ERDC Topographic Engineering Center

BATTLESPACE TERRAIN REASONING & AWARENESS BATTLE COMMAND (BTRA BC) JOINT-GEOSPATIAL ENTERPRISE SERVICE (J-GES)

Volume 3, 2 QTR 2008

J-GES Team goes into "web-slinging" action for successful demonstration to LTG Van Antwerp and VADM Murrett! For more information on this demo, see page 14!

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A message from the Program Manager ...

I would like to personally welcome you to the third edition of BTRA BC/J-GES Gazette. The goal of this publication is to provide timely, relevant information on each program and to educate the broader community on our missions. This edition will focus on upcoming J-GES experiments and showcase the BTRA Battle Engine (BBE) development that we believe is truly "ground-breaking" technology. As always, our bottom-line is to provide tangible products to the war fighter.

Dan Visone, PM BTRA BC/J-GES

The Team...

Breaking NEWS!

BTRA and J-GES Launch New Websites

Thanks to the hard work of Delma Delbosque , the BTRA and J-GES programs have launched new websites. The websites are now available through the Topographic Engineering Center (TEC) Home Page. The links are provided below:
http://www.tec.army.mil/
http://www.tec.army.mil/btra/index.html
http://www.tec.army.mil/JGES/index.html

BuckEye Data Now Available to the Intelligence Community

The Topographic Engineering Center's Distributed Geospatial Intelligence Network (DGInet) virtual node was upgraded in January 2008 to serve BuckEye imagery to the Intelligence Community via the SIPRnet. This complements previous efforts to serve the Operations Division's Water Resources Data Base (WRDB) and Urban Tactical Planner (UTP). Plans are underway to make this data available on the JWICS network this coming spring. This work was made possible by close cooperation of the Joint-Geospatial Enterprise Service (J-GES) program and the Operations Division at the Topographic Engineering Center (TEC) and the National Ground Intelligence Center (NGIC).

BTRA CJMTK Extensions to participate in CWID 08

BTRA CJMTK Extension (BCE) has been entered as trial 5.14 in the Coalition Warfare Interoperability Demonstration (CWID) 2008. CWID is the Chairman of the Joint Chiefs of Staff's annual event that enables U.S. Combatant Commands and the international community to investigate new and emerging technologies that can be moved into operational use within 12-18 months following the execution period. The demonstration builds a temporary global network over which cutting edge communications technologies interact to support a scripted scenario. Technologies are evaluated for utility, interoperability and security.

BCE will be demonstrating the Movement Projection and Choke Points Generator as web services. The client will be the CJMTK Java Framework which is being utilized for the reference implementations being delivered by BCE. The data will be hosted on the CJMTK Geospatial Appliance (CGA) which is also a CWID trial. CWID08 is scheduled for the month of June.

Powers and Braswell Presented the De Fleury Medal!

TEC Deputy Director, Joe Fontanella presents the De Fleury Medal to Mike Powers (left) and Ken Braswell (right). The highly-deserved medals were awarded based on Mike and Ken's tremendous service to the Army, the Corp of Engineers and in my view their INVALUABLE contributions to the BTRA and J-GES programs!

THE DE FLEURY MEDAL

As the Corps of Engineers implemented the US Army Regimental System, the senior engineer leadership sought a method for the Corps of Engineers to honor those individuals who have provided significant contributions to Army Engineering.

The Army Regimental System was developed to emphasize the history, customs, and traditions of the Corps; so MG Daniel R. Schroeder, then Commanding General of Fort Leonard Wood and Engineer School Commandant, wanted an award that would tie in with the beginnings of the nation and the Army Corps of Engineers.

In 1777, a French Engineer volunteered to serve with the American Army in its fight for independence from Britain. Francois Louis Tesseidre de Fleury was born in St. Hippolyte, France in 1749; was trained as an engineer; and served in the French Army during the Corsican Campaign.

The Continental Congress appointed de Fleury a captain of engineers, and he quickly proved himself. Wounded at the battles of Fort Mifflin and Brandywine (where his horse was shot out from under him), he soon became LTC de Fleury.
But it was in the desperate battle at Stony Point, New York in 1779, that de Fleury's courage, under fire, won him the accolades of Congress.

In June of 1779, two small American forts were being established on the Hudson River at Stony Point and Verplanck's Point, about 30 miles from Manhattan Island. A large British force easily captured both sites. The enemy began building a strong defensive perimeter around Stony Point. The Point was actually a peninsula jutting nearly half a mile into the Hudson, tipped with rocky crags which shot up 150 feet above the river. On the landward side was swamp which flooded at high tide, sinking a causeway running to the shore under two feet of water and making the Point an island.

The formidable defense included several batteries partially connected by trenches, log and earth redoubts around the main fort, and a double abatis. It was called "Little Gibraltar".

GEN George Washington was disturbed by the capture of the two forts. British occupation gave them control of a vital segment of the river and rerouted American communications, supplies, and troops moving between New England and the other colonies. Worse, GEN Washington was convinced the enemy was preparing to strike West Point, less than 15 miles upriver.

American reinforcements were quickly moved into position north of Stony Point, but Washington thought there was no hope of recapture. A recently formed light infantry corps led by the daring Brigadier General "Mad" Anthony Wayne, consisted of hand picked combat veterans. The group was made up of four regiments of about 340 men each. COL Christian "Old Denmark" Febiger headed the 1st Regiment with de Fleury as second in command.

On July 15th, the corps, except for a small diversionary force, unloaded weapons and turned in their ammunition. Secrecy was so tight the troops did not know they were going to attempt to recapture Stony Point. For such a risky assault, surprise was vital; and the attack was to take place in total darkness. Fixed bayonets and hand-to-hand combat were the orders of the day. Wayne's column had no sooner sloshed into the waist-deep water before a British picket sent up an alarm. During the fierce fighting, Wayne and Febiger both suffered stunning head wounds.

The Continentals scrambled up the rocky slope with de Fleury in the lead. First over the wall, de Fleury was followed by a wave of American bayonets. Rushing to the flag pole, de Fleury cut the British colors from their staff.

In addition to the recapture of Stony Point, the defeat of the British fired the American's determination and lifted their morale. It showed the enemy that the colonies had an able fighting force.

So it was that on 1 October 1779, de Fleury stood before the Continental Congress to be praised for his valor at Stony Point by the men who had penned the Declaration of Independence and would later sign the Constitution. For his intrepid behavior, the Continental Congress awarded a medal struck in his honor.
The Engineer Regiment adopted the de Fleury Medal as an award because of the values demonstrated by the man for whom it was struck - values of special meaning to Engineer Soldiers. It is understood that the de Fleury Medal was the first Congressional Medal struck, if not the first medal authorized.

On the obverse of the medal is the Latin inscription meaning: "A MEMORIAL AND REWARD FOR COURAGE AND BOLDNESS". In the center appears the image of a helmeted soldier standing amidst the ruins of a fort, holding in his right hand an unsheathed sword, and in his left the staff of the enemy's flag, which he tramples underfoot.

On the reverse, again in Latin: "FORTIFICATIONS, MARSHES, ENEMIES OVERCOME". In the center the fortress at Stony Point is depicted with both turrets and a flag flying. At the base of the hill are two shore batteries, one of which is firing at one of six vessels on the Hudson River- Beneath the fort is the legend: "STONY POINT CARRIED BY STORM, JULY 15, 1779".

Presentation of the de Fleury Medal, to those individuals meeting established criteria, was begun in 1989. Soldiers and civilians, active and retired, from enlisted soldiers to Generals to the Chief of Staff of the French Army proudly wear the de Fleury Medal. The de Fleury award program is administered by the Army Engineer Association for the US Army Corps of Engineers. The medal dies are controlled by the United States Mint which is responsible for striking the medals.

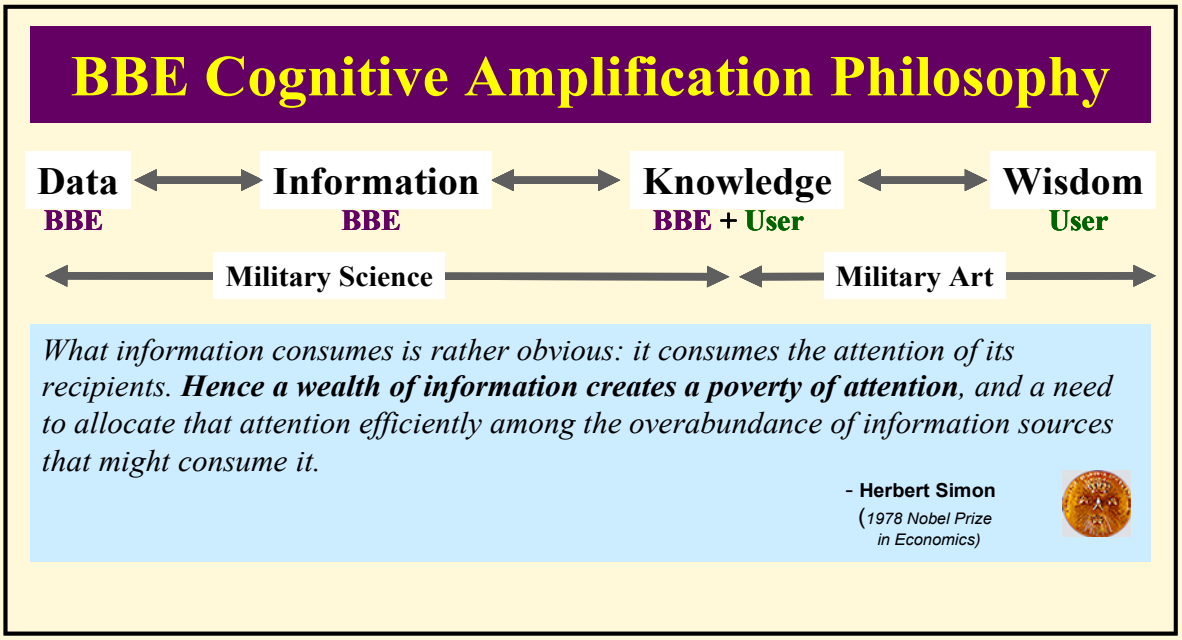
BTRA BC Battle Engine: Cognitive Amplification for Battle Staff Planning

By Jerry Schlabach

"The advantage of time and place in all martial actions is half a victory, which being lost is irrecoverable."
- Sir Francis Drake

