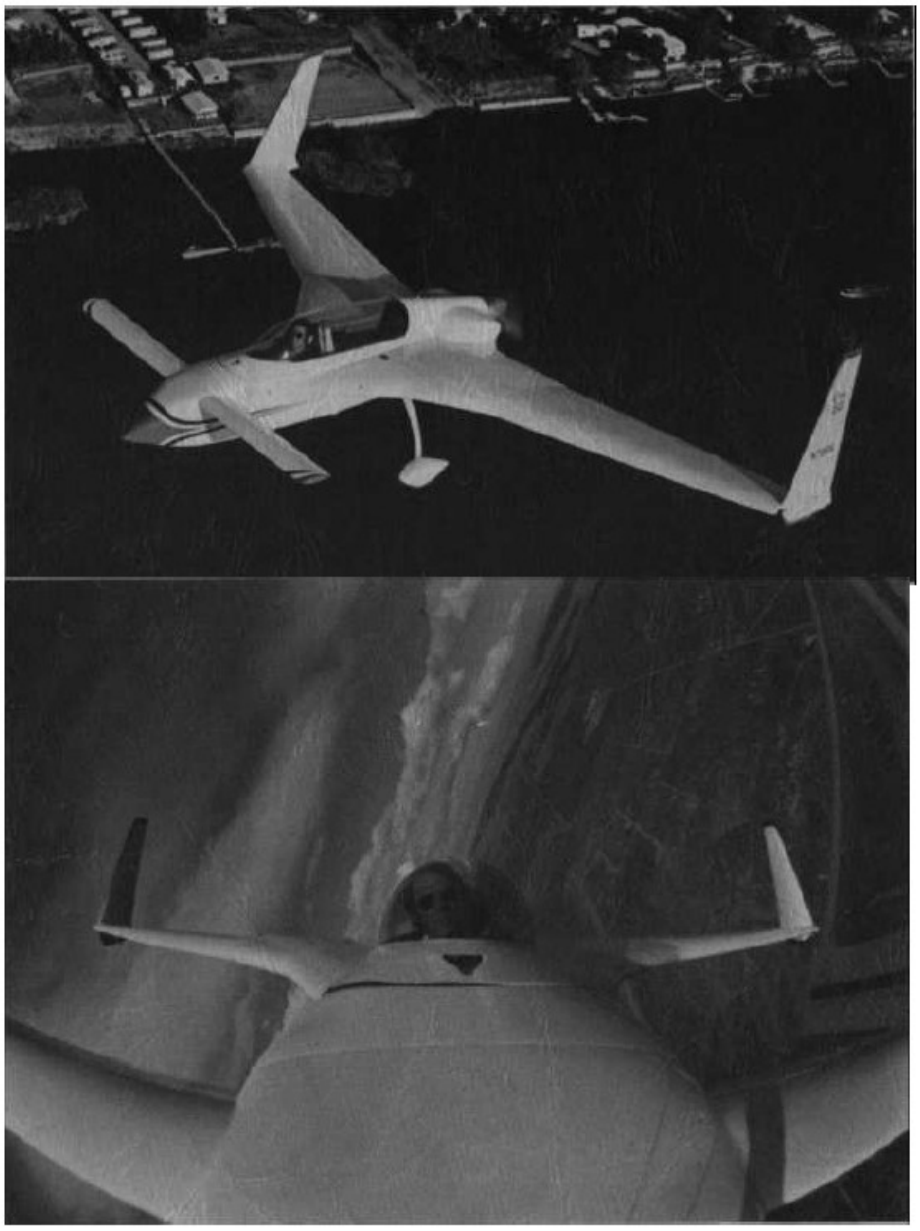
Long-EZ

for Microsoft Flight Simulator

OWNER'S MANUAL
Version 1.13 — January 2021



Published by IndiaFoxtEcho Visual Simulations

RELEASE NOTES:

Version 1.13
January 1st 2021
- Further improvements to canopy scatches
- Fixed bug preventing pilot figures to show in the green-checker livery
- Added red and silver livery courtesy of Christoph Tantow
- Added checklists courtesy courtesy of Lucas Aulen aka Laulenture
- Changed color of airspeed needle for better gauge readability

Version 1.12
December 15th 2020
- Added sunglasses to pilot figures
- Reintroduced canopy scatches (hopefully done much better this time)
- Changed model name to comply with Microsoft convention
- Increased engine volume when in virtual cockpit
- Minor tweaks to sound spatialization

Version 1.11
November 25th 2020
- Added wing pods: to make them appear, add weight to the Wing Pods station in the fuel and weight settings
- Vastly reduced elevator trim effectiveness following feedback from version 1.10
- Several tweaks to improve the behavior at high speeds
- Reduced rudder effectiveness, especially during takeoff run
- Reduced canopy sound attenuation (considered excessive by some users)
- Added traditional (non-canard) flight model files for users who may prefer those settings (files are in the “backup old flight model” folder)

Version 1.10
November 20h 2020
- Redone flight model to implement new canard settings
- Minor tweaks to engine performance
- Minor tweaks to aircraft maneouverability
- Increased detail and polycount of several cockpit objects
- Retextured cockpit with higher res textures
- Fixed miscellaneous animations and mouse areas
- Added missing lubber line to compass
- Minor improvements to sound package
- Miscellaneous fixes in configuration files
- Cleaned canopy textures
- Replaced library pilot figures with custom models including possibility to remove the pilot figures (beware not to tilt the aircraft!)
- Sound package entirely redone in WWise

Version 1.02
October 16th 2020
- Fixed missing rain effects in the canopy
- Fixed throttle lever animation
- Fixed CoG limits in UI
- Fixed wrong shadowing in Thunderbirds livery
- Added "green checkers" livery
- Added "military camo" livery

Version 1.00
October 10th 2020
INITIAL RELEASE

WELCOME

The Rutan Model 61 Long-EZ is a tandem 2-seater homebuilt aircraft designed by Burt Rutan's Rutan Aircraft Factory.
The Long-EZ has a canard layout, with a delta wing and wingtip rudders, and a pusher engine and propelleor. The tricycle landing gear has fixed main wheels with streamlined spats, and a retractable nosewheel. Its predecessor was the VariEze, plans of which were first available to homebuilders in 1976. The prototype, N79RA,of the Long-EZ first flew on June 12, 1979. The Long-EZ was a plans-only kitplane, and several variants of the basic design have surfaced over the years.

