

# AGI USER EXCHANGE

EAST • WEST 2006

## AVALON

Custom COLA, Sensor, and Communications Analysis  
STA International (formerly RABA Technologies)



# Company Overview

- RABA Technologies
  - Specialize in communications and enterprise software solutions
  - Primarily DoD and Intelligence clients
- Headquarters in Columbia, Maryland, with offices in Virginia, Colorado, and Texas
- 196 staff
- Founded in 1994
- Customers include: NSA, CIA, Air Force, DARPA, Army, FBI, NORAD

## Nutritional Facts

**Serving Size** Team RABA

**Servings per Container** 1 Vision



### Core Technology Capabilities $\pi$

Research	20%
Solutions	60%
Deployment Services	20%

### Experience $\geq$ 11 years

Hard Problem Solving & Innovative R&D
Advanced Engineering Solutions
Top-tier Commercial and Federal Assignments
Full System Life-Cycle Support

### Opportunities $\infty$

Software / Systems Engineers & Architects
Multidisciplinary Scientists & Engineers
Interactive Designers

### Career Benefits $>$ the competition

Expert Level Peers
Family Friendly Organization
Career Growth & Ownership Opportunity
Education & Training Benefits

**INGREDIENTS:** IMAGINATION, CREATIVITY, TALENT, COMMITMENT, INTEGRITY, EXPERIENCE, AND THE DESIRE TO PUSH THE BOUNDARIES OF WHAT IS POSSIBLE. MAY CONTAIN TRACES OF NUTS AND DAIRY.

Packaged by: The talented people of RABA Technologies  
**Maryland, Virginia, Colorado, Texas, Florida**



# Program Overviews

## AFSPC: Operational support

- General operations and analysis support for various satellite systems

## Air Force: Communications analysis

- COMSAT Beam And Transponder Assessment Report (CBATAR)
- Site surveys for multiple vignettes each with varied transmitters and receivers sets
- Commander Joint Space Operations (CDRJSO) requested site survey from AFSPC

## NORAD: Sensor analysis

- Conducting trade study of multiple sensor systems in support of acquisitions and deployment for CONUS defense
- Sensors modeled to generate Measures of Effectiveness (MOE) to populate TAC (Technology Assessment Calculator) application
- TAC generates normalized "Utility" score for each system

# Challenges

- Develop aerospace applications quickly
- Implement intuitive User Interfaces (UI) tailored for specific mission or task
  - More efficient operations environment
  - Reduce learning curve
  - Systematic and repeatable processes
- Provide extensible, high-fidelity environment
  - Integrate multiple sources of data
  - Diverse set of aerospace algorithms
  - Implements vetted algorithms
  - Rich 2D and 3D graphics support
- Implement Air Force ‘Astrostandards’ to maintain consistency with key organizations

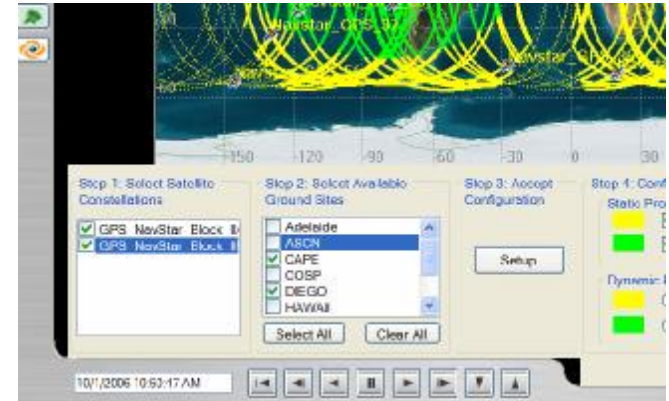


Figure 1: Custom ‘Step-wise’ process panel for intuitive interface

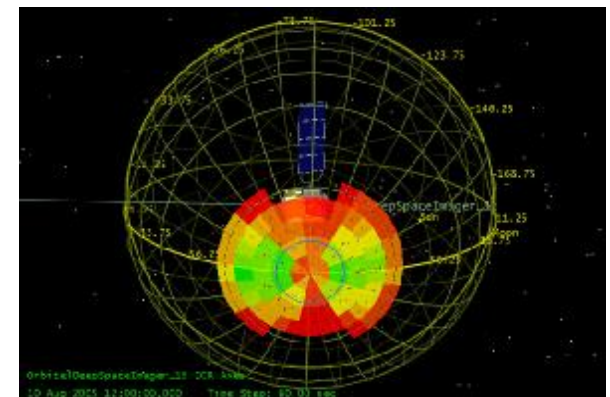


Figure 2: Communications results graphically depicted around 3D models

# Solution Criteria

- Extensible environment with comprehensive Astrodynamics algorithms including:
  - Satellite and terrestrial vehicle propagation
    - Includes Astrodynamics Special Perturbations (SP) and SGP4
  - Line Of Site (LOS) access calculation / coverage analysis
  - Communications / Link Budget analysis
  - Digital Terrain (DTED)
  - Ability to integrate custom code
- High Fidelity 2D and 3D Visualizations:
  - Multiple 2D projections
  - 3D Satellite modeling with articulations
- Cost Effective
  - License and development of tools < \$300K
- Rapid Development Time
  - Implementation of application within 3 month timeframe