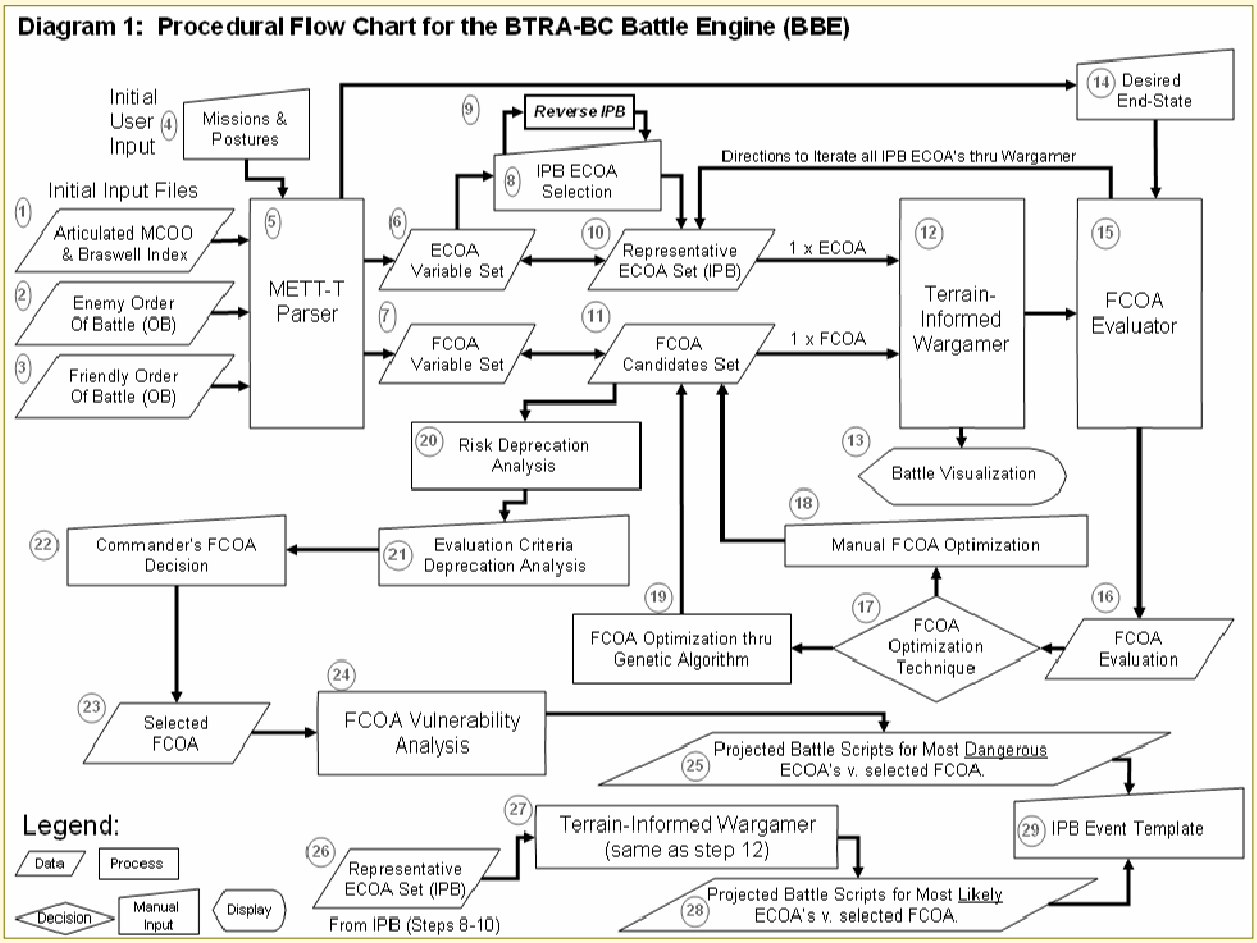
Battles are often won or lost based upon which side first reaches key terrain. It is nearly impossible to imagine a Union victory at Gettysburg if General Buford's Cavalry had required a few extra hours to arrive at the high ground south of town. And yet, using widely-accepted guidelines, 56 percent of a Brigade's battle-preparation time is consumed by Brigade and Battalion staff planning, before the Company Commanders even receive the mission and start their own planning. So, any reduction in the amount of time a staff requires for planning will result in a marked battlefield advantage, since the unit will be faster.

The BTRA-BC Battle Engine (BBE) offers the potential for significant reductions in the amount of time a staff requires for battle planning. BBE delivers this opportunity by "cognitively amplifying" the ability of battle staff planners to conduct Intelligence Preparation of the Battlefield (IPB) and the Military Decision Making Process (MDMP). More precisely, the human-computer reasoning team will develop and analyze tactical "Courses of Action" (COA's) much faster and better than humans alone.



It is important to note the distinction between Cognitive Amplification (CA) and Artificial Intelligence (AI). Unlike many AI efforts, CA does not attempt to "remove the human from the loop." The CA philosophy in BBE not only retains the human in the loop, the humans are in charge of the loop, as illustrated in the diagram above. The time saved in conducting IPB and MDMP comes from the twin facts that computers can be programmed to execute Military Science much faster than any human, and a properly-informed human expert can conduct Military Art much faster than any computer. In all cases the human users direct the computer's battlefield reasoning, and that automated cognition remains accountable to the human users.

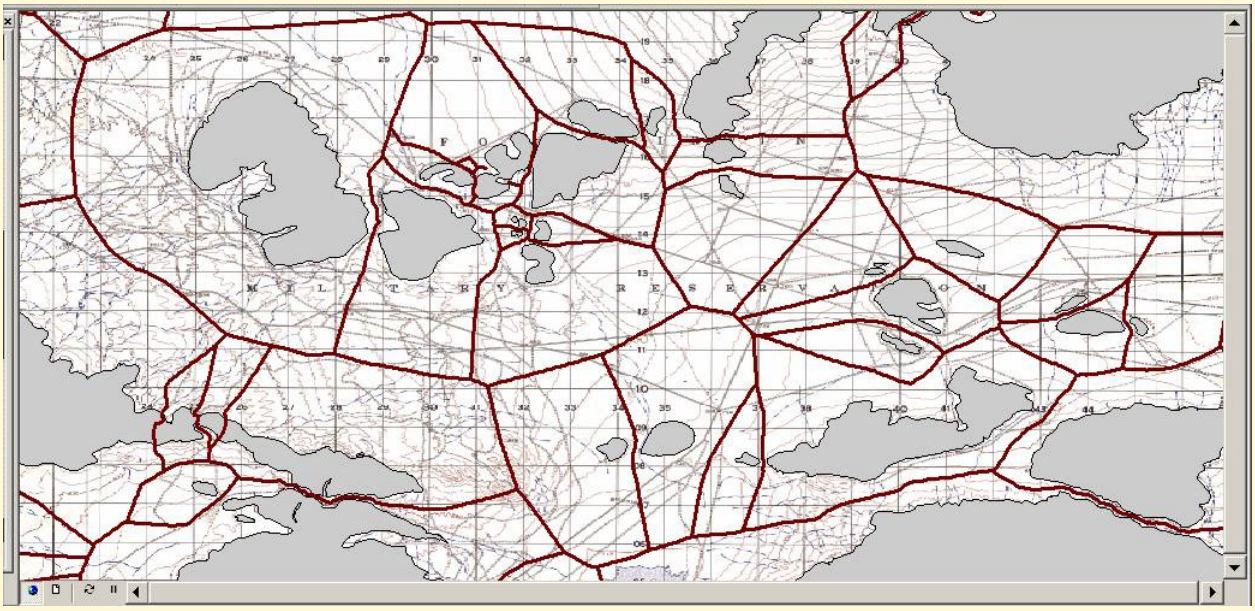
BBE accomplishes this Cognitive Amplification by using a terrain-informed, fast abstract Agent-Based System to conduct a doctrinal war gaming analysis of a battle situation. The system also uses a genetic algorithm to recommend solutions which appear to best satisfy the "Desired End-State," an important component of Commander's Intent. The flow-chart below illustrates how BBE supports battle staff execution of the IPB and MDMP doctrinal processes.



BBE supports Military Decision Making Process (MDMP) and Intelligence Preparation of the Battlefield (IPB) through a comprehensive Game-Theoretic Support Environment.

It is beyond the scope of this brief article to describe each of the BBE steps diagramed above – the invention disclosure for the government patent submission required 55 pages. However, it is worthwhile to discuss some of the more pertinent components, starting with the terrain-analysis inputs that form the BBE 'game board.' The picture below shows one view of Ken Braswell's Tactical Spatial Index, which enables BBE to abstract away detailed terrain ***features*** while retaining the terrain ***effects*** upon combat attrition modeling. The grey polygons represent major obstacles to unit movement, while the network of red lines bisect the Mobility Corridors between every pair of obstacles.

Combat actions are usually compartmented within those mobility corridors, so BBE's attrition calculations can reference just the smaller data of combat effects for the pertinent Mobility Corridor. For example, a mobility corridor with excellent Cross-Country Mobility (CCM) will increase the (otherwise) combat power of an attacker. BBE only needs to import that corridor's CCM combat 'multiplier' rather than the corridor's detailed, geo-rectified CCM information. BBE retains the feature-class key of each mobility corridor, to support later visualization in ArcMap.



Ken Braswell's Tactical Spatial Index allows BBE to abstract terrain features for fast wargaming, while retaining terrain effects for realistic modeling of combat attrition.

The cumulative effect of this abstraction enables BBE to load a combat-realistic terrain-game board into a computer's basic memory, rather than having to use its hard-drive. The computer's access to its hard-drive is usually measured in milliseconds, whereas access to basic memory is typically in microseconds. Therefore, Braswell's terrain index enables BBE to realistically model combat roughly 1000 times faster than if the terrain game board were loaded on the hard-drive.

Another key contribution from the BTRA-Classic terrain analysis program is Adam Kuchinski's "MCOO-Maker," which builds upon Braswell's Index to establish a logical infrastructure to support the development of Avenues of Approach (AA's) and Lines of Defensible Terrain (LDT's), consistent with the IPB doctrinal product, the Modified Combined Obstacle Overlay (MCOO). The products coming out of Kuchinski's MCOO-Maker are in greater detail than the typical human-developed MCOO, so we call this BBE input an "Articulated MCOO." The articulated detail helps the computer explicitly reason through issues which human experts implicitly understand.

An example of this is the capability for each of the AA's on the MCOO. Experienced planners implicitly know how many subordinates could attack abreast in a given AA, whereas the computer must explicitly tag each AA with its ability to support side-by-side formations of subordinate units. Otherwise, BBE couldn't match the ability of the skilled planner to develop COA's with feasible formations in each AA.

