



## A Description of the 2008 Sting S3

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The Sting S3 is manufactured by TL-Ultralight, sro  
and distributed in North America  
by

**SportairUSA**  
LIMITED CORPORATION



international sport aircraft

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# Sting S3

## A Higher Standard

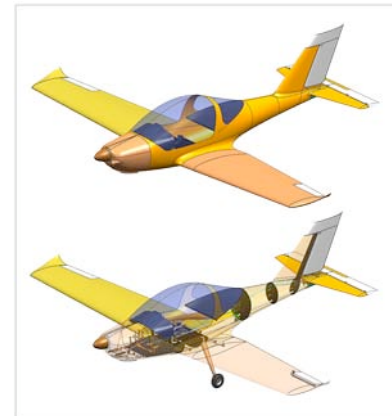
The Sting S3 is an energetic performer in a tough, carbon-composite shell, incorporating advanced technology that makes it simpler, safer, more fun to fly. The airplane is manufactured in the Czech Republic by TL-Ultralight, sro. The typical Sting S3 is well equipped and ready for local or cross-country flight. Its predecessor, the StingSport was the fifth light sport aircraft to be certified in the USA. The S3 is the fourth generation in a line of distinguished aircraft that includes the S3 (2008), the StingSport (2004), the Sting Carbon (2000) and the Star (1996).



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## 1.0 Design Notes

The design of the Sting S3 is a product of Miroslav and Petr Kabrt, whose Vanessa Air company, in collaboration with Czech Technical University of Prague, specializes in the design, analysis and testing of whole-composite aircraft and aircraft components for civilian and military applications.



The Sting S3 is an aerodynamically clean, low-wing, tricycle-gear, single-engine airplane manufactured from composite materials with two side-by-side seats. The wing of the Sting S3 uses the MS (1)-0313 airfoil profile and is tapered. Wings are removable in as little as 30 minutes, and lock together through the fuselage in a manner similar to sailplanes. The standard 100 horsepower Rotax liquid-cooled, four-cylinder, four-cycle engine swings a 68-inch, ground-adjustable, three-bladed carbon composite propeller. The airplane is designed to perform to the limits of FAA-specified performance envelope for light sport aircraft.

Powerful control surfaces and structural stiffness contribute to the agility and stability of the Sting S3. The ailerons and elevator respond briskly to light control pressures. Split flaps slow the airplane with minimal disruption of airflow over the top of the wing. The empennage consists of fixed horizontal and vertical stabilizers with conventional elevator and rudder.

Conformal cowling closely follows the contours of the engine, directing cooling air to exactly the areas where it is needed. This permits the use of smaller inlets, presents less frontal and wetted area and reduces drag.

The cockpit is designed for quietness, comfort, reduced workload and exceptional visibility.

## 2.0 Composite Construction

The Sting S3's airframe is a strong, light epoxy composite structure reinforced with carbon fiber fabrics. Fiberglass is employed to a lesser extent where greater flexibility is required in the component, in the main landing gear, for example. The fuselage is a sandwich construction of carbon/epoxy prepreg enclosing a structural closed-cell (waterproof) foam core, assembled with epoxy adhesives and laid up in two halves that are subsequently joined. The wings and horizontal tail are similarly constructed.



Wing and fuselage skins are vacuum-bagged and oven cured. The wing skins are joined over composite spars and ribs for redundant strength and stiffness. Wing spar caps and other heavily loaded components are cured in the autoclave. The caps are formed from axially-oriented unidirectional tape and the woven shear webs are oriented at 45°.

No gel coat is employed in the Sting S3. Gel coat is purely cosmetic and adds weight that is undesirable in a light aircraft. To achieve a good appearance, prepreg materials are carefully laid up and resin is meticulously forced through the carbon fabric onto the surface of the mold. The assembled airplane is finished with a two-part epoxy paint. Overall weight savings of  $\pm 50$  pounds is achieved with this technique.

Fiber-reinforced epoxy structures have a long, successful history in aircraft. For example, Boeing's B-737-200 graphite/epoxy horizontal stabilizer was developed jointly with NASA in 1975. The National Institute for Aviation Research at Wichita State University, in Wichita, Kansas, recently initiated testing on the horizontal stabilizer from a decommissioned 737-200 as part of a study of the aging of composite aircraft structures, and found little effect from the stabilizer's long service experience. The first mechanical and physical property tests revealed little difference in critical values after 18 years and 52,000 flight hours. The project continues.

