

STK Helps NASA's FUSE Project Get Off the Ground

The Far Ultraviolet Spectroscopic Explorer (FUSE) satellite—part of an overall restructuring of the Explorer program—is being developed for NASA by the Johns Hopkins University, which has the primary responsibility for all aspects of the project, including both the development and operational phases of the mission. This is the first time that a mission of this scope has been developed and operated entirely by a university. The launch from Cape Canaveral on a Delta II rocket is scheduled for late May or early June.

In the process of restructuring FUSE as a Medium Explorer mission, the Johns Hopkins University reduced the total mission cost from \$254 million to \$108 million, in addition to committing to a launch date 2 years earlier than originally planned. The goal of the Explorer program restructuring is to enable funding for more frequent Medium Explorer missions to be launched on a new medium-light expendable launch vehicle, with development cost not to exceed \$70 million (not including launch, mission operations, and data analysis).

The FUSE satellite mission was designed to

study the origin and evolution of the lightest elements—hydrogen and deuterium—created shortly after the Big Bang, and the forces and processes involved in the evolution of galaxies, stars, and planetary systems. The far ultraviolet region of the spectrum can only be observed outside the Earth's atmosphere.

The FUSE wavelength region is largely unexplored. In the 1970s, the Copernicus mission opened the far-ultraviolet universe by obtaining spectra of bright, nearby hot stars (within 1 kiloparsec or about 3,000 light years of the sun). Two telescopes, the Hopkins Ultraviolet Telescope and the Orbiting Retrievable Far and Extreme Ultraviolet Spartan payload flown on Shuttle missions, have also provided brief but tantalizing glimpses into the FUSE wavelength range. FUSE will be able to observe sources more than 10,000 times fainter than Copernicus, reaching distant objects in our galaxy and beyond.

The FUSE satellite consists of two primary sections: the spacecraft and the science instrument. The spacecraft contains all of the elements necessary for powering and pointing the satellite, including the Attitude Control



The FUSE satellite after delivery to NASA.

System, the solar panels, and communications electronics and antennas. FUSE is expected to go into a circular orbit roughly 775 km (465 miles) above the Earth's surface. The orbit will be inclined by 25 degrees with respect to the equator and it will take FUSE about 101 minutes to go around once.

With over 30 years of NASA background, Dennis McCarthy was the logical choice for FUSE Program Director. McCarthy and his team are acutely aware that this project is becoming a model for the industry. Other universities will be looking to Johns Hopkins University to set the precedent on how to write and implement proposals to NASA. Fortunately, the infrastructure of Johns Hopkins University allows a proposal of this size to be carried out successfully. "This is the wave of the future," says McCarthy. "There are many professors at many universities who now understand that NASA wants these missions done outside its gates."

As a value-added supplier of commercial off-the-shelf (COTS)-based command and control solutions, Interface & Control Systems, Inc. (ICS) has placed great emphasis on utilizing commercial products for satisfying specific, well-defined system requirements. "As with many other fields, the field of orbit determination and propagation is relatively mature," explains ICS President Patrice Cappelaere. "As such, products that address this field can essentially be treated as com-

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ICS has integrated STK into its Satellite Control Center, which is a key component of the FUSE mission.



President Paul Graziani, an actor portraying George Washington, and Congressman Curt Weldon (R-PA) celebrate the historic mission.

CURT WELDON VISITS AGI FOR A CELEBRATION OF STS-95

MISSION MODELED WITH STK

As John Glenn headed into a new frontier with the Oct. 29 Space Shuttle mission, he shared his voyage with a part of our country's old frontier. Two modern replicas of George Washington's personal flag from the Revolutionary War were onboard the Space Shuttle Discovery as it circled the globe.

In support of this event, AGI used STK/Visualization Option (STK/VO) to model the flight and donated the AGI web site—www.stk.com—to provide access to information on the STS-95 mission and its objectives. Hyperlinks on the site included connections to various related organizations.