Two more key inputs to BBE are the articulated Order of Battle (OB) files for both friendly and enemy units. To properly support attrition calculations in BBE, Eric Nielsen developed a terrain-savvy implementation of Trevor Dupuy's Quantified Judgment Method of Analysis (QJMA).
That method of analysis is described in Dupuy's 1979 book, "Numbers, Predictions, and War." Nielsen's implementation, standing upon the shoulders of Dupuy's giant work, allows BBE to develop realistic, fast combat attrition models, which appropriately respect the number and quality of weapons in each side's OB in the context of the local terrain.

Upon digesting the game board and game pieces described above, the Mission, Enemy, Terrain, Troops & Time Available (METT-T) Parser in BBE analyzes the 'battlefield physics' of the situation, and establishes

Course of Action (COA) Variables for both the attacking and defending forces. COA Variables include standard elements of a commander's decision, to include unit formation, subordinate boundary locations, task organization, bypass criteria, withdrawal criteria, and other common factors. The METT-T Parser also identifies all possible instances for each COA Variable. In BBE a planner can quickly develop a Friendly COA (FCOA) or an Enemy COA (ECOA) by selecting appropriate COA Variable instances.

Von Moltke

A planner submits an FCOA and an ECOA into BBE's "Terrain-Informed Wargamer" to acquire a time-phased battle estimate, which includes the disposition, strength, and status of all unit forces throughout the battle. The use of wargaming as a tool for analyzing battle is a highly respected doctrine, first implemented as "Kriegspiel" for the German General Staff in the 19th Century by Helmuth Von Moltke (the Elder).

BBE's Wargamer automates the "Yellow-Sticky" wargaming drill that used to be taught at Fort Leavenworth's Command and General Staff College. Before the days of computerized map displays, planners conducted a wargame analysis by maneuvering yellow Post-It notes on an acetate MCOO, overlayed on a paper map. Sometimes a butcher-board sketch of the MCOO and the Area of Operations was used. The National Training Center popularized this procedure as the "Rock Drill," which used rocks to represent terrain obstacles and index cards for units.

BBE automates traditional "Rock Drills" and "Yellow-Sticky Drills."

The FCOA Evaluator in BBE wargames each FCOA against each of the ECOA's in the IPB Representative ECOA Set. The Evaluator fires a set of desired-end-state assessments, against the final disposition of each wargame. The commander can modify the default set to better reflect his intent. BBE produces an evaluation matrix for each FCOA, as shown below. This evaluation contains a single, cumulative score for the FCOA, which is 785.9755 in the example below. This cumulative score enables BBE to compare the relative ability of each FCOA to satisfy the Commander's Desired End State Criteria against the IPB.

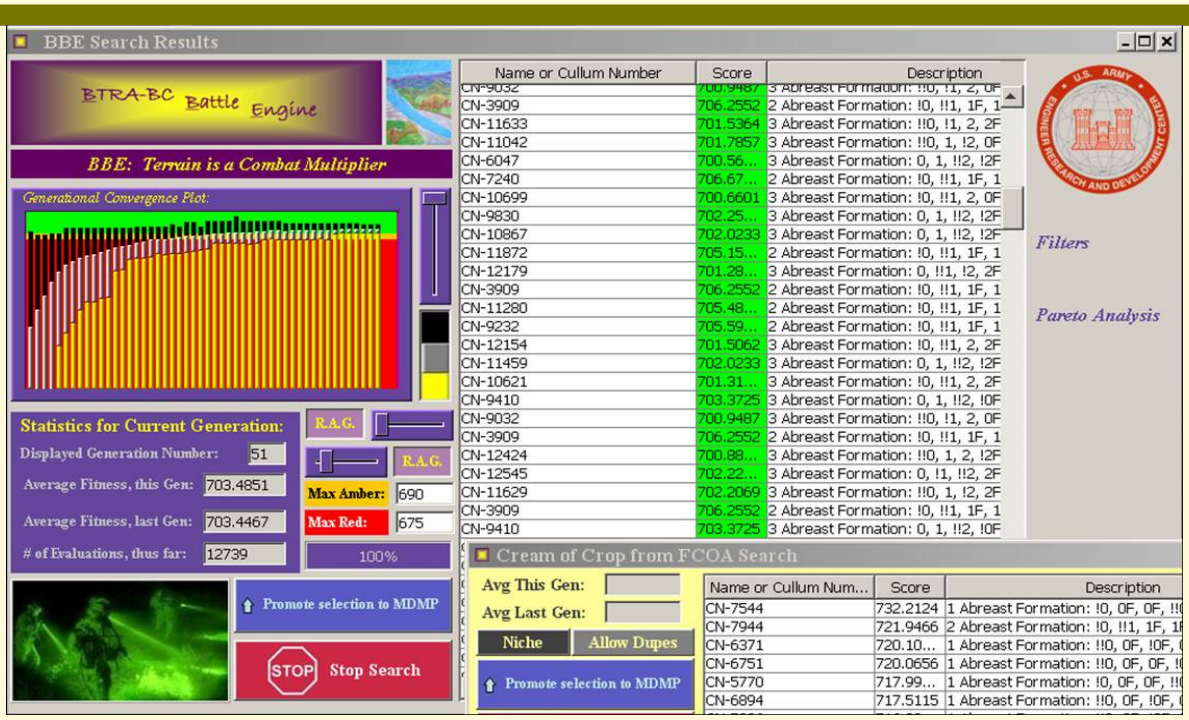
Evaluation Results for FCOA Tukhachevsky

R.A.G. | Max Red: 33.33 | Max Amber: 115 | De-Synchronize

Evaluation Criteria	Wt	ECOA Auerstadt	ECOA Jena	ECOA Leipzig	Cum
ECOA Relative Probability:	-->	1.0	1.5	2.0	
Maximize Overall Attacker Strength	1.0	50.04117	78.448006	112.44142	240.93...
Minimize Overall Defender Strength	2.0	109.97629	170.96075	228.73805	509.6751
Maximize Atk Strength at OBJ Sayers	1.0	0.0	0.0	0.0	0.0
Maximize Atk Strength at OBJ Payton	2.0	0.0	0.0	0.0	0.0
Maximize Atk Strength at OBJ Butkus	2.0	0.0	0.0	35.36983	35.36983
ECOA Score (this FCOA):		160.01746	249.40875	376.54932	785.9755

BBE consults the Commander's Desired End-State and the IPB ECOA set to provide evaluation scores for wargamed FCOA candidates.

After studying the evaluation matrix and battle animation in BBE's Battle Visualization service, the staff planner may try to improve the strength (cumulative score) of an FCOA by adjusting one of its COA variable instances, such as subordinate unit task organization. Or, the user can launch BBE's Genetic Algorithm (GA) to automate the search for better FCOA candidates. The GA is capable of returning a large number of FCOA's in just a few minutes, as displayed below.



BBE's terrain-informed Wargamer allows the genetic algorithm to quickly nominate large numbers of wargame-analyzed candidate FCOA's for Command and Staff consideration.

BBE also offers a suite of tools to help the Commander and Staff conduct an intelligent analysis of these large sets of FCOA's. These tools include a Risk-Deprecation Analysis, which assists the Commander in understanding which FCOA's are strong or weak against each of the ECOA's in the IPB set. As a result, the Commander may decide to accept risk against the possibility of a certain ECOA. A similar tool is the Evaluation Criteria (Trade-Off) Deprecation Analysis, which helps the Commander understand the price he's paying for each of the criteria in his Desired End State. This may lead him to re-weight his Desired End State Criteria. BBE also offers a more standard set of evaluation filters and Red-Amber-Green color coding tools to assist in the FCOA Comparison process.

BBE also supports post-decision analysis, to assist in the development of the IPB Event Template. The intelligence planner conducts an FCOA-Vulnerability Analysis by running BBE in reverse against the Commander's Selected FCOA. This results in a set of "Most Dangerous" ECOA's to accompany the original set of "Most Likely ECOA's. The battle scripts resulting from the Most Dangerous and Most Likely ECOA's enable the intelligence planner to identify unique/telling Named Areas of Interest (NAI's) for the Event Template. This product pre-informs collection planning and intelligence synchronization procedures.

John Boyd

<u>Select Accomplishments of John "40-Second" Boyd:</u>

- Won several hundred simulated dogfights at Nellis AFB in 40 seconds or less. He tied once, and never lost.
- Authored a revolutionary air-to-air tactics manual.
- Transformed the F-15 fighter jet: "I could screw up and do better than this!" *(sanitized quotation)*.
- Conceived and championed the F-16 fighter jet.
- Developed an influential theory of combat revolving around fast "OODA" loops (Observe, Orient, Decide, and Act)

The collective effect of a battle staff's use of BBE will be to significantly accelerate and enhance the IPB and MDMP planning processes. This will lead to faster unit OODA-loops (Observe, Orient, Decide, Act), which will hopefully increase the likelihood that friendly units will arrive at key terrain before the enemy, just like Buford at Gettysburg or Leonidas at Thermopylae.

"In the first years of World War II the Germans whipped everybody else, in part, because they were 10% faster at staff planning."

- Eric Nielsen
BTRA Subject Matter Expert

The BBE Effort within TEC's BTRA-BC Program:

BBE is fundamentally modeled upon the FOX system developed at the University of Illinois in support of the Army Research Laboratory (ARL) "FedLabs" Consortium. FOX was originally developed in 1997 by (then) Major Jerry Schlabach, a graduate student who had previously co-authored the 1994 FM 34-130 (Intelligence Preparation of the Battlefield). In 2006 the (then) BTRA Program Manager, Mike Powers, hired Schlabach to demonstrate the power of leveraging automated terrain analysis products. Terrain realism was one of the glaring deficiencies of the original FOX prototype, but it is also one of the great strengths of the BTRA program. Powers' intuition has resulted in BBE's highly synergistic integration of FOX and BTRA technologies.

TEC executives Mike Powers and Dan Visone have directed a 2008 effort that will integrate BBE into an ArcGIS extension, to further facilitate Army adoption of this new technology. ESRI has code-named this effort "Nash," in honor of John Forbes Nash, a significant contributor to the science of game theory. The Nash effort will integrate BBE into an ArcGIS environment, to include ESRI's implementation of 2525B symbology (MOLE). The resulting objects will be exposed in ArcEngine for implementation by Programs of Record.

