

Design Goals and Decisions

Operational Profile

- Sonex Xenos Motorglider (Amateur Built Experimental)
- Day / Night VFR
- Local and Cross Country Flights
- Extended periods of engine-off glider operation (goal is to provide a minimum of 2 hours of battery power with enough reserve to restart the engine).

Design Goals (in order of priority)

1. Safety – Design the electrical system to function in a safe manner without requiring pilot intervention. Electrical system should function in the background, whenever possible, reducing pilot workload.
2. Reliability – As defined in the AeroElectric Connection (Rev. 12A, Page 17-4)
"System reliability is optimal when I can suffer any of the most common failures and still put the wheels on the ground, at my intended destination, without breaking a sweat."
3. Weight – Minimize when feasible.
4. Cost – Reduce cost when there is no major sacrifice in other goals.

Design Decisions

- Use proven components for all major systems
 - Sonex supplied AeroVee kit for engine and accessories.
 - 2180 cc 80Hp Engine
 - 20 Amp Permanent Magnet Alternator
 - External Voltage Regulator
 - Sky-Tec Starter
 - Magnatron Primary Ignition
 - Electronic Secondary Ignition
 - Odyssey PC625 Main Battery (as recommended by Sonex)

These components are cost effective and proven to be reliable in Sonex aircraft when assembly and installation instructions are followed.

Note: An Auxiliary Battery will be added to the standard design to provide electrical power during glider operations with the Main Battery kept off-line to preserve engine starting capability.

- Panel Instruments
 - MGL Enigma EFIS
 - Integrated Flight Instruments, GPS Navigation, and Engine/Electrical Instrumentation (ideal for limited panel space in Xenos)
 - Low Power, Volume, and Weight, at reasonable Cost
 - Proven in Sonex aircraft and supported by Sonex
 - Includes provision for Backup Battery dedicated to the EFIS system

Xenos #43 Electrical System

- MGL V10 VHF Transceiver
 - Low Power, Volume, and Weight, at reasonable Cost
 - Integrates with Enigma EFIS
 - NOTE: Will be changing this to the smaller MGL V6 or V10/R6, available soon...
- Trig TT21 Mode-S Transponder
 - Low Power, Volume, and Weight, at reasonable Cost
 - Integrates with Enigma EFIS
 - Meets FAA requirements for ADS-B Out for 2020 (using 1090ES)
- Alpha Systems Angle-of-Attack (AOA)
 - Mechanical display on glare shield (requires no electrical power)
 - Pressure inputs provided to EFIS for AOA display and warning

NOTE: Backup for nav and com provided by handheld GPS and VHF Transceiver.

- Use proven electrical system designs and construction methods from the AeroElectric Connection
 - Electrical architecture that reduces component count and increases reliability
 - Simplified power distribution design
 - Eliminate Master Switch and Avionics Bus
 - ATC Fuse Block instead of circuit breaker panel
 - Integrated Firewall/Panel ground bus
 - Handle failures in a safe manner
 - Automatic alternator disconnect on overvoltage condition
 - Provide system status information in a simple manner
 - Voltage / Current displayed on EFIS with out-of-limit warnings (visual and audible)
 - Use AeroElectric guidance for wire sizing, routing, termination, connection, and circuit protection
- Use new technology as needed to meet design goals
 - Use LED Nav/Pos, Strobe, and Landing Lights to reduce power consumption
 - Use a Shorai LiFePO4 as the Auxiliary Battery to reduce weight. There is an 11 lb weight saving using the Shorai (18 AmpHr) vs using a 2nd Odyssey PC625 (17 AmpHr).
 - Use Tyco EV200 battery contactors to reduce power consumption
- Protect for future upgrades
 - MGL may be releasing a new EFIS product in the Enigma screen size in 2011 which would be a likely candidate for the EFIS on Xenos #43. EFIS purchase will probably be early in 2012. A new EFIS from MGL should not change the basic electrical architecture.
 - Design includes provision for a NavWorx ADS-600B Universal Access Transceiver (UAT) which supports the integration of the following services into the EFIS:
 - TIS-B – Traffic Information Service (Traffic Awareness)
 - FIS-B – Flight Information Service (Weather Text and Graphics, ATIS, NOTAM's, TFR's, special use airspace restrictions)