



WSTIAC

WEAPON SYSTEMS TECHNOLOGY INFORMATION ANALYSIS CENTER



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Vehicle for Change - Army Combat Forces

by Andrus Viillu

Introduction

The U.S. Army is taking the lead within the Department of Defense in transforming its combat forces. At the center of this change is the Future Combat Systems (FCS) Organizational and Operational (O&O) concept for Units of Action (UAs) which revolutionizes how Army units will fight in future conflicts. At the heart of this revolutionary transformation are concepts that will enable commanders to make better informed and time sensitive decisions on the increasingly complex future battlefields. Both the flow of information and robust on-the-move communications network to coordinate and implement the Commander's decisions are essential components of the FCS concept. Of nearly equal importance is a revolution in how the UAs will fight. The concept requires an integrated capability to acquire and rapidly defeat enemy forces at standoff ranges 10s of kilometers away from supported maneuver elements, limiting casualties associated with intense direct fire battles. The UA operational tenants are finish the battle quickly, move rapidly to the next engagement, and substantially shorten the duration of the conflict.

In the midst of this revolutionary change, the U.S. Army more than any other service, is shouldering the nation's financial and operational burden of the Global War on Terror and the stability operations in Iraq. This current situation by default forces a balance of current operations versus revolutionary transformation envisioned within FCS. The commitment to revolutionary change within FCS was necessary to move the Army away from the "branch" bound traditions of the past. The near-term needs of the Army suggest a more evolutionary approach that introduces FCS capabilities into the current force in discrete increments, permits active duty units to develop the necessary tactics, techniques and procedures to incorporate the advanced technologies and, consequently, reduces the risk of fielding the full suite of FCS capabilities.

Continued on page 3





by Mr. Gary J. Gray

Ladies and Gentlemen:

I am pleased to have my former boss, Mr. Andrus Viilu, write this edition's feature article entitled "Vehicle for Change - Army Combat Forces".

Mr. Viilu is truly a world-renowned expert on this subject and the former Director for Land Warfare, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics from 1985 until 2003. In this key position, he had oversight of close combat, fire support, air defense, aviation, and combat support mission areas, where he had a major role in shaping multiple Army and Marine Corps programs. He possesses tremendous depth and breadth of the technical aspects of these systems, while understanding the warfighting contribution and cost effectiveness, as well. Mr. Viilu's expertise is still in great demand, as evidenced by his pivotal role in the recent Army Science Board study on Transformation.

Prior to assuming his position as Director for Land Warfare, Mr. Viilu held various private sector positions and that included advanced armor designs, intelligence projections, helicopter studies and joint field testing of Army and Air Force deep attack weapons. He also spent time in Viet Nam and Thailand during the war working to design, field and train combat units with advanced technology systems designed to attack, defend, gain intelligence and defeat insurgents.

In closing, I hope you gain a much broader perspective on the Army's transformation from Mr. Viilu's thoughts.

Gary

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Army Combat Forces...(Continued from page 1)

The Army has introduced the concept of Brigade Combat Teams (BCTs) as the basis for future force design, to facilitate the transition to FCS and, most important, to support on-going force deployments by expanding the base of rapidly deployable combat elements in the active force from 33 to 43 BCTs (both light and heavy combined) with an end state of 48 BCTs. The reserve component would be similarly restructured, and create an additional 35 BCTs.

The organizational structure of both light and heavy BCTs is somewhat similar to the FCS UA combined arms design. However, from a weapons platform and Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) standpoint, the BCTs are, of necessity, equipped with currently fielded systems. The first unit in the Army that will be restructured is the 3rd Infantry Division (Mechanized), with four BCTs formed under a previously three-brigade division. The next division to be restructured is the 101st Airmobile Division. As the Army executes this transformation, a critical issue is whether the BCTs can be enhanced with any capabilities that can both meet and integrate with current operations (Iraq) and also accelerate the Army's transition to UA/FCS. If affordable, cost-effective enhancements to a BCT could go a long way towards the Army's transformation, especially given that as far out as 2020, less than 20 percent of the total Army forces are projected to consist of FCS Units of Action.

New Threat Environment

The Army's future force design envisions an expeditionary force of BCTs that are more deployable, more self-sufficient and capable of controlling a significantly larger geographic area than current force brigades. Much like expeditionary U.S. Marine Corps combat units, BCTs will require greater, and much more integrated, support from the air. In reviewing lessons learned from Afghanistan and again in Iraq, it is clear that the Central Command made excellent use of air-delivered precision munitions, but unlike the days of pre-determined air strikes dictated by detailed air operations order (with inherent latency), a vast majority of aircraft in these engagements received target coordinates after they lifted off from airfields.

The interdependent character of expeditionary forces is further complicated by the nature of the threat encountered in stability operations. While the FCS Operational and Organizational (O&O) Concept discussed earlier focuses on mid-intensity combat, the immediate threat to current force units and BCTs are the terrorist tactics and Improvised Explosive Devices (IED) in Iraq. The threat in Iraq is pervasive with little notice of enemy preparation for battle. Firefights occur largely based on the enemy's initiative. The enemy adapts rapidly to take advantage of our vulnerabilities. The enemy attacks our support structure rather than our combat units. Enemy targets are often civilian targets, selected based on political rather than military considerations. The traditional concept of intelligence preparation of the battlefield and the consideration of likely enemy courses of action are frustrated by the clutter of civilian activity in large urban areas like Baghdad.