The hand-stitched silk flags will be used in commemorative ceremonies in 1999 marking the 200th anniversary of Washington's death. Services will be held at Valley Forge, PA, where Washington spent the winter of 1777-78, and Mount Vernon, VA, the first president's home. The original flag is displayed at Valley Forge by the Valley Forge Historical Society, which acquired it from a direct descendant of Washington's sister.

Immediately following the launch, the Valley Forge Historical Society hosted a ceremony at Valley Forge National Historical Park with a subsequent reception at AGI headquarters in Malvern, PA. Guest of honor was Congressman Curt Weldon (R-PA). ■

STK Tracks Bualoi, the Malaysian Elephant

STK is currently playing an integral part in a unique project coordinated by the Thai Forest Industry Organization's Elephant Conservation Center, the World Wildlife Federation, and the Smithsonian Institution's Conservation & Research Center to determine whether domesticated elephants can thrive in the wild and form wild herds after living in captivity.

On Feb. 10, 1998, by order of the Queen of Thailand, Bualoi and four other work elephants were relocated and released into the Doi Cha Muang Wildlife Sanctuary in Northern Thailand. Four of the five females were equipped with satellite transmitters to track their movements as they roamed the forest for the first time in decades. The need for trans-migration of the elephants was prompted by the problem of crop-raiding, damage inflicted on crop fields by work elephants no longer used in the once-thriving timber industry.

In October 1995, the first two Asian elephants to be equipped with satellite transmitters were relocated in Malaysia following several unsuccessful attempts to follow the movement of elephants using regular ground-tracking telemetry. The hilly and dense rain forest terrain make it almost impossible to receive signals from transmitters this way, and as a result very few—if any—data points on the elephants were obtained. Using radio telemetry and aircraft also turned out to be not only inaccurate but also logistically impossible due to the few small aircraft available in Malaysia.

Environmental scientists then turned to satellite technology as the only accurate and consistently reliable means of obtaining the data needed to track the location of the elephants. STK—teamed with add-on module STK/Connect—is



STK and satellite telemetry allow this relocated elephant to be tracked on a daily basis.

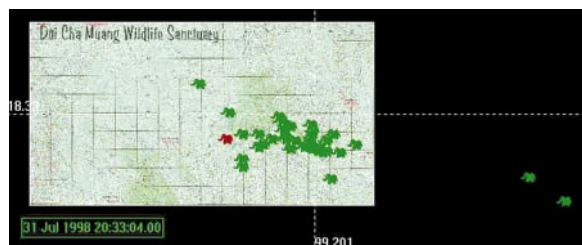
able to clarify the data by rendering it in a visual format, which makes the data easier to interpret and the work less laborious.

The use of satellite telemetry virtually eliminates the difficulties of inaccurate and inconsistent data produced by other methods of tracking. ARGOS instruments attached to NOAA weather satellites detect signals emitted by the satellite transmitters and the location points collected are entered into a database maintained by the Smithsonian. The latitude and longitude data is then automatically entered into STK/Connect, which plots them on a 2D map to visualize the migration. Successive screenshots can then be put together in STK to create an animation of the migration.

AGI Software Engineer Tres Herndon wrote the special processor that takes the ARGOS messages with Bualoi's locations and plots them on the maps. "STK drastically simplifies the task of visually rendering the elephant's progress through the Malaysian forest," Herndon explains. "Using STK and STK/Connect also proves to be substantially less tedious and time consuming than the alternative means of plotting the migration."

The accuracy and efficiency of STK makes the relevant data meaningful to those involved in the evaluation of the trans-migration program. It has also provided STK with a way to participate in Bualoi's triumphant return to the wild.

For more examples of how STK software is being used, visit AGI's web site at www.stk.com. ■



A map of Bualoi's movements from June 24, 1998 to July 31, 1998.

Santa Site Visited by More Than 28 Million



More than 28 million hits were registered over the month of December—not surprisingly, the heaviest traffic being reported on Christmas Eve—on www.noradsanta.org, the interactive web site by the U.S.-Canadian North American Aerospace Defense Command (NORAD).

