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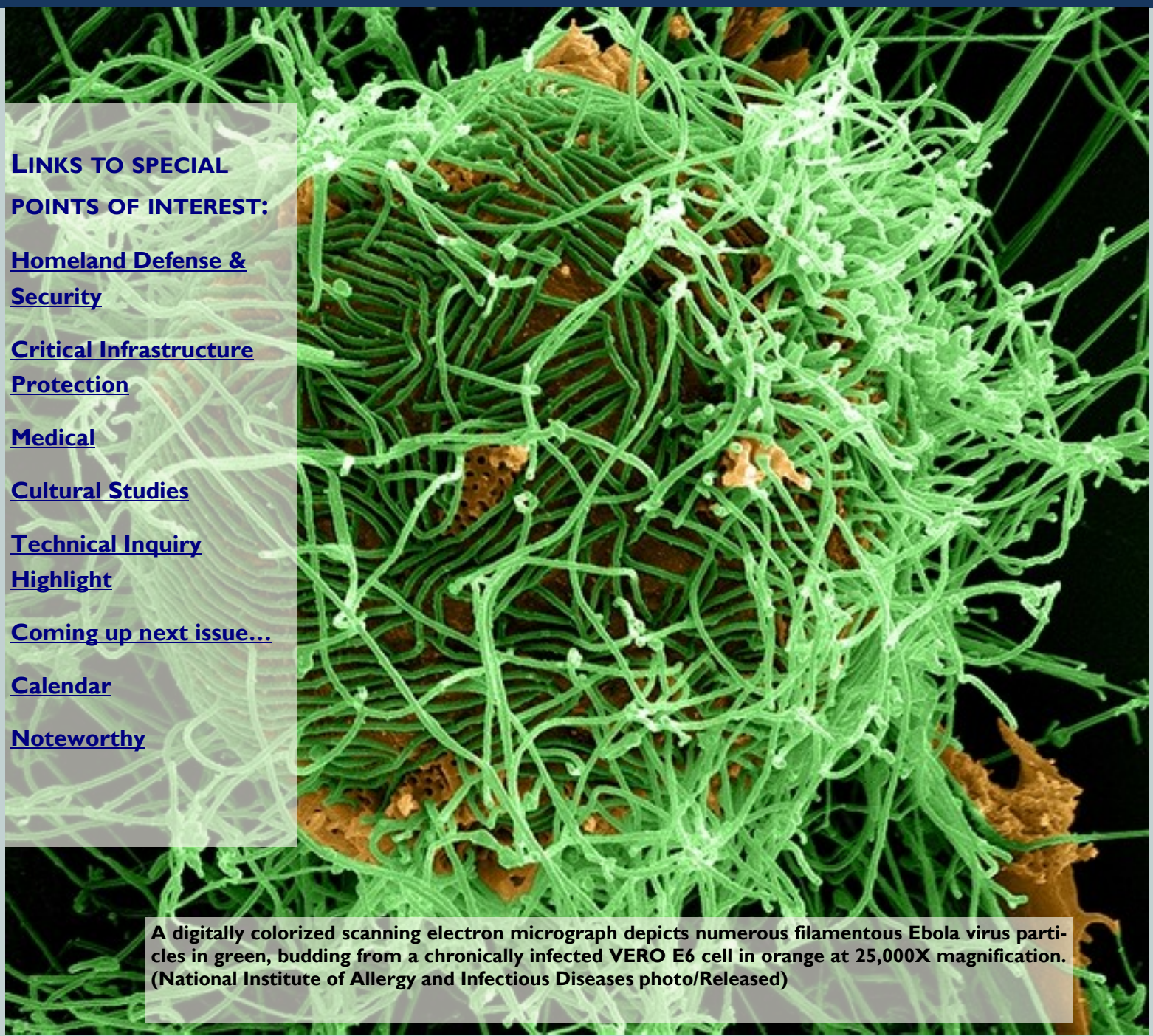

LINKS TO SPECIAL POINTS OF INTEREST:

A digitally colorized scanning electron micrograph depicts numerous filamentous Ebola virus particles in green, budding from a chronically infected VERO E6 cell in orange at 25,000X magnification. (National Institute of Allergy and Infectious Diseases photo/Released)

HDIAC Journal

Volume 1, Issue 4

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About This Publication: The Journal of the Homeland Defense and Security Information Analysis Center (HDIAC) is published quarterly by the HDIAC staff. The HDIAC is a DoD sponsored Information Analysis Center (IAC) with policy oversight provided by the Assistant Secretary of Defense for Research and Engineering (ASD(R&E)), and it is administratively managed by the Defense Technical Information Center (DTIC). The HDIAC is operated by Information International Associates (IIa) in Oak Ridge, TN.

Advances in Explosive Trace Detection Technology

G. Callender

July 2014 saw the widespread reporting of new explosives developed by radical extremist groups to target commercial aviation. Most significantly, this plot was based around a 'new' explosive that extremist groups claimed was undetectable to current screening measures. [1] Ongoing media reports talk of Yemen-based, radical jihadists developing new bombs: non-metallic, liquid, low-vapor explosives built into electronic smart devices or surgically implanted.

Aviation remains the obvious target, and commercial airliner targeting has been described by experts as an al-Qaeda 'obsession.' [2] Not only is the potential destruction of a commercial aircraft an extremely high profile event that attracts worldwide publicity, but blowing a hole in an aircraft fuselage, causing the aircraft to breakup through rapid decompression, only requires a small explosive device. [3]

The Reality

Current intelligence processes and security measures have halted most terrorist bomb attacks on the aviation industry before they progress to anywhere near execution, with some obvious exceptions. This prompts the question, "How are terrorists such as Umar Farouk Abdulmutallab, the 2009 'underwear bomber,' able to move explosives through airport security screening undetected?" Additionally, why are seemingly ad hoc, short notice security measures, such as inspections of electronic devices, pat downs and banning of liquids, required on many flights even though explosive trace detection technology is being employed throughout airports worldwide?

The simple answer is that while current explosive trace detection units are good for detecting most military and organic explosives, they do not detect inorganic and peroxide-based explosives well. There is not currently a silver bullet in commercially available explosive trace detection units that can identify all potential explosives used by terrorists.

Recently, a team at the University of Tasmania in Australia developed leading technology innovation for the next generation of explosive trace detection equipment. The team developed technology that can identify military and commercial grade explosives and both inorganic and peroxide molecules found in many 'home-made' explosives. The key breakthrough of this technology is its ability to accurately and consistently detect trace quantities of inorganic explosives within 60 seconds - a world first for trace detection technology.

Current Situation

It is widely acknowledged that the greatest terrorism threat to homeland security in western countries in the coming years is posed by foreign fighters returning from conflicts such as those currently occurring in Syria and Iraq. These hardened extremists will bring hardline beliefs and training in fabricating and employing explosives to achieve maximum effect with them.

It is likely many of these returning fighters will have had training in devices designed to avoid detection. They may have had training from figures such as radicalized, Saudi-born Ibrahim Hassan al-Asiri, who focuses on developing new, innovative and difficult to detect explosives.

(Above and Below) Scantex proof-of-concept demonstrator in use by airport security for explosives testing. (Courtesy of Grey Innovation/Released)

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While explosives such as TNT, RDX or Semtex may be extremely powerful, their production in 'back-yard' laboratories is problematic. Not only is the chemical process difficult, requiring commercial grade equipment, but some steps of the process can be extremely dangerous. Therefore, it is much more likely that these returned foreign fighters will turn to 'home-made' explosives. Such explosives are produced using rudimentary processes and chemicals that are generally easy to obtain. These types of explosives fall into either inorganic salt-based or organic peroxide-based categories.

Home-made explosives have been prevalent on the world stage for some time. For example, ammonium nitrate aluminum has been widely used in improvised explosive devices throughout the conflict in Afghanistan. This is largely because of both the ease of access to the chemical components (ammonium nitrate fertilizer and aluminum powder) and the safety and ease with which they can be manufactured in vast quantities. Other infamous events that used inorganic salt or peroxide-based explosives include:

- **1993 World Trade Centre bombing (urea nitrate)**
- **1995 Oklahoma City bombing (ammonium nitrate)**
- **2001 'shoe bomber' (contained TATP as a primary explosive)**
- **2002 and 2005 Bali bombings (potassium chlorate)**
- **2005 London bombings (TATP)**
- **2010 and 2012 Prune India bombings (ammonium nitrate)**
- **2011 Oslo bombing (ammonium nitrate/fuel oil)**
- **2013 Boston Marathon bombing (black powder)**

Perhaps one of the most understated attractions of 'home-made' explosives for terror cells is that many of these types of explosives currently fall within the grey area of what can be accurately identified by current explosive trace detection technology. Presently, most inorganic salts and peroxides cannot be identified by the same detection unit, which increases the likelihood of successfully smuggling the dangerous substance through screening areas.

Image of the explosion during the Boston marathon bombing, April 15, 2013. (Courtesy of www.nationalreview.com/ Released)

Inorganic Salt and Organic Peroxide Identification

Much of the technology behind many current explosive trace detection units is effective in identifying military and commercial grade explosives. However, there is no clear option for one system to detect inorganic salt-based and organic peroxide-based explosives in addition to commercial and military explosives. This is because inorganic salts do not contain the nitrogen molecules found in most explosives, and organic peroxide molecules are difficult to identify using many common trace detection methods because of their volatile nature, making novel detection methods necessary.

Ion Mobility Spectrometry (IMS)

One of the most common explosive trace detection technologies is IMS, developed over 25 years ago and now widely used in airport screening. In IMS, the samples are analyzed through a process where the explosive molecules are ionized and then passed through a drift region. The drift time is calculated (usually only milliseconds), and this calculation is used to identify and classify the specific explosive. [4]

A shortfall of this system is that peroxide-based explosives are generally too volatile for successful trace detection; however, the technique has some ability to detect peroxide explosive precursors such as acetone and hydrogenated water molecules. [5] The limitation of IMS for detecting inorganic salt-based explosives is that those explosives are not volatile, making ionization difficult. Ammonium nitrate is an exception, and it can be detected by IMS because of the slight volatility of ammonia.

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Mass Spectrometry (MS)

MS uses a process in which the explosive molecules are ionized in much the same way as the initial stages of the IMS process. Identification is achieved through measurement and comparison of mass-to-charge ratios of ionized molecules through a process of acceleration and deflection using a magnetic field. MS can be very effective in identifying volatile organic peroxides; however, the process fails to detect inorganic salt-based explosives.

Ion Chromatography (IC)

The IC process has proven to be reliable for identifying very small traces of inorganic salt-based explosives. However, analysis times of up to 25 minutes make this process prohibitively slow for use in high-throughput screening applications. [5]

Next Generation Trace Detector Technology

While there has been much speculation that nanosensor technology will be the next generation technology for explosive trace detection, a team in Tasmania, Australia has developed a novel capillary electrophoresis technique known as Scantex. This technology shows promise for inclusion in the next generation of explosive trace detection screening equipment. To date, it has attracted significant interest and funding from both the Australian government and the U.S. Department of Homeland Security for homeland security applications.

