

# AGI USER EXCHANGE

EAST • WEST 2006

## Intercept Engagements for End-to-End Simulation

Jeff Kirby October 25, 2006



LOCKHEED MARTIN



**Electronic Systems**



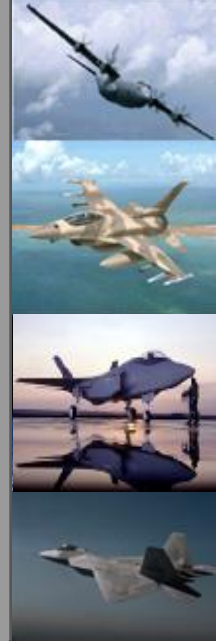
**Space Systems**



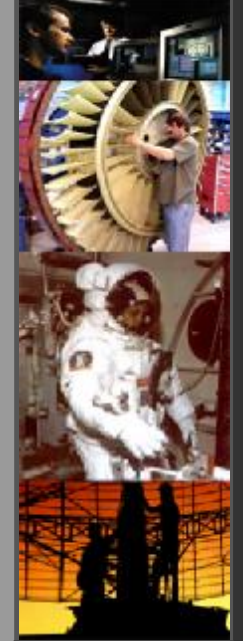
**Integrated Systems and Solutions**



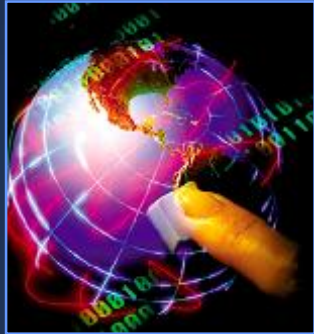
**Aeronautics**



**Information & Technology Services**



# Lockheed Martin Space Systems



**Special Programs**



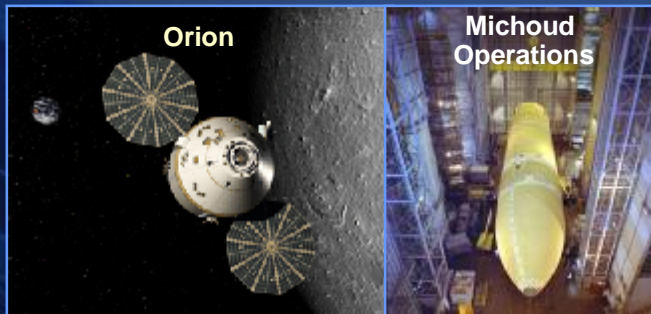
**Military Space**



**Surveillance & Navigation Systems**



**Strategic Missiles**



**Human Space Flight**



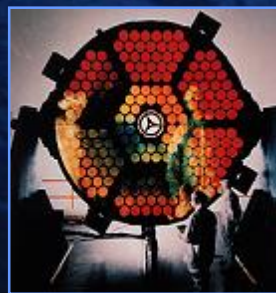
**Civil Space**



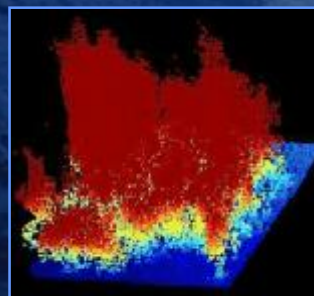
**Missile Defense**



**Space Transportation**



**Advanced Technology Center**



**Coherent Technologies**

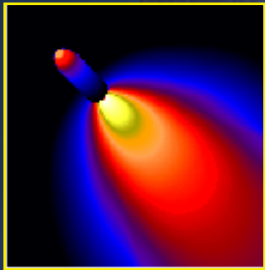