MINIMUM HARDWARE REQUIREMENTS

Due to the high-detail model and textures, we suggest to use the Long-EZ on systems that meet or exceed the following requirements:

CPU: 3.0GHz dual core processor or better
GPU: at least 4Gb dedicated memory, Nvidia 960 or better recommended
RAM: 4.0Gb minimum
Hard Disk: 1Gb required for installation

INSTALLATION

NOTE: IF YOU HAVE A PREVIOUS VERSION OF THE LONG-EZ INSTALLED, IT IS RECOMMENDED TO DELETE IT BEFOR INSTALLING A NEWER ONE.

This package is distributed both on the Microsoft Marketplace and by external vendors.

If you have purchased the package though the Marketplace and you have followed the on-screen instructions, no further action is required from your end. The plane should be available in the aircraft selection menu as the other default planes.

If you have purchased the package from an external vendor and the product comes with an .exe installer (such as SimMarket) the installer will ask you to provide the location of the COMMUNITY folder. The exact location of the folder will depend on your selection when you have installed Microsoft Flight Simulator. Once you have indicated where your COMMUNITY folder is, just follow the on-screen instructions.
The aircraft will be available in the aircraft selection menu next time you start Flight Simulator. If Flight Simulator was running during the install process, you need to close it and restart it for the aicraft to appear.l

If the aircraft is provided as a .zip file without any installer, just unzip the content of the file into your COMMUNITY folder.

If you don't know wher your COMMUNITY folder is, you can locate with the following procedure:

Go to Options / General.

1.Click on "Developers" which you will **find** at the bottom of the list on the left.

2.Switch Developers Mode on.

3.On the Dev Menu select Tools / Virtual File System.

4.The **community folder** location can be found under "Watched Bases"

CREDITS

Dino Cattaneo …..Additional 3D modelling, texturing, system and avionics programming, project management and project lead.

Original 3D mesh by AlienPioneer, acquired through TurboSquid.

We'd like to thank the Beta testing Team and everyone who supported this project and IndiaFoxtEcho.

For questions, support and contact:

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ABOUT THIS MANUAL

This manual is partially based on the real world owner's manual for the Long-EZ but it has been vastly changed to reflect the Microsoft Flight Simulator rendition.
Sections *blue italics* apply only to the simulated version of the aicraft.

THIS MANUAL SHALL NOT BE CONSIDERED A SOURCE FOR REAL-WORLD INFOMATION OR OPERATION OF THE LONG-EZ AIRCRAFT!

UPDATES

We will try our best to keep the product updated and squash significant bugs as soon as possible. Our update policy is as follows:

- major updates, which either require a new installer or a major changes to a significant number of files, are typically deployed as new installers and will be available from your distributor.

- minor updates or quick-fixes will be typically deployed as patches for manual installation on our blog indiafoxtecho.blogspot.com

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GENERAL DESCRIPTION

The Long-EZ is a modern, high performance, custom built long range aircraft featuring the latest advances in aerodynamics and structure to provide good utility, economy, comfort, simplicity and flight safety. The aircraft uses one of two proven certified aircraft engines, the continental O-200 (100 hp) and the Lycoming O-235 (115 hp.) It has an alternator powered electrical system and can be equipped with an electric engine starter. It's cockpit layout is designed to compliment pilot work load with throttle, mixture, carb heat, pitch trim and landing controls on the left side console and a side stick controller on the right console. Seating provides correct armrest, lumbar, thigh and headrest support allowing "recliner chair' comfort not found in conventional aircraft seats. This allows long, fatigue free flights. The inboard portion of the large wing strakes are used as baggage areas accessible from the front and rear cockpit. These, combined with special suitcases and three other storage areas, provide nearly 10 cubic feet of baggage room.

The Long-EZ aircraft pioneers the use of the NASA developed winglet system which consists of an upper and lower cambered surface at each wing tip. These are designed to offset the wingtip vortex and reduce induced drag. The Long-EZ's use of one way rudders in each winglet, makes use of the winglet camber to tailor the rudder forces. This results in low forces at low speeds where rudders are used, and higher forces at higher speeds where rudders are not needed.

NOTE:

The Long-EZ is not suitable/recommended for operation from unprepared surfaces, gravel, loose dirt or rough fields.

SIMULATION NOTE:

Starting from version 1.10, the flight model implements a more accurate "canard" approach, introduced in version 1.10.7.1 of the simulator. The aircraft may still exhibit odd behaviors at very low and very high speeds, but should be fine in most of the normal flight conditions.

