Mission Overview: Mission Statement

The Oregon State University RockSat-X team intends to demonstrate that an autonomous robotic arm can locate marked areas around the payload under zero-gravity conditions. The learning outcomes could contribute ideas towards creating assemblies, autonomous repairs, and performing experiments in space.

Mission Overview: Mission Objectives

The objectives of the mission include:

1. Extend the arm outside the rocket
2. Make contact with all targets on the payload
3. Record all instances of contact between the arm and the targets
4. Record a video of the arm in action
5. Retract the arm back into the rocket

For minimum success criteria, all objectives except number 4 must be achieved.

Mission Overview: Theory and Concepts

The idea is that if an autonomous arm can maneuver itself to reach each point, it would be able to do repairs, build assemblies, and perform experiments outside the spacecraft if it was equipped with the correct equipment.

The robot needs to:

- Determine where each point is on its own
- Use the correct motions to reach its target
- Measure when it makes contact with a point

The Canadarm is a somewhat similar idea to this, but it was not autonomous. It aided the Space Shuttle orbiters in working with payloads.

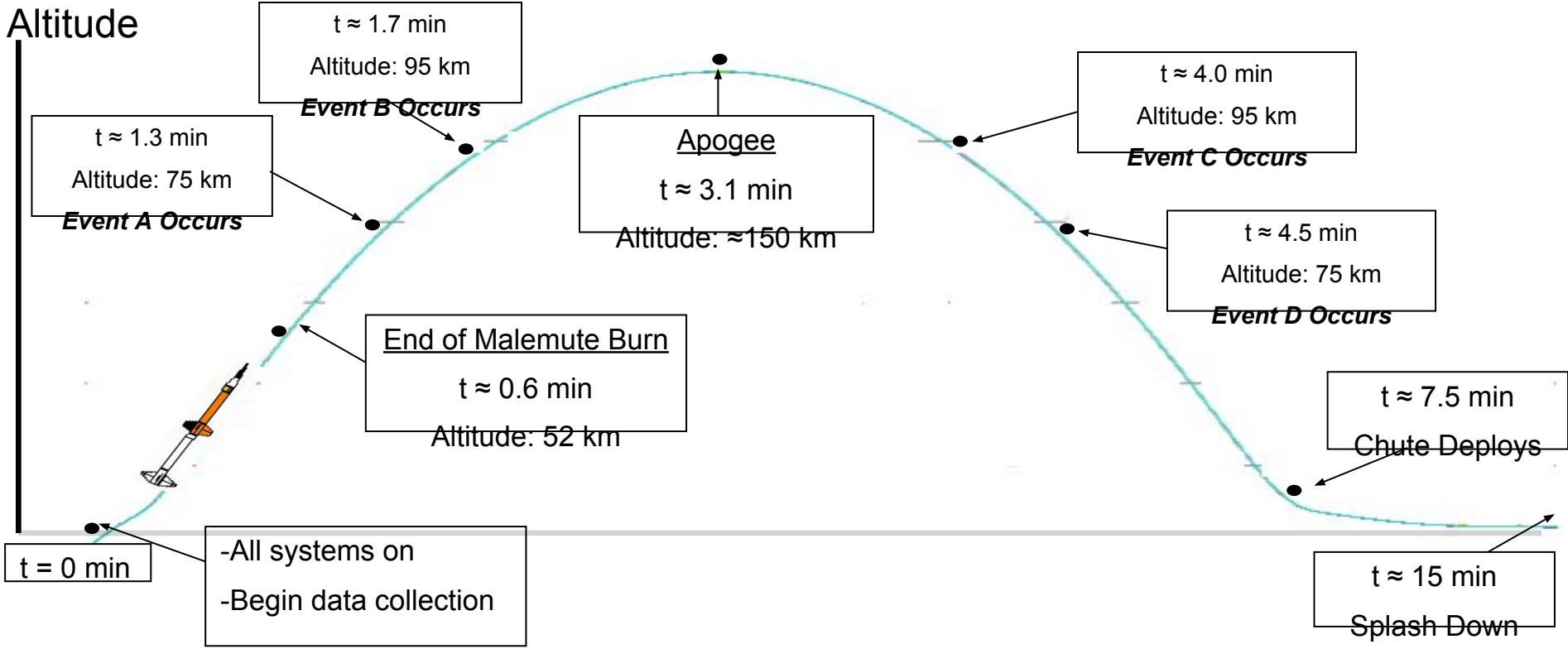
Mission Overview: Expected Results

After the demonstration is performed and the craft is back on Earth, we expect to see data showing the arm made contact with each point. Additionally, there will be a video recording the arm while it is outside the craft, further proving the payload worked as intended.

