Joint Trauma Analysis & Prevention of Injury in Combat

JTAPIC

Preventing Injuries Through Actionable Analysis

Joint Trauma Analysis and Prevention of Injury in Combat Program

2018 ANNUAL REPORT

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Department of Defense

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Joint Trauma Analysis and Prevention of Injury in Combat Program

Inaugural Report

August 2018

Joint Trauma Analysis & Prevention of Injury in Combat

JTAPIC

Preventing Injuries Through Actionable Analysis

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LETTER FROM THE DIRECTOR

August 2018

Captain Mark D. Clayton, Ph.D., US Public Health Service

I would like to welcome you to the first independent annual report for the Joint Trauma Analysis and Prevention of Injury in Combat (JTAPIC) Program. Since 2006, JTAPIC has supported the Executive Agent (EA) for Medical Research for Prevention, Mitigation, and Treatment of Blast Injuries. Activities and contributions by the JTAPIC Partnership in support of fulfilling the EA mission have been described to date within the context of the Department of Defense (DoD) Blast Injury Research Program Coordinating Office's (BRPCO) Annual Report.

This report, specific to JTAPIC, serves to highlight the complete picture of the Program, its organizational partners, and the contributions to the Warfighter through analysis of incidents and accidents via intelligence, medical, operational, and materiel viewpoints.

MARK D. CLAYTON
CAPT, US Public Health Service
Director, JTAPIC

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TABLE OF CONTENTS

TABLE OF CONTENTS

INTRODUCTION

Establishment of the JTAPIC

Section 256 of the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2006, Public Law 109-163, provides that the Secretary of Defense (SECDEF) shall designate an EA to be responsible for coordinating and managing the medical research efforts and programs of the DoD relating to the prevention, mitigation and treatment of blast injuries. DoD Directive (DoDD) 6025.21E, Medical Research for Prevention, Mitigation and Treatment of Blast Injuries, in compliance with Section 256 of Public Law 109-163, designates the Secretary of the Army (SECARMY) as the DoD EA and outlines responsibilities governing coordination and management of Medical Research for Prevention, Mitigation and Treatment of Blast Injuries.

The SECARMY delegated this authority and assigned responsibility to the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA/ALT) to execute the EA responsibilities, functions and authorities on 4 January 2007. The ASA/ALT further delegated to the Commander, US Army Medical Command (MEDCOM), as the authority and assigned the responsibility to execute the relevant DoD medical research efforts and programs on 16 January 2007. MEDCOM's major subordinate command responsible for executing DoD medical research efforts and programs is the US Army Medical Research and Materiel Command (MRMC), which currently houses the JTAPIC Program and provides its current Operations Maintenance, Army (OMA) funding.

JTAPIC Vision

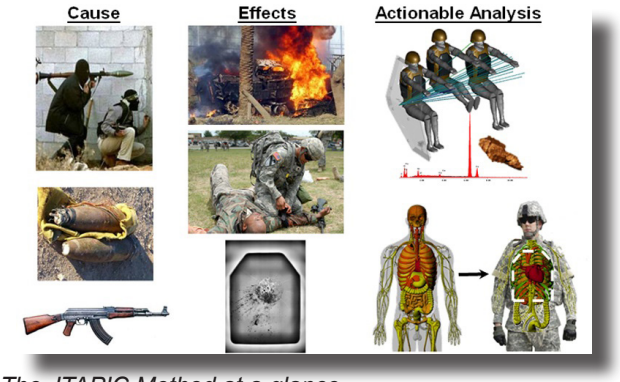
Preventing injuries through actionable analysis.

JTAPIC Mission

Inform solutions that prevent or mitigate injury during the full range of military operations, by collaborative collection, integration, analysis, and storage of data from operations, intelligence, materiel, and medical sources.

JTAPIC's Impact

To date, the JTAPIC program has created approximately 417 analysis products originating from requests for information (RFIs) submitted by Combatant Commanders (CCDRs), vehicle program managers (PMs), materiel/combat developers, medical researchers, life cycle managers, and senior leaders throughout the DoD. JTAPIC's products are amended, by request, to provide the most accurate representation of a given issue over time, in a particular operational environment. JTAPIC products are enduring and made widely available to provide the DoD with the best decision support available for complex challenges in dynamic operational environments.



The JTAPIC Method at a glance.

CUSTOMERS

JTAPIC's customers encompass the entire DoD, though the past fifteen years of ground war supports a substantial Army emphasis. More than half of JTAPIC's customers are repeat patrons, demonstrating the utility of JTAPIC analysis products to provide influential decision support to organizations addressing the challenges of today's military.

DoD Customers

Office of Secretary of Defense (OSD)
Office of the Chairman of the Joint Chiefs of Staff (OCJCS)
Defense Health Agency (DHA)
Defense Advanced Research Projects Agency (DARPA)
Unified Combatant Command (UCC)
US Central Command (CENTCOM)
US Northern Command (NORTHCOM)
US Pacific Command (PACOM)
US Special Operations Command (SOCOM)
Defense Centers of Excellence (DCoE)
Vision Center of Excellence (VCE)
Joint Aircraft Survivability Program Office (JASPO)
Joint Improvised-Threat Defeat Agency (JIDA)
Defense and Veterans Brain Injury Center (DVBIC)
Office of the Surgeon General (OTSG)

Air Force Customers

Air Education and Training Command (AETC)
Air Force Research Laboratory (AFRL)

Navy Customers

Commander, Fleet Forces Command (CFFC)
Naval Air Systems Command (NAVAIR)
Naval Facilities Engineering Command (NAVFAC)
Naval Sea Systems Command (NAVSEA)
Naval Surface Warfare Center (NSWC)
Bureau of Medicine and Surgery (BUMED)
Naval Postgraduate School (NPS)
Naval Research Laboratory (NRL)
Naval Criminal Investigative Service (NCIS)

Marine Corps Customers

Headquarters, Marine Corps (HQMC)
Commandant of the Marine Corps (CMC)
Combat Development Command (MCCDC)
Assistant Commandant of the Marine Corps (ACMC)
Marine Corps Systems Command (MARCORSYSCOM)
Combat Equipment & Support Systems (CESS)
Marine Corps Operational Test & Evaluation Activity (MCOTEA)