Professor Michael Breadmore, from the Australian Centre for Research on Separation Science (ACROSS) based at the University of Tasmania, led the team that developed an electrically driven analysis device that offers many advantages over traditional trace detection methods. A recently developed proof-of-concept demonstrator showed that capillary electrophoresis can detect inorganic salt-based and organic peroxide-based explosives. The 60 second analysis time makes the technology suitable for high-throughput screening applications. The accurate and consistent identification of inorganic salt-based explosives in such a short time is a world first for any explosive trace detection system.

The capillary electrophoresis process involves a sample being taken from a surface via a swab that is then inserted into the testing unit. Within the unit, the sample is refined using a fluid reagent that draws out target molecules for identification. Minute quantities of the solution are then injected into a series of microscopic pipes where they are energized with a high voltage current to detect inorganic salts and irradiated with UV-light to identify peroxides via degradation.

This process has proven to be highly accurate, providing consistent results during trials. While developed specifically for inorganic and peroxide explosives, the same technology can also be used to detect commercial and military explosives, although the ability to do so rapidly has yet to be developed. If done, this could herald the introduction of a single unit with the ability to screen all types of explosives with a high degree of sensitivity and minimal false positives in a manner fast enough to allow functional screening of people in high-throughput areas.

Scantex proof-of-concept demonstrator (Above) and interface (Below). (Courtesy of Grey Innovation, Released)

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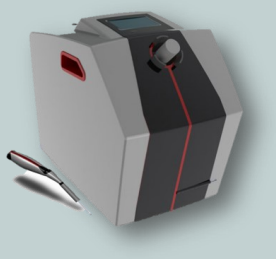
Conclusion

While many may be surprised that the world's first breakthroughs in explosive trace detection are coming out of the University of Tasmania in the picturesque city of Hobart, Australia, ground breaking research is not new to the ACROSS team. This team prides themselves on conducting multi-institutional, internationally prominent and genuinely collaborative research. [6]

This work is likely to result in Scantex units being fielded in thousands of secure area screening locations around the world. With the growing international interest in 'safe community' initiatives and the number of screening lanes growing to over 400,000 internationally (6,500 for airline passengers), it is likely that the need for low-cost, high-sensitivity technology like Scantex will increase. [4] While an all-in-one detection unit was previously a dream, advances in technology, like capillary electrophoresis, have made this a reality for homeland security.



Scantex Demonstration Unit
(Courtesy of Grey Innovation/Released)

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About the Author:

Mr. Garth Callender is a former Australian Army officer with extensive experience in the counter IED field. As a junior officer, he commanded security elements protecting the Australian Embassy in Baghdad and saw the impact of IED strikes first hand. He went on to work in the Australian Counter IED Task Force assisting in coordination of counter IED efforts and providing strategic guidance to government. More recently he commanded a weapons intelligence team in Afghanistan supporting both Australian and U.S. forces. Mr. Callender now works with Grey Innovation, a technology innovation company based in Melbourne, Australia.

Critical Infrastructure Protection

A Primer on the Defense Industrial Base

HDIAC BCO Staff

This is the third in a series of articles for the Homeland Defense and Information Analysis Center (HDIAC) describing the fundamental directives and charters that provide our strategy for Homeland Defense and Security, as well as the Department of Defense's (DoD) role in supporting the National Infrastructure Protection Plan (NIPP). [1] This article describes the DoD plan for protecting our Critical Infrastructure as the Sector–Specific lead for the Defense Industrial Base (DIB).

The Defense Industrial Base

When thinking of the DIB, many people associate the defense industries with the nation's industrial strength that was brought to bear to win World War II. Many remember the war products developed and manufactured by U.S. industries. These industries and technologies created the Jeep, multi-engine propeller driven bombers, carrier fighter aircraft, the Sherman tank, the M-14 and fleets of destroyers, carriers and Liberty ships. As the nation rallied to support the war effort, the "war industry" industrial base ramped up to provide the machines of war on a massive scale. As men were called up to fight the war on two fronts, women enrolled to help the effort as well.

A recent August 11, 2014, Washington Post article titled: "Rosie the Riveter, 70 years later," reminded us of how American women working in industrial factories during World War II contributed to winning the war by out-producing the Axis powers. The American Rosie the Riveter Association estimated that more than 6 million women worked in war industries, helping to produce more than 300,00 airplanes, 100,00 tanks, 44 billion rounds of ammunition and other material. [2]

In the three years following the Battle of Midway, the Japanese built six aircraft carriers. The United States built 17. American industry provided almost two-thirds of all the Allied military equipment produced during the war: 297,000 aircraft, 193,000 artillery pieces, 86,000 tanks and two million army trucks. In four years, American industrial production, already the world's largest, doubled in size. [3] The combined 1940s DIB network of manufacturing plants, far-sighted industrialists and engineers, and our nation's efforts to conserve resources (the United States auto industry produced 3 million cars in 1939 and only 139 more cars until the end of WW II [3]), directly affected the outcome of the war.

Today, the collective DIB has morphed in scope and form from its post WW II production capabilities that allowed massive frontal campaigns and island-hopping strategies. The abilities for large-scale amphibious assaults and massive movements of divisions are not as applicable in the war on terrorism as they were on D-Day or the WWII battlegrounds in the deserts of North Africa or Anzio Beach.

The Cold War changed the requirements once again as more strategic bombers and missile defense and antisubmarine warfare systems were needed. With the end of the Cold War and after the events of September 11, 2001, enemies from non-nation states are engaged in asymmetric warfare against the United States as saboteurs and terrorists. The non-nation-state enemy no longer wears a uniform and rarely attacks with armored divisions, engages in sea battles or has air superiority. Our warfighters today encounter improvised explosive devices delivered by suicide bombers or roadside bombs using remote detonation. The enemy uses snipers, mortars and rocket launchers hidden within local population centers to fight a highly robust technology-based mobile and personal war against the United States. In response, our defense forces need sophisticated Chemical, Biological, Radiological, Nuclear (CBRN) sensors, protective systems for Improvised Explosive Devices (IED), robust communication systems, biometric identification systems and cyber security protection systems.

Production of B-24 Liberators at Ford plant in Detroit, MI. (Understanding Capitalism Part V: Evolution of the American Economy. Price, R.G., March 15, 2013/Released)

Accordingly, the defense industries have had to continue to evolve and innovate with new and better technologies to assist the warfighter. Although the face of the DIB is changing and there are only a handful of shipyards and airplane manufacturers and one major air transport manufacturer, the United States still needs aircraft and ships to move men and equipment to conduct wars on foreign soil. The United States still needs to protect the industries that supply the materials for standing defense forces. Understanding that the way we engage the fight has changed, we also recognize the

warfighter's requirements to fight the war against terrorism have spawned new technologies and new industries to produce advanced weapons that are more precise and surgical. The DIB has grown to include industries that produce Unmanned Aerial Vehicles (UAVs), Global Positioning Satellites (GPS) guided bombs and precision guided weapons, laser weapons, sophisticated missile defenses, satellites, cruise missiles and technologies for cyber warfare. The scope and form of our new industrial base has to be considered when thinking of critical infrastructure and how to protect it.

U.S. Air Force Tech. Sgt. Matthew Green fastens the GPS mechanism inside a RQ-11B Raven B unmanned aerial vehicle at the Eglin range, Fla., Aug. 9. The UAV comes equipped with a GPS in order to track the aircraft when maintaining a visual may not be possible. (U.S. Air Force Photo by Airman Gustavo Castillo/ Released)

So, what does the 21st century DIB look like as we fight the war against terrorism? How do we identify what comprises critical infrastructure protection (CIP), and how does the DoD manage the complexities of a changing and dynamic national industrial base while protecting it from resourceful and ruthless terrorist organizations?

DoD Role in Supporting the National Infrastructure Protection Plan (NIPP)

The Defense Industrial Base Sector Specific Plan [4] provides the DoD's in-depth planning that supports the National Infrastructure Protection Plan. [1] This carefully thought out and detailed plan was modified in 2010 from its original 2007 version. [5] As such, the 2010 plan is described as a dynamic document, taking into account the multiple collaborations between government agencies and the ongoing assessments with regard to infrastructure priorities, capabilities and vulnerabilities.

This plan takes into account 21st century strategies against asymmetric warfare while maintaining a strategic ability to fight globally. Among its many parts, the Plan identifies today's defense industrial base assets and associated segments and sub-segments as described in the following chart:

Industry Segment	Industry Sub-segment	Industry Segment	Industry Sub-segment
Aircraft	Fixed Wing Rotary Wing Unmanned Aerial Systems	**Munitions**	Missile Tactical Missile Strategic Missile Air-Air Missile Air/Surface Missile Defense Missile Surface/Air Missile Surface/ Surface Precision Guided Munitions Ammunition Missile Defense Agency
Ships	Surface Sub-Surface Unmanned U/W Vehicles	**Space**	Launch Vehicles Satellite Missile Defense Agency
Tracked and Wheeled Land Vehicles	Combat Vehicles Tactical Vehicles Unmanned Ground Vehicles	**Mechanical**	Transmissions (Air/ Auto) Propulsion (Diesel/ Rocket/Turbine) Hydraulics Bearings Nuclear Components (including Depleted Uranium)
Electronics	Electronic Warfare Command Control Communications, Computer and Intelligence (C4I)	**Structural**	Castings/Forging Composites Armor (Ceramic/ Plating) Precious Metals
Soldier Systems	Chemical Biological Defense Systems Clothing and Textiles Subsistence/ Medical		

Table of DIB assets and associated segments and sub-segments. (Courtesy of DIB Sector Specific Plan/Released)

The thousands of companies that comprise the DIB assets listed on the previous page provide the research and development, design, production, delivery and maintenance of the military weapons systems, subsystems, components and/or parts to meet U.S. military requirements. The identification of the individual companies that are part of the critical infrastructure protection plan involves a carefully defined screening and vetting process using mission essential tasks defined by the Combatant Commanders.

Naval Research Laboratory has developed and demonstrated technologies for the recovery of CO_2 to hydrocarbons that can be used to produce designer fuel. (U.S. Navy photo by Mass Communication Specialist 3rd Class Gregory Pickett/ Released)

What is Critical Infrastructure for the DoD?

To encompass the broad spectrum of what constitutes today's defense industrial base, the DoD begins by soliciting nominations and screening industries and technologies for impact on national defense missions. The 2010 Defense Industrial Base Sector Specific Plan details responsibilities and requirements for this process as follows: [4]

The Defense Contract Management Agency (DCMA) augments the Combatant Commanders (CCDR) mission analysis by soliciting nominations for DIB critical assets. This additional process ensures a comprehensive examination of possible DIB Critical Infrastructure/ Key Resources (CIKR).