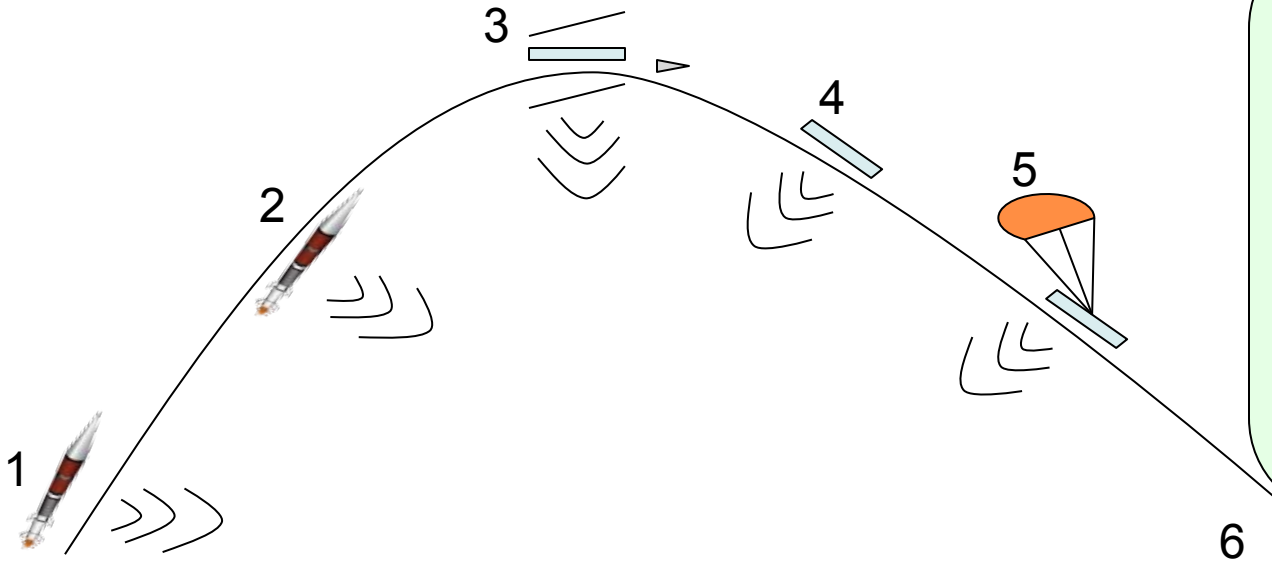
Mission Overview: Concept of Operations

1. **Launch**: The payload will stay dormant for launch and the journey to apogee
2. **Zero Gravity**: Once at Apogee, the arm's encasement will extend out of the rocket and perform its short demonstration.
   a. After the encasement is fully extended outwards, the arm will begin to look for targets around the payload.
   b. When a target is spotted, the arm will maneuver itself towards the target to make contact with it.
   c. Contact will be confirmed when a sensor realizes it has touched the target.
   d. Steps 2a-2c will be repeated until contact has been made with each target.
3. **Descent**: The arm will retract shortly before descent begins and will stay retracted from then on out.

Example #1 ConOps



Example #2 ConOps



1. Launch
   - Telemetry/GPS begins
2. Launch to Apogee
   - Telemetry/GPS continues
3. Apogee
   - Nose cone separation
   - Skin separation
   - De-spin to TBD rate
   - Option to align with B Field
   - Telemetry/GPS continues
4. Descent
   - Telemetry/GPS continues
5. Chute Deploy
   - Telemetry/GPS continues
6. Landing
   - Telemetry/GPS terminates
   - Payloads recovered