CUSTOMERS

Army Customers

Office of Secretary of the Army (OSA)
Assistant Secretary of the Army/Acquisition, Logistics, Technology (ASA/ALT)
PEO Combat Support & Combat Service Support (PEO CS&CSS)
PEO Ground Combat Systems (PEO GCS)
Program Executive Office Ammunition (PEO Ammo)
PEO Simulation Training & Instrumentation (PEO STRI)
Office of Chief of Staff of the Army (OCSA)
Training & Doctrine Command (TRADOC)
Combined Arms Support Command (CASCOM)
Maneuver Center of Excellence (MCoE)
US Army Recruiting Command (USAREC)
Army Materiel Command (AMC)
Research, Development, and Engineering Command (RDECOM)
Armament Research, Development and Engineering Center (ARDEC)
Communications Electronics Research, Development & Engineering Center (CERDEC)
Edgewood Chemical Biological Center (ECBC)
Natick Soldier Research, Development, and Engineering Center (NSRDEC)
Tank Automotive Research, Development and Engineering Center (TARDEC)
Army Materiel Systems Analysis Activity (AMSAA)
US Army Communications-Electronics Command (CECOM)
Tank-automotive and Armaments Command Life Cycle Management Command (TACOM LCMC)
Medical Command (MEDCOM)
Northern Regional (NRMC)
Southern Regional (SRMC)
Public Health Command (USAPHC)
Medical Research & Materiel Command (MRMC)
US Army Medical Materiel Development Activity (USAMMDA)
US Army Medical Materiel Agency (USAMMA)
Walter Reed Army Institute of Research (WRAIR)
Intelligence & Security Command (INSCOM)
US Army Corps of Engineers (USACE)
Army Test & Evaluation Command (ATEC)
Army Evaluation Center (AEC)
Aberdeen Test Center (ATC)
United States Army Combat Readiness Center (USACRC)
US Army Corps of Engineers (USACE)

LEGACY

Historical Accomplishments of JTAPIC

The JTAPIC PMO established a process, in coordination with Program Executive Office (PEO) Soldier/PM Soldier Protection and Individual Equipment (SPIE), for collecting and analyzing damaged personal protective equipment (PPE), such as hard body armor plates, soft body armor, and combat helmets, to provide PPE developers with the information needed to develop enhanced protection systems. These efforts resulted in the development of injury-based standards for PPE improvements and contributed to the development of the enhanced small arms protective inserts (ESAPI), enhanced-side ballistic inserts (ESBI) and the improved outer tactical vest (IOTV).

JTAPIC established a standardized near-real time process for collecting and analyzing combat incident data across multiple communities to provide direct feedback to commanders in theater for improving tactics, techniques and procedures (TTPs).

The JTAPIC partnership provided actionable information to combat vehicle PMs that led to modifications and/or upgrades to vehicle equipment and protection systems, such as fire suppression modifications to the Bradley vehicle platform, mine resistant seats and Tank Urban Survival Kits (TUSK) for the Abrams platform; Drivers Enhancement Kits (DEK), and Stryker vehicle modifications including the double V hull (DVH).

The JTAPIC program has provided injury profiles of injured US Service members (SMs) including attacks against individual dismounted personnel, mine resistant ambush protected (MRAP) vehicles, Stryker vehicles, Bradley fighting vehicles, armored security vehicles, and miscellaneous attacks against other US assets. Injury profiles consisted of injury descriptions using International Classification of Diseases (ICD) diagnostic codes, Abbreviated Injury Scale (AIS) coding for each injury, and an overall Injury Severity Score (ISS). These detailed profiles are integrated into intelligence investigations for each tactical event resulting from insurgent activity against US assets. The ability to define injury and severity and then link these to the investigations of the tactical events allows the intelligence and materiel communities to track the evolution of the insurgency threat and test and evaluate the effectiveness of countermeasures.

JTAPIC conducted an evaluation of Kevlar shears in lieu of the current standard scissors for cutting through the Kevlar of the IOTV. Findings from this assessment, resulted in the immediate addition of the Benchmade 7 safety hook to five US Air Force (USAF) Unit Assemblages. The JTAPIC Dismounted Analysis Team (DIAT) at the MCoE, the JTAPIC PMO, PEO Soldier/PM SPIE, and the US Army Research, Development, and Engineering Command (RDECOM) Field Assistance in Science and Technology (FAST) team personnel conducted this evaluation in joint collaboration.

RECOGNITION

JTAPIC within the Military Community

PM, Heavy Brigade Combat Team (HBCT) acknowledged JTAPIC for providing combat incident medical data analyses that keep SMs, "alive to fight another day." The data was vital to the ongoing modernization efforts for all HBCT platforms and ensured current and future generations of these platforms provide the best Soldier protection the Army can offer.

Director, Technical Management Division (TMD), PMO, Stryker Brigade Combat Team (SBCT) recognized the JTAPIC Program for crew casualty assessments that resulted in a design initiatives that significantly enhanced the survivability of the Stryker Family of Vehicles.

The Director of the US Army Tank Automotive Research, Development and Engineering Center (TARDEC) distinguished JTAPIC as a critical link between TARDEC and SMs on the battlefield for efforts supporting the RDECOM FAST Orientation program.

RDECOM FAST Medical Science and Technology (S&T) Advisor in Afghanistan thanked JTAPIC Program for providing a rapid turn-around response (less than 48 hours) to a RFI pertaining to self-contained underwater breathing apparatus (SCUBA) pony bottles for vehicles during water rollovers. He wrote, "Several units including the explosive ordinance disposal (EOD) unit inquired about the need for this capability, and with the JTAPIC information, commanders can make better-informed decisions."

The Major Jonathan Letterman Medical Excellence Award Winner was presented to JTAPIC in 2010. The National Museum of Civil War Medicine recognizes individuals and organizations that carry on the legacy of Major Jonathan Letterman's innovation and service to Wounded Warriors (WW) with the Letterman Award. From the award citation: JTAPIC's legacy is its universal impact on the prevention and mitigation of combat related injuries across the entire fighting force. JTAPIC's contributions to enhancing Warfighter health protection through development of technical and procedural solutions to real world health concerns facing Warfighters of today and tomorrow are truly in keeping with the ideals of Major Jonathan Letterman. JTAPIC is honored to be one of the first recipients of this accolade.

JTAPIC is invited aboard the USS Mesa Verde.

JTAPIC Deputy Director Mr. Vernon Richmond receives an award from MG Barbara Holcomb, CG USAMRMC.

FUNDING

At its inception in FY06, sustainment of the JTAPIC program was through the Joint Improvised Explosive Device Defeat (JIEDDO), now the Joint Improvised-Threat Defeat Organization (JIDO), funding which continued through FY09 when the JTAPIC program formally transitioned to the DA, under BRPCO, the designated EA for medical blast injury research programs.

Funding sources for FY09 through FY13 were principally Operations Maintenance, Army (OMA) Overseas Contingency Operations (OCO) with a shift in the primary source of program funding from OMA OCO funds to OMA Program Objective Memorandum (POM) funds in FY13.

In response to decreased contingency operations, JTAPIC's FY15 OMA POM and OMA OCO funding was projected to decrease 43% from FY14 funding levels.

During FY15, JTAPIC requested and received additional Defense Health Program (DHP) Operations and Maintenance (O&M) funding to cover unfunded project areas.

