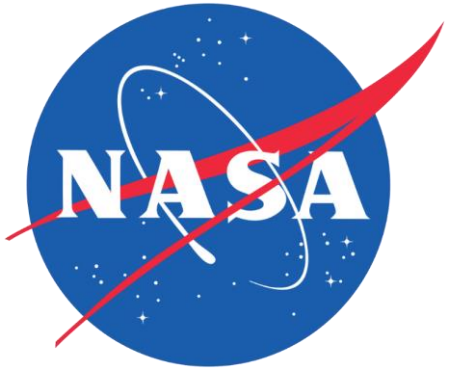
EagleSat-1: Flight Operations

Madison Padilla

Embry-Riddle Aeronautical University Aerospace Engineering, Senior



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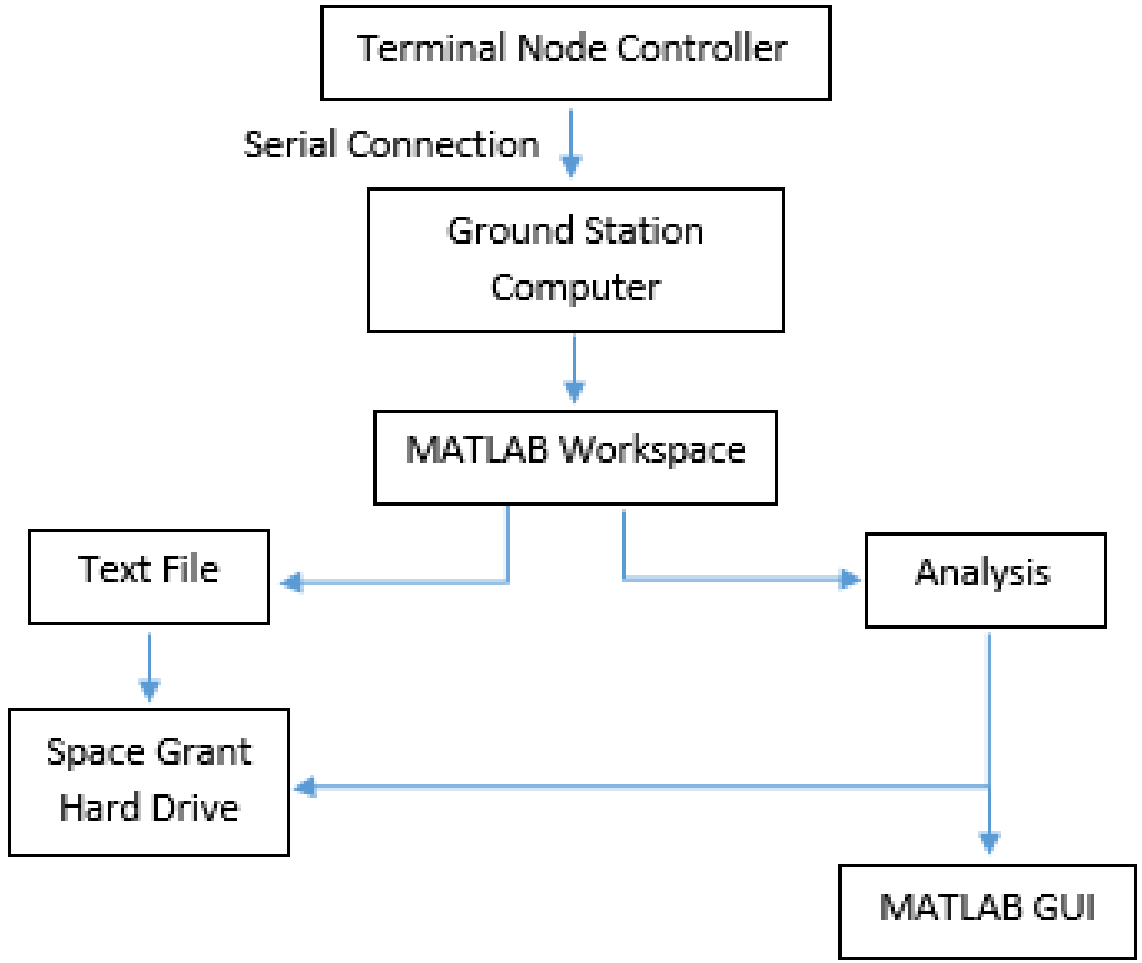
Overview

