Transition to Light Sport Airplanes (LSA)

Introduction

Transitioning into a light sport airplane (LSA) requires the same methodical training approach as transitioning into any other airplane. A pilot should never attempt to fly another airplane that is different than the pilot's current certification, experience, training, proficiency, or currency without proper training. Some pilots may be lulled into a false sense of security because LSAs seem to be simple. However, a pilot seeking a transition into light sport flying should follow a systematic, structured LSA training course under the guidance of a competent instructor with recent experience in the specific training airplane.

The light sport category is not a new type of airplane. It is a classification that intends to broaden the access of flight to more people. LSA has been defined as a simple-to-operate, easy-to-fly aircraft; however, "simple-to-operate" and "easy-to-fly" does not negate the need for proper and effective training. This chapter introduces the light sport category of aircraft and places emphasis on LSA transition.

Light Sport Airplane (LSA) Background

Several groups were instrumental in the development and success of the LSA concept. These included the Federal Aviation Administration (FAA), Light Aircraft Manufacturers Association, American Society for Testing and Materials (ASTM) International, and countless individuals who promoted the concept since the early 1990s. In 2004, the FAA released a rule that created the LSA category, which covers a wide variety of aircraft including: airplane, gyroplane, lighter-than-air, weight-shift-control, glider, and powered parachute. *[Figure 16-1]*

The primary concept of the LSA is built around a defined set of standards:

- Powered (if powered) by single reciprocating engine
- Fixed landing gear, seaplanes are excluded
- Fixed pitch or ground adjustable propeller
- Maximum takeoff weight of 1,320 pounds for landplane, 1,430 for seaplane
- Maximum of two occupants
- Non-pressurized cabin

Figure 16-1. *The LSA category covers a wide variety of aircraft including: A) airplane, B) gyroplane, C) lighter-than-air, D) weight-shift-control, E) glider, and F) powered parachute.*

- Maximum speed in level flight at maximum continuous power of 120 knots calibrated airspeed (CAS)
- Maximum stall speed of 45 knots. *[Figure 16-2]*

The LSA category includes standard, special, and experimental designations. Some standard airworthiness certificated aircraft (i.e., a Piper J-2 or J-3) may meet Title 14 of the Code of Federal Regulation (14 CFR) 1.1 definition of LSA. Type certificated aircraft that continue to meet the CFR 1.1 definition of LSA allows for that type certificated aircraft to be flown by a pilot who holds a Sport Pilot certificate. The Sport Pilot certificate is discussed later in this chapter. Aircraft that are specifically manufactured for the LSA market are included in either the Special (S-LSA) or Experimental (E-LSA) designations. An approved S-LSA is manufactured in a ready-to-fly condition and an E-LSA is either a kit or plans-built aircraft based on an approved S-LSA model.

It is important to note that S-LSAs or E-LSAs are not type certificated by the FAA and are not required to meet any airworthiness requirements of 14 CFR part 23. Instead, S-LSA and E-LSA aircraft are designed and manufactured in accordance with ASTM Committee F-37 Industry Consensus Standards. Therefore, LSA aircraft designs are not subjected to the scrutiny, demands, and testing of FAA standard airworthiness certification. Industry Consensus Standards are intended to be less costly and less restrictive than 14 CFR part 23 certification requirements and, as a result, manufacturers have greater latitude with their designs. ASTM Industry Consensus Standards were accepted by the FAA in 2005, which established for the first time that the FAA accepted industry-developed standards rather than its own standards for the design and manufacture of aircraft.

ASTM Industry Consensus Standards for LSA airplanes covers the following areas:

- Design and performance
- Required equipment
- Quality assurance
- Production acceptance tests
- Aircraft operating instructions
- Maintenance and inspection procedures
- Identification and recording of major repairs and major alterations
- Continued airworthiness
- Manufacturers assembly instructions (E-LSA aircraft)

Using the ASTM Industry Consensus Standards, an LSA manufacturer can design and manufacture their aircraft and assess its compliance to the consensus standards. The