WEIGHTS

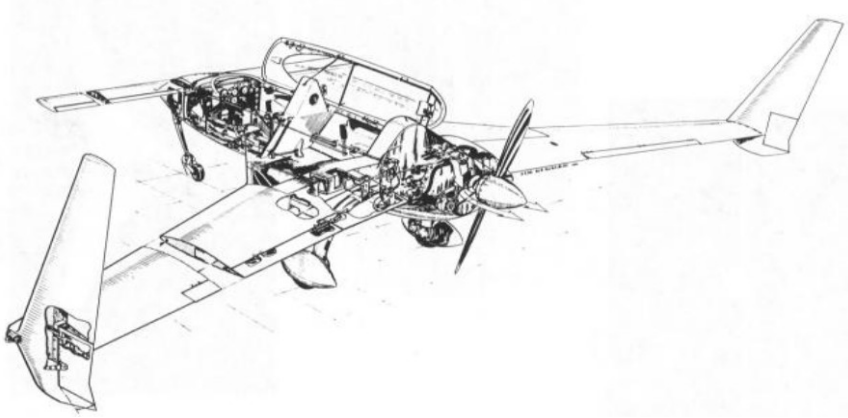
The normal equipped empty weight is approximately 750 lbs.
Actual weights for each airplane will vary according to installed equipment and builder workmanship. The maximum allowable gross weight for takeoff is 1325 lbs except as noted below. The strake baggage areas are structurally limited to 100 lbs on each
side. The airplane can structurally accommodate pilots or passengers weighing up to 250 lbs. Actual limitations of each pilot area, each baggage area and fuel load depends on the empty weight and balance of the particular aircraft.

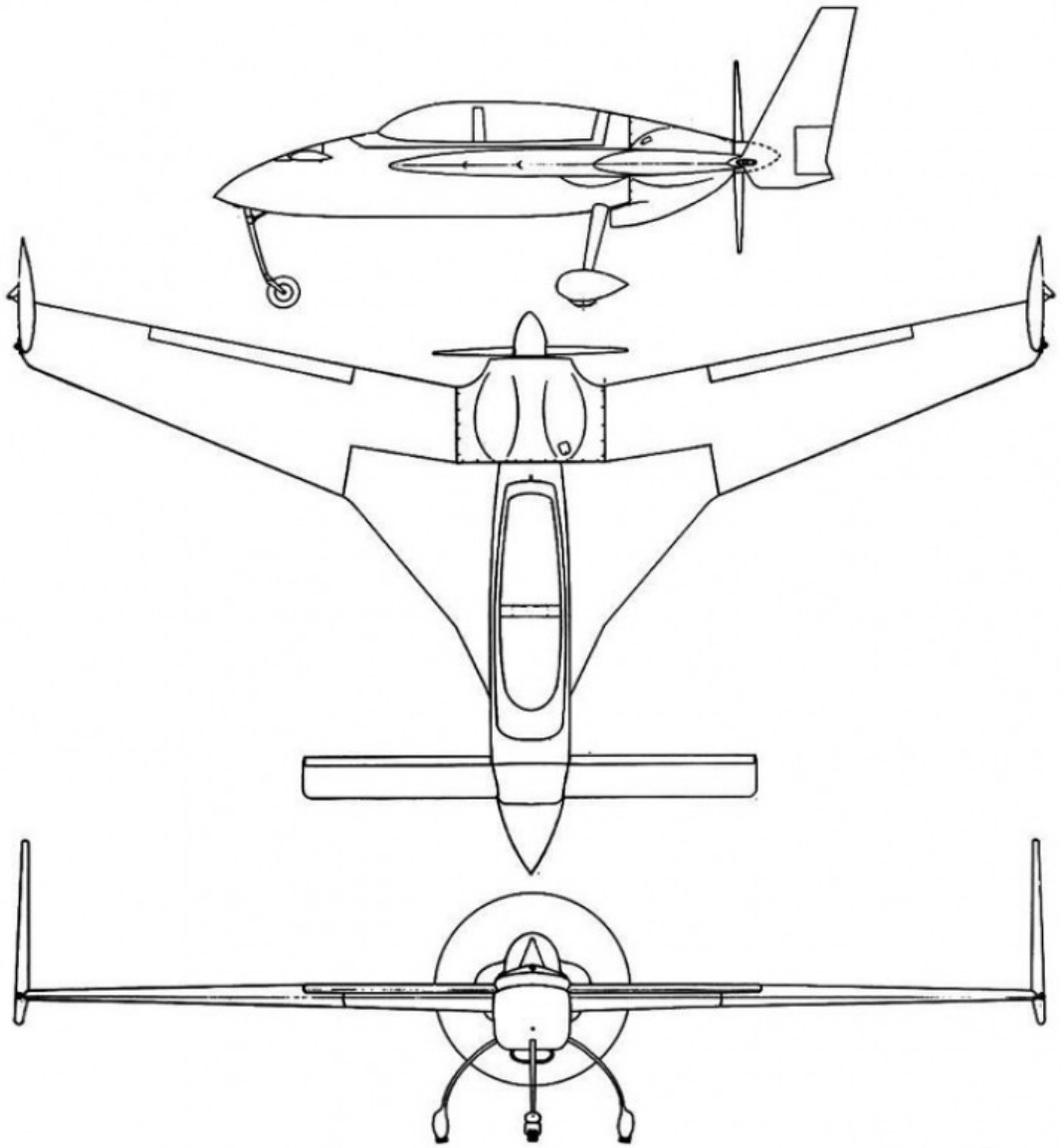
NOTE:

A gross weight of up to 1425 lbs can be allowed for takeoff but only under certain conditions.

SIMULATION NOTE:

Due to the differences between the "structure" of the real Long-EZ and the simulated one, weight and balance is not accurately depicted in the simulation. The load stations and fuel location have been set in such a way that the aircraft is fully and easily controllable in any weight and balance condition.