**Commercial Space**

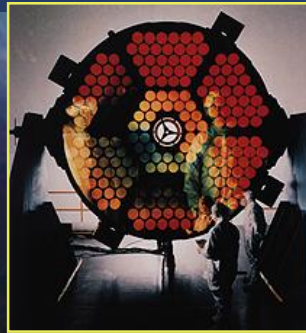


**International Launch Services**

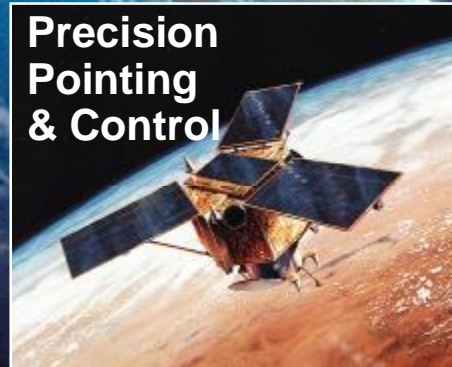
# Advanced Technology Center



**Phenomenology**



**Optics & Electro-Optics**



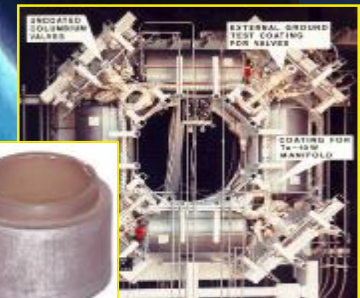
**Precision Pointing & Control**

**Guidance & Navigation**

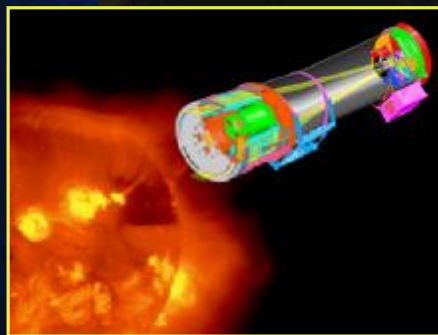
**Beam Control & Atmospheric Compensation**



**Modeling, Simulation & Information Science**



**Materials & Structures**



**Space Science & Instrumentation**

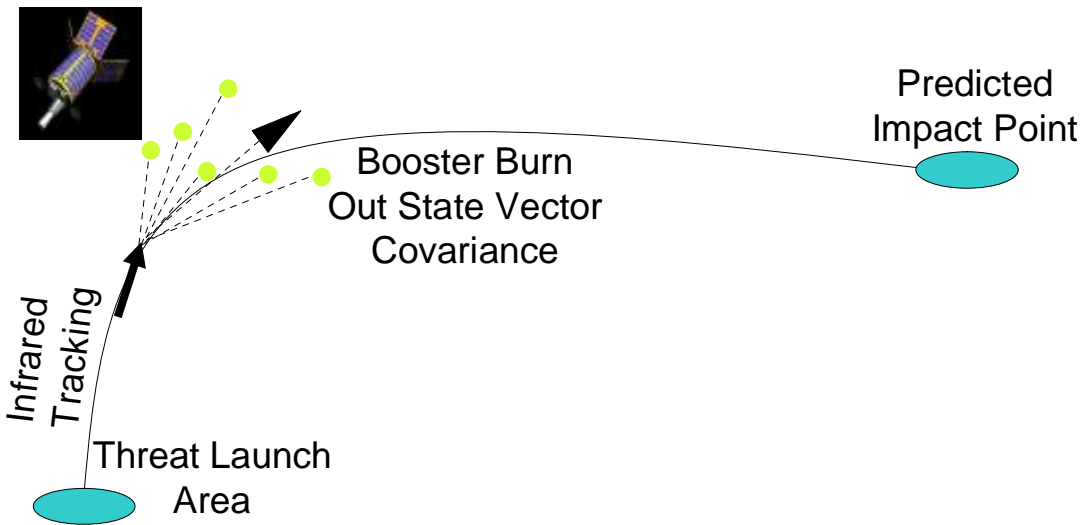


**Thermal Sciences & Cryogenics**

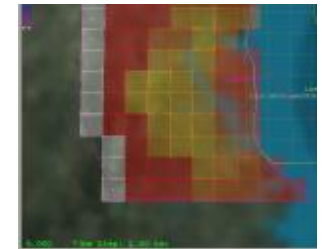


**Telecom, RF & Photonics**

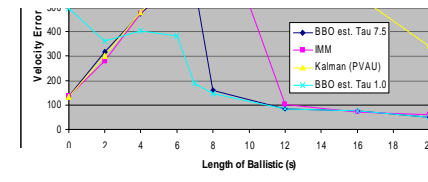
# Overhead Non-imaging Infrared Advanced Planning