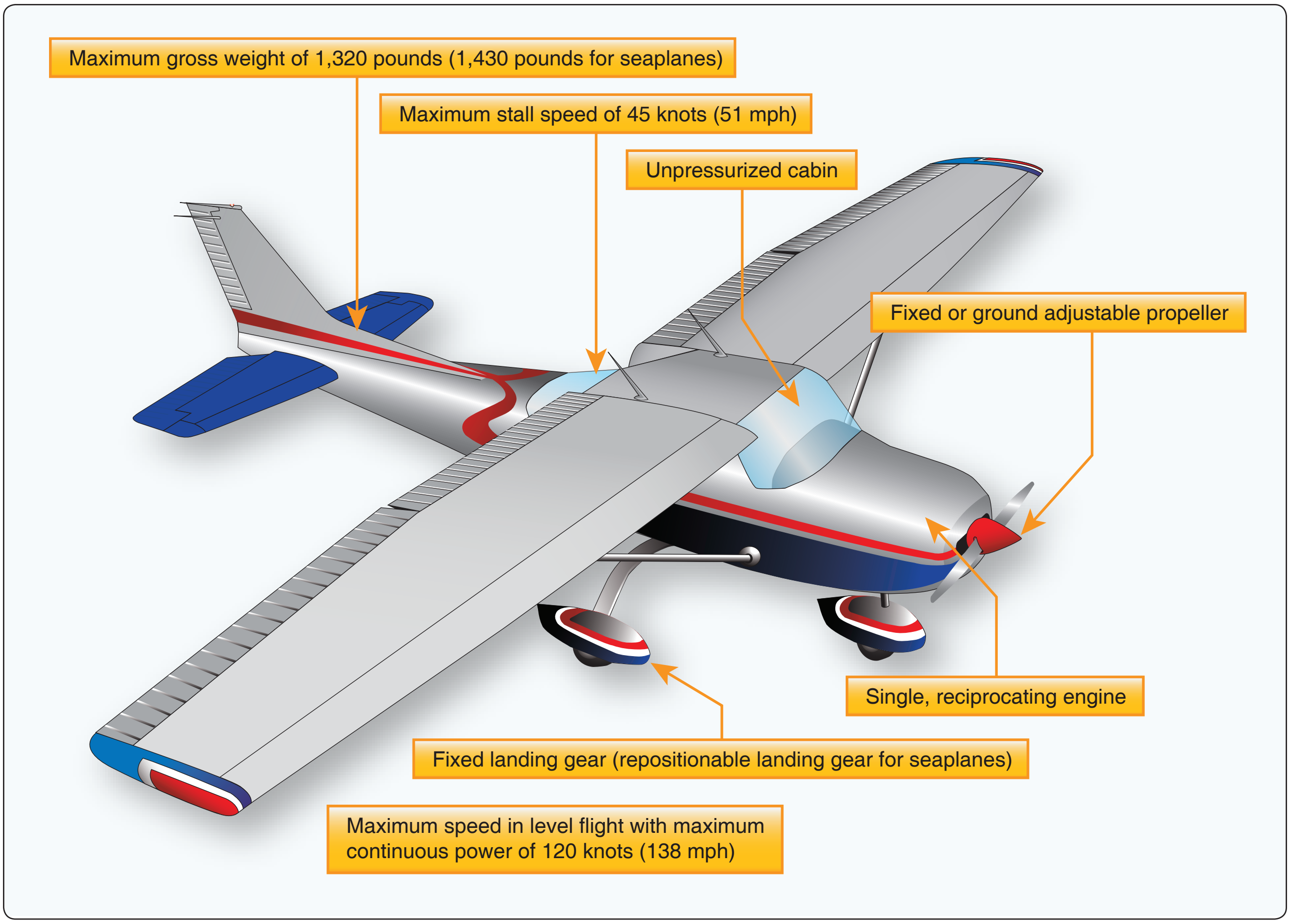

Figure 16-2. *Light sport airplane.*

manufacturer then, through evaluation services offered by a designated airworthiness representative, completes the process by submitting the required paperwork to the FAA. Upon approval, an LSA manufacturer is permitted to sell ready-to-fly S-LSA aircraft.

LSA Synopsis

- The airplane must meet the weight, speed, and other criteria as described in this chapter.
- Airplanes under the S-LSA certification may be used for sport and recreation, flight training, and aircraft rental.
- Airplanes under the E-LSA certification may be used only for sport and recreation and flight instruction for the owner of the airplane. E-LSA certification is not the same as Experimental Amateur-Built. E-LSA certification is based on an approved S-LSA airplane.
- Airplanes with a standard airworthiness type certificate (i.e., a Piper J-2 or J-3) that continue to meet the 14 CFR 1.1 LSA definition may be flown by a pilot with a Sport Pilot certificate.
- Must have an FAA registration and N-number.
- United States or foreign manufacturers can be authorized.
- May be operated at night if the aircraft is equipped per 14 CFR part 91, section 91.205, if night operations are allowed by the airplane's operating limitations, and the pilot holds at least a Private Pilot certificate and a minimum of a third-class medical.
- LSAs can be flown by holders of a Sport Pilot certificate or higher level pilot certificate (recreational, private, etc.)

Sport Pilot Certificate

In addition to the LSA rules, the FAA created a new Sport Pilot certificate in 2004 that lowered the minimum training time requirements, in comparison to other pilot certificates, for newly certificated pilots wishing to exercise privileges only in LSA aircraft. A pilot that already holds a recreational, private, commercial, or airline transport pilot certificate and a current medical certificate is permitted to pilot LSA airplanes provided that he or she has the appropriate category and class ratings. For example, a commercial pilot with exclusively a rotorcraft rating cannot pilot an LSA airplane.

Pilots who hold a recreational, private, commercial, or airline transport pilot certificate with the appropriate category and class ratings but do not hold a current medical certificate may fly LSAs as long as the pilot holds a valid U.S. driver's license as evidence of medical eligibility; however, if the pilot's most recent medical certificate was denied, revoked, suspended, or withdrawn, a U.S. driver's license is not sufficient for medical eligibility. In this case, the pilot would be prohibited from flying an LSA until the pilot could be issued a third class medical.

Transition Training Considerations

Flight School

The LSA category has created new business opportunities for flight school operators. Many owners and operators of flight schools have embraced the concept of LSA aircraft and have LSAs available on their flight line for flight instruction and rental. An S-LSA may be rented to students for flight training and rented to rated pilots for pleasure flying. While S-LSAs cannot be used for compensation or hire (such as charter—however, there are some exceptions), their low cost of operation, frugal fuel usage, reliability, and low maintenance costs have made them a favorite of many students, pilots, and flight school owners. E-LSAs are not eligible for flight training and rental except when flight instruction is given to the owner of the E-LSA airplane.

When considering a transition to LSA, a potential pilot should exercise due diligence in searching for a quality flight school. Considerations should be given as in any flight training selection. First, locate a flight school that has a verifiable experience in LSA instruction and can provide the LSA academic framework. Consider if the flight school can match your needs. Some questions to be asked are the following: how many pilots the flight school has transitioned into LSAs; how many LSAs are available for instruction and rental; what are the flight school's rental and insurance policies; how is maintenance accomplished and by whom; how is scheduling accomplished; how are records maintained; what are the school's safety policies; and, take the time to personally tour the school before starting flight training. Finally, if possible, solicit feedback from other pilots that have transition into LSAs.