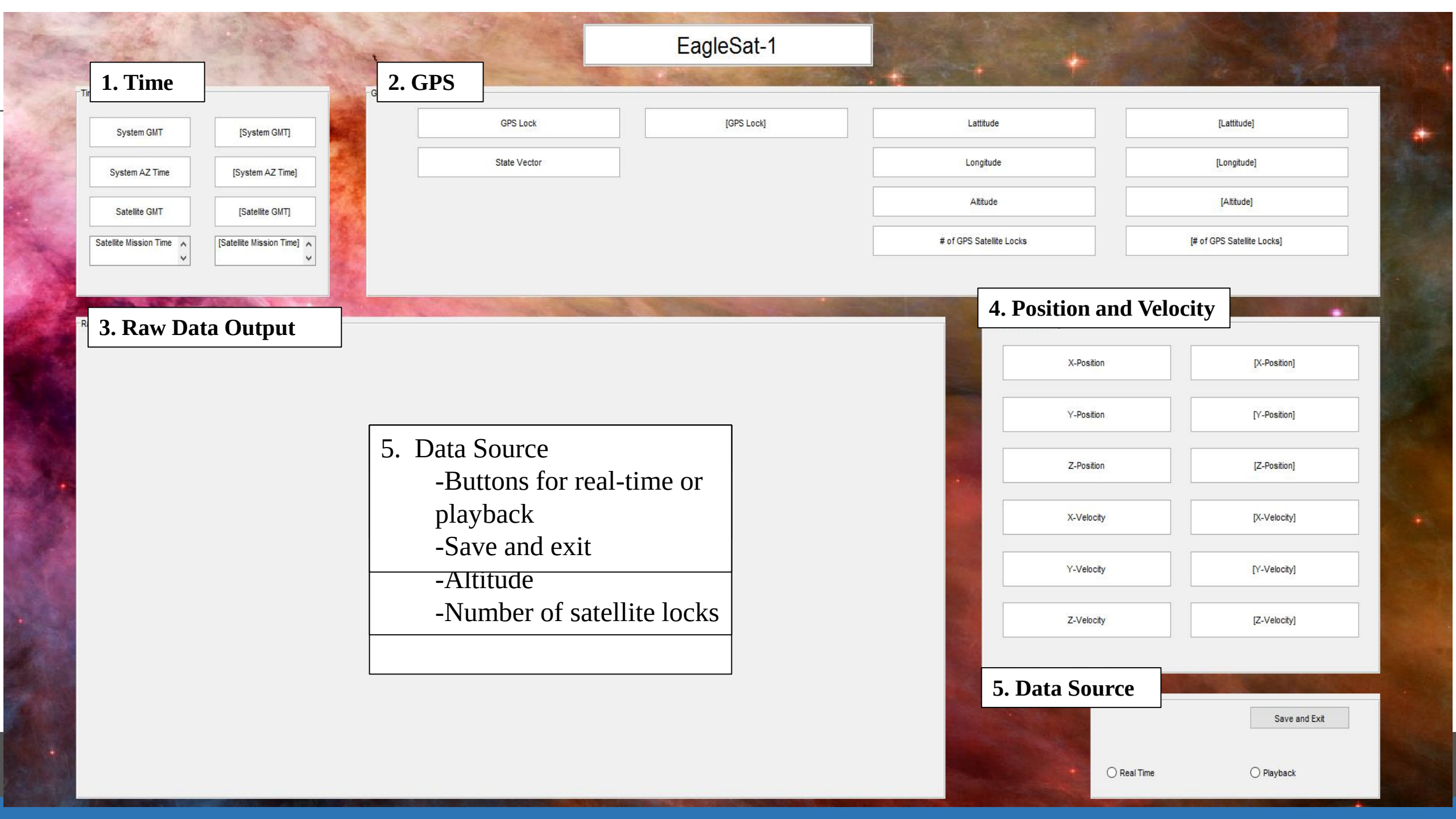
- Ground system overview
- Ground system breakdown
- Graphic user interface (GUI) layout
- Flight dynamics overview
- Flight dynamics analysis
- Questions

Ground System Overview

- A ground system to provide a Graphical User Interface (GUI) that is able to connect to EagleSat-I through a serial connection to the Terminal Node Controller (TNC)
- View, save, observe and process data from EagleSat-I
- Matrix Laboratories (MATLAB) chosen for all ground station software

