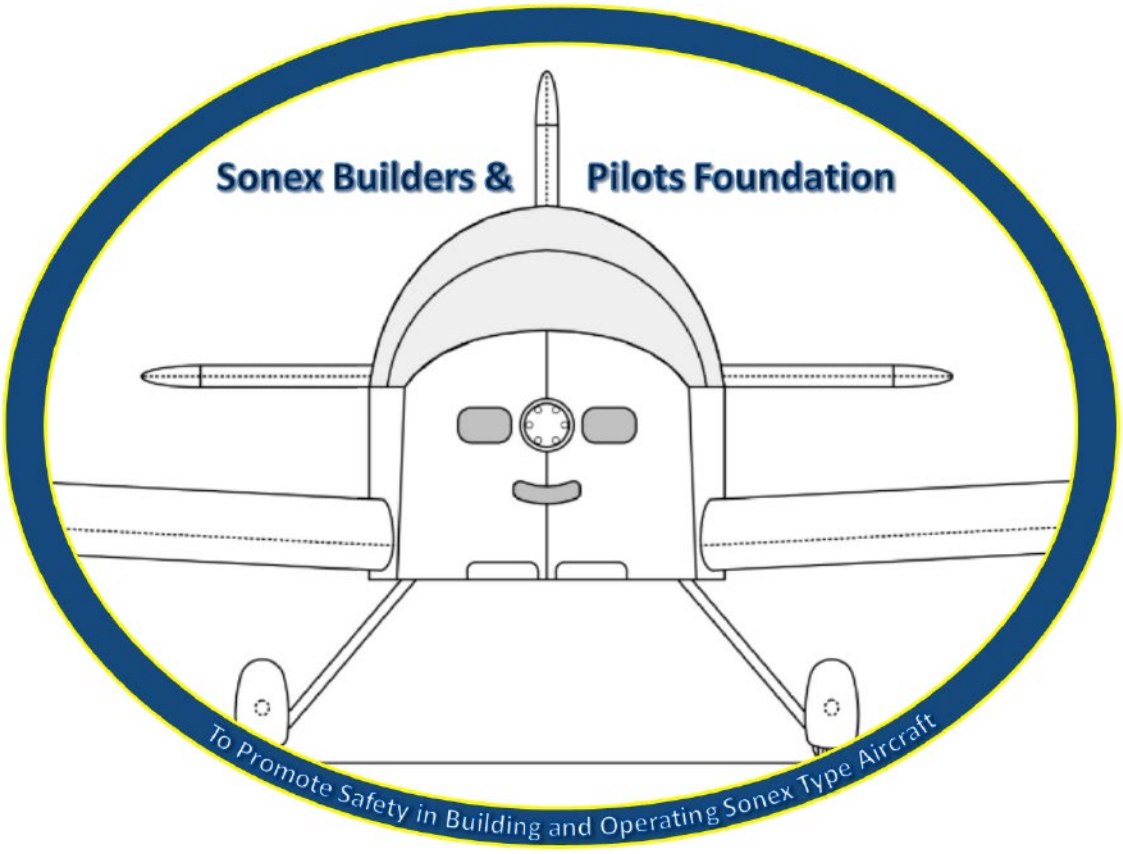
Sonex Aircraft
New Pilot Training Guidelines
and
Transition Training Syllabus



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Introduction

Good training is vital to preserving aviation safety, and this is even more important when transitioning to a new aircraft type. Given the limited availability of customer owned Sonex aircraft to obtain make and model specific transition training needs, many builders and new owners of Sonex aircraft are now turning towards transition training options in alternate aircraft that have similar performance and handling characteristics as a Sonex.

The Sonex Builders and Pilots Foundation (SBPF) recognizes that a wide variety of aircraft models exist that meet this criteria in certified standard category aircraft, Special Light Sport aircraft (S-LSA), as well as Experimental Amateur Built (E-AB) aircraft. It is the hope of the SBPF that any new Sonex pilot take the time to obtain such training so that they may be better prepared when they begin flying their own Sonex.