Flight Instructors

The flight school provides the organization for the transitioning pilot; however, it is the flight instructor that is the critical link in a successful LSA transition. Flight instructors are at first teachers of flight, so it should be considered vital that a pilot wishing to transition into LSA locate a flight instructor that has verifiable experience in LSA instruction. Considerations for selecting a flight instructor are similar to any other flight training; however, some clarity around selecting a flight instructor is needed. The Sport Pilot rule allows for a new flight instructor certificate, the CFI-S. The CFRs limit a CFI-S to instruction only in LSAs—a CFI-S cannot give instruction in a non-LSA airplane (i.e., a Cessna 150). However, a flight instructor certificated as a CFI-A can give instruction in LSA, as well as instruction in non-LSA airplanes for which the flight instructor is rated. It is important to note that a CFI-S or a CFI-A should not be the criteria for selecting an LSA flight instructor. A CFI-S with teaching experience in LSA is the correct choice compared to a CFI-A, which has minimal teaching experience in LSA airplanes.

A transitioning LSA pilot should ask the flight instructor to make available for review their LSA curriculum, syllabus, lesson plans, as well the process for tracking a pilot's progress though the transition training program. Depending on the transitioning pilot's experience, currency, and type of airplane typically flown, the flight instructor should make adjustments, as appropriate, to the LSA training curriculum. A suggested LSA transition training outline is presented:

- CFR review as pertaining to LSAs and Sport Pilots
- Pilot's Operating Handbook (POH) review
- LSA maintenance
- LSA weather considerations
- Wake turbulence avoidance
- Performance and limitations
- Operation of systems
- Ground operations
- Preflight inspection
- Before takeoff check
- Normal and crosswind takeoff/climb
- Normal and crosswind approach/landing
- Soft-field takeoff and climb
- Soft-field approach and landing
- Short-field takeoff
- Go-around/rejected landing
- Steep turns
- Power-off stalls
- Power-on stalls
- Spin awareness
- Emergency approach and landing
- Systems and equipment malfunctions

- After landing, parking, and securing

LSA Maintenance

Proper airplane maintenance is required to maximize flight safety. LSAs are no different and must be treated with the same level of care as any standard airworthiness certificated airplane. S-LSAs have greater latitude pertaining to who may conduct maintenance as compared to standard airworthiness certificated airplanes. S-LSAs may be maintained and inspected by:

- An LSA Repairman with a Maintenance rating; or,
- An FAA-certificated Airframe and Powerplant Mechanic (A&P); or,
- As specified by the aircraft manufacturer; or
- As permitted, owners performing limited maintenance on their S-LSA

The airplane maintenance manual includes the specific requirements for repair and maintenance, such as information on inspections, repair, and authorization for repairs and maintenance. Most often, S-LSA inspections can be signed off by an FAA-certificated A&P or LSA repairman with a Maintenance rating rather than an A&P with Inspection Authorization (IA); however, the aircraft maintenance manual provides the specific requirements which must be followed. The FAA does not issue Airworthiness Directives (ADs) for S-LSAs or E-LSAs. If an FAA-certified component is installed on an LSA, the FAA issues any pertaining ADs for that specific component. Manufacturer safety directives are not distributed by the FAA. S-LSA owners must comply with:

- Safety directives (alerts, bulletins, and notifications) issued by the LSA manufacturer
- ADs if any FAA-certificated components are installed
- Safety alerts (immediate action)
- Service bulletins (recommending future action)
- Safety notifications (informational)

S-LSA compliance with maintenance requirements provides greater latitude for owners and operators of these airplanes. Because of the options in complying with the maintenance requirements, pilots who are transitioning to LSAs must understand how maintenance is accomplished; who is providing the maintenance services; and verify that all compliance requirements have been met.

Airframe and Systems

Construction

LSAs may be constructed using wood, tube and fabric, metal, composite, or any combination of materials. In general, a primary effort by the manufacturer is to keep the airplane lightweight while maintaining the structural requirements. Composite LSAs tend to be sleek and modern looking with clean lines as molding of the various components allows designers great flexibility shaping the airframe. Other LSAs are authentic-looking renditions of early aviation airplanes with fabric covering a framework of steel tubes. Of course, LSAs may be anything in between using both metal and composite construction. *[Figure 16-3]* A pilot transitioning into LSA should understand the type of construction and what are typical concerns for each type of construction:

- Steel tube and fabric—while the techniques of steel tube and fabric construction hails back to the early days of aviation, this construction method has proven to be lightweight, strong, and inexpensive to build and maintain. Advances in fabric technology continue to make this method of covering airframes an excellent choice. Fabric can be limited in its life span if not properly maintained. Fabric should be free from tears, well-painted with little to no fading, and should easily spring back when lightly pressed.
- Aluminum—an aluminum-fabricated airplane has been a favorite choice for decades. Pilots should be quite familiar with this type of construction. Generally, airframes tend to be lightly rounded structures dotted with rivets and fasteners. This construction is easily inspected due to the wide-spread experience with aluminum structures. Conditions such as corrosion, working rivets, dents, and cracks should be a part of a pilot's preflight inspection.
- Composite—a composite airplane is principally made from structural epoxies and cloth-like fabrics, such as bi-directional and uni-directional fiberglass cloths, and specialty cloths like carbon fiber. Airframe components, such as wing and fuselage halves, are made in molds that result in a sculpted, mirror-like

Figure 16-3. *LSA can be constructed using both metal and composites.*

finish. Generally, composite construction has few fasteners, such as protruding rivets and bolts. Pilots should become acquainted with inspection concerns such as looking for hair-line cracks and delaminations.

