General Aviation Aircraft Family Design

Report to ME546.1 Class
05 March 2009

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Motivation/Objective

• Product
  – General Aviation Aircraft (GAA) 2, 4, & 6-seat single engine aircrafts
  – Vary 9 parameters in order to optimize the family

• Motivation
  – Multiple objective optimization of a product family of three aircrafts

• Objective
  – Develop both a specific and universal method to visually steer and optimize a family of three aircraft using the ARL (Applied Research Laboratory) Trade Space Visualization Tool (ATSV)
  – Use this optimization method to develop a family of aircrafts
  – Compare the optimized family using ATSV with the results from currently used numerical algorithms
What is ATSV?

Increasing Values of Cruising Velocity

Increasing Values of Range

Increasing Values of Noise

Literature Review (Algorithms)

- Using ATSV for exploration
- 3 general product family design strategies:
  - Top-down
  - Bottom-up
  - Simultaneous

- Model (Excel) \(\leftrightarrow\) ATSV \(\leftrightarrow\) Visual Exploration

- Strategies above depend on how the variables are entered into Excel and linked to ATSV
- To decrease dimensionality: reduce objectives from 27 to 3
  - 9 outputs (x3) \(\leftrightarrow\) constraint violation, deviation, and commonality index
Project Plan

- Background reading/research
- Implement new codes into ATSV
- Find extreme points (all unique; all common)
- Explore design space
- Trends and trade-offs
- Create method for optimizing use of ATSV
- Compare results to other coded results
- Visualization better or worse?
- Determine pros/cons of specifying commonality before and after ATSV