Supplement Number 1

Model: Zodiac 601XL / 601XLi / 650LS / 650LSi

NIGHT VFR FLYING

EAA ARTICLE 10/13/05 - SPECIAL LSA AND NIGHT/IFR FLYING

Some confusion exists in the aviation marketplace regarding the use of special light-sport aircraft (S-LSA) for flying at night and/or under instrument flight rules (IFR). The ASTM consensus standards that govern the manufacture and production of S-LSA specifically address day/visual flight rules (VFR) operations only.

First, sport pilots, or those exercising sport pilot privileges, are restricted from flying at night or in IFR conditions, so they may not operate an S-LSA, or any aircraft, at those times.

Other properly rated pilots may fly an S-LSA in those conditions if allowed per the aircraft's operating limitations and if it is equipped per FAR 91.205. Additionally, FAR 91.327(d) requires all S-LSA to be operated in accordance with the aircraft's operating instructions. An aircraft's operating instructions are different from operating limitations; operating instructions are issued by manufacturers-engine, airframe, and accessory-while operating limitations are issued by the FAA.

Many S-LSA are equipped with Rotax engines. Rotax's operating instructions prohibit the use of a Rotax engine at night or in IFR conditions unless it is the FAA type-certificated engine; that is, certificated to FAR Part 33. Rotax's non-certificated engines are indicated by the letters "UL" after the engine series number; for example, 912UL, 912ULS, and 914UL.

Additionally, S-LSA airframe and engine manufacturers may place restrictions against the use of their aircraft and/or engines for night/IFR operations. For example, other S-LSA are powered by Jabiru engines; these engines are certificated to JAR-22H and are limited to day/VFR operation.

Bottom line: some S-LSA can be equipped for night and IFR operation; be sure to tell the manufacturer/dealer if your intent is to operate the aircraft under those conditions...and make sure you have the proper ratings.

For more information, call EAA's Aviation Service at 888/EAA-INFO (322-4636) or e-mail info@eaa.org.

SUPPLEMENT NUMBER 1
LOG OF REVISIONS

Revision Date	Revised Pages	Description of Revision
JAN 2006	All pages	Initial Issue

SUPPLEMENT NUMBER 1
List of Effective Pages

Supplement Number 1	Page	Date
	1	JAN 2006
	2	JAN 2006
	3	JAN 2006
	4	JAN 2006
	5	JAN 2006

CAUTION

The Zodiac is a single engine airplane. When the operating limitations and maintenance requirements are complied with, it has the high degree of reliability. Nevertheless, an engine failure is not completely impossible. For this reason, flights during the night, or above terrain which is unsuitable for a landing, constitute even more risk. It is therefore highly recommended to select flight times and flight routes such that this risk is minimized.

> NOTE
> Supplement #1 is for NIGHT VFR only. Aircraft must be equipped with "MINIMUM EQUIPMENT LIST FOR NIGHT VFR"

MINIMUM EQUPMENT LIST FOR NIGHT VFR

Minimum operating equipment. The following table lists the minimum equipment required. Additional minimum equipment for the intended operation may be required and also depends on the route to be flown.

	DAY VFR	NIGHT VFR
Flight and Navigation Instruments	- airspeed indicator - altimeter - compass	- magnetic compass
Engine Instruments	- fuel indicators - integrated engine instrument	- ammeter - voltmeter
Lighting		- position lights - strobe lights (anti collision lights) - landing light - Taxi light - instrument lighting / cabin light - flashlight
Other operational minimum equipment	- POH - Registration - C of A - W&B and installed component list	
Placards	- Section 9 of POH	Supplement #1

TYPES OF OPERATIONS

The airplane is approved for the following operations when equipped in accordance with the prevailing regulations.

Day V.F.R.
Night VFR
Flight in known or forecast icing conditions is prohibited.

OTHER LIMITATIONS.

BATTERY CHARGE

Taking off for Night VFR with an empty battery is not permitted. The use of an external power supply for engine starting with an empty airplane battery is not permitted if the subsequent flight is intended to be a Night VFR flight. In this case the airplane battery must first be charged, and aircraft charging system must be working.

OPERATION TIME OF ELECTRICAL EQUIPMENT

Following an alternator failure, it can be expected that the systems are supplied with power for half an hour if only essential equipment is left on.

NAVIGATION LIGHTS AND STROBES

Conventional type navigation lights are located on the wing tips and the rudder. Strobe lights are also mounted on the wing tips. ON/OFF switches, found on the instrument panel are labeled (NAV LIGHTS), and (STROBES) respectively. The switches are ON in the up position.