AGI worked with NORAD to expand the

now 44-year-old tradition of tracking Santa to include the Internet and full-motion video. Based on NORAD's data, Santa tracking imagery was created by AGI in tape and video-based formats to give both television viewers and web surfers a satellite and cockpit view of Santa's location throughout Christmas Eve. The award-winning web site

featured 2D and 3D images accompanied by video and audio updates from NORAD's Cheyenne Mountain Operations Center. Among the top recognitions received this year were ABCNews.com's Site of the Week, *USA Today's* Hotsite, WGB's Award of Excellence, and Juno's Platinum Award.

Hosted by IBM this year, NORAD's Santa tracking program for 1998 was by far the largest and most successful to date. "Clearly, we would not have been able to put together such a comprehensive program on our own," says Major Jamie Robertson, Deputy Director of NORAD Public Affairs. "I am extremely pleased with the support that AGI and IBM provided to make the program so successful. We were able to take the concept and communicate it in five languages around the world to make it truly an international event."

Available in French, Italian, Japanese, and Spanish as well as in English, NORAD's tradition of tracking Santa Claus became active on December 2nd with updates from the North Pole. On December 24th, the site went live—giving children all over the world the opportunity to follow Santa's annual Christmas Eve trek live via digital animation, JPEG satellite/cockpit images, and audio reports from NORAD's Operation Center inside Cheyenne Mountain. ■

AGI Teams with Silicon Graphics

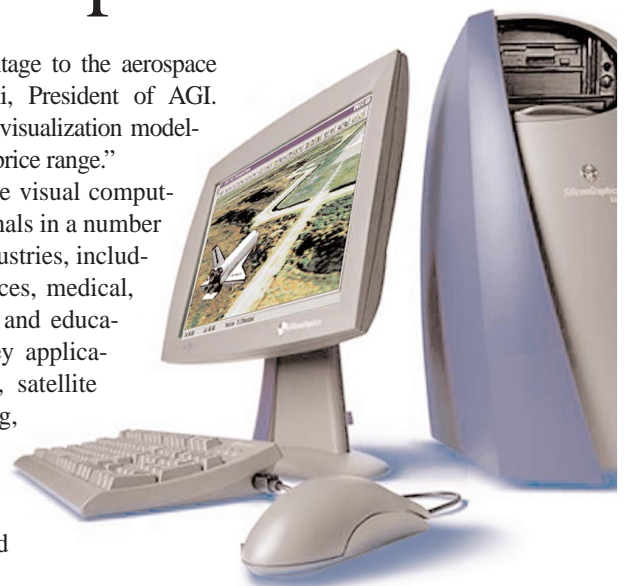
AGI has teamed with Silicon Graphics, Inc. to introduce the company's new family of visual workstations based on Intel processors and the Microsoft Windows NT operating system.

The Silicon Graphics initial product line includes the Silicon Graphics 540, the industry's only quad-processor Pentium II Xeon processor-based graphics workstation, and Silicon Graphics 320 workstation, a dual-processor Pentium II based system with a starting price of less than \$3,400. Silicon Graphics visual workstations provide one of the market's best price/performance for applications using standard APIs and offer compatibility with Windows NT-certified off-the-shelf applications.

"With high-end visual computing and performance at mainstream desktop pricing, the ability to run STK software on the Silicon Graphics 320 workstation is a

tremendous price point advantage to the aerospace industry," says Paul Graziani, President of AGI. "Complex space analysis and visualization modeling is possible at an attractive price range."

The workstations extend the visual computing capabilities for professionals in a number of Silicon Graphics' core industries, including entertainment, geo/sciences, medical, government, manufacturing, and education. The systems enable key applications in desktop publishing, satellite analysis, CAD, 3D rendering, modeling, animation, and video editing applications that are vital to the work of creative and technical professionals. ■



Visualize Your World

AGI recently gave the seminar floor to the latest release of STK/VO and STK/VO-TerrainView. Both were demonstrated in seven locations across North America. More than 250 aerospace professionals attended the free demonstrations held in cities across the country.