Engines

LSAs use a variety of engines that range from FAA-certificated to non-FAA-certificated. Engine technology varies significantly from conventional air-cooled to high revolutions per minute (rpm)/water-cooled designs. *[Figure 16-4]* These different technologies present a transitioning pilot new training opportunities and challenges. Since most LSAs use non-FAA-certificated engines, a transitioning pilot should fully understand the engine controls, procedures, and limitations. In most LSA airplanes, engines are water-cooled, 4-cycle, carbureted with a gear reduction drive. Engines such as these have much higher operating rpms and require a gear-box to reduce the propeller rpms to the proper range. Because of the higher operating rpms, vibration and noise signatures are quite different in most LSAs when compared to most standard type certificated designs.

Figure 16-4. *A water-cooled 4-cycle engine.*

Instrumentation

In addition to advanced airframe and engine technology, LSAs often have advanced flight and engine instrumentation. Often installed are electronic flight instrumentation systems (EFIS) that provide attitude, airspeed, altimeter, vertical speed, direction, moving map, navigation, terrain awareness, traffic, weather, engine data, etc., all on one or two liquid crystal displays. *[Figure 16-5]* EFIS has become a cost-effective replacement for traditional mechanical gyros and instruments. Compared to mechanical instrumentation systems, EFIS requires almost no maintenance. There are tremendous advantages to EFIS systems as long as the pilot is correctly trained in its use. EFIS systems can cause a "heads down" syndrome and loss of situation awareness if the pilot is not trained to quickly and properly configure, access, program, and interpret the information provided. Transition training must include, if EFIS is installed, instruction in the use of the specific EFIS installed in the training airplane. In some cases, EFIS manufacturers or third party products are available for the pilot to practice EFIS operations on a personal computer as opposed to learning their functions in flight.

Weather Considerations

Managing weather factors is important for all aircraft but becomes more significant as the weight of the airplane decreases. Smaller, lighter weight airplanes are more affected by adverse weather such as stronger winds (especially crosswinds), turbulence, terrain influences, and other hazardous conditions. *[Figures 16-6* and *16-7]* LSA Pilots should carefully consider any hazardous weather conditions and effectively use an appropriate set of personal minimums to mitigate flight risk. Some LSAs have a maximum recommend wind velocity regardless of wind direction.

Figure 16-5. *An electronic flight instrumentation system provides attitude, airspeed, altimeter, vertical speed, direction, moving map, navigation, terrain awareness, traffic, weather, and engine data all on one or two liquid crystal displays.*

[Figure 16-8] While this is not a limitation, it would be prudent to heed any factory recommendations.

Due to an LSA's lighter weight, even greater distances from convective weather should be given. Low level winds that enter and exit a thunderstorm should be avoided not only by all airplanes but operations in the vicinity of convection should not be attempted in lightweight airplanes. Weather accidents continue to plague general aviation and, while it is not possible to always fly in clear, blue, calm skies, pilots of lighter weight LSAs should carefully manage weather-related risks. For example, some consideration should be given to flight activity that crosses varying terrain boundaries, such as grass or water to hard surfaces. Differential heating can cause lighter weight airplanes to experience sinking and lift to a greater degree than heavier airplanes. Careful planning, knowledge and experience, and an understanding of the flying environment assists in mitigating weather-related risks.

Flight Environment

The stick and rudder skills required for LSAs are the same stick and rudder skills required for any airplane. This section outlines areas that are unique to LSA airplanes – most skills learned in a standard airworthiness type certificated airplane are transferrable to LSAs; however, since LSAs can vary significantly in performance, equipment and systems, and construction, pilots must seek competent flight instruction and refer to the airplane's POH for detailed and specific information prior to flight.

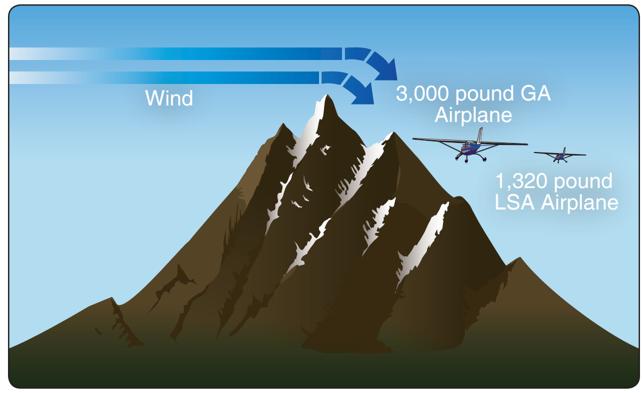

Figure 16-7. *Moderate mountain winds can create severe turbulence for LSA.*

Preflight

The preflight inspection of any airplane is critical to mitigating flight risks. A pilot transitioning into an LSA should allow adequate time to become familiar with the airplane prior to a first flight. First, the pilot and flight instructor should review the POH and cover the airplane's

Maximum Demonstrated Crosswind Velocity	
Takeoff or landing	12 knots
Maximum Recommended Wind Velocity	
All operations	22 knots