In FY16, JTAPIC continued to operate under mainly OMA POM funds, with an additional $1.2M in DHP O&M. OCO funding was completely cut in FY16 due to decreased contingency operations and defense-wide budget cuts.

Per the MEDCOM FY18 Program Budget Advisory Committee (PBAC), JTAPIC continues to receive predominantly OMA POM funds, with some allocation from DHP O&M (when excess becomes available). Increased contingency operations yielded JTAPIC additional OMA OCO funding for both FY17 and FY18. Effects of the addition of Futures Command and the Army Modernization effort on JTAPIC funding are pending.

JTAPIC's FY19-23 POM projections include primarily OMA POM funding. An OCO POM justification was submitted in February 2018 for FY20-24 to the Army and adjudication is pending.

In its early years, JTAPIC was funded through JIEDDO (now JIDO). A JIEDDO device trainer demonstrates equipment used to counter radio-controlled IEDs.
Photo Credit: Ed Drohan, CJTF Paladin Public Affairs

JTAPIC is located at USAMRMC HQ in Fort Detrick, MD

JTAPIC PROCESSES

Analysis Process Overview

After the occurrence of a combat event, PPE, ballistic fragmentation evidence, threat assessments, and battle damage assessment of vehicular equipment are collected along with operational data. Casualty identification occurs concurrently through both medical and operational reporting channels ideally resulting in linkage of incidents with the individuals involved. Using personally identifiable information (PII), protected health information (PHI) is linked to classified intelligence and operational reports under strict Federal, DoD and Service privacy acts, guidelines and procedures.

To adequately analyze a combat event, JTAPIC gathers information from disparate sources with varying levels of classification and access points to link cause (incident operational data and analysis), effect (injury and combat casualty care data and analysis), and mitigation (materiel performance data and forensic equipment analysis) factors. Critical capability gaps that JTAPIC has been at the forefront to address include, combat data collection methodology and standardization, in country materiel recovery and subsequent return to the continental US (CONUS) for analysis, data sharing across Service components and agencies, integration of cross domain data, and improving timeliness and responsiveness to requests for comprehensive analyses.

Materiel recovery and analysis is a combined effort by PM SPIE, the Armed Forces Medical Examiner System (AFMES) and RDECOM Survivability/Lethality Analysis Directorate (SLAD), formerly Army Research Lab (ARL) SLAD, to provide in-theater collection of damaged PPE (e.g., individual helmets and body armor) from wounded in action (WIA) SMs, and identification and analysis of foreign bodies (fragments) removed from SMs killed in action (KIA) or died of wounds (DOW) during postmortem examination. PPE returned from theater are analyzed for damage and performance, and retrieved fragment material properties are characterized. Fragment analysis data provides clues to the threat weapons involved in an incident, and modeling by SLAD provides kinetic energy data that is useful to PPE and armor developers.

Detailed forensic crosswalks of combat incidents link key information from numerous disparate sources related to a specific combat event. The National Ground Intelligence Agency Combat Incident Analysis Division (NGIC/CIAD) provides operations and intelligence data, AFMES provides information on KIA SMs, Naval Health Research Center (NHRC), Joint Trauma System (JTS) and US Army Aeromedical Research Laboratory (USAARL) provide information on WIA SMs, SLAD provides analysis on any fragments collected from the incident and models the event, and PM SPIE provides analysis of the PPE involved in the incident. A multi-community analysis of each incident independently as well as in the context of the posture of US forces in a given contingency provides the “so what” message. JTAPIC customers use these analysis products to guide survivability models and analyses, to support vehicle and equipment development, milestone acquisition decisions and to characterize injuries typical of a given combat scenario. Specific processes for event types, materiel, personnel and the dissemination and analysis of data are standardized for efficient management of customer requests.

The Dismounted Incident Analysis Process

Lead: DIAT

There are six basic lines of effort within the dismounted analysis process including data collection, categorization, storage, integration/ fusion, analysis, and dissemination.

Data collection efforts begin with operational reporting on casualty-producing combat incidents. In the past, Significant Activity Reports (SIGACTs) filed in the CENTCOM's Combined Information Data Network Exchange (CIDNE) database, provided a continual flow of operational data and serve as the primary venue for alerting DIAT analysts to casualty-producing events. However, with the shift from US-led to US-Advised/Assisted combat operations, far less operations data flows through this channel and collection of operational reporting has grown exponentially more challenging. On a daily basis when available, NGIC/CIAD populates operational reporting of casualty-producing combat incidents into the Combat Incident Database (CIDB) in which the JTAPIC Database (JDB) resides.

To address the lack of dismounted combat incident data prior to the DIAT stand-up, the team is also engaged in a parallel effort to collect operational combat data on events occurring prior to 2010. Legacy data (LD) collection processes mirror those used for current incidents and are presently focused on calendar year 2003-2004 incidents.

DIAT conducts review and collection of casualty reports provided via the Defense Casualty Information Processing System (DCIPS). Daily, DCIPS records for roughly the last 18 months are pulled for comparison to the previous day to identify and extract new or updated casualty records. Casualty information is uploaded and integrated into the correct incident record through careful interrogation of injury date/time, the SM's unit, and information provided concerning the circumstances surrounding the SM's injury.

Occasionally, DIAT receives casualty information for which there is no operational reporting, or operational reporting with no associated DCIPS casualty reporting. The DIAT then drills further down into command-level operations reporting and sometimes down to unit-level reporting. NHRC and JTS periodically provide DIAT with casualty data for casualties not identified through daily processes. Drilling to diminutive levels to collect and integrate incident and casualty information is time consuming and labor intensive, but the effort is critical to establishing a full understanding of the combat environment faced by US forces.

As data is collected and ingested into the CIDB, DIAT reviews and categorizes each combat incident. Categorization distinguishes between mounted or dismounted operations; US-only, Host Nation-only, Allied-only, or partnered operations; casualty-producing and non-casualty-producing; type of enemy attack; enemy weapons employed; friendly mission and task at time of incident; and a number of other considerations. Other discreet data elements identified and entered into the JDB include: engagement distances between enemy and friendly forces; range between a casualty and the weapon inflicting the wound; specific weapons employed and numbers, sizes, configurations; and many other elements. During the categorization process, initial summary analysis is also conducted and comments incorporated. Additionally, any/all "associated" documents and records are located, downloaded, and linked to the primary record.

All collected data are ingested and stored in the CIDB for retrieval through the JDB interface. All analysis, categorization, and additional comments are made in additional fields and/ or tables. Associated reports, documents, and media (including intelligence reports) are downloaded, and attached to the original incident record.

Casualties and incidents are linked and fused on a daily basis. Once a record containing WIA is placed in a "reviewed" status, the record is available for NHRC to pull a detailed list of casualties linked to an incident and then abstract data from medical records for review, analysis, and coding of injuries. Records containing KIA or DOW are processed similarly and concurrently by AFMES. Other information, including supplemental operations and intelligence information, PPE data, and evidence data is received on an ad hoc basis. When received, this data is reviewed for association to specific incidents and casualties and linked as appropriate.