STK/VO 3.1 displays realistic and dynamic 3D views of spacecraft, sensor projections, and orbit trajectories that provide a quick, intuitive understanding of space that cannot be achieved by analyzing raw numerical engineering data alone.

Among the many new features of STK/VO 3.1 is the ability to visualize your spacecraft's field of view at varying elevation angles above the horizon and an equatorial space grid that provides a reference for the position of your spacecraft relative to other objects.

In conjunction with the latest

STK/VO, AGI also introduced a new complementary product to STK/VO 3.1 called STK/VO-TerrainView. Among the product's many features are the visual display of detailed terrain data; drag-and-drop capabilities that let you quickly create a detailed view of the area of your interest; expanded support for raster file format images such as ADRG, CADRG, and CIB; and the ability to adjust the resolution of your terrain to obtain maximum performance. All this can be done without compromising the quality of the rendered data. STK/VO-TerrainView allows real-time, "on-the-fly" continuous 3D visualization, whether you are looking at half the world or the side of a mountain.

"We are dedicated to keeping all of our STK products on the cutting edge of technology," says Doug Claffey, AGI VP of Product Development. "STK/VO has long been a popular compo-



AGI VP of Product Development Doug Claffey explains the new features of STK/VO 3.1 and STK/VO-TerrainView at the Vienna, VA seminar.

nent because it provides instant, intuitive insight into the complex geometries involved with aerospace systems, such as a spacecraft's attitude as it relates

to the sun."

For more information on STK/VO and STK/VO-TerrainView, visit our web site at www.stk.com. ■

TAKE STK TO THE NEXT LEVEL

The STK Certification Programs provide a means by which individuals with considerable knowledge of STK and the ability to provide support for STK can go to the head of the class.

STK Certification is a 4-day course identifying proficiencies with STK while reviewing complementary add-on module summaries, usage, and exercises. Certification is based on problem-solving ability, scenario development, capabilities, and a multiple-choice evaluation that concludes the session.

Participants in the STK Certification program need to have completed a free or paid STK training course and have a minimum of 6 months experience using STK.

Classes are scheduled from 9 a.m. to 5 p.m. each day. Lunch is provided as well as morning and afternoon refreshments. For more information, contact the Training Department at 610-578-1073, e-mail: training@stk.com, or visit the AGI web site at www.stk.com. ■

AEROSPACE PROFESSIONAL OF THE YEAR

The American Institute of Aeronautics & Astronautics' (AIAA) Greater Philadelphia Section has recognized Paul Graziani, President of AGI, as its 1998 Aerospace Professional of the Year. Each year, the Section recognizes individuals in the Delaware Valley who have made significant contributions and achievements in the aerospace sciences.

AIAA annually presents the Aerospace Professional of the Year award to the person who has the greatest impact on recent developments in aerospace technology. Past winners include Professor Portonovo Ayyaswamy from the University of Pennsylvania in 1997 and the Jupiter Encounter Project Team

at GE Re-entry Systems in 1996.

"Paul Graziani and AGI have filled a very specific need within the space industry in a rather unique manner," said



Peter Cavallo, Honors & Awards Director for AIAA's Greater Philadelphia Section. "It is important that we recognize the company's accomplishments as its presence within the aerospace community of the Delaware Valley continues to increase."

AIAA is the world's leading professional society in the aerospace profession whose primary goal is to advance the arts, sciences,

and technology of aeronautics and astronautics while fostering and promoting the professionalism of those engaged in these pursuits. ■

STK Down Under

The 5th Australian Space Development Conference was held last summer in Sydney, Australia. Attendees of the conference discussed issues such as new technological development through policy and regulatory issues, the state of world financial markets, and new business opportunities. Another highlight was how the rapidly growing Australian space industry fits into the global space scene.

Throughout the conference, there were presentations covering all aspects of space endeavors, from geosynchronous, LEO, and remote-sensing satellite projects to indigenous launch proposals and the role of Australian launch licensing activities in opening the pathway to reusable launch services.

