The Cozy

(SIDE-BY-SIDE LONG EZ)

OWNER'S MANUAL

First Edition — May 1986

Published by

Co-Z Development Corp.

2046 N. 63rd Place

Mesa, Arizona 85205

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CONTENTS

NOTE

THE INFORMATION IN THIS MANUAL REFERS TO AIRCRAFT BUILT ACCORDING TO THE COZY MANUFACTURING MANUAL. ANY HOMEBUILDER MODIFICATIONS MAY ALTER THE APPLICABILITY TO HIS (OR HER) AIRCRAFT.

WARNING

THIS MANUAL IS OBSOLETE UNLESS UPDATED BY NEWSLETTER #12 AND ON.

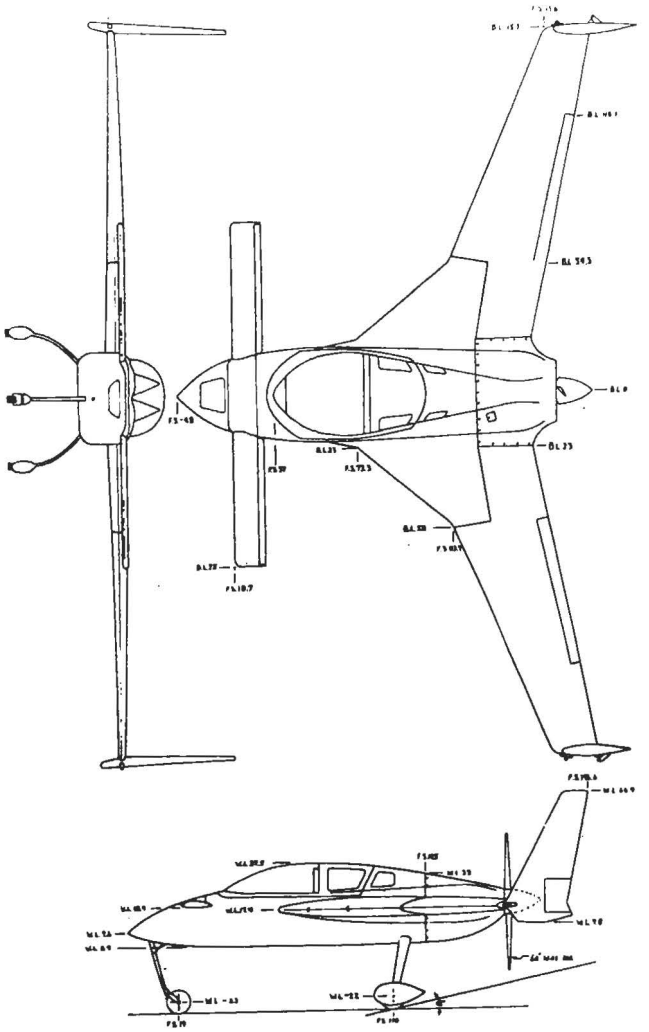
GENERAL DESCRIPTION

The COZY is a small, compact, high performance, high utility sportplane. It features side-by-side seating for an average size couple or smaller, full dual controls, an expansive instrument panel, and a large baggage bay in the rear which could double as an extra seat. While recommended mainly for day-VFR operation, competent pilots can also equip it for night and IFR flying. The recommended power plant is any model of the O-235 Lycoming. A mechanical fuel pump is required. It has an alternator powered electrical system and can be equipped with an electric starter. The cockpit layout is designed to complement pilot and/or co-pilot work load, with throttle, mixture, carb heat, pitch trim, aileron trim, landing brake, landing light, nose wheel crank, cabin heat and fuel tank selector valve located in a center console for equal access to both pilot and copilot, and individual side-stick controllers on both outside armrests. Seating provides armrest, lumbar, thigh and head support for "recliner-chair" comfort not found in conventional aircraft seats. This allows long, fatigue-free flights.

The COZY uses the very latest aerodynamic technology, combining winglets, a high aspect-ratio wing with Eppler airfoils optimized for efficient cruise, and a configuration with far less wetted area than conventional airplanes. Because its power-off glide angle is only 3.7 degrees, a belly mounted landing brake is used to steepen descent to landing.

DIMENSIONS

Wing Span/Area	26.1 Ft. (7.9m) /	81.99 $Ft.^2$ ($7.62m^2$)
Canard Span/Area	12.5 Ft. (3.8m) /	13.6 $Ft.^2$ ($1.26m^2$)
Total Wing Area		95.6 $Ft.^2$ ($8.88m^2$)
Length	16.8 Ft. (5.12m)	
Height	7.9 Ft. (2.4 m)	
Cockpit Width		
Front	40 in. (1.02m)	
Rear	25 in. (0.64m)	
Cockpit Height		
Front	36 in. (0.91m)	
Rear	35 in. (0.89m)	
Cockpit Length		
Front	70 in. (1.78m)	
Rear	54 in. (1.37m)	



FLYING QUALITIES

The flying qualities of the COZY are superb. It is a very solid, stable airplane that has responsive ailerons, good turbulence resistance, excellent "hands-off" stability and docile stall characteristics. It resists stall or spin even when maneuvered sharply to full aft stick. Flight tests show the prototype to be free from stall departures and spins. Climb is excellent, even at full aft stick speed. Trim changes due to power, gear retraction or landing brake are all very small.

The COZY's approach and langing speed are 80 mph (68 kts) and 65 mph (55 kts) at normal landing weights. The approack and landing are docile and conventional. Forward visibility is excellent even during touchdown.

UTILITY

The COZY adds side-by-side seating, a large instrument panel, full dual controls, and a large baggage compartment to the unusual efficiency, speed and range of the Long EZ, from which it was derived*. This allows passenger to assist with piloting and/or navigating duties, making long trips more enjoyable and less fatiguing. More complete instrumentation and navigation aids adds a margin of safety on long trips, particularly if deteriorating weather is encountered enroute.

Range will depend upon the cruise speed selected and the amount of payload available for fuel. Fast cruise at 8,000 ft. and 180 mph results in a fuel burn of 6.7 gph. With a full load of fuel, range would be 1,200 miles in 6.7 hrs with a 1 hr. reserve. Economy cruise at 12,000 ft. and 140 mph results in a fuel burn of 3.6 gph and with full fuel, range would be 1,800 miles in 12.8 hrs. with 1.5 hrs. reserve.

The COZY is not suitable nor recommended for operations from unprepared surfaces; i.e. gravel, loose dirt, or rough fields.

The COZY requires management of front seat loading within predetermined limits as discussed below in "Weights" and in "Weight & Balance" section, page **28**.

*Under a written license agreement with Rutan Aircraft Factory.

WEIGHTS

The normal equipped empty weight is approximately 900 lbs. Actual weights for each airplane will vary, according to installed equipment and builder workmanship. The maximum allowable gross weight for takeoff is 1500 lbs., except as noted below.

The front seat, because of its location approximately 40" ahead of the acceptable loaded c.g. range, will have a minimum and maximum weight limit, which will be determined for each airplane after completion as part of the weight & balance. The prototype, with a light engine installation, no starter, battery in the aft location, and a heavy instrument installation, has a 185 lb. minimum and 340 lb. maximum front seat limit. Pilots lighter than the minimum, when flying solo, MUST add ballast to the nose compartment. The maximum weight limit cannot be extended by use of ballast.

The back seat can structurally accommodate a maximum of 200 lbs, if gross weight limit of 1500 lbs. allows, and if placed over c.g. so as to not affect c.g. adversely.

Total loading of aircraft with people, baggage, and fuel must meet both c.g. and gross weight limitations.
NOTE: A gross weight in excess of 1500 lbs. for take off only can be allowed only under certain conditions. See "Weight & Balance" section of this manual.

ENGINE AND PROPELLOR

All models of the Lycoming O-235 are currently approved for use in the COZY. A mechanical fuel pump is required. If the engine was originally installed in a high-wing airplane, like a Cessna, it will not have a mechanical pump. However, one can be retrofitted at a nominal additional cost. Other accessories such as alternator, starter and vacuum pump may be used. The most desirable model is the 100 octane with dynafocal mount. All models are suitable for pusher operations in this application. Most models are in current production. Used engines are preferred over new ones, because they are much less expensive and less likely to overheat during initial taxi and flight testing.

Due to weight and balance and structural considerations, heavier or higher horsepower engines are not recommended. The Rolls-Royce Continental O-240 (130 hp) is probably also satisfactory, because it meets the weight limitation, but has not been flight tested in the COZY.

Only the light-weight, fixed-pitch, solid wood propellors are approved. Turbo charging and constant speed, variable pitch or metal propellors are not approved.

The modern wood prop uses a plastic leading edge to minimize rain erosion and has an efficiency close to the best metal propellors, while offering a solution to the fatigue problem. For good takeoff and climb performance, a propellor should turn in excess of 2400 rpm on the ground (static), since horsepower is a function of rpm. The higher the static rpm, however, the higher will be the rpm at 75% power cruise (full throttle at 8,000 ft.). A good "climb" prop will turn 100 to 200 rpm over the engine's rated rpm at 75% power cruise. With light wood props, this overspeed condition is not considered by most people to be detrimental to the engine. Overspeed at maximum cruise can be avoided by selecting a higher pitched "cruise" prop; however takeoff and climb might be affected as much as 25%, and cruise speed will not necessarily be any faster. Data on propellors of 4 different suppliers in a 125 hp Long EZ is shown below:

Manufacturer	Diam./Pitch	RPM	
		Static	Fast Cruise
Ted's	62 x 66	2360	2900
B & T	63 x 67	2300	2920
Grt American	62 x 62	2520	2925
Sensenich	64 x 72	2150	2860

For lower horsepower engines, the pitch should be less. We prefer a "climb" prop to get best takeoff performance, and like to cruise at about rated rpm. At 75% power cruise, the "climb" prop will overspeed, but be slightly faster than the "cruise" prop.

LANDING GEAR

The COZY features a tricycle landing gear with fixed mains and a retractable nose wheel. The main landing gear is a one piece, molded S-fiberglass/epoxy unit which gives exceptional energy absorption for bounce-free landing. For minimum drag penalty with fixed main gear, the gear strut is molded into an airfoil shape, eliminating the need for superficial fairings. The main wheels are streamlined with wheel pants. The retractable nosegear strut is also molded S-glass, and is mechanically actuated by a simple crank in the front cockpit. The nose gear is retracted in flight for optimum performance and also on the ground to provide nose-down parking. This stable, self-chocking parking position allows easy entry for a back seat passenger. Nosegear position is displayed to the pilot through a plexiglass window, through which he views the nose wheel directly.

The main landing gear uses Cleveland 5-inch wheels and brakes, and 500 x 5 tires. The nose wheel is 4-inch diameter and uses a 2.80/2.50 x 4 tire and tube.

The COZY is equipped with a buzzer gear-warning system which is actuated at low power settings with the gear up.

COCKPIT

Both the front and rear cockpits are exceptionally comfortable. Semi-supine (reclined) seating is provided for optimum crew comfort. Although the front seat will physically accommodate a pilot or passenger 6 ft. 4 in. tall weighing 200 lbs. in comfort, the combined weight in the front seat must NOT exceed 340 lbs. (individual airplanes may vary). The rear seat will also accommodate a passenger weighing up to 200 lbs. in comfort. Since the rear seat is over the c.g., only the gross weight limitation need be considered.

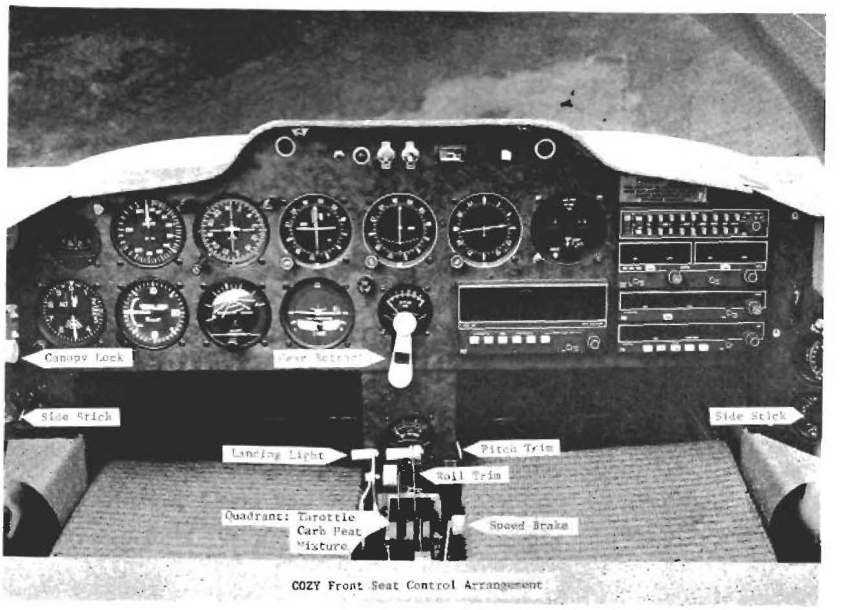
Full flight controls are provided on both sides in the front seat. Wrist-action control sticks are positioned on both the right and left side consoles, enabling the airplane to be flown from either seat, and enabling the pilot to relax and rest the weight of his (or her) arm on the side console, reducing work load on long trips. Throttle, carburetor heat and mixture controls, landing brake handle, landing light handle, and aileron trim are located in the center console. The landing gear crank actuation knob is located in the center of the instrument panel, and pitch trim is located underneath the center of the panel.

Storage pockets are provided at both sides and in the center of the seat back for charts, etc. There is also storage space under the front seats, although not as readily accessible.

The rear seat leg area is wide enough to store luggage even when the seat is occupied with a passenger. Additional storage space is available in the centersection spar and behind the rear seat.

Due to the highly insulated fuselage structure and the large plexiglass canopy, the COZY will maintain about 60° F inside temperature with an outside temperature of 10° F (vent closed, sun shining). Thus the requirement for cabin heat is far less than other light-planes. Due to the small cabin volume and good vent location, the COZY is more comfortable on hot days than conventional light-planes.

The COZY is equipped with an electrical alarm system with buzzer and light which warns the pilot if he advances the throttle for takeoff with the canopy unlocked. Also, a canopy safety latch is installed as a back-up, to catch the canopy if the pilot neglects to lock it and ignores the warning system.



COZY Front Seat Control Arrangement

FUEL SYSTEM

The fuel system consists of two 25 gal. individually selectable wing tanks. A three way selector (left, right, and off) is located in the center of the front seat back. There is no provision for cross feed (nor is it desirable) so fuel can be used from only one tank at a time. Two fuel sump blisters located under each fuel tank at the fuselage juncture assure fuel supply to the engine in all normal flight attitudes. Each tank is individually vented. Vent location is in the sheltered, high-pressure area under each strake. A mechanical engine-driven fuel pump transfers fuel from the tanks to the carburetor. An auxillary electric fuel pump provides backup for the engine-driven pump, should it ever fail. Fuel pressure is indicated on a gauge in the cockpit. The electric pump should be turned on if the mechanical pump fails as indicated by loss of pressure. The electric fuel pump should also be used to provide fuel pressure redundancy during low altitude operation, such as takeoff and landing.

There are three fuel drains on the airplane, one in the leading edge of each fuel tank strake, and one on the gascolator mounted on the firewall. The gascolator is easily accessable through the air scoop under the cowling for draining during preflight. To prevent overfilling the fuel tanks, exceeding the gross weight limitations, the tanks can not be completely filled with nose down parking. To fill the tanks to the full 50 gallon capacity, the nose wheel must be extended to level the aircraft. Be careful to hold the nose down during this operation. The nose can be lowered after full up fueling with the caps on without leaking. However, heat expansion may force fuel out the vents. Filling to the full capacity should be done only when required low gross weight, extended-range trips.

> CAUTION
>
> Fuel additives should be checked for compatability prior to use. Some fuel additives such as MEK, or deicing fluids like "Canned Heat", auto gas, especially the high aromatic content no-lead, should NEVER be used. Even extremely small amounts of dissolved epoxy can gum up and plug the carburetor.

CONTROL SYSTEM

Pitch is controlled by a full-span canard slotted flap providing a large allowable c.g. range. Roll is controlled by conventional ailerons on the rear wing. The cockpit controls are similar to most aircraft with pitch and roll controlled by the side sticks and rudder pedals for yaw. The side stick controllers are employed to give the pilot the smallest workload control arrangement possible. The rudders, located on the winglets at the wing tips, operate outboard only, providing two totally independent systems. The rudders are used singly for yaw control or can be deployed together as a mild speed brake.

BRAKES

Brakes are provided on the main wheels. They are used together for deceleration on the ground and individually for directional control at low speed on the ground. The brake actuating mechanism is the rudder pedal; after full rudder deflection is reached, the brakes are actuated. The brake master cylinder is the rudder stop. This system aids in keeping brake maintenance low by insuring that full aerodynamic control or braking is employed before wheel brakes are applied.

The parking brake is provided by the rubber bumper on the nose gear (nose down parking). For those aircraft not equipped with a starter there is a brief period, after the engine is hand prop started, while the pilot enters the cockpit that the aircraft could roll forward before he can get his feet on the brakes, unless, of course, the passen- has already boarded, in which case the front seat passenger can hold the brakes while the pilot boards. Avoid parking downhill or downwind to keep the airplane from rolling. One solution is to use a small wheel chock on a tether which the pilot can pull in after reaching the brakes.