GENERAL CHARACTERISTICS

Crew: 1 Pilot

Capacity: 1 Passenger

Length: 16 ft 10 in (5.12 m)

Wingspan: 26 ft 1 in (7.96 m)

Height: 7 ft 10 in (2.40 m)

Wing area: 81.99 sq ft (7.617 m2)

Empty weight: 710 lb (322 kg)

Max takeoff weight: 1,325 lb (601 kg)

Fuel capacity: 52 US Gal (197 L)

Powerplant: 1 × Lycoming O-235 air-cooled flat-four engine, 115 hp (86 kW)

PERFORMANCE:

Maximum speed: 185 mph (298 km/h, 161 kn) (max cruise)

Cruise speed: 144 mph (232 km/h, 125 kn) (40% power)

Range: 2,010 mi (3,230 km, 1,750 nmi)

Service ceiling: 27,000 ft (8,200 m)

Rate of climb: 1,750 ft/min (8.9 m/s)

ENGINE AND PROPELLER

The Lycoming O-235 and the Continental O-200 engines are currently approved for use in the Long-EZ. The standard accessories: alternator, starter and vacuum pump may be used. The Lycoming O-235, 100 octane dynafocal mount, is the most desirable engine. Both the Lycoming and Continental are suitable for pusher operations in this application. Both engines are currently in new production, however, the used/rebuilt engines are approximately one half the cost of a new one. A partially run-out engine is generally preferred due to the excessive cost of a zero-time engine. The Continental O-200 is being built in Europe and marketed in the U.S. under the “Rolls-Royce Continental" name.
Due to weight/balance and structural considerations, heavier or higher horsepower engines are not recommended. The Rolls O-240 (130 hp) and Lycoming O-235R (125 hp) engines will probably be satisfactory since they meet the weight restrictions, however, they have not been flight tested on a Long-EZ. Only the light-weight fixed —pitch solid wood propellers are approved. Turbo charging and constant speed, variable pitch or metal propellers are not recommended. Extensive developmentl testing would be required. To qualify a metal or variable pitch prop for pusher application due to aerodynamic-induced vibration.
The modern wood prop uses a plastic leading edge to minimize rain erosion and has an efficiency close to the best metal prop, while offering a solution to the fatigue problem. Climb and cruise props are listed below. Note that the climb prop does not limit maximum speed. Maximum speed is fastest with the climb prop, but the engine turns faster than rated RPM at max speed.

SIMULATION NOTE:

The aircraft has been tuned so that the performance reflects the most poweful engine variant available for the Long-EZ. The model features a three-bladed prop, which in reality is very uncommon.

LANDING GEAR

The Long-EZ 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 landings. 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 can be streamlined with wheel pants.
The retractable nose gear 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 for easy entry for the backseat passenger. Nose gear position is displayed to the pilot through a Plexiglas window through which he views the nose gear directly.
The main landing gear uses Cleveland 5 inch wheels and brakes. A low profile3.40 x 5 industrial rib 6 ply tire is used. Larger 500 X 5 tires can also be used on the mains. The nose wheel is 4 inches in diameter and uses a 2.800-2.50-4 tire and tube.
The Long-EZ is equipped with a buzzer gear warning system which is actuated at low power settings with the gear up.

SIMULATION NOTE:

In the simulation, it is not possible to retract the landing gear when the aicraft is on the ground. Also, the aircraft is not equipped with the landing gear warning buzzer.

COCKPIT

Both front and rear cockpits are exceptionally comfortable. Semi-supine (reclined) seating is provided for optimum crew comfort.
Pilots up to 6ft 8in tall and 220lbs, and passengers up to 6ft 3in tall and 220lbs, will find the cockpit quite comfortable. Pilots 6ft 3in or less, find it easy to seat themselves first and then comfortably extend their legs forward from the sitting position. The canard configuration provides a wide CG range which allows for a full length rear cockpit without the passenger having to straddle the pilot.
Full flight controls are provided in the front cockpit only. The wrists action control stick is positioned on the right side console enabling the pilot to relax and rest the weight of his arm on the side console, reducing his work load on long trips. Throttle, carburetor heat and mixture controls are found on the left console. The landing gear crank actuation knob is found in the center of the instrument panel.
A control stick is located in the rear seat area to allow the passenger to land if the pilot becomes incapacitated. The rear stick is removable to allow increased baggage room. The rear seat does not have rudder pedals due to the awkward foot position of the rear seat occupant. Also, the airplane is not intended

for, nor recommended for flight training.

The inboard portion of the large strakes are used as baggage areas accessible from the front and rear cockpits. Small baggage, snacks, maps and navigation instruments may be stored in the front cockpit in two areas beneath the thigh support and in the pilot headrest/map case/rollover structure. Two custom made suitcases fit into the rear cockpit behind the pilot‘s seat against each fuselage side. The two suitcases still allow full length leg room in the rear cockpit. Baggage areas inside the center section spar and behind the rear seat provide additional stowage.

Due to the highly insulated fuselage structure and long Plexiglas canopy, the Long-EZ will maintain about 60° F inside temperature with an outside temperature of 10° F (vent closed, in sunny conditions.) Thus the requirement for cabin heat is far less than for conventional light planes. Due to the small cabin volume and good vent location the EZ is more comfortable on hot days than conventional light planes.
The airplane is equipped with an electrical buzzer which warns the pilot not to take off with the canopy unlocked. Also, a canopy safety latch is installed as a backup, to catch the canopy if the pilot forgets to lock it for takeoff.

SIMULATION NOTE:

The aircraft is not equipped with the canopy warning buzzer.