AGI's Australian partner, Asia-Pacific Aerospace Consultants (APAC), co-sponsored the booth. AGI Partners Bruce Middleton and Alan Hatfield attended. Also participating were Tom Wagner, Director of International Business Development, Rick Price, Director of the Asia Pacific Regional Office, and James Koppersmith, Asia Systems Engineer.

The first of the conference sessions on Australian Activities began with Middleton of APAC. "By holding a session on Australian activities, the Society is defining the word to mean Australian and Asian, not just the western Pacific," said Middleton. He presented a paper at the conference entitled "Space Developments in the Asia Pacific." ■



James Koppersmith and Alan Hatfield man the AGI booth in Australia.

ARC Brings STK/VO to Life

ARC Science Simulations, Inc. of Loveland, CO joins AGI's Business Partners Program in an agreement that will allow AGI to use ARC's Face of the Earth™ 1-kilometer resolution images of the Earth in STK/VO Earth Imagery™ data sets.

ARC's imagery was derived from NOAA satellite imagery as distributed through the USGS/EROS Data Center. ARC realistically colored the raw data using an in-house colorization algorithm calibrated from Space Shuttle photography.

The images are applied to the STK/VO 3D globe, resulting in an incredibly realistic view of the Earth. "When combined with ARC's Face of the Earth imagery, AGI's STK/VO software takes a substantial step forward in providing photo-realistic planet-modeling capability to an important group of users," says Thomas Ligon, Senior Scientist at ARC.

STK/VO users may purchase the basic Face of the Earth imagery data, then add advanced data that includes a bathymetric ocean (relative ocean depth), lights of the world at night, and a darkened ocean for use with cloud overlays. ■



AGI MAKES THE FAST 50 AND FAST 500



AGI was recently named one of Eastern Pennsylvania's Fast 50 and the country's Fast 500 for the second year in a row. Sponsored by Deloitte & Touche, the program ranks the fastest-growing technology companies based on sales growth for the preceding 5 years.

EASTERN PENNSYLVANIA
TECHNOLOGY
FAST 50

With a phenomenal sales growth rate of 1,062 percent for this period, AGI earned the number 8 ranking in the top 50 companies in Eastern Pennsylvania. "It is nice to have our hard work and achievements recognized," notes Paul Graziani, AGI President. "Today, we're one of the few commercial off-the-shelf software companies solely dedicated to serving the global aerospace industry. It is a tremendously positive indicator of our continued growth and success."

The Fast 500 is a list of the 500 fastest growing companies in the country as determined from within the winner's circle of the 19 U.S. regional Technology Fast 50 competitions. AGI ranked 297th in the list of fastest growing companies in the nation for the last 5 years.

To qualify, companies must have had revenues of at least \$50,000 in 1993; be headquartered in the United States, and be a technology company. ■



AGI Begins Work on STK/MATLAB Interface

AGI has joined The MathWorks Connections Partner Program to develop an interface between STK and The MathWorks' core product MATLAB®. The MathWorks, Inc. of Natick, MA, produces MATLAB, the world's leading general purpose mathematical analysis tool. MATLAB supports a family of application-specific solutions called toolboxes, which allow users to solve particular classes of problems using standard analysis methods in various applications, including control engineering, simulation, remote sensing, and aerospace engineering analysis. There are currently over 150 MATLAB toolboxes available, which were developed by either the MathWorks or MathWorks Connections Partners.

When the AGI-developed STK-MATLAB toolbox becomes available, the integration of STK and MATLAB will allow MATLAB users to employ STK as a geometry engine as well as allow them to parametrically script



complex scenarios within STK. "The integration of these two products will be tremendously powerful," says Tom Neely, AGI Lead Engineer. "With AGI's toolbox for use with STK, MATLAB

process communications module, STK/Connect, from inside MATLAB. Through enhancement of these basic functions and the addition of more requested features, the STK-MATLAB toolbox will be developed to allow STK to connect directly to MATLAB and establish interactive analysis sessions.

Two of AGI's

Business Partners currently develop and market MATLAB Toolboxes that complement the much anticipated STK/MATLAB integration: Analyticon Ltd. of the UK and Princeton Satellite Systems, Inc. of Princeton, NJ. Analyticon conducted an extensive pointing-performance error-analysis project for the European Space Agency (ESA), which produced the Analytic Pointing Performance (APP) software tool.