To identify critical asset nominations, DCMA uses the following screening criteria that focus on impact to national defense missions:

- Single source, sole source or defense-unique suppliers
- Suppliers of products that have dual-use qualities
- Suppliers of products that are used in multiple DoD programs
- Suppliers with high requalification cost or long lead requalification timeframes
- Suppliers developing and possessing advanced or emerging technology

The criticality screening process focuses on each industrial facility. As facilities are identified, the crux of providing a protection plan begins to take form. This plan of action provides for real time assessment of vulnerabilities and steps that need to be taken to protect these facilities from sabotage or terrorist attacks.

The DIB Sector Specific Plan describes how DoD, in collaboration with other DIB Sector partners, performs a screening of all candidate DIB critical assets based on the potential consequences of loss or disruption to DoD missions. DoD determines the consequence of loss for DoD-owned assets as part of the overall mission decomposition. If the impact of the loss results in mission failure, the asset is deemed critical regardless of how likely that loss might be. Clearly, potential threats, hazards and exploitable vulnerabilities do not determine the criticality of an asset. Loss of DoD mission capability places the national defense at risk regardless of the reason for the lost capability, hence the dominance of this screening criteria in the DIB Sector risk assessment. This criterion also reflects the importance of the DoD-DIB consumer-supplier relationship in achieving overall mission assurance. It should be noted that the most sensitive information resides in electronic product portfolios on a DoD classified system portal. This repository contains summaries of supporting information on DIB CIKR. The Assistant Secretary of Defense for Homeland Defense & America's Security Affairs (ASD (HD&ASA)) and other DoD decision makers use this information for risk management and continuity of operations purposes. [4]

"The DIB Sector Specific Plan describes how DoD... performs a screening of all candidate DIB critical assets based on the potential consequences of loss or disruption to DoD missions."

How to Assess Vulnerabilities

The DCMA completes DIB CIKR prioritization based on the consequence of loss before conducting asset-specific vulnerability assessments. This ensures that the highest consequence CIKR receives a vulnerability assessment first and facilitates necessary mitigation activities as soon as possible.

The cornerstone of the DIB CIKR vulnerability assessment process is the CIP-Mission Assurance Assessment (MAA). The MAA is conducted by a State National Guard team. Based on the prioritization of CIKR, DCMA will coordinate a schedule with CIKR owners and operators for CIP-MAAs that are conducted by the National Guard. A CIP-MAA considers an "on-the-ground" refinement of the impact (consequence of loss) and evaluates the exploitability of a wide range of vulnerabilities and risk vectors. The CIP-MAA also evaluates plausible threats/hazards from natural disaster, technological failure, human error, criminal activity or terrorist attack. This approach ensures consideration of relevant factors for each DIB asset as well as the relative prioritization of risks to DoD missions. Through FY 2009, the SSA has completed comprehensive vulnerability assessments at 52 critical DIB asset sites. Aggregate analysis is currently underway to identify trends in risk profiles, dependencies, lessons learned and best practices across the sector. The SSA plans to refine this analysis and incorporate future assessment results to share findings with industry and government stakeholders going forward. [4]

The DoD 2010 DIB Sector Specific Plan (SSB) Updates

Since publication of the 2007 DIB SSP, the following major steps have been taken to identify and update the inventory of DIB CIKR: [4]

- DCMA and DIB members identified potential suppliers meeting screening criteria.
- The Military Departments, DCMA and other Defense Agencies have validated and updated the list of potential DIB CIKR.
- DCMA has coordinated the DIB Critical Asset List (CAL) with Military Department acquisition executives and Defense Agency directors.
- DCMA has submitted the DIB CAL to Deputy Undersecretary of Defense (DUSD) for Industrial Policy and then to Undersecretary of Defense (USD) for Acquisition, Technology and Logistics (AT&L) for approval.
- The ASD(HD&ASA) have notified DIB CIKR owners/operators of their criticality designation.
- The ASD(HD&ASA) has submitted the DIB CAL and Important Capabilities List (ICL) to the Department of Homeland Security (DHS).

The DoD continues to work with DHS and other Sector Specific Agencies (SSAs) to identify overlaps and gaps in responsibility for DIB assets. The DIB SSA also interacts with its partners under a flexible approach based on relevant circumstances. DoD maintains basic data on all DIB partners. This data provides a general characterization of potential critical assets, systems and networks. There are no regulatory requirements to provide infrastructure data among DIB partners. DIB asset owners provide data on a voluntary basis with assurances that DoD employs appropriate measures and procedures to protect business-sensitive and proprietary information.

In addition to the activities described above, DCMA leverages its global contract management enterprise to acquire, validate, maintain and protect fundamental industrial data and specific DIB asset data. Tools, networks and associated policy documentation are currently under development and implementation to facilitate these data collection and retention processes. [4]

Air Force Staff Sgt. Jennifer Hurley, 673d Dental Squadron dental technician, applies a moulaged arm wound to Airman 1st Class Corey Williams, 3rd Operations Support Squadron air traffic controller, in preparation for Mission Assurance Exercise 14-3 on Joint Base Elmendorf-Richardson, Alaska, March 27, 2014. JBER's MAE 14-3 aims to test the base's ability to operate during a major natural disaster. (U.S. Air Force photo by Senior Airman Omari Bernard/Released)

Example of Risk-Mitigation and Enhanced Outer-Perimeter Security. (Courtesy of William F. Booth, CPP/Released)

Metrics for Success

The DIB 2010 Sector-Specific Plan also provides a detailed plan for measuring the effectiveness of DoD's protection of the defense industry's critical infrastructure. The 2010 plan is the first reporting of these metrics and is designed to collect data that reflects the dynamic nature of the recommended risk mitigation efforts commensurate with updated risk assessments. The metrics measure the effectiveness of the CIP MAAs recommendations conducted by the DoD for many of the critical industry segments. The detailed Measurement Effectiveness plan described in Chapter 6 of the 2010 Defense Industrial Base Sector-Specific Plan states: "The performance and outcome metrics enable DoD and the DIB to establish accountability, document actual performance, facilitate the diagnosis of problems, promote effective management, make decisions and provide feedback to senior decision makers in the DIB partnership." The Measurement Effectiveness Plan allows for annual reviews, updates and monitoring of the metrics program.

Other Considerations

In a recent memorandum from the Office of Management and Budget and Office of Science and Technology, multi-agency research and development priorities were proscribed for the 2016 budget, which stated, in part, that the Administration is "committed to revitalizing America's manufacturing sector, which will require innovation in the products that are manufactured and the manufacturing systems themselves. Agencies should give priority to those programs that advance the state of the art in manufacturing, with particular emphasis on government-industry-university partnerships and enabling technologies for industries of the future (such as nanotechnology, robotics, materials development and cyber-physical systems) that benefit multiple sectors, as described in the National Strategic Plan for Advanced Manufacturing." [6]

In view of the above, and the recognition by both the Secretary of Defense and the Under Secretary of Defense for Acquisition, Technology and Logistics that the proliferation and development of advanced military technologies make it difficult for continued military dominance by U.S. forces, we can understand why the landscape of our defense industry needs to change. The recent August 21, 2014, *War on the Rocks* commentary by Harrison and others, titled: "A New Defense Innovation Base," describes the change as follows:

"...the explosion of global public and private R&D investment has led to the proliferation of increasingly sophisticated component, design, prototyping and manufacturing technologies, enabling a new generation of innovators and threats that learn in rapid, iterative cycles. In short, the steady state threat and technology environments around which the legacy defense acquisition system and the defense industrial base came into being in the Cold War have been replaced by an uncertain, rapidly evolving world subject to disruptions that cannot be predicted or planned for with a high level of certainty. It is within this innovation environment that DoD must now compete." [7]

Accordingly, our ability to protect our evolving critical infrastructure through processes contained within the National Infrastructure Protection Sector Specific Plans remains paramount to the protection of our DIB.

How HDIAC Contributes

The Homeland Defense Information Analysis Center (HDIAC), one of three Information Analysis Centers managed by the DoD IACs enterprise administered under the Defense Technical Information Center (DTIC), is tasked to collect, analyze, synthesize, produce and disseminate worldwide scientific and technical information (STI) and drive innovation and technology developments by anticipating and responding to the information needs of the defense and broader community, while enhancing collaboration through integrated STI development and dissemination. The IACs continue to use this ability to enhance their Technology Domain Awareness (TDA). TDA is the effective understanding of the technology landscape as it relates to current and future defense capability needs. "It is predicated on timely, relevant and accurate knowledge of the 'technology commons'" - those areas where global leadership in technology development and application are increasingly spread across multiple nations and non-state interests. As defense-relevant innovations increasingly occur in commercial markets, the IACs' TDA efforts seek to expand awareness and application of commercial and non-government

investments to enable better, cheaper and faster Defense capability development." [7]

Although still in its formative stages, HDIAC hopes that the TDA initiatives will promote the following:
TDA initiatives will provide "…faster, more cost-effective defense capability development capitalizing on commercial market efficiencies, networked knowledge and lessons learned from past engagements. TDA will provide a defense-wide platform for identifying, synthesizing and amplifying technology-based innovations and lessons learned in order to enhance scalability, adoption and impact while improving defense stakeholder awareness of "outside innovations"– technologies derived from, or underwritten by, the commercial (non -defense) R&D marketplace." [8]

Furthermore:
"… the TDA seeks to build an extended defense-focused innovation base that (1) informs the existing defense acquisition enterprise by broadly aligning innovative commercial and consumer-facing products with defense applications; (2) complements the defense industrial base by creating a flexible, scalable industry platform, where businesses and institutions primarily focused on non-defense markets can easily "opt-in" to support the rapid, cost-effective development of new defense capabilities." [8]

As noted in other guiding documents, the preservation of knowledge and development of a defense-focused innovation base are critical for solving current problems and meeting future challenges. The actions taken to identify and protect the Nation's infrastructure from an ever increasing threat of a terrorist action using Weapons of Mass Destruction or a "lone wolf" attempt to cripple one sector of our national infrastructure need to be communicated and made readily available to our government interagency partners to maximize our effectiveness. The IACs serve to facilitate that communication.

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Medical

Ebola

R. Malone

Ebola Hemmorhagic Fever (Ebola HF) or Ebola Virus Disease (EVD) is a severe and often fatal viral hemorrhagic fever disease of humans and other primates. Case fatality rates vary from 50 to 90 percent in humans. [1] The name "Ebola" recognizes the 1976 discovery of the Ebola virus near the Ebola River (two simultaneous outbreaks in Nzara, Sudan and Yambuku, Democratic Republic of Congo). Periodic outbreaks of the disease suggesting crossover into a new human host from a natural reservoir (which may include indigenous bat populations) have been observed since that time, leading up to the most severe outbreak on record, which currently involves populations in Guinea, Liberia and Sierra Leone. [2] Ebola HF illustrates an important insight in medical virology: most pathogenic viral infections are often associated with recent inter-species crossover from an evolved and adapted host-viral interaction (Ebola virus – Bat) to infection of a new host (Ebola virus – Human).

