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STK/Astrogator in Maneuver Planning for Geostationary Satellites

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AGI Pg 1 of xx www.agi.com

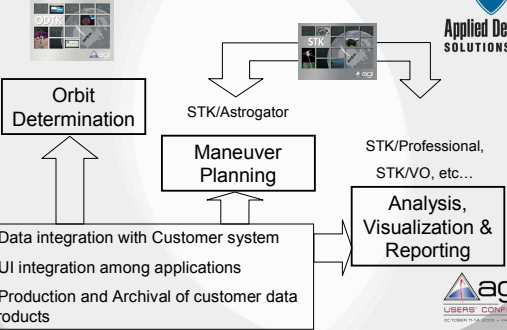
ADS - Applied Defense Solutions

- 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.






AGI Pg 2 of xx www.agi.com

Satellite Operations using STK

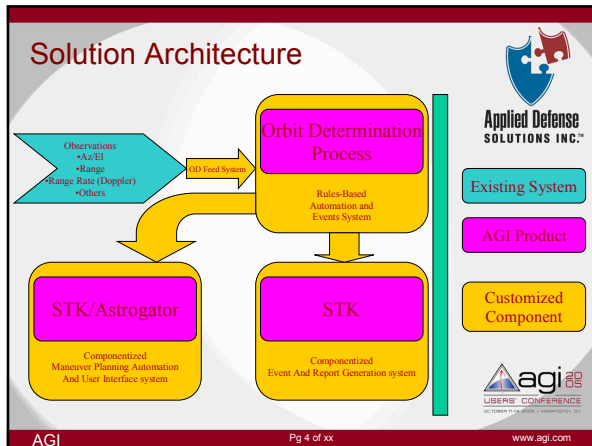


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    graph TD
      A[Data integration with Customer system  
• UI integration among applications  
• Production and Archival of customer data products] --> B[Maneuver Planning]
      B --> C[STK/Astrogator]
      C --> D[Orbit Determination]
      C --> E[STK/Professional, STK/VO, etc...]
      E --> F[Analysis, Visualization & Reporting]
      F --> A
  
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AGI Pg 3 of xx www.agi.com



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

The slide includes a screenshot of a 3D plot titled '3D Graphics 1 - Earth'. The plot shows a satellite's path (indicated by a white arrow) within a defined 3D box around the Earth. The plot shows the satellite's position over time, with a color gradient from blue to red. Logos for Applied Defense Solutions Inc. and AGI are present.

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.

The graph plots 'Time' (y-axis, 0 to 30) against 'Longitude' (x-axis, -0.4 to 0.6). It shows two trajectories: a blue curve representing an optimal trajectory that just touches the 'high' longitude bound, and a red curve representing a suboptimal trajectory that spends less time in the box. Logos for Applied Defense Solutions Inc. and AGI are present.

Validation of Maneuver Strategies

1. Calculate "turning point" (λ_d)
2. Compare to target, (λ_t)
3. Calculate effect of burn $\frac{\partial \lambda_t}{\partial (\Delta V_x)}$
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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