APP is a GUI-based package developed in a MATLAB environment to perform end-to-end spacecraft pointing and measurement error budget calculations in full adherence to ESA-recommended methods. Calculating accurate solutions using a number of different probability, statistical, and performance indices, APP gives the user full control of and confidence in the calculation accuracy. Analyticon is currently upgrading APP to work with MATLAB version 5.0, after which it can be used with STK via STK/Connect to aid in predicting sensor-pointing errors.

Princeton Satellite Systems

produces the Spacecraft Control Toolbox, primarily used by those who need to design spacecraft control systems. The Spacecraft Control Toolbox includes a set of design and simulation tools, giving users a comprehensive and easy-to-use package of visualization tools ranging from sophisticated 2D and 3D plotting functions to 3D spacecraft visualization tools. With the 3D tools, users can assemble a spacecraft from components within MATLAB, display the spacecraft model, then hook the model into simulations. Princeton Satellite's Spacecraft Control Toolbox is compatible with STK, which allows easy transfer of data between the software packages.

"With MATLAB so widely used and well accepted in the

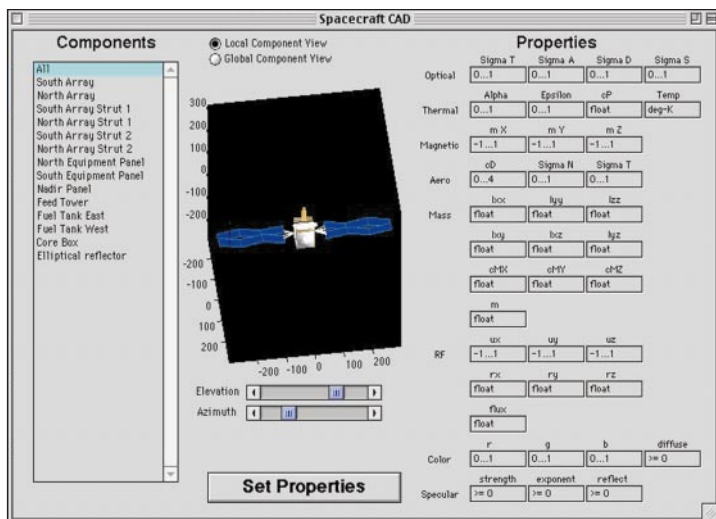


scientific community, it is very important for AGI to foster this mutually beneficial partnership with The MathWorks and continue supporting AGI Business Partners that are STK and MATLAB compatible," says Lauren Miller, Manager of the AGI Business Partners Group. ■



users will have the ability to access raw geometry data from STK and manipulate it in the MATLAB environment. Also, MATLAB users requiring precise dynamic positions and velocities of objects on and above the earth can generate this data with incredible ease as native MATLAB variables," Neely says.

AGI has developed a preliminary set of MATLAB functions that enable use of AGI's inter-



The STK/MATLAB interface will add even more power to STK's data manipulation.

Braxton Technologies Partners with AGI

Braxton Technologies, Inc. of Santa Clara, CA has joined AGI's Business Partner Program to combine the capabilities of its industry-leading ACE Premier System with STK. The ACE Premier System integrated with STK provides a complete suite of telemetry processing, satellite command and control, scheduling, and flight dynamics for the ground station operator.

Recognized for excellence by U.S. Department of Defense organizations, Braxton Technologies has experience in building simulators and interface computers for the aerospace industry at large. Braxton Technologies' engineers have extensive background in all areas of the Air Force Satellite Control Network (AFSCN) and its peripheral entities, even holding two patents for both software algorithms and hardware devices that are used in various subsystems



of the AFSCN. They have also designed, built, integrated, and trained users of the ACSS (ARTS Control Simulator Suite) system for AlliedSignal and Lockheed Martin. This system provides a generic simulator environment that allows for plugging various simulators into a single interface, thereby reducing cost, increasing flexibility, and

reducing the user learning curve. Using the ACE Premier System and STK/VO, Braxton Technologies and AGI recently teamed to provide complete telemetry processing and visualization of the October 3rd NRO Space Technology Experiment (STEX) satellite launch from Vandenberg AFB in California.