Aircraft that may be appropriate for this training may include, but are not limited to:

- Grumman AA-1 Yankee, AA-5 Cheetah/Tiger
- Van's RV series of aircraft, including the RV-12, RV-6/6a and RV-7/7a
- Zenith 601/650 series of aircraft
- Many low wing S-LSA aircraft may also qualify for this purpose

Members of the SBPF believe that proper transition training is a vital element in the building, flying and ownership process. Quality training helps to ensure the protection of individuals, families, friends and the aircraft, and safeguards our continued ability to enjoy our freedom to dream, design, build and fly. Furthermore, transition training is often expected and sometimes required by insurance companies prior to issuing a liability or hull-loss policy. Pilots are encouraged to review the terms to their insurance quote or policy with their transition training flight instructor.

As an aid for planning and executing member transition training, this document offers suggestions, tips and insights for Sonex owners and pilots who wish to obtain transition training into the Sonex series of experimental aircraft, including those pilots that do not have access to an actual Sonex airplane for their specific training needs. This document provides a roadmap for a pilot and instructor to follow, but every situation is unique and pilots are encouraged to speak openly and candidly with their instructors regarding their individual needs. Please exercise your Pilot in Command authority as to the implementation of this guide!

Aircraft Design Characteristics

The Sonex line of aircraft are designed to be a sporty, fun to fly personal-owned airplanes that fall into the European Microlight category, as well as the United States Light-Sport category of airplanes. The Sonex utilizes basic aluminum construction, a single tractor-style engine, fixed landing gear, and depending on the model of airplane, either one or two passenger seats. All aircraft fall into the Experimental category and are delivered from the factory in kit form. Several options, including landing gear type and engine options are available from the factory. All models allow operations in the normal, utility and aerobatic categories, depending on weight and center of gravity restrictions.

Aircraft Structure

The majority of the aircraft structure is fabricated out of 6061-T6 aluminum, and most exterior skins are 0.025" thick. Construction utilizes stainless-steel pulled rivets (also called blind or pop rivets) for the majority of the airframe. The Sonex kit comes with fiberglass wingtips, wheel pants, cowling, and tail end tips. The front windshield is a wrapped single piece of polycarbonate to offer superior bird strike protection while the canopy bubble is a single piece of flexible acrylic.

Controls on the Sonex are mainly push/pull tubes for the ailerons, flaps and elevator while the rudder is actuated with steel braided cables.

The wings on the Sonex are designed to be removable for transportation, maintenance, and storage needs.

Landing Gear

The landing gear on the Sonex is a fixed gear setup, known to be very rugged and robust, utilizing titanium solid dowel rods for the main gear legs and tailspring, and a welded chromoly steel nosewheel assembly for tri-gear models. The single place Onex uses a single-piece flat aluminum spring gear. The landing gear and landing gear legs are typically covered with non-structural aerodynamic fairings to reduce drag and increase performance.

The wheel brake setup is a single hand lever actuated design utilized by the pilot for proper application. Two basic versions of the brake system are available; a mechanical actuated system which includes brake shoes and drums at the wheels, or an upgraded hydraulic system is available. The hydraulic system utilizes a caliper and rotor system which replaces the mechanical drum and shoe setup of the mechanical brakes.

Engine

Several factory recommended engine options are available for the Sonex line of aircraft. The factory supports the following engine options:

- AeroVee – A VW Type-1 based, air-cooled direct-drive engine that generates 80 hp. The AeroVee engine is available only in kit form and must be assembled by the builder.

- AeroVee Turbo – An AeroVee engine with an added exhaust-driven turbocharger. The turbo increases engine power to 100 hp.

- Jabiru 3300 – An Australian built, direct-drive, air-cooled engine that produces 120 hp.

- Rotax 912 – An Austrian built, certified, liquid-cooled engine that produces 80-100 hp depending on model. Rotax engines are high-revving engines that use an integral geared propeller speed reduction unit.

- UL Power – A family of European built, air-cooled direct-drive engines, with power outputs of 97-130 hp depending on model.

Fuel System

The stock fuel tank in the Sonex is a rotationally molded, polyethylene fuel cell located under the glareshield in the forward fuselage. Fuel tank capacities vary depending on model, with the legacy Sonex models holding 16 gallons, the B-Models holding 20 gallons, and the Onex holding 15 gallons. The system is designed to operate on a gravity feed setup, and as such a fuel pump is generally not installed or needed. Fuel level monitoring can be accomplished by an electronic, capacitance style fuel probe threaded into the bottom of the fuel tank, or by incorporating a clear visual sight tube into an upper and lower port into the fuel tank. A shutoff ball-valve is standard, located under the instrument panel at the outlet of the fuel tank. It is common practice to close this valve when the aircraft is not in use.