The first installation of the beta for the BBE-powered ESRI extension will be in TEC's J-GES laboratory, to facilitate integration with other program efforts like GeoBML. We also hope to identify a TRADOC organization to facilitate user-studies of the beta version. User studies are particularly important for BBE, to better understand the ergonomics of cognitive amplification.

BBE is the first C2/ISR prototype to demonstrate the power of leveraging BTRA-BC terrain analysis products, and the development team is pursuing a government-owned patent to reduce the costs for future Army and DOD use. In the future, the BBE development team plans to demonstrate new techniques for cognitively amplified intelligence analysis, and also for a user-adjustable BBE-like game engine to support Low Intensity Conflict scenarios.

BBE is a major step forward in allowing commanders, planners, and analysts to concentrate on Terrain, Tactics, and the Military Art, while the computer explores the Military Science implications of that Art. The Army needs this, now more than ever.

- ***Mr. Robert Burkhardt, TEC Director, Army Geospatial Information Officer***

BTRA-BC Commercial Joint Mapping ToolKit (CJMTK) Extension (BCE) Update

By Adam Kuchinski and Scott Clark

The objective of the BCE is to provide the BTRA analysis capabilities to the CJMTK Mission Application development community. BTRA performs research and development to create advanced geospatial analysis and processing capabilities, supporting a wide range of missions for the Warfighter. The CJMTK provides a geospatial toolkit for programs and projects to develop specific applications that are fielded to command and control and intelligence operators. The BCE effort provides a mechanism to transition the capabilities from BTRA to programs that can leverage those capabilities and field them to the Warfighter. The BTRA capabilities include analysis engines, data manipulation routines, and other software products in support of terrain reasoning. The BCE program staff will transition the BTRA capabilities by conducting testing, building Reference Implementation Sample Applications (RISAs) and packaging them for distribution to the CJMTK developer community. The following table depicts the updated status of engine delivery, testing, and planned delivery to CJMTK of the BTRA engines.

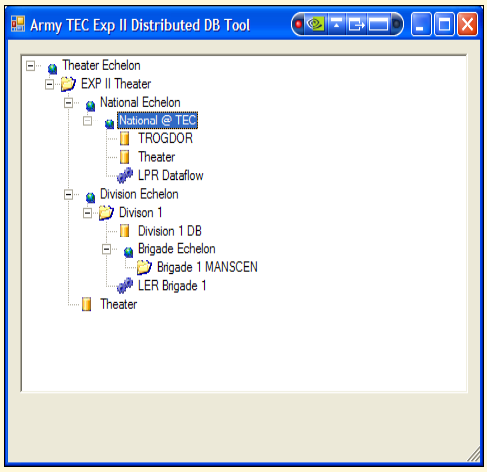
Component	Expected Delivery by TEC	Test Harness Status	Integration Status	Planned Delivery to CJMTK (with RISA)
Slope Aspect Generator	Delivered	100%	100%	Feb 08
Complex Generator	Delivered	100%	100%	Feb 08
Standard Mobility	Delivered	100%	100%	Feb 08
Obstacle Generator	Delivered	100%	100%	Feb 08
Concealment Area Generator	Delivered	100%	100%	Feb 08
Network Generator	Delivered	N/A	95%	2nd Quarter 08
Movement Projection	Delivered	50%	85%	Mar 08
Common Data Service	Delivered	100%	90%	Feb 08
Movement Projection Web Service RISA	N/A	N/A	20%	Mar 08
Fields of Fire Generator	TBD			
Choke Points Generator	Delivered	0%	0%	2nd Quarter 08
Engagement Areas Generator	TBD			
FASST-C	TBD			
TSO Web Service RISA	N/A	N/A		Feb 08
9.3 Release of all Engines and RISA	N/A	N/A		3rd Quarter 08

March 2008 Replication/Synchronization Experiment #2

By Douglas Caldwell and Larry Cook

The Joint-Geospatial Enterprise Services (J-GES) Program is making final preparations for Replication/ Synchronization Experiment #2, which is planned for March 2008. This experiment will build on the lessons learned in Replication/Synchronization Experiment #1 and focus on the key recommendations. Three new capabilities will be tested: improved automation and customization, data review, and mobile data collection.

The replication/synchronization process will be greatly simplified with automation and customization. In Replication/Synchronization Experiment #1, operators used out-of-the box wizards to perform operations. This required that they move through multiple forms, think in terms of the information architecture, and remember long, cryptic names. This approach has been revised for Experiment #2 where unnecessary details are hidden from the operators. Now they only need to know their current echelon and the operation they wish to perform.



Operator-centric interface

New tools will be added to allow operators to review all changes to the database prior to synchronization. Users will be able to see before and after graphical views of any proposed changes to the database. Previously, changes could only be made to the database when conflicting edits were made. Non-conflicting edits were not easily available for review. This enhancement will dramatically improve quality control.

Mobile clients below Brigade will be added in Replication/Synchronization Experiment #2 Using ESRI Mobile Application Development Framework (ADF) and ArcGIS Server software, clients will edit and synchronize data whenever a connection between the mobile client and ArcGIS server is established. This capability will be tested on cell phones with Personal Digital Assistant (PDA) capabilities, as well as tablet personal computers.

Participants will include the Topographic Engineering Center's J-GES Program and Operations Division, the U.S. Army Maneuver Support Center (MANSCEN), and ESRI. Plans are to edit a Theater Geospatial Database covering Fort Polk, LA, with mobile editing in the Washington, DC area.

Phase I Image Server Experiment Completed

By Douglas Caldwell

The Joint-Geospatial Enterprise Service (J-GES) Program recently completed the Phase I Image Server Experiment. The J-GES Program worked with ESRI to test the ability of their ArcGIS Image Server product to perform on-the-fly orthorectification and mosaicking of the U.S. Army's BuckEye high-resolution data.

BuckEye provides Soldiers with high quality battlefield information through high-resolution imagery; geospatial intelligence; elevation data; intelligence, surveillance and reconnaissance (ISR); and detailed maps of the urban area of interest. ArcGIS Image Server has the capability to perform on-the-fly orthorectification and mosaicking of large volumes of raw imagery, serving the resulting images to soldiers across the network.

The focus of the Phase I Image Server Experiment was the orthorectification of raw, uncompressed BuckEye data. Unfortunately, the current BuckEye camera information was not sufficient to produce accurate orthoimages using ArcGIS Image Server without additional control. The ArcGIS Image Server software relies on highly accurate camera information or external control and does not generate the control within the software.

Although the preliminary results were disappointing, there remain a number of options for addressing the problem. The BuckEye program is currently developing images that will contain Rational Polynomial Coefficients (RPCs). This imagery will contain the necessary information to support highly accurate on-the-fly orthorectification. A second option is the integration of on-the-fly control generation software with ArcGIS Image Server. The J-GES Program will continue to track these and other options and resume testing as they become available.

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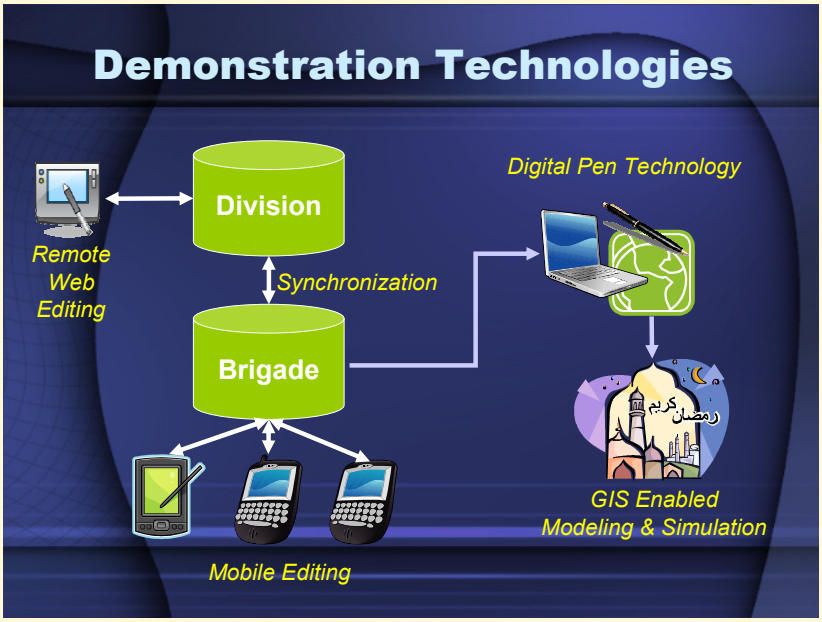
J-GES Spiral #3 Technology Demonstration

By Douglas Caldwell

The Joint-Geospatial Enterprise Service (J-GES) team's Spiral #3 Technology Demonstration highlighted advanced and emerging geospatial technologies for the net centric battlefield.

On 20 November 2007, these capabilities were demonstrated to Vice Adm. Robert B. Murrett, Director, National Geospatial-Intelligence Agency, and Lieutenant General Robert L. Van Antwerp, Chief of Engineers and Commander of the U.S. Army Corps of Engineers.

The Spiral #3 Technology Demonstration focused on the Below Brigade, Brigade and Division levels, with mobile editing, remote web editing, synchronization, digital pen technology and modeling & simulation integration.



For mobile editing, Below Brigade forces collected Stryker Brigade Combat Terrain (SBCT) data using cell phones and tablet PCs. They added, deleted, and modified features, using the ESRI's Mobile Application Development Framework (ADF) to synchronize their information with the Brigade database. In addition to their communication with the Brigade, the Below Brigade forces also exchanged information with each other using peer-to-peer communications. They were able to send alerts and messages that reset the displays to a common area of interest.

Meanwhile, at the Division level, forces used ESRI's ArcGIS server and remote web editing capabilities to modify the Division's Spatial Database Engine (SDE) geodatabase. These edits affected the same features as the Brigade database. Synchronization of the data between Division and Brigade updated databases at both echelons and for the Below Brigade units. These demonstrations showed the wide variety of devices and environments available for updating data, as well as rapidly communicating changes to differing echelons.

The digital pen demonstration focused on the annotation and markup of paper maps and transfer of the information to a geographic information system. Using the Adapx digital pen and maps printed using the Capturx for ArcGIS software; an analyst prepared a plan for a mock enemy interdiction. The analyst placed enemy and friendly units and drew their proposed routes. After docking the pen and downloading the data, the plan was available to ArcGIS users.