In his 1997 article for *Sport Aviation*, Ron Alexander summarized the benefits of fiber-reinforced epoxy for aircraft construction as follows. "Modern composite construction offers several advantages over conventional techniques. While safety tolerances for metal structures are often designed at 1.5 to 1, lightweight reinforced composites allow 'overdesign' by factors of several times, increasing both safety and performance. These designs also achieve better aerodynamics by eliminating joints and rivets in addition to reducing problems of corrosion. Composite design allows an easy way to achieve a low drag airfoil. Composite airplanes are usually faster for a given horsepower than their counterparts because of airfoil shape and smoothness." Composite aircraft are also less complex, therefore easier and less costly to inspect.

Cirrus and Diamond are currently the best known of the type-certificated private aircraft manufacturers to build all-composite airframes, but gliders have been built of glass and carbon fiber composites for many years.

The specifications, materials and high-temperature, vacuum-bagged curing techniques used in the Sting S3 insure that the airframe is built to withstand stress and environmental temperature extremes. The surface of the Sting S3 is well-protected against cosmetic UV damage by the two-part epoxy paint.

Cosmetic and structural repairs to composite structures are straightforward. Impact damage can occur even though carbon fiber composites are tough. When needed, repairs can be performed at most aircraft maintenance centers or by any of a number of journeyman A&P mechanics.

### 3.0 Specifications

<u>Weights:</u>	
Maximum take-off weight	1320 lbs
Standard Empty Weight (varies)	780 lbs
Maximum Useful Load	540 lbs
Maximum Weight of Crew	480 lbs
Minimum Weight of Crew	100 lbs
Maximum weight of luggage	60 lbs
Center of gravity limits	22-34% MAC
<u>Basic Dimensions:</u>	
Wing Span	28.9 ft
Length	20.3 ft
Height	6.3 ft
Cockpit Width	44 in
<u>Wing:</u>	
Profile	MS (1)-0313
Span	29.9 ft
Area	122.2 ft
Aspect ratio	7.32
Aileron span	2.8 ft
Flap area	15.9 ft
Flap span	18.2 ft
Aileron deflection up	30°
Aileron deflection down	20°
Flap deflection take-off	15°
Flap deflection landing	30°
Wing Loading	10.8 lbs/sqft
Power Loading	13.2 lbs/Hp
<u>Elevator:</u>	
Span	8.8 ft
Area	9.4 sf
Elevator deflection up	+15°
Elevator deflection down	-5°
<u>Rudder:</u>	
Span	3.7 ft
Area	8.4 sf
Rudder deflection left	20°
Rudder deflection right	20°
<u>Fuel:</u>	
Standard Tank	21.5 gal (20.5 usable)
With Wing Tanks	32.5 gal (31.5 usable)

## 4.0 Performance

### Speeds

Never exceed: $V_{ne}$	164 kts
Max @ continuous power: $V_h$	120 kts
Max, structural cruise: $V_{no}$	118 kts
Cruise, 75% power: $V_c$	116 kts
Max, half flaps	75 kts
Max, full flaps	65 kts
Climb: $V_y$	60 kts
Climb: $V_x$	55 kts
Approach: $V_{ref}$	55 kts
Takeoff: $V_{lof}$	42 kts
Stall, no flaps: $V_s$	39 kts
Stall, full flaps: $V_{so}$	34 kts
Max rate of climb	1,000+ fpm
Demonstrated crosswind	17 kts

### Distances & Endurance

Take-off roll	295 ft
Take-off: 50 ft. obstacle	745 ft
Landing roll	345 ft
Landing: 50 ft. obstacle	1020 ft
Glide Ratio	12:1
Range @ $V_c$ , std tanks, 30 min. reserve	495 nm
Range @ $V_c$ , wing tanks, 30 min. reserve	790 nm
Endurance @ $V_{be}$ , standard tanks	5+ hours
Endurance @ $V_{be}$ , wing tanks	7.5+ hours

*Note: Speeds and distances were tested in production aircraft flying at maximum gross weight under standard meteorological conditions, with a floating pitot tube installed.*

## 5.0 OEM Equipment

This section includes pictures and descriptions of OEM equipment installed in the typical Sting S3. Many options and upgrades are available, including glass cockpit (EFIS) selections from Dynon, Grand Rapids Technologies, TruTrak and others.