TRIM SYSTEMS

Cockpit-adjustable trim is provided for pitch and roll only. Yaw/rudder trim is ground adjustable only. Pitch and roll trim are bungee/spring systems. Adjustable aerodynamic trim tabs are not used. The pitch trim handle is located just off center, below and slightly forward of the instrument panel. The aileron trim handle is located in the center console. The pilot can safely override any trim setting even if it's stuck in an extreme position. The pitch trim can trim to hands-off flight from stall to maximum speed.

LANDING AIRBRAKE

A drag device is used to allow a steeper approach and to provide more deceleration in the flare. This belly-mounted "speed-brake" is deployed by a lever on the center console. It is normally extended on downwind after gear extension and left down until after landing. Maximum speed with the airbrake down is 85 knots (100 mph). Above this speed, the brake automatically closes. The brake does not affect trim, stability, stall speed, or stall characteristics. The awkward position of the brake handle in the deployed position aids in reminding the pilot that the brake is down if he forgets it on his takeoff checklist. Climbs should be avoided with the brake down, as cooling and climb rate are reduced. The brake induces a mild buffet when down. During landing and taxi the landing brake down provides some prop protection from rocks being kicked up by the nose wheel.

ELECTRICAL SYSTEMS

Refer to the below diagram that shows the basic electrical power distribution. NOTE: Any builder modifications should be noted on this diagram. Fill out the installed electrical equipment.

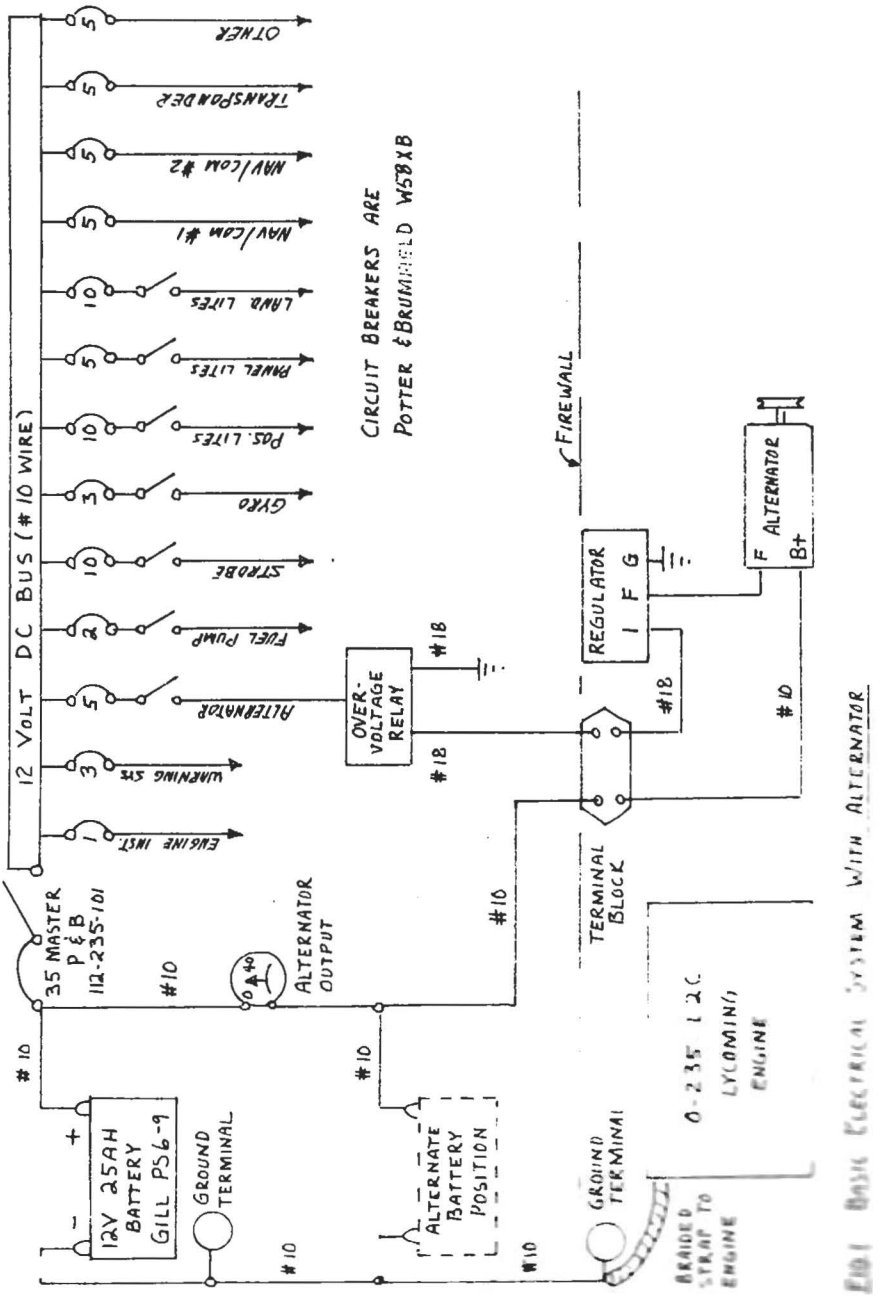


FIG 1 BASIC ELECTRICAL SYSTEM WITH ALTERNATOR

NORMAL OPERATIONS

This section covers the normal operating procedures for the COZY. A summary checklist is provided at the end of this book for more convenient cockpit use. Detailed loading information and performance data are provided in later sections of this manual.

PILOT POSITION

The COZY was designed to accommodate tall pilots up to 6 ft. 4 in. Short pilots can fly the aircraft but they MUST sit on cushions to position their eyes in about the same position as tall pilots in order to have adequate forward visibility. The adjustable rudder pedals should be set in the aft position for short pilots and they should use cushions primarily under them, not behind them. If a short pilot uses a large cushion behind him, he will be positioned forward and down because of windshield slant angle and have inadequate forward visibility during climb and landing flare. Confirm that your head is within 1" of touching the canopy before you takeoff.

ENGINE START

Engine starting may be accomplished by hand-propping. Hand-propping a COZY is much safer than hand-propping a tractor type (engine in front). With the latter, you have to reach through the propellor to grasp the trailing edge of the blade, when the engine starts, the airplane tends to come toward you, and the airflow through the prop tends to suck you into it. With the COZY, on the other hand, you hold the prop on the edge nearest you, and when the engine starts, the airplane tends to run away from you, and the prop blast tends to push you away also. The tractor type must be chained down and the main wheels chocked for marginal safety when hand propping. The COZY, with nose down parking, chocks itself. With modern, impulse-coupled magnetos, it is not necessary (nor desirable) to make a Herculean pull of the propellor for starting; just pull the engine up on compression and give it an EZ flip through. In the unlikely event that your COZY does run away from you after starting (if you leave the throttle open and unattended), it won't carve the first thing it comes to into hamburger, but will give it a bump with the nose instead. FAA regulations require that you have a qualified person in the cockpit, or at least reaching in with hands on the throttle and ignition switches when hand propping. For hand propping, the COZY should always be parked nose down on the bumper.

If the carburetor on your engine does not have an accelerator pump, install a primer. Starting can be very difficult without priming the engine, particularly in cold weather. Some engines have only one magneto equipped with an impulse coupling (which retards the spark). In this event, the non-impulse magneto should be turned off for starting, and turned on only after the engine starts firing. If your COZY is starter equipped, use special care that the prop is clear before starting. You will find that your COZY attracts a lot of attention, and people like to stand around and watch. Holler loud and wait for a response and time for people to get out of the way. Have an outside observer confirm that the prop is clear prior to starting.

COLD START

Pump throttle once or twice (or prime)
Mags OFF
Pull engine through four blades
Mags ON
Grab prop about 1 ft. from tip; pull down onto compression, and give prop a smooth flip.
Repeat as necessary. If the engine doesn't start after five or six pulls, see flooded start procedure or very cold conditions procedure.

HOT START

Leave throttle at idle (don't pump).
Mags ON
Pull prop through gently
If the engine gives no indication of starting after three or four tries, use flooded start procedure.

FLOODED START

Mags OFF
Throttle open or 1/2 open.
Turn prop BACKWARDS about 10 blades to clear the manifold of fuel.
Throttle - 1/2 inch from closed.
Mags ON
A flooded engine will start easier if cranked with throttle about 1/2 open. Do not do this UNLESS you have someone holding his hand on the throttle to retard it to idle immediately after the engine fires and starts running.

VERY COLD CONDITIONS

Very cold temperatures, below 25° F, will make the engine hard to start.
Pump throttle four times (or prime four strokes)
Mags OFF
Pull prop through four blades
Mags ON
Pull prop through gently
When feasible, engine preheat or use of an oil dipstick heater is desirable.

After start, the engine should be idled at 1000 RPM. Oil pressure should rise to within limits within 30 seconds after starting.

TAXIING

After start (or before), a back seat passenger can board while the airplane is still parked nose-down. Then, raise the nose by lifting at the canard leading edge, and while holding the nose up, crank the nose gear into the extended position, and hold the nose down on the nose gear while the right-seat passenger climbs aboard. Instruct the right seat passenger to hold his or her feet on the brakes while you climb aboard. If you are flying from the right side, have the passenger steady the airplane while you climb in, and after putting your feet on the brakes, have your passenger follow. DO NOT attempt to raise of lower the nose with the nosewheel crank with any weight on the nosegear.

> **CAUTION**
>
> Keep taxi speed slow on unprepared loose surfaces. The COZY is more susceptible to prop damage than tractor type aircraft.

Steering below 25 knots (30 mph) is accomplished by applying full rudder and brake as required in the direction you wish to go. As you accelerate, the single pedal control will automatically shift you to rudder steering as the rudders become increasingly effective. The nose gear will free swivel, enabling you to maneuver in very tight places with ease. At low speed, steering is done exclusively with differential braking. The geometry of the COZY makes it much less sensitive to upset than most aircraft. Comfortable taxiing operations have been demonstrated in 40 knot crosswind components. Be careful to hold the stick while taxiing downwind so the "tailwind" won't damage the ailerons or elevators.

> **CAUTION**
>
> When taxiing in a strong wind, an open canopy may have an adverse affect on steering, and the wind may put undue stress on the canopy latch. It is better to close and lock the canopy in strong winds.

TAKEOFF

Complete your pretakeoff checklist. Check static RPM at full throttle. It must be at least 2450 for normal takeoff performance. Double check that your fuel valve is FULLY open and that your canopy is locked down. Taxi forward a few feet to straighten the nose gear. Set pitch trim for takeoff.

NORMAL: Apply full throttle smoothly. As the aircraft accelerates, use rudder and brake as necessary for directional control. Maintain slight aft stick pressure as you accelerate to relieve the nose wheel. Rotate the nose gear just clear of the ground as soon as possible about 50 - 60 knots (59 - 70 mph) and hold the nosewheel just clear as you accelerate to about 63 knots (72 mph). As you pass through 63 - 65 knots (72 - 75 mph), rotate smoothly and you'll be off and flying. Add 5 knots if operating at heavy gross weights.

> CAUTION
> Never rotate the nose beyond the angle that places the canard on the horizon.

CROSSWIND TAKEOFF

During takeoff ground roll, with a crosswind component above 10 knots you will find that wheel braking may be required long into the ground roll for directional control. In stronger crosswinds you may require braking almost up to rotation speed. The best technique is to hold full rudder but not to ride the brake continuously. Apply brake intermittently and allow the aircraft to accelerate between applications. The takeoff ground roll can be extended significantly (50% or more) by strong crosswind, especially at high density altitudes and high gross weights. The braking requirement for directional control is the reason for the takeoff limitation of 15 knots crosswind. Landings can be made up to a 20-knot crosswind component.

CROSSWIND TAKEOFF TECHNIQUE: Hold aileron into the wind as you rotate for lift off. Let the aircraft accelerate above normal rotation speed and then rotate the nose abruptly to make a clean lift off without side-skip. For crosswind components above 10 knots, add 5 knots plus one half the gust factor to the normal rotation speed. When clear of the ground, make a coordinated turn into the wind to correct for drift and to maintain a straight track over the runway.

SHORT FIELD OBSTACLE CLEARANCE

Reduce gross weight as much as feasible and check the c.g. to insure it is not so far forward as to delay rotation. Be sure the engine is thoroughly warmed up and taxi to the very end of the runway. Make sure the fuel selector valve is fully open. Align the aircraft with the runway, hold the brakes, and apply full power. Release the brakes and try to use minimum braking for directional control. Rotate to lift-off at 56 knots (light weight) or 65 knots (heavy weight). Maintain 70 knots (80 mph), best angle of climb speed, until the obstacle is cleared, then accelerate to normal climb speed. See page for distances.

ROUGH FIELD CAUTION

Although the COZY uses 500 x 5 tires and a spring loaded shock strut, this does not make the aircraft totally suited to rough, gravel, or unprepared fields. Since the COZY is a pusher, it cannot be rotated as easily as tractor type aircraft, which have a prop blast across the tail. You still must accelerate to normal rotation speed 50 - 60 knots, depending on c.g., before the nosewheel comes off and during this time the nosewheel can kick debris into the prop. The small nose wheel tire, high rotation speed, and possible prop damage makes the COZY less suitable for unprepared field operation than low performance tractor types.

However, if you must use an unprepared surface, reduce gross weight as much as feasible and adjust the c.g. as far aft as practical (within limits) to allow an early rotation. Do not use high power with the aircraft stationary, do the mag check on the roll if necessary. Hold full aft stick and apply power gradually to start the aircraft moving before coming in with full power. This technique will help minimize prop damage. As the nose raises, the elevator should be eased forward so the nosewheel is held just clear of the ground. Accelerate and lift-off at the normal speed and accelerate to the desired climb speed. Don't try to "jerk" the aircraft off prematurely; this only places the prop closer to the ground and increases the chance of damage.

Operation from grass fields, even if smooth, is not recommended. The additional rolling resistance will extend the takeoff roll. Even with 500 x 5 tires and the shock strut, most grass fields will punish the gear more than hard surfaced runways.

HIGH DENSITY ALTITUDE

At density altitudes above 5000 ft., follow the normal takeoff procedures except (1) lean the engine for best power during run up and (2) let the aircraft accelerate to 65 - 70 knots (75 - 80 mph), and then smoothly rotate and lift off.

CLIMB

Climb performance data is given on page of this manual. For optimum rate of climb, maintain 90 knots (105 mph). Best angle of climb is obtained at 70 knots (80 mph). For better visibility and improved cooling, a normal cruise climb of 110 knots (125 mph) is used. Climb performance is improved with the nose gear retracted, although not drastically, and it should be retracted once your initial climb is established.

> **CAUTION**
>
> The altitude capability of the COZY far exceeds the physiological capability of the pilot. Use oxygen above 12,500 ft.

CRUISE

Maximum recommended cruise power setting is 75%. A high cruise power setting (full throttle at 8,000 ft. density altitude will result in the maximum true cruise speed of 161 knots (185 mph) for a 118 hp Lycoming engine and a RPM slightly over rated. However, to take the best advantage of range and fuel economy, you may find that cruise power settings as low as 45% get you to your destination faster by avoiding fuel stops. Cruise at 60% power is the best compromise, providing good speeds and significant lowering of engine noise over 75% power. Lean your fuel mixture for best economy at cruise. Below 75% power, lean mixture until a very slight RPM loss is noted (20 RPM max.). This approximates peak EGT setting for optimum lean mixture. Note (page) that best range is obtained at a very low speed.

A good rule of thumb for choosing an economical cruise power setting is to cruise at the same RPM that you get during a full-throttle static run-up before takeoff.

Maneuvering speed is 120 knots (140 mph) indicated. Remain below this speed in rough air.

Check the fuel level in each tank occasionally. Switch tanks to maintain a reasonably balanced fuel load. If possible, select an unused tank only when a forced landing can be easily accomplished (in case the valve malfunctions or there is water in the newly selected tank). Always try to be within range of a suitable landing place with the fuel in the selected tank until you verify that you can select and use the fuel in the other tank.

Once at cruise altitude in smooth air, trim the aircraft to allow hands-off cruise. It is much less fatigueing to fly by using an occasional shift of the body weight or an occasional small adjustment of the trim knobs, than to fly by continuously holding the stick. After a little practice setting trims, you will find you will be doing most of your flying including climb and descent without holding the stick. The rudder pedals are designed to allow the pilot to tilt his feet inward, slide them forward of the pedals, and relax in a stretched out position. This places the weight of the thigh on the thigh support, rather than the tail bone and greatly increases comfort on long flights.

Lycoming engines are not particularly susceptible to carburetor ice (compared to Continentals), however, when cruising in moist air, particularly at low power settings (when there is a larger temperature drop through the carburetor), check carburetor heat often or cruise with heat on.

> CAUTION
>
> When approaching or entering visible moisture (rain) the COZY may experience a small pitch trim change. This amounts to about a 2^{o} change in elevator position at cruise (out of 22^{o} available). This phenomenon is not fully understood and your aircraft may react differently. Our flight test on the prototype COZY has found a slight performance loss and the pitch trim change could be trimmed hands off with the cockpit trim handle at air speeds above 90 knots when entering rain. At lower speeds, only a slight back-pressure on the stick is required to counteract this effect. Once the aircraft is in visible moisture conditions it can be retrimmed and flown normally. Most other aircraft also experience some trim change in rain. There may be a disorientation factor during the transition from VMC to IMC that the pilot should be ready for, especially if your trim change is found to be significant. If your rain trim change is significant, install a placard to notify pilots of this characteristic.