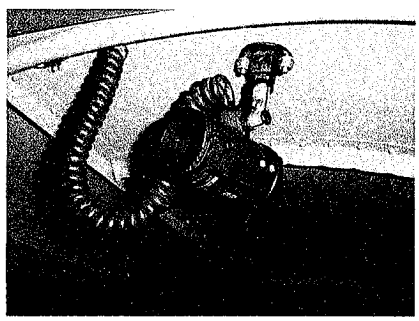
Strobe lights must be turned off when taxiing in the vicinity of other airplanes, or during night flight through clouds, fog or haze.

LANDING LIGHTS

Dual landing / taxi lights are mounted on the airframe. The ON/OFF switch for the landing / taxi lights is found on the instrument panel.

CABIN LIGHT

Cabin light is located between the seats in baggage area. The light is a multi purpose light providing narrow spotlight or floodlight beam. Rotate dial for red or white lens. Push-button for instant full light. Adjustable rheostat. Coiled cord & snap-in mounting makes light portable in cockpit area. Cabin light is not connected through the aircraft master switch and must therefore be turned off independently.



NIGHT VFR PLACARDS

DAY AND NIGHT VFR
IN NON-ICING CONDITIONS

LANDING LIGHT	TAXI LIGHT	STROBE LIGHTS	NAV LIGHTS	LIGHTS MASTER BKR

Above placards are added to aircraft in addition to standard placards in section 9.

Supplement Number 2

Model: Zodiac 601XL / 601XLi / 650LS / 650LSi

IFR

CAUTION

The Zodiac is a single engine airplane. When the operating limitations and maintenance requirements are complied with, it has the high degree of reliability. Nevertheless, an engine failure is not completely impossible. For this reason, flights during the night, in IFR conditions, or above terrain which is unsuitable for a landing, constitute even more risk. It is therefore highly recommended to select flight times and flight routes such that this risk is minimized.

NOTE

For the upgrade of an airplane for IFR operation, it is not sufficient to install the required equipment. The upgrade must be carried out by the manufacturer. Your aircraft model must be the ZODIAC 650LS / LSi.

EAA ARTICLE 10/13/05 - SPECIAL LSA AND NIGHT/IFR FLYING

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Many S-LSA are equipped with Rotax engines. Rotax's operating instructions prohibit the use of a Rotax engine at night or in IFR conditions unless it is the FAA type-certificated engine; that is, certificated to FAR Part 33. Rotax's non-certificated engines are indicated by the letters "UL" after the engine series number; for example, 912UL, 912ULS, and 914UL.

Additionally, S-LSA airframe and engine manufacturers may place restrictions against the use of their aircraft and/or engines for night/IFR operations. For example, other S-LSA are powered by Jabiru engines; these engines are certificated to JAR-22H and are limited to day/VFR operation.

Bottom line: some S-LSA can be equipped for night and IFR operation; be sure to tell the manufacturer/dealer if your intent is to operate the aircraft under those conditions...and make sure you have the proper ratings.

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SUPPLEMENT NUMBER 2
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	3	JAN 2006
	4	JAN 2006
	5	JAN 2006
	6	JAN 2006
	7	JAN 2006
	8	JAN 2006

OTHER LIMITATIONS

BATTERY CHARGE

Taking off for a Night VFR and or IFR with an empty battery is not permitted. The use of an external power supply for engine starting with an empty airplane battery is not permitted if the subsequent flight is intended to be a Night VFR and or IFR flight. In this case the airplane battery must first be charged, and aircraft charging system must be working.

OPERATION TIME OF ELECTRICAL EQUIPMENT

Following an alternator failure, it can be expected that the systems are supplied with power for half an hour if only essential equipment is left on.
After this, electrical power is available for the attitude gyro (artificial horizon) and flood light for another 1 hour when the back-up battery is used.

WARNING

Autopilots and Multi Function Displays that may be installed in your aircraft are not IFR approved and therefore may not be used when flying IFR. GPS use for IFR flight requires an IFR approved GPS. Gyros which are TSO are the primary flight instruments. TSO NAV equipment must be used when flying in IFR conditions.

WARNING

Neither the flying surfaces nor the propeller are equipped with deicing devices, IFR flight into known or forecast icing conditions is prohibited.

SUPPLEMENT #2 IFR
ZODIAC 601XL / 601XLi / 650LS / 650LSi -SLSA WITH 0-200 ENGINE
The airframe is approved for IFR when properly equipped by the manufacturer.

MINIMUM EQUPMENT LIST FOR IFR

Minimum operational equipment. The following table lists the minimum equipment required. Additional minimum equipment for the intended operation may be required and also depends on the route to be flown.