FUEL SYSTEM

The fuel system consists of two 26 gallon, individually selected, wing tanks. A three way selector (left, right and off) is located in the thigh support center, just aft of the nose wheel position window. There is no provision for cross feed nor can fuel be used from both tanks simultaneously. Two fuel sump blisters located under each fuel tank at the fuselage junction assure fuel supply to the engine in all normal flight attitudes. Each tank is individually vented. Vent location is on the center fuselagejust aft of the canopy. A mechanical (engine driven) fuel pump delivers fuel from the tanks to the carburetor. An auxiliary electric fuel pump provides backup for the engine driven pump. Fuel pressure is indicated on a gage in the cockpit. The electric pump should be turned on if the engine driven pump fails as noted by a loss of fuel pressure. The electric fuel pump should also be used to provide fuel pressure redundancy during any 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 accessible through the air scoop under the cowling for draining during preflight. To prevent overfilling the fuel tanks, exceeding the gross weight limitations for two place, the tanks cannot be completely with the nose down parking. To fill the tanks to the full 52 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 through the vents. Filling to full capacity should be done only when required for single place, extended range trips.

CONTROL SYSTEM

Pitch is controlled by a full-span canard slotted flap providing a large allowable CG 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 stick and two rudder pedals for yaw. The side stick controller is employed to give the pilot the smallest workload control arrangement possible. The rudders, located in the winglets at the wing tips, operate outboard only, providing two totally independent systems. The rudders are used simply for yaw control or can be deployed together as a mild speed brake.

SIMULATION NOTES:

- The canard in the simulation will start to have an effect at a slightly higher speed than the real world one. This may cause the nose landing gear to “bounce” a little during the take off run. Moderate stick movement can required to will compensate this behaviour, but it should be excercised with caution as excessive nose down during take-off run may lead to a slightly unbalanced input (user inadventently applying aileron input).

- Rudders have no braking effect in the simulation.

BRAKE

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 the 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.

Avoid parking downhill or downwind to keep the airplane from rolling. One solution is to use a small wheel chock on a tether that 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 tabs are not used. The pitch trim handle is located on the left console inboard of the landing brake handle. The aileron trim handle is
located on the right 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.
This feature allows the pilot to land the aircraft using the pitch trim, rudders and throttle only. This is an excellent backup should a failure/disconnect occur in the normal control stick.

SIMULATION NOTE:

For gameplay simplicity and player comfort, the simulated aircraft is also equipped with rudder trim controls.

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 left console. It is normally extended on downwind after gear extension and left down until after landing. Maximum speed with the airbrake down is 90 knots (105 mph.) Above 95 knots (110 mph) 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.

SIMULATION NOTE:

The landing airbrake is VERY effective in the sim, causing a rapid decelation when deployed!
In the simulation, the speedbrake will not automatically retract at any speed.

NORMAL OPERATIONS

This section covers the normal operating procedures for the Long-EZ. A summary checklist is provided at the end of this book for more conventional cockpit use.

PILOT POSITION

The Long-EZ was designed to accommodate tall pilots up to 6’ 8". Short pilots can fly the aircraft but they must sit on cushions to position their eyes in about the same position as
the 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 under them, not behind them. If a short pilot uses a large cushion behind him, he will be positioned forward and down because of the windshield slant angle and have inadequate visibility during climb and landing flare. Confirm that your head is within 1 inch of touching the canopy before you take off.

SIMULATION NOTE:

Following testing feedback, for better visibility during landing, the aircraft has a default point of view slightly higher than the real-world counterpart – player can adjust it via Microsoft Flight Simulator view controls.
We recommend player shift to traditional view panning to enjoy the Long-EZ at its best.

ENGINE START

Engine starting may be accomplished by hand propping. While you have doubtlessly been horrified by the accident statistics on hard-starting antique aircraft, remember that the Long-EZ is a totally different story. Antiques are generally tractor aircraft, which means that they tend to chase you, once started. The Long-EZ’s on the other hand, try to run away from you. The traditional hand-start airplane has to be chained down and main wheels blocked for marginal safety (the tractor prop still tries to suck you in.) The Long-EZ with nose down parking, chocks itself, and the pusher prop blows you away from danger. With modern, impulse coupled magnetos, it is not necessary (or desirable) to make a Hurculean pull of the propeller for starting. Just pull the engine up on compression and give it an EZ flip through. In the unlikely event does run away from you after starting (if you leave the throttle open,) it won't carve the first thing it comes to into hamburger, but will give it a bump with the nose instead. Note also that on a tractor installation, you have to reach through to the back of the prop to grab it. On a pusher, you hold the prop on the face nearest you. For engine starting the aircraft should be parked nose down on the bumper.

Be sure your carburetor has an accelerator pump for automatic priming. Starting can be difficult without one. Even though the Long-EZ is much less susceptible to run away during hand propping, it is still a good practice to have someone tend to the throttle and switches during starting.
Some engines have only one magneto equipped with an impulse. Be sure the non-impulse magneto is off for starting. If your Long-EZ is starter equipped use special care that the prop is clear before starting. Yell loudly and wait for a response or time for the person to get out of the way. Have an outside observer confirm that the prop area is clear prior to starting.

SIMULATION NOTE:

The simulated aicraft is equipped with an electrical starter. It is not possible to retract the nose landing gear when the aircraft is on the ground, so engine must be started with nose landing gear extended.

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

HOT START
Leave throttle at idle (do not pump)
Mag(s) ON

Pull prop through gently. If the engine gives no indication of starting after three or four tries, use the flooded start procedure.