DESCENT

You will find that your COZY has such a good climb performance that you routinely use higher cruising altitudes to avoid turbulence discomfort more often than with most light aircraft. It is not unusual nor inefficient to climb to 12,000 ft. altitude for a 150 mile trip. Bearing this in mind, you want to plan your descent into your destination enough in advance so that you don't find yourself over your destination with 10,000 ft. of altitude. The COZY is a clean airplane and even with power at idle, it may take 20 minutes to land! Using the extra altitude for a cruise descent speed advantage will get you there a lot sooner. Don't forget to reduce power slowly to avoid rapid cooling of the engine. Partially richen mixture

when descending. Start your descent about 6 miles from your destination for every 1,000 ft. of altitude to lose, to arrive at pattern altitude.

LANDING

Make your approach and traffic pattern very cautiously. Most pilots and controllers are accustomed to looking for more conventional aircraft of gargantuan proportions (like Cessna 150s) and may ignore you completely. Others may think there is enough room to sneak in ahead of you. Best pattern speed is 75 - 80 knots (85 - 90 mph), slowing to 70 knots (80 mph) on final approach (a little faster in turbulence or gusty winds). The COZY is a very clean airplane and you can double the runway length required if you are 10 or15 knots fast on your approach.

Deploy the landing brake on downwind or base to obtain a normal glide path angle comparable to conventional aircraft. Failure to use the landing brake will result in a flat/wide pattern, more difficult airspeed control, and the probability of overshooting your desired touchdown point. Make a complete flare and touch down at 55 knots (63 mph). The normal landing technique of holding the nose off to minimum speed should not be used in the COZY. Make a complete flare, then fly it down to touch down. This avoids a common tendency to flare too high. While full-stall landings are easily done with some practice, it is better to land a bit fast on your first attempts, than to run out of airspeed while 10 feet in the air. Maintain a slightly nose high attitude as you roll out and use aft stick to ease the loads on your nosewheel during heavy braking. While the landing gear is strong enough for rough surfaces, the small tire diameters will give the crew a harsh ride. This, combined with the 50 to 55 knot (57 to 63 mph) touchdown speed, makes a hard surfaced runway much more pleasant. If you need to land on a rough field, hold the aircraft off to minimum speed and keep the nose high as long as possible.

> **CAUTION**
>
> Never flare beyond the angle that places the canard on the horizon.

Crosswind landings may be flown several ways. Mild cross winds are easily handled using the wing-low sideslip approach. Another method is to simply land in a wings-level crab. The landing gear design makes this technique safe and easy. The best method for strong gusty crosswinds is to approach in a wings-level crab and straighten the nose with the rudder immediately before touchdown. Be careful not to lock a wheel brake (full rudder), at touchdown. The COZY has demonstrated taxi, takeoffs, and landings in gusty winds to 45 knots and with crosswind components as great as 18 knots for takeoff and 28 knots for landing.

Fly from long runways until you develop your proficiency. The following runway lengths can be considered as minimums, but only after you have made at least 20 landings on longer runways: with landing brake, 1800 ft.; without landing brake, 2400 ft.

LANDING GEAR SPEEDS

Don't extend gear above 120 knots (138 mph). At higher speeds, the airloads make it hard to extend. The gear can be down or can be retracted at speeds up to 140 knots (163 mph).

CAUTION

If the c.g. is aft, it is possible to rotate the nose to an excessively high angle during landing rollout, placing the c.g. aft of the main wheels. Avoid rotation above 12 degrees (canard on horizon), using forward stick or brakes as necessary, to avoid prop damage or tipping the aircraft onto its tail.

CAUTION

If the nose gear mechanism is not lubricated or is binding, it may be difficult to crank down the gear. If this occurs, do not force the handle. Slow down to minimum speed, if necessary, to allow it to crank down easily. Fix the cause of binding before further flight.

CAUTION

With the nose gear extended and without the pilot (or a passenger) in the front cockpit, the COZY might fall on its tail. The aircraft might initially sit on the nose wheel, but after the fuel bleeds through the baffles towards the aft of the tank, it might tip backwards. Be sure to brief all ground handlers that the aircraft can fall on its tail unless parked nose down and could get away from them while moving the aircraft. If your aircraft is subject to being moved by unknowledgable people, ballast the nose or attach a sign to caution them about the possibility of tipping over.

Normal care of the main landing gear strut should always include lifting one wing tip to allow the gear to spring inward ("set" the gear) when parking, especially in hot weather. This lowers the stress on the strut and reduces the possibility of gear creep and loss of alignment.

GROUND HANDLING AND TIE DOWN

The easiest way to handle the aircraft on the ground is to stand in front of the canard and grasp its top surface with one hand and the elevator slot underneath with the other hand. Do not handle the elevator. Leave the nose gear retracted for ground handling. The airplane balances best with the nose slightly lower than level.

The COZY can be safely left unattended, parked on the nose bumper, in moderate winds. However, it is prudent to always tie down any aircraft whenever possible. For long term parking, position the COZY backwards in the parking slot with the nose over the normal tail tie down rope. Install the removable tie down rings, one near each wing tip and one on the nose bumper forward of the canard. "Set" the main gear and securely tie down the wings. Position the nose alongside of the "tail" tie down and tie the nose securely to the ground against the rubber bumper. An alternate method is to use only the wing tie downs and just weight the nose with ballast. (Be sure it is removed before flight).

LOW SPEED HANDLING AND STALL CHARACTERISTICS

The COZY has good flight characteristics at minimum speed. It is a docile, controllable airplane at full aft stick at its minimum airspeed of ~~50~~ to ~~55~~ knots. It does 58-63
not exhibit any of the conventional airplane's tendencies to roll or pitch down uncontrollably or other common uncommanded flight path excursions. Any power setting may be used at full aft stick without changing the way the airplane handles. By adjusting the throttle setting, you can climb, descend, or maintain level flight. The very low speed range (below 58 knots) is characterized by a doubling of the force required to hold the stick aft, tending to keep the inattentive pilot at a more normal flying speed. Ailerons and rudder are effective at all speeds, including full aft-stick flight.

Since the flight characteristics of the COZY are so much better at minimum speed than contemporary conventional aircraft, it hardly seems fitting to use the term "stall" in characterizing the COZY behavior, even though it is technically correct. The COZY's "stall" consists of any one of the following, order of prevalence:

1. Stabilized flight (climb, level, or descent, depending on power setting) at full aft stick. Below 60 knots, there is a very definite increase in the aft stick force, such that the pilot has to pull noticeably harder on the stick to get below 60 knots.

2. Occasionally, particularly at forward c.g., the airplane will oscillate mildly in pitch after full aft stick is reached. This is a mild "bucking" of a very low amplitude, one to two degrees and about one-half to one "bucks" per second. If the full aft stick is relieved slightly, the bucking stops.

3. Occasionally, particularly at aft c.g., the airplane will exhibit an uncommanded Dutch-roll, a rocking back and forth of the wings in roll. The rock, if it exists, will be mild and sometimes divergent, reaching a large roll (30° bank) by about the fourth or fifth cycle. The "wing rock" should be stopped immediately by relaxing off the full aft stick stop. Prolonged wing rock can result in an uncontrolled roll-off and altitude loss.

At any time during the "stall" power can be set at any position, or slammed to full or idle, without affecting the stall characteristics. There is a small roll trim change due to power and very slight pitch trim change, neither affect the aircraft's controllability at sustained full aft stick.

Accelerated stalls to 3-g and steep pullups to 60 degrees pitch (min. speed, 55 knots) can be done at full aft stick without departure tendency.

Intentional spins have been attempted by holding full aft stick and using full rudder, with all combinations of aileron control, and at all c.g. positions. These controls were held through 360 degrees of rotation. Full aft stick and full pullup results in a lazy spiral which ends up in a steep rolling dive at 3+ gs and 100 knots. At any time, the spiral can be immediately stopped by removing rudder control and a completely straight forward recovery can be made. That maneuver is not a spin, since at no time is the aircraft departed from controlled flight. If the above maneuver is done at aft c.g., the rotation rate is higher so the lazy spiral is more of a slow snap roll. However, even at aft c.g. the recovery is immediate when controls are neutralized.

You are cleared to do stalls in your COZY in any power, trim or landing condition within the normal operations envelope. Intentional spins (or attempts to spin) are not approved.

NOTE

Experience with other aircraft of similar configuration (Varieze, etc.) has shown that some variation in stall characteristics may be expected from one airplane to another. Inaccurate airfoil shapes, incidence errors, or weight and balance errors can result in a degradation of the normal safe stall characteristics. Aft of the aft c.g. limit, the COZY may be susceptable to aft wing stall which, while easily recovered with forward stick, can result in a stall break with high sink rate. If any of your aft c.g. characteristics are undesirable, adjust your aft

c.g. limit accordingly.
Builder experience with other aircraft of similar configuration has indicated that it may be possible to spin them when at or aft of the aft c.g. limit. Analysis indicates that the spin mode or recovery would not be affected by power. Recovery should be forward stick, rudder against rotation, and ailerons neutral or with spin rotation.

EMERGENCY PROCEDURES

FIRE

There are normally only two sources of aircraft fires: electrical and fuel. In the event of fire on the ground, kill all electrical power and shut the fuel off. Clear the aircraft. Use a dry-type extinguisher. For inflight fire, determine the cause; if electrical, all electrical power off; if fuel, fuel off and electrical power off. Turn the cabin heat off, and open the cabin air vent. Execute a precautionary landing as soon as possible.

ENGINE FAILURE

Modern aircraft engines are extremely durable and seldom fail catastrophically without plenty of advance warning (lowering oil pressure, excessive mechanical noise, rising oil temperature, etc.). Pilot induced failures, on the other hand, are far more common (carburetor ice, confusion of mixture and carb heat controls, fuel starvation, fuel management, etc.). In the event of inflight engine stoppage, check mixture - RICH, fuel - switch tanks, boost pump on, magnetos - BOTH, and attempt to restart. If the engine begins to run rough, check for induction icing, improper mixture setting, or a bad magneto. If carburetor heat or an alternate magneto setting fail to correct the roughness, make a precautionary landing as soon as possible and trouble shoot. Lowering/rising oil pressure, rising oil temperature or increasing mechanical noise are good indications of impending failure and flight should be aborted as soon as possible. Don't hesitate to declare an emergency to obtain priority clearance. If stoppage does occur and restart is impossible, execute the engine out approach and landing.

CAUTION

In weather conditions where carburetor ice is likely, descents should be made with as high a power setting as possible, to keep maximum available carb heat and to reduce the temperature drop through the carb venturi. Descent at idle power is more likely to generate ice, particularly in Continentals.

In case of engine failure, the engine will probably windmill above 70 knots. However, as the engine cools down, a higher speed may be required to maintain engine rotation. With some engine/prop combinations, a glide speed as high as 100 knots may be required. Windmilling RPM decays slowly enough to give the pilot time to increase his speed to maintain rotation. Once the prop stops, a speed of 130 knots or more is required to regain rotation (2,000 ft.of altitude loss). This may be 180 knots & 4,000 ft. for the high compression O-235-F. The pilot should determine when it is no longer feasible to attempt restart, since the best glide angle speeds (page 59) may be lower than windmill speeds (best glide distance may be done with the prop stopped). A windmill start uses less altitude if you dive steeply initially to attain speed rapidly.

ENGINE OUT APPROACH

If an engine-out landing is unavoidable, check wind direction, choose your landing area and establish your glide at 70 to 75 knots (80 to 87 mph). Gliding performance is shown on page 59. Remember that with the engine out and prop windmilling, your glide will be considerably steeper than the normal engine-idle glide that you are accustomed to. If you are radio equipped, tune in 121.5 and declare an emergency and give your intended landing site. Shut off the fuel valve. Your landing gear should be down, even for an off-airport landing in rough terrain, or water. This will cushion the landing and keep the nose from slapping down and digging in after the main gear hits. Your glide will be steepened and rate of descent increased with the gear down. Set up the forced landing pattern with the landing brake out and shoot for the middle 1/3 of the force landing area. Therefore if you miss judge short, you can retract the landing brake and possibly still make the field. Turn your electrical power and mags off before touchdown to minimize any potential fire hazard. Touch down as slowly as possible if landing in rough terrain and steer between any obstacles.

DITCHING IN WATER

This is theoretical since no ditching of aircraft of this configuration are known to have occurred. The recommended procedure is as follows: Wear a life jacket for over water flying. On descent, bend the safety catch away but do not open the canopy. Extend the nose gear. Touch down should be at minimum speed, landing into the wind. Land on the back side of a swell, or parallel to the swells. The aircraft or major components of the aircraft should float and support the occupants and equipment due to the large amounts of structural closed-cell foam.

INFLIGHT CANOPY OPENING

Canopy opening in flight is a serious emergency. It has not yet happened with a COZY, but has happened to other aircraft of similar configuration. With the canopy unlatch warning system and the safety catch, the likelihood of a canopy opening in flight is remote. However, should the canopy open to the safety catch, the aircraft is still controllable. Reduce airspeed to minimize wind blast and return and land.

Should the canopy open fully in flight, immediately grab the canopy handle and pull the canopy down. If assistance is available to fly the aircraft, use both hands to lock the canopy; otherwise, hold the canopy down with one hand and FLY the aircraft down to a safe landing with the other. The aircraft is controllable and can be landed safely with the canopy being held down with one hand. REMEMBER: Maintain control of the aircraft! Do not be so concerned with trying to lock the canopy that you allow the aircraft to fly into the ground unnecessarily.

LANDING GEAR EMERGENCIES

Since only the nose gear retracts, and it's actuation system is so simple, failure to extend or retract properly is highly unlikely. A far more likely failure is the pilot forgetting to extend the gear. Should you find yourself in the landing flare or even rolling along on the mains at 50 knots or more, you can easily hold the nose off to make a go-around or even extend the gear at that point. If you just can't avoid landing gear up, hold the nose off for as long (and slow) as practical, and then fly the nose gently to the runway. Avoid a nose-high canard stall, allowing the nose to drop hard to the runway. It is good practice on the landing roll-out to glance at the nose gear handle (or window) to verify that the gear is down before the canard stops flying.

Damage from landing gear-up should be minor and easily repaired. If you have your choice of landing on known smooth grass, you might minimize the skin damage on the nose, but don't go charging off into the boondocks without knowing the surface conditions. A smooth paved surface is far better than rough grass.

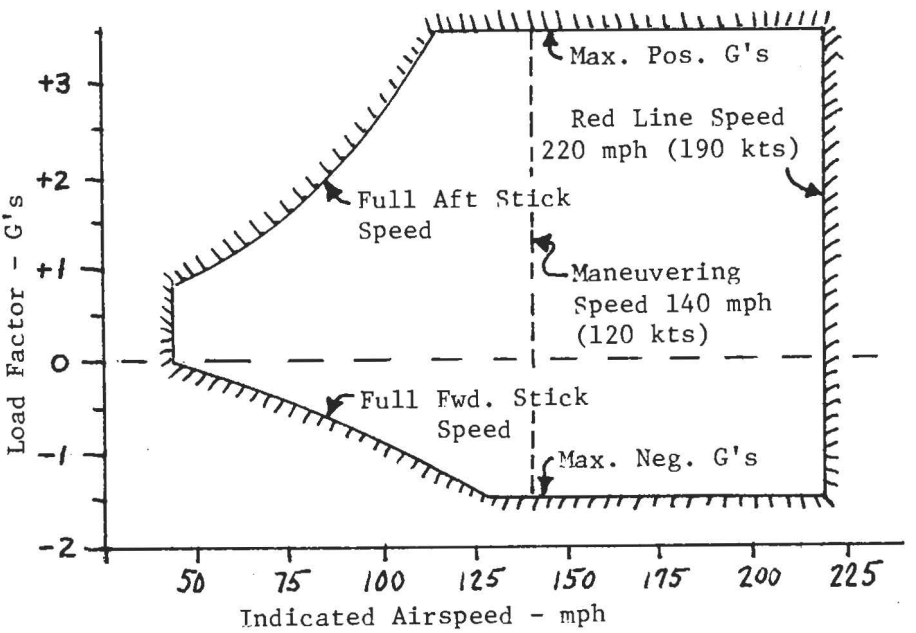
The only other gear emergency to be considered is a flat tire. Landing with a flat/blown main tire - make a normal landing touchdown near the side of the runway with the good tire. Use ailerons to hold the weight off the flat tire. Lower the nose and use brakes for directional control. Never attempt to take off with a flat tire.

WHEEL BRAKE FAILURE

Since the brakes are the only means of directional control after the aircraft decelerates below about 35 knots, landing with a brake out poses a special kind of problem. The risk of damage can be minimized by considering the following: If possible, select a long runway with a cross wind from the side of the failed brake. The aircraft will weather-vane into the wind and by careful application of the good down-wind brake, directional control can be maintained. If it becomes obvious that the aircraft will leave the runway and enter rough terrain, or strike an obstacle, it might be preferable to retract the nose gear. Caution to keep fingers clear of the handle as it may spin uncontrolled as the nose gear retracts. Doing this may strip the worm gear and will scrape the bottom of the nose. However, this may be preferrable to running into an obstacle. A Long EZ was successfully landed in a calm wind with no damage with a complete failure to the left brake. Two people on a motorcycle rode next to the wing tip and at 35 knots, just as the rudders became ineffective, pushed or pulled on a winglet to guide the aircraft to a stop straight ahead on the runway. It was found that only a very slight tug fore or aft was all that was required to keep it straight.

