

Case Study: NORAD Analytical Visualization Tool (AVT)

Challenge:

- Provide software to analyze and visualize in 3D sensor systems and families, the second phase of NORAD's sensor evaluation program.
- Develop an efficient way to convey testing/ranking results to leadership.
- Increase consistency in trial and scenario-creation processes.
- Provide an intuitive environment and eliminate reconstruction of complex scenarios which are often repeated throughout the evaluation process.

Addressing an ever-increasing need for homeland security surveillance options and strategies in support of the United States and Canada's North American Aerospace Defense Command (NORAD) and United States Northern Command J8 directorate, Serco integrated AGI's STK and 4DX Embedded Technology software products into a custom tool to create the Advanced Visualization Tool (AVT).

AVT provides 3-D analytical and graphical visualization of families of sensor systems, fighter intercept boundaries, and assesses how each handles multiple NORAD mission requirements against a wide range of air threats. Using the software, analysts advocate the best systems to meet the various requirements and strategically plan the role that sensor architecture will play in the future. This information supports leaders as they advance NORAD's objectives of detecting, validating, and warning against aircraft, missile, or space vehicle attacks on North America. NORAD's AVT software

tool functions in two phases. In the first, analysts use the Microsoft Excel-based Technology Assessment Calculator (TAC) created by NORAD Canadian defense analysts to assess a single sensor's capabilities and utility. TAC stores parametric data of sensor systems and has built-in multi-criteria decision-making algorithms that rank sensors in different scenarios based on varying priorities set by analysts. In the second phase, those sensors with the best application-specific scores are moved on to AVT.

Serco, in conjunction with our partner Applied Defense Solutions (ADS), integrated STK capabilities—particularly the ability to develop custom Figures of Merit—into AVT with 4DX Embedded Technology. Using pre-set templates and functionalities and AVT's ability to walk step-by-step through complex scenarios, NORAD analysts are now able to access stored, common surveillance assets. Using AGI technology, analysts defined three types of

geospatial requirements—area targets, volume targets, and point targets—, define the type of requirement (air, ground, ship, etc...) and prioritized them. With the requirements and sensor architectures defined, the AVT tool schedules the sensor pointing to maximize coverage capacity. The tool can schedule a variety of radar types, for example Patriot, ARSR4, AeroStat airships,

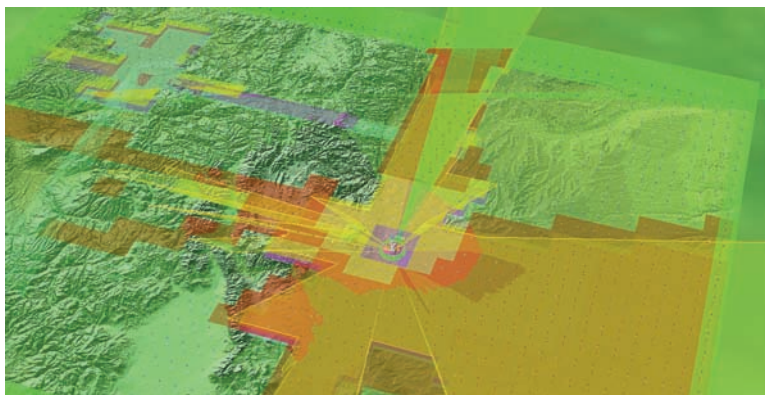


Figure 1. Radar assets coverage displayed reflects effects of terrain in Colorado

Case Study: NORAD Analytical Visualization Tool (AVT) (continued)

and ROTH (Remote Over-The-Horizon) systems. Once the analysis is performed in AVT, it is displayed in the embedded time-dynamic 3-D environment, providing analysts with a clearer picture than they had before.

The AVT tool also enables NORAD to assess the response time of intercept aircraft against potential inbound cruise missile or commercial aviation terrorist threats similar to 9/11. AVT allows NORAD to model a wide variety of interceptor assets



Figure 2 - Advanced interceptor aircraft launch to intercept inbound threats

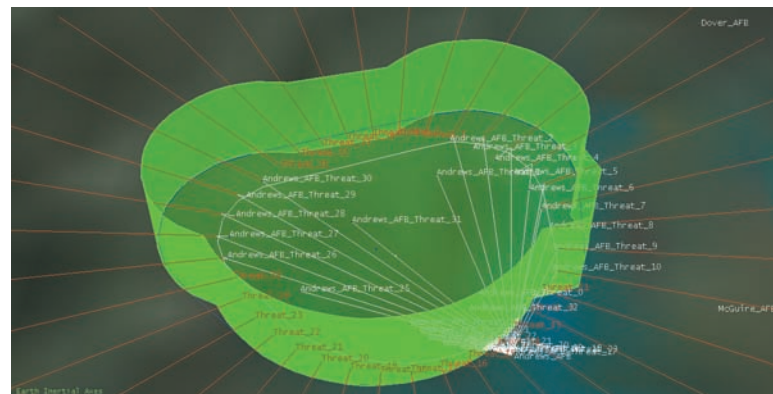


Figure 3 - NORAD assess capability to defend Washington NCR (National Capitol Region)

including traditional fighters, helicopters, and VSTOL aircraft. Each engagement incorporates high-fidelity characteristics of the interceptor including launch runway requirements, fuel flow, max G-turn, max acceleration, and max cruise speeds. The analysis incorporates individual airbase scramble delay times, intercept launch, intercept route, and chase/follow times. The results of the analysis provides a defended area boundary that NORAD can use to determine if current architectures are sufficient to protect high value regions such against a wide variety of threats.

AVT helps quickly and cost-effectively meet analytical and graphical needs by:

- **Assisting with scenario creation.** Through AVT, results previously in spreadsheet form are inputted to a 3-D visualized environment, mitigating risk and saving time.
- **Providing greater scenario and trial consistency.** Many aspects of assessing sensor systems' scores need to be repeated in every scenario. AVT allows for stored functionalities to be accessed in every scenario, increasing consistency among trials.
- **Increasing ease-of-use.** By integrating with a step-by-step scenario-building tool, training costs and time are reduced and risk of error is mitigated.
- **Allowing for clear, easy information sharing.** STK Author is used to create AGI Visual Data Format (VDF) files from scenarios that leadership easily views with freeware AGI Viewer.

AVT was developed by Serco through Air Force Space Command's C4I2TSR (Command, Control, Communications, Computer, Intelligence, Information Technology, Surveillance and Reconnaissance) contract in conjunction with subcontractor Applied Defense Solutions.

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