Many of the problems posed by stability operations in built-up areas extend beyond the standard operating procedures for BCTs on a mid-intensity battlefield and the span of control of a single BCT. When the 3rd Infantry Division rotates back to Baghdad, it will control 7 BCTs dispersed over an extended geographical region. In addition to the span of control, many of the capabilities required for stability operations are not necessarily central to the BCT organizational and operational concept. The ability to detect and track the movement of individuals 24 x 7, as an example, is not a core capability, although essential to protection of both troops and equipment in Iraq. The ability to rapidly and safely screen civilian vehicles is not a priority for combat operation, but certainly essential to current stability operations. Finally, the ability to set up a surveillance system along city streets is not supportable by either the engineer or signal components of a BCT.

Apart from the weapons platforms with their inherent fire power and intelligence capabilities, neither the BCT nor the FCS UA have focused and/or committed resources to improve the survivability of its non-combat elements within the combat service support units/structure that has already been curtailed to enhance deployability, which directly affects the sustainability of the entire force. Tactical trucks are not designed with ballistic protection or any features designed to minimize the effects of insurgent weapons (whether AK-47 assault rifles, "Rocket Propelled Grenade (RPG), hand grenade", improvised explosive devices or land mines). As a lesson learned that should not be repeated in the future UA/FCS transformation, the first combat units going into Iraq did not have the means to provide truck convoy protection with Armored Security Vehicles (designed by the Army to permit military police to provide a modest level of convoy protection) because the program had been cancelled in favor of the Stryker.

Continued on page 4



Finally, a major lesson in threat deterrence during stability operations is that we must capitalize on the use of Unmanned Aerial Vehicles (UAVs), which are particularly well suited to cost-effective surveillance over difficult terrain. While the Israeli Defense Forces continue to leverage the capabilities of UAVs to inhibit insurgent activities, the Air Force currently only supports a single continuous Predator A orbit in Iraq, even though 15 could be made available. This seems to suggest that either the Air Force is not as fully deployed as the U.S. Army or the U.S. Army is not organized to take advantage of persistent aerial surveillance for either border security or convoy route security, both of which are widely recognized deficiencies.

BCT Combat Effectiveness Enhancements

As discussed earlier, both the light and heavy BCTs will be initially fielded with current force equipment. The firepower of the BCTs is limited compared to current practices for brigade organization and deficient compared to the capabilities envisioned for the FCS UAs. As an example, the restructured BCTs will have either 16 towed 105mm howitzers or 16 self-propelled 155mm howitzers and some mortars for indirect fire support depending on whether it is a light or heavy BCT, respectively. Past practice has been to allocate one divisional artillery battalion to each brigade, which equates to 36 tubes of artillery in direct support.

In contrast, an FCS UA includes 24 self-propelled mortars with the precision guided mortar munitions, 60 multi-role direct fire cannon systems with a beyond line-of-sight fire capability with a terminal guided munition, 18 non-line-of-sight cannons with the Excalibur guided artillery round and 24 non-line-of-sight launch systems with the Precision Attack Munition (later also with the Loitering Attack Munition). In addition, there are four categories of unmanned aerial vehicles in an FCS UA (110 UAVs in three categories as of 2012) while the BCT would have two Raven UAV platoons (4 UAVs each) and a platoon of Shadow 200 UAVs at brigade level. FCS envisions armed unmanned ground vehicles (UGVs) that could help reduce casualties in the direct fire zone while near-term UGV technology offers the potential of some reconnaissance and logistics support for BCTs.

The most important difference between the restructured BCTs and the FCS UA is in their communication, command and control capabilities. The FCS architecture envisions a common operating environment where all users would have access to the data they need and can communicate effectively with the bandwidth and signal strength required, but efficiently managed to satisfy priority needs. The BCT will have SINCGARS radios and EPLRS nets that limit the area within which the brigade can operate and brigades have only limited capability for satellite links to national systems. The Force Battle Command Brigade and Below (FBCB2) system will permit the transmission of formatted messages through the existing communication links but is subject to significant latency problems when a large number of messages are routed through the net.

There are a number of technologies available in the near term that will facilitate this transition from the current force command, control and communication systems to the radically different system envisioned for FCS and, thus, assure the backward compatibility of FCS UA with current force BCTs. The first step could be to increase the reach and reliability of communication links. The Army can join the Air Force technology demonstration for the Joint Airborne Communication Node and expand BCT access to commercial L-band satellite with mobile ground stations and, subsequently, to Ka-band links with the Wide-band Gap Filler satellites, as steps toward the FCS multi-altitude communication system.

The Army has already invested in the Command Post of the Future (CPoF) with the 1st Cavalry Division in Iraq and is in the process of enhancing the capabilities of CPoF while fielding it with the 3rd Infantry Division as it rotates back to Iraq. The CPoF provides distributed planning, collaboration and digital mapping capabilities for the division and brigade level, and the capability will be subsequently made available down to the battalion level. With the help of Joint Blue Force Tracking and data provided by the Army Battle Command System (ABCS) (6.4 software), it is possible to begin to learn how the FCS command and control system should function. The transition to the FCS System of Systems Common Operating Environment should be similarly managed by integrating some FCS software in BCTs, including the Task Integration Network, and service enabling some ABCS applications and taking maximum advantage of commercial off-the-shelf software for E-mail, file sharing, instant messaging and web meetings.