LIMITATIONS

Allowable Flight Envelope.



PLACARDS

Install these placards in the cockpit, visible to the pilot:

Min. Front Seat Weight _____lbs. (If less, add ballast)
Max. Front Seat Weight _____lbs.
Max. gear extension speed, 120 knots (138 mph)
Max. speed with gear down, 150 knots (172 mph)
No aerobatic maneuvers are approved except those listed below:

Maneuver	Recommended Entry Speed*
Chandelles	130 knots (150 mph)
Lazy Eights	130 knots (150 mph)
Steep Turns	130 knots (150 mph)
Stalls (No whip stalls)	Slow deceleration
Accelerated Stall	110 knots (126 mph)

*Abrupt use of controls prohibited above 120 k (140 mph)

Crosswind component 15 knot takeoff, 20 knot landing.
Maximum wind for taxi (all quarters) 40 knots (46 mph) with canopy closed.
Max. speed brake extension speed, 86 knots (100 mph)
Max. speed - Red Line, 190 knots (220 mph)
Maneuver speed, 120 knots (140 mph)
Max. Gross Weight, 1500 lbs.
Center Gravity Limits - forward 97.0 - aft 102.0
Intentional spins (or attempts) not permitted.
Fuel Tank - Octane - Capacity (near fuel cap).

ENGINE LIMITATIONS*

Lycoming O-235

RPM	2800 Max.
CHT	500 F Max.
	435 F Continuous
Oil Temp.	245 F Max.
	180 F Desired
	170 F Min. Continuous
Oil Pres.	60 - 90 psi Normal
	25 psi Idle
Fuel	Series C & E - 80 Octane
	Series F, L, & G - 100 Octane

*Refer to your specific engine's operator's manual for detailed operating instructions and limits.

PILOT EXPERIENCE REQUIREMENTS

PILOT CHECKOUT

There is no such thing as a minimum number of total hours a pilot should have, to be qualified for checkout solo in a new aircraft. The best pilot qualification is variety. He should be current in more than one type of airplane. The COZY is not difficult to fly, but it is different; like a Yankee is different from a Cessna, or a Cub is different from a Cherokee. A pilot who is used to the differences between a Cessna and a Cub is ready to adapt to the differences in a COZY. The COZY has entirely conventional flying qualities. However, its responsiveness is quicker and its landing speed is faster than most light training aircraft. It should not be considered as a training airplane to develop basic flight proficiency. The COZY ranks with the best tricycle-geared types for ground stability and has none of the ground-looping tendencies of the taildraggers.

The requirement for a variety of experience applies to checkout in any type of new aircraft, not only to the COZY. Of course, the COZY is an ideal airplane for checking out other COZY pilots, or even Long EZ pilots, because of the dual controls. The pilot to be checked out can first ride as a passenger on the side he will later solo from. The following criteria is strongly recommended for initial pilot checkout.

1. Checkout should not be done in gusty winds, particularly crosswind conditions.
2. Use runway at least 3,500 ft. long for initial checkouts. The beginning COZY pilot often finds himself fast on approach and the airplane is so clean that it is easy to use up a lot of runway in the flare.
3. Give the pilot a ride or two as a passenger. This gives him a first-hand look at the aircraft's performance envelope and general flying qualities. Trim the airplane up and let him fly it. This will give him an appreciation of the airplane's natural stability. Show him the use of the trim systems (pitch and roll). Let him get used to the pitch and roll feel. Let him follow through while you shoot some landings and takeoffs. As his confidence builds, let him try some landings and takeoffs. Do not transition him to his first solo flight until he flies the aircraft smoothly and confidently from the passenger seat.
4. His first solo flight should be without any passengers and he should fly from the same seat he was checked out in.

5. Add ballast to the nose compartment so the c.g. will be in the forward portion of the flight box recommended for the first flight (see Weight & Balance, page 31), preferably in approximately the same location as during his checkout.
6. Briefing must emphasize that the aircraft should never be rotated past the angle that places the canard on the horizon for takeoff or landing.
7. Pilot being checked out must have a minimum of 10 hours each in at least two type aircraft in the last 4 months (5 in the last 30 days) and feel competent and comfortable in them during marginal conditions, such as crosswind landings near demonstrated limits, etc.

Since the COZY performs practically identically to the Long EZ, the experience of RAF in checking out new Long EZ pilots might be helpful. Keep in mind that they did not have the luxury of a full-dual checkout in the front seat:

> "Initially some of the pilots checked out by RAF tended to do the following on their first takeoff: Immediately after lift-off, they would level off or descend, then re-establish a normal climb. We have found that this is caused by the unusual visual cue provided by the canard. Even though the climb angle is similar to other light planes, the canard gives the pilot the impression that he has over-rotated. Since we found this was the cause, we have told pilots the following and have found that the pitch "bobble" no longer occurs: Rotate smoothly to lift-off at 65 knots. If you think you have over-rotated do not overreact, don't shove the stick forward. Hold the liftoff attitude and the airplane will accelerate to 80 knots for climb.
> "Occasionally a new Long EZ pilot will tend to make a "full stall" landing or flare too high. Tell him that if he has made the approach at the correct speed and pulls power to idle before the flare, he should not spend a lot of time in the flare. Make a complete flare, then fly the airplane down onto the runway."

For further information on checkouts, refer to flight test procedures, Appendix II, page 41.

WEIGHT AND BALANCE

Every aircraft has an acceptable c.g. (center of gravity) range which is determined by the designer and confirmed by flight testing, within which the aircraft has positive stability, predictable performance, and can be operated safely. It is a basic requirement for obtaining a pilot's license that the pilot be familiar with c.g. calculations and be able to perform them correctly. It is the responsibility of every pilot to load his aircraft in such a way that the c.g. is in the acceptable range, using ballast if necessary. Empty weight and empty c.g. location is determined before the first flight by weighing. It must be up-dated and revised whenever new, permanent equipment is added; i.e., wheel pants, spinner, different propellor, instruments, etc.

Loading data and sample calculations are shown below. Be sure you use empty weight and moment data for your aircraft determined by actual weighing. There can be considerable builder differences, depending upon workmanship and equipment. You can use the simple loading graphs provided for routine service use, but to develop an accurate c.g. location, use the mathematical formula and your pocket calculator with the weight vs fuselage station chart.

Add up the weight and moment totals for your load as shown in the sample problems. Then divide the total moment by the total weight, to get the loaded c.g. position fuselage station (inches aft of the datum, F.S. 0.0).

$$\text{FORMULA: c.g. position} = \frac{\text{empty moment} + \text{pilot moment} + \text{passngr moment} + \text{fuel moment} + \text{ballast moment}}{\text{total loaded weight}}$$

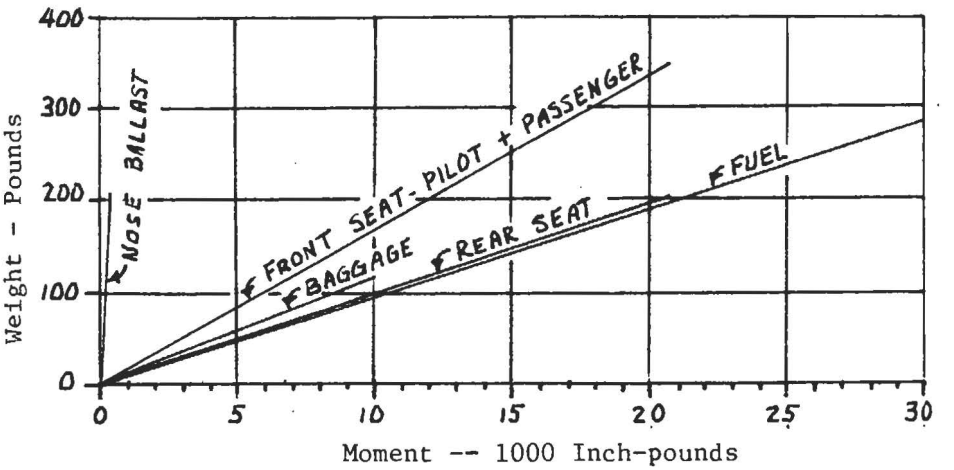
WHERE: Empty moment is determined by weighing (see p. 39)
Pilot moment = pilot weight x 59
F. seat passngr moment = passenger weight x 59
Fuel moment = fuel weight x 104.5
Fuel weight = fuel gallons x 6.0
Ballast moment (in nose) = ballast weight x 8
Total weight = empty weight (see p. 39) + pilot + passenger + fuel + ballast

NOTE: For sake of brevity, we omitted oil at 8 lbs. and F.S. 142 and baggage (or passenger) in rear seat at F.S. 103.

For the light pilot sample calculation (next page), total weight is 1,244 lbs., total moment is 126,014 in.lbs., and the resultant c.g. is 101.3 F.S., or 101.3 in aft of F.S.0.0. The chart (next page) shows this weight and c.g. to be in the acceptable flight envelope.

SAMPLE LOADINGS

Light pilot, solo, w/ballast				Heavy pilot w/passenger		
Item	Wt.	Sta.	Moment	Wt.	Sta.	Moment
Empty	906	110.5	100,113	906	110.5	100,113
Oil	8	142	1,136	8	142	1,136
Fuel	150	104.5	15,675	150	104.5	15,675
Pilot	150	59	8,850	190	59	11,210
F.Seat Passngr	-	59	-	120	59	7,080
Ballast	30	8	240	-	8	-
Baggage	-	103	-	20	103	2,060
Total	1,244	101.3	126,014	1,394	98.5	137,274



YOUR AIRPLANE

Item	Weight	Station	Moment
Empty A/C	997	111,25	110935,25
Oil	INCL.	N/A	N/A
Fuel			
Pilot			
F. Seat Passngr.			
Ballast			
R.Seat			
Baggage			
Total			

YOUR AIRPLANE

Item	Weight	Station	Moment
Empty A/C	997	111.25	110935.25
Oil	INCL.	N/A	N/A
Fuel			
Pilot			
F.Seat Passngr.			
Ballast			
R.Seat Baggage			
Total			

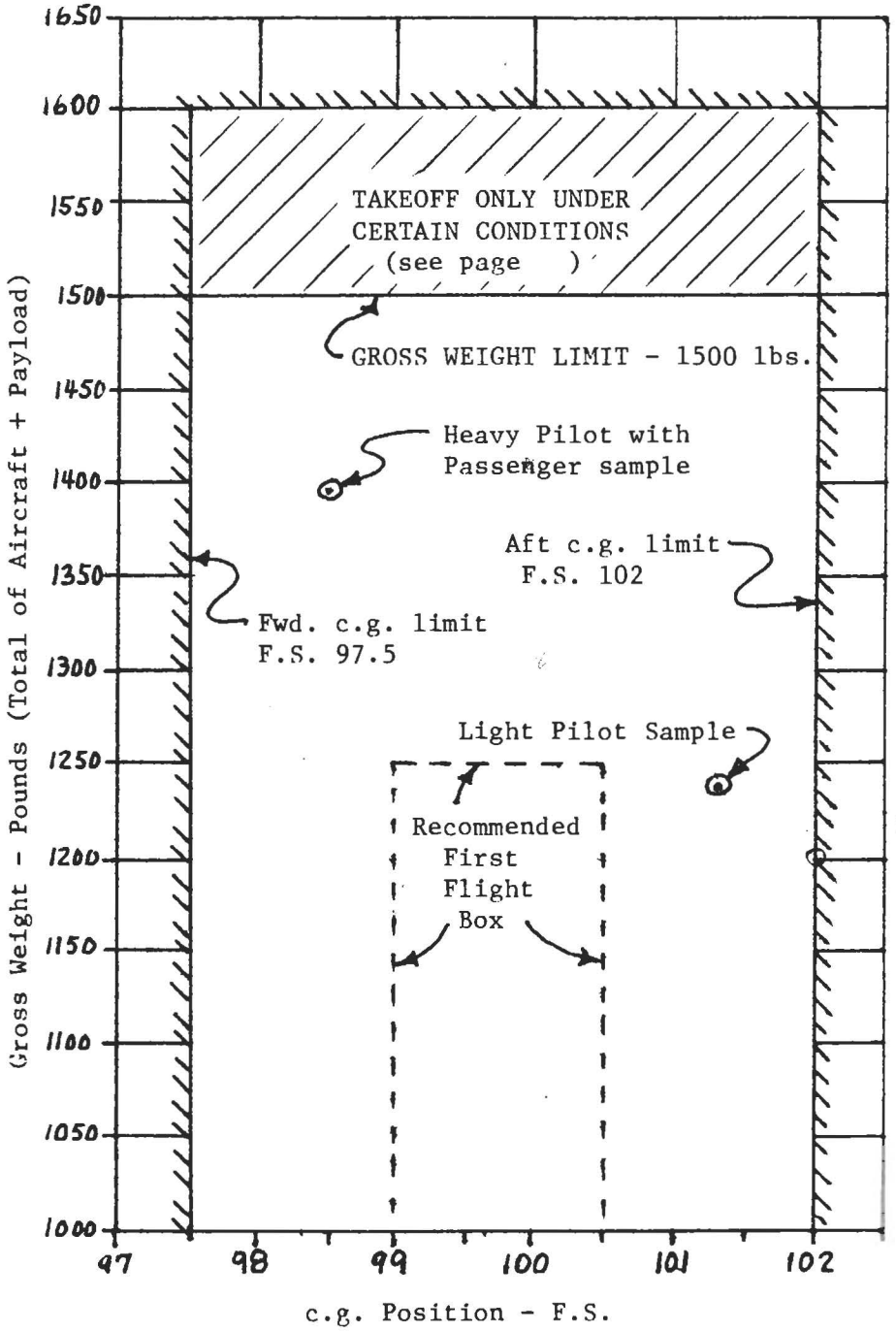
YOUR AIRPLANE

Item	Weight	Station	Moment
Empty A/C	997	111.25	110935.25
Oil	INCL.	N/A	N/A
Fuel			
Pilot			
F.Seat Passngr.			
Ballast			
R.Seat Baggage			
Total			

YOUR AIRPLANE

Item	Weight	Station	Moment
Empty A/D			
Oil			
Fuel			
Pilot			
F.Seat Passngr.			
Ballast			
R.Seat Baggage			
Total			

WEIGHT AND C.G. LIMITS



APPENDIX I

INITIAL SYSTEMS CHECKOUT

Before initial taxi testing is begun, each new aircraft should have a very complete inspection and functional test of its flight systems. Factory built aircraft are given a similar series of testsbefore the pilot ever sees his new mount; however, the COZY owner must perform these production tests himself. The following procedure should be used for initial system checkout and for each annual inspection.

General

- Check all fasteners for proper security and safetying.
- Check canard attach bolts for security and proper installation.
- Check wing attach bolts for tightness and proper number of threads showing.
- Check wing incidence, canard incidence, rudder, ailerons, and elevator deflections.

Canard incidence = (Use canard incidence template B & C)
$\pm$ 0.3°

Wing incidence = Wings must be within 0.3° incidence
Zero $\pm$ 0.5° of each other. (Use wing incidence templates)

Rudder Travel = Measured at the top of the rudder at
(Original rudders) the trailing edge. Measure this with
6" $\pm$ 0.5" pilot holding full rudder pedal while someone applies a 5 lb. force inboard on the rudder trailing edge, to take any " slack" out of the system.

Opt. High Performance rudders = Measured at the bottom of the rudder
4.25"$\pm$ 0.25" at the trailing edge.

Elevator travel = 22° $\pm$ 2° Trailing edge down
20° $\pm$ 2° Trailing edge up

Aileron travel = Measured at the inboard trailing edge,
2.1" $\pm$ 0.3" both up and down. When in the neutral position, both aileron trailing edges must be aligned with wing trailing edges.

CONTROL SYSTEM

- Check that canopy sponge seals are in place and that the canopy locking handle is adjusted so it must be forced hard forward to lock. This extremely important to eliminate any possibility of it being bumped open in flight.

- Elevator and aileron pushrods for proper installation (spacers, washers, bolts, locknuts, clevis pins, and safety clips installed properly).

- Elevator and ailerons pushrods for freedom of movement throughout control travel.

- Pitch and roll trim mechanisms for proper function, and freedom of movement.

- Elevator and aileron for freedom of movement throughout range without binding or chafing.

- Rudder pedals for freedom of movement, cable attachment, and positive return to neutral.

- Rudder pulleys for free rotation and cable guard installation (the four cotter pins on the pulley brackets).

- Cable clearance throughout control travel.

- Brake actuating cable for freedom.

- All rodends - reject any with evidence of bent tangs.

- Elevators for proper mass balance - 12° to 25° nose down when suspended upside down from pivot holes by a fine wire. Weight evenly distributed between inboard and outboard locations. Max. elevator weights with mass balances installed are 3.9 lb. left and 3.6 lb. right. Check this.

- Ailerons for proper mass balance - When suspended from the hinge pivots, the ailerons must hange between the angle that makes the bottom surface level and the angle that makes the top surface level (after painting).