# Alternative Solutions

- Standard government tools
  - SSNAM (Space Surveillance Network Analysis Model)
    - Models satellite maneuvers, but too specialized for its unique problem set
  - SCOPES (Space Common Operational Picture Exploitation System)
    - Very capable satellite analysis tool, but limited communications and DTED features
- Commercial
  - MATLAB
    - Limited 2D and 3D capabilities
    - Could not feasibly implement astrodynamics in time allotted
- Internal Development
  - C++ / .NET
    - Could not feasibly implement in allotted time and resources

# Solution

- AGI's 4DX and analysis modules provide key components:
  - Rapid development environment with 2D/3D visualization
  - Communications/link budget
  - Seamless .NET integration
  - Plug-in integration with AF Astrostandards
  - Extensive coverage analysis
- Current modules being used:
  - STK/X – 4DX
  - Advanced VO/Professional
  - Communications
  - Connect
  - WeatherX (by Trinnovations)
  - Author
  - Coverage
  - Radar
  - Terrain

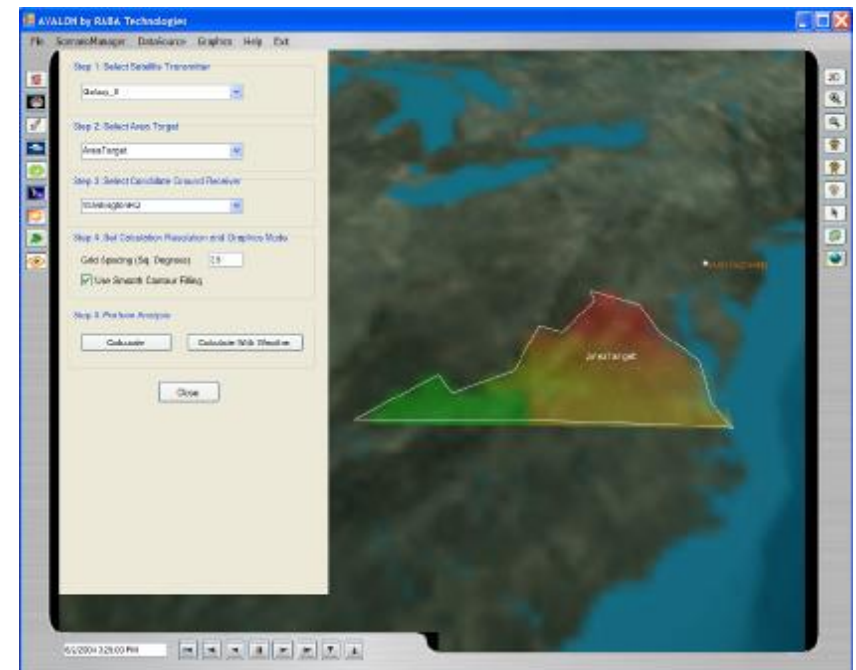


Figure 3: Rcvr/Trans Link Budget with integrated Weather

# Results – AFSPC

- Analytical improvements
  - Enabled astrostandards SP and GP propagators
  - Generation of TLE from ephemeris
  - Resident COLA capability
    - Multiple runs/multiple excursion daily
    - Run with SP propagator
    - Interactive reports
    - Supports covariance for error ellipse sizing
  - Customized analysis (classified)
  - Integrated intelligence reports
  
- Process improvements
  - Reduced 80 step process to six steps
  - Significantly reduced time to process
  - Customized reports to support output to other supporting agencies
  - VDF files to support daily briefings
  - Automatic logging of reports
  - Automatic archiving of ops analysis
  - Scenario saved in native STK format for any additional analysis with standard STK