One of the most transmissible of the viral hemorrhagic fevers, Ebola HF is caused by infection with a virus of the family *Filoviridae*, genus *Ebolavirus.* Five subspecies of Ebola virus have been identified, four of which cause disease in humans: Ebola virus (*Zaire ebolavirus*); Sudan virus (*Sudan ebolavirus*); Taï Forest virus (*Taï Forest ebolavirus*, formerly *Côte d'Ivoire ebolavirus*); and Bundibugyo virus (*Bundibugyo ebolavirus*). The fifth, Reston virus (*Reston ebolavirus*), has caused disease in nonhuman primates but not in humans. Marburg virus is a closely related filovirus that shares many viral and pathophysiologic characteristics with Ebola virus. The natural reservoir of Ebola virus remains unproven, but current evidence suggests zoonotic host(s) native to the rain forests of Africa and the Western Pacific.

Ebola Hemmorhagic Fever Key Facts [3]

- Ebola virus disease (EVD), formerly known as Ebola hemorrhagic fever, is a severe, often fatal illness in humans.
- EVD outbreaks have a case fatality rate of up to 90 percent.
- EVD outbreaks occur primarily in remote villages in Central and West Africa, near tropical rainforests.
- The virus is transmitted to people from wild animals and spreads in the human population through human-to-human transmission.
- Fruit bats of the *Pteropodidae* family are considered to be the natural hosts of the Ebola virus.
- Severely ill patients require intensive supportive care. No licensed specific treatment or vaccine is available for use in people or animals.

Straw-colored fruit bats, Eidolon helvum (shown), and other bat species may have carried Ebola virus from Central Africa to West Africa, where the virus is now causing the largest-ever epidemic of the disease. (Courtesy of Fritz Geller-Grimm/Released)

African fruit bats are considered possible natural hosts for Ebola virus (genera *Hypsignathus monstrosus*, *Epomops franqueti* and *Myonycteris torquata*), and the geographic distribution of Ebola viruses may overlap with the range of the fruit bats. Human-to-human transmission of the Ebola virus is primarily associated with direct or indirect contact with blood and body fluids. Transmission to health-care workers has been observed when appropriate infection control measures have not been followed.

Clinical features of Ebola HF begin with a prodrome (early symptom) period of 2 to 21 days, which then steadily progresses to yield a characteristic cluster of physical symptoms and manifestations coupled with a flat affect and sunken eyes often referred to as "mask like" or "ghost like." [4] During the prodrome period, symptoms are non-specific and can be easily misdiagnosed or overlooked by medical professionals, public health workers and safety specialists such as those responsible for customs and border protection and for screening international air travelers.

"Ebola Hemmorhagic Fever… is a severe and often fatal… disease of humans… Case fatality rates vary from 50 to 90 percent…"

Ebola—continued

R. Malone

Causes of Naturally Occurring Viral Hemorrhagic Fever

Ebola Virus: Natural reservoir and reservoir – human transmission unknown

Marburg Virus: Natural reservoir and reservoir – human transmission unknown

Lassa Virus: Rodents are primary natural reservoir

New World Viral Hemorrhagic Fevers: Multiple viral agents, rodent reservoirs, transmission to humans typically via contact or intake of rodent fecal material (including dust)

Rift Valley Fever: Mosquito borne disease of mammals, including humans

Yellow Fever: Mosquito vector-borne disease of humans

Dengue Hemorrhagic Fever: Mosquito vector-borne disease of humans

After the clinical disease declares itself, initial prodromic symptoms typically progress over four to five days to a general toxic presentation with more pronounced fever, severe myalgia (including pain on palpation), arthralgia (joint pain) and prominent gastrointestinal symptoms, which may include vomiting coupled with colicy abdominal pain and profound anorexia. A papular or maculopapular rash of the upper arms, flexor surfaces of the forearms and upper leg often develops and may progress to desquamation (shedding outer skin layers) in the same distribution as well as palms and soles of the extremities.

Hemorrhagic bleeding diatheses (predispositions) include gastrointestinal (watery diarrhea with fresh blood, melenotic stools, vomiting of fresh blood), naso-oropharyngeal (mouth, gums, nasopharynx), ocular (subconjunctival) and genital (vaginal) presentations. Common early central nervous symptoms include stiff neck, which is common to meningitis but with clear cerebrospinal fluid, and as the disease progresses patients often exhibit bizarre behavior, including a tendency to leave the place of care and wander in a confused state. Severe cases progress to death from 2 to 21 days after clinical presentation, with a peak at day nine.

Initial diagnosis of Ebola HF presenting early in the clinical progression in the absence of a documented outbreak can be challenging. The differential diagnosis includes many disease also found in edge environments associated with the sporadic pattern of Ebola HF. Disease presenting with similar symptom clusters include the following: [5]

Bacterial and Rickettsial Infections:

Gram-negative bacterial septicemia
Staphylococcal or streptococcal toxic shock syndrome
Meningococcemia
Secondary syphilis
Septicemic plague
Typhoid fever
Rocky Mountain spotted fever
Ehrlichiosis
Leptospirosis

Viral and Parasitic Infections:

Malaria
African trypanosomiasis
Hemorrhagic smallpox
Measles
Hemorrhagic varicella
Rubella
Viral hepatitis

Other Conditions:

Thrombotic or Idiopathic thrombocytopenic purpura
Acute leukemia
Hemolytic uremic syndrome

Surrounded by Ebola patients, a health worker (center) gives thumb ups to visitors near the hot zone. The hot zone is defined by the double barrier orange fence in the event a sick person falls, they cannot contaminate the clean zone. (U.S. Army Africa photo by Cmdr. Peter Niles/ Released)

Ebola—continued

R. Malone

Ebola HF Prodrome Symptoms

- Progressive, febrile "flu-like" illness
- Can be mistaken for malaria or non-specific viral syndrome
- Chief complaints include:
  - Mild fever between 100 and 102 F
  - Severe headache
  - Generalized myalgia, arthralgia
  - Dry, sore throat
  - Pleuritic chest pain with dry cough

Diagnostic Signs of Ebola Hemmorhagic Fever[5]

- Acute onset fever (<3 weeks duration)
- Severe prostrating or life-threatening illness
- Bleeding manifestations (at least two of the following: hemorrhagic or purpuric popular rash, epistaxis, hematemesis, hemoptysis, blood in stool or other bleeding)
- No predisposing factors for a bleeding diathesis

Recent field reports suggest that many patients do mount a robust humoral immune response concurrent with reduced viral load but loss of functional integrity of the gut (particularly lower intestine) typically results in bacterial sepsis, shock and death consequent to bacteremia (bacterial infection of the blood). [6] This observation suggests that evolving clinical management strategies may require both novel anti-viral medical countermeasures coupled with more traditional methods for managing both bacterial sepsis from intestinal flora as well as associated shock and sequelae (clinical consequences).

"...evolving clinical management strategies may require both novel anti-viral medical countermeasures coupled with more traditional methods for managing both bacterial sepsis… as well as associated shock…"

Laboratory testing to confirm the diagnosis is often complicated by challenging field conditions and lack of readily available sophisticated nucleic acid amplification-based capabilities. Ebola viruses may be recovered from soft tissue effusions, semen and anterior eye fluid, especially during later stages of illness. Diagnosis is most typically performed using blood or serum samples. For serological testing, avoid collection tubes with citrate, oxalate or EDTA (Ethylenediaminetetraacetic acid, a chelating agent). For PCR tests, use an EDTA tube, and collect acute-phase specimens within seven days of illness onset. Collect convalescent-phase specimens 7-20 days later and at least 14 days after illness onset. [5] Antigen-capture testing by ELISA (enzyme-linked immunosorbent assay), IgM antibody testing, paired acute-convalescent serum serologies, PCR, immunohistochemistry methods and electron microscopy are advocated but rarely practical options. Cell culture-based viral identification is the reference standard, but the time and hazard associated with this approach restricts use to research and reference labs with high-level biosafety facilities.

U.S. Navy Lt. Jose Garcia pipettes each patient sample into testing plate for analysis in order to identify the Ebola virus. Garcia works at a Naval Medical Research Center mobile laboratory at Bushrod Island, Liberia. The NMRC sent two mobile testing labs to Liberia to support Operation United Assistance. Each two-person lab is capable of testing up to 80 samples per day. (U.S. Army Africa photo by Chief Petty Officer Jerrold Diederich/ Released)

Ebola—continued

R. Malone

Methods suitable for field diagnosis of Ebola HF in edge environments are being developed. Evolving pre-published data developed by Rescue Medicine has resulted in development of a practical "five by five" diagnostic algorithm (five clinical signs, five laboratory tests). Current data indicates 92 percent sensitivity and 84 percent specificity relative to PCR-based diagnostic standards. [7] This algorithm is based on a study of 169 prospectively monitored Ebola Bubdybugio and Zaire infected patients being managed using standard of care good clinical practice. In brief, the five by five requires a positive finding for all ten of the following assessment criteria:

Five clinical signs:

- Epidemiologic risk (history of contact with an infected individual)
- Retro-orbital headache (not meningeal but rather true retro-orbital headache)
- Pharyngitis
- Myalgia
- Documented or subjective fever and/or chills

Five laboratory signs based on field testing with i-STAT or Piccolo point of care laboratory diagnostic devices: [8]

- Platelet count less than 100 x 10^9/L
- Transaminitis (increased transaminases (AST, ALT)): at least three-fold increase over normal
- AST/ALT ratio of 1.2 to 1.25 to 1
- Rising lactate levels (sepsis marker)
- Coagulopathy, as measured by whole blood clotting test

Supportive care is essential for patients with Ebola HF and includes maintenance of fluid and electrolyte balance, active hemodynamic monitoring, mechanical ventilation, dialysis and appropriate therapy for secondary infections. Treatment of other suspected causes of disease, such as bacterial sepsis, should not be withheld while awaiting confirmation or exclusion of the diagnosis of Ebola HF. Anticoagulant therapies, aspirin, nonsteroidal anti-inflammatory medications and intramuscular injections are contraindicated. [5]

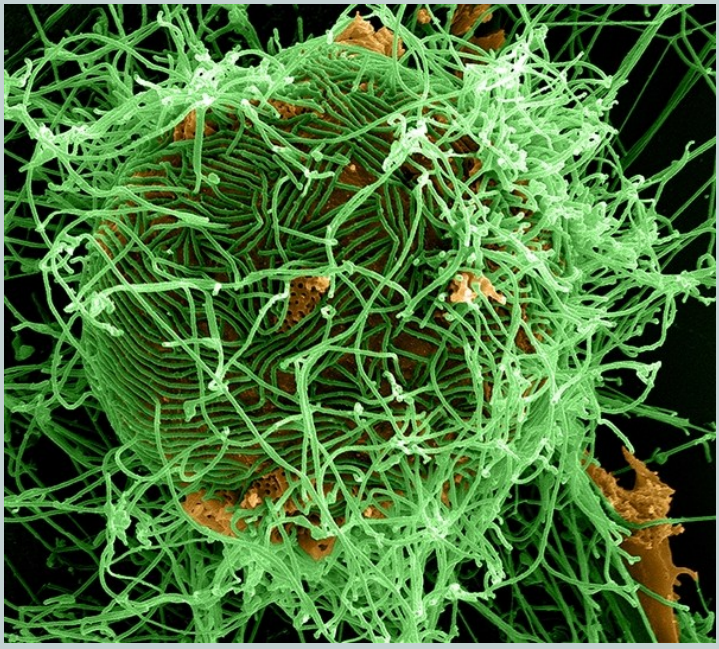
Current practical considerations for field management in edge environments include obtaining personal protective equipment and rigorous training and reinforcement for all caregivers concerning proper use. Additional recommendations have been developed based on a recent review of 446 critically ill patients with Ebola Bubdybugio and Zaire. [6] Mechanical ventilators and supplies may be useful in some cases (e.g. DARPA SaveII manufactured by AutomedX) but of lower priority relative to colloid, antibiotics and bedside clinical lab units (e.g. i-STAT Abbott point of care testing system). Access to whole blood, PRBC (packed red blood cells) and Leukocyte-depleted platelet preparations is important for clinical management, and platelet infusions have demonstrated statistical improvement in survival during the hemorrhagic phase. Pressor support therapy and supplies (dopamine or other) assist in managing the shock that frequently develops. Fentanyl patches are useful for supportive pain control in field environments. An improvised disposable bedside commode is required to prevent contagion of care providers.