- Check for 1/16" minimum clearances around all mass balances. Binding can occur at elevated load factors if clearance is too tight.

LANDING GEAR

Main Gear

- Double check that all attach bolts and axle bolts are installed and secured.

- Check tires for proper inflation pressure. The 500 x 5 tires on the main gear should be inflated to 40 psi. Higher pressures should be used for 6 ply tires. Wait 24 hours and check for leaks.

- Adjust brakes and test for proper function. Service with fluid as required. Bleed by filling from the bottom up to the master cylinder. Recheck rudder travel to verify max. limit (see previous page) is not exceeded.

- Double check for proper main tire toe-in. Should be ¼ to ½ degrees per side.

- Wheel bearings should be packed with grease and safetyed.

- Brake calipers should move freely and be safetyed.

Nose Gear

- Nose gear tire inflation should be 40 psi.

- Wheel bearing should be greased and safetyed.

- Axle nut for security and proper installation.

- Shimmy damper for friction adjustment. Side force to rotate pivot should be two to four lbs.

- Check safetying and security on all actuating mechanism hardware.

- Light grease on worm and wormgear.

- Hold nose up and cycle gear to verify proper function and locking. Verify an over-center condition on the NG50. Cycle gear with a 10-lb. load to simulate air drag load.

- Verify nose gear warning microswitch is activated in last 1/10" of NG 50 travel.

INSTRUMENTATION

- Cylinder Head Temp.
- Exhaust Gas Temp.

  - These two gauges should be accurately calibrated before use. This is important! Dip probes in hot oil and check oil temperature with a candy thermometer.

- Pitot/static system - Check for leaks.

- Oil Pressure
- Tachometer
- Fuel Pressure

  - Verify proper function during initial engine runup.

POWERPLANT

- Clock the propellor for compression stroke at the 10 o'clock position for proper hand-propping.

- Check propellor bolts for proper torque. Old style 4 or 5 laminate birch propellors should be torqued to 200 in./lbs.(no more than 220). "Multi-laminate" (30+) Canadian maple props can be torqued to higher values without crushing the wood. RAF reports that they have gone as high as 300 in./lbs.

- Propellor track and cracks.

- Spinner track and cracks.

- Engine mount bolts for security and safety.

- Oil level.

- Mixture, throttle, carb. heat controls for security and proper function.

- Magneto wiring. Be sure mags are cold when the switches are off.

- Check that the magneto impulse coupling clicks at, or after top dead center. Check if only one mag has an impulse coupling. If so, the other should be off for hand-propping.

- Cowling baffles must fit tight all around the engine and cowling. If not, you will have air leakage, insufficient cooling and engine overheating will result.

- Check that the fuel caps seal securely and the vent system is clear and without leaks.

- Check your fuel selector valve for proper function (left, right, and off). Do not use a valve with a "both" position. Make sure you can feel the detent at each position (to avoid taking off without full fuel flow). After flushing the entire fuel system, check your fuel filter and carburetor filter (at the carb inlet) for contamination. If any, clean.

- Calibrate your fuel gauges with the aircraft level If the fuel level isn't clearly visible, sand the gauge area to a very smooth surface with 220 sandpaper and paint on a clear coat of epoxy (laying a piece of smooth plastic film over the epoxy while it is curing and stripping it off later will insure a glass-smooth surface and greater transparency).

- Check freedom of fuel valve. If it requires more than 10 lb. of force at the handle, the valve must be overhauled or lubricated with an approved fuel valve lubricant.

CAUTION

Under no circumstances should fuel of a lower octane rating than that specified by the manufacturer for your engine be used. It will result in power loss, possible detonation at high power settings, and possible catastrophic engine failure.

Be sure the minimum octane for your engine is clearly labeled at each fuel cap. Color coding for 80/87 is red, 100LL is blue, and 100/130 is green.

CAUTION

Under no circumstances should auto fuel be used in your engine or tanks, EAA tests notwithstanding. Auto fuels are not blended to the same high standards as aviation fuel, i.e. octane rating, vapor pressure, chemical composition, etc. Some unleaded auto fuels have very high aromatic content, which makes them very powerful solvents. All it would take is one bad tank-full, and you would lose many times the amount you are hoping to save.

WEIGHT AND BALANCE

Your final weighing before initial flight tests is very important and should be done carefully. The measurements taken should be recorded in the airframe log book and used in the weight and balance data kept aboard your airplane (table on page 39).

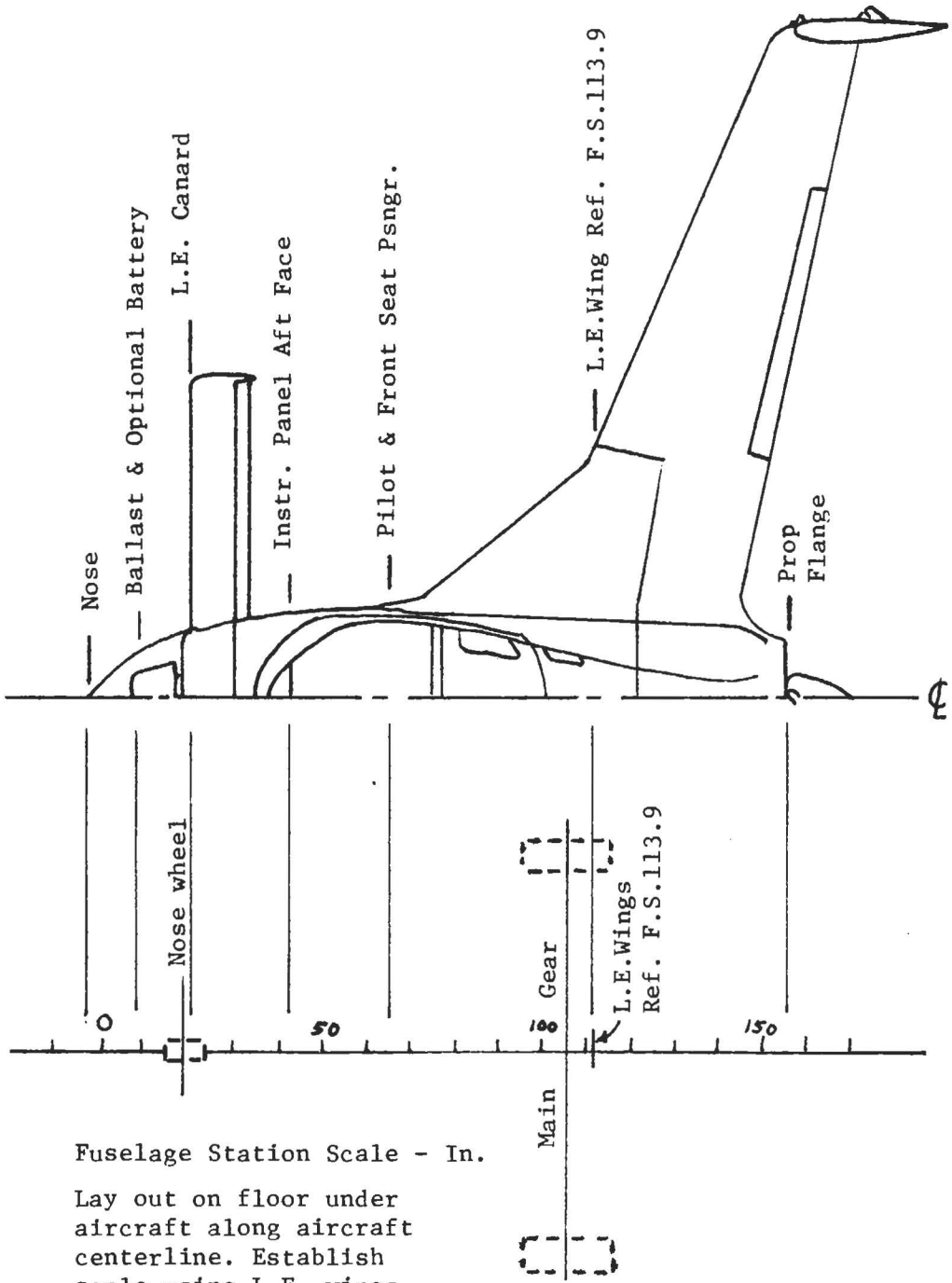
You will need three scales. Platform scales are preferred. Make sure they have a large enough capacity for the anticipated load on the mains. Bathroom scales are unsuitable, except perhaps for the nosewheel, and only then if you have calibrated them at about the same weight being measured. The platform scales under the mains must be aligned with their wheels perpendicular to the center line of the airplane so the gear doesn't side-load the scales. You will also need a level, a 12 ft. decimal tape measure, a plumb bob and line, chalk and chalk line to mark the hangar floor, and some ballast weight to keep the nose down on the scales with nosegear extended. Check accuracy of the scales by weighing an item you already know the weight of.

Position the airplane on the scales with the W.L. reference (top longerons) level fore and aft and side to side. If you have only one scale and plan to measure just one gear at a time, the other gear must be propped up so the airplane is level. Put the ballast in the nose ballast compartment (F.S. approx. 8, measure yours). Close the canopy. Record the scale readings with the airplane alone (no fuel, no pilot, no baggage, etc.).

After weighing, with the airplane off the scales but still level, use your plumb bob and line to mark the aircraft centerline on the floor, and then the position of the nose, ballast compartment, nose wheel axle, canard leading edge (both sides), front face of instrument panel, main gear axles (both sides), wing root L.E. (both sides), firewall, and propellor hub flange. Then roll the airplane out of the way, translate the plumb bob points to the aircraft centerline, assign F.S. 113.9 to the wing root leading edge, and measure and record all of the other points (see example, next page).

Note that the reference point for all c.g. calculations and limits is the wing root L.E., which is set at F.S. 113.9 in. The forward face of the instrument panel should be approximately F.S. 41.25. Record the exact location in the airplane. The main gear should be at F.S. 109.5 $\pm$ 0.5 to allow correct rotation speed and ground handling. Canard L.E. should be at F.S. 18.6 $\pm$ 0.5 for correct flying qualities.

When ballasting the aircraft for the initial flight testing, and for initial pilot checkouts, the weight and c.g. must fall in the first flight box (see page). If one must be exceeded, overweight is preferable to an aft c.g. condition.



Fuselage Station Scale - In.

Lay out on floor under aircraft along aircraft centerline. Establish scale using L.E. wings as reference at F.S. 113.9

EMPTY WEIGHT AND C.G. LOCATION

The calculation of empty weight and c.g. location is straight-forward. Empty weight is the total of all weights measured on the scales, less ballast and/or tares (boards or shims placed below wheels on scales). Each net weight times its F.S. position gives its moment, and the sum of the moments divided by the net weight gives the c.g.location.

SAMPLE DATA AND CALCULATION:

ITEM	GROSS	TARE	NET	ARM	MOMENT
Scale R. Main	447.6	0.0	447.6	109.5	49,012.2
Scale L. Main	450.0	-0.5	449.5	109.5	49,220.3
Scale Nose wheel	4.0	-1.0	3.0	18.5	55.5
Ballast (minus)	-10.0	0.0	-10.0	8.0	-80.0
Totals			890.1	110.3	98,208.0

Empty c.g.= $\frac{\text{Total moment (98,208)}}{\text{Net weight (890.1)}}$ = 110.3

NOTE: Be sure to subtract both weight and moment of ballast.

YOUR AIRCRAFT DATA AND CALCULATIONS:

ITEM	GROSS	TARE	NET	ARM	MOMENT
Scale R. Main					
Scale L. Main					
Scale Nose wheel					
Ballast (minus)					
Totals					

Now, record the empty weight and moment for your airplane on the table on page 29. Determine by trial and error the maximum front seat weight with zero fuel and no back seat baggage or passenger which will stay inside the forward c.g. limit on page 31. Do the same for the minimum front seat weight with full fuel and no back seat load which will just stay within the aft c.g. limit. Once these weight limits are determined, placard your aircraft accordingly. As an example, the placard could read:

Front Seat Weight Limits	
Maximum	340 lbs.
Minimum	185 lbs.

SAMPLE

If a pilot weighing less than 185 lbs. wishes to fly solo, he must add ballast to the nose (moving the battery forward would help, but it is inconvenient). Remember, you must do the initial testing in the first flight box. Mid c.g. gives the best overall flying qualities. Even after initial testing you may wish to ballast for mid c.g. when flying solo.

Use the loading charts on page 29 and try several sample problems with different pilot and passenger weights and fuel loads to develope an understanding of your loading capability.

CAUTION

Whenever you add equipment to your aircraft, after the initial weighing, record the weight, fuselage station and moment in your aircraft log book and adjust the aircraft empty weight, c.g. and moment accordingly. The same holds true if you relocate equipment, like the battery, brake cylinders, etc.

CAUTION

Operations above the designed gross weight limitations as stated in this manual, is a high risk activity and an extremely hazardous practice.

NOTE

A maximum gross weight, for takeoff only, of 1600 lbs. may be used, but only under the following limitations:

1. Taxi and takeoff only on smooth hard surface. Use the 6 ply industrial rib tire or equivalent with 80 psi inflation.
2. Maximum landing weight limited to 1500 lbs.
3. Refer to gross weight takeoff distance. See chart page 54. Lift off at 75 knots (85 mph) and climb at 95 knots (110 mph). See chart p 55.
4. Maneuvers limited to normal category +3.8g, -1g. No abrupt maneuvers.
5. Before conducting over-gross operation, the pilot should be a proficient and competent COZY pilot with at least 50 landings in the aircraft. The pilot should not attempt high gross operations at high density altitudes or gusty crosswinds. Maximum crosswind component is 8 knots.
6. High gross weight operations should not be considered a routine operation since the chances of surviving an off-airport forced landing diminish rapidly as weight goes up. It should only be considered on those rare occasions when a long range, full fuel, full baggage two place operation is desired. Routine operations above 1500 lbs gross weight are not recommended.

APPENDIX II

FLIGHT TEST PROCEDURES

As you complete the final checkout on your new airplane, you are going to be hot to fly your first flight. You may push a little too hard at the last minute and try to fly prematurely, possibly with something wrong with your airplane. To avoid this "homebuilder syndrome" give the only key to your bird to a close friend (preferably one who really likes you and to whom you owe money) and give the absolute authority to say "go" or "no go" to your initial flight tests. With all the other things you are thinking about, it's best to give the decision (of whether the airplane is ready) to someone else. If you really get a bad case of "homebuilder's syndrome" your friendship may be strained somewhat, but you will be able to make up after you have tested your new bird safely. A little champagne seems to help!

This "homebuilders syndrome" has been a major factor in many first-flight accidents. Typical of this problem is where an individual spends all his time and money building his airplane and, for several years, lets his flying proficiency lapse. Very typically we find a finished homebuilt with the owner/pilot seriously lacking in pilot proficiency. In one case the pilot who tried to fly the first flight on his homebuilt had only one flight in the last two years!!! Another problem surfaces about thetime the aircraft is ready to fly - "Ego", that is, "I built the machine, I'll fly it. After all, who knows more about my machine than me - - I built it". The homebuilder is understandably proud of his creation and becomes very possessive. So, we find the proud builder/pilot at the end of the runway "ready" for takeoff with possiblya bad case of "homebuilder syndrome". But he won't know it until just after lift off when he finds himself suddenly thrust into an environment he is ill prepared to handle.

The best remedy for "homebuilder syndrome" is to accept help on your flight testing from an experienced COZY pilot. Then get a good checkout from him after you meet the currency requirements on page

GROUND TESTING

Don't just race outand fly your airplane first thing. You will spend a while checking out all of your systems on the ground before you leap off on the first flight. The first order of business is to check out your engine system thoroughly. Ground run it for an hour or so at low to medium power. Run it with the top cowling off and look for excessive vibration, unsafetied hardware, leaky fuel lines, or anything else unpleasant. After this initial run-in period (or the

manufacturer's recommended run-in for new or overhauled engines), check everything over very carefully. Recheck the exhaust nuts for torque, look for leaks around gaskets, loose clamps, check fit of cowling baffles, etc. Check everything thoroughly before you button up the cowling to begin taxi tests. Be sure the engine compartment is clean. Check for nuts, washers, bits of safety wire, etc. because in a pusher, everything that comes off goes right through the prop.

And last of all, are you sure you have complied with all the details in Appendix I ?

LOW SPEED TAXI

Make all initial taxi/runway flights without wheel pants for better brake cooling.

Refer to "Pilot Position" page 10 to set up the seat for correct visibility. Low speed taxi is defined as that slower than required to lift the nose wheel off the ground - 35 knots (40 mph). Spend at least a full hour doing low speed taxi to fully familiarize yourself with the cockpit environment and to thoroughly check the engine, brakes, controls, landing gear, etc.

Thirty five knots is sufficient speed to evaluate rudder steering and brake effectiveness. You may find that extensive taxiing can overheat the brakes. At 35 knots you will note that the floppy feel of the control stick is gone and airloads now provide a comfortable centering feel.

Recheck that your weight and balance is within the "first flight" box on the diagram on page 31. Recheck wing and canard incidences and control travel and freedom before proceeding. Now is the time for the final FAA inspection and issuance of your airworthiness certificate.