Figure 16-8. *Example of wind limitations that a LSA may have.*

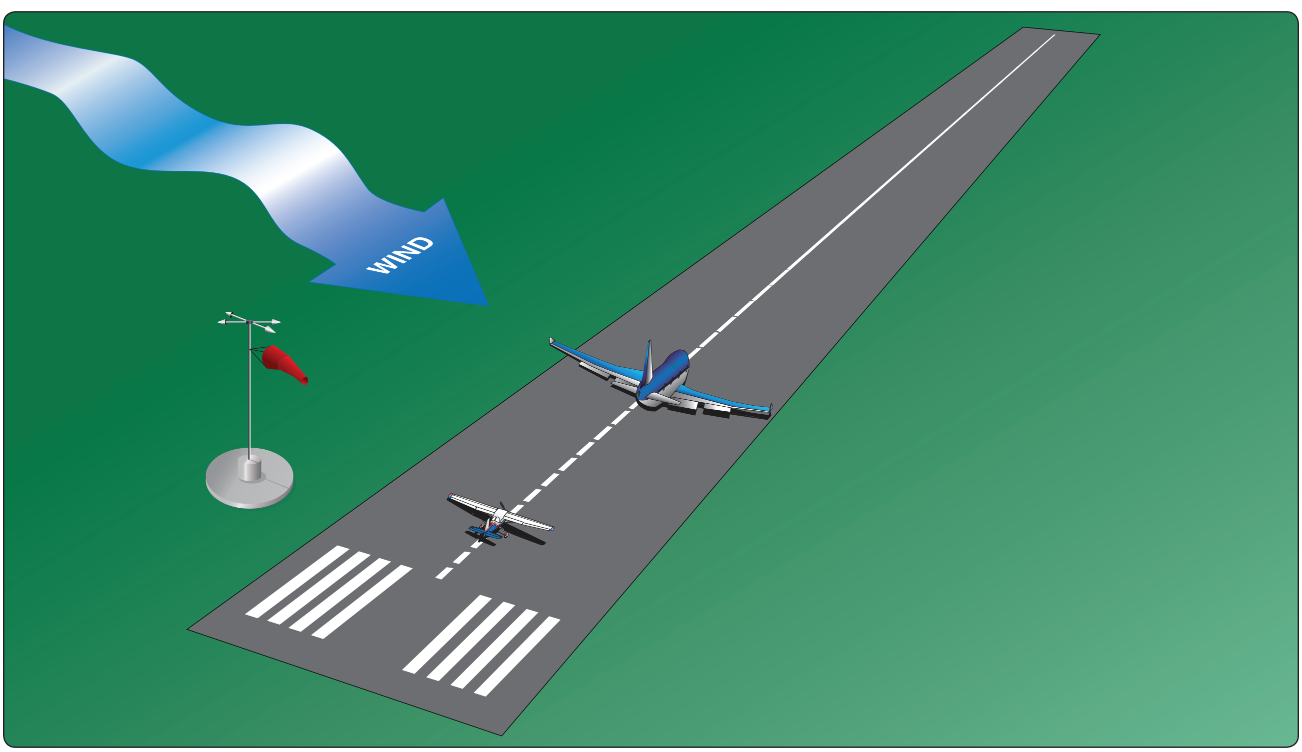

Figure 16-6. *Crosswind landing.*

limitations, systems, performance, weight and balance, normal procedures, emergency procedures, and handling requirements. *[Figure 16-9]*

Inside of the Airplane

Transitioning pilots find an LSA very familiar when conducting a preflight inspection; however, some preflight differences are worth pointing out. For example, many LSAs do not have adjustable seats but rather adjustable rudder pedals. *[Figure 16-10]* Often, LSA seats are in a fixed position. There are varied methods that LSA manufacturers have implemented for rudder pedal position adjustment. Some manufacturers use a simple removable pin while others use a knob near the rudder pedals for position adjustment. Shorter pilots may find that the adjustment range may not be sufficient for certain heights and an appropriate seat cushion may be required to have the proper range of rudder pedal movement. In addition, seats in some LSAs are in a semi-reclined position. The first time a pilot sits in a semi-reclining seat, it may seem somewhat unusual. A pilot should take time to get comfortable.

Another area that transitioning pilots require familiarity is with the flight and engine controls. These may vary significantly from airplane model to airplane model. Some

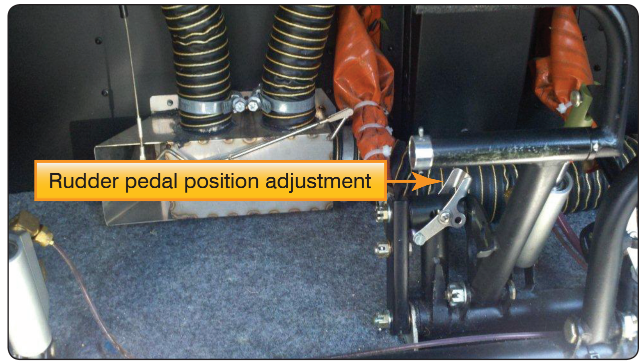

Figure 16-10. *Adjustment lever for the rudder pedal position.*

LSA airplanes use conventional control stick while others use a yoke. One manufacturer has combined the two types of controls in what has been termed a "stoke." While this control may seem unique, it provides a completely natural feel for flight control. *[Figure 16-11]* Regardless of the flight controls, a full range of motion check of the flight controls is required. This means full forward to full forward left to full aft left to full aft right and then full forward right. Verify that each control surface moves freely and smoothly. On some LSAs, aileron control geometry, in an attempt to minimize adverse yaw, moves ailerons in a highly differential manner;

Figure 16-9. *Pilot's Operating Handbook for a LSA.*

Figure 16-11. *Stoke flight control with conventional engine controls.*

a pilot may see very little "down" aileron when compared to the "up" aileron. Pilots should always verify the direction of control surface movement.