### Flight Instrumentation

#### **The Leading Edge Six-Pack**

The traditional six-pack has proved to be a reliable arrangement of flight instrumentation to provide critical information to the pilot with minimal effort. Sting S3's exceptional Leading Edge Six-Pack packs the information into an even quicker scan, saves space and incorporates superior safety improvements and backups.



#### **Attitude Direction Indicator**

The attitude direction indicator (ADI) is a remarkable instrument from TruTrak Flight Systems. We selected it for the Sting S3 for several reasons. By combining many functions into one easy to read 3 1/8" dial, the ADI reduces your workload. And because of its battery backup and always lighted, multifunctional display, it becomes the principal flight instrument to rely on when the weather lets you down: again, simplifying your workload and reducing distraction. Here are some of the ADI's key features.



- Artificial horizon – agrees with the real horizon
- Roll – bank angle is instantaneous gyro data
- Pitch – gyro enhanced vertical speed
- Yaw – the incorporated slip/skid ball is placed front and center on the instrument panel
- Direction – actual ground track information supplied by independent, built in GPS
- Low airspeed alert – flashing “A-S” on the display
- Extreme bank angle alert – flashing red arrows on the display indicate required stick motion to correct unusual attitude
- Backup battery power
- Always lighted, to be visible when you need it most
- Low electrical load
- No mechanical gyros to wear out

#### **Pictorial Turn and Bank Indicator**

TruTrak's pictorial turn and bank indicator does the job of the turn coordinator with one distinct improvement. Like the ADI, the artificial horizon display agrees with the real horizon, once again, simplifying your workload.



## Pitot-Static System

A traditional pitot-static system drives the Sting S3's airspeed, mode C altitude encoder and vertical speed indicators (and autopilot if installed).

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## Optional Glass Cockpits

### TruTrak EFIS / Flight Director

Designed by pilots, for pilots, the main thing that sets the TruTrak EFIS SG apart from other units is flyability.

- Flyability: The analog scales of airspeed and altitude are without question the best in existence. Even the slip indicator ball looks and acts like a conventional ball in fluid. Perhaps the most significant analog presentation is the HSI with its very bold scale marks and numbers combined with smooth operation found only in the most expensive systems. Finally, there is the gyroscopic VSI scale within the artificial horizon. This feature greatly enhances the ease of holding altitude in level flight and making precision climbs and descents.
- Ease of operation: The use of labeled soft keys makes the unit so simple to operate that a manual is not even necessary. This is also true when operating the optional built-in autopilot.
- Picture quality: While other comparably priced systems use hard-to-read single-pixel lines and text, this system is bold and readable (more like the painted lines in good old steam gauges). All lines in the display are smoothed (anti-aliased) to give photo-quality appearance. The 60-Hz refresh rate provides silky smooth display movement.
- Readability: No other system in the same price range can even compare when it comes to sunlight readability. This system is readable in ALL lighting conditions and can be seen at the widest viewing angle of any system in comparable price range.



### GRT Sport EFIS / GRT Horizon EFIS

The GRT Sport EFIS provides a brilliant 6.5" display with internal GPS moving map, terrain display, and internal database mapping. With Highway-In-The-Sky (HITS) technology, these units display where you WILL be, not just where you are. SL30 and GTX 330 interfaces are included to provide external sources for HSI/CDI display and TIS traffic alerts. GRT also offers the Horizon EFIS series, advanced lateral and vertical autopilot coupling, synthetic approach, dual AHRS with integrity monitoring, reversionary display capability, and the ability to upgrade to synthetic vision.



### **Dynon EFIS D-100**

The EFIS-D100 features a 7” diagonal, color LCD that boasts the highest resolution in its class. The super-bright display enables split-screen viewing to augment the primary EFIS data with other pages of information called up by the pilot, including engine monitoring parameters mirrored from the EMS-D120. Six buttons arranged along the bottom of the screen serve as the interface to the softkey-driven menu system for easy access to in-flight functions and setting pilot preference. The PFD provides advanced ADAHRS and DG. Connecting to either the Garmin GPSMAP 496 or the SL30 Nav/Comm radio activates HSI/CDI display. Includes super-bright screen and internal backup batteries.