FLOODED START
Mag(s) OFF
Throttle OPEN or HALF OPEN
Turn prop BACKWARDS about 10 blades to clear manifold.
Throttle 0.5 inch from closed
Mag(s) ON
A flooded engine will start easier if cranked with the throttle about half open. Do this only if you have someone standing by with his hand on the throttle to retard it to idle immediately when the engine starts running.

VERY COLD CONDITIONS
Very cold temperatures (below 25° F) will make the engine hard to start.
Pump throttle four times.
Mag(s) OFF
Pull prop through four blades
Mag(s) 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 within limits within 30 seconds.

TAXIING
Have your passenger board and strap in while the aircraft's nose is still on the ground. Long-legged types may step directly into the rear cockpit. Shorter passengers can step into the front seat first, then into the rear cockpit. With your passenger aboard, raise the nose by lifting at the canard leading edge. Crank the nose gear into the extended position and enter the cockpit by swinging your leg over the side or using the step. Do not try to raise or lower the nose with the nose wheel crank with any weight on the gear.

CAUTION
Keep taxi speed slow on unprepared and/or loose surfaces. The Long-EZ is more susceptible to prop damage than a conventional 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 accomplished through differential braking. The geometry of the Long-EZ 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 that the “tailwind" won‘t damage the ailerons.

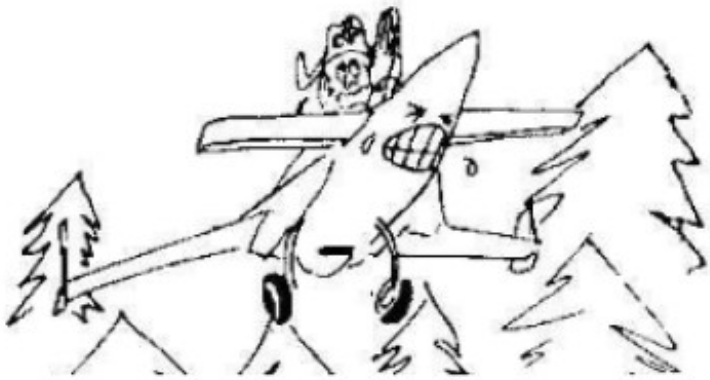
CAUTION
When taxiing with the canopy open, be careful that the wind does not slam it closed on your fingers. Close and lock the canopy during windy conditions.

SIMULATION NOTE:

For player comfort reasons, the simulated aircraft has nose wheel steering functionality: note however that the nose wheel steering is very sensitive.

TAKEOFF
Complete the pre-takeoff checklist. Check static RPM at full throttle. It must be at least 2450 for normal takeoff performance.
Double check 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 gearjust clear of the ground as soon as possible (about
50-60 knots, 59-70 mph) and hold the nose wheel 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 weight.



CAUTION

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

CROSSWIND TAKEOFF

During takeoff ground roll, with a crosswind component greater than 10 knots, you will find that wheel braking may be required long into the ground roll for directional control. 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 gross weights and high density altitudes. The braking requirement for directional control is the reason for the takeoff limitation of a crosswind component of 15 knots. Landings can be made with a crosswind component of up to 20 knots.

CROSSWIND TAKEOFF TECHNIQUE

Hold aileron into the wind as you rotate for liftoff. Let the aircraft accelerate above normal rotation speed and the 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.

SHORT FIELD OBSTACLE CLEARANCE

Reduce gross weight as much as feasible and check the CG 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. 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 best angle of climb speed (70 knots or 80 mph) until the obstacle is cleared then accelerated to normal climb speed.

ROUGH FIELD CAUTION

Although the Long-EZ may use the larger 500 X 5 tires, this does not make the aircraft totally suitable for rough, gravel or unprepared fields. Since the Long-EZ is a pusher, the aircraft cannot be rotated as easily as a conventional tractor aircraft. You still must accelerate to normal rotation speed (50 - 60 knots) depending on CG, before

the nose wheel comes off and during this time the nose wheel can kick debris into the prop. The small nose wheel tire, high rotation speed and prop damage possibility makes the Long-EZ less suitable for unprepared field operation than a conventional aircraft.

If you must use an unprepared surface, reduce gross weight as much as feasible and adjust the CG 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 rolling 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 nose wheel is held just clear of the ground. Accelerate and lift-off at the normal speed then accelerate to the desired climb speed. Don’t try to "jerk" the aircraft off prematurely as this only places the prop closer to the ground and increases the chance of damage.

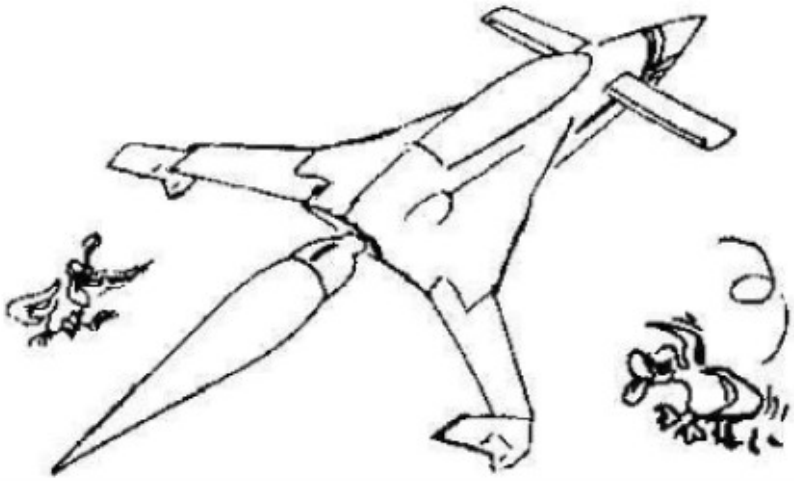
NOTE

Rutan Aircraft Factory has developed a spring-loaded shock strut for the nose gear. This unit permits

the nose wheel strut to deflect farther aft and up. This shock strut along with the larger 500 x 5 main tires will provide satisfactory operation from most grass fields and will allow operation from rough fields.