Elevator trim on many LSAs is electrically actuated with no mechanical trim adjustment available. *[Figure 16-12]* Depending on the airplane, trim position indication may be displayed on the EFIS or an LED or mechanical indicator. On electric trim systems, as it is with any airplane, it is important to ensure that the trim position is correctly set prior to takeoff. Because trim positioning/indicting systems vary widely in LSA airplanes, pilots should fully understand not only how to position the trim, but also how to respond to a trim-run-away condition. Part of the preflight inspection should include actuating the trim switch in both nose-up and nose-down directions, verifying that the trim disconnect (if equipped) is properly functioning, ensure that the trim system circuit breaker can disconnect the trim motor from operating, and then properly setting the takeoff trim position.

Depending on the engine manufacturer, the engine controls may be completely familiar to a transitioning pilot (throttle, mixture, and carburetor heat); however, some engines have no mixture control or carburetor heat. Instead, there could be a throttle, a choke control, and carburetor preheater.

Figure 16-12. *Trim control.*

Regardless, a pilot must become familiar with the specific engine installed and its operation. A transitioning pilot also needs to become comfortable with difference between conventional engine control knobs and LSAs. In standard airworthiness airplanes, control knobs are reasonably standardized; however, LSAs may use controls that are much larger or smaller in size.

If the LSA is equipped with an EFIS, the manufacturer's EFIS Pilot Guide should be available for reference. In addition, the airplane POH likely has specific EFIS preflight procedures that must be completed. These checks are to verify that all internal tests are passed, that no red "Xs" are displayed, and that appropriate annunciators are illuminated. Some systems have a "reversionary" mode where the information from one display can be sent to another display. For example, should the Primary Flight Display (PFD) fail, information can be routed to the Multi-Function Display (MFD). Not all LSA EFIS systems are equipped with a MFD or reversionary capability, so it is important for a transitioning pilot to understand the system and limitations.

Fuel level in any airplane should be checked both visually and via the fuel level instrument or sight gauges. In LSAs, fuel level quantities can be shown on a wide range of technologies. Some models may have conventional float activated indictors while other may have the fuel level display on the EFIS with low-fuel alarm capability. It is not uncommon for an LSA airplane to have advanced EFIS technology for attitude and navigation information but have a simple sight gauge for fuel level indication. Fuel tank selection can also vary from simple on/off valves to a left/right selector. Fuel starvation remains a leading factor in aircraft accidents, which should be a reminder that when transitioning into a new airplane, time spent understanding the fuel system is time well spent.

A popular safety feature of some LSAs is a ballistic parachute. *[Figure 16-13]* These devices have been shown to be well worth their cost in the remote case of a catastrophic failure or some other unsurvivable emergency. This system rockets a parachute into deployment and then the parachute slowly lowers the aircraft. The preflight inspections of these systems require a check of the mounts, safety pin and flag, and the activation handle and cable. Because most standard airworthiness type certificated airplanes do not have these systems installed, LSA training should cover the operation and limitations of the system.

Outside of the Airplane

Transitioning pilots should feel comfortable and in a familiar setting when preflighting the outside of an LSA. Some unique areas worthy of notation are presented below.

Figure 16-13. *A ballistic recovery parachute is a popular safety feature available on some LSA.*

Propellers of LSAs may range from a conventional metal propeller to composite or wood. The preflight inspection is similar regardless of the type of propeller; however, if a transitioning pilot is principally familiar with metal propellers, time should be spent with the LSA flight instructor covering the type of propeller installed. Many LSA propellers are composite and have a ground adjustable pitch adjustment. As a result, there may be more areas to check with these types of propellers. For example, on ground adjustable propellers, ensure that the blades are tight against the hub by snugly twisting the blade at the root to verify that there is no rotation of the blade at the hub.

Many LSAs are equipped with engines that have a water cooling system. LSAs may be tightly cowled, which reduces drag, and with liquid-cooled engines, this minimizes the need for cylinder cooling inlets, which further reduces drag and improves performance. This does present a new system for a transitioning pilot to check. Preflighting this system requires that the radiator, coolant hoses, and expansion tank are checked for condition, freedom from leaks, and coolant level requirements. Most standard type certificated airplanes do not have coolant systems.

Split flaps may be used on some LSA designs. *[Figure 16-14]* These flaps hinge down from underneath the wing and inspecting these flaps require the pilot to crouch and twist low for inspection. A suitable handheld mirror can facilitate inspection without undue twisting and bending. In an attempt to keep complexity to a minimum, flap control is typically a handle that actuates the flaps. A pilot should verify that the flaps extend and retract smoothly.

Figure 16-14. *Split flap.*

Before Start and Starting Engine

Once a pilot has completed the preflight inspection of the LSA, the pilot should properly seat themselves in the airplane ensuring that the rudder pedals can be exercised with full-range movement without over-reaching. Seat belts should be checked for proper position and security. The pilot must continue to use the POH for all required checklists. Starting newer generation LSA engines can be quite simple only requiring the pull of the choke and a twist of the ignition switch. If the LSA is equipped with a standard certificated engine, starting procedures are normal and routine. The canopy or doors of an LSA may have quite different latching mechanisms than standard airworthiness airplanes. Practice latching and unlatching the doors or canopy to ensure that understanding is complete. Having a gull-wing door or sliding canopy “pop” open in flight can become an emergency in seconds.