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## Navigation & Communication

### **Garmin GPSMAP 496 (dock mounted)**

Garmin calls this versatile instrument the “know-it-all” mini-MFD. We agree that it puts more power and information at your fingertips than any other portable GPS in the history of aviation, and we dock mount it in the panel in the Sting S3 so you can take it with you over land and water as well. The 496 provides you with:



- WAAS enabled, highly accurate GPS receiver
- Moving map display of the included Jeppesen® database
- Backlighting screen
- Enhanced terrain and obstacle awareness
- SafeTaxi™ airport diagrams
- The AOPA airport directory
- Altitude-sensitive Smart Airspace™ alerts
- Fast 5Hz information updates
- Voice annunciation of low terrain alerts (integrated with the Sting S3’s intercom)
- XM WX™ satellite weather data display – the 496 come fully capable of receiving and displaying satellite weather transmissions when you activate this capability by subscribing to the XM WX™ service
- Portable features – allow the 496 to be removed from the Sting S3 and used for land and sea navigation. The City Navigator® NT street maps and points of interest database is preloaded, and BlueChart® g2 data cards are available.

With backlit screen and backup battery power good for five hours, the GPS496 combines with the always-lighted TruTrak ADI to provide you with essential flight, navigation and situational awareness information in a weather or electrical emergency.

### Garmin SL40 VHF Transceiver

The SL40 is a pilot-friendly, high-performance unit featuring active and standby flip-flop frequency tuning, direct sunlight-readable alphanumeric display and easy access to National Weather Service broadcasts. The SL40's frequency-monitoring function gives you the ability to monitor ATIS or the 121.5 emergency frequencies without leaving your assigned ATC channel. This allows you to listen to standby frequencies while giving priority to the active channel, meaning you'll never miss a transmission.



### (Optional) Garmin SL30 Nav/Comm Radio

The SL30 is a 760 channel, VHF/VOR/ILS radio with active and stand-by flip-flop frequency changes and standby frequency monitor mode, dedicated emergency channel selector, includes memory storage of your local channels and stuck mike time-out, 200 Channel VOR Nav Localizer and Glideslope receivers with antenna, VOR display of to/from and radial, OBS setting full alphanumeric display.



### Garmin GTX327 Transponder with Mode C Altitude Encoding

The GTX™ 327 digital transponder with Mode C altitude encoding is a full-featured, TSO certified transponder. Its solid-state transmitter provides 200 watts nominal power output without need for a cavity tube.



The DSTN Liquid Crystal Display, which reverses the numbers out of black for optimal viewing, makes for readable display. The numeric keypad simplifies entering a squawk code, and a dedicated VFR button allows for easy 1200/VFR squawking. The GTX 327 also offers functions such as flight time and count-up and countdown timers, as well as current pressure altitude, setting a new standard in transponder functionality.

### (Optional) Garmin GTX330 Transponder with Mode S Altitude Encoding and TIS

See the same radar traffic your ATC controller is watching with the solid-state GTX 330, a panel-mounted Mode S digital transponder with traffic datalink capability.



The IFR-certified GTX 330 offers a Traffic Information Services (TIS) interface, giving you greater traffic awareness in some of the United States's busiest airports. From the comfort of your aircraft, you can receive TIS, including location, direction, altitude and climb/descent information of nearby aircraft. This information is displayed on your compatible panel mount primary flight display (PFD).

### PS Engineering PM1000// Intercom

The PM1000II panel mounted intercom features individual gain



and squelch controls for pilot and co-pilot, along with:

- Soft Mute circuitry for managing the music volume levels against radio reception and transmission.
- Separate pilot and copilot transmit capabilities ensures that only the person pressing the PTT will be heard over the radio. A red transmit light is illuminated when a PTT is pressed -- this also serves as a "stuck-mic" indicator.
- Independent intercom volume and squelch settings do not affect radio equipment volume levels, allowing better control over communications.

## Compass

A wet compass is mounted above the glare shield.

