

Aircraft Systems Field Exam

January 2009

Note: You have 60 minutes to prepare for this examination. The preparation is closed book, but you can bring any notes that you generate during the preparation period to use in the oral exam. The oral examination will be 45 minutes long.

GOOD LUCK!

Consider the design of a 2 seat light sport aircraft with the goal of achieving a cruise fuel efficiency greater than 100MPG.

1. Identify the major design parameters which will influence cruise efficiency and combine these to derive a formula for the estimated cruise efficiency.
2. Assuming you use a diesel engine with a cruise BSFC of 0.4 lb/HP-hr. What aerodynamic performance would be required to meet the 100MPG target? Is this feasible?
3. Making some reasonable estimates (which you should explain), what would be the required cruise thrust?
4. Now consider a takeoff performance goal of a 800ft takeoff roll with a 900ft obstacle clearance distance (50ft obstacle). What additional design parameters are required to determine if you can meet these takeoff requirements?
5. Can you develop an expression for the estimated takeoff roll distance?
6. Discuss how the takeoff performance trades against the cruise performance.
7. Sketch a vehicle configuration which might meet these requirements.