HIGH SPEED TAXI & NOSE WHEEL LIFTOFFS

Before conducting the following tests with your new COZY, do all of them first with two other different airplanes in which you are proficient. These maneuvers (nosewheel liftoffs at low power) are a little strange to the average pilot. Doing them in a familiar airplane takes the strangeness out of the maneuver and better prepares you to do them in a new airplane. It also gives you a first-hand look at runway length requirements and wind conditions.

Some of the following requirements and procedures may seem excessive. This is not due to any special feature of the COZY; we feel they should be required of any homebuilt during its initial testing. The safety record of homebuilts during first flights is not as good as it could be if the owners and pilots would follow the following cautious procedures during initial testing.

- Weather - wind calm or smooth wind straight down the runway. Smooth air - check turbulence in another airplane.
- Runway - at least 3,500 ft., preferably over 4,000 ft.
- Fuel - 10 gallons each tank.
- Pilot - see pilot experience requirements (page 26) for absolute minimum criteria. Do not test fly a new airplane while fatigued: go home, get some dinner, sleep; you're more alert in the morning.

The reason for the long runway requirement is to allow you to do nosewheel lift-offs and decelerations without concern for stopping distance or brake heating. The air must be smooth and without crosswind. Set the pitch trim for takeoff. Set neutral roll trim.

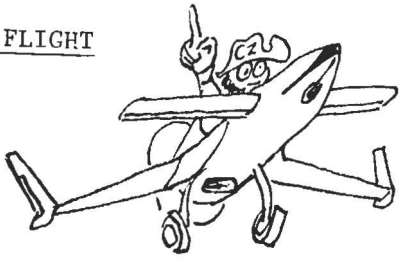
The purpose of this phase of testing is to evaluate the aircraft's performance and trim during high speed taxi/nose wheel lift-offs, to acquaint the pilot with the pitch and yaw characteristics of the COZY, and, most importantly, to give him the correct visual cue of zero height to allow him to judge flare height on his first landing. ; The pilot should spend enough time just below rotation speed to be thoroughly proficient and comfortable with the unique COZY rudder system. There should be no tendency for the pilot to inadvertently push/deploy both rudders at the same time, unless during braking.

Next step is to practice speed control before attempting nose wheel lift-offs. It's important to be able to control speed accurately so as not to get airborne inadvertently.You will find that once a speed is attained it takes VERY LITTLE power to maintain it. Practice accelerating to and maintaining different target speeds (30, 40, 50, & 60 knots). Do not rotate.

You will find that once the target speed is reached, you must reduce power to idle or just a "hair" above to keep from exceeding it. Be proficient and comfortable in holding speed before moving on to nose wheel lift-offs. The aircraft will rotate at different speeds depending on gross weight and center of gravity. To determine rotation speed, accelerate to 40 knots, set power to maintain speed (close to idle), then attempt to rotate. If 40 knots is too slow to rotate, then go back to the start and try 45 knots, etc. Find the speed that will just rotate the nose (about 55 knots), reduce power to near idle and practice holding thenose at a predetermined position. Be careful not to over-rotate. Always keep the canard well below the horizon. The pilot should not allow the aircraft to exceed 60 knots or rotate to a point of becoming airborne during this exercise.

When you've done enough runs down the runway so that you can comfortably, smoothly and precisely control speed, pitch, and yaw with the nosewheel off the ground, you should be ready for the first flight.

FIRST FLIGHT



RAF

You should be proficient in rudder operations and positime control of pitch control and are ready for the "big one". But be sure you review and understand the following:

The COZY does not fly like a Cessna 150 or some other sluggish trainer. The COZY is a high-performance, responsive aircraft with differences. It has a side stick and the pilot should keep his forearm on the arm rest and use his wrist to control pitch. Also, the rudders can both be deployed simultaneously and the pilot should be careful not to inadvertently do this in flight.

There are two differences in a COZY which must be thoroughly understood prior to flight:

1. The non-standard rudder pedals. Be sure not to inadvertently deploy both rudders at the same time in flight. If this happens, one will usually be out more than the other, producing unwanted yaw. The COZY rudders are quite effective. Adjust the pedals so your feet do not press the pedals naturally.
2. Pitch over-controlling. The novice pilot will expect COZY to handle like the Cessna 150, or whatever he last flew. The experienced pilot knows that J-3 Cubs and Bonanzas handle differently and will make the transition easily. Spend enough time on the runway just above rotation speed, but below lift-off speed, and practice controlling pitch so you can put and hold the desired/selected pitch proficiently. Hold the forearm on the arm rest and control pitch with the wrist only. Do not overrotate! The highest rotation you should see during this or later flights is the canard up to, but never above the horizon. Better yet, keep it always at least 2 degrees below the horizon.

NOTE

If you are accustomed to flying with the stick in your right hand and the throttle in the left, make your first and subsequent flights sitting on the right side. Do not transition to the left side until you are thoroughly accustomed to the aircraft and familiar with its flying qualities. Transitioning to the left seat is not difficult, except you will have to concentrate on the fact that your left hand holds the stick for the first few landings. After that, it's very natural.

Remember, the first flight of your aircraft is just one baby step up from the lift-off that you've just completed, and is just the bare beginning of your flight test program. First flight should again be made under ideal weather conditions. The weight and c.g. position should be within the limited envelope shown on page for initial flight tests. This will require adding ballast to the nose. First flight is not intended to demonstrate the capability of your aircraft or of the pilot and should be flown very conservatively. Leave the gear down and give yourself one less thing to worry about. Limit your airspeed to a range of from 70 knots (80 mph) to 130 knots (150 mph), stay over the airport, and resist the urge to buzz your observers. Buzz jobs on the first flights are done by fools, never by professional test pilots. During your climb out, set your pitch and roll trims to trim the airplane for hands-off flight. This will be a handy reminder of trim direction, if the airplane needs adjustment. You will notice a small roll trim change when you reduce power. The airplane will require more right trim with power off. Limit your first flight to feeling out roll, pitch and yaw responses and checking engine operation, temperatures, pressures, etc. Make your approach at 75 knots (86 mph) and make a slightly fast touch down (70 knots), leaving full stall landings for later in the test program.

After this first flight, make a thorough systems check, clean and flush the gascolator, electric fuel pump screen, and carb screen. Also remove and clean out carb float bowl. Check float needle valve and seat for cleanliness.

ENVELOPE EXPANSION

With first flight completed and any squawks resolved, you are ready to expand your flight envelope. Do not promptly charge out and test-fly your aircraft at the extreme c.g. position and weights shown on page . Expand your envelope in small increments. Remember, you have to spend 40 hours in your test area, so put the time to good use and do a professional job of flight testing. Before expanding the weight and c.g. range shown for initial testing, spend a few hours and become thoroughly comfortable in your piloting tasks. When you feel at home in the airplane, begin your expansion of the weight, c.g. position, load factor, and airspeed ranges. Don't feel obligated to expand into the full ranges shown in the plans and in this handbook. Expand your limitations slowly, and if you reach a point that you feel uncomfortable, stop! The ranges shown are those demonstrated by the designer. Feel free to restrict your airplane as you determine in your own testing; just don't exceed the design limits shown.

Do not assume that your aircraft will fly exactly the same as N22CZ, the COZY prototype. Minor homebuilder construction tolerances can affect flying qualities and performance; for example, your aircraft may exhibit less or more stall margin. As with any aircraft, completely determine your stall characteristics at a safe altitude, then operate your aircraft accordingly.

After you complete the expansion of the c.g. envelope on your aircraft, you may want to change the placarded minimum and maximum front seat weights to those with which you are comfortable.

Some words of general caution - Wear a parachute for your flight testing. Never leave a squawk unresolved; find and fix problems as you encounter them. Airplanes usually give a hint of impending trouble. The problem is, we pilots don't always listen. If something changes, a slight roughness or vibration, new oil leak, trim change, new squeek, etc., look until you find it. Don't rationalize it away. Have bunches of fun!

FLIGHT - FLUTTER ENVELOPE EXPANSION

Before you exceed 130 knots (150 mph), you should be absolutely certain your elevators and ailerons are balanced per specs, you should be wearing a parachute, and you should be at a height of at least 7000 ft. AGL. You should expand the airspeed envelope in increments of not more than 5 knots. At each increment, access the damping of the controls as follows: kick a rudder pedal, and jab the stick left, right, forward and aft. After each input, the controls should immediately return to trim, and any structural motion should damp within one cycle. This will require at least 3 or 4 dives, climbing back to altitude between dives. Do not expand airspeed in the dive when below 7000 ft. AGL. Use care to not overspeed the engine RPM. If you have just increased speed and find lower damping (i.e., the structure or controls shake more after the jab than at the 5-knot lower speed), do not continue to higher speeds. Recheck balance and weights of control surfaces. Solve any suspected cause of low damping before expanding airspeed. Expand speed to at least the red-line speed you desire to place on your aircraft, up to, but not exceeding 190 knots (220 mph). Placard your airspeed indicator with your red line.

CAUTION
Friction in the pitch system can seriously degrade flying qualities.

APPENDIX III

Maintenance/Inspection

Composite Structure

The COZY is painted with a white acrylic enamel or lacquer. UV Barrier is used (dark primer) to protect the epoxy and foams from deterioration. Do not expose unprotected fiberglass to sunlight for extended periods. Unpainted areas should be retouched. The high surface durability and high safety margins designed into the COZY make it highly resistant to damage or fatigue. If the structure is damaged, it will show up as a crack in the paint. The strain characteristics of the material are such that it cannot fail internally without first cracking the paint. If damage is suspected due to a crack in the paint or a wrinkle in the skin, remove the paint around the crack (by sanding) and inspect the glass structure. Do not use enamel or lacquer paint remover. If the glass structure is damaged, it will have a white appearing ridge or notch, indicating torn (tension) or crushed (compression) fibers. If there is no glass damage, it will be smooth and transparent when sanded. If there is glass structure damage, repair as shown in Plans Section I, Chap. 3. Delaminations are rare, due to the proper design of joint (none have occurred in the prototype). If a delamination occurs (skin trailing edge joints, etc.), spread the joint, sand the surfaces dull, trowel in wet flox, clamp back together, and let cure, or use the method in the construction manual.

Inspect suspected debonds (areas where skin has separated from the foam) by tapping a 25¢ coin across the surface. A debond will give a "dull thud" compared to the "sharp knock" of the adjacent good area. Debonds must be repaired by injecting epoxy in one side of the area and venting the air out the opposite side.

Plexiglass Canopy

Due to the uniform frame and lack of metal fasteners, the COZY canopy is not as susceptible to cracks as the common aircraft plexiglass components. If a crack up to three inches does occur, stop drill it just outside the end of the crack with a 1/8" drill. Cracks longer than three inches require canopy replacement.

Scheduled Maintenance/Inspections

In addition to the schedule listed below, follow the manufacturer's recommendations for inspection/maintenance of engine, accessories, wheels, brakes, etc.

Each 25 Hours

- Inspect the prop and spinner for damage or cracks.
- Prop bolts - check torque (wood props require 200 in-lbs.) and resafety. Check after initial run, at 10 hours, and each 25 hours thereafter, or before next flight when transitioning from humid to dry conditions. Wood shrinkage in dry environments can cause bolts to loosen with resultant loss of propellor in flight.
- Engine Cowl - Remove and check baffling for cracks.
- Engine Oil Change - Every 50 hours for spin-on filters.
- Engine Oil Screen - Clean every 50 hour oil change.
- Fuel Filters - remove and clean (gascolator, electric fuel pump, carb finger strainer).
- Carb Float Bowl - disassemble and check for contamination. Inspect float needle valve and seat. Look for a gummy substance, clean if necessary. Perform this inspection each 25 hours until 100 hours, then each annual/100 hour inspection thereafter.

NOTE

Any contaminates (foam - flox, dust/chips, etc.), left in the fuel system during construction could take 50 hours or more to be completely purged from the system. Check the filters often during the first 100 hours. Contaminates can stick in the gascolator drain valve causing a slight leak. If this happens, remove the bowl and flush the valve.

- Exhaust system - check for cracks, leaks, and security. Carefully check the four exhaust gaskets for leaks. Never reuse an exhaust gasket.

NOTE

It is very important to avoid exhaust leaks if using a cabin heater, to prevent fumes from entering the cockpit.

- Engine Mount - carefully check for cracks.
- Air Filter - Check and replace (if dirty).
- Brake Fluid Level - check and refill master cylinders.
- Cables, push rods, fuel/oil lines and electrical wires - check for chafing.
- Fuel System - pressure check (electrical pump on) for leaks and correct pressure - 2 to 8 psi.
- Engine run - check for leaks, mag drop, mags grounded, idle speed/mixture and idle mixture cut off.
- Landing gear attach fittings - check for security/damage.
- Fuel Vents - check that they are open.
- Canopy - check hinges for damage, locking mechanism for rig/snub, and safety catch operation.
- Tires and Brakes - remove wheel pants, check tire inflation (mains 60 psi, nose 40 psi) and tire wear or cuts. Check brake pucks for wear. Adjust nose wheel friction damper (2-4 lbs. side force to swivel pivot.
- Nose gear retraction - grease worm gear. Check for damage, wear and gear-down warning switch adjustment.

- Tires and Brakes - remove wheel pants, check tire inflation (mains 60 psi, nose 40 psi) and tire wear or cuts. Check brake pucks for wear. Adjust nose wheel friction damper (2-4 lbs. side force to swivel pivot).
- Nose gear retraction - grease worm gear. Check for damage, wear and gear-down warning switch adjustment.
- Lights - Nav., landing, strobe, cockpit, check operation.

ANNUAL/100 HOURS

Check all items listed in the preceding 25 hour inspection schedule, plus all items in Appendix I, page 32 except weight and balance (Have you entered all additions?)

Review the COZY Newsletter from #12 on for any airworthiness directives. Also any FAA ADs that would apply to certified components/accessories. Be sure all are complied with prior to returning your aircraft to service.

Review the weight and balance/equipment list for currency (Airplanes, like people, get heavier with age). Your airplane should be reweighed at the first annual (you may be surprised). Update the weight and balance form. Reweigh every 3 years, or after any major modification.

- Nose and Main wheel bearings - repack with grease.
- Air Filter - replace.
- Engine - refer to manufacturer's inspection manual. Be sure to check mags grounding/timing. Clean and gap plugs (.018"). Reverse top and bottom plugs. Check compression. If below 70/80, investigate. Check engine controls: Throttle, mixture, and carb heat for freedom of operation. Lube if required.
- Control system - inspect and lube all hinges, rodends, and bearings. Check for freedom. Check jamnuts.
- Canard - remove the canard (see page 50) and inspect the rudder pedals, nose gear retraction mechanism, canard lift tabs for damage/elongation, elevator torque tubes for damage, elevator balance weights for security/binding.
- Battery - check fluid level and remove any corrosion.
- Pitot static system - check for leaks.
- Vacuum system - replace filter.
- Canopy locking hooks - check rig (all three making equal contact) and proper snub. The handle must be adjusted so it has to be firmly pushed forward to engage the lock.
- Wings - remove both wings (see page 51) and inspect the glass areas around the center section spar and wing attach fittings. Look for cracks, delaminations, etc. Note that the reason for this inspection is not based on any anticipated problem or failures, but to insure that the aircraft, at least once each year, is given a thorough structural inspection.
- Inspect the entire surface of the aircraft. Look for evidence of cracked paint, delamination, or deformity of any kind. See composite structure, page 47.

NOTE

The composite material structural history in over 40,000 flying hours of similarly built aircraft (VariEzes) has never indicated a reason to be concerned about structural integrity. This annual structural inspection is important though, to indicate at an early stage any problem that needs attention. Report any structural defect to the Co-Z Development Corp.

CANARD REMOVAL/INSTALLATION

You can remove the canard by yourself in about 5 minutes, but before you start, set up some foam blocks or padded sawhorses to set the canard on after removal. Tools required: one 7/16" socketwrench and screw driver. Weight the nose with ballast so the airplane won't tip over after the weight of the canard is removed. Remove the nose access cover, disconnect the nav antenna and unhook both pitch trim springs in the center, forward of the panel. Remove the elevator push rod quick disconnect pins on both sides of the cockpit. Reaching in through the nose access hole forward of the canard, remove the two AN-4 main canard hold down bolts. These bolts screw into nut plates behind the bulkhead so no back-up wrench is required. Remove the bolts, label them (they may be different lengths), and record the number of washers used. There are no washers between the canard lift tabs and the bulkhead. Carefully lift the canard up and forward. Set the canard upside down on the supports you have provided. Be especially careful of the elevator pushrods that they do not get bent by an unknowing passerby. Bent rodends must be replaced.

To reinstall the canard, slip the push rods into the fuselage and lower the canard into position. Hold the canard slightly leading edge high, engaging the locating pins, and then slide the canard into position. Be careful not to get the nav antenna cable between the canard and the bulkhead. Next, install the two AN-4 canard main hold down bolts through the canard tabs into the nut plates on the aft side of the bulkhead. Add the correct washers under the bolt heads (not between the tab and bulkhead) so the bolts will tighten without bottoming prematurely in the nut plate. Caution - bolt length may be different left/right. These bolts should be snugged well (about 30 in.-lbs.) but not over-tightened. Reconnect the nav antenna, pitch trim springs, and elevator push rod quick disconnects. Perform an operational check of nav, trim, and elevator systems. Recheck the AN-4 bolts (in and torqued). Note: A VariEze attempted a takeoff without these bolts in. Fortunately, only the canard flew (leaving one surprised pilot sitting on the ground). Replace the nose access cover.