Some Thoughts on Transition to the Sonex

** The following article has been reprinted from the Sonex Foundation archives. Former Sonex employee and T-Flight Chief Instructor Joe Norris offers insights and suggestions on making a comfortable and safe transition into the Sonex series of airplane.*

Having spent the summer giving transition training to Sonex builders, potential builders, and buyers, I have found that there are some universal truths in the world of Sonex. I hope you will find the following musings to be both illuminating and entertaining. (NOTE: These comments apply equally to Sonex, Waiex, and Xenos airplanes, so I'll just use the term “Sonex” universally.)

Truth #1 – Nobody goes away disappointed! I have flown with high time pilots, low time pilots, builders who are preparing to fly their completed airplanes, pilots who have just purchased a flying Sonex design, and potential customers who are contemplating what airplane they might want to build. In every single case the pilot has a big smile at the conclusion of their training. Not one single person has found the airplane to be less than they expected.

Truth #2 – This ain't your father's Cessna (or Piper, or Beechcraft, etc.) Pilots whose sole experience has been in general aviation aircraft have found the Sonex to be a whole new world in control feel. It takes a while to get comfortable with flying the airplane with JUST the fingertips. You don't have to hold on tight when the control pressures are light and the airplane is responsive. This is probably the steepest learning curve I've run into. Pilots who have flown light-sport aircraft, or have experience in other homebuilt designs are better prepared to get in tune with the Sonex' responsive handling.

Truth #3 – This thing is LOW to the ground! Everybody has a tendency to flare too high at first. The Sonex designs sit quite a bit closer to the ground than a typical GA airplane, and they respond to control inputs more promptly than most GA airplanes, so pilots need to learn to fly the airplane down closer to the runway before starting their flare, lest they want to run out of energy before they run out of altitude. (We all know the result of that situation!)

Truth #4 – Speed control is king! As a follow on to the previous truth, a good landing will follow if the pilot flares at the proper height above the ground AND at the proper speed. Just a couple of extra MPH of airspeed will result in a prolonged float before touchdown. And as we all know, the longer you float down the runway the longer you have to screw up what could have been a good landing. With proper speed you will get a nice round-out, flare and touchdown in short order. Most pilots tend to fly their final approach too fast. Slow the danged thing down!!

Truth #5 – That long, sloping windshield and long glare shield make for an interesting sight picture. This is a multifaceted truth. First, since the Sonex is a side-by-side airplane and the pilot is sitting off center, the sight picture for a left turn is much different than for a right turn. This is of course true of any side by side airplane, but the unique windshield of the Sonex seems to accentuate this difference. As a result, every pilot I've flown with has a tendency to lose altitude in left turns and gain altitude in right turns when sitting in the left seat. (This is reversed when the pilot is sitting in the right seat.) It takes a while to get used to the very different location of the horizon in the windshield for left turns versus right turns. Also, the unique sight picture messes up your landings too. The airplane tapers from your shoulders to the nose, and the two “break” lines in the glare shield also taper toward the front. This gives pilots a false signal as to what “straight ahead” is, which results in pilots trying to land the airplane with the nose cocked off to the left when sitting in the left seat (or off to the right when sitting in the right seat). Pilots need to really study what “straight ahead” looks like when taxiing out for takeoff so that they know how to align the airplane with the runway at touchdown.

Truth #6 – This is an “attitude” airplane. Once the pilot gets the right sight picture in their mind for level flight and level turns, the instrument panel becomes largely unnecessary and possibly a distraction. When I find pilots spending too much time looking at the panel I'll simply cover it up. In every case the pilot will end up being smoother when flying the airplane by looking outside. The airplane “talks” to you. What you see, what you hear, and what you feel will tell you everything you need to know about what the airplane is doing. The panel is mostly just for a quick check every once in a while and an engine monitor. Look outside!!