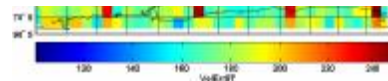
Launch Area Denied



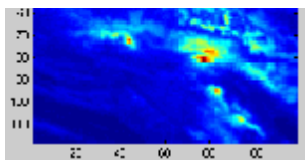
Tracking Accuracy Estimation



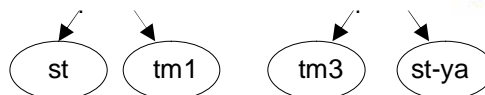
Satellite Constellation Performance Analysis



Infrared Signal Processing

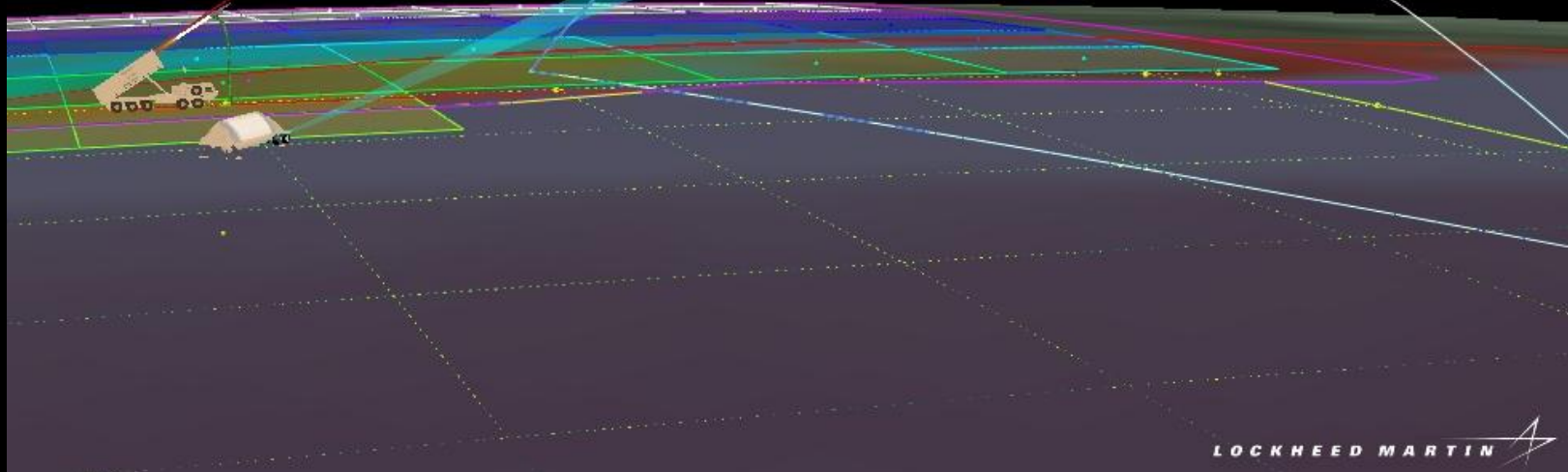


Advanced Tracking Algorithms



# Challenge

- Determine the probability that an enemy missile can be intercepted if detected only by a satellite infrared system
- Analyze threats from a grid of launch points heading to a grid of impact points
- Color grids based on combined probability
- Analyze the Launch Area Denied and Defended Area Footprint (LAD vs. DAF)