To provide the proper learning environment for the transitional steps toward FCS command and control capability, it is necessary to build on existing simulation facilities like the combination training and simulation facility at Ft. Hood. There



is no better measure (short of war) of the effectiveness of unit command and control than the quality and the timelines of command decisions made under the stress of the controlled simulation environment.

Similarly, the Army needs to work out the tactics, techniques and procedures for the employment of the full spectrum of FCS precision munitions. As the initial step, the Army and Air Force need to come to a common understanding how precision munitions will be used to support combat operations on the future battlefield. The combat experiences of Afghanistan and Iraq, although successful, do not appear to be sufficient. The Air Force has used the DPPDB terrain data to deliver GPS guided munitions against stationary targets. It is evident that the UTM grid is not adequate for delivery of GPS guided munitions (note variance to local datum on map sheets), especially for the much smaller GPS guided warheads fielded by the Army. One near-term approach could be to use precision delivered marking rounds to align the photo images of the target area with GPS coordinates.

The Secretary of Defense has testified to Congress that the Army is two decades behind the Air Force in employment of GPS guided precision munitions, and recent Army statements that the Army cannot afford to train with precision munitions because of their cost sounds like the same complaint made 30 years ago when recoilless rifles were being replaced by TOW and Dragon anti-tank guided missiles. The problem is less with the cost of precision munitions than the lack of doctrine and planning procedures for the effective integration of precision munitions into combat operations. The precise location of targets and the digital transfer of target coordinates, along with the criteria for employing a particular munition and fuze against the selected target, in the close proximity to friendly troops (or non-combatants) are more important than the Terminal Trajectory of the guided munition, although that can also become important in a built-up area. Joint Service exercises with guided rounds are needed to overcome the institutional inertia to adapting combat operations planning to take full advantage of joint precision munitions delivery capabilities and assure that Service munitions acquisition plans support warfighter needs.

Additional Force Development Needs

There are a number of transformational force development needs that go beyond the mid-intensity warfare focus of BCTs and the FCS UA. While UAVs are viewed as one of the principal means for precise location of targets, and thereby enabling the delivery of precision munitions beyond line-of-sight of maneuver units, the function UAVs need to perform in support of stability operations are quite different. Looking through an optical soda straw for targets, within an area selected based on other intelligence, is not the same task as persistent surveillance of large geographic areas or extended national borders. It requires different platform and sensor characteristics and a different output than precise target location. In order to track the movement of individuals or small groups, the platform needs to be elevated and stationary and mount a radar sensor capable of detecting movement of low velocity objects. In addition, techniques such as tagging may be needed to distinguish insurgent activity from the background of civilian traffic. Storage of surveillance imaging is needed to trace insurgent movement before and after incidents and change detection is helpful in discovery of ambushes and improvised explosive devices. These techniques, although technically feasible, do not readily conform to brigade-level combat unit-operating patterns.

Similarly, the combat support and combat service support components of the brigade are not designed to operate in a front-line environment. The Army acquires tactical trucks for equipment and personnel transport and, while some trucks may have a requirement for off-road mobility, there has not been a requirement for vehicle survivability when attacked with light infantry weapons. Even soldier's personal weapons like the M-16 or M-4 are difficult to operate from inside a truck cab or a seat within a HMMWV because the weapons are too large. Tactical vehicles, when upgraded with ballistic protection, lose payload, lack durability and safety because the protection system is top heavy and leads to rollover. Trucks operating in the combat zone must be designed to be upgradeable in their ballistic protection as dictated by the threat. Additional payload capability, along with attach points for the ballistic protection, must be designed into the vehicles. The submachine gun version of the XM-8 could be a good weapon for vehicle crews. The Armored Security Vehicle was designed for the military police with some of the needed ballistic protection and on-road mobility characteristics to escort convoys, but has only recently been funded for deployment in Iraq.

One final goal of Army transformation is operational mobility of FCS UAs based on vertical lift of the combat elements in a configuration that is ready to fight. The value of such a capability was demonstrated during Desert Storm by the 101st Airmobile Division by its ability to lift light infantry into battle. The technology is available to lift FCS UAs into battle under "high, hot" conditions but it is bulky and expensive. It is not likely that the Department of Defense can afford the needed fleet of aircraft until the scheduled replacement of the C-130 fleet in 2018.

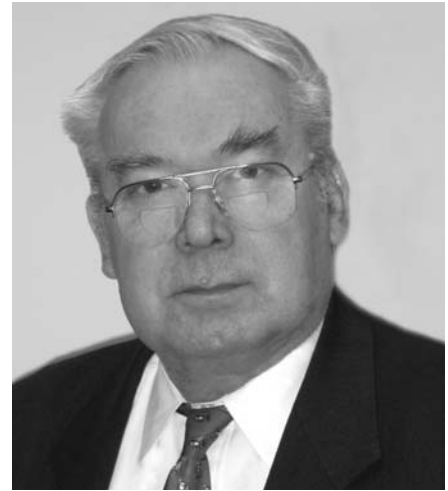


Summary

- The Army needs an integrated strategy for upgrading BCTs and reducing the risk of fielding FCS UAs.
- The Army must balance the force development needs imposed by stability operations and mid-intensity combat. One is not a subset of the other; the BCTs must be tailorable.
- Finally, while development of interdependent joint combat capabilities is essential, it should not obscure the need to fully integrate sensor and weapon delivery capabilities. The armed Predator A is an example, as is the AC-130 gunship. The ability to transmit Predator A video to the AC-130 has been useful. The fundamental rationale for forward observers can be altered if the video of the target area and Blue Force Tracking can be shared at the fire direction center. Technology is also available for a platoon engaged in urban warfare to launch its own sensor and weapon combination as the need arises, rather than wait for external support. ♦