"This endorsement of STK software by a leading provider of ground station software technology further increases our acceptance and usability in the ground station market," explains Frank Linsalata, AGI's VP of Technical Services. "Braxton Technologies has shown the ability to provide true NT-based commercial off-the-shelf ground station solutions, which is a unique asset to our industry. Its knowledge and engineering expertise is industry-leading and we are excited about the solutions this partnership will make available to our customers." ■

What's New with STK/Coverage 2.0 and STK/Comm 2.0

With STK/Coverage, you have always been able to analyze satellite visibility to geographical areas. But now with STK/Coverage 2.0, you can perform analyses of regions at altitude and specify the locations of grid points used in the visibility computations. Coverage analyses may also be performed on stationary or moving objects. A new option to save and restore the raw visibility data makes users more productive and facilitates the sharing of coverage scenarios.

Enhanced reporting and graphing capabilities along with the new data-contouring feature for figures of merit provide you with a both the detailed and summary-level information you need to understand and communicate results. Additional figures of merit include the ability to measure the value of a user-selected access constraint such as the ground-elevation angle. You can also measure if a point has cover-

age from multiple assets within a user-defined time tolerance.

Likewise, STK/Comm has always let you analyze and graphically display the quality of communication links among multiple satellites and between satellites and ground stations. But STK/Comm 2.0 now lets you perform interference analysis based on the ITU recommendation for calculations of epfd/apfd and import the ITU's GIMROC antenna data to support link analysis, among numerous other enhancements.

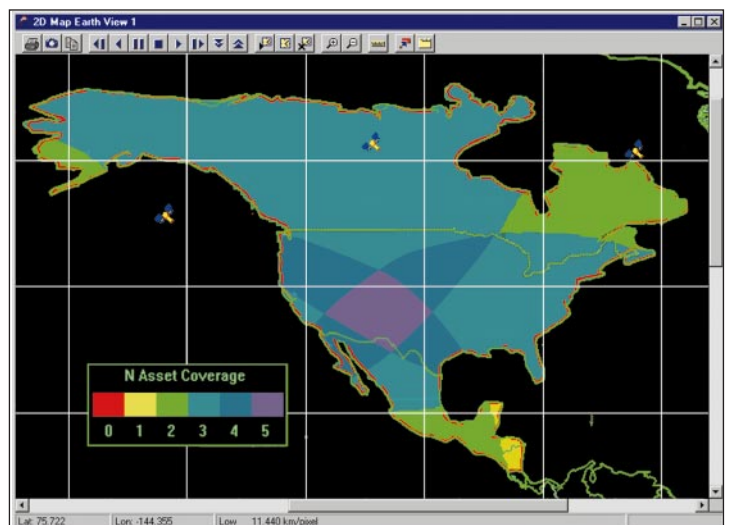
Used together, STK/Coverage 2.0 and STK/Comm 2.0 can increase satellite system coverage and communication link analysis. For example, suppose you need to model a GPS-guided missile trajectory and you are displaying GDOP with STK/Coverage 2.0 along its flight path from launch to impact. At certain times, however, GPS jammers could veer you off course due to erroneous/corrupted signals from GPS. With STK/-

Comm 2.0, you can place the jammers in the scenario and derive signal strength/integrity in the interference environment. This information may then be used to construct a new course to minimize interference while maintaining favorable geometric conditions for navigation.

"STK/Coverage 2.0 and STK/Comm 2.0 build on the extensive

base we have already developed for STK," says Doug Claffey, VP of Product Development. "The synergy between STK/Coverage and STK/Comm brings an unprecedented level of link modeling fidelity to coverage analyses, allowing STK users to obtain accurate results in a minimum amount of time."

For more information, visit AGI's website at www.stk.com. ■



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ATTENTION STK USERS!