The analyst's plan was the basis for the development of a simulation using Mak Technologies' Geospatially-Enabled Modeling & Simulation (GEMS) software. This software supported the visualization of simulations using the Distributed Interactive Simulation (DIS) protocol inside of ArcGIS. During the simulation, friendly forces monitored, tracked, and ultimately eliminated enemy forces.

The Spiral #3 Technology Demonstration was a joint effort of the J-GES team, ESRI, Adapx, and Mak Technologies, highlighting industry-government cooperation. It will serve as the foundation for future technology demonstrations.

J-GES Value Experiment #1: Evaluation of Advanced Geospatial Tools

By Walter A. Powell, Dr. Kathryn B. Laskey, Dr. Leonard Adelman, Shiloh Dorgan, Ryan Johnson and Dr. Mike Hieb

Distinguished Visitors …

November 20, 2007
J-GES Spiral #3 Technology Demonstration
Vice Adm. Robert B. Murrett,
Director, National Geospatial-Intelligence Agency
Lieutenant General Robert L. Van Antwerp,
Chief of Engineers and Commander of the U.S. Army Corps of Engineers

December 10th, 2007
Mr. Ken Rash
Chief, Operations
Army Wounded Warrior Program

January 3, 2008
Mr. Jack Hild,
Deputy Director, NGA/S

January 30th, 2008
Ms. Toni Dineen
PFPS Platform Integration Manager

February 4th, 2008
Ernie Boehner
Director, Model Management Directorate
Army Warfighting Simulation

Summary: The general purpose of this experiment was to assess the added value of specific automated geospatial tools and information to military decision-making. The specific purpose of Value Experiment #1 was to assess the added value of Advanced Automated Geospatial Tools (AAGT), as represented by the Battlefield Terrain Reasoning and Awareness – Battle Command (BTRA-BC) tool set, in a terrain analysis scenario. Eighteen U.S. Army/Marine active duty students in the Advanced Terrain Analysis Course (ATAC) were tasked to perform identical terrain analysis tasks on similar terrain using the Digital Topographic Support System (DTSS) with and without the added BTRA-BC functionality. A statistical analysis of the results was conducted.

Results: The added value of the BTRA-BC toolkit was assessed by the following measures:

Time to task completion.
Objective quality of the output – evaluators counted specific participant-identified Tactical Spatial Objects (TSO), such as Mobility Corridors and Avenues of Approach, and answered yes/no to questions related to output.
Subjective quality of the output – Subject Matter Experts (SME) evaluated the information presented and the clarity of the presentation of the output.
Participant knowledge of the impact of terrain on military decision making – SMEs evaluated the participants' answers to questions requiring knowledge of terrain.
Participant perception of the value of the BTRA-BC toolkit– participants completed questionnaires designed to elicit these perceptions.

On average, participants completed similar terrain analysis tasks 64% faster using DTSS with BTRA-BC than without BTRA-BC. In addition, participants who used DTSS with BTRA-BC first completed the tasks using DTSS without BTRA-BC 28% faster than participants that used DTSS with BTRA-BC second.

On average, participants generated higher quality output using DTSS with BTRA-BC than without BTRA-BC for both objective and subjective quality measures. The improvement in quality was 33% and 24% for objective and subjective quality, respectively. The level of knowledge and understanding of the effects of terrain for participants using BTRA-BC and those not using BTRA-BC were statistically indistinguishable.

Lastly, participants thought that DTSS with BTRA-BC assisted them in completing the tasks faster and with better quality output than using DTSS without BTRA-BC. They thought that the use of BTRA-BC did not reduce their understanding of the terrain.

Overall, Value Experiment #1 indicated significant added value through the use of AAGT as represented in BTRA-BC: (1) There was substantial reduction in the time (man-hours) required for terrain analysis tasks, (2) The quality of the output was improved without degrading the analysts' knowledge of the effects of terrain.

J-GES Value Experiment #2: Evaluation of Advanced Geospatial Tools in a Mission Context

By Walter A. Powell, Dr. Kathryn B. Laskey, Dr. Leonard Adelman, Shiloh Dorgan, and Ryan Johnson

Summary: Value Experiment #2 is a direct follow-on to Value Experiment #1 which assessed the added value of Advanced Automated Geospatial Tools in a terrain analysis scenario. The specific purpose of Value Experiment #2 is to further assess the value added of Battlefield Terrain Reasoning and Awareness – Battle Command (BTRA-BC) tools in a military planning scenario. In this experiment, sixteen U.S. Army junior officers (O3-O4) with staff planning experience will be tasked to perform identical, complex planning tasks on similar terrain using Commander's Support Environment (CSE), an advanced Command and Control (C2) system, with and without BTRA-BC functionality. A statistical analysis will be performed on the data gathered.

Environment: Originally sponsored by DARPA, CSE was developed by Viecore, FSD, Inc. in response to the Future Combat System (FCS) requirements of mobile C2. Combining sensor data, intelligent agents, and simulation capabilities, CSE provides a commander's staff with the tools to filter, assess and respond to critical battlefield information.

Experimental Design: The experiment is structured as a within-subjects design (i.e. participants will perform similar tasks using CSE with and without BTRA-BC). The tasks involve planning a maneuver schema for the companies of a Brigade Combat Team (BCT) battalion. The tasks include terrain analysis, route planning, concealment analysis, selecting hide and battle positions, evaluation of possible hostile force Courses of Action (COA), and generation of Named Areas of Interest (NAI). The order of the "with BTRA-BC" and "without BTRA-BC" trials and the order of the scenarios will be counter-balanced and randomly assigned in order to control for the effects of these parameters in our analysis.

Hypotheses: The experiment is designed to test the following hypotheses:

- The participants perform tasks faster with BTRA-BC than without BTRA-BC.
- The products produced by participants are of higher quality when using BTRA-BC than without BTRA-BC.
- The knowledge and understanding of the effects of terrain on decision-making are at least as good for participants using BTRA-BC than for those not using BTRA-BC.
- The participants believe BTRA-BC helps them to complete tasks faster, produce higher quality output, and that their knowledge and understanding of the effects of terrain are as good as when not using BTRA-BC.

The added value of BTRA-BC tools will be assessed by the following measures:

- Time to task completion: This measure was highly significant when evaluating Tier 1 tools, but the opinion of Subject Matter Experts (SMEs) is that with more complex problems the participants will use all the time available to refine their products. Therefore this measure may not be as significant in Value Experiment #2.
- Subjective quality of the output: SMEs will evaluate the information presented and the clarity of the presentation of the output. Because of (1) above, this may be the most important of the measures.
- Knowledge of the impact of terrain on the military problem – SMEs will evaluate the participants' answers to questions requiring reasoning about the terrain.
- Participants' perception of the value of Advanced Automated Geospatial Tools (AAGT) – Participants will complete a questionnaire designed to elicit these perceptions of BTRA's effect on how quickly they can produce planning products, the quality of their products, and their terrain understanding.

Experiment #2 will be conducted in two groups. The first of these is scheduled for April/May timeframe.

J-GES Value Experiment #3: Evaluation of High Resolution Buckeye Data and Imagery

By Walter A. Powell, Dr. Kathryn B. Laskey, Dr. Leonard Adelman, Shiloh Dorgan, and Ryan Johnson

Summary: Value Experiment #3 is a departure from Value Experiments #1 and #2 which assess the added value of the Battlefield Terrain Reasoning and Awareness – Battle Command (BTRA-BC) toolset. Value Experiment #3 will assess the military planning value of high resolution imagery, specifically data generated by Buckeye, as compared to conventional, Controlled Image Base one meter resolution data (CIB1). The environment and experimental design are similar to Value Experiments #1 and #2, but the metrics by which we evaluate added value will be revised to accommodate the change from evaluating a tool set (data remaining constant) to evaluating the effect of better data (tool set remaining constant).

Environment: Like Value Experiment #2, Commander's Support Environment (CSE) will be the operating environment through which the evaluation of Buckeye data will be made.

Data and Location: As both Buckeye and CIB1 data are available on Iraqi cities, the location chosen will be in Iraq.

Experimental Design: The experiment is structured as a within-subjects design where the participants will perform tasks involved in evaluating plans for a transit from safe havens to positions of a planned Vehicle Control Points (VCPs) and the plans for establishing those VCPs. The participants, senior enlisted and junior officer personnel who have in-country experience, will be evaluating for platoon-sized units. Participants will be using the intrinsic CSE tools to evaluate the plans based on imagery and DEM data. Several scenarios with highly similar urban terrain are being developed for use both with CIB1 and Buckeye data. Participants will be trained in the use of CSE and imagery evaluation prior to running the experiment.

Hypotheses: The experiment is designed to test the following hypotheses:

- The participants will perform evaluations faster with Buckeye data than with conventional CIB1 data.
- The plans which include Buckeye data will be judged to be of higher quality by participants than the same plans using CIB1 only data.
- Plans which include Buckeye data will generate fewer Requests for Information (RFIs) than those which include only CIB1 data.
- The knowledge and understanding of the effects of terrain on decision-making will be better when using Buckeye data as when using conventional data.
- The participants believe that Buckeye data allows them to conduct plan evaluations faster, with fewer RFIs and their knowledge and understanding of the effects of terrain will be better than when using CIB1 data.

Upcoming Events ...