At the end of the integration and storage efforts, analyzed dismounted combat incident, casualty, and injury data are permanently linked and instantly available for holistic analysis and production.

The DIAT engages in two basic analytical efforts—trend analysis and incident analysis.

Trend analysis is a basic statistical analysis tailored to specific requirements as they become apparent or as they are requested. While time-intensive, the effort to categorize and break out discrete data elements during the categorization phase is critical to this level of analysis. Trend analysis provides quantifiable data on types of wounds received; weapons inflicting those wounds; locations of wounds; friendly missions and tasks engaged in when the wounds were received; and many other discreet elements of value. When applied over geographical, unit, and/or temporal factors, it also aids in identification and understanding of patterns and shifts from day to day, week to week, month to month, and within a specific area of responsibility (AORs).

Incident analysis is the detailed case study of a specific incident. The objective is to identify, collect, process, and integrate every available source of data on a specific incident to enable its virtual recreation for detailed study and analysis. This effort requires exhaustive collection of all-source intelligence and operations data, including witness statements and personnel or unit debriefs if possible. All available data on the incident is broken down into time, place, action, and result which is then plotted in mapping software. The incident is studied from multiple angles and perspectives played in time sequence. The objective is to fully understand the incident, every action, reaction, and consequence. As incident analysis is time-intensive, DIAT places emphasis on incidents that are either typical (i.e., recurring), atypical (asymmetrical), catastrophic or indicative of radical new enemy TTPs. JTAPIC uses incident analysis to provide context and insight into observed trends.

Dissemination of DIAT analysis products typically is driven by specific user requirements and tailored to that user's needs on a case-by-case basis in the form of reports, briefings, and charts. However, recurrent case studies (incident analysis from above) on recent dismounted, casualty-producing incidents are a steadfast DIAT process. Analysts collect, fuse, and analyze data that includes input from other JTAPIC partners as well as interview data from WWs and unit umbrella week debriefs. These cases are presented at JTAPIC Partner meetings to solicit additional input prior to sanitizing the product for release to appropriate stakeholders.

A Marine Expeditionary Unit sits around a terrain model and discuss the hilly terrain they are about to hike in Djibouti. Photo Credit: GySgt Matthew Orr.

The Mounted Incident Analysis Process

Lead: NGIC/CIAD

Mounted event analysis processes consist of vehicle battle damage assessments, threat identification, medical data integration, aggregate analysis, fragmentation analysis, and vulnerability identification. Story boards produced from this collaborative effort by JTAPIC partners, and subsequent derived information are primarily used to answer RFIs from DoD agencies, CCDRs and Vehicle PMs, among other customers.

When a combat event occurs, the NGIC/CIAD is notified through internal reporting processes and the event date, surrounding circumstance and a random unique event identifier are disseminated to begin casualty identification by NHRC. Casualties from combat events are located within medical/casualty databases and assigned a unique person or crew identification number. Identified casualty information collected by NHRC is sent to AFMES and JTS for abstraction of detailed data and subsequent coding of injuries. AFMES provides cause of death information, autopsy results and coded injuries for KIA or DOW casualties. JTS and NHRC provide information and coded injuries for WIA casualties as well as updates of a SMs current status. Once identified and validated, the transfer of SM information through the JTAPIC partnership uses person and event identifiers in accordance with the DoD social security number (SSN) reduction policy. Once processed, casualty information is routed through the CIDB and incorporated into each SM's respective record.

Aggregate analysis characterizes injury data by injury type, severity, and body region for each combat vehicle platform in a usable format. Incident information from NGIC/CIAD and casualty information from AFMES, JTS, and NHRC are integrated to conduct analysis. Information and results are used to answer RFIs, provide factual information to PMs for possible upgrades to mitigate vulnerabilities and threats. JTAPIC mounted analysis products also provide actionable information to CCDRs to improve TTPs; and to identify prevalent or emerging injury trends.

Fragments recovered by AFMES during autopsies and by medical personnel from casualties in the theater of operations are packaged and sent to RDECOM SLAD for metallurgy analysis. The analysis conducted by RDECOM SLAD identifies the country of origin and the types of munitions being used against US ground vehicles.

Story Boards identify and provide understanding of vulnerabilities and recognize success against threats on the battlefield. NGIC/CIAD provides operational information for a specific mounted event through Battle Damage Assessments (BDAs) and incident reports. AFMES provides casualty information for KIAs through autopsy reports. JTS and NHRC provide casualty information for WIAs through medical records. RDECOM SLAD uses this information to conduct event modeling and simulation (M&S) and at times live-fire (LF) testing and evaluation (T&E). JTAPIC subject matter experts (SMEs) with medical, engineering, operational and intelligence backgrounds collectively draw conclusions from the story boards and share information widely in accordance with applicable law, policy and security classification

Soldiers maintaining convoy intervals in addition to familiarizing themselves with terrain.

The PPE Analysis Process

Lead: PEO Soldier/PM SPIE

JTAPIC uses returned, damaged PPE and clothing to help determine range of fire and distinguish between entrance and exit ballistic wounds. Returned PPE is examined for any retained ballistic evidence that may help identify the specific threat. The JTAPIC Program further analyzes PPE to improve Warfighter survivability by matching data from AFMES' analysis with incident circumstances to determine if: PPE performed as expected; PPE was worn correctly; testing standards are adequate; thresholds and objectives are correct; and improvements can be made.

PPE Collected Rollup

Year	Items Collected
2003	1
2004	107
2005	682
2006	1029
2007	1110
2008	657
2009	1641
2010	4922
2011	3833
2012	3541
2013	1370
2014	375
2015	58
2016	25
Total	19351

Damaged PPE returned to PEO Soldier from 2003-2013.

PPE Processing

Since 2003, PEO Soldier has collected over 19,000 items of PPE from theater which have been damaged or worn while in a combat incident or accident. Theater Collection Teams (TCTs) coordinate collection and consolidation of damaged PPE items with units stationed in theater and arrange for shipping. PPE transported from theater to the PM SPIE TMD at Fort Belvoir is processed for damage or fragments, analyzed, and stored for future reference. PM SPIE TMD maintains a database of all information and analysis for referencing as needed for JTAPIC RFIs or detailed research and analysis into any specific incident. For cases where the SM is KIA, TMD coordinates directly with AFMES for delivery and processing of returned PPE. Further, TMD conducts ongoing, holistic analysis of collected PPE as a whole – identifying trends in how PPE reacts to specific threat types and opportunities for improvement for greater Soldier protection.

