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# STK/Astrogator in Maneuver Planning for Geostationary Satellites

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## ADS - Applied Defense Solutions

Applied Defense SOLUTIONS INC.™

- Engineering services firm focused on the Aerospace and Defense Communities
- Specialize in the integration and use of COTS software products
- Senior Staff are former AGI Development Staff and Product Management
- Principal value proposition – Helping customers realize the promise of their COTS software investment.



## Satellite Operations using STK

Applied Defense SOLUTIONS INC.™

Orbit Determination

STK/Astrogator

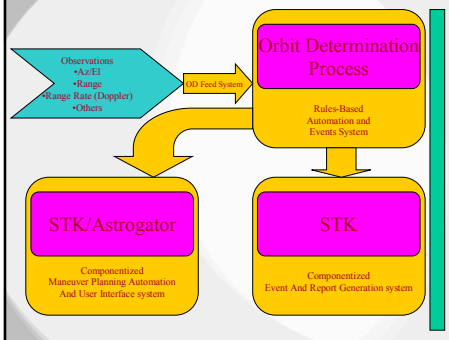
Maneuver Planning

STK/Professional, STK/VO, etc…

Analysis, Visualization & Reporting

Data integration with Customer system
- UI integration among applications
- Production and Archival of customer data products

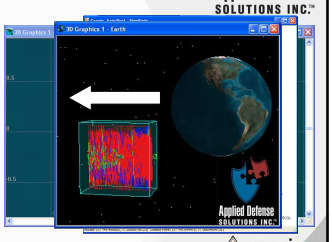
## Solution Architecture






## Geostationary Maneuver Planning

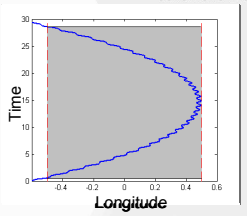
- Keep the Satellite inside the "BOX"
- The "BOX" is a 3D shape
- Concentrating on East/West maneuvers
- Natural drifting to 1 Side
- Well planned maneuvers create this longitude drift with time





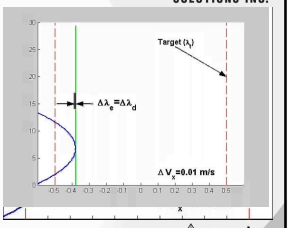
## Validation of Maneuver Strategies

- Optimize any trajectory with a single burn maneuver
- Optimal trajectory just touches the "high" longitude bound of the box
- Suboptimal trajectories spend less continuous time in the box.
- Orbits producing suboptimal trajectories require correction.



## Validation of Maneuver Strategies

1. Calculate "turning point" ($\lambda_e$)
2. Compare to target, ($\lambda_t$)
3. Calculate effect of burn $\frac{\partial \lambda_d}{\partial(\Delta V_x)}$
4. Estimate total burn, apply to orbit, and iterate.

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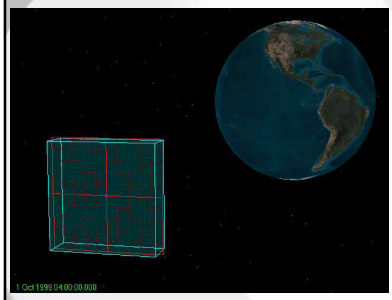
## Geostationary Maneuver Planning



This animation shows the natural evolution of the "Stationary" satellite's movement.

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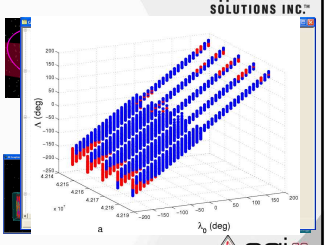
## Using STK Astrogator

- Generic tool designed to plan nearly all maneuver/orbit types
- GEO problem is a subset of this capability
- GEO problem is predictable
- Map User inputs to complex maneuver plans
- User Input space must be tested for convergence

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