Truth #7 – The difference between a Sonex and a Waiex is the shape of the tail. That's IT! There is no discernible difference in performance, handling, or stability. When you're sitting in the cockpit flying the airplane you can't tell which tail is on the back. They all fly the same. It's ALL about the look!

Truth #8 – No matter how hard you push on both rudder pedals, the brakes don't work! Years ago there were quite a few airplanes that had hand brakes, but most “modern” pilots haven't had any experience with them. It takes the pilot a little while to quite pushing on the pedals and reach for the brake handle to get the plane slowed or stopped. It's a good idea not to put yourself in a situation where immediate braking will be necessary until the hand brake has become second nature.

Truth #9 (the ultimate truth) – There's no replacement for experience! By all means, before you fly a Sonex yourself get some time in one. Take advantage of our factory transition training, get together with other transition training LODA holders around the country, or get some stick time with another Sonex owner. This will be time well spent and will prepare you to fly your new airplane. Be safe!

Preparation for Initial Flights

Regardless of whether you purchased a flying Sonex as a second or subsequent owner, or if you are the builder of your own airframe, thorough preparation is critical to your success as the Pilot in Command. The over-arching concept of proper aircraft control is covered extensively and repeatedly in this syllabus, and is central to a transitioning Sonex pilot. The following section covers a list of other important strategies and recommendations aimed at making those first few Sonex flights safe and enjoyable. Additional information regarding flight testing experimental amateur-built aircraft can be found in the Experimental Aircraft Association's Flight Test Manual, available directly from the EAA.

1) Know your Sonex!

Every Sonex is a custom built example, and you will not find any two that are built and equipped exactly alike. If you are the builder of your Sonex you will undoubtedly know the airplane better than anyone else, but if you purchased a Sonex that was built by someone else, taking the time to learn your new airplane is vital for safety. Knowing the location, layout, and operation of every switch, valve, and component in the airplane prior to actually flying it is highly recommended; when flying your new airplane, all of your focus should be on maintaining aircraft control and not looking for some random switch or knob. Sit in the airplane, look all through it, and be comfortable with the operation of all systems before you start the engine to go flying.

2) Be proficient in your flying skills.

For a great many homebuilt aircraft builders, the time spent during aircraft construction didn't allow for a lot of flight time to maintain currency and proficiency, and a dangerous combination may be a non-proficient pilot flying a new, untested airplane in which they have little or no recent experience. Before you begin any appropriate transition training that's outlined in this syllabus, spend some time getting current in another airplane by practicing basic flight maneuvers, takeoffs and landings, and simulated emergency procedures. If able, fly with your CFI and complete a Flight Review or similar overview of your flying skills prior to the start of any transition training. This will help prepare you as you start flying a new aircraft type.

3) Always be ready for an "engine out" situation.

Depending on the phase of flight, you must be prepared to and accept the fact that it is better to sacrifice the airplane in order save yourself. This can be a very difficult mindset

to accept, especially if you are test flying your new, recently finished pride and joy. As difficult as it may be to accept, remember that if the engine quits, at that moment the airplane belongs to the insurance company. Finally, always remember to avoid the impossible turn at all costs. Accident statistics show that turning back towards the runway during an engine failure almost always results in a very serious accident. Don't try it!

For the Sonex owners who are nearing completion of the build phase and preparing for the initial test flight, we offer the following recommendations:

4) Prep the airport before first flight.

Before you begin test flying your new airplane, go to the air traffic control tower (if based at a towered airport) and talk to them about your plane and your proposed flight test plan in order to let them know who you are so they will be aware of you and your plans should you call and need assistance during flight. You will find the tower controllers more than happy to assist you if you need anything, so if any abnormal or emergency situations occur while flying, be sure to ask for their help!

5) Stay in the "Cone of Safety".

The "cone of safety" is the radius that the airplane can safely glide back to a normal landing on the runway. The cone gets bigger in diameter the higher you fly, so use altitude to your advantage. As you perform the initial test flights, keep the radio turned to the tower frequency, even if above or slightly outside of their airspace limit.

6) Keep it Short.

For the first flight of your new airplane, keep the flight short and simple. You're not out to perform a full test flight regime on the initial flight. Plan on the first flight to take no more than 15-20 minutes; take off, climb up to a safe altitude, make sure the airplane flies normally, perform some slow flight, and come in for a landing. The first flight should be basic and simple.

