Academic Year 2010-2011 Design Overview Questions

USLI Proposal

1. List two figures from the *USLI proposal* that were either illegible, difficult to interpret, or too complex to understand. What could be done to improve them?
2. List three figures in the *proposal* report that convey information well, are easy to interpret and are easy on the eyes. What do you like about these figures?
3. List three paragraphs that are particularly well written. What makes these sections effective? List three paragraphs that are poorly written or hard to understand. What makes these sections ineffective?
4. What is the maximum allowable altitude during the USLI competition?
5. Which section as a whole (ie, "*Recovery Subsystem*" or "*Propulsion*") was best written? Which was the worst? Why?
6. What is an aerospike nozzle? How doe it differ from a conventional nozzle?
7. What were the "scientific payload" mission objectives?
8. Who is NAR, and what do they do?
9. What working fluid options were investigated for the Cold-Gas Augmentation system?
10. What does the acronym C-BAS stand for?

Preliminary Design Review (PDR) Report

1. What impulse-class motor was chosen? What was its manufacturer and name-designation?
2. Describe how the motor was chosen.
3. Name a reliable on-line source where can one get thrust profiles for every NAR certified motor? What is "Blue Tube?" What motor component was constructed of this material?
4. What was the diameter of the selected motor?
5. What is the maximum load the Blue Tube must withstand?
6. What was the proposed length of the rocket?
7. What does the acronym CONOPS stand for?
8. What is Pflanz's method used for?
9. How was the parachute diameter sized?
10. What does the acronym TRL stand for?

Critical Design Review (CDR) Report

1. Summarize the major propulsion design change that occurred between the PDR and CDR report. Why?
2. How did this change affect the overall vehicle design?
3. Define "Potential Altitude," How was this parameter used in the vehicle design?
4. What material was finally selected to build the airframe body tube?
5. What working fluid was finally selected for the C-BAS system?
6. What size flight storage tank was used for this working fluid?
7. Describe what a "Monte-Carlo" simulation does?
8. What is the impulse range for L-Class motors?
9. Under what conditions is a rocket statically stable?

10. How did the 2010-2011 (*Javelin*) airframe length compare in length to the 2008-2009 (*Pike*) and 2007-2008 (*Barracuda*) airframe lengths?

Flight Readiness Review (FRR) Report

1. How many successful static motor tests were conducted?
2. What was the approximate motor burn time?
3. What was the mean total motor impulse and standard deviation?
4. Name 4 potential failure modes and consequences, with regard to the aerodynamics of the rocket.
5. What was the best estimate of the incompressible rocket drag coefficient, C_{D0}? What data sources were used to calculate this drag coefficient?
6. How does Mach number affect the drag of the rocket?
7. Name all of the critical components of the flight avionics?
8. What does IMU stand for? What does it do? What is the output format of the data from the IMU used for the Javelin design?
9. Why was level-shifting board required for the avionics system?
10. Briefly describe the procedure for making the parachute ejection charges.

Post Launch Assessment Report (PLAR)

1. What was the launch date for the competition launch?
2. Describe the launch weather conditions.
3. What is the GRAM 99?
4. What was the final launch mass? How much propellant was consumed during the main motor burn?
5. What was the "official" achieved final apogee during the competition flight? What was the "best estimate" of the achieved maximum altitude at the competition flight.
6. What did the backup recovery altimeter read for the maximum altitude?
7. Describe the most probably reason why the rocket overshot the target altitude.
8. How did the motor perform compared to pre-flight predictions?
9. How did the C-BAS system perform?
10. How was FLUENT used in the post-launch assessment analysis?

Joint Propulsion Conference Final Report (AIAA-2011 6065)

1. Summarize the top-level design requirements, and the sources of these requirements?
2. Describe a "Hazard Assessment" Matrix and how it is used?
3. How many fuel grains does the main motor use? What is their "type"?
4. How much does each propellant load weigh?
5. Of what material is the nozzle constructed?
6. Name the key mechanical components of the C-BAS system.
7. What is a "direction cosine" matrix?
8. Describe how the drag coefficient was estimated using the wind tunnel data.
9. What was the maximum measured motor case temperature during the static firing ground tests?
10. Where were the pressure ports located along the C-BAS aerospike ramps?