PPE Returns Program

When a SM is involved in a combat event or accident where the worn PPE is credited to saving a life or preventing serious injury, SMs may request return of the damaged PPE. After a detailed analysis, the damaged portion of the Soldier's PPE is presented as a permanent keepsake and testament to the life-saving benefits of PPE provided by PEO Soldier. Since the program began, several dozen returns have been completed. Additionally, twenty-two more return cases are in progress with the PEO Public Affairs Office (PAO) for future events. A recent change in policy opens the returns program beyond SMs who are exclusively on active duty. This broadens the potential number of future returns and will allow greater visibility of the end result of JTAPIC's efforts, particularly PM SPIE and AFMES in enhancing Soldier protection and other life-saving equipment.

The PEO Soldier PPE returns program reunites SMs with the PPE that saved their lives.

Future of the JTAPIC PPE Analysis

Though operational temp has slowed, PM SPIE continues to processes PPE received from theater and AFMES on an as-returned basis. JTAPIC is undertaking efforts to increase awareness regarding the requirement to return damaged PPE for SMs KIA/DOW as well as those WIA. Persistently low PPE return rates hamper JTAPIC's ability to provide comprehensive analysis to advance developments in PPE due to small sample sizes when attempting to make generalizations and AFMES' ability to complete forensic investigations is hindered.

The JTAPIC PMO has engaged the Director, Operational Test and Evaluation (DOT&E) to potentially incorporate PPE returns into their Joint Combat Assessment Team (JCAT) process to facilitate both increased return rate as well as the timeliness in which PPE is returned for analysis. An effort to export all PPE data to the central JDB is in process which will allow all JTAPIC partners greater and timelier access to basic PPE data. This will facilitate more efficient and effective RFI processes, analysis of combat events, and assessment of PPE effectiveness to better protect Warfighters in combat.

Items in the PEO Soldier Portfolio.

Collaboration Spotlight: US/UK Senior Scientist Exchange Program

In November of 2016, PEO Soldier hosted a senior UK scientist and Senior Fellow, Personal Ballistic Protection, Defense Equipment & Support Technology Office, Technical Directorate, Bristol, UK under the auspices of the US/UK Exchange of Scientists and Engineers (ESEP) program. Topics discussed during this week-long exchange were JTAPIC partnership overview, PPE processing and electronic storage procedures, and previous analysis conducted on pelvic injury and Protective Undergarment / Protective Over-Garment (PUG/POG) protection. Specific topics regarding the JTAPIC partnership centered on evaluation of the JACS as a possible model for a future UK effort; future US Army pelvic protection; potential methods of analysis of the efficacy of pelvic protection; and interrogation of the PPE database for analysis of returned PUG/POGs. Furthermore, possible strategies for expanding the JTAPIC partnership with other UK organizations with missions similar to other JTAPIC partners were extensively discussed.

Historically low damaged PPE returns rates hamper analysis.

The Fragment Collection and Analysis Process

Lead: RDECOM SLAD
Participating Partners: AFMES, NGIC/CIAD

Fragments from the threat weapon and surrounding environment often become embedded in SMs during combat events in theater. Analyzing these fragments is crucial to the characterization and identification of threats. Fragments are removed during autopsy by the AFMES from SMs who were KIA or DOW and subsequently analyzed by SLAD. Results are used to characterize and identify threats to assist in determining enemy TTPs. The results also support JTAPIC event re-creations, M&S, assist with armor and PPE test designs, and assist in understanding personnel vulnerabilities to threats. The analysis procedure includes the sterilization, scanning, and documentation of the physical properties of the fragments. SLAD determines the elemental composition of fragments using qualitative and quantitative metallurgy analysis procedures.

When a fragment is recovered, it is first sent to SLAD to ensure that all fragments are safe to handle and are scanned for radiation, and inspected for explosive residue. The fragments are then logged, photographed, and separated into groups of metal and plastic to then get sterilized. Following the sterilization, the fragments are photographed again and the physical properties measured and recorded. Mass, length, width and depth of each fragment are measured, and a light microscope is used to record a basic physical description of the fragments. Using an L-shaped forensic evidence ruler, another set of photographs are taken. Three-dimensional scans are also completed on selected, primarily atypical, fragments.

Qualitative analysis is then performed using Scanning Electron Microscopy-Energy Dispersive X-ray Spectroscopy (SEM-EDS). Results from this testing are displayed as an elemental spectrum. Some cases of particular interest undergo quantitative analysis using Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES). Results from this testing show the exact elemental percentages of the trace concentrations of metals within the fragment and can be used for metal alloy identification.

All results are uploaded into the JTAPIC Physical Evidence Database (PEDB). The fragment photographs, physical properties, 3-D scans and elemental analysis results can be found. The database also contains chain-of-custody information and medical data received from the AFMES that relates to each case.

Currently, only fragments from KIA/DOW cases are collected and analyzed. JTAPIC is currently working towards developing an approach to collect fragments from WIA casualties for analysis as well. This, combined with the current process, will enhance the ability to support event recreations, assist with test designs, help determine enemy TTPs, and assist in understanding personnel vulnerabilities to threats.

Exploded M67 fragmentation grenade. Photo Credit: Alejandro Pena.

Collection of fragmentation from exploded ordnance for identification. Photo Credit: LCpl Quentarius Johnson.

JTAPIC Umbrella Week Debrief Process

Lead: DIAT

Umbrella Week (UW) is a week-long study where a unit recently returned from theater gathers to share information to help shape the future of deployments for the Army. SM experiences are collected by organizations such as JTAPIC, the Army Research Institute, and JIDO (formerly JIEDDO), among others to conduct research. The intent is taking lessons learned during deployment and apply them to create better equipment, update doctrine, conduct better training, and share insight gained across the US military.

Prior to an upcoming UW, DIAT identifies all casualty-producing incidents involving a returning unit. Date, times, and general situation overview are provided to the unit, and DIAT requests to interview SMs present at those incidents. Depending on the unit and SMs, there are different debriefing checklists integrated with special interest topics from the MCoE, Training and Doctrine Command (TRADOC) Capability Managers (TCMs), and Combat Developers. Questions tailored to the specific unit, mission, and operating area are predesignated to minimize the impact on the unit's time. One checklist is specific to casualty-producing incidents, and includes everything from mission pre-planning through return to base and after actions. If appropriate, checklists for specific focus groups, such as Squad Leaders, or Platoon Leaders/Platoon Sergeants are employed. These address more overarching issues and are arranged in a "Shoot, Move, Communicate" format.

Prior to the interviews. DIAT assembles all known information gaps, prepares debriefing packets that provide an overview of the incident as understood from traditional operational and intelligence reporting channels, and specific questions that remain unanswered. SMs involved in the incidents are briefed on the above and are encouraged to then discuss the incident as they recall it. The entire exchange is captured for further investigation. DIAT out briefs unit leadership and shares with them the questions asked, answers received, and other relevant information. New or conflicting information presented by a unit is investigated and the JDB incident record is updated as appropriate. Lessons learned and takeaways as a result of Umbrella Week debriefings are shared with the JTAPIC partnership, MCoE, and the participating unit.