ABOUT THE AUTHOR

Andrus Viilu is a WSTIAC Subject Matter Expert for land warfare and related technologies. He has recently retired from the Office of the Under Secretary of Defense (Acquisition, Technology and Logistics), where he served as Director of Land Warfare. In this capacity, he maintained management oversight of close combat, fire support, air defense, Army aviation and combat support mission areas. He managed milestone decision reviews for major land warfare weapon systems, participated in program budget decisions and contributed to defense guidance and the military services' five-year plans. In the past, he was Vice President at Aeronautical Research Associates of Princeton, a member of the research staff of the Systems Evaluation Division at the Institute for Defense Analyses and director of Tactical Weapons Technology at The System Planning Corporation. He holds a B.S. in Aeronautical Engineering from MIT and a Masters degree in Applied Mathematics from the University of California.



Class I Unmanned Aerial Vehicle



Medical Vehicle



Multifunctional Utility/Logistics and Equipment (MULE) Vehicle

Future Combat System

Photos courtesy of the U.S. Army



Non-Line-Of-Site Mortar (NLOS-M)



Recovery and Maintenance Vehicle (FRMV)

Col (Ret) Mark Jones Joins WSTIAC Staff

WSTIAC is pleased to introduce Col (Ret) Mark Jones who joined the WSTIAC technical staff in September 2004. His expertise includes systems acquisition, research & development, strategic planning and business case analysis spanning command and control systems, force protection, power generation, information technology and distance learning.

Colonel Jones was born in Pensacola, Florida, on May 12, 1956. He graduated from West Point and was commissioned a second lieutenant in the Field Artillery in 1978.

He has held a wide variety of military assignments to include Fire Direction Officer and Battery Executive Officer in III Corps, 2nd Battalion 12th Field Artillery; Operations and Maintenance Officer in the 558th United States Army Artillery Group, Drama, Greece; Commander, HHB, 5th Battalion, 29th Field Artillery, 4th ID; and, Battalion/Brigade Fire Support Officer in support of the 1st Mechanized Infantry Brigade, 4th ID.



Colonel Jones' first acquisition assignment was as the Contingency Contracting Officer for the 7th Transportation Group. He subsequently served as the Operations Officer and Material Acquisition Management Officer for the Army Training Support Center; Executive Officer to the Program Executive Officer for Command, Control & Communications Systems; Assistant PM-Test for Project Manager Maneuver Control System at Fort Monmouth, NJ, and Chief, Acquisition Proponency Branch in the Pentagon. He was then selected as the Product Manager, Defense Information Systems Network CONUS and later as the Product Manager, DoD Metropolitan Area Network, both with the Defense Information Systems Agency. Colonel Jones' assignment prior to PM MEP was as the Director, Aviation & IEW systems in ASA(ALT).

Colonel Jones holds an undergraduate degree in engineering from the United States Military Academy at West Point, a master of business degree from the Florida Institute of Technology, and a master of resource management from the Industrial College of the Armed Forces.

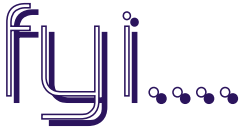
His military education includes the normal military officer schools, the Greek Language School at the Presidio of Monterey California, the Project Managers Course at the Defense Systems Management College, and the Senior Service College.

Colonel Jones' awards include the Legion of Merit, Defense Meritorious Service Medal, the Meritorious Service Medal with 3 OLC, Army Commendation Medal with OLC, Army Achievement Medal, Humanitarian Service Medal, the Parachute Badge and the Army Staff Badge.

Colonel Jones is married to the former Doris M. Wilson of Atlanta, GA. They have two children and reside in Prince William County, Virginia. ♦

From all of us at WSTIAC...

Best Wishes
for a Happy Holiday



Publications of interest

Recent NDIA conference proceedings

Precision Strike Technology Symposium
Accelerating Joint & Coalition Technology Advances for Precision Strike
12-14 October 2004
<http://www.dtic.mil/ndia/>

Precision Strike Summer PEO Forum
Balancing Precision Strike for the Joint Force Commander across Asymmetric Battlefield
7-8 July 2004
<http://www.dtic.mil/ndia/>

International Armaments Technology Symposium & Exhibition
June 14-16, 2004
<http://www.dtic.mil/ndia/>

Center for Strategic and International Studies

IRAQ Briefing book: War and postwar analysis
There are a large number of full text reports on such topics as Post-War Iraq, The Lessons of War, Iraqi Order of Battle, The Cost of War, Iraq and the War on Terrorism, at: <http://www.csis.org/features/iraq.cfm>

A few titles of interest include:
Low Intensity Conflict and Nation-Building in Iraq: A Chronology - Stephen Lanier November 12, 2004
Iraq, Afghanistan, and the Lessons of Recent Conflicts in the Middle East - Anthony H. Cordesman October 21, 2004
Iraq War Note: The Changing Role of Airpower - Anthony Cordesman April 05, 2003
Iraq War Note: The True Nature of Urban Warfare - Anthony Cordesman March 30, 2003

Managing to Survive in Washington
Norman R. Augustine Foreword by Sam Nunn
With each presidential transition in Washington, a host of capable individuals are drawn from the private sector, academia, and the nonprofit world to assume critical positions in government. The transition, however, is not nearly as straightforward and efficient as many new officials would hope it to be. Although the institutions and processes underpinning government can and do benefit from the skills and experiences gained from other disciplines, the reality is that management in government often bears little resemblance to management in other areas.