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## Engine Instrumentation

### GreenLine™ Engine Monitoring System

We partnered with I-K Technologies, a leading manufacturer of aircraft information systems, to design the proprietary GreenLine™ EMS aircraft engine monitoring system that makes flying the Sting S3 simpler, safer and more fun. A quick scan answers the question, “am I in the green?” and, if not, instantly alerts you to out-of-limit conditions. An instantaneous scan covers RPM, oil temperature, oil pressure, fuel pressure, exhaust gas temperature and cylinder head temperature. When the green line is showing, all parameters are within limits. When yellow or red shows in any parameter, a message flashes on the LCD screen and the master alert indicator illuminates, notifying you that corrective action is required. This innovative EMS also displays numerical data for all engine parameters along with voltage, engine time and elapsed flight time



**GREENLINE CLEAR**  
All parameters within limits.



**GREENLINE CAUTION**  
Oil temp approaching limit.



**GREENLINE ALERT**  
CHT & EGT out of limit.

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## Autopilots

### (Optional) TruTrak Autopilots (ADI Pilot II shown here)

All of the TruTrak autopilots are GPS-slaved solid-state DG devices with digital ground track selector and GPS nav mode, magnetic backup



mode and true control wheel steering. Single- and dual-axis autopilots are available. The dual-axis models may optionally be equipped with vertical speed selector. The version shown here is a two axis autopilot – roll and pitch control.

TruTrak’s new EFIS (see above) is also available with integrated autopilot controls.

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## Safety

### **Zaon Collision Avoidance System**

The panel-mounted Zaon PCAS™ collision avoidance system displays highly accurate range and relative altitude information of the closest traffic, and continuously monitors the top ten threats within five nautical miles. Radio annunciation of traffic advisories and alerts is integrated with the Sting S3’s intercom system.



### **Inertia Reel Restraints**

Four-point, inertia reel restraints set the standard for crew and passenger restraints on commercial, business and general aviation aircraft. The Sting S3 is equipped with AmSafe restraints as standard equipment.



These restraints have been laboratory and impact tested in the Sting S3 cockpit and approved for your added protection. Inflatable restraints (air bags) are available.

### **Galaxy Ballistic Recovery System**

The whole-plane ballistic parachute system looks very similar to other available products, but on closer inspection there are obvious differences in operation which make the GRS a superior unit. While it is unlikely that you will ever use the GRS in an aircraft, it is comforting to have a parachute system for an unexpected dramatic event.



The GRS is a new design in which the canopy is not gradually drawn from a box by means of a long conventional sleeve, distorted by air currents and possibly fouling on the aircraft structure or its debris, during deployment. The GRS canopy is drawn away from the aircraft in a short special compact container to a distance of 30 feet. At this point the whole hanging system from canopy to aircraft is stretched, a container lock is released and the canopy is inflated directly, significantly reducing the risk of debris damaging the canopy. The GRS is designed and constructed for the fastest possible opening, which enhances the potential of a rescue of the aircraft and crew from the lowest possible height.

Firing the system is done mechanically, by hand pulling the activation handle with a force of approximately 20 pounds. Launching ignition mechanism is activated and two igniters will be fired by double strikers, which will ignite the powder load and ignite the TPH (solid fuel) of the rocket engine.

During firing there is minimum rearward impact. Unlike other similar systems, the flame from the rocket tube is not directed back in the trajectory of the rocket, which can cause a powerful backfire into an aircraft construction. After canopy opening above the aircraft at a height of around 60 feet the rocket engine continues its own flight with its remaining energy and separates from the main canopy. It then free falls with its own braking INNER chute. The main canopy system is open and fully inflated above the aircraft within seconds after being fired. This means that a rescue can be successful from as little as 100 to 500 feet above the ground, depending on the position of the aircraft, its speed and trajectory. The necessary height needed for a rescue is deduced from measured figures in horizontal flight up to the stated  $V_{NE}$  of aircraft in its MTOW. These figures are stated in the technical parameters of the system. The rocket is aimed in the best direction, vertical to the lengthwise axis of the plane in an upward or slightly oblique aft direction. The rocket system has been designed with sufficient power reserve so that it can pull out the chute even under extreme conditions ranging in temperatures from  $-40^{\circ}\text{F}$  to  $+140^{\circ}\text{F}$ .

### **Ameri-King ELT**

ELTs are required for operation of light sport aircraft in the USA. The Ameri-King AK-450 emergency locator transmitter is installed as standard equipment on the Sting S3. This FAA TSO'd ELT is the best-selling ELT in the aviation industry due to its superior quality and features: lightness, durability, crashworthiness, environmental operating range and light weight. The ELT may be removed from its mount and used for voice transmit/receive, broadcasting on 121.5 in the event of an emergency. Simply plug in a headset.



