Introduction

Teleoperations of Aerospace Payload Systems

Week 01

Tokyo Institute of Technology

- Rocketry
- RC Basics
- System Design Overview
- Vehicle Model
- Motors
- Power Sources
  - Batteries
  - Solar
  - Matter/Antimatter
- Project Engineering
- Environment of use
- Autonomy vs. remote operations

- Communications
  - Data, Audio, Video, etc.
  - Ham Radio (UHF/VHF)
  - FRS
  - Cellular
  - Wireless LAN
  - Smoke Signals

Performance Objectives

Performance Objectives:

1. Produce a CanSat payload that will be launched to 10,000’ AGL via high-power amateur rocket.
2. Produce an autonomous or remotely-controlled land-vehicle that will recover the payload and bring it back to the launch site as accurately and quickly as possible.
3. Perform these tasks during ARLISS 2003, on the last weekend in September of 2003 in the Black Rock Desert of Northern Nevada.
4. Complete the principal design prior to May 2nd of 2003.
5. In our “spare time” autonomous car races.
6. Do it all within a budget of ~$10,000.

Design Features

Design Features (Capabilities):

1. Payload pickup & return
2. Mobility– go out and come back
3. Navigation and control should be acceptable at all relevant speeds.
4. Environment Handling
5. Power (for all aspects)
6. Can must be “findable”
7. Overall safety issues.
8. Survivability of systems
9. Telepresence & Telecontrol (including communications capability)
10. Data acquisition, control and storage (for all aspects)
11. Operating range should be sufficient to deal with likely scenarios
12. Usable and “comfortable” control station.
13. Should be as autonomous as possible.
14. Should fit into our budget and time constraints.
15. Remain within the “spirit” of the competition

Key Systems

Key Systems:

1. Recovery Vehicle (robot) [Chris, Guillermo]
2. Payload [Jill, Guillermo]
3. Environmental Characterization and Handling (wind, water, etc.) []
4. Control Station [Jill]
5. Rocket & Launch Interface [Chris]
6. Staging Area [Jill]
7. Accommodations []

Subsystems

Subsystems:

1. Power (source & delivery) [Guillermo]
2. Drivetrain (motor, transmission, axels, wheels) [Guillermo]
3. Chassis (structure, suspension, steering) [Guillermo, Chris]
4. Payload (recovery & storage) [Guillermo]
5. Video (camera, transmitter) [Chris]
6. Data acquisition (other than video) [Jill]
7. Communications [Chris, Jill]
8. Navigation & Tracking (GPS & Radio Tracking) [Chris, Jill]
9. On-board Computer (decision making, central command routing) [Jill]

Subsystems

Subsystems:

1. Transponding/locator (communications: GPS, radio transmitter, etc.) [Jill, Chris]
2. Power [Guillermo, Chris]
3. Recovery (Descent & On-ground) [Guillermo]
4. Auxiliary Functionality [Jill]
5. Structural [Guillermo]

Subsystems

Subsystems:

1. Laptop Computer (GPS) [Jill]
2. Power [Guillermo]
3. Remote vehicle controls [Chris, Guillermo]
4. Video (receiver, display, recording) [Jill, Chris]
5. Human Factors (workspace, chairs, shade, light source, etc.) [Jill]
6. Communications [Jill]

Subsystems

Subsystems:

1. Tools (mechanical, electrical) [Jill, Guillermo]
2. Spare parts & supplies [Chris, Jill, Guillermo]
3. Power [Guillermo]
4. Human Factors (Workspace, chairs, shade, light source) [Chris, Jill]

Subsystems

Subsystems:

1. Rocketeer Liason [Chris, Guillermo]
2. Integration equipment & Procedures [Jill]