BTRA BC:

CSE Experiment #2
April 2008 - Access the value added of BTRA-BC tools in a military planning scenario

ERDC-wide Integrated demo
April 2008

J-GES:

Replication/Synchronization – Experiment #2
March 2008 - Two of the key new capabilities tested will be improved automation and the addition of mobile clients to the architecture

CTIS/CMB/CGA/
April 2008 - Test loading and use data from both the CMB and the CGA

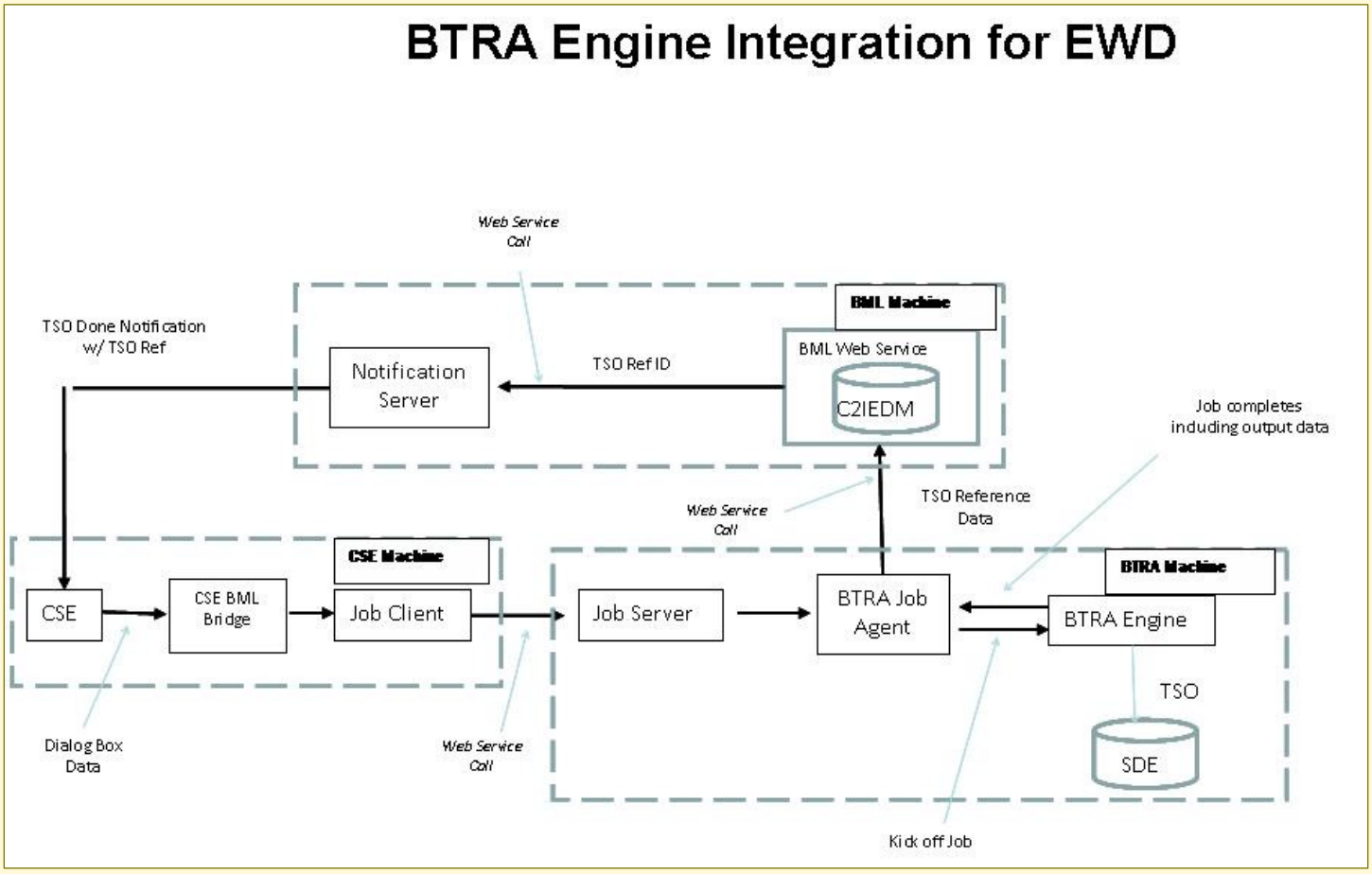
Data Modeling—SDE Data Scalability
April 2008 - Evaluate data models and test scalability issues

Geospatial Battle Management Language (GeoBML) Update

By Harland Yu

Several new and exciting developments have taken place in the GeoBML program since the last issue. Most notably is the start of BTRA Tactical Spatial Objects (TSOs) engine integration with the GeoBML testbed. Scientists and engineers from CERL, CRREL, GSL, TEC, Atlantic Consulting Services (ACS), Charles River Analytics, and Viecore FSD have been hard at work designing and implementing a BTRA prototype system from the ground up. The subject matter experts haven't been resting either – they've crafted several operational vignettes based on the TRADOC-approved Caspian Sea training scenario and the Modular Brigade Combat Team force structure to showcase the new and improved GeoBML testbed at the ERDC-wide demo (EWD) in early April.

The BTRA prototype system encompasses several new software components as well as enhancements to existing ones and is shown below. CERL donated the code and use of their JobServer (now BTRA JobServer), which was originally developed for the Fort Future project. ACS redesigned the notification service so that the CSE would know when a TSO was generated and enhanced the Battle Management Language (BML) web service to store the TSO reference in the Command and Control Information Exchange Data Model (C2IEDM). Viecore developed new wizards to generate the XML requests needed for input to the TSO engines and is working on custom renderers for each TSO. CERL, CRREL, GSL, TEC, and Charles River Analytics have been developing TSO engines for UAV routes, weather effects and sensor performance, casualty collection points, and attack by fire positions. They have been coding the interfaces that will integrate the engines with the rest of the system.



In December a combined Scenario/Developers meeting was hosted by TEC in order to:

- Review and further develop the operational scenario/script that provides the context for the demonstration.
- Develop the operational processes and Tactics, Techniques and Procedures (TTP) that will be used for generating the TSOs within a realistic tactical context.
- Continue technical development of the BTRA prototype and the systems architecture that will support the demonstration.

The CERL technical director, who attended in part on the last day, was duly impressed by the cooperative and collegial spirit he encountered and noted that the meeting set the standard for future inter-lab efforts.

In the meantime, Dr. Harry Keeling at Howard University coordinated the effort to ship out a single echelon version of the GeoBML testbed to each of the participating ERDC labs. Additionally, his team of graduate students is preparing to begin software development work in conjunction with Systematic Software Engineering that will integrate SitaWare, a Multilateral Interoperability Programme (MIP)-compliant C2 system, with GeoBML and BTRA.

GIS-Enabled Modeling and Simulation (GEMS)

GIS-Enabled Modeling and Simulation (GEMS) technology combines Mak Technologies' VR-Forces Simulation software with ESRI's ArcGIS software suite, allowing for the creation of geospatially accurate battlefield scenarios. Using VR-Forces, an interactive GUI, the user can position red and blue forces, specify vehicle type, speed, and route, interact with terrain, and create and avoid obstacles. The dynamic display capability allows for smooth transitioning when forces are on the move; previously, the screen constantly refreshed to show progression, causing the movements to look choppy. Mak Technologies continues to work on integrating BTRA and GeoBML products to allow for the most realistic scenario simulation. The GEMS technology was recently showcased during the J-GES Mobile Demo, conducted in November 2007 for LTG Van Antwerp and VADM Murrett, and will be an important part of future demonstrations to come in Spring 2008.

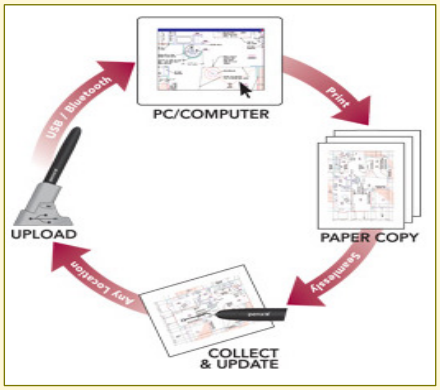
J-GES Adapx Digital Pen Demonstration

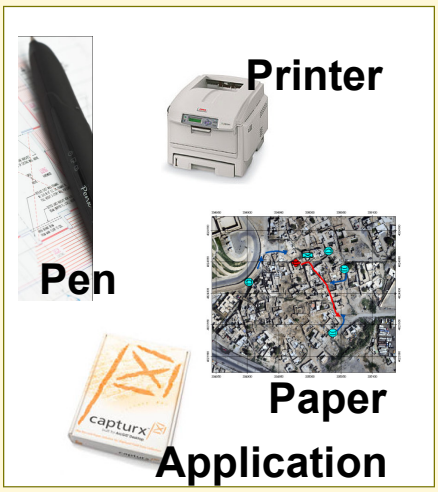
By Jennifer Hanson

J-GES has acquired the Adapx Digital Pen for evaluation and demonstrations. The Adapx Digital Pen works with the Capturx for ArcGIS software to collect information from a printed map and bring it into ArcGIS.

The four steps are:

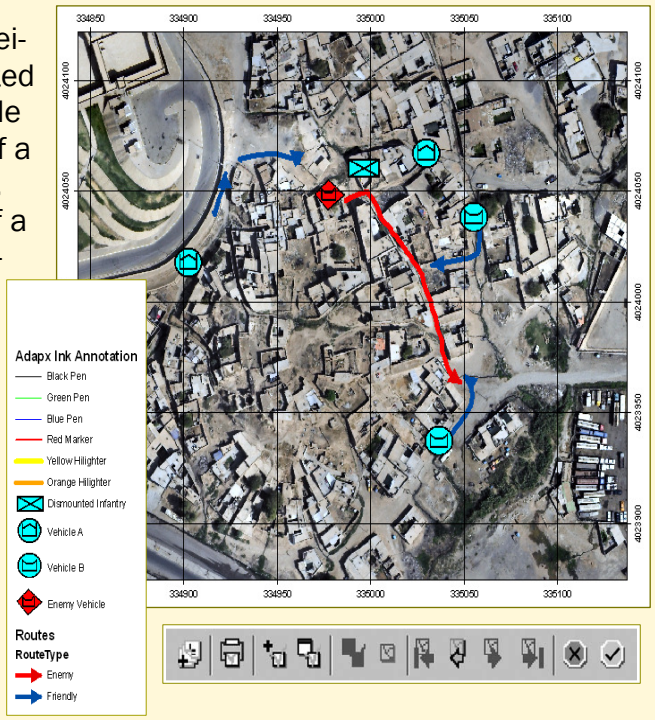
1. Print the map
2. Draw on the printed map using the pen
3. Upload the information by docking the pen
4. Add/view the drawn information in ArcGIS





The Adapx system has four components: the pen, the printer, the paper, and the application. The pen has the look and feel of a ball point pen, but contains a camera and microprocessor. that holds up to one MB of information. The maps are printed with a laser printer that prints at least 1200 DPI. The key is the grid that is printed. The grid, an Anoto pattern, eliminates the need for registration and calibration. Information can be entered on paper that is torn or crumpled and can be used in adverse conditions, such as rain or snow. The application, Capturx for ArcGIS was recently released and is an ArcGIS extension that currently only runs in Version 9.2.

The information is stored in the ArcGIS map document in either an annotation layer or feature layer. The map is printed and the user adds data by touching the symbol in the Table of Contents and then drawing on the map. For instance, if a green line in the annotation part of the legend is selected, then the "writing" on the map will be in green. Similarly, if a Blue Force symbol in the feature layer on the legend is selected, then the symbol will be drawn wherever the pen mark is located on the paper.



The information is uploaded to the computer from the pen by placing the pen in the docking station. Once the features and annotation are saved, they can be modified in ArcGIS.