Units that have been debriefed by DIAT on behalf of JTAPIC include, 2-101 ABN Fort Campbell, 3rd Cavalry Regiment, Fort Hood, 4-3 Infantry Division (ID), Fort Stewart, 4-4 ID, Fort Carson, 1-82 ABN, Fort Bragg, and 824th Base Defense Squadron (USAF), Moody Air Force Base 1-4ID, Fort Carson.

Umbrella Week provides an opportunity for agencies to meet with Soldiers following a recent deployment.
Photo Credit: CPT Scott Kuhn.

Soldiers stand in formation during a redeployment ceremony.
Photo Credit: SFC Heather Danby.

JTAPIC Army Wounded Warrior Debrief (AW2D) Process

Lead: DIAT, NGIC/CIAD

Since 1 July 2011, JTAPIC conducts Army WW Debriefs (AW2D) with identified WWs to gain critical insight into specific mounted and dismounted combat casualty events in theater. This information bridges gaps and validates existing reports on casualty-producing combat events for the intelligence, medical, and materiel communities. The AW2D process enables our SMs to be a vital part of helping protect fellow SMs through their experiences and knowledge.

The information from WW interviews is not used to support adverse administrative or disciplinary action, is independent of any criminal investigation, and participation is strictly voluntary. The knowledge gained provides a more comprehensive understanding of how SMs are being injured on the battlefield. The Army has used the information provided by JTAPIC to change the way it protects SMs from combat injuries. Modifications and upgrades have been made to vehicle equipment and protection systems, such as seat design, blast mitigating armor, and fire suppression systems. CCDRs have altered their TTPs in the field as a result of JTAPIC incident analyses.

Visits with wounded service members at Walter Reed National Military Medical Center, Bethesda, MD. Photo Credit: P01 Jennifer Villalovos.

The AW2D process requires timely and accurate communication and data sharing between the

Wounded Marines plot a course on a map during the land navigation part of corporals course. Photo Credit: SSgt Daniel Wetzel, Office of Marine Corps Communication.

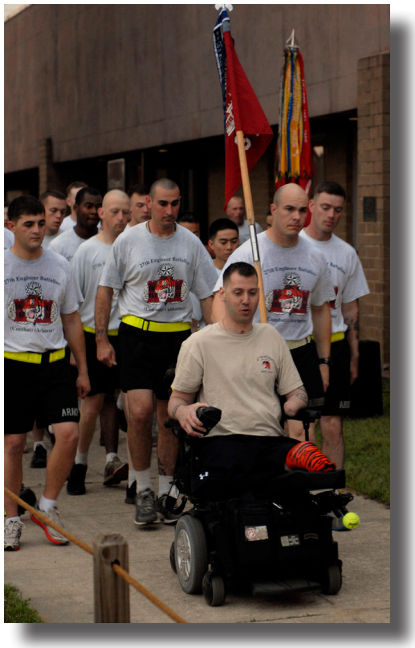
JTAPIC program and the WW's Warrior Transition Unit (WTU) leadership on a routine basis.

Typically, JTAPIC reviews and identifies WWs from events of interest and creates a list of interview candidates. The WW's WTU reconciles these lists, provides inpatient or outpatient locations, and assists with scheduling interviews. JTAPIC Analysts, either mounted or dismounted SMEs, conduct interviews with special consideration given to the individual WW's physical and psychosocial circumstances. Interview questions are determined depending on the specific incident involved.

For mounted events, questions may include identified data gaps such as actual number of vehicle occupants, unknown crew positions used, if there were unknown casualties, total number of vehicles in a convoy, the order of march for vehicles attacked, or the suspected/identified improvised explosive device (IED) type. Another objective during an interview is to reconcile any reporting inaccuracies or conflicting information. For example, a threat reported as a house borne IED through traditional operational and intelligence methods may have been a road borne IED per the WW account. Any discrepancy is investigated. Other valuable information typically not reported could include additional minor incidents the vehicle had been in previously that may explain any repairs or damage evident to Battlefield Vehicle Forensic Technicians (BVFTs) that interrogated the vehicle post-incident.

Individuals in dismounted events follow a similar interview procedure looking for information valuable for trend analysis. The dismounted interviewer focuses on data gaps such as estimated number and types of weapons used by insurgents, troop engagement ranges from direct-fire weapons used in the attack, IED types and trends in the operational area, local atmospherics in the engagement area, and if there was any retained damaged PPE not reported via other channels. Conflicts that dismounted interviewers seek to resolve include, determining whether there was a sustained firefight versus engagement with a single sniper, which element hit the IED for example the breaching element or the security over watching the breaching element.

After the interview, JTAPIC confirms and validates information within standard reporting channels and reconciles the JDB. Firsthand accounts from WWs provide increased accuracy of incident analysis and data fidelity in the actionable information provided to Senior Leaders and materiel developers. These debriefs ultimately contribute to the JTAPIC mission to improve Warfighter survivability while providing firsthand account feedback to MCoE, CCDRs, and the T&E communities.



Army Sgt. Adam Keys leads a formation of fellow Nasty company paratroopers following a run, Mar. 21, 2012, on Fort Bragg, NC. Photo Credit: SFC Thaddius Dawkins.

JTAPIC RFI Process

The JTAPIC RFI process ensures actionable information contained within the JTAPIC Partnership is shared as broadly as possible except where limited by law, policy, or security classification and that those data and analysis products produced are communicated in accordance with DoD Directive 8320.2 (Information Sharing in a Net-Centric Department of Defense).

JTAPIC at a glance.

RFIs can be submitted by anyone with a common access card by visiting JTAPIC's website, registering and accessing JACS, and submitting a new analysis request. Our RFI process results in a variety of analysis products used to fill intelligence gaps and aid in the completion of combat or accident event analysis. Ultimately, JTAPIC products often contribute to materiel or non-materiel solution modifications and improve overall understanding of vulnerabilities to threats. JTAPIC products enable the development of improved materiel solutions, PPE, vehicular equipment, and TTPs, ultimately to develop better ways to prevent and mitigate injuries to the US Warfighter. In the future, as JTAPIC expands its aperture, the intention is to modify processes so other civilian agencies and Allies have access to JTAPIC products to strengthen their decision support.

JTAPIC PMO PROJECT AREAS

In addition to governing the JTAPIC Partnership, the JTAPIC PMO is comprised of analysts who complete select projects authorized by the DoD in the areas of mild traumatic brain injury and environmental sensors.

