

AE 440A Design Topic: Design of a Novel Marketable Light Sport Aircraft (LSA)

This is a more open-ended version of the AIAA Individual Aircraft Design Competition

Background

The recent adoption of the Light Sport Aircraft (LSA) aircraft class by the FAA has resulted in significant market activity to produce aircraft that satisfy these rules. These aircraft are **limited** to two seats, a **maximum** takeoff weight of 1320 lbs, a **maximum** required stall speed of 45 knots (clean wing), along with **maximum** level flight speed capability of 120 knots (sea level). Some more information is available at <http://www.flysportusa.com/lisa1.html>

A number of early General Aviation aircraft, such as the Piper J-3 Cub, currently meet the LSA rules. Typically, within the LSA market today, there are models that promise performance to satisfy the upper limits of the LSA cruise speeds. However, these models tend towards operations out of typical general aviation airports. There are also some LSA models that emulate more the classic Piper Cub approach, capable of Short Take-off and Landing (STOL) like operations out of unimproved fields, but at commensurately slow cruise speeds. One should consider, your target “consumer” in designing your plane.

You represent a company of six employees who will design an LSA which another manufacturer would do detailed part drawings, test, build and sell the aircraft. Thus you do not need to worry about having a factory, manpower, loans, networks, etc. and your group need only focus on the design of a marketable aircraft. The design is your only product and you can sell this if it is technically feasible, novel and marketable – all of which you must demonstrate.

Aircraft Requirements:

- 1) The aircraft design will satisfy the Light Sport Aircraft ASTM standards (ASTM 2245) along with any appropriate FAA certification standards.

- 2) The power-plant selected must comply with the LSA ground-rules (a single reciprocating non-turbine engine). The engine should be an existing model or one expected for production by 2010. Examples of a few potential manufacturers the RFP may wish to consider (but not limited to) include: Rotax, Jabiru, Continental.

- 3) The aircraft should be “marketable” based on a minimum production run of 120 vehicles over a ten-year period, starting in June 2012.

Report Requirements

- 1) Identify the theme and objectives of the design and the target consumers. Explain various concepts considered (or still being considered) which meet this objective.

- 2) Estimate the total production run by performing a competitive market analysis comparing your concept design to others in the market or coming to market. Estimate purchase cost, based

on expected production run and operating costs. This cost should also include research and development costs and costs for any test vehicles and testing programs. You may also include the cost of your design to the manufacture – or you can give the design away free.

- 3) Convincingly demonstrate that the design can satisfy all the appropriate LSA and FAA requirements.
- 4) Justify the final design, and describe the technologies, engine selection and technical approach used to meet the mission requirements.
- 5) Include a dimensioned 3-view external view layout and show the internal arrangement.
- 6) Include an illustrated description of the primary load bearing airframe structure concept, and state rationale for material selection.
- 7) Show an estimated drag build-up and drag polar for the cruise configuration, the take-off configuration, and the landing configuration.
- 8) Show a weight breakdown of the major components and systems and center of gravity travel.
- 9) Provide performance estimates, and demonstrate and characterize aircraft stability for primary flight and loading conditions.
- 10) Describe any novel concepts or advanced technologies and their relative benefits as used to obtain performance improvements.

Notes:

- 1) This is only a concept design and that aircraft and/or report requirements may be modified for AE441A in Spring 2009.