	DAY VFR	NIGHT VFR	IFR
Flight and Navigation Instruments	- airspeed indicator - altimeter - compass	- magnetic compass	- vertical speed indicator sensitive - attitude gyro (artificial horizon) TSO - turn & bank indicator - directional gyro TSO - OAT indicator - clock with indication of hours, minutes, and seconds - VHF radio (COM) TSO - VOR receiver and or GPS TSO / IFR certified by FAA - transponder (XPDR) mode C TSO -1 headset
Engine Instruments	- fuel indicators - integrated engine instrument	- ammeter - voltmeter	
Airframe / Engine			Airframe model: ZODIAC XLi / LSi (see data plate on fuselage side) Engine: FAR 33 certified (see data plate on engine)
Lighting		- position lights - strobe lights (anti collision lights) - landing light - Taxi light - instrument lighting / cabin light - flashlight	
Other operational minimum equipment	- POH - Registration - C of A - W&B and installed component list		- pitot heating system - alternate static valve - lightning protection - de-icing window - Electrical battery back-up - Second electric bus system with master switch
Placards	- Section 9 of POH	Supplement #1	Supplement #2

Minimum equipment includes all items in DAY VFR column, NIGHT VFR column, and IFR column.

TYPES OF OPERATIONS

The airplane model ZODIAC XLi / LSi is approved for the following operations when equipped in accordance with the prevailing regulations.

Day V.F.R.
Night VFR - IFR
Flight in known or forecast icing conditions is prohibited.

Supplement Number 3

Model: Zodiac 601XL / 601XLi / 650LS / 650LSi

USE OF AUTOMOBILE GASOLINE

USE OF AUTOMOTIVE GASOLINE IN TCM AIRCRAFT ENGINES

Teledyne Continental Motors would like to remind its customers that the use of automotive fuels in TCM aircraft engines not only represents a potential safety of flight concern, but can also significantly affect cylinder life and durability.

Engines produced by TCM are FAA certificated to a minimum grade of fuel conforming to ASTM D910 - grade 100LL or 100 aviation gasoline. Early engine models such as the O-200, O-300, and O-470 series are certificated to grade 80 aviation gasoline, also conforming to ASTM D910. Detonation margins, compression ratio, rated power, engine cooling, fuel schedules, ignition timing, and fuel system vapor handling are established and FAA certificated based upon use of a fuel conforming to ASTM D910. The use of any fuel not conforming to ASTM D910 may compromise safety and/or result in significant mechanical difficulties.

Automotive gasoline is manufactured to the industry specification ASTM D4814 which does not control or establish limits for octane rating, major anti-knock constituents, or energy density (lower heating value). In addition, critical properties such as vapor pressure and level of contaminants are not tightly controlled as with AVGAS. Vapor characteristics for auto gas are inferior to AVGAS and result in a tendency for auto gas to more readily convert to vapor. In addition, the lower octane rating of auto fuel can lead to detonation and pre-ignition which may damage the engine. Alcohol content of auto fuels may also result in damage to o-rings, seals, and other elastomer components in the fuel system.

It is important to note that automotive gasolines are not subject to the high level of quality control applied to AVGAS. The allowable concentrations of additives, contaminants, and water in AVGAS are precisely controlled by ASTM D910. Automotive gasolines within the United States are changing rapidly to meet ever more demanding environmental regulations. Fuel producers have advised that auto gas will be subject to continuing changes in the future, with additive formulas varying widely. Current Federal and State laws allow properties of automotive gasoline to vary seasonally and geographically. Some states do not even require that automotive gasoline conform to the ASTM D4814 industry standard.

Current aircraft engines feature valve gear components which are designed for compatibility with the leaded ASTM D910 fuels. In such fuels, the lead acts as a lubricant, coating the contact areas between the valve, guide, and seat. The use of unleaded auto fuels with engines designed for leaded fuels can result in excessive exhaust valve seat wear due to the lack of lead. The result can be remarkable, with cylinder performance deteriorating to unacceptable levels in under 10 hours.

Field experience has determined the use of unleaded automotive gasoline to be the cause of premature cylinder replacement due primarily to rapid and severe valve seat recession. Therefore, if you choose to operate your engine on automotive gasoline, valve seat and guide wear may occur at an accelerated rate. TCM strongly advises against the use of such fuels for reliability and safety reasons. **Because of this, engine or parts warranty will be voided where such fuels are used.**

TCM understands the high cost of flying and is committed to the relentless pursuit of product improvements leading to improved cost effectiveness. Unleaded aviation gasoline and next generation cylinder components are integral to our strategic plan for that future. In the interim, we ask you to consider the adage of "...penny wise..." when considering the use of automotive fuels in your aircraft engine.

Copied from Teledyne Technologies Incorporated May 2006

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	5	MAY 2006

Note: EAA aviation foundation has an STC for the Cessna 150 with Continental 0-200 engine. Peterson Aviation Inc. also has an STC for the Cessna 150 with Continental 0-200 engine. It has therefore been well proven that the 0-200 engine works well with automobile gasoline. The Zodiac airframe has over 20 years of field history on automobile gasoline. In Europe and in the USA, hundreds of Zodiac aircraft are equipped with the Rotax 912UL which runs on automobile gasoline. In addition to this, AMD has successfully completed its own tests.