The Management of Mild Traumatic Brain Injury Reporting Process in Accordance with DoD Instruction 6490.11

JTAPIC is at the forefront of DoD efforts to facilitate the reporting and management of mild traumatic brain injury (mTBI) for deployed personnel since Directive Type Memorandum (DTM) 09-033 “Policy Guidance for Management of Concussion/Mild Traumatic Brain Injury in the Deployed Setting” was signed on 21 June 2010. The PMO was specifically tasked by the DoD in DTM 09-033 as the principal data collection, processing and stakeholder reporting organization for the Blast Exposure and Concussion Incident Report (BECIR) involving deployed personnel from all combatant commands (CCMDs). In August 2010, the JTAPIC PMO began receiving and processing BECIR reports from the US Central Command (CENTCOM) area of responsibility (AOR).

Soldiers at the range wear full PPE during training in order to protect themselves from injuries including TBI.
DoD News photo by USAF Tech Sgt. Brian Kimball.

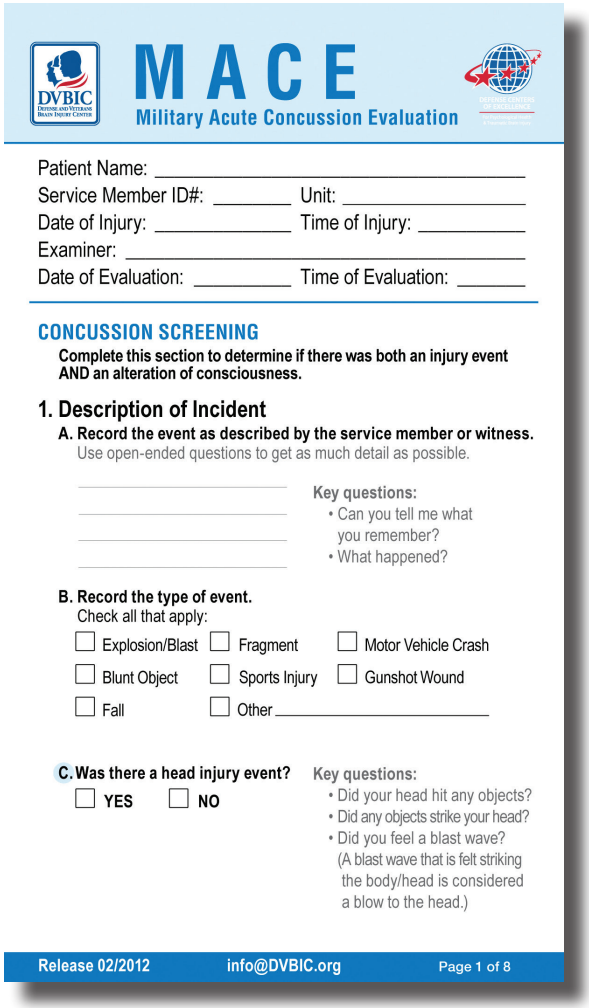
TBI, a hidden injury. Credit: PO2 Jonathan David Chandler..

From mid-2012 until late 2014, the JTAPIC PMO was an active participant in the weekly BECIR working group call composed of mTBI evaluation and management stakeholders initiated by CENTCOM. On 18 September 2012, DoD Instruction (DoDI) 6490.11 DoD Policy Guidance for Management of Mild Traumatic Brain Injury/ Concussion in the Deployed incorporated and replaced DTM 09-033. JTAPIC’s role under DTM 09-033 remained in effect and JTAPIC continued to process all BECIR reports received.

JTAPIC ceased receiving BECIR reports from CENTCOM in October of 2014 in the areas of principal engagement, Iraq and Afghanistan, when the retrograde of forces in these areas took place and there were limited personnel on the ground. In the absence of CCMD BECIR reporting, the JTAPIC PMO attempted to continue concussion stakeholder reporting using “outcome” based reports from the Theater Medical Data Store (TMDS). Unfortunately, this medical encounter based reporting failed to capture the intent of DoDI 6490.11, to capture the exposures of those SMs not choosing to “self-report” potentially concussive event (PCE) exposures. The JTAPIC Director discontinued this effort in October 2015, due to the absence of a funded requirement to perform this function.

On 9 January 2017, the Department of Health Affairs submitted two RFIs to JTAPIC for PCE exposure data for 2016 with the goal of re-energizing the required DoDI 6490.11 reporting effort. Both RFIs were completed ahead of schedule and provided invaluable assistance to the DHA in this regard.

In anticipation of the DoDI 6490.11 requirement being re-energized and with the goal of minimizing use of SSNs, JTAPIC initiated a memorandum of understanding (MOU) in place with the Defense Manpower Data Center (DMDC). The goal of eliminating the CCMD's need to report using SSNs was met and the MOU was executed in January, 2018.



MACE

Military Acute Concussion Evaluation

Patient Name: _____

Service Member ID#: _____ Unit: _____

Date of Injury: _____ Time of Injury: _____

Examiner: _____

Date of Evaluation: _____ Time of Evaluation: _____

CONCUSSION SCREENING

Complete this section to determine if there was both an injury event AND an alteration of consciousness.

1. Description of Incident

A. Record the event as described by the service member or witness.
Use open-ended questions to get as much detail as possible.

Key questions:
- Can you tell me what you remember?
- What happened?

B. Record the type of event.
Check all that apply:

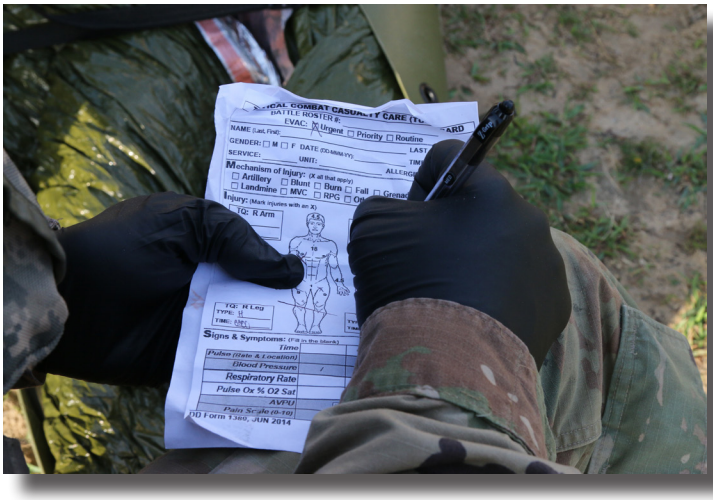
☐ Explosion/Blast ☐ Fragment ☐ Motor Vehicle Crash
☐ Blunt Object ☐ Sports Injury ☐ Gunshot Wound
☐ Fall ☐ Other _____

C. Was there a head injury event? ☐ YES ☐ NO

Key questions:
- Did your head hit any objects?
- Did any objects strike your head?
- Did you feel a blast wave? (A blast wave that is felt striking the body/head is considered a blow to the head.)