The suspected ward of the Monrovia Medical Unit – an Ebola treatment facility specifically built for medical workers who become infected while caring for patients – stands silent Nov. 4, 2014, before the opening scheduled for Nov. 8, 2014. (U.S. Army photo by Sgt. 1st Class Nathan Hoskins, Joint Forces Command – United Assistance Public Affairs/Released)

Ebola—continued

R. Malone

There are no licensed prophylactic or therapeutic medical countermeasures effective against Ebola virus infection. Current candidate medical countermeasures for Zaire Ebolavirus have demonstrated both preventive and treatment benefit in preclinical testing, but none have yet obtained sufficient clinical trial data to support approval of emergency use authorization by relevant regulatory authorities. However, the severe mortality and morbidity of the present epidemic have already led to their limited use on an emergency, patient by patient basis. Pre-clinical developmental phase vaccines include VSV-vectored recombinants under development by Profectus BioSciences and the Public Health Agency of Canada, and Adenovirus-vectored vaccines under development by multiple firms, and there are non-clinical data suggesting possible utility for both pre- and post-exposure prophylaxis. Potential low molecular weight therapeutics include an RNA i-based product (TKM-Ebola, Tekmira Pharmaceuticals, an interfering ribonucleic acid drug), a nucleoside analog (USAMRIID), a variety of monoclonal antibody preparations including the triEste Fab mAb, which anecdotally may clear viremia without impacting on mortality, [6] and the antisense product AVI-7537 (Sarepta Therapeutics). [9]



A digitally colorized scanning electron micrograph depicts numerous filamentous Ebola virus particles in green, budding from a chronically infected VERO E6 cell in orange at 25,000X magnification. (Courtesy of National Institute of Allergy and Infectious Diseases/Released)

The CDC documented 12 major Ebola outbreaks between 2000 and the present, with 17 outbreaks of any size (including Reston virus) occurring between 1976 and 2000. [10] Ascel Bio, a leading U.S.-based company focusing on development and application of infectious disease forecasting tools and technology solutions, has analyzed recent outbreaks and is currently actively monitoring and analyzing the current outbreak. [8] This analysis indicates that the level of crisis caused by the current Ebola outbreak is far more severe on a relative basis than the level of crisis caused by any other current disease anywhere else in the world. An Ascel Bio analysis from August 2014 yielded eight key findings: [11]

1. The number of reported human Ebola cases is the highest ever recorded.

The 2014/2015 West Africa Ebola deaths across Guinea, Liberia, Sierra Leone and, previously, Nigeria, are occurring across a very wide geographic scale and have strained international medical response capacity. Ascel Bio assesses case count numbers as the key indicator for success or failure of ongoing or new Ebola containment efforts. Continued high case counts in multiple urban areas with an international Port of Entry increase the likelihood of international translocation.

2. The current case fatality rates (CFR) are within the expected range.

The current CFR for the 2014 West Africa epidemic is 60 percent, against an average CFR of 59 percent across 16 outbreaks over the past twenty years. Historically, Ebola CFRs have been recorded at higher levels. There was a 90 percent CFR observed in Kikwit, Democratic Republic of the Congo (DRC). There is no evidence that the current virus has mutated into something more lethal or more easily transmitted. Furthermore, medical workers appear to be succeeding in keeping the CFRs from rising higher.

3. Ascel Bio has been able to quantitatively confirm that the current outbreak is creating disaster conditions, but there is strong evidence to suggest that the level of disruption caused by the 2014 West Africa Ebola outbreaks is not unique.

Ascel Bio has assessed the level of community disruption caused by Ebola outbreaks across Africa over the past twenty years according to our common standard, the Infectious Disease Impact Scale (or, "IDIS"). The Kikwit, DRC 1994-1995 epidemic, even though it was associated with less case counts than the current epidemic in West Africa, was far more disruptive.

Ebola—continued

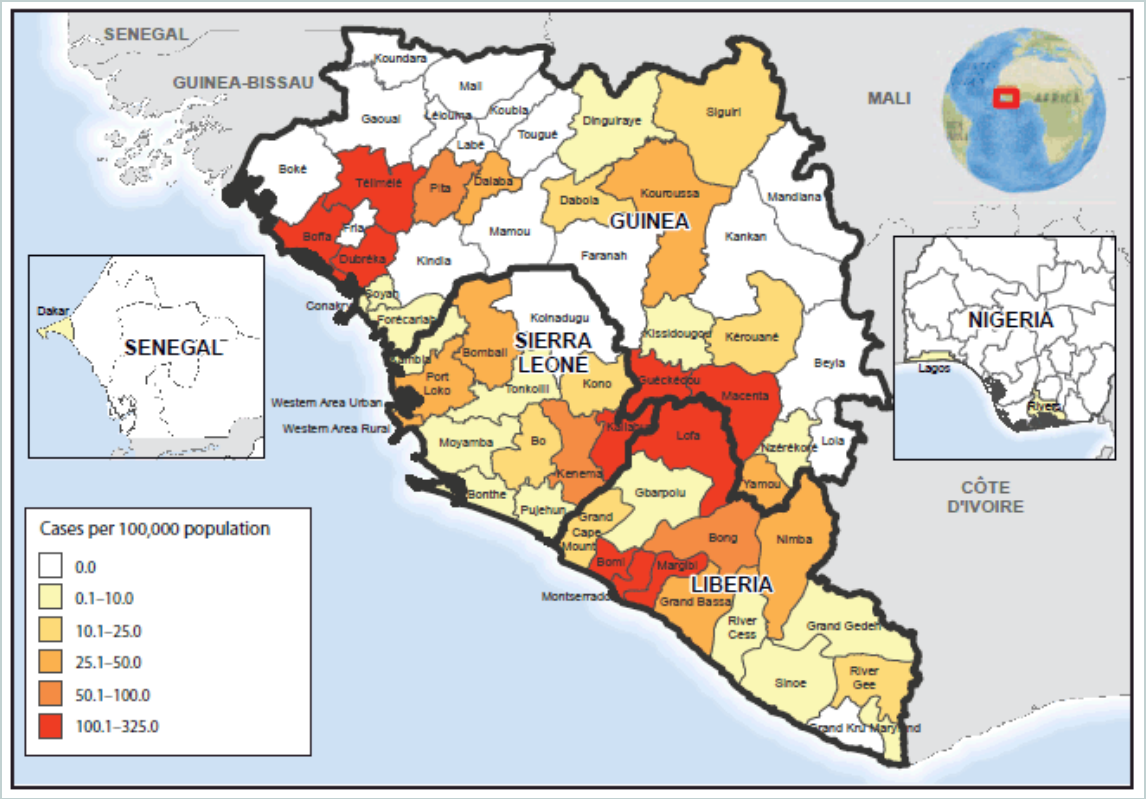
R. Malone

4. There are compelling indications that the causes of the current levels of disruption are unique.

According to Ascel Bio's analysis, historic causes of disruption that may be ruled out as causes of current disruption include (i.) lack of international recognition and experience of Ebola and (ii.) lack of local recognition and experience of Ebola. Restated another way, the problem today is not that people do not understand that they are facing Ebola, which was a condition that had led to maximal, sustained disruption in the past. It is Ascel Bio's assessment that risk communication and education campaigns that should be driving containment have been ineffective, if not counterproductive. The level of disruption is rooted in locals' rejection of these initiatives associated with international aid workers. These conditions are similar to what was observed by Ascel Bio after the 2010 Haiti earthquake. It is Ascel Bio's assessment that the broad solutions will require a specific focus on fixing communications and trust failures at the local level.

5. There are indications of drivers for evacuation and flight.

It is important to recognize that evacuation and flight are common, routine components of the Ebola signature pattern. In the case of Sierra Leone and Liberia, non-essential personnel have been evacuated; however, current reporting suggests expatriate healthcare workers will seek to evade airport screening procedures and violate their quarantine contract in an effort to flee the epidemic zones. At the community level, we have indication of non-ambiguous disaster conditions, as mentioned above. Ascel Bio has received multiple reports of abandonment of the dead in indigenous homes, where the inhabitants fled in fear. This implies a potential to reach an extremely rare, but known "apocalyptic" level of disruption referred to as an IDIS CAT 7. This level of disruption refers to total loss of social control to the point of abandonment of living family members, also known as familial disintegration. This has been observed rarely in history, and has been seen with First Contact situations with Ebola, Marburg and Nipah viruses. The importance of this is a community shift from convergence to care for loved ones to divergence away from the ill. The latter point then highlights the threat of further expansion throughout the region. Therefore, we continue to have risk of both terrestrial and airflight-based translocation of the epidemic.



The map of West Africa shows Ebola virus disease cumulative incidence as of September 20, 2014. Geographic distribution of the cumulative incidence of Ebola, as of September 23, indicates that the highest cumulative incidence (>100 cases per 100,000 population) was found in five districts in Guinea (Boffa, Dubreka, Gueckedou, Macenta, and Telimele), two districts in Liberia (Loffa and Margibi) and two districts in Sierra Leone (Kailahun and Kenema). (Courtesy of http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6339a4.htm/Released)

Ebola—continued

R. Malone

6. **Regarding conflict, both Sierra Leone and Liberia continue to exhibit strong social unrest signature patterns.**

Social unrest is also a common signature component of Ebola to the point of presenting a threat to in-country international responders, as noted in the current situation. State failure has not been documented to date, and Ascel Bio does not assess this to be a probable (albeit not impossible) outcome.

