
13. Pressure Switches	1 (1 high, 1 low)
14. Front Hydraulic Cylinder Bracket	1
15. Rear Hydraulic Cylinder Bracket	1
16. Hydraulic Cylinder	1
17. Napkin Rings (Top of gear leg rings)	1
18. Hardware Package	1
19. Installation Manual	1

Cost: \$4,000 (Kit available thru Velocity Aircraft this fall, 2007)

Cost Review for Cozy 540RG



- Engine – IO540 D4A5, narrow deck parallel valve

Estimated engine cost difference	\$5000
Retractable gear	\$4000
Carbon fiber	\$2050
Custom engine mount	\$1300

- Scratch build items - raw materials and time
- Items not purchased:
 - Main Landing Gear Hoop
 - Wheel Pants
 - Upper and Lower Cowlings
 - Preformed Opera Windows
 - Turtle Back
 - Standard Engine Mount

Plans Addendum



- Changes addendum is being considered at a future time when time is more plentiful.



Questions? and Answers