Taxi

Like standard certificated airplanes, LSAs may have a full-castoring or steerable nosewheel or, if conventional gear, a tailwheel. In order to taxi a full-castoring nosewheel equipped airplane, the use of differential brakes is required. This type of nosewheel can require practice to develop the skill necessary to keep the airplane on the centerline while minimizing brake application or damage to the tires. The balance is just enough taxi speed so that only light taps of brake pressure in the desired direction of turn or correction is required to make a turn or correction without carrying excessive taxi speed. If the speed is too slow, application of a brake can cause the aircraft to pivot to a stop, rather than an adjustment in direction, resulting in excessive brake and tire wear. If the speed is too fast, excessive brake wear is likely.

An LSA with conventional gear (tailwheel) should be initially transitioned into during no-wind conditions. The airplane, due to its light weight, requires the development of the proper flight control responses prior to operations in any substantial wind.

Takeoff and Climb

Takeoff and climb performance of LSA can be spirited as it typically has a high horsepower to weight ratio and accelerates quickly. Due to design requirement for low stall speeds, LSAs typically have low rotation and climb speeds with impressive climb rates. Like other airplanes, the pilot should be flying the published speeds as given the airplane's POH. Stick (yoke or stoke) forces tend to be light, which may lead a transitioning pilot to initially over-control as a result of flight control deflections being greater than required. The key is to relax, have reasonable patience, and input only appropriate flight control pressures needed to get the required response. If a transitioning pilot is inducing excessive control inputs, they should minimize flight control pressures, set attitudes based on outside references, and allow the airplane to settle.

During climbs, visibility over the nose may be difficult in some LSAs. As always, it is important to properly clear the airspace for traffic and other hazards. Occasionally lowering the airplane's nose to get a good look out toward the horizon is important for managing flight safety. Shallow banked turns in both directions of 10° to 20° also allow for clearing. Trim should be used to relieve climb flight control pressures that are generally light. Because flight control pressures tend to be light, it is easy to get in the habit of flying with an LSA airplane out of trim. This is to be avoided. Trim off any flight control pressures. This allows the pilot to focus as much time as possible looking outside.

Cruise

After leveling off at cruise altitude, the airplane should be allowed to accelerate to cruise speed, reduce power to cruise rpm, adjust pitch, and then trim off any flight control pressures. *[Figure 16-15]* The first time a transitioning pilot sees cruise rpm setting of 4,800 rpm (or as recommended), they may have a sense that the engine is turning too fast; however, remember that the engine has gear-reduction drive and the propeller is turning much slower. If the LSA is equipped with a standard aircraft engine, rpms are in a range that the transitioning pilot is immediately comfortable. The pilot should refer to the Cruise Checklist to ensure that the airplane is properly configured.

Figure 16-15. *EFIS indication of level cruise flight.*

In slower cruise flight, stick forces are likely to be light; therefore, correction to pitch and roll attitudes should be made with light pressures. Excessive pressures result in the pilot inducing excessive correction causing a chasing effect. Only enough pressure needed to correct a deviation is required. This is best accomplished with fingertip pressures only and not with a wrapped palm of the hand. Stick forces can change dramatically as airspeed changes; for example, what could be considered light control pressures at 80 knots may become quite stiff at 100 knots. A CFI-S or CFI-A experienced in the LSA airplane is able to demonstrate this effect. This effect is dependent on the specific model of LSA and any significance or relevance varies from manufacturer to manufacturer.

LSA maneuvers such as steep turns, slow flight, and stalls are typically conventional. These maneuvers should be practiced as part of a good transition training program. Steep turns in LSA airplanes tend to be quite easy to perform precisely. With light flight control pressures, stick mounted trim (if installed), and highly differential ailerons (if part of the airplane's design), makes the performance of the maneuver simpler than heavier airplanes. Basic aerodynamics applies to any airplane and factors, such as over-banking tendency, are still prevalent and must be compensated.

Slow flight in LSAs is accomplished at slower airspeeds than standard airworthiness airplanes since stall speeds tend to be well below the 45-knot limit. The first time practicing slow flight demonstrates the unique capability of LSAs. Power off stalls are typically of no particular significance as simply unloading the wing and the application of power immediately puts the airplane back flying. However, a pilot should understand that control pressures tend to be light so an aggressive forward movement of the elevator is generally not required. In addition, proper application of rudder to compensate for propeller forces is required, and retraction of any flap should be completed prior to reaching V_{FE}, which comes very quickly if full power and nose down pitch attitude are maintained. Power on stalls can result in a very high nose-up attitude unless the airplane is adequately slowed down prior to the maneuver. In addition, some manufacturers limit pitch attitudes to 30° during power on stalls. If aggressive pitch attitudes are coupled with uncoordinated rudder inputs, spin entry is likely to be quick and aggressive.

Depending on the LSA design, especially those airplanes which use control tubes rather than wires and pulleys, flight in turbulence may couple motion to the stick rather distinctively. If a transitioning pilot's flight experience is only with airplanes that have control cables and pulleys, the first flight in turbulence may be disconcerting; however, once the pilot becomes familiar with the control sensations induced by the turbulence, it only becomes another sign for the pilot to feel the airplane.

Approach and Landing

Approach and landing in an LSA is routine and comfortable. Speeds in the pattern tend to be in the 60-knot range, which makes for reasonable airspeeds to assess landing conditions. Flap limit airspeeds tend to be lower in LSAs than standard airworthiness airplanes so managing airspeed is important. Light control forces require smooth application of control pressures without over-controlling. Pitch and power are the same in an LSA as in a standard airworthiness airplane.