7. **Regarding translocation to developed nations such as the United States, Ascel Bio does not assess there to be a significant concern in terms of seeing an uncontrolled epidemic.**

Small case clusters are possible. The key to mitigation of the potential for IDIS CAT 3/crisis conditions is the element of surprise: local physicians must be sensitized to the possibility of translocation and prepared through education and preparedness planning. Particular areas of sensitivity include the emergency department and intensive care units, which are critical structures that ensure continued ingestion of patients for any developed nation's hospitals. Live feedback from one of the nation's largest social networks for physicians, Sermo, has indicated significant anxiety and concern that the medical community is unprepared:

How prepared do you feel the US healthcare system is to respond to an Ebola outbreak?

- Very unprepared (383/929)
- Extremely unprepared (315/929)
- Neither prepared or unprepared (157/929)
- Very prepared (65/929)
- Extremely prepared (9/929)

8. **One Ascel Bio team member was in the process of prepping to deploy in with Samaritan's Purse to support medical response. His observations about federal assistance associated with this potential deployment include the following:**

- Finding a single focal point for credible, vetted information was difficult, which is typical in a disaster response situation.

- There was significant difficulty obtaining the latest guidance for Personal Protection Equipment (PPEs), clinical management protocols and specific isolation ward management information. Many SMEs in the government had differing views, where disagreements between agencies resulted in lack of clear consensus regarding therapeutics. The impression that the Ascel Bio team member is the U.S. government no longer enjoys the same level of experience in Ebola management it once had in the late 1990s.

- Protocols were not in place beforehand to assist non-U.S. government American citizens in medical evacuation and aggressive treatment for high consequence pathogens.

Based on this analysis and observations, the following scenario probabilities for the current outbreak have been assigned by Ascel Bio operational biosurveillance subject matter experts based on a review of available data.

Scenario 1: Locals will learn & adopt effective containment practices in the next weeks, sui generis.

Probability	Scenario
20%	Fatality numbers alone will create conditions where locals generate independent reasons to apply the same containment methods being promoted by international health authorities that they are currently rejecting.
80%	Absent a resolution of ineffective risk communication and education campaign approaches, the level of disruption will remain high, and medical countermeasures will continue to be sub-optimal.

Members of a joint service medical support team don their Protective Personal Equipment as part of their training for personnel to respond quickly, effectively and safely in the event of additional Ebola cases in the United States, on San Antonio Military Medical Center, Texas, Oct. 23, 2014. (U.S. Air Force photo by Airman 1st Class David R. Cooper/Released)

Ebola—continued

R. Malone

Scenario 2: Locals will learn and adopt effective containment practices in the next weeks through a resolution of current trust issues.

Probability	Scenario
40%	Through concerted efforts to better engage directly with local community leaders, trust will be built to enable effective containment practices.
60%	Locals will remain hardened against international health workers in the weeks ahead.

Based on this most recent analysis, Ascel Bio concludes that "High fatality numbers, spread, and continued hardening against international health workers, coupled with a strained medical infrastructure, from international to local capabilities, across multiple urban areas with international Ports of Entry would create conditions suitable to more translocation and threaten far higher fatalities."[11] To further illustrate the potential risks associated with this current outbreak, public health experts have expressed concerns about scenarios that may present direct threats to the continental United States (CONUS). One current example of a CONUS safety concern involves expatriate healthcare provider elopement from quarantine. Twelve of the forty nine United States expatriate healthcare providers working in West Africa supporting the international medical response to the current outbreak have violated the terms of their quarantine contract and returned prematurely to CONUS.[6]

As the epidemic expands in and beyond West Africa, and international efforts surge to provide new medical countermeasures, National Health Authorities and local practitioners will be faced with the dilemma as to whether to use a potentially growing number of medical countermeasures provided under an emergency or investigational new drug application framework. These decisions will also be taken in the context of rampant local mistrust of medical quarantine and hospitalization practices, which have already led to treatment avoidance, hospital flight and violence against health care workers. For this reason, there is a growing need for Host Nations, International Health Authorities (WHO) and medical countermeasure (MCM) donor nations to develop a practical ethical framework for triaging the use of MCMs to provide the greatest possible public health benefit and to manage expectations for their availability and safe use.

Supporting Operation United Assistance, Armed Forces of Liberia engineers work on the Tubmanburg Ebola treatment unit. Crews quickly put up a series of tents on freshly leveled and graveled ground. The U.S. Agency for International Development is the lead U.S. Government organization for Operation United Assistance. U.S. Africa Command is supporting the effort by providing command and control, logistics, training and engineering assets to contain the Ebola virus outbreak in West African nations. (U.S. Army Africa photo /Released)

"As the epidemic expands in and beyond West Africa… National Health Authorities and local practitioners will be faced with the dilemma as to whether to use a potentially growing number of medical countermeasures provided under an emergency or investigational new drug application framework."

Ebola—continued

R. Malone

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About the Author:

Dr. Robert W. Malone, MD, MS, served as a subject matter expert to the HDIAC Basic Center Operations (BCO) support team at TASC Inc. A Maryland-licensed physician trained in molecular virology and immunology at The Salk Institute Molecular Biology and Virology Laboratories, and in Clinical and Anatomic Pathology at UC Davis Sacramento Medical Center, Dr. Malone is an original (1989) inventor of "naked DNA" and "DNA Vaccine" technology. Dr. Malone is also recognized for pioneering scientific contributions in RNA delivery and non-viral gene transfer (cationic lipids, in-vivo electroporation). Since the unfortunate events surrounding 911, Dr. Malone has focused on facilitating pre-clinical to clinical transition and advanced development of medical countermeasures to biothreat agents in support of DoD and HHS missions, with his current focus being on supporting the TASC CSIS Medical division.

Cultural Studies

Army Social Science Lessons for Homeland Defense Planning and Operations

M. Griffin

I was the first anthropologist on a Human Terrain Team (HTT) to arrive in Iraq and contribute to an understanding of the social and cultural considerations that impact Army strategy, plans and operations. Shortly after my arrival in 2007, I received an email from Homeland Security asking if I felt Human Terrain Teams were appropriate for domestic security. I said that in principle, yes, but that I needed time to figure out my work since I was part of an experimental program still in need of validation. After seven years with the Human Terrain System, a program recently mothballed, I am confident the lessons and experiences from social science studies for the Army in Iraq and Afghanistan have direct relevance to improving the security of our nation.

"How do we meet the challenges operational and strategic environments pose?"

Successfully achieving national security goals, whether abroad or domestically, depends on understanding the cultures and populations within which personnel operate. This is hardly a new concept. The U.S. Army's Combat Training Institute, for example, published *Through the Lens of Cultural Awareness: A Primer for US Armed Forces Deploying to Arab and Middle Eastern Countries*. [1] That same year, the Marine Corps created the Center for Advanced Operational Culture Learning and produced a book entitled, *Operational Culture for the Warfighter,* which still remains relevant given its firm grounding in theories of social organization, change and meaning. [2] More recently, edited collections, such as *Operational Relevance of Behavior and Social Science to DoD Missions*, have made the sound argument that the intelligence community needs to change how it conducts analysis by incorporating social and behavioral science insight regarding complex and less predictable operational and strategic environments. As MG Flynn said in the preface to that publication, "America's security environment faces a diverse set of challenges, all of which are shaped by sociocultural dynamics." [3]

How do we meet the challenges operational and strategic environments pose? I propose that part of the answer is found in the lessons learned from the Army's use of Human Terrain Teams. Seven years of deployed social science show that obtaining accurate, timely and relevant sociocultural insight to use in planning processes requires researchers working with the population in question and alongside security personnel responsible for a given area. The level of accuracy and relevance needed in regards to cultures cannot be obtained from computer simulations, remote sensing systems and reach-back centers, or by sifting through documents and reports on a hard drive or the internet. Although these options may add value, they remain insufficient.

Social science support for planning, decision-making and developing a shared understanding of the human domain requires being in the field. This equates to interdisciplinary social science teams conducting research among the population and interacting with stakeholders on the ground.

Controversy surrounded HTTs for many years, but a hard won lesson for myself and others deployed in support of warfighters was that a deliberate research product was needed. This product needed to have clear input for the general operations process and the specific integrated planning process. First, by being on the ground and using theoretically framed research questions and systematic analysis, social science teams could help decision makers and their staffs understand the what, so what and now what of the human domain to improve planning, execution and assessment of operations. This entailed clear input for understanding the Operating Environment (OE), visualizing and describing it, and assessing outcomes. A deliberate product called the Sociocultural Running Estimate was eventually created to achieve this tie-in and is continuously maintained. This process and product will serve Homeland Security planning and operations well and should be adopted to improve how the intelligence community helps decision makers develop a shared and systemic understanding of complex, unpredictable, rapidly changing operating environments domestically and transnationally.

Marcus Griffin, an anthropologist working for the 101st Airborne Division's 2nd Brigade Combat Team, inspects a fruit stand in Ghazaliyah, Iraq, while on patrol Jan. 13, 2008. Griffin is helping soldiers better understand the needs of the Iraqi people. (U.S. Army photo by Sgt. James P. Hunter, USA/Released)

Army Social Science Lessons—continued

M. Griffin

Human Terrain Teams

HTTs were five person teams that served as the deployed element of the U.S. Army's Human Terrain System (HTS). It was the only Army organization with a dedicated and trained capability to conduct field-based, social science research and analysis in pursuit of sociocultural understanding. At its zenith, there were over thirty teams deployed simultaneously in Iraq and Afghanistan. Each HTT was assigned to a deployed unit, reported to the commander and aided his staff in a way that best supported unit operations. The purpose and function of the HTT was to seek sociocultural understanding of local populations to allow for culturally astute decision-making. In terms of the Army's operations process, the HTT enhanced the commander's ability to Understand, Visualize and Describe the operational environment in terms of the human terrain; Direct detailed planning that took into account the human aspects of the environment; Lead through socioculturally-savvy decision-making; and then Assess the human effects of military operations and make adjustments accordingly.

Army Capt. Thomas H. Melton, a native of Shreveport, La., and commander of Troop A, 1st Squadron, 75th Cavalry Regiment, and Marcus Griffin, an anthropologist for the 101st Airborne Division's 2nd Brigade Combat Team, talk with an Iraqi woman inside her home in Ghazaliyah, Iraq, Jan. 13, 2008. Griffin is helping soldiers better understand the needs and living conditions of the Iraqi people. (U.S. Army photo by Sgt. James P. Hunter, USA/Released)

In addition to facilitating the principles of planning, they also engaged in planning activities by closely studying operational variables. The HTT's method of analysis incorporated the Army's strategic and operational variable frameworks but complemented them by continuously maintaining a Sociocultural Running Estimate and looking at the OE in terms of the following categories:

Identities
Values, Beliefs, Behaviors, Norms (VBBN)
Conflict resolution mechanisms
Political system
Economic system
Social safety nets
Demographics
Cultural geography
Essential services
Religion
Communication media
Pattern of Life analysis

Examples of Work from Iraq

Below are three examples of my work in Iraq, illustrating the importance of working with staff officers in a Brigade Combat Team and mingling with the local population. Without being physically among the Soldiers, understanding the local population's physical and social context through first hand observation and interaction, or appreciating the nuances of the problems faced by commanders and their staff, contributions to Soldiers would not occur. The necessity to explore research questions among populations in the United States and elsewhere as well as working alongside Homeland Security planning staffs or those engaged in Defense Support to Civilian Authorities are equally important for addressing domestic security.