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## **Power & Propulsion**

### **Rotax ULS 100 Horsepower Engine**

The 1500 TBO Rotax 912 ULS is a 4-cylinder, 4-stroke liquid/air cooled engine with opposed cylinders, dry sump forced lubrication with separate 3.2 quart oil tank, automatically adjusting hydraulic valve tappets, dual CD carburetors, mechanical fuel pump, electronic dual ignition, electric starter and integrated 1:2.43 reduction gear. Liquid cooling maintains cylinder head



temperatures within limits and provides a heat source for cockpit heating and for full-time carburetor heating. The Rotax boxer aircraft engines are of superior design and power/weight ratios and are in wide use around the world.

**Specifications:**

Take-off power (5 minutes max.)	100 hp @ 5800 rpm
Continuous power	95 hp @ 5500 rpm
Torque	94 ft. lb. @ 5100 rpm
Bore & Stroke	3.31 in & 2.4 in
Displacement	82.6 cu.in.
Compression ratio	10.5:1
Fuel	Min. 91 octane auto fuel, or 100 LL
Oil	API SF or SG
Cooling liquid	50/50 DexCool with distilled H <sub>2</sub> O
Ignition unit	Ducati double CDI
Ignition timing	4° to 1000 rpm, 26° above
Spark plug	Rotax part no. 297 940
Generator performance	250 W DC @ 5500 rpm, 13.5 v
Weight, with gearbox	124.8 lbs

Rotax engines are installed in the Sting with a slipper clutch, stainless steel exhaust, oversized radiator, oil cooler, oil cooler bypass thermostat, fuel return line and full-time carburetor body heat (see below)

**Woodcomp Propeller**

The wood-cored carbon fiber composite SR 200 Woodcomp propeller is provided with the Sting S3. This 3-bladed, ground-adjustable propeller incorporates a plastic leading edge that serves to protect against impact damage and wear from sand, small stones, water and other matter that can damage propellers. This propeller does not require regularly scheduled overhauls.



**SkyDrive Carburetor Body Heat**

The full-time Skydrive coolant carburetor heater adds a small amount of heat to the carburetor body in order to keep the temperature of the body above freezing point, so that any ice formed will not adhere to the carburetor throat. Because there is no significant heating of the actual intake air, the effect on engine power is negligible. Requires no pilot action. Standard equipment on every Sting S3.

## 6.0 Flying the Sting S3

### Taxi

The superb visibility in all directions along with the excellent canopy optics allows clear maneuvering in the taxi area. (HANGAR RASH NOTE: If your shadow does not touch anything, you won't touch it either.) Taxi speeds should be low - at a brisk walk. The airplane will accelerate even at idle power, and you will need to use the brakes. So you don't have to add power to move, just



let the idle engine thrust accelerate the aircraft from a dead stop. No hurry. That way you don't add power, burn fuel just to get up speed and quickly have to waste that energy with immediate braking. Don't 'drag' the brakes; just apply them firmly, slow – almost to a stop – and release slowly. Use the excellent nose wheel steering and make it a habit to keep your aircraft on the taxiway centerline. Wait for engine temps to stabilize at 120 degrees before engine run-up. The run-up is very simple and quick; you won't need to spend an extended time at high power setting for the ignition checks.

Hold the brakes (They can hold the aircraft at full power.) and increase the power to 4000 RPM, quickly switch off each electronic ignition, note the reduced single ignition RPM repeat and immediately reduce the power. Exactly 4000 RPM is not required but allow the engine RPM to stabilize to obtain correct changes in the electronic display. Wait only long enough with an ignition OFF for the engine to stabilize at the lower RPM. Check it and quickly return the ignition switch back to ON. Then check that the RPM returns to 4000 and go to the other ignition switch. Repeat the process and reduce the engine power. Your propeller will thank you and your maintenance folks will thank you. Complete the pre-take-off checks and confirm that the safety pin is removed from the aircraft parachute (GRS) ballistic recovery system. (All Sting S3 aircraft are chute-equipped.) Don't forget to check for traffic on short final approach.

### TakeOff

When the approach is clear, make your departure radio call and taxi to align with the center of the runway. Set the flight controls for any crosswind component. Check the time, release the brakes, but don't hurry, just power up to 4000 rpm to do a 'last chance' EMS GreenLine check. If the display is in-the-green, immediately advance to full power and check that the engine RPM is within limits. Lift the weight off of the nose wheel about 30 knots rotate and you will fly off the surface at 40 knots.

