Smead Scholar Update

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Motivation

- 3 Major Collisions in LEO
- > 500,000 pieces of debris

Unique Challenges of MEO
- Drag will not naturally deorbit the debris
- Positions are crucial to their functionality
Atmospheric Reentry
Target GPS Resonance

- Resonance map for GPS orbits
- Lines approximately correspond to resonances
- Crossing lines indicate regions of more intense chaotic behavior
How Accurately Do We Need to Target these Regions?

Monte Carlo Simulations
1,000 runs over 200 years
Picking a Region to Target

\[ \Omega = 343^\circ \]
\[ \omega = 243^\circ \]

- See outcome outside of a specific \( \Omega \) and \( \omega \)
- 14 Right Ascension of the Ascending Nodes and Argument of Perigees
- The maximum for all 196 cases is shown.
• Large deviations in position don’t affect the reentry time of the solution by more than a year

• Large deviations in targeted velocity can cause the satellite to not reenter the Earth at all.
Comparison of Doubly Averaged vs Singly Averaged

Can we use the doubly averaged solution to inform studying this phenomenon?
Why Do We Want to Use the Doubly Averaged Solution?

- Full Numerical Solution
  - Still running from last night

- Singly Averaged
  - 6 seconds

- Doubly Averaged
  - .4 seconds
Perturbing the Doubly IC

- .2% of deviation of IC
- .25% of deviation of IC
- .5% of deviation of IC
Where I have been this past year
Questions?

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