Ground System Breakdown



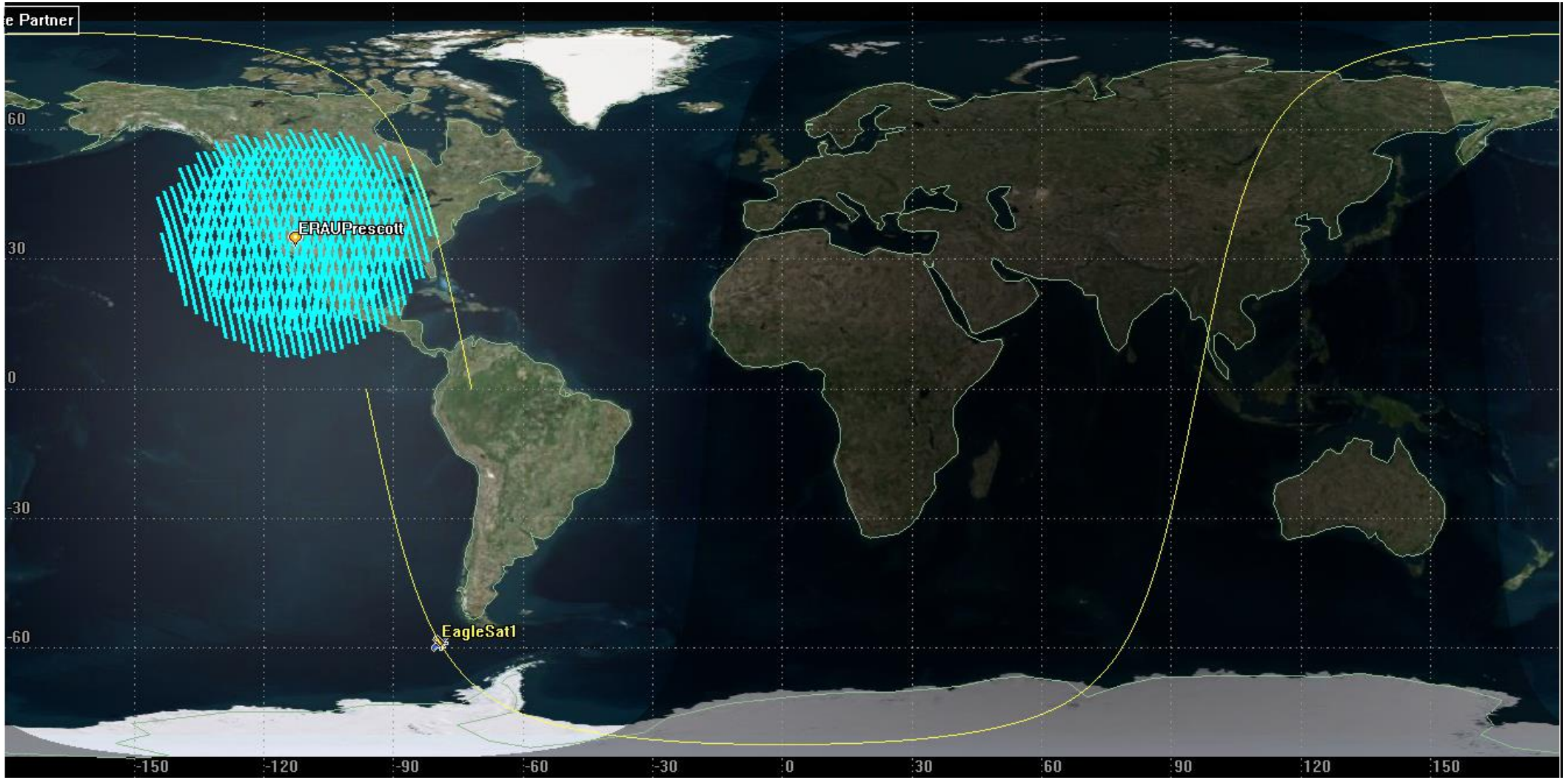


5. Data Source
   - -Buttons for real-time or playback
   - -Save and exit
   - -Altitude
   - -Number of satellite locks

Flight Dynamics Overview

- Main objective: To calculate and incorporate drag in order to predict the deorbit time on the EagleSat-I
- Orbital Predictions:
  - Altitude at apogee: 818.0 km
  - Altitude at perigee: 453.0 km
  - Inclination: 97.7°
  - Launch date: November 18, 2017
- All flight dynamics analysis was done in Systems Tool Kit 11 (STK)
- Two-Line Element sets for EagleSat-I were obtained from Space-Track.org

STK Simulation Example



Flight Dynamics – Coverage

- Predicted passes over Ground Station (located in ERAU's AXFAB)
  - 3 to 6 passes per day
  - 2-3 passes within approx. 1-2 hours, separated by approx. 8-10 hour intervals
  - Mean coverage time: approximately 10 minutes
- Optimal downlink time was determined by the local start time and the duration of the pass

EagleSat1-To-ERAU

	Start Time		End Time		Duration		Optimal Downlink Time
Access Number	UTC Start	Local Start Time	UTC End Time	Local Time End	In Seconds	In Minutes	Yes/No
1	3/28/18 6:50 PM	11:50:14 AM	3/28/18 7:02 PM	12:02:18 PM	724.082	12.07	Yes
2	3/28/18 8:24 PM	1:24:49 PM	3/28/18 8:39 PM	1:39:32 PM	882.645	14.71	Yes
3	3/28/18 10:05 PM	3:05:48 PM	3/28/18 10:12 PM	3:12:56 PM	428.64	7.14	No

Flight Dynamics – Orbital Decay

- Analysis for the orbital decay of EagleSat-I was based on the updated TLE's provided
- Calculations for the orbital decay were completed in STK
- EagleSat-I's drag area was set to 0.02 m^2 to accommodate for tumbling

Simulation #	Start Date (mm/dd/yyyy)	Projected Orbital Decay (Years)
0	11/18/2017	6.8
1	1/25/2018	6.7
2	2/8/2018	6.7
3	2/15/2018	6.7
4	2/22/2018	6.6
5	3/1/2018	6.6
6	3/8/2018	6.6
7	3/22/2018	6.5
8	3/28/2018	6.4

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Questions?

Madison Padilla
padillm3@my.erau.edu