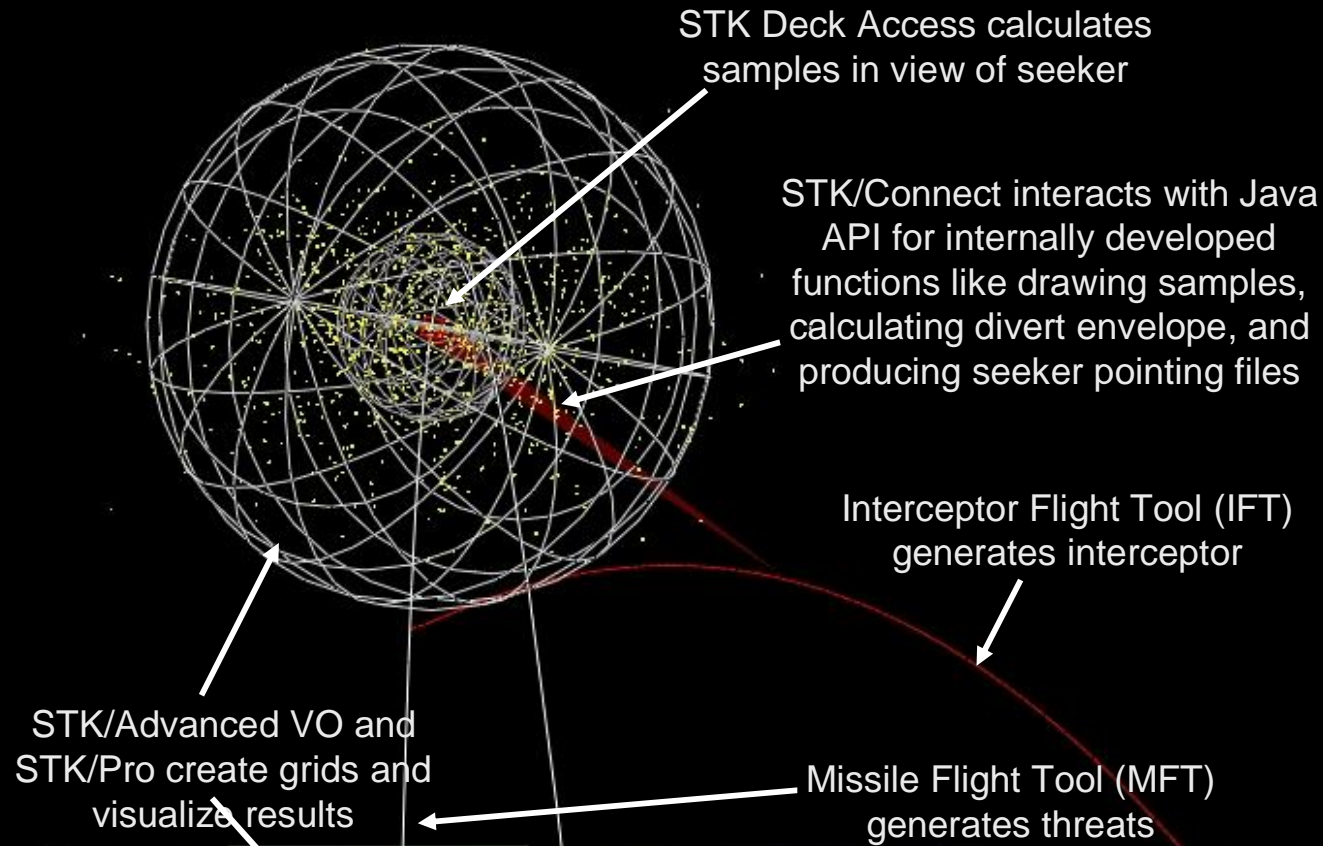
# Solution Criteria

- Rapid development--needed results in two months
- Needed to have ability to make movies and charts in PowerPoint presentations based on criteria that change frequently
- Needed a quick way to change scenarios: the launch zone, the impact zone, the threat, the interceptor, secret data versus unclassified data
- Two big drivers
  - Generate a complete interceptor fly out given possibly 20,000 different threat cases
  - Given a distribution of many, say 1,000 samples, calculate how many are in the field of view of an interceptor's seeker

# Alternative Solutions

- What alternative solutions did you consider?
  - Commercial software
    - None considered
  - GOTS software
    - STAMP for generating threats
  - Internal development
    - Several similar solutions and pieces available

# Solution



# Results

What did AGI products provide?

- Saved time: I was expected to produce a working, first prototype in two months. Instead I was able to complete it in two weeks.
- Reduced risk: first prototype was expected to be only infrastructure with no results. Instead I was able to produce analysis with the first prototype after two weeks.
- Saved time: similar internally developed tools produce results but are dependent on other internally developed products for visualization and have a staff shortage available to add new features and repair bugs.
- Reduced risk: whenever a lead or manager 'pops in,' because the simulation interacts with STK the entire time it's running, I can pause the simulation right where it is and demonstrate it to them
- Reduced risk: newly requested features, like a step-stare seeker model or higher-fidelity threat trajectories, are fairly easy to add by harvesting from STK features

# Contact

Jeff Kirby

Lockheed Martin Space Systems  
Modeling, Simulation and Information Sciences  
1111 Lockheed Martin Way, Building 153  
Sunnyvale, California 94089

[jeff.d.kirby@lmco.com](mailto:jeff.d.kirby@lmco.com)  
408 742 8545