National Academy of Sciences

The Engineer of 2020:
Visions of Engineering in the New Century

To help maintain the nation's economic competitiveness and improve the quality of life of the world's population, engineering education in the United States must anticipate and adapt to dramatic changes in engineering practice in the coming decades. The report recommends ways to improve engineers' training and prepare them for the complex technical, social and ethical questions raised by emerging technologies.
<http://www.nap.edu/catalog/10999.html>

Meeting the Energy Needs of Future Warriors 2004
The central characteristic of the evolution of the combat soldier in recent years is an increasingly sophisticated array of sensing, communications, and related electronics for use in battlefield situations. The most critical factor for maintaining this evolution will be the development of power supply systems capable of operating those electronics effectively for missions up to 72 hours long. To address the challenge, it is important that new approaches be sought on how to integrate and power these electronics. To assist in addressing this problem, the Army requested the National Research Council to review the state-of-the-art and to recommend technologies that will support the rapid development of effective power systems for the future warrior. This report presents the results of that review. It provides an assessment of various technology options for different power level requirements, power system design, and soldier energy sinks. The report also describes future design concepts, focusing on low-power systems. Recommendations for technology development and system design are presented.
<http://www.nap.edu/catalog/11065.htm>

Army Science and Technology for Homeland Security: Report 2—C4ISR (BAST)
Shortly after the events of September 11, 2001, the U.S. Army asked the National Research Council (NRC) for a series of reports on how science and technology could assist the Army meet its Homeland defense obligations. The first report presented a survey of a road range of technologies and recommended applying Future Force technologies to homeland security wherever possible. In particular, the report noted that the Army should play a major role in providing emergency command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) capabilities and that the technology and architecture needed for homeland security C4ISR was compatible with that of the Army's Future Force. This second report focuses on C4ISR and how it can facilitate the Army's efforts to assist the Department of Homeland Security (DHS) and emergency responders meet a catastrophic event.

in the news...

Weapon System Effectiveness Call for Papers

The American Institute of Aeronautics and Astronautics (AIAA) National Forum on Weapon System Effectiveness is a biennial event dedicated to promoting and sharing knowledge about the complex nature of modern weapon systems. The 4th Forum has been scheduled for 18 - 20 October 2005 and will be hosted by the Institute for Advanced Technology in Austin, Texas. Technical paper abstracts are being solicited now for presentation at the meeting.

The key objective of the 2005 Forum will be addressing the themes of major weapon systems, test and evaluation, performance analysis, and future systems, with particular emphasis on:

- Challenges, threats, experiences, and lessons learned with current weapon systems
- Future challenges and future weapon systems
- Emerging weapon system technologies
- Weapon system effectiveness methodologies

This CLASSIFIED event is structured to provide maximum opportunities for technical experts and government leaders interested in the technologies and applications associated with weapon systems to meet at an outstanding event that provides a review of the state of the art across a broad spectrum of disciplines, as well as a forward-looking series of invited presentations concerning future challenges.

Submission of UNCLASSIFIED Abstracts

Authors are invited to submit UNCLASSIFIED abstracts that describe the objectives and content of proposed final presentations on any of the conference themes, topics, or additional topics that relate to weapon systems effectiveness. Final presentations may be classified up to SECRET. Each abstract submitted will be assessed for relevance to the Forum themes and to the advancement of weapon systems effectiveness discipline. Technical papers will be evaluated for depth and the degree to which results are shown.

This event is CLASSIFIED and includes presentation and discussion of both classified and unclassified papers.

Categories and Topics

Major weapon programs, including future weapon systems
Weapon system performance analysis and measures of system effectiveness

- Weapon system test, evaluation, and training
- New advances in weapon system technologies
- WMD threat and negation issues
- Directed energy weapon systems
- Kinetic and chemical energy weapon systems
- Non-lethal weapon systems
- Robotic and unmanned weapon systems
- Sensors, target acquisition, battle damage assessment
- Network-centric operations

All abstracts must be UNCLASSIFIED and cleared for public release with unlimited distribution. Authors are reminded that technology transfer guidelines have substantially extended the time required for reviews. All reviews are the responsibility of the author.

Abstracts should be limited to 750 words.

Abstracts must be submitted no later than 28 February 2005.

Authors will be notified of paper acceptance by 18 March 2005.

AIAA will not consider any paper that has been presented or published or that is currently under consideration for presentation or publication elsewhere.

Submit abstracts online at: www.aiaa.org/
(Click on "Conferences & Events")

Questions?

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Planning a Conference or Seminar?

WSTIAC can assist with technical support:

- Call for papers
- Local arrangements
- Registration
- Exhibits, receptions
- Announcements
- Author kits/paper selection
- Security, meals, transport
- Proceedings

news... (cont)

Improvised Explosive Devices

As the Marine Corps look for answers to the deadly dangers of improvised explosive devices in Iraq, and the Navy seeks to protect ships from sea mines and anti-ship missiles, the Office of Naval Research is exploring radically new approaches to designing metals that could lead to effective blast shielding for military units—and protection for civilian targets against terrorist attack.