### Climb

You will find that the climb out at less than 60 knots for obstacle clearance has a rather steep deck angle. Lower the nose to retract the flaps at 70 knots and continue the climb, flaps up, at 75 to 85 knots for a good visual clearance and engine cooling during the climb. Rate of climb will increase with reduction of flaps.

## **Cruise**

Level off from the climb and allow the plane to accelerate at full power to cruise speed. The smooth surface of the Sting S3 wing profile (MS(1)-313) allows the air to stay attached aft of the leading edge without those nasty rivets. Once level and at cruise speed, set power to 75%, to enjoy the view and fun of flight. At sea level the S3 and most other aerodynamically clean sport aircraft will easily cruise at  $V_h$ , the FAA regulation maximum of 120 knots calibrated airspeed (CAS). The same 120 knots exists higher but becomes true airspeed (TAS) so expect your indicated airspeed (IAS) to reflect the affects of fewer air molecules. Estimate about 2 knots less for each thousand feet above sea level and you should indicate from 105 to 115 knots IAS depending on weight and variations from standard data.

## **Descent**

Plan the descent from altitude well ahead of your arrival point. Although shock cooling is minimal in the Sting engine, it is 'bad form' to do an idle-power descent. Vne arrives quickly and you will still need to descend. At high speed, that only leaves heavy maneuvering to scrub off the speed and altitude. If you anticipate the descent, you will also be in good position to handle any turbulence at a reasonable airspeed that is not high into the yellow arc. Have your GPS system set to help you with its built in 500 FPM descent profile. Then you will always arrive one mile from your destination at 1000ft above the field elevation. Lead your level-off altitude by 10% of the VSI descent rate. Level off and reset power for the lower altitude.

## **Traffic Pattern Entry**

When approaching an uncontrolled airport again make a radio call and announce your intentions. Our CFI recommends that you use the airport name at the end of your radio call so your location is a prominent part of the reception by other traffic. Try to be at, or slightly above, the traffic pattern altitude some distance out from the pattern area. This will keep you from interfering with other aircraft climbing to downwind from the crosswind location. To enter the airport traffic pattern, check for traffic, position yourself at the pattern altitude, make your radio call and enter at 45° to the downwind position. If equipped, the S3 advanced EFIS autopilot will make the 1000 ft pattern entry, base turn and final approach runway heading for you by pressing only two buttons. Of course all auto-approaches are supervised by the pilot, but are very handy when arriving at a strange airport after dark.

## **Downwind**

Once downwind, reduce power slightly, hold your altitude and allow your airspeed to decay to 75 knots. Across from your intended landing point, reduce power to IDLE. Hold altitude and continue on downwind doing your pre-landing checklist. At 70 knots, extend half flaps and start your base turn with a traffic check and radio call. Keep the power at idle and use pitch to keep your speed at about 60 knots. Crosscheck the VSI. If your decent rate is about 5-600 feet per minute, you have it figured out. Keep the 60 knots as your speed around the initial portion of the base turn. Don't forget to check the extended final approach for that unexpected straight-in traffic.

## **Base**

Establish and hold 55 knots in final portion of the base turn. This will show up in your VSI as a decrease in the decent rate. Around 500 fpm is about perfect. Again check final approach for traffic and make your final approach radio call. Make the turn to final with varying degrees of bank to allow for the wind and your distance from the runway centerline. At 55 knots the S3 will give you plenty of maneuvering energy for any turns you have to make. If you find that you are overshooting the final approach course, don't tighten the turn to make the heading; just continue the turn through the approach heading to a new intercept angle from the other side. Then correct with a new turn in the opposite direction to final. You should still arrive on final with 55 knots, which will allow you to roll out and extend the second stage full flaps when you are positive you can reach the landing area at idle. (Zero thrust in the S3 is equivalent to 55 knots, idle RPM, and half flaps.)

## **Final**

Complete the final landing checklist; maintain the proper glide path, and allow the speed to stabilize at 50 knots on short final. Setting the final flaps to full will increase your decent rate even though you have slowed to the final approach airspeed. So keep the VSI steady at about 500 fpm to stabilize the approach. Make any last minute SMALL (1/8" of throttle movement) power changes to allow for wind gusts or deviations from the proper glide path.