INVIEW is looking for innovative uses of STK. Let others read about how you use STK in your space analysis. Send a short synopsis to:

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STK Helps NASA's FUSE Project Get Off the Ground Continued from page 1

modities, allowing prospective buyers to evaluate the products based upon their value-added features. This is where STK has a true advantage."

He continues, "We have found that by using COTS products that are an industry standard, you are almost guaranteed of continued support along the way. And generally those same products not only possess the type of functionality that you need but are also routinely upgraded, incorporating additional state-of-the-art capabilities. That has definitely been the case with STK, which is the principle reason why we will continue to use it in the future."

"Developing COTS-based solutions for a wide variety of problems is definitely the wave of the present and of the future," elaborates ICS Senior Systems Engineer Allan Posner. "It has been one of the predominant themes at many of the recent symposia on space-systems development. Companies industry-wide are now acknowledging what ICS realized long ago—the value of using existing solutions for satisfying requirements that are common among ostensibly unique systems."

Posner continues, "There is no doubt that STK is a time-tested, proven, and reliable product that is also extremely robust and versatile. It not only provides COTS solutions to generic control center requirements, it also supports evolving requirements through its expandability and ability to interact with other products within an integrated software environment. It is truly the gold standard of orbit and mission analysis tools."

ICS is currently under contract to the Johns Hopkins University as a team member for the FUSE program. For the FUSE program, ICS is not only integrating its flight version of SCL within the instrument data controller—as the key component of the FUSE mission's day-to-day management of instrument and spacecraft activities—but it is also developing the entire Satellite Control Center (SCC), of which SCL is an integral component.

ICS is also providing systems-engineering support for FUSE and is participating in the development and maintenance of requirements and designs for the FUSE satellite command and control software; the ground station control software; and the telemetry, tracking, and commanding data system software.

In an effort to take advantage of industry-leading COTS products, ICS has incorporated Satellite Tool Kit (STK) software into the integrated, control center architecture. STK was chosen specifically for its proven and reliable orbit propagation capabilities. "The FUSE SCC is able to propagate two-line element sets and use additional STK output in the gen-

eration of extended-precision-vector data that can be uploaded to the spacecraft," explains ICS's SCC Program Manager Howard Calk. "STK is also being used to pipe in real-time telemetry, and ICS plans to use the STK/VO module to display that information on a projected screen."

Another major advantage that ICS has found using STK is the ability to seamlessly integrate STK with other products. ICS was also pleased with the styles of reports that can be generated by STK, allowing satellite analysts to quickly process ground station pass data into a consolidated format. "The fact that we knew there was a relatively plug-and-play product that provides the required functionality relieved us from having to allocate and dedicate resources to developing those same functions on our own," Calk says.

The STK Fit

ICS's integration of STK within the SCC environment was made possible by the STK/Connect module and its tight coupling with the STK product. "STK/Connect's functionality has been easily incorporated into the object-oriented design of our custom-developed software," explains ICS Software Engineer David Woodard. "Its well-defined interface allows us to effectively meet our interface needs between SCC processes and STK. As a result, an SCC user can interact with STK, automatically generating extended-precision-vector data from STK's standard report output and converting it for the eventual upload to the satellite."

Although the FUSE program represents the most ambitious control center implementation that ICS has undertaken to date, it is by no means the last. In fact, the company has been so pleased with STK's integration on the FUSE project that it is planning to use it as one of the key functional packages for upcoming control center-based projects. Those projects will not only incorporate STK but a whole suite of other add-on modules such as Generic Resource Event Activity Scheduler™ (GREAS) and STK/Navigator.

Concludes Cappelaere, "We are developing alliances with a number of aerospace companies and incorporating STK and its related products every step of the way—from the initial, proposed system design to the final, integrated, control center product. We couldn't be more satisfied with the entire product suite."

For more information on how STK played a critical part in this mission, go to AGI's web site at www.stk.com or call for a printed copy of the case study at (800) 220-4STK or (610) 578-1000.■

SATELLITE TOOL KIT'S
INVIEW

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