7) Eliminate non-essential people from your first flight.

Do not have a huge crowd for your first test flight. Your attention needs to be on the airplane and flying it safely, not on entertaining friends. Have one or two trusted people but no more than that. You do not want any pressure on completing the flight on a specific given day because you have a party planned; wait until the airplane is ready, the weather cooperates, and you are ready before you attempt your first test flight.

Transition Training Course Outline

Ground Training: Introduction to Aircraft, Systems and Performance

**Discuss these items with your transition-training flight instructor using the aircraft Pilot Operating Handbook, Sonex Aircraft Flight Manual, or other references and appropriate.*

- □ Flight Characteristics of the Sonex/Waiex/Xenos/Onex Aircraft
- □ Aircraft Flight Controls and Systems
- □ Identify ***Unique*** Controls, Configurations, and Features of the Aircraft Used
- □ Engine Management using the AeroInjector/AeroCarb
- □ Stall Characteristics and Indications
- □ Aircraft Operating Limitations
- □ Weight and Balance
- □ V Speeds (*Vs, Vr, Vx, Vy, Va, Vno, Vne, best glide, cruise climb, acro-entry*)
- □ Aircraft Performance (Climb, Glide, Takeoff and Landing Distance, High DA)
- □ Spin Characteristics
- □ Cockpit Management
- □ Taxi Techniques
- □ Usage of Hand Brakes during Taxi, Takeoff and Landing
- □ Maximum Crosswind Component
- □ Takeoff Profile
- □ Climb Profile and Climb Performance
- □ Torque, P-factor and Gyroscopic Effect, as appropriate, on Takeoff
- □ Approach and Landing Flight Profile
- □ Awareness of High Sink Rates with Low Airspeeds on Approach
- □ Landing Flare and Touchdown
- □ Go Arounds & Recovery from Bounced or Ballooned Landings
- □ Emergency Procedures

Flight Lesson #1: Basic Introduction and Flight Demonstration

Aircraft Pre-flight

- □ Normal procedures and techniques
- □ Standard entry and exit procedures
- □ Canopy latch and emergency egress
- □ Cockpit familiarization
- □ Checklist usage
- □ Review fuel and oil capacity and consumption
- □ Passenger safety and pre-takeoff briefs

Engine Start, Taxi and Run-up

- □ Cold start
- □ Hot start
- □ Mixture control usage (AeroInjector/AeroCarb)
- □ Control positioning

Normal Takeoff and Climb (Demonstrated)

- □ Normal operations
- □ Aborted takeoff procedures

Aircraft Familiarization

- □ Basic aircraft control
- □ Pitch attitude familiarization
- □ Effect of trim
- □ Engine operation

Normal Descent and Landing (Demonstrated)

- □ Normal operations
- □ Effect of flaps
- □ Effect of wind
- □ Energy management

Shut Down and Securing Aircraft

- □ Checklist usage
- □ Post-flight Inspection

Flight Lesson #2: Basic Maneuvers

Normal Takeoff and Climb (Demonstrated)

- □ Normal operations
- □ Maintaining directional control

Basic Flight Maneuvers

- □ Straight and level flight
- □ Normal climbs and descents
- □ Normal turns (30 degree bank 360 left and right)

Performance Maneuvers

- □ Steep turns (45 degrees left and right)
- □ Slow flight (clean, partial and full flaps)

Stall Maneuvers

- □ Stall awareness
- □ Power off stalls
- □ Effect of flap settings
- □ Power on stalls
- □ Spin awareness and prevention

Ground Reference Maneuvers

- □ S-turns across a road
- □ Turns around a point
- □ Rectangular course

Normal Descent and Landing (Demonstrated)

- □ Normal operations
- □ 3-pt landing pitch attitude familiarization
- □ Maintaining directional control

Flight Lesson #3: Takeoff and Landing

Takeoff Maneuvers

- Normal and crosswind procedures
- Short field and soft field procedures
- Crosswind takeoff
- Aborted takeoff

Landing Maneuvers

- Normal and crosswind procedures
- Stabilized approach using power and trim
- Short field and soft field procedures
- Slips
- No flap landing
- Mitigating high sink rates when slow
- Crosswind and gusty landing procedures