The digital pen has many applications in both the military and commercial arenas. It requires little training and can be used in environments that are hostile to computers and displays.

ERDC Wide Demo (EWD) Weather Scenario

By George G. Koenig, Ph.D.

In October 2007, CRREL implemented a procedure to obtain mesoscale weather information from the Air Force Weather Agency for five mesoscale windows covering a majority of the Northern Hemisphere. The base times of the mesoscale forecast are 06 and 18 UTC or 00 and 12 UTC depending on the mesoscale window. Weather parameters needed by BTRA/Fast All-season Soil Strength (FASST), CRREL's thermal model, can be derived from the mesoscale forecast information when they are not available. For example, from knowledge of the cloud cover, cloud vertical location, cloud type, and the atmospheric temperature profile, we can calculate the solar and infrared fluxes needed for the soil energy budget.

In selecting the EWD weather scenario, we considered the computational burden incurred in 'spinning up' FASST. The time to run FASST for a three-month dataset in a live mode for the demonstration is prohibitive. To overcome this restriction and still insure model fidelity, we ran FASST offline to produce temperature and moisture soil profiles needed to initialize FASST for the EWD weather scenario. Another consideration in selecting the EWD weather scenario was the effect weather can have on military operations. We want a mixture of good weather that has little or no affect on system and sensor performance, and bad weather that affects systems and sensors and requires commanders to seek alternatives or to adjust mission plans. To provide EWD project managers with some degree of freedom in selecting the final EWD weather scenario, we extracted a 17-day period starting on 12/08/2007 and ending on 12/25/2007 from the available Air Force Weather Agency (AFWA) mesoscale data. It is a simple task to cut and paste a subset of this period to reduce the scope of the weather information provided. However, the converse is not true. Considerable effort would be required to extend the period of the weather information.

The information in the EWD weather scenario includes all the mesoscale weather cells indicated in Figure 1. The shading corresponds to the topography (white is high), the blue box is the EWD Area of Interest (AOI), the red areas represent the EWD OPS plan, the yellow boxes indicate the weather cells, and the numbers represent the weather cell identification scheme used in BTRA. Figures 2-4 are plots of weather information from the weather cell flagged with the green starburst in Figure 1. Figure 2 plots the relative humidity and the ambient (air) temperature for the weather cell. This weather cell is in a valley as evident from Figure 1. However, we still have periods when the ambient temperature is below freezing. We also have several periods of high humidity indicative of potential periods of rain or fog. Both rain and fog can affect ground and air operations. Figure 3 displays the occurrence of fog (red diamonds), rain (blue dots), and the visibility in kilometers. For the fog events, the visibility ranges from 0 km to greater than 8 km. The lowest period of visibility occurs in conjunction with the rain events on days 17 through 19 December. Finally, Figure 3 provides information on the cloud amount and the cloud base height for low clouds. Middle level and high-level cloud information is available, but not shown since these upper level clouds will not affect Unmanned Aerial System (UAS) operations. The optimal operating altitude of the Shadow is 1.219 to 1.829 meters Above Ground Level (AGL). From Figure 4, it is evident that Shadow operations for part of the time will be above the cloud base, and potentially in-cloud. Both the Shadow Charge-Coupled Device (CCD) and Infrared (IR) imager may not be able to see the ground during these periods if the optical depth of the clouds is too great.

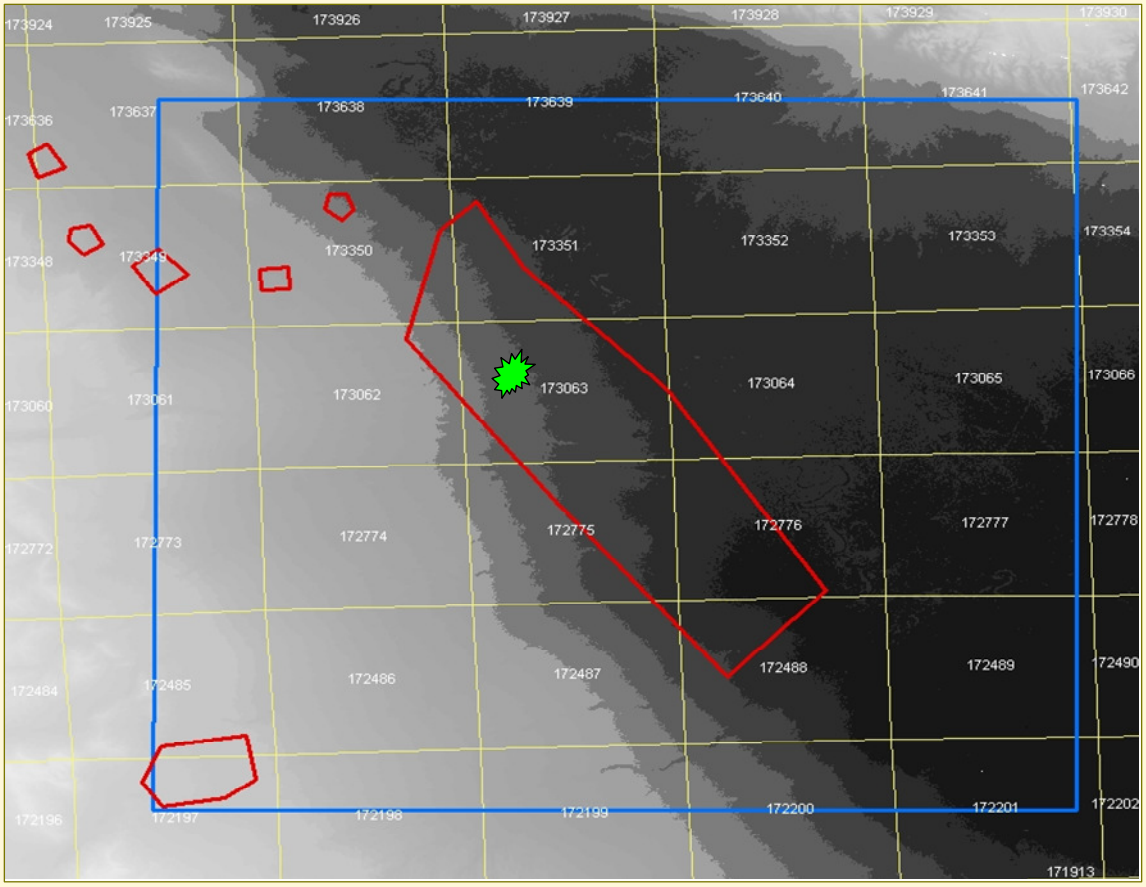


Figure 1. See text for explanation of the different color-coded areas and the numbers.