The first example highlights the need to listen and respond to the problems staff officers grapple with routinely. In 2008, a Civil Military Operations staff officer (S9) was deciding what to do about a run-down bread factory, and he needed to produce a slide for the next day's briefing to the commander. The S9 already knew about the costs associated with refurbishing the facility and the likelihood that replacement parts would need to be custom built. I discussed with him how the bread factory fit into the system of bread production and consumption in the area. Mass produced bread would reduce the cost for local consumers, but we needed to know the impact on neighborhood bakeries. We also needed to determine if production and distribution of bread in homes by women was important to the maintenance of social relations within the family and community. The officer and I came up with a potential way ahead and information that he used to brief the commander.

Army Social Science Lessons—continued

M. Griffin

This shows that social science researchers need to be alongside planners and staff responsible for helping decision-makers understand, visualize, describe and assess their Area of Operations (AO) in all its complexity and detail. This is true for the Department of Defense and Homeland Security. Agency planners cannot be expected to know how societies function or malfunction, or how the social fabric is woven or torn through changes in relationships associated with production. An applied researcher working alongside can be expected to catch nuances in need of attention and deliberation so that unintended consequences do not compromise mission success and cause community alienation or harm.

Army Capt. Thomas H. Melton, commander of Troop A, 1st Squadron, 75th Cavalry Regiment, and Marcus Griffin, anthropologist for the 101st Airborne Division's 2nd Brigade Combat Team, talk while on patrol in Ghazaliyah, Iraq, Jan. 13, 2008. (U.S. Army photo by Sgt. James P. Hunter, USA/Released)

The second example demonstrates the need to go out among the local population and provide timely operational support. Violence was significant in the AO, and the commander wanted to know if infusing a specific neighborhood with significant business and community development money would cause the local population to be less tolerant of the insurgents hiding in empty houses and causing violence. I went out into the community and talked with locals about how they went about their daily life. I examined available goods and services in the local markets and plotted the kinds of houses and their architecture. I spoke with a variety of men I encountered along neighborhood streets and discussed the presence or absence of extended kin within the community with them. I added historical data about the neighborhood to what people were telling me, what I was seeing in the built environment of the neighborhood and how people moved within it. While I only had a single day, I still was able to confidently conclude that development monies would not have the desired effect. This was clear by taking multiple data points into consideration: the relative well-being of the population evidenced by what they were consuming; the lack of family members within a walking distance, contributing to social isolation; the high-walled architecture of houses discouraged interest in what neighbors were doing; and a few other considerations. As a result of being there for immediate operational support, the commander was able to consider the sociocultural evidence presented and turned his attention to other Courses of Action (COA). The unit avoided wasting three million dollars on a project that would have likely failed.

The lesson here is that for some decisions, a leader needs timely input based on field data. This data suffers from a bias caused by small sample sizes, but the triangulation of data still produces a compelling, qualitative description and explanation of what is going on in a specific place at a specific time. Secondary data found in prior reports and publications or primary data found in existing data sets will provide complementary insight, but they are insufficient by themselves. Homeland Security personnel may use research centers, commercial databases, census data and more than internet search engines, but proactive field research conducted as part of the planning process is vital to success.

The final example involves a unit that needed a better understanding of who the influential members of the community were. Link diagrams of who was who in the AO did not lead to an understanding of the local power dynamics. This was an obvious point of frustration for the commander during Intel Update briefs. The HTT approached the unit's Assistant S2 and explained that the team could conduct a Community Power Study. Using data on who attended District Advisory Committee and Neighborhood Advisory Committee meetings, who was present at a variety of Key Leader Engagements throughout the AO, who held formal positions in local government, who was winning local contracts, who were the known tribal leaders and other data, the HTT engaged in a social network analysis. The result was a sociogram that characterized its density and cohesion as well as relationship tie strength. The social distance of leaders in relation to each other was described through the number of common connections and visually represented mathematically by the distance between members in the sociogram. This highlighted individuals who likely had social and economic influence over others. The network paths illustrated in the sociogram suggested how the unit might influence specific key leaders with messaging and social pressure through intermediaries in the group. The sociogram also showed which individuals may have been proxies for other leaders, suggesting the need for further inquiry on those hidden people of influence.

Army Social Science Lessons—continued

M. Griffin

The research product not only contributed to a more robust Intel Update, the product helped to ensure message synchronization by subordinate units to members in the network.

This example makes a point that is often overlooked: social science today takes teamwork and unified effort. If not integrated into a staff, getting out into the field and fusing data from across the force for common benefit, then social scientists cannot do their job. As we look at countering domestic threats and building partnerships with other nations to achieve national security objectives, social science as part of Homeland Security must be done as part of group effort. The strategic and operational environments are simply too complex and answers are needed too quickly to conceive of lone researchers doing their own thing.

The Sociocultural Running Estimate

Since 2006, researchers on HTTs have produced many useful reports based on getting outside the wire. They have provided useful input for daily operations in Iraq and Afghanistan through participation in working groups and enduring the innumerable meetings that characterize a unit's daily battle rhythm alongside Soldiers. Operational relevance of research was most often ensured by reverse engineering Priority Intelligence Requirements and the Commander's Critical Information Requirements. However, it took years of creative and critical work to determine that participation by HTTs in the planning process required a more deliberate, standard method: the creation and maintenance of a sociocultural running estimate. By approaching the human domain using social theory-based research to produce a running estimate, shared and systemic understanding of the OE across a unit and between echelons could be effectively and efficiently produced with a much greater return on investment and lower opportunity cost than previously. The three examples of research described above show a greater return on investment by contributing data to the maintenance of the sociocultural running estimate.

The following three sociocultural running estimate concerns are the first action steps for generating a shared understanding of the OE. This is necessary for conceptual and detailed planning and the ability to operate successfully among the population. The information listed below stands on its own (the what) but becomes more powerful when analysis explains the interconnections between content (the so what). Understanding how sociocultural information is linked together in a complex system is necessary for mission success and can often lead to better Course of Action Development (the now what). The three sets of information are presented in the next column:

What are the meaningful social groups to which people belong?

Who leads these groups in the community; for what issues or domains do they have authority?

What is the community's cultural narrative that binds the people together through common values, beliefs, behaviors and norms?

Ed Campbell, Department of the Army employee with the Human Terrain Team from Task Force Cyclone, and his interpreter stop and talk with a local shop owner in the city of Bagram in Parwan province, Afghanistan. (U.S. Army photo by Spc. Charles Thompson/Released)

The importance of this information comes not from, for example, listing the meaningful social groups in an area, but knowing how the cultural narratives are similar and dissimilar across the groups (associating 1 with 3). The sociocultural content found in each of the three questions, when treated as elements in a complex system, leads to evidence-based understanding of the OE.

Army Social Science Lessons—continued

M. Griffin

Each question, presented as a research task for social science teams to conduct, is as follows:

A. Meaningful social groups

1) Group identities
2) Group size, relative to one another
3) Key characteristics/ideologies defining membership
4) Geographic location or areas of control and areas contested by groups
5) Historical grievances between social groups; current status of these grievances
6) Social groups vulnerable to spoiler intimidation, messaging and recruitment (alienated, disenfranchised or oppressed)

B. Social group leadership; issues or domains of authority

1) Conduct a Community Power Study
2) Formal and informal influence in a community
3) Local bases of power, wealth and prestige. Common Bases of power, wealth and prestige include:
- **a.)** Educational attainment
- **b.)** Holding past and present formal positions of authority
- **c.)** Ownership of land, commercial property, farms, apartment/housing tracts, markets/stores

4) Formal leadership positions in civil government (Who, What, When)
5) Formal leadership positions in public life (business, tribe/family/ethnic, religion) (Who, What, When)
6) Local leaders based on achieved status (doctors, judges, retired senior military officers, wealthy heads of family and successful business people)
7) Overlap of individuals occupying multiple positions of influence
8) Overlap Analysis
- **a)** Biographies of leaders
- **b)** Issues/people they influence
- **c)** Gaps in leadership
- **d)** Relationships: who knows whom and how among the leadership networks

C. Cultural Narrative Analysis: Community's Cultural Narrative - binding people together through common values, beliefs, behaviors and norms

1) Grade school textbook and religious learning materials analysis:
- **a.)** Basic textbook themes relating to appropriate and inappropriate behavior, personal and community identity, and common beliefs and any forms of punishment for violating accepted norm
- **b.)** List of themes and ways in which they are illustrated through stories and pictures; these form the foundation of the community's cultural narrative of who they consider themselves to be, who outsiders are, and what beliefs, behaviors, values and norms characterize members of the community
- **c.)** Messaging themes for greatest compatibility with the community

2) Narratives of religious and other community leaders speaking at public events, non-state actor propaganda, lyrics to popular local songs and media broadcasts
- **a.)** Basic themes relating to appropriate and inappropriate behavior, personal and community identity, and common belief and any forms of punishment for violating accepted norms; themes and the ways they are illustrated form the foundation of the community's counter-narrative to the dominant society's Cultural Narrative
- **b.)** Theme comparison as Step 1 above for similarity and dissimilarity
- **c.)** Messaging themes for greatest compatibility with the community

The results from each of the three tasks must be continuously maintained in order to have a sociocultural running estimate available for use in integrated planning. The data and analysis that accumulates allows for a robust contribution to a unit's Common Operating Picture development and continuous assessment of the OE.

"Understanding how sociocultural information is linked together in a complex system is necessary for mission success and can often lead to better Course of Action Development."

Army Social Science Lessons—continued

M. Griffin

Conclusion

The DoD experience in Iraq and Afghanistan suggests Homeland Security agencies need social scientists skilled at field research as part of their planning and operations teams. This allows the agency to be ahead of the game when cultural and religious communities need to be engaged or a response to a crisis is required. Understanding culture and applying it to domestic and transnational problem sets takes significant education, training and on-the-job synthesis. This job cannot be accomplished as a collateral duty. With dedicated, field-experienced social scientists alongside them, agencies and departments can more readily work with the people on the ground and more effectively shape their OE. Because all culture is locally lived, researchers can provide agency personnel with descriptions and explanations of local worldviews of cultural communities, leadership and power networks, dominant and counter narratives, and an understanding of how social institutions function in the lives of local people. This is the method and practice necessary to ensure the best possible results. By doing this, Homeland Security may work effectively with civilian populations through shared understanding and thereby promote community safety and mission success.