In an effort prompted in part by the October 2000 terrorist attack on the Navy destroyer USS Cole in Yemen that killed 17 Navy personnel, ONR's Engineering, Materials, and Physical Science division is sponsoring pioneering work at Northwestern University. A team of crack engineering students that calls itself Team BlasTruss is being led by veteran metallurgist Greg Olson to develop "recipes," or toolboxes for the design of super-hard steels.

ONR program manager Julie Christodoulou explains that metals aren't monolithic substances, but vary widely in composition and structure. Different types of steels are composed of crystal-like "micro-structures" that are neither uniform nor homogenous. Metallurgists typically develop new types of steel and other metals through trial-and-error by combining, for example, percentages of certain steels, nickel, and other known metals to produce the desired degree of strength, endurance, and other characteristics.

That approach works backward from the structural level to determine the usable combinations of materials for desired applications. Instead, Northwestern's Team BlasTruss first identifies the desired characteristics of the steel. It then looks at elementary molecular-level composition of materials in order to determine the optimal mix of metallic ingredients needed to meet Navy requirements.

The BlasTruss team used available research data on metals to identify and demonstrate the performance of a new metal, designated BlastAlloy-160, for use in fabrication of a folded-plate truss, a blast-resistant steel structure that could be used in construction of a rugged vehicle such as the commercial Hummer, as well as a safe room, trash receptacle, and a Boeing 747 cargo bay. The team also has looked at the potential for using BA-160 for a blast-resistant luggage rack for trains that would protect passengers from the kind of blast that killed many of the victims of the Madrid bomb attack of March 11, Christodoulou says.

Office of Naval Research Public Affairs For additional information contact Ed Walsh, 703-588-1010 or email: Edward_Walsh@onr.navy.mil.

Airborne Laser Achieves "First Light"

The U.S. Missile Defense Agency (MDA) announced that it completed a test on November 10 that successfully fired all six modules of the megawatt-class Chemical Oxygen Iodine Laser (COIL) for the Airborne Laser, a landmark achievement in the development of a directed energy system that will be mounted aboard a modified Boeing 747 aircraft and when deployed will provide a capability to destroy a hostile ballistic missile soon after it is launched, in the "boost" phase of flight.

The test, internally called "First Light," lasted only a fraction of a second and was conducted in a special laser research, development and testing facility in the ABL section of Edwards Air Force Base, Calif. It was the first time that multiple modules of the powerful laser had ever been fired while linked together as a single unit.

In the test, the laser light produced by the six modules was fired into a wall of metal called a calorimeter or beam dump. The temperature rise of the metal was used to validate that laser power was generated.

While the COIL lasers were being tested in the special lab, the ABL aircraft, YAL-1A, was parked nearby preparing for its own major test – a return to flight for the first time in almost two years. It was taken out of service in December 2002 for modifications to the airframe and the installation of the complex laser beam control system.

Initially, only the passive sensors of the beam control system will be tested. The ABL Track Illuminator Laser (TILL) and Beacon Illuminator Laser (BILL) will be installed early next year and the full beam control system will be tested in flight. After completion of additional tests, the COIL will be installed on the flight test aircraft. Ground and flight tests of ABL will continue, and planning is now underway to incorporate the laser system in a test that will include shooting down a ballistic missile over the Pacific Ocean. No date has been set for the test.

Missile Defense Agency Office of Public Affairs
For additional information contact: Ken Englade, ABL
Public Affairs – 505-846-7681

DTIC Administrator Kurt Molholm retires

During his 20-year tenure as Administrator, he has been very active in the scientific and technical information community and has received numerous professional awards and honors.

Directed Energy Weapons Course

Instructor: Dr. Edward Scannell, WSTIAC

Location: Huntsville, Alabama
 24 February, 18 May, 10 August, 16 November 2005

Course Description:

This one-day classified short course provides an introduction to the basic principles and techniques of Directed Energy Weapons (DEWs). The technologies behind each type of DEW will be examined, and the critical path components will be identified and explored with respect to their effect on future DEW development. In addition, advantages that can be achieved by employing DEWs will be discussed, as well as the status of U.S. and foreign DE developments and deployments. The key DEW programs in High Energy Lasers and RF-DEWs or High Power Microwaves will be fully described.

This short course will be of great benefit to people who need to understand the basic concepts, technologies, design requirements and practical applications of DEWs, including program and business managers, political decision makers, engineers, scientific researchers and military personnel. An undergraduate technical degree is recommended. Mathematics is kept to a minimum, but important formulas are introduced.

Questions to be examined include:

- What is Directed Energy and what are the different types of Directed Energy Weapons?
- What are the advantages and disadvantages of each type of DEW and what are their target effects and tactical and strategic capabilities?
- How do DEWs work and what are the critical technologies that must be developed for their eventual use in practical systems?
- How may threat DEW effects be countered and how can we protect our own systems?
- What are the major U.S. and international DEW programs that are being pursued?
- What is the prognosis for future DEW development?

About the Instructor:

Dr. Edward Scannell is the Senior Program Manager of the Engineering & Technical Division, Chief Scientist for WSTIAC, and formerly Chief of the Directed Energy and Power Generation Division of the U.S. Army Research Laboratory. He has 30 years of experience in technical areas related to DEWs, including: plasma physics; conventional and alternative energy sources, electromagnetic (EM) guns, particle beam, laser, high power microwave (HPM), and pulse power physics.