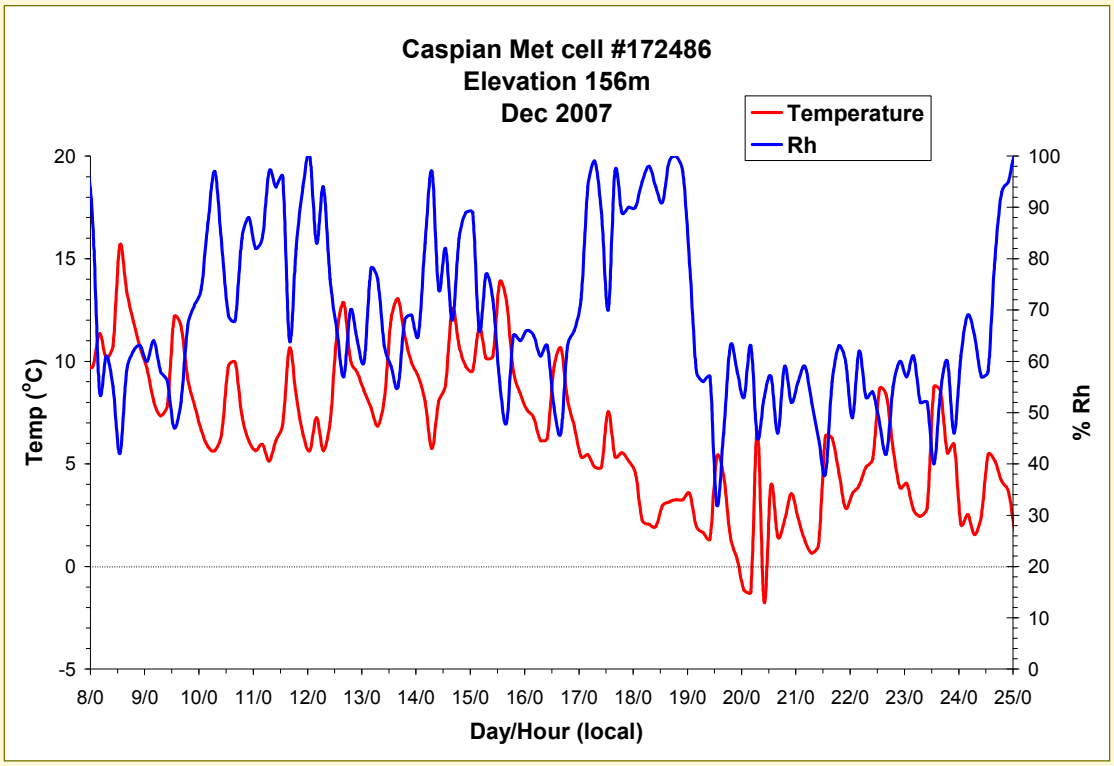


Figure 2. Plot of the temperature and humidity for the EWD weather scenario

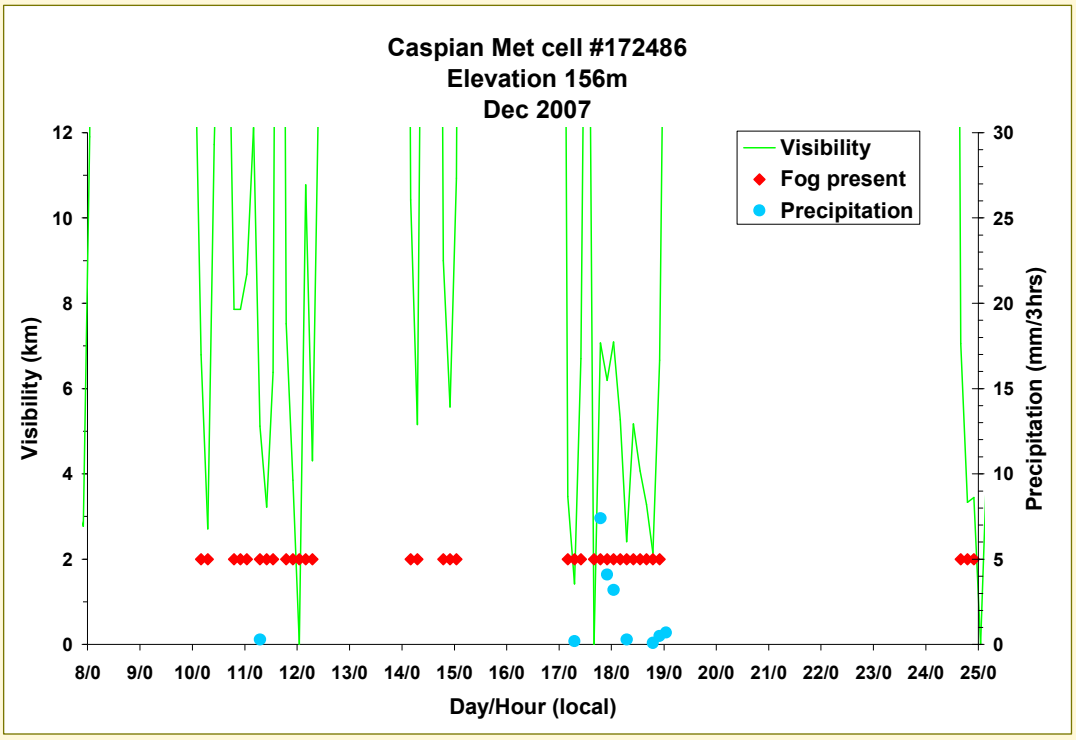


Figure 3. Plot of the occurrence of fog, rain, and the forecast visibility

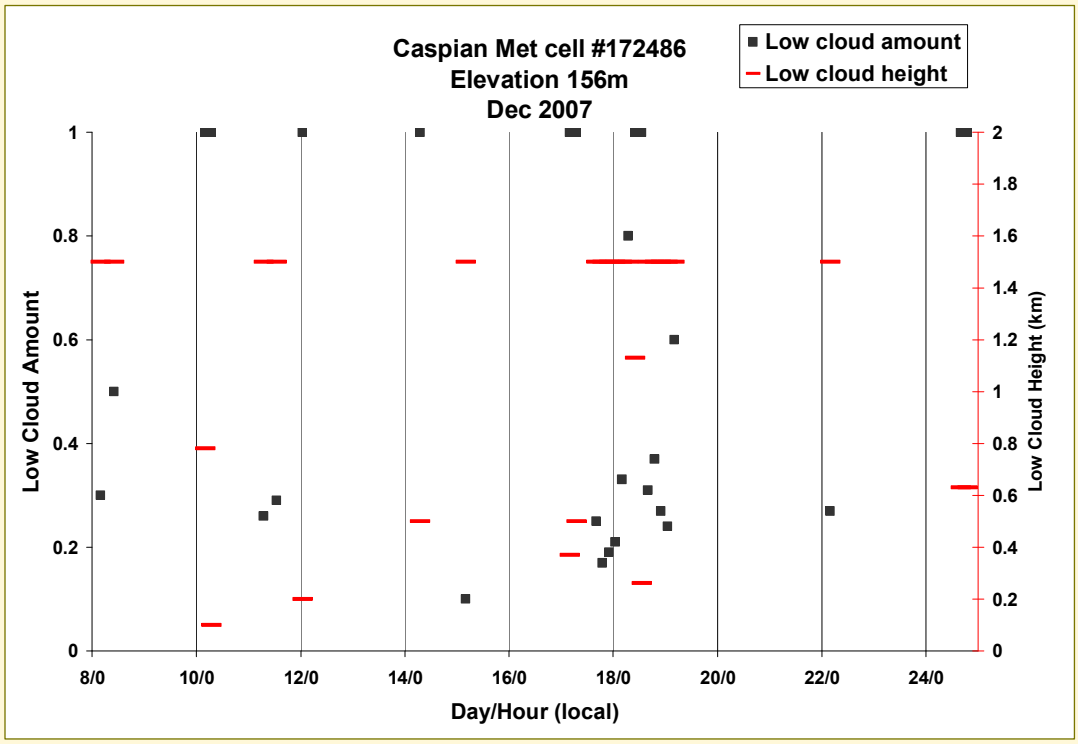


Figure 4. Cloud amounts and cloud heights for the EWD weather scenario

CRREL provided the weather scenario information, consisting of the shelter height information and the upper air information, for the period from 12/08/2007 to 12/25/2007 for all the weather cells associated with the blue box in Figure 1, to key members of the EWD demonstration team. Once we have consensus on the period of the weather scenario, CRREL will generate the appropriate files and redistribute the new files to any team member needing the weather information.

Focusing ISR to Support the Commander's Intent

By Chris Rewerts

The objective of the Integrated Horizontal and Vertical Maneuver (IHaVM) component of BTRA is to provide seamless integration of command and control between the Unmanned Aerial Systems (UAS) commander and the supported (maneuver) commander. BTRA is in a unique position to provide this integration based on its models of terrain, weather and the military decision making process (MDMP). This article will focus on the latter.

In the current use of UAS there are a number of layers of staff, communication, and coordination required to express the maneuver commander's needs to UAS operators and then to access the required imagery and information. For example, to support the Intelligence, Surveillance, and Reconnaissance component of a mission, a number of Named Areas of Interest (NAIs) are identified using the following process. **FM 2-01.3** *Intelligence Preparation of the Battlefield (Final Draft, Jul 06), Para 5-30, states:* After identifying the set of potential threat Course of Actions (COAs), the initial challenge is to determine which one the threats will actually adopt. This determination revolves around predicting specific areas and activities which, when observed, will reveal which COAs the threat has chosen. Nominate the specific areas where you expect key events as Named Areas of Interests (NAIs). In a counterterrorism operation NAIs can depict or encompass locations, persons, or actions within the terrorist organization, operation, or other cell. The activities which reveal the intended threat COA are called indicators.

The UAS planner then plans the sortie(s) necessary to service the designated NAIs, taking into account weather, airspace restrictions and other factors. UAS commanders also attempt to optimize the use of the platform on its way to and from its primary observation targets; for example, the UAS may be flown over road networks to make observations in real time to support troops on the ground, or otherwise collect imagery in areas of general interest.

The IHaVM now gives the UAS planner a very high fidelity understanding of the probable sensor performance based on weather, terrain and the friendly dispositions.

While the current focus of IHaVM is to assist the UAS planner to more optimally plan UAV routes based on the inherent military value of the terrain, the project is uniquely situated to leverage other BTRA assets to streamline the layers between soldiers on the ground and UAS - enabling integrated operations. The UAS must be a component of a highly synchronized, intricate collection of sensors and systems. The IHaVM will help the entire system of systems (human, computer, and organizations) do a better job of employing UAS assets as a part of the overall planning process and mission tasking architecture. There are a number of different ways that this can happen. Using BTRA and GeoBML tools to integrate UAS route planning into C2IEDM (Command & Control Information Exchange Data Model) creates an avenue to connect ISR components of the UAS to the ground movements of units, which could, for example, enable more timely observations of enemy positions and movements during an operation. IHaVM is also poised to be able to demonstrate how BTRA can be used to coordinate Intelligence, Surveillance, and Reconnaissance (ISR) assets, so instead of planning courses of action of individual components, the commander will have a landscape view of integrated components, allowing the MDMP to evolve. Furthermore, because of the value and demand for UAS, it is logical to anticipate greater numbers of UAS used in the future. This implies that there will be an even greater need to provide IHaVM to enable the complex planning and operation of UAV flights, with less human interaction.

Through GeoBML and the MDMP, the IHaVM component of BTRA will provide information products enabling improved and integrated flight planning of UAS, increasing the utility, responsiveness, and value of this important ISR asset.

CTIS/CMB/CGA/ J-GES Summit

By Jennifer Hanson

The Combat Terrain Information System (CTIS) program has many systems that consume and provide digital terrain data. Acquiring up-to-date data from NGA has always been a challenge. The Common Map Background (CMB) and the CJMTK Geospatial Appliance (CGA) are two possible solutions to address this problem. The CMB provides field users with geospatial data for their area of interest that they previous had to acquire, manage, and load/import from CD-ROMs provided by National Geospatial-Intelligence Agency (NGA). This data can be delivered to the field user on a firewire drive. The CGA is an appliance from Northrop Grumman (NG) TASC that provides effective, user friendly access to worldwide coverage of NGA geospatial products in application-ready formats to users on a network.

On 29 January 2008, there was a CTIS/CMB/CGA/J-GES summit at TEC hosted by the CTIS team and attended by representatives from CTIS, J-GES, USATEC Operations Division (OD), ESRI, and NG TASC. The focus of the summit was to learn about the CMB and CGA capabilities and if/how they could support the CTIS requirements. After briefings on the capabilities of the CMB and the CGA, it became clear that the devices performed differing functions. Below are some of the findings.

CMB

- The main strength is the ability to distribute large amounts of data in native NGA format
- Could be used by DTSS to load basic data into Common Topographic Operating Environment
- Data updates could be provided monthly by TEC OD
- The data updates would need to be managed in the field by the geospatial engineer.
- Provides raster data only
- Supports disconnected users

CGA

- Focuses on providing application ready data
- Supports native NGA formats, GDBs, and Web Services
- Manages NGA data updates automatically with little impact to the end user
- Synchronizes updates between all connected CGAs on network.
- Best for programs that need one or few servers to support many users
- No data download capability - server access only
- Provides raster and vector data
- Supports connected users

J-GES will investigate the value of each product to CTIS. A CGA will be loaned to the J-GES program for a short time period in the Spring of 2008. During that time, a CTIS system will be used to test the loading and use of data from both the CMB and the CGA.

Recent Events ...

BTRA BC:

Dec 07 - GeoBML Integration Event

Jan 08 - BTRA meeting and demonstration with TCM FBCB2

Jan 08 - BTRA demonstration to Portable Flight Planning Software Users

Feb 08 - GeoBML Integration Event

Feb 08 - Meeting with Army Warfighting Simulation (AWARS)

J-GES:

Phase I Image Server Experiment
Jan 08 — Tested the ability of the ArcGIS Image Server product to perform on-the-fly orthorectification and mosaicking of the U.S. Army's Buck-Eye high-resolution data

Feb 08 - J-GES synchronization/ replication presentation at the ESRI FedUC Executive Leadership Track

Feb 08 - Meeting with Warrior Transition Unit