As you slow down and stabilize on final approach there will be about half of the cruise speed of airflow over the control surfaces which will require a bit more control displacement to maintain the desired aircraft attitude and heading. This is also true for the rudder. Just remember to keep the nose pointed with the rudder and the ailerons as required to stay coordinated. This process quickly becomes intuitive when you see it, so words are a bit crude for the explanation. But the this method of understanding the reduced aerodynamic forces on the aircraft will prevent a lot of adverse yaw and create an easy training method to maintain a constant heading to the landing area aim point.

## **Landing**

While close into your landing aim point and into the area of 'ground effect', (remember you are still at idle power) simply start the flare and stop your decent just above the runway surface. Don't allow the airspeed to decay below the 50kt approach speed while you are still 20' in the air. Raise the nose as the airspeed slows to present the main gear to the runway and attempt to touch down at your intended landing point with little or no vertical descent rate. The aiming point will pass underneath while you are working at holding the nose wheel off the runway. This is normal and don't worry about it. Spot landing will come later and be much more accurate if you continue to train to use the stabilized approach and a non-moving aim point.

You know from your stall practice that the Sting S3 will continue to fly well below the speed of the approach and flare. You will be using that difference in speed (energy) to maneuver the plane during the last few inches above the runway. The intent of any landing is to contact surface of the earth at a tangent to the runway surface so that (in

theory) you touch down at minimum speed just as you stop the descent rate. The most common problem is that the pilot stops flying the controls at touch down and lets the nose wheel flop on to the runway. Keep flying the plane with full crosswind authority and use full aft controls if necessary to position the nose where you want it. Use the elevator for pitch control and keep the nose wheel from dropping to the runway as you touch down. Hold the nose wheel in the air and gently lower it to the surface at about 35 knots.

### **Roll Out**

But the landing is not over! Continue to fly the airplane, both with ailerons and rudder for crosswind control just as you did for takeoff. Now primary steering control will be with the rudder pedal interconnect to the nose wheel. Apply the brakes gently at first to determine the braking effectiveness for the surface conditions. Do not 'ride' the brakes or 'slam' them on. Apply the brakes as firmly and evenly as is required for the desired stopping distance in coordination with the nose wheel steering to a perfect stop. The brakes on the S3 are VERY effective and can completely stop the main wheels from rotating at touchdown speeds.

### **Turn Off**

Generally you won't stop on the runway, even at an uncontrolled airport. However, when you are on the runway, it is you, the pilot, who is in control of the landing area. Don't be inconsiderate, but do not rush the plane off the nearest exit unless you have total control of the aircraft and it is clearly within your skill level to turn and exit. Heavy, excessive braking will cause premature tire and brake pad wear. Finally, make your radio call that you are clear of the landing area. The gradient at some uncontrolled runways does not allow direct vision of all the exit taxiways from the runway hold position.

### **Parking**

As in the taxi for takeoff, do not let the ground speed increase as you return to parking. The engine RPM should be kept about 2000 to allow the engine to cool before shut down. The GreenLine will let you know if you reduce power below 1850 RPM. This is also the best RPM to reduce the engine impulse loads on your the gearbox, so, use about 2000 RPM for all ground operations. Even at this RPM the aircraft will want to accelerate. Do that braking thing.

Complete the 'after-landing' checklist in a non-congested area. Alternating which ignition switch is turned off first can do a small check of your ignition system. Just shutdown by switching the 1 IGN Off – 2 IGN Off for the first flight of the day, followed by 2 IGN Off – 1 IGN Off for the next, alternating with the end of each flight.

After engine shutdown, don't forget to replace the safety pin in the aircraft parachute recovery system. Re-check that all switches are off and exit the cockpit. Chock the wheels, and check the engine oil immediately after engine shutdown to obtain the correct oil level reading.

Lock the canopy; install the canopy cover and tie-downs; then log your flight time. Don't forget to close your flight plan! Finally, it's 'Miller' time. Congratulations on another fun flight with your new Sting S3!

**A Final Note**

All of the above information will be covered in greater detail along with your personal questions during your five hours of transition flight and checkout in your own new S3 aircraft. These services, including a review of the Pilot Operation Handbook, Airworthiness Operating Limits, and Sport Pilot regulations are included as a part of your purchase. If you wish we also have an FAA CFI Pilot available for your currency and a Biannual Flight Review.