Security Classification:

The information presented is kept at the unclassified level, but is designated export controlled and limited to U.S. citizens only. The security classification of this course is UNCLASSIFIED.

Training at Your Location:

WSTIAC can conduct this course at your location to reduce your travel time and cost. Please call Mrs. Kelly Hopkins to discuss.

Fee:

\$700.00 for government personnel; \$800.00 for government contractors.

Handout Material:

Each student will receive a comprehensive set of course notes covering the material presented.

For additional information, contact:

Mrs. Kelly Hopkins, Seminar Administrator,
 at (256) 382-4747, or by e-mail
khopkins@alionscience.com

Notice: WSTIAC reserves the right to cancel and/or change the course schedule and/or instructor for any reason. In the event of a schedule change or cancellation, registered participants will be individually informed.

Introduction to Sensors and Seekers for Smart Munitions and Weapons Course

Instructor: Mr Paul Kisatsky, WSTIAC

Location: Huntsville, Alabama

19-21 April, 7-9 June, 18-20 October, 6-8 December 2005

Course Description:

This 3-day short course provides an introduction to the most commonly used sensors and seekers employed in smart munitions and weapons (projectiles, missiles and wide area mines). It is oriented to managers, engineers, and scientists who are engaged in smart weapons program development and who desire to obtain a deeper understanding of the sensors they must deal with, but who do not need to personally design or analyze them in depth. An undergraduate technical degree is recommended. Mathematics is kept to a minimum, but important formulas are introduced. This course also provides an excellent foundation for those scientists and engineers who desire to pursue this discipline to intermediate and advanced levels.

The course covers:

- Classification of seekers and sensors
- Fundamentals of waves and propagation
- Fundamentals of noise and clutter
- Fundamentals of search footprints
- Introduction to infrared
- Introduction to radar
- Introduction to ladar
- Introduction to visionics
- Introduction to acoustics
- Future projections and interactive brainstorming

Noise and clutter, the predominant obstacles to success in autonomous seekers, are given emphasis. The major sensor types are classified and each is discussed. In particular, infrared, radar, optical laser radar (ladar), imaging and non-imaging, and acoustic sensors are individually covered. Of special interest is the discussion on human visionics versus machine recognition, since this concept is of central importance to understanding autonomous versus man-in-the-loop sensing systems. The implications of "artificial intelligence", "data fusion", and "multi-mode"

sensors are also briefly discussed. System constraints, which force tradeoffs in sensor design and in ultimate performance, are also covered. Time permitting, a projection of future trends in the role of sensors for smart munitions will be presented, followed by a "brain-storming" session to solicit student views.

About the Instructor:

Mr. Paul Kisatsky is a Senior Physical Scientist. He is a nationally recognized expert on sensors and seekers for smart munitions and weapons and has more than 30 years of hands-on experience developing sensors and seekers fielded in modern smart munitions and weapons.

Security Classification:

This course is unclassified.

Training at Your Location:

WSTIAC can conduct this course at your location to reduce your travel time and cost. Please call Mrs. Kelly Hopkins to discuss.

Fee:

The registration fee for this 3-day course is \$950 for U.S. government personnel and \$1150 for government contractors. Contractor teams of 3 or more, registered at the same time, are charged \$950 per person.

Handout Material:

Each student will receive a comprehensive set of course notes covering the material presented.

For additional information, contact:

Mrs. Kelly Hopkins, Seminar Administrator,
at (256) 382-4747, or by e-mail
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Weaponeeing Course

Instructor: Professor Morris Driels, US Naval Postgraduate School

Location: Huntsville, Alabama
29-31 March, 21-22 June, 4-6 October, 29 November - 1 December 2005

Course Description:

This 2½-day short course is based on a very successful graduate-level weaponeeing course developed by Professor Driels and taught at the Naval Postgraduate School(NPS), Monterey, CA. The course will provide an overview of the fundamentals of the weaponeeing process and its application to air-to-surface and surface-to-surface engagements. The course explains the analytical basis of current weaponeeing tools known as the Joint Munitions Effectiveness Manuals (JMEMs) produced by the Joint Technical Coordinating Group for Munitions Effectiveness (JTTCG/ME). The JMEMs are used by all Services to plan offensive missions and allow the planners to predict the effectiveness of selected weapon systems against a variety of targets.

The short course is divided into three parts.

Part I covers the basic tools and methods used in weaponeeing:

- The weaponeeing process
- Elementary statistical methods
- Weapon trajectory
- Delivery accuracy of guided and unguided munitions
- Target vulnerability assessment

Part II covers the weaponeeing process for air-launched weapons against ground targets:

- Single weapons directed against point and area targets
- Stick deliveries (point and area targets)
- Projectiles (guns and rockets)
- Cluster munitions
- Weaponeeing for specific targets: bridges, buildings, etc.)
- Collateral damage modeling

Part III covers the weaponeeing process for ground engagements:

- Indirect fire systems - artillery and mortars.
- Direct fire systems - infantry and armored vehicles.
- Mines - land and sea.

About the Instructor:

Professor Driels is a Professor of Mechanical Engineering at the U.S. Naval Postgraduate School in Monterey, California. He has worked with the JTTCG/ME on a variety of topics in support of the JMEMs for a number of years. He has taught a quarter-long weaponeeing course at NPS for three years and he has published a textbook on the subject.

Security Classification:

The security classification of this course is UNCLASSIFIED.