Emergency Procedures

- Complete power loss
- Partial power loss
- Return to landing (i.e. the “Impossible turn”)
- Electrical system / instrument failure

Recurrent Flight Training

Aircraft Pre-flight

- Normal procedures and techniques
- Cockpit management
- Checklist usage

Engine Start, Taxi and Run-up

- Cold start
- Hot start
- Mixture control usage (AeroInjector/AeroCarb)
- Control positioning

Normal Takeoff and Climb

- Normal takeoff and climb out

Flight Maneuvers

- Normal turns (30 degree bank left and right)
- Steep turns (45 degree bank left and right)
- Slow flight (clean, partial and full flaps)
- Turns around a point
- S-turns across a road

Stall Maneuvers

- Stall awareness and recognition
- Power off stall
- Power on stall
- Full flap turning stall (accelerated stall)
- Spin awareness and prevention

Takeoff and Landing Maneuvers

- Normal landing to a full stop
- Crosswind procedures
- Short field procedures
- Soft field procedures
- Slip to landing
- No-flap landing
- Aborted takeoff
- Balked landing
- Go arounds

Emergency Procedures

- Complete power loss
- Partial power loss
- Return to landing (i.e. the “Impossible Turn”)
- Electrical system / instrument failure

Aircraft Post-flight Inspection

- After landing checks
- Parking and securing the aircraft
- Aircraft servicing (as appropriate)

Sonex Transition Training Checklist

Pilot: _____

Instructor: _____

Aircraft: _____ Date: _____

Ground Instruction:

- ❑ Aircraft Flight Controls and Systems
- ❑ Flight Characteristics of the Sonex/Waiex/Xenos/Onex Aircraft
- ❑ Engine Management using the AeroInjector/AeroCarb
- ❑ Stall Characteristics and Indications
- ❑ Aircraft Operating Limitations
- ❑ Weight and Balance
- ❑ V Speeds (*Vs, Vr, Vx, Vy, Va, Vno, Vne, best glide, cruise climb*)
- ❑ Aircraft Performance
- ❑ Spin Characteristics
- ❑ Cockpit Management
- ❑ Checklists
- ❑ Taxi Techniques & Nose Attitude
- ❑ Usage of Hand Brakes during Taxi, Takeoff and Landing
- ❑ Maximum Crosswind Component
- ❑ Takeoff Profile
- ❑ Climb Profile, Attitude and Performance
- ❑ Torque, P-factor and Gyroscopic Effect
- ❑ Approach and Landing Flight Profile
- ❑ Awareness of High Sink Rates with Low Airspeeds on Approach
- ❑ Landing Flare and Touchdown
- ❑ Go Arounds & Recovery from Bounced or Ballooned Landings
- ❑ Emergency Procedures

Notes:

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Sonex Transition Training Checklist

Aircraft Preflight & Departure

- ❑ Perform a preflight inspection
- ❑ Perform a passenger safety brief and pre-takeoff brief
- ❑ Practice proper mixture control usage for ground ops
- ❑ Execute a normal takeoff and climb out

Flight Maneuvers

- ❑ Normal turns (30 degree bank left and right)
- ❑ Steep turns (45 degree bank left and right)
- ❑ Turns around a point
- ❑ S-turns across a road
- ❑ Slow flight (with and without flaps)
- ❑ Power off stall
- ❑ Power on stall
- ❑ Demonstrate spin awareness and prevention

Takeoff and Landing Maneuvers

- ❑ Normal landing to a full stop
- ❑ Practice an aborted takeoff
- ❑ Execute a short field takeoff
- ❑ Execute a short field or “spot landing” approach
- ❑ Execute a no-flap approach using a slip to landing
- ❑ Execute a go-around on short final

Emergency Procedures

- ❑ Simulated complete power loss
- ❑ Simulated partial power loss
- ❑ Evaluate potential emergency landing sites in flight
- ❑ Simulated loss of electrical system and/or instruments
- ❑ Practice a power-off landing from the traffic pattern

Aircraft Postflight

- ❑ Perform after-landing checks
- ❑ Park and secure the aircraft, servicing as appropriate