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

CLIMB
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 this aircraft 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 8000 ft density altitude) will result in the maximum true cruise speed of 161 knots (185 mph) for Lycoming and 149 knots (171 mph) for Continental. To take the best advantage of range and fuel economy, you may find that a cruise power setting as low as 45% will 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.
A good rule of thumb for choosing an economical cruise power setting, is to cruise at the same RPM that you get during 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 contaminants exist 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 can verify that you can and use the fuel in the other tank.
Once at cruise altitude (in smooth air) , trim the aircraft to allow for hands-off cruise. It is much less fatiguing to fly by using an occasional shift of the body weight or an occasional small adjustment of the trim, than to fly by continuously holding the stick. After a little practice setting trims, you will find you will be doing most of (including climb and descent) without holding the stick. The rudder pedals are designed to allow the taller pilot to tilt his feet inward and relax them in an outstretched position in front of the rudder pedals. This places the weight of the thigh on the thigh support rather than the tailbone and greatly increases comfort on long flights.

The Continental engines are particularly susceptible to carburetor ice.
Icing can occur during cruise in moist air, particularly at low cruise power settings. When in moist conditions, check carburetor heat often or cruise with the carb-heat on.

CAUTION
When entering visible moisture (rain), the Long-EZ may experience a pitch trim change. The Long-EZ prototype (N79RA) has a significant nose down pitch trim change in rain. The VariEze owners report nose up and some nose down. This phenomenon is not fully understood and your aircraft may react differently. Our flight tests on the prototype Long-EZ have found a slight performance loss and the pitch trim change forces could be trimmed hands off with the cockpit trim handle at air speeds above 90 knots, when entering rain. Once the aircraft is in visible moisture conditions, it can be re-trimmed and flown normally. There may be a slight disorientation factor during the transition from VMC to IMC that the pilot must be ready for. especially if your trim change is significant. If your rain trim change is found to be significant, install a placard to notify pilots of this characteristic.

DESCENT
You will find that your Long-EZ 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 Long-EZ 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 the mixture when descending. Start your descent about 6 miles from your destination for every 1000 ft of height to lose, in order 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 150's) and may ignore you completely. Best pattern speed is 70-75 knots (80-85 mph) slowing to 65 knots (75 mph) on final approach (70-75 knots in turbulence or gusty winds). The Long-EZ is a very clean airplane and you can double the runway length required if you are 10 to 15 knots fast on your approach.

Deploy the landing brake on downwind or base to obtain a normal glide path angle compared 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 a Long-EZ. Make a complete flare, then fly it down to touch down. This avoids the 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 air-
speed 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 the nose wheel during heavy braking. While the landing gear is strong enough for rough surfaces, the small tire diameters give the crew a harsh ride. This combined with the 50-55 knots (57-63 mph) touch down speed, make a hard surfaced runway much more pleasant. If you need to land on a rough field, hold the aircraft off to the 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
Crosswind landings may be flown in several ways. Mild crosswinds are easily handled using the wing-low side-slip 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 rudder immediately before touch down. Be careful that you do not lock the wheel brake (full rudder) at touch down. The Long-EZ has a demonstrated taxi, takeoff and landings
in gusty winds to 45 knots and with a crosswind component 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 the gear above 120 knots (138 mph.) At higher speeds the air loads 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 CG is aft, it is possible to rotate the nose to an excessively high angle during landing rollout, placing the CG aft of the main wheels. Avoid rotation above 12 degrees (canard on the horizon) using forward stick or brakes if necessary, to avoid prop damage or tipping the aircraft onto it's 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 handie. Slow down to minimum speed if necessary to allow it to crank down easily. Fix the cause of the binding before conducting any further flights.

CAUTION
With the nose gear extended and without the pilot in the front cockpit, the Long-EZ may fall on it's tail. The aircraft may initially sit on it's nose wheel but may tip backwards when the fuel bleeds through the baffles toward the aft of the tank. Be sure to brief all ground handlers that the aircraft can fall on it's tail unless parked nose down and could also get away from them while moving the aircraft. If your aircraft is subject to being moved by people who are unaware of this trait, ballast the nose or attach a sign to caution them about the possibility of tipping over backward.
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 it 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 Long-EZ can be safely left unattended, parked on it's nose bumper, in moderate winds. It is prudent to always tie down any aircraft whenever possible. For long term parking, position the Long-EZ backwards in the parking slot with the nose over the normal tail tie down rope. Install the removable tie down rings, two near each wing tip and one on the left side of the nose just forward of the canard. "Set" the main gear and securely tie down the wings. Position the nose just to the right 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 weigh the nose with ballast. Be sure to remove the additional ballast before flight.

LOW SPEED HANDLING AND STALL CHARACTERISTICS
The Long-EZ has good flight characteristics at minimum speed. It is a docile, controllable airplane at full aft stick at it's minimum airspeed of 50 to 55 knots. It doesn't exhibit any of the conventional airplane's tendencies to roll, 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 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 Long-EZ are so much better at minimum speed than contemporary conventional aircraft, it hardly seems fitting to use the term "stall" in characterizing the Long-EZ behavior (even though it is technically correct.) The Long-EZ's "stall" consists of any one of the following in 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 aft stick force, such that a pilot has to pull noticeably harder on the stick to get below 60 knots.

