Mechanical System Design
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11/1/14
Q&A

- Please send emails with questions as they come up
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- All questions will be answered at end
  - Please ask questions! We are here to make sure you get as much out of this as you can
Design Cycle Options

- **Multi-year Phasic Redesign**
  - Keep what worked, tackle new problems
  - Easy on resources - know what you can handle
  - Shorter design cycle for additional designs

- **Annual Complete Vehicle Redesign**
  - Good for training new members
  - Keeps knowledge of each subsystem with current team members
  - Requires lots of resources (materials and manpower)
  - Longer design cycle
Design Objectives

Order of Importance for Objectives

- Sealing (11/15)
- Thruster layout
- Sensor layout
- Vehicle Trim
- Manipulator/Actuator Layout (11/22)
- Drag Profile
- Weight savings
- Aesthetics
CUAUV System Design

● 3 groups
  ○ Structures
  ○ Actuators
  ○ Enclosures (Main Hull)

● 12 month design cycle
  ○ Concept and brainstorming: August
  ○ Design, modeling, simulation: September-October
  ○ Manufacturing: November-February
  ○ Testing and implementation: March-May
  ○ Summer testing and competition adjustments: June-July

● Key objectives of mechanical design
  ○ Keeping electronics dry
  ○ Optimizing ability to control vehicle
  ○ Creating reliable task manipulators
  ○ Learning and improving manufacturing techniques
CUAUUV Subsystems

- **Structures**
  - Mount all components
  - Provide rigidity and protection
  - Responsible for trim and optimal controls layout

- **Actuators**
  - Responsible for all competition manipulation tasks
  - Claw or grabbing mechanism is generally a must
  - Mix of electric and pneumatic

- **Enclosures (Main Hull)**
  - Holding and sealing all boards, computer, cameras, etc.
  - Optimizing connections and wire routing
  - Making everything accessible for testing
Structures Group

Mechanical System Design
Vehicle Layout: Case Study on Gemini
Actuators Group
Enclosures (Main Hull)
Enclosures (Main Hull)
Manufacturing Techniques

- **Mill, Lathe, CNC (in house)**
  - Improves skills of team members
  - Cheap
  - Wide range of material options

- **Water jetting, laser cutting**
  - No skill or resource time required
  - Lead time and cost could be issues

- **3D Printing**
  - Effective for many non-structural parts
  - Easy to iterate
  - Cost is really variable depending on resources available

- **Carbon Fiber**
  - Lightweight and strong
  - Expensive and if done in house requires time/skill
Questions?