Note: Required by law in many states, it must be noted that it is the pilot in command's responsibility to insure that the fuel meets the specifications. It is recommended that the pilot uses gasoline from known and reliable suppliers and especially to observe precautions against fueling the airplane with contaminated fuel.

WARNING: Do not use gasoline that contains alcohol.

Note: In order to make sure that there is no alcohol in the gasoline, test the gasoline before putting it in the aircraft tanks. See EAA "Field test for determining presence and amount of alcohol in gasoline" at http://www.eaa.org/education/fuel/oxygenated.html or contact Peterson Aviation for a tester.

The ZODIAC 650LS / LSi with 0-200 engine is approved for automobile gasoline when the following is complied to:

1, This flight manual supplement must be added to the standard POH.

2, Install placards regarding approved fuels on the wing close to the fuel tank inlet, left and right wings.

Note: Be sure that the gallon capacity of each tank is labeled as required.

3, The **HODGES VOLATILITY TESTER** must be used in accordance with the instructions supplied with the **HODGES VOLATILITY TESTER.**

WARNING: Fuel must pass the **HODGES VOLATILITY TESTER.**
Use before take off when outside air temperature exceeds 70 deg. F.

Note: Water is the principal contaminant of fuel. The actual contamination occurs through condensation (occurring in partially filled fuel tanks and in storage and dispensing facilities such as underground tanks and fuel truck tanks), and entry out of moisture (such as rain or snow entering through the vent system)

4, Drain fuel sumps at each preflight (and drain fuel screens to prevent water contamination).

5, After refueling, it is recommended waiting about 20 minutes because it may take that long for water to settle low enough to show up at the sumps. It this is not feasible, make takeoff on a tank that has not been added to.

6, Turn on auxiliary electric fuel pump before startup and leave on until cruising. Turn on before descending.

Note: On a new factory engine or newly overhauled engine, use 2-3 hours 100LL avgas before using autogas.

Note: After any prolonged period of heat soak, such as hot day ground idling or engine restart a short time after a long period of engine operation, perform a FULL POWER check before taking off. Ensure recommended fuel pressure is indicated within fuel pressure gauge limits (use up the hot fuel in the fuel line).

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HODGES VOLATILITY TESTER

The most important thing to consider when using auto fuel in aircraft concerns vapor pressure or volatility. The fact that approved engines operate quite well on auto fuel is not in dispute. But given the right set of circumstances **any** airplane can vapor lock. Until the Hodges tester was developed the only method of determining a fuel's vapor lock potential was to send a sample of fuel to a laboratory along with a substantial fee and wait patiently for six weeks to receive the results. This is of course totally impractical.

Thanks to Dr. Ray Hodges of Australia, a simple fail-safe portable tester is available. The Hodges Fuel Volatility Tester is small enough to be carried in the airplane and will tell you at a glance whether or not the fuel has any serious vapor lock potential, given the current outside air temperature. It immediately tells you if the fuel could cause vapor lock, regardless of contributing factors such as, temperature, altitude, seasonal blend, weathering history, or blends with avgas or ethanol. The operation of the tester is fail safe since air leaks cause low ("unsafe") readings.

This tester has become standard equipment for many people who use auto fuel and desire a preflight safety check of the fuel. Operating the tester is quick and simple. A sample of fuel is drawn into the syringe; the syringe is then coupled to the gage and the plunger is drawn down. This creates a vacuum in the syringe, the fuel boils, evaporates, and a reading is obtained on the gage which indicates whether the fuel is "safe or unsafe". Complete instructions are, of course, included with the tester.

The Hodges Volatility Tester gives an on-the-spot answer to the question - "could the fuel cause vapor lock?" - and unlike all other standard tests it does not give an answer that needs further interpretation. If the fuel has weathered to a lower Reid Vapor Pressure (RVP) than normal, the equipment automatically accounts for the current vapor pressure, and registers a "safe or unsafe" result dependent only on the current value. This capacity to read current value gives the pilot the option of blending fuels until a safe reading is obtained, or of delaying the flight until a cooler part of the day when a "safe" reading can be obtained.

Please note that the volatility tester does not give octane ratings, nor does it specifically give you RVP. However, a chart is available at your request that can be used to extrapolate RVP to within 1 psi. RVP by itself means nothing. The tester is designed to give a "go-no go" indication which is really the most useful way to evaluate the fuel for vapor lock potential. Furthermore, samples for testing must be fresh, since any sample collected in an open jar or blends tested that are not properly mixed won't give a true result.

The Hodges Volatility Tester sells for $65.00 (shipping included). Purchase from Peterson Aviation.

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