About the Author:

Dr. Marcus Griffin is a cultural anthropologist with significant experience providing research support to the U.S. Army and Marines, including the recently completed ARI research effort in Optimizing an Integrated Planning System. Marcus was the lead social scientist for one of the first Army Human Terrain System Teams, deploying to Baghdad, Iraq and providing research support and instructing two Brigade Combat Teams and one Marine Expeditionary Force in in how to apply ethnography to understanding their environment. Because of his ability to derive and impart lessons learned and best practices from the integration of social sciences with planning, stability operations and community development, Marcus was selected to serve as the Dean of Academics for the Human Terrain System, where he led a transformation of the education and training of Human Terrain System Teams and team members. Marcus is the author numerous articles and of the first integrated cultural research management plans for the XVIII Airborne Corps, the United States Marine Corps, the United States Navy and the U.S. Army Corps of Engineers. He is the past Associate Professor of Sociology and Anthropology at Christopher Newport College, where for nine years he developed and delivered thirteen courses.

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Technical Inquiry Highlight

Emerging Threats to Water Security

A request was submitted to the HDIAC to research information on the nexus of water and energy and emerging threats to water security, including climate change, natural disasters, radiological contamination and chemical/biological attacks. Energy and water are inextricably linked and mutually dependent, with each affecting the other's availability. Water scarcity, variability and uncertainty are becoming more prominent, leading to vulnerabilities in the U.S. energy system. "Fossil fuel and nuclear power plants rely heavily on water for cooling purposes. Hydraulic fracturing methods also require significant amounts of water. Water is also required to mine and transport coal and uranium; to extract, produce and refine oil and gas; and to support crops used in biofuel production. The energy sector is projected to account for 85 percent of the growth in domestic water consumption between 2005 and 2030. The drivers of this growth are mostly from rising energy demand, increased development of domestic energy, and shifts to more water-intense energy sources and technologies."

Water sector assets are vulnerable to a variety of separate or combined attack methods and natural disasters. Plausible attack methods include explosive devices, contamination of drinking water distribution systems, sabotage of water treatment systems, hazardous material releases and cyber attacks on Supervisory Control and Data Acquisition (SCADA) systems. Natural incidents, such as earthquakes, hurricanes, tornadoes, floods and pandemics, also pose a threat to the water sector. Water is an integral part of the energy sector. When one sector is impacted by a threat, there is a cascading effect to the other infrastructure sectors such as medical, transportation, communications and agriculture.

Understanding the interdependencies among infrastructures in the context of climate change risks and vulnerabilities is an ongoing research need. HDIAC identified infrastructures critical to the Nation, e.g. energy, water and waste management, communication, defense industrial bases, information technology, financial services, nuclear facilities and transportation systems, and determined they are all interrelated and interdependent. Threats to our critical infrastructure threaten all elements of our National Power—from security and the economy to the availability of vital goods such as food, water and health services. HDIAC concluded that climate change is a cross-sectorial vulnerability issue related to infrastructures and urban systems. In addition to the costs associated with clean-up and repair of infrastructures, there are also costs associated with the disruption of economic, social and environmental supply chains. HDIAC recommended that solutions from R&D technology, policy analysis and stakeholder engagement are all needed, and strategic interagency connections need to be leveraged to ensure the security of water. Analysis of the energy-water nexus is complex and affected by many factors including supply and demand, land use and land cover, population/ migration, climate and weather, technologies, policies, regional economics and more. It is imperative that research data is shared and collaboration on these challenging issues takes place.

HDIAC also stressed the continuing need for research on the interdependencies of the critical infrastructures. Data modeling that evaluates the impacts of population/migration, energy technology pathways, urbanization and infrastructure dynamics, and land use and land cover changes is needed. There is also a need for an integrated data, modeling and analysis framework. Substantial data exists in highly distributed systems across government agencies, but the data needs to be made more accessible and consistent through a layered, data-analytic platform.

Coming up next issue...

Alternative Energy

Perovskite Solar Cells

Perovskite-based solar cells are "the next big thing" in solar photovoltaic technology and are currently undergoing a frenzy of activity in worldwide research laboratories primarily because of their promise to be both high-performing and inexpensive to manufacture. Their advances in photo-efficiency (3.8 → 16 percent) over the past 5 years have been truly astounding, and target efficiencies of upwards of 20 percent have been predicted. Perovskites comprise a class of minerals named after a Russian mineralogist (L.A. Perovski, 1792-1856) that are based on calcium titanate, $CaTiO_3$, or any compound of ABX_3 stoichiometry that exhibits the perovskite crystal structure. The perovskites that everyone is excited about nowadays are the organometal trihalides, of which the most commonly studied is $CH_3NH_3PbI_3$, although other mixed halides such as $CH_3NH_3Pb(I_{1-x}Cl_x)_3$ and $CH_3NH_3Pb(I_{1-x}Br_x)_3$ have been studied as well. Their chief advantage over current solar photovoltaic materials is their ability to be manufactured using simple, low-temperature, solution-based processes. This would make them extremely cost-competitive with current technologies. If some of their stability problems can be solved (for example, certain perovskites are degraded by prolonged exposure to oxygen and humidity), most researchers today are quite optimistic that devices based on these materials will rival and/or surpass conventional silicon-based photovoltaics.

Biometrics

An Overview of Privacy Policy in the European Union

The DoD has played an active military role in Europe for more than half of the past century. During this time, the DoD has transitioned from active combat to training and various states of combat readiness, culminating in the present phase of training, operations support, facilitation of North Atlantic Treaty Organization (NATO), partner nation military engagement, and coalition and NATO Allied military contingency operations such as Kosovo Force (KFOR) Operations. The focus has also shifted from a relatively stationary target to a nebulous trans-national and trans-regional threat emanating from various parts of the globe. An important aspect of DoD's partner nation, military-to-military, NATO and law enforcement engagement strategy and activities is the development, maintenance, and use of biometric capabilities to support a spectrum of military missions and operations. The use of biometrics for any DoD operations in the European Union (EU) will be subject to the various EU privacy laws. This article will provide a summary of some of the relevant privacy policies in the EU.

Coming up next issue...

CBRN Defense

Collaborative Efforts Responding to the Prevention, Protection, Mitigation, Response, and Restore Missions Associated with Addressing CBRNE Acts of Terrorism

Countering CBRNE acts of terror is a critical element of the national emergency all-hazards preparedness process. It contains mission elements of prevention, protection, mitigation, response, and recovery. This article will highlight the collaborative efforts necessary among federal, state, local and other organizations to counter such acts of terror and other national level incidents. Critical U.S. Government documents that discuss the requirements for protecting and ensuring the United States' security interests by planning for and conducting collaborative all-hazard emergency preparedness will also be reviewed. Some of the important ongoing efforts in this area being conducted by the Department of Homeland Security, the Department of Defense and the Federal Emergency Management Agency are discussed. The article traces preparedness from Presidential Policy Directives, through implementation in National Prevention, Protection, Mitigation, Response and Recovery Frameworks that define Core Capabilities and Critical Tasks required for mission success, and set the strategy and doctrine for building, sustaining and delivering the Core Capabilities. It also examines the many different types of flexible and adaptable collaborating and coordinating structures necessary. Such structures involve the many government agencies, non-government agencies, tribal, state and local governing bodies, as well as private institutions and companies that all have role in, and contribute to, preparedness and successful mission area accomplishments. The paper continues down to the preparedness training individuals receive and how the equipment they use in responding to CBRNE and other Acts of Terror is certified for use.

Weapons of Mass Destruction

Lean-Sensing: Intelligent, Low-Cost, Remote Detection by Integrating Currently Available Components for Distant Early Warning

Today, a convergence of new capabilities that leverage government and/or commercial components through a thoughtfully integrated construct is being seen. This construct does not involve another sophisticated, computerized network of pre-positioned and expensive sensors in a presumably correct matrix but instead features a Lean-Sensing approach. In this approach, possible hazards are geo-located in real-time by optical means, visually checked and initially identified using a VTOL drone with a sensor payload vectored to the hazard location. On-board sensing can be as simple as M-8 Paper or more sophisticated using a JCAD, Radiac, TacBio or IBAC.

A Lean-Sensing approach offers a real potential for cutting exposure risk, response time and life-cycle cost through precision unmanned delivery of a detector early in the response sequence. When Lean-Sensing combines with a networked decision-support system such as a Force Protection Architecture (FPA) or JWARN, the total system performance can be further enhanced.

HDIAC Calendar of Events

2015 National Hurricane Conference
30 March – 2 April 2015
Austin, TX

Air Operations Symposium
31 March – 2 April 2015
San Antonio, TX

GovSec
31 March – 2 April 2015
Washington, DC

Contingency Planning & Management (CPM) East 2015 Conference & Expo
31 March – 2 April 2015
Washington, DC

2015 Munitions Executive Summit
6-8 April 2015
Parsippany, NJ

2015 Society for Economic Anthropology Conference – Technologies and the Transformation of Economies
9-11 April 2015
Lexington, KY

HIMSS 2015
12–16 April 2015
Chicago, IL

United States Society on Dams 2015 Annual Meeting and Conference
13-17 April 2015
Louisville, KY

Small Modular Reactor Summit 2015
14-15 April 2015
Charlotte, NC

Preparedness Summit
14-17 April 2015
Atlanta, GA

IEEE Technologies for Homeland Security
14-16 April 2015
Waltham, MA

Noteworthy

Alternative Energy

Uncovering the secrets of super solar power perovskites
March 16, 2015

Clean energy future: New cheap and efficient electrode for splitting water
March 17, 2015

Biometrics

Biometric security could do away with passwords
March 13, 2015

Australian city opens $1.3m surveillance center with facial recognition technology
March 16, 2015

CBRN Defense

Early lessons from Onkalo
March 16, 2015

ISIS employed crude chemical weapons against Kurdish peshmerga
March 16, 2015

Critical Infrastructure Protection

Derailments, ruptures of new crude-oil tank cars raise safety concerns
March 10, 2015

Predicting the scope of flash flooding
March 11, 2015

Cultural Studies

Four years on, Syria's refugees search for a future
March 17, 2015

Why Cults Work: The Power Games of the Islamic State and the Lord's Resistance Army
March 18, 2015

Noteworthy

Homeland Defense and Security

Include Climate Change in Disaster Planning, FEMA Says
March 17, 2015

Climate change discussion: Shifting from mitigation to adaptation
March 19, 2015

Medical

Researchers uncover a mechanism linking inhaled diesel pollution and respiratory distress
March 14, 2015

Rapid blood test to 'cut antibiotic use'
March 18, 2015

Weapons of Mass Destruction

Russia declares right to deploy nuclear weapons to Crimea - and may already have done so
March 11, 2015

The Homeland Defense & Security Information Analysis Center (HDIAC) is a Department of Defense (DoD) Information Analysis Center (IAC) providing scientific and technical information (STI) to the homeland defense and security communities.

HDIAC is managed by the DoD IACs Program Management Office (PMO) through the Defense Technical Information Center (DTIC).

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Defense Systems Information Analysis Center

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