WING REMOVAL

Removal or installation of a wing requires either two or three people, depending on whether there are electrical cables to be disconnected while the wing is being held. The operation should take no more than 15 minutes per wing. Tools required: screw driver (cowl removal), two 3/4" sockets with 3/8" drives, two 3" x 3/8" drive extensions, one 3/8" drive ratchet, one 3/8" drive breaker bar. Procedure: Remove the cowling, disconnect the aileron push rod and the rudder cable using the quick disconnects. Disconnect the nav/strobe light wires and the antenna cables. Remove the three wing access attach hole covers. Support the wing tip and proceed to remove the three main wing attach bolts. To remove the two outboard bolts use the ratchet on the wing side and the breaker bar in the lower spar hole. The single inboard bolts access is from inside the cowling area in the wing root. Access to the nut for this bolt is from inside the centersection spar accessible from inside the back cockpit.

> **CAUTION**
>
> Be sure the nose is weighted/ballasted so as not to fall over backwards while working in the rear cockpit, especially after the canard is removed.

When the three main wing attach nuts are removed, support the wing at tip and root, and slide it aft, off the aircraft. Note the number and position of each incident (or sweep) shim washer on each bolt. These shims control the incidence (or sweep) of the wings and should be replaced exactly as they came off. If the bolts are also removed, label them (they are different lengths) and note the number of washers under each head. Set the wing on foam blocks or padded sawhorses to protect the surface from damage. The procedure is the same for both wings.

WING INSTALLATION

To install the wings, use the reverse of the sequence explained above. Be sure the nose is weighted/ballasted so the weight of the wings won't tip the aircraft over on its tail. Recheck for the correct number of incidence shims on each bolt. Torque the bolts to between 150 and 200 in.-lbs. Since you cannot get a torque wrench in the access wells, it's acceptable to just estimate the torque. These bolts are <u>not</u> highly stressed in spplication (contrary to normal wing attach bolts) and accurate torquing is not required - just snug them up. Be <u>sure</u> that at least two threads show outside each locknut. Be <u>sure</u> to hook up and run a complete operational check of the ailerons, rudders, and lighting prior to flight.

APPENDIX IV

FAA RECORDS

Records required for the COZY are basically the same as for any production airplane (F.A.R. 91). A valid airworthiness certificate, issued by a FAA maintenance inspector, is required to be displayed in the cockpit, along with the aircraft registration certificate, weight and balance record and operating limitations. Airframe and engine log books are required as in any other aircraft. One area which is different from production aircraft is the method for maintaining records of major repairs and alterations. A major repair or alteration of the COZY requires relicensing and issuance of a new airworthiness certificate and operating limitations instead of using FAA form 337A. Radio equipped aircraft must also have a valid FCC radio telephone license.

FILL IN THE FOLLOWING TO COMPLETE THE DESIGN DOCUMENTATION OF YOUR AIRCRAFT:

1. This aircraft was built to the drawings described in the COZY manufacturing manual.

   Yes_____ No_____

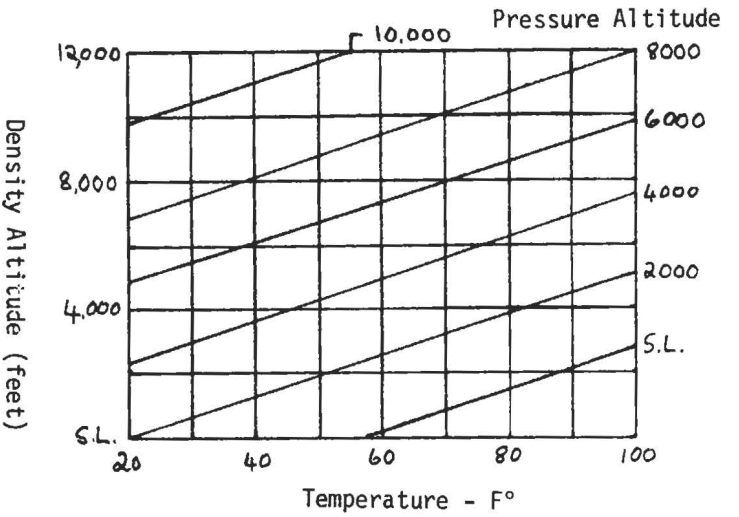
2. Co-Z Development Corp. has assigned serial number_____.

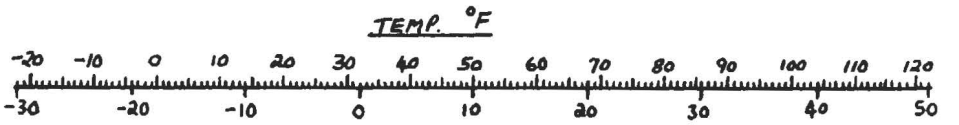
3. Modifications are completely documented as shown (if you have modified the design, you should make a drawing to show the change; if you have installed an engine other than a Lyc 0-235, also note).

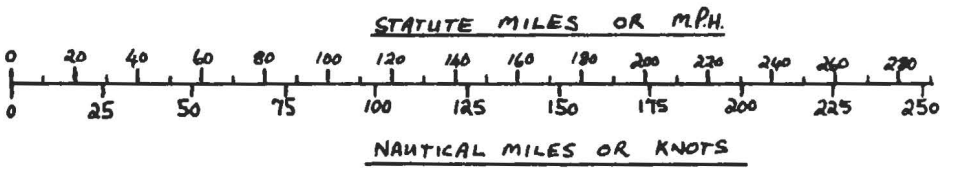
Modification	Drawing No.

APPENDIX V
PERFORMANCE DATA

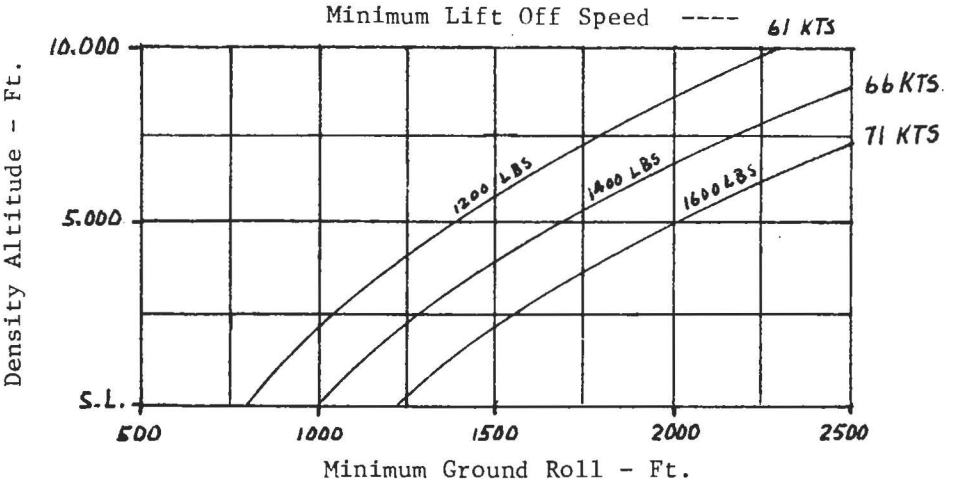
To determine density altitude

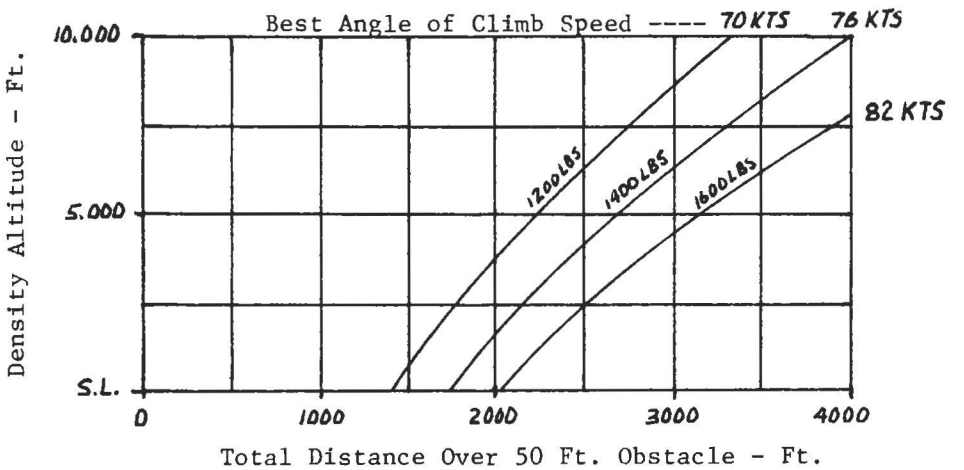






TAKEOFF DISTANCES



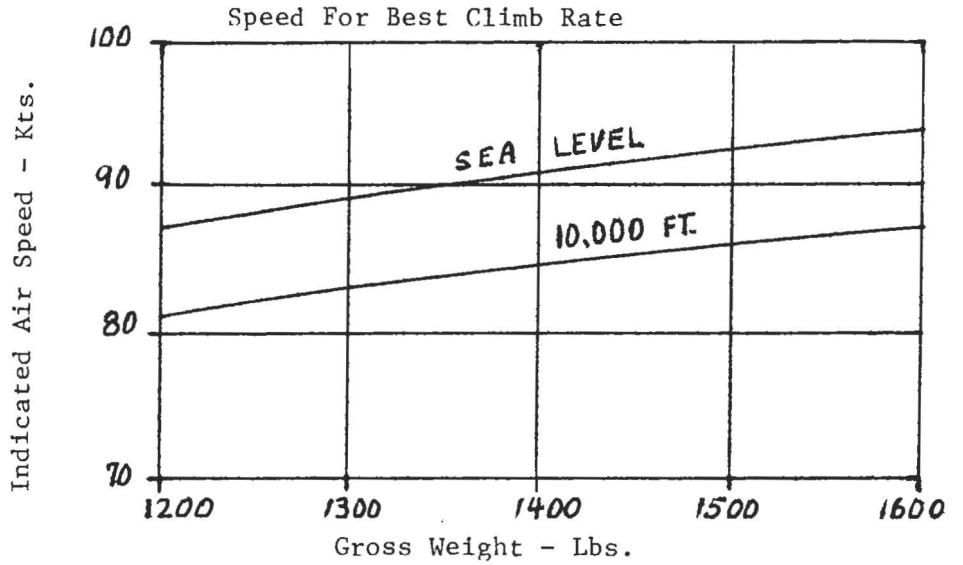


Note: 1) Data for Lycoming O-235 L2C with Grt. Amer. 62 x 62 or B & T 63 x 66 props.

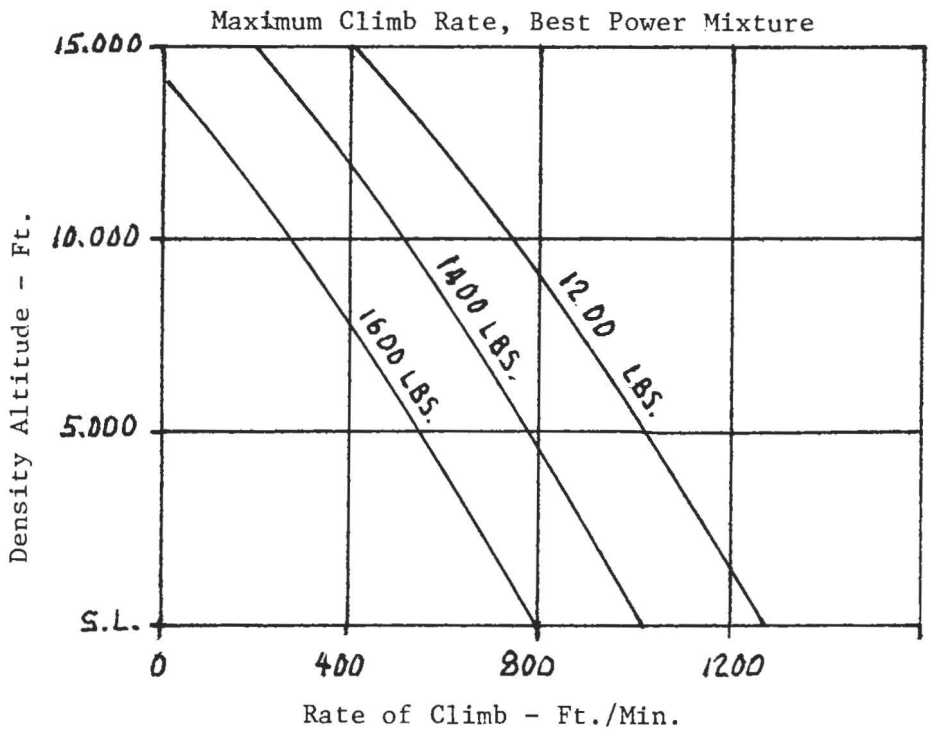
2) Due to brake steering requirements, crosswinds can extend take off roll. For a 15 knot crosswind component, multiply take off roll data by 1.25.

3) At forward c.g. the nosewheel lift off speed may be higher than the "minimum ground roll lift off speed." This can extend takeoff distance as much as 20% at maximum forward c.g.

CLIMB SPEEDS

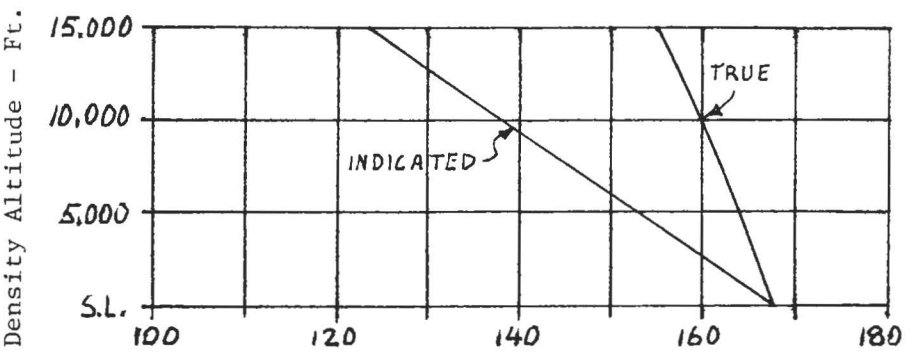


Note: For best cooling and visibility, increase speed 20 kts.



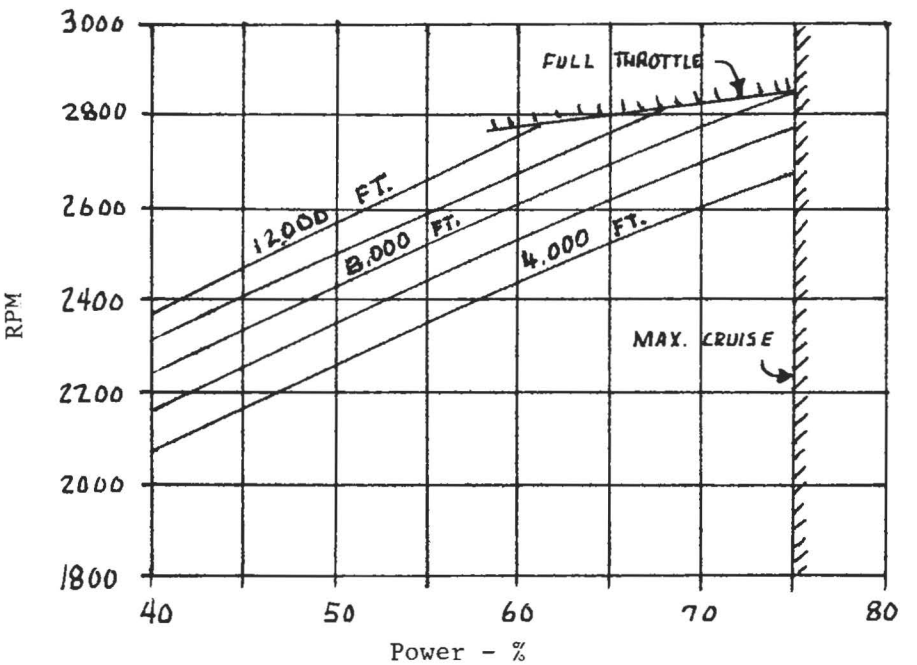
Note: Data for Lyc O-235 L3C with Grt. Amer. 62 x 62 or B & T 63 x 66 prop.

MAXIMUM SPEED - LEVEL FLIGHT



Speed - Knots
(With wheel pants - without, subtract 5 Kts.)

