Astro Engr 423 – Homework 08

Name:

Due: Lesson 14

You may receive help from any person; however, you are required to turn in your own homework. This assignment must be documented in accordance with the policies explained in the DFAS Policy Letter and course handbook. Show all work – just writing the answer is not sufficient. If you use Matlab or some other software, provide a copy of your code. Submit your homework with this coversheet and per the homework format guidance in the course handbook.

Documentation:

Exercise 1 (20 pts)

You are planning an RPO mission to rendezvous with the USSF's new refueling hub in GEO. Your spacecraft uses an optical camera system for relative motion navigation. The refueling hub has a representative diameter of 15 m, and it has distinctive features with a diameter of 1 m painted on its exterior to aid with spacecraft rendezvous and docking. Your spacecraft's camera has a field of view of 25°, and a square detector with 6,250,000 pixels. Calculate range windows for the three RPO phases discussed in class and fill in the following table:

Mission Phase	Max Range [km]	Min Range [km]
Rendezvous Ops	Max Range at which target is detectable	
Close Proximity		
Final Approach		Range at which features are no longer in view due to FOV limits

Exercise 2 (20 pts)

A target satellite operates in a circular orbit with r=7000 km. A chase satellite is stationary (in the RIC frame), 5 km behind the target. Develop a maneuver plan to move the chase satellite to a stationary waypoint 1 km behind the target while accommodating the following mission planning constraints.

a) Time: The chase must reach the new waypoint in 5 hours or less.
b) Passive safety: The chase's trajectory, to include any potential free-drift trajectories if a planned Delta-V is missed, must stay at least 0.75 km from the target for at least 12 hours.

Provide the following information for your maneuver plan:

- Planned ΔVs including values (provide ΔV vectors in the RIC frame) and the time for each (e.g., ΔV2 is performed 2 hours after ΔV1)
- A plot of your nominal trajectory
- Plot(s) verifying your plan meets the passive safety constraint

You may use the HWC model for your analysis. You may use either the RMOE parameterization and/or HCW targeting for ΔV calculations.