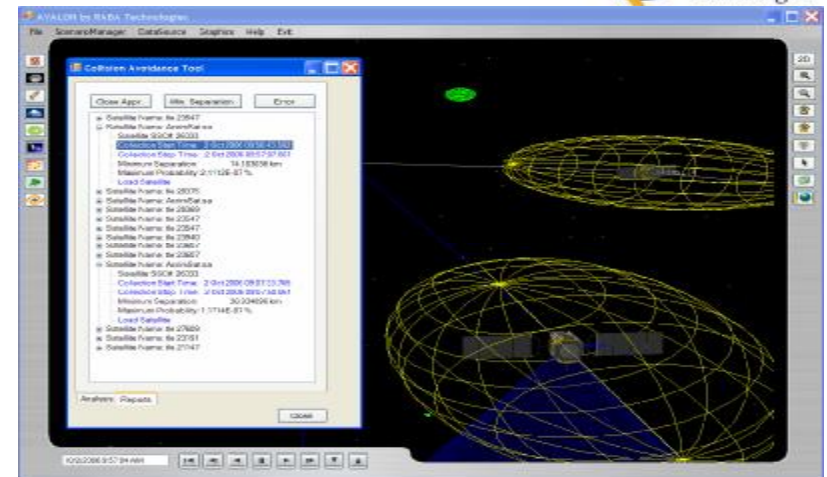


Figure 4: Interactive reports key operators to events

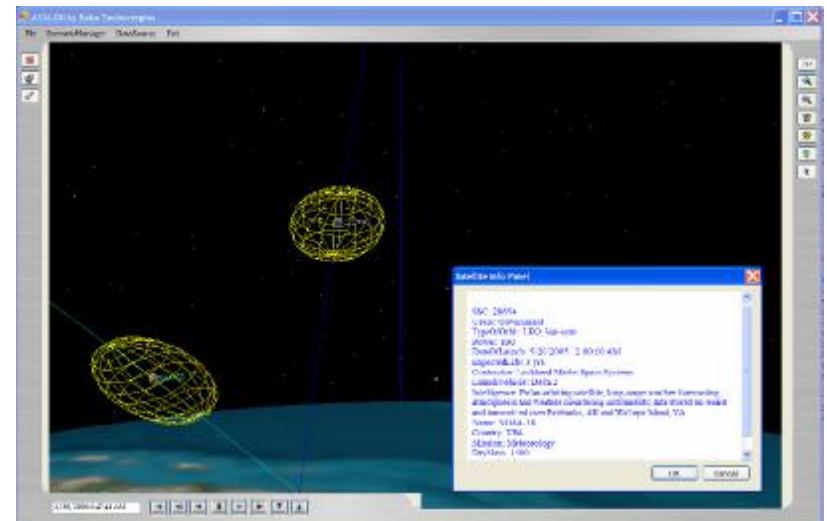


Figure 5: COLA event with secondary sat intel

# Results – NORAD

- Analytical improvements
  - Enabled qualitative coverage analysis of multiple sensor systems
  - Model non-traditional sensor profiles (i.e. ROTH-B)
  - Enhance radar modeling capability
  - Generates sensor schedules
- Process improvements
  - Integration with TAC (Technology Assessment Calculator) Excel spreadsheet
    - Draws sensor definition and characteristics from TAC
    - Directly populates database with coverage results
  - Reduced time to model sensor scheduling from weeks to minutes

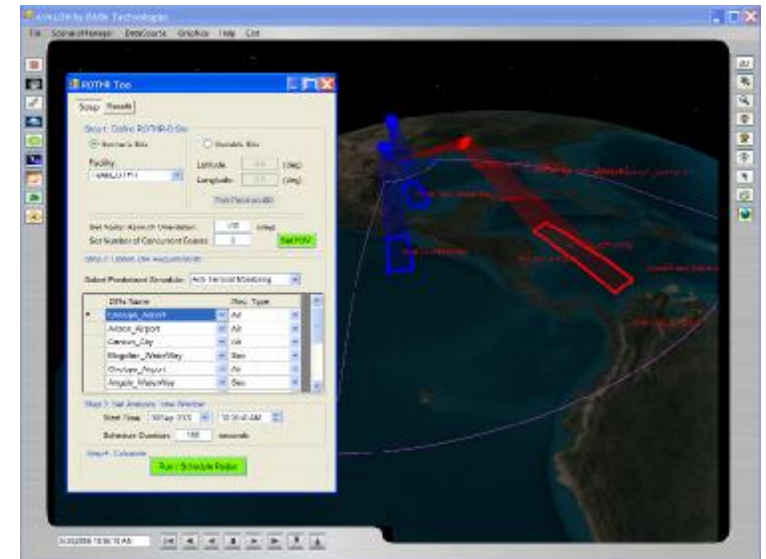


Figure 6: Model Over-The-Horizon Radar



# Contact Information

For questions about this presentation,  
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