Crosswinds and gusty conditions can represent hazards for all airplanes; however, the lighter weights of LSA airplanes should place an emphasis in this area. Control application does not change for crosswind technique in an LSA. Manufacturers' place a maximum demonstrated crosswind speed in the POH and, until sufficient practice and experience is gained in the airplane, a transitioning pilot should have personal minimums that do not approach the manufacturer's demonstrated crosswind speed. The LSA's light weight, slow landing speeds, and light control forces can result in a pilot inducing rapid control deflections that exceed the requirements to compensate for the crosswind. However, prompt and positive control inputs are necessary in strong winds. In addition, strong gusty crosswind conditions may exceed the airplane's control capability resulting in loss of control during the landing.

Emergencies

LSAs can be advanced airplanes in regard to its engines, airframes, and instrumentation. This environment requires that a transitioning pilot thoroughly understand and be able to effectively respond to emergency requirements. While LSA are designed to be simple, a strong respect for system knowledge is required.

The airplane's POH describes the appropriate responses to the various emergency situations that may be encountered. *[Figure 16-16]* Consider a few examples; the EFIS is displaying a "red X" across the airspeed tape, electric trim runaway, or control system failure. The pilot must be able to respond to immediate actions items from memory and locate emergency procedures quickly. In the example of trim runaway, the pilot needs to quickly assess the trim runaway condition, locate and depress the trim disconnect (if installed), or pull the trim power circuit breaker. Then depending on

CESSNA
Model 162
Garmin G300

SECTION 3
EMERGENCY PROCEDURES

INTRODUCTION

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur. Emergencies caused by airplane or engine malfunctions are extremely rare if proper preflight inspections and maintenance are practiced. Enroute weather emergencies can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered. However, should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem. In any emergency situation, the most important task is continued control of the airplane and maneuver to execute a successful landing.

Emergency procedures associated with optional or supplemental equipment are found in Section 9, Supplements.

AIRSPEEDS FOR EMERGENCY OPERATIONS

ENGINE FAILURE AFTER TAKEOFF
Wing flaps UP....................70 KIAS
Wing flaps 10" - FULL....................65 KIAS

MAXIMUM OPERATING MANEUVERING SPEED
1320 pounds....................89 KIAS
1200 pounds....................85 KIAS
1100 pounds....................80 KIAS

DESIGN MANEUVERING SPEED....................102 KIAS

MAXIMUM GLIDE....................70 KIAS

PRECAUTIONARY LANDING WITH ENGINE POWER........... 60 kias

LANDING WITHOUT ENGINE POWER
Wing flaps UP....................70 KIAS
Wing flaps 10" - FULL....................65 KIAS

Figure 16-16. *Example of a POH Emergency Procedures section.*

control forces required to maintain pitch attitude, the pilot may need to make a no-flap landing due to the flap pitching moments. Another example is failure of the EFIS. If the EFIS "blanks" out and POH recovery procedures do not reset the EFIS, an LSA pilot may have to be prepared to land without airspeed, altitude, or vertical speed information. An effective training program covers emergencies procedures.

Post-Flight

After the airplane has been shut-down, tied-down, and secured, the pilot should conduct a complete post-flight inspection. Any squawks or discrepancies should be noted and reported to maintenance. Transitioning pilots should insist on a training debriefing where critique and planning for the next lesson takes place. Documentation of the pilot's progress should be noted on the student's records.

Key Points

Many LSA's have airframe designs that are conducive to high drag which, when combined with their low mass, results in low inertia. When attempting a crosswind landing in a high drag LSA, a rapid reduction in airspeed prior to touchdown may result in a loss of rudder and/or aileron control, which may push the aircraft off of the runway heading. This is because as the air slows across the control surfaces, the

LSA's controls become ineffective. To avoid loss of control, maintain airspeed during the approach to keep the air moving over the control surfaces until the aircraft is on the ground. LSAs with an open cockpit, easy build characteristics, low cost, and simplicity of operation and maintenance tend to be less aerodynamic and, therefore, incur more drag. The powerplant in these aircraft usually provide excess power and exhibit desirable performance. However, when power is reduced, it may be necessary to lower the nose of the aircraft to a fairly low pitch attitude in order to maintain airspeed, especially during landings and engine failure.

If the pilot makes a power off approach to landing, the approach angle will be high and the landing flare will need to be close to the ground with minimum float. This is because the aircraft will lose airspeed quickly in the flare and will not float like a more efficiently designed aircraft. Too low of an airspeed during the landing flare may lead to insufficient energy to arrest the decent which may result in a hard landing. Maintaining power during the approach will result in a reduced angle of attack and will extend the landing flare allowing more time to make adjustments to the aircraft during the landing. Always remember that rapid power reductions require an equally rapid reduction in pitch attitude to maintain airspeed.

In the event of an engine failure in an LSA, quickly transition to the required nose-down flight attitude in order to maintain airspeed. For example, if the aircraft has a power-off glide angle of 30 degrees below the horizon, position the aircraft to a nose-down 30-degree attitude as quickly as possible. The higher the pitch attitude is when the engine failure occurs, the quicker the aircraft will lose airspeed and the more likely the aircraft is to stall. Should a stall occur, decrease the aircraft's pitch attitude rapidly in order to increase airspeed to allow for a recovery. Stalls that occur at low altitudes are especially dangerous because the closer to the ground the stall occurs, the less time there is to recover. For this reason, when climbing at a low altitude, excessive pitch attitude is discouraged.

Chapter Summary

LSAs are a new category of small, lightweight aircraft that may include advanced systems, such a parachutes, EFIS, and composite construction. While the transition is not difficult, LSA does require a properly designed transition training program led by a competent CFI-S or CFI-A. Safety is of utmost importance when it comes to any flight activity. In order to properly assess the hazards of flight and mitigate flight risk, a pilot must develop the skill, judgment, and experience in order to effectively and safely pilot a LSA.