Training at Your Location:

WSTIAC can conduct this course at your location to reduce your travel time and cost. Please call Mrs. Kelly Hopkins to discuss.

Fee:

The registration fee for this 2½-day course is \$950 for U.S. government personnel and \$1150 for government contractors. Contractor teams of 3 or more, registered at the same time, are charged \$950 per person.

Handout Material:

Each student will receive a comprehensive set of course notes covering the material presented.

For additional information, contact:

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 at (256) 382-4747, or by e-mail
 khopkins@alionscience.com

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Smart/Precision Weapons Course

Instructors: Mr. Hunter Chockley and Mr. Mark Scott, WSTIAC

Location: Huntsville, Alabama

1-3 March, 24-26 May, 26-28 July, 13-15 September, 1-3 November 2005

Course Description:

This 2½-day short course provides a comprehensive understanding of smart weapons and related technologies. This course is aimed at providing general knowledge about smart weapons technology and a source of current information on selected U.S. and foreign smart weapons, to include system description, concept of employment, performance characteristics, effectiveness and program status.

A variety of ground, sea and air smart/precision weapon systems are discussed, to include fielded and/or developmental U.S. systems such as Joint Direct Attack Munition (JDAM), Joint Air-to-Surface Standoff Missile (JASSM), Small Diameter Bomb, Javelin, Line-of-Sight Anti-Tank (LOSAT), XM982 Excaliber, Extended Range Guided Munition (ERGM), Common Missile, Tomahawk, Standoff Land Attack Missile - Expanded Response (SLAM-ER), Cluster Bomb Munitions and Airborne Laser, among others, as well as representative foreign smart/precision weapons.

The objective of this course is to inform materiel and combat developers, systems analysts, scientists, engineers, managers and business developers about smart/precision weapons, to include:

- State-of-the-art of representative U.S. and foreign smart weapons systems;
- Employment concepts
- Smart weapons related systems, subsystems, and technologies; and
- Technology trends.

About the Instructors:

Mr. Mark Scott and Mr. Hunter Chockley are Science Advisors. Each instructor has more than 25 years of experience with weapons technology and/or smart/precision weapons.

Security Classification:

The information presented is kept at the unclassified level, but is designated FOR OFFICIAL USE ONLY (FOUO), export controlled, and attendance is limited to U.S. citizens. The security classification of this course is UNCLASSIFIED.

Training at Your Location:

WSTIAC can conduct this course at your location to reduce your travel time and cost. Please call Mrs. Kelly Hopkins to discuss.

Fee:

The registration fee for this 2½-day course is \$950 for U.S. government personnel and \$1150 for government contractors. Contractor teams of 3 or more, registered at the same time, are charged \$950 per person.

Handout Material:

Each student will receive a comprehensive set of course notes covering the material presented.

For additional information, contact:

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Calendar of Events

Upcoming Conferences and Courses

January 2005

5-7 January 2005
AUSA Aviation Symposium & Exhibition
Arlington, VA
703-907-2687 emannig@ausa.org
<https://www.ausa.org/www/ia.nsf>

24-26 January 2005
Institute of Navigation 2005 National Technical Meeting
San Diego, CA
<http://www.ion.org>

26-27 January 2005
Network Centric Warfare 2005
Washington, DC
<http://www.idga.org/cgi-bin/templates/document.html?topic=329&event=5517&document=44407>

30 January-3 February 2005
MEMS 2005
8th IEEE International Conference on
Micro Electro Mechanical Systems
Miami Beach, FL
<http://www.mems2005.org/>

February 2005

1-2 February 2005
Tactical Power Sources Summit
Fueling the Future Force
Arlington, VA
<http://www.idga.org/cgi-bin/templates/genevent.html?topic=329&event=5878>
&

2-4 February 2005
16th Annual NDIA SO/LIC Symposium & Exhibition
Washington, DC
asaliski@ndia.org
http://register.ndia.org/interview/register.ndia?PID=Brochure&SID=_1E30UNHS1&MID=5880

6-8 February 2005
2005 Tactical Wheeled Vehicles Conference
Monterey, CA
adekleine@ndia.org
http://register.ndia.org/interview/register.ndia?PID=Brochure&SID=_1E30UNHS1&MID=5530

February 2005

9-10 February 2005
NAWWAR Conference
Melbourne, FL
Conference Classification SECRET
http://www.crows.org/EVENTS/2005/020905_NAVWAR/05NAWWAR_Preview.htm

9-11 February 2005
2005 Munitions Executive Summit
Washington, DC
cohara@ndia.org
http://register.ndia.org/interview/register.ndia?PID=Brochure&SID=_1E30UNHS1&MID=5650

23 February 2005
Technical Support Working Group APBI
Washington, DC
mdowd@ndia.org
http://register.ndia.org/interview/register.ndia?PID=Brochure&SID=_1E30UNHS1&MID=5090

March 2005

14-17 March 2005
Third Directed Energy Modeling & Simulation
Conference
Tampa, FL
<http://www.deps.org/>

15-16 March 2005
Military Technologies Conference
Evolving technologies driving military transformation
Boston, MA
E-mail: lgovern@pennwell.com
<http://mtc05.events.pennnet.com/>

15-18 March 2005
Second Annual High Energy Laser Lethality Conference
Tampa, FL
<http://www.deps.org/>

22-23 March 2005
UAV Summit: Combat & Micro
Washington, DC
<http://www.iqpc.com/cgi-bin/templates/singlecell.html?topic=222&event=6250>



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