2. Occasionally, particularly at forward CG, the airplane will oscillate mildly in pitch after full aft stick is

reached. This is a mild “bucking” of a very low amplitude consisting of 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 CG, 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 divergent wing rock can result in a 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 slight pitch trim change, neither of which affect the aircraft's controllability at sustained full aft stick.

Accelerated stalls to -3 g and steep pull-ups to 60° pitch (min speed 55 knots) can be done at full aft stick without any departure tendency.

Intentional spins have been attempted by holding full aft stick and using full rudder, with all combinations of aileron control, and all CG positions. These controls were held through 360 degrees of rotation. Full aft stick and full pull-up results in a lazy spiral which ends up in a steep rolling dive at +3 g 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 aft CG, the rotation rate is higher so the lazy
spiral is more of is more of a slow snap roll. Even at aft CG, the recovery is immediate when controls are neutralized.
You are cleared to do stalls in your Long-EZ in any power, trim or landing configuration within the normal operations envelope.

Intentional spins (or attempts to spin) are not approved.

NOTE
Experience with VariEze has shown that some variance in stall characteristics may be expected from one airplane to another. Inaccurate airfoil shapes, incidence errors, or errors in weights and balance can result in degradation of the normal safe stall characteristics.

SIMULATION NOTE:

***The underlying aircraft structure in the simulation is a conventional (non-canard) aircraft: therefore stall and spin characteristics are significantly different from the real-world aircraft. In particular, it is possible (and relatively easy) to spin the aircraft – although spin recovery is very easy*.**

LONG-EZ CHECK LIST

EXTERIOR PREFLIGHT INSPECTION

COCKPIT
Mags Switches — Off
Master Switch — On. Check battery condition and warning system
Master Switch — Off
Mixture - Idle Cutoff
Throttle — Idle
Cockpit Access Door— Closed. Key removed.
Flight Control Lock — Removed
Stick - Free and unobstructed both fonlvard and rear cockpits
Rudder Pedal Area — Clear of loose items, Unneeded ballast removed
Rudder Cablel 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 and undamaged
Nose Parking Bumper— Check Condition

RIGHT FUSELAGE AND WING
Canopy Hinge — Undamaged
Fuel Quantity - Visual check
Fuel Cap O-Rings - Condition
Fuel Cap - Secure (check alignment marks
Fuel Tank Vents — Clear
Fuel Tank Drain - Check free of contaminants
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/Carb Inlet - Clear
Drain Gascolator — Check free of contaminants
Cowling — Check condition — All fasteners secure
Propeller - Check for nicks, cracks, erosion
Spinner - Check for cracks - Screws secure
Exhaust Tubes — Check for security
Engine Area - General condition, baffles, loose items

RIGHT FUSELAGE AND WING
Same as right.

NOSE GEAR AND LANDING BRAKE
Perform fuel and gascolator drains prior to lifting nose.
Lift nose. Extend nose gear and landing brake. (Hold the nose down during this check to prevent the aircraft from tipping over backwards.)
Strut/Pivot — Secure and undamaged.
Wheel shimmy damper - Adjusted (2-4 lbs force to swivel.)
Wheel Well/Door — Secure.
Tire — Check wear and inflation pressure.
Landing Brake — Check for damage.
Landing Brake - Retract.
Nose Gear — Retract for hand starting.

ENGINE START (ELECTRIC STARTER)
Lift nose, extend and lock the nose gear.
Board aircraft and hold brakes.
Mixture — Rich
Carb Heat — Off
Throttle - Prime and crack
Master Switch — On
Auxiliary Fuel Pump — On to check pressure (4-8 psi)
Auxiliary Fuel Pump — Off
Propeller - Clear
Mag Switches — On (Lycoming left mag only for start)
Throttle Idle
Mag Switches - Both on.
Oil Pressure - Check

ENGINE START (HAND PROPPING)
Engine Start— (Hand Propping)
Park on Nose Bumper (Chock if necessary)
Mixture — Rich
Carb Heat — On
Throttle — Prime and crack
Master Switch - On
Auxiliaiy Fuel Pump — On to check pressure (4-8 psi)
Auxiliary Fuel Pump — Off
MAG - OFF
Pull prop through 8 blades
Area — Clear
Mag Switches — On (Lycoming left mag only for start)
Hand Prop Engine
Throttle - Idle
Mag Switches — Both on.
Oil Pressure — Check

BEFORE TAXI
Correct pilot position — Rudders adjusted, seat cushions to place head
within 1 inch of canopy top.
Seat belts and shoulder harness - adjusted/locked.
Radio, Avionics, lights - As required.

BEFORE TAKEOFF
Emergency Canopy Access Door - Closed and 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 Altimeter, DG, Attitude indicator.
Auxiliary Fuel Pump — ON

Engine Run Up - (List specific engine limitations)
Mags
Carb Heat
Oil Pressure
Fuel Pressure
Gen/Alt output
Mixture — Set as required
Static RPM — 2450 min
Canopy – Locked

CLIMB/CRUISE
Gear — Up
Auxiliary Fuel Pump - OFF above 1000ft AGL
Mixture — Lean as required
Fuel Select0r— Balance Management

DESCENT AND LANDING
Circuit Breakers — IN
Fuel Selector— Fullest Tank
Mixture — Rich
Carb Heat - On as required
Auxiliary Fuel Pump — ON below 1000ft AGL
Gear— Down below 110 kts
Landing Brake — Deployed as required

AFTER LANDING AND SHUT DOWN
Auxiliary Fuel 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 cutoff
Mags — OFF
Master Switch — OFF
Depale, hold nose, retract gear, lower nose
Secure Aircraft — Canopy, controls, tie downs