CRUISE POWER

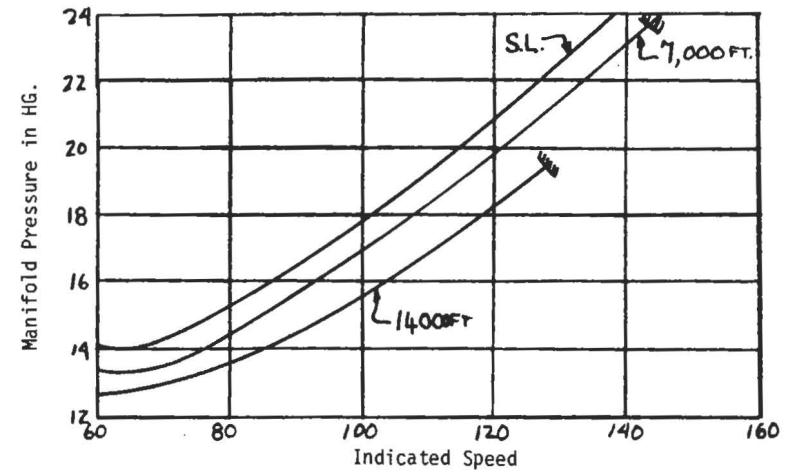


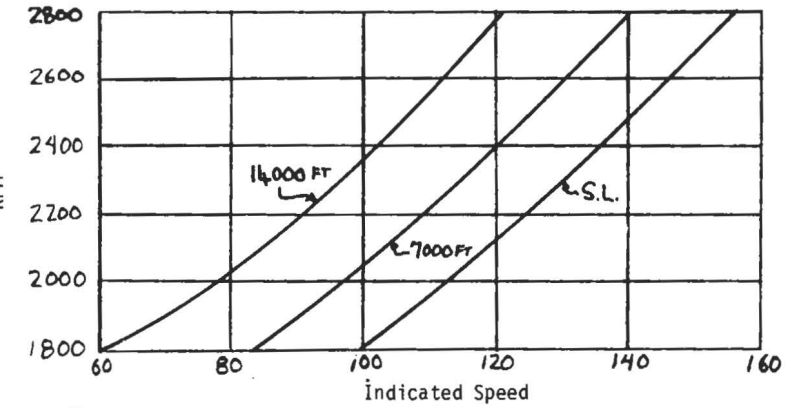
Power - %

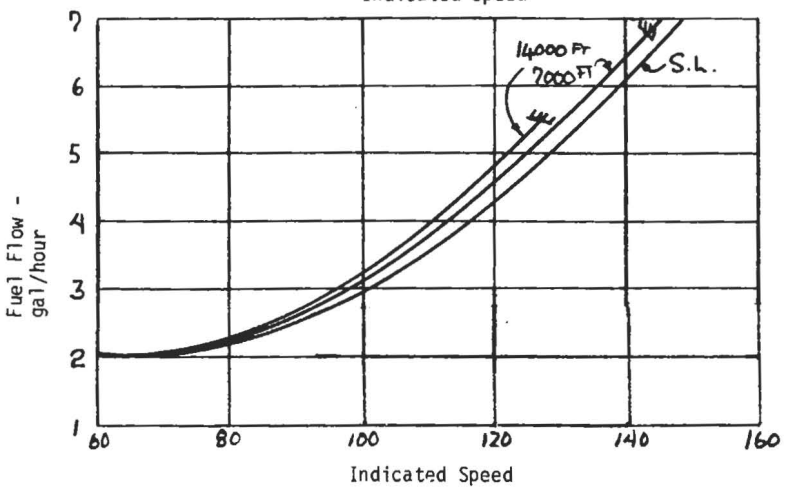
Note: 1) Data for Lyc O-235 L2C with Grt. Amer. 62 x 62 or B & T 63 x 66 props.

2) Max. continuous cruise speed (161 kts. true) is obtained at 8000 Ft. with full throttle (2840 rpm, 6.7 gal./hr.). Economy cruise at 12,000 Ft. at 2550 rpm at 50% power uses 4.0 gal./hr. and gives 137 kts. true.

CRUISE DATA





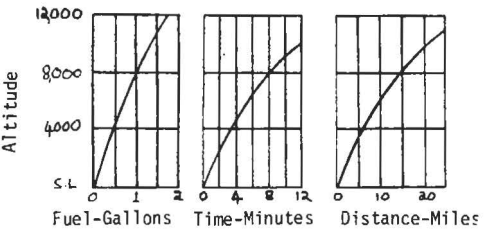


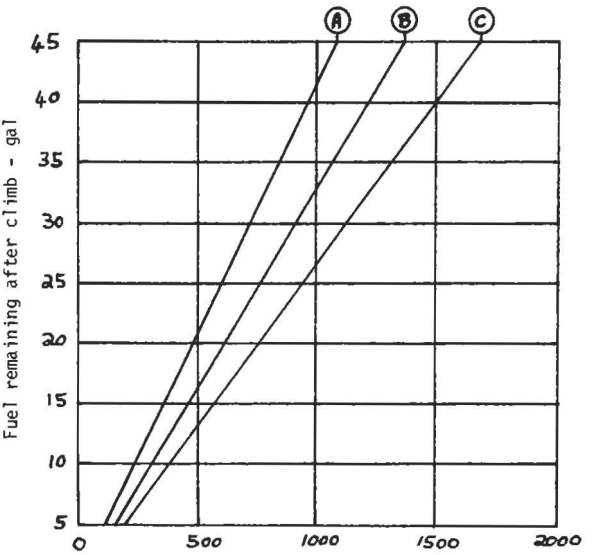
Note: Data for peak EGT mixture, Lyc O-235 L2C, and Grt. Amer. 62 x 62 or B & T 63 x 66 props.

RANGE

To calculate range,
(1) Subtract 4 gal. from total fuel, for reserve.
(2) Figure climb fuel and climb distance (top chart)
(3) Subtract climb fuel and look up cruise range from lower chart.
(4) Total range is climb distance plus cruise range.

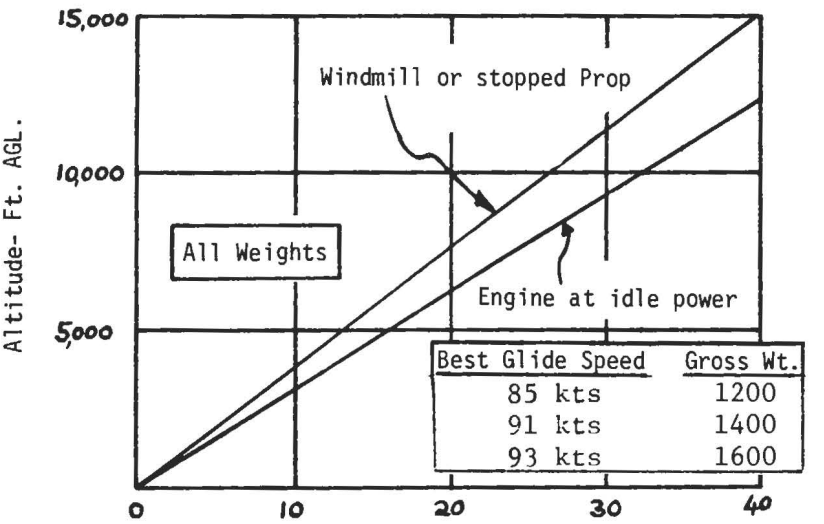
Fuel, time and distance to climb.
Gross weight = 1325 lbs.
90 kts indicated, Lycoming O-235.



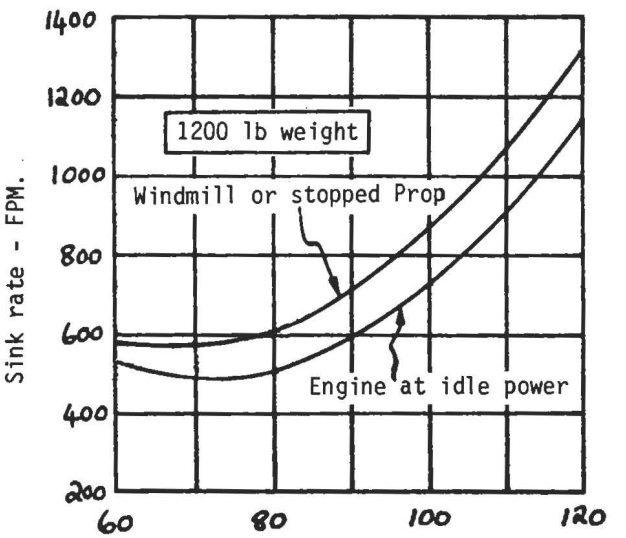


(A) Full throttle at 8000 ft - 75% power max cruise 143 kt indicated, 161 kt true, and 6.7 gal/hr
(B) Full throttle at 12,500 ft - 60% power 122 kt indicated, 148 kt true, 4.9 gal/hr
(C) Partial throttle at 12,500 ft - 40% power economy cruise,105 kt indicated, 127 kt true, 3.4 gal/hr.

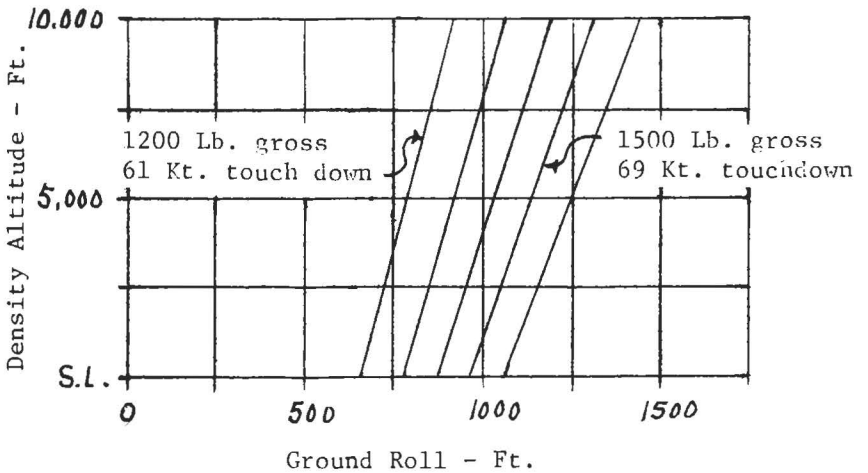
Glide - Gear up

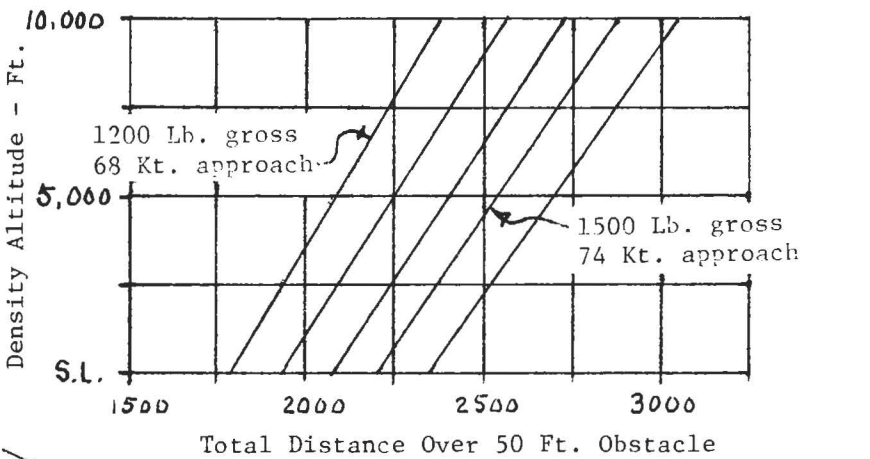


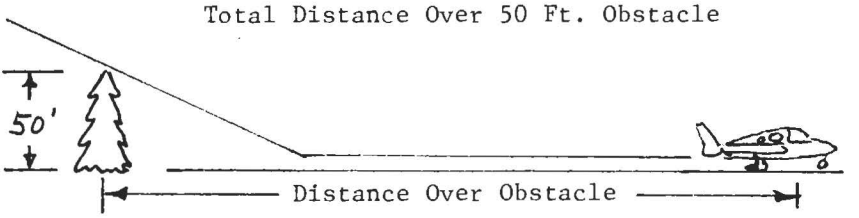
Sink rate- sea level- gear up.



LANDING DISTANCE - LANDING BRAKE EXTENDED







COZY AIRWORTHINESS DIRECTIVES

Number	Description	Date complied with

EQUIPMENT LIST

This list should consist of all those items of equipment installed in the aircraft that determine the aircraft empty weight. This list should be complete to include as applicable: engine, prop, spinner, wheel pants, each instrument, radios, seat cushions, headset, intercom, battery, tie downs, canopy cleaner, lights, ballast, etc. Be very complete with this list and keep it up to date. Every item outside of basic air frame structure should be on this list. Use this list to correct and update the weight and balance. Weigh each item and use the back cover of the plans to determine fuselage station for moment.

COZY Serial No. _____ Registration No. _____ Date ____

Paint type _____ Color _____ No. _____

Trim type _____ Color _____ No. _____

Interior type _____ Color _____ No. _____

Status of Equipment - X Installed
0 Removed

Status	Item	Weight	Arm	Moment
Engine				
Prop				

COZY CHECK LIST

Exterior Preflight Inspection

Cocktpit

Mag Switches - Off
Master Switch - On,check Battery condition and warning systems
Master Switch - Off
Mixture - Idle cutoff
Throttle - Idle
Cockpit access door - Closed,key removed
Flight control Lock - Removed
Stick - Free and unobstructed foward and rear cockpit.
Rudder Pedal Area - Clear of loose items, balast not required removed.
Rudder cable / Quick Disconnect - Secure
Pitch Trim - Check operation and cable connected.
Fuel Selector - ON (left or right)

Canard Nose Section

Elevator - Condition,hinges, Balance weights secure
Elevator - Free
Static Ports - Unobstructed
Pitot Tube - clear undamaged
Nose Parking Bumper - Check condition

Right fuselage/Wing

Canopy Hinge - undamaged
Fuel Quantity - Visually check
Fuel Cap O-ring - Condition
Fuel Cap - secure check alignment marks.
Fuel Tank Vents - Clear
Fuel Tank Drain - Check free of water/sediment
Fuel - Proper color (red 80, Blue 100ll, Green 100/130)
Wing and Vertical Fin - Condition
Tie Down - Removed
Rudder - Free, cable/Hinges secure, drain hole open.
Rudder return Spring- Secure, returns to neutral
Nav Light - Secure.
Aileron - Free hinges, secure

Aft Fuselage - Engine

Main Gear Strut - Secure
Brakes - Check for wear
Tires - Check wear and inflation
Cooling/Carbinlet - Clear
Drain Gascolator - Check free of water sediment
Gascolator Drain Valve - Check for complete shut off
Cowling - Check condition - all fasterners secure
Propellor - Check for nicks, cracks, erosion
Spinner - Check for cracks, screws secure
Exhaust Tubes - Check for security
Engine Area - General condition, baffles, loose items.
Oil Level - Check, dip stick and door secure

Left Wing Fuselage
Same as Right.

Nose Gear/Landing Brake

Perform fuel tank and gascolator drains prior to lifting nose.

Lift nose. Extend gear and landing brake. (Hold nose down during this check).
Strut/Pivot - Secure, undamaged.
Wheel Friction Damper - Adjusted (2-4 lbs force to swivel).
Wheel well/Door - Secure
Tire - Check wear/inflation
Landing Brake - Check for damage, hinge/push rod secure
Landing Brake - Retract
Nose Gear - Retract for hand starting.

Engine Start - (with electric starter)

Lift nose, extend and lock nose gear, board aircraft and hold brakes.
Mixture rich / carb heat cold
Throttle - Prime and crack
Master Switch - ON
Auxilary Fuel Pump - On to check pressure (4-8 psi)
Auxilary Fuel Pump - OFF
Propeller - Clear (Holler loud, wait for response, have outside observer confirm area clear).
Mag Switches- On (Lycoming left mag only for start)
Start Engine - Check both mags on - Oil Pressure

Engine Start - (Hand Propping)

Park on nose bumper
Mixture rich / carb heat on
Throttle - Prime and crack
Master Switch - On
Auxilary fuel Pump - On to check pressure (5-8 psi)
Auxilary Fuel Pump - OFF
Pull prop through 8 blades (mags cold)
Mag/s On (Lycoming start left mag only)
Hand-Prop engine
After start - check both mags on and oil pressure
Throttle - idle and chock in necessary
Hold nose down and board aircraft.

Before Taxi

Correct pilot position - rudders adjusted, seat cushions to place head within 1" of canopy top.
Seat belts and shoulder harness - adjusted / locked
Radio / Avionics lights - On, as required

Before Takeoff

Emergency Canopy access door - closed / locked
Fuel Caps - Locked, check alignment marks.
Fuel Selector - Fullest Tank
Controls - free and correct
Trim - Set for takeoff
Landing Brake - Up
Circuit breakers - In
Gen/Alt - On
Lights - as required
Flight instruments - Set (alt, D.G., Attitude ind., clock)
Auxilary Fuel Pump - ON
Engine Run Up - (List specfic engine limitations)
Mags
Carb Heat
Oil Pressure
Fuel Pressure
Gen/Alt out put
Mixture - set as required
Static RPM - 2450 min.
Canopy - Locked

Climb/Cruise

Gear - Up
Boost Pump - OFF (above 1000 ft AGL)
Lean Mixture - as required
Fuel Selector - Balance management

Descent/Landing

Circuit Breakers - In
Fuel - Fullest tank
Mixture - Rich as required
Carb Heat - On as required
Boost Pump - On below 1000 ft AGL
Gear - Down below 110 knots
Landing Brake - On as required

After Landing/ Shut Down

Boost Pump - Off
Carb Heat - Off
Landing Brake - Up (After fast taxi speed)
Lights - Off as required (landing, Nav, strobe, cockpit)
Electrical Equipment - Off (radios, nav)
Mixture - Idle cut off
Mags - Off
Master Swich - Off
Deplane, hold nose, retract nose gear, lower nose.
Secure aircraft, canopy, controls, tie downs.


N52CE