Release 02/2012 info@DVBIC.org Page 1 of 8

The Military Acute Concussion Evaluation (MACE) is a concussion screening tool for the acute assessment of service members involved in a potentially concussive event.



An infantryman completes a tactical casualty care card. Photo Credit: SGT Michelle Blesam.

In June 2017, the JTAPIC PMO was notified by DHA that the Joint Staff had directed the resumption of PCE reporting not later than 15 August 2017. In order to streamline CCMD reporting and to resolve complications identified in the earlier BECIR effort, the need for a new process to facilitate reporting emerged. JTAPIC designed, built, tested and implemented this new process and designated the system the JTAPIC Concussion Exposure Reporting System (JCERS). In July 2017, the JCERS SharePoint front was constructed to be the focal point of file exchange and data entry leveraging existing DoD architecture (INTELINK) for common access card (CAC) verification. In addition, a set of Microsoft Access® database tables were constructed to store and manipulate the PCE reporting data that populate from the CCMD's for processing. A single record data entry form and mass record spreadsheet was developed to provide the CCMD's with some flexibility in how they were to report.

On 11 August 2017, the JTAPIC Director and Deputy Director briefed the Joint Staff Surgeon (JSS) on the JCERS project and gained approval to begin leveraging the system once DHA approval was provided. At the end of FY17, PCE reporting from some CCMDs commenced and the JTAPIC PMO continues to socialize JCERS throughout the others.

JTAPIC Sensor Analysis Program

Obtaining metrics for blast and impact events in the combat theater is a priority for the DoD. By equipping Warfighters with sensing equipment, battlefield blast metrics can be analyzed to better understand injury modalities. In 2010, the JTAPIC contracted L-3 Applied Technologies Inc. (L3 ATI) for its Battlefield Exposure Sensors (BES) Project Area to provide biomechanical, engineering, and analytical services in support of research efforts to analyze collected field data from blast exposure sensor systems. Three sensor systems fielded in battlefield environments were analyzed; 1) the Helmet Mounted Sensor System (HMSS), 2) Blast Gauges, and 3) Integrated Blast Exposure Sensor System (I-BESS). The goal of the sensor analysis program was to determine if correlations exist between pressures and kinematic measures by vehicle and individual-worn sensors from blast and impact events and the physical injuries sustained in those events, such as mTBI/concussion.

Each sensor system was evaluated and unique algorithms and models were developed to provide meaningful analysis. To correlate medical injury data with an exposure, the equipment mounted sensor data needed to be transferred to the exposure on the Warfighter's body. Each sensor system was characterized in laboratory field blast testing. Screening and correction algorithms were then developed to identify false sensor recordings and account for the known limitations of the sensors. Models were developed to transfer sensor data to body loading data such as head motion and true incident pressure of an incoming blast wave. This loading data was considered as the dose with the response being the medical outcomes from electronic medical records (EMR), supplied by the JTAPIC PMO. Dose-response correlations were constructed using logistic regression analysis techniques. Analysis was performed on all three sensor systems, with the majority of the data coming from the HMSS. The largest source of paired sensor and medical record data came from a Known Event Tracker (KET) which recorded details of known events such as IEDs, Rocket Propelled Grenade (RPG) attacks, vehicle rollovers and other high kinetic energy events. Paired data points for the helmet sensor with both positive and negative outcomes for concussion were used to create a human based dose-response curve. The dose metric with the highest statistical confidence was peak head velocity. There was insufficient data from the other two sensor systems to develop a dose-response relationship.

This project produced a set of unique and highly meaningful human injury data from events in a combat environment. The following products were completed during this project: 1) dose response correlations for concussion, 2) database of raw and analyzed sensor data with matched medical outcomes, 3) Head-borne Energy Analysis and Diagnostic System (HEADS) Screening Software analysis tool used in theater, 4) Blast Estimate software for Blast Gauge analysis and injury prediction, and 5) final report with detailed methodology of analysis, project results and lessons learned.

The sensor analysis program was completed in FY16. JTAPIC continues to participate in working groups to guide the future of environmental sensors in the operational environment and has offered data from this program to support other agencies.

GEN II Helmet Sensor package.

PARTNERSHIP EFFORTS

Crosswalks and Vulnerability Mapping

Lead: RDECOM SLAD
Participating Partners: AFMES, NHRC, NGIC/CIAD

In 2007, the MRAP vehicle acquisition program, formed a case study of a rapid acquisition program where requirements development and updates, system design and engineering changes, and full-up system-level vulnerability LFT&E all took place concurrently with, and within the context of, current combat operations. Much of this work took place on timescales measured in weeks, not months or years. Combat developers need information on the nature, extent and severity of various injury mechanisms, including emerging or unexpected threats, to specify and prioritize protection requirements for new systems as well as upgrades to existing ones. Materiel developers required the same information to design and improve the systems. Service and Department T&E organizations, including DOT&E, needed access to similar information to aid in developing relevant and highly compressed test programs to inform users and decision-makers, and to validate and supplement the results derived from those programs.

In response, SLAD, with support from JTAPIC, developed two analytical methodologies, known as crosswalks and vulnerability maps, which compare the results of attacks in theater to similar LF test results. These methodologies have provided essential insights which led to improved vehicle and personnel protection, as well as TTPs in the field. Several analyses of the Stryker and MRAP family of vehicles have been used by PMs to benefit vehicle improvement programs. Based on these comparisons, SLAD identified and recommended ways to mitigate vehicle damage and occupant injury which resulted in changes in TTPs, materiel, medical treatments, and M&S. To date, SLAD has analyzed and translated over 2500 theater attacks to a LFT&E context, and these analyses have been provided to many Army and DoD decision makers including the SECARMY, the OCSA, DOT&E and the OTSG. Because crosswalks and vulnerability maps support the assessment and/or evaluation of mature system and conformance with performance specifications to determine operational effectiveness, operational suitability, and survivability, DOT&E has a continual requirement for access to timely and accurate information on crew casualties incurred during current combat operations.

Since 2008, JTAPIC has been expediting vehicle improvements through comparisons of theater events to LF testing. Based on SLAD's recommendations, MRAP vehicles, up-armored High-Mobility Multi-Purpose Wheeled Vehicles (HMMWVs), and other tactical vehicles were fielded with increased operational effectiveness, suitability, and survivability through redesigned vehicle structures.

Full-up system-level vulnerability LFT&E for the MRAP vehicle acquisition program.

Impacts, Issues, and Accomplishments from JTAPIC MRAP Analyses

"JTAPIC analysis informs Army decision to field improved protection for the MRAP All-Terrain Vehicle M-ATV"

Impact: JTAPIC's analysis of LF tests and combat events informed the decision to retrofit 100% of M-ATVs in theater with the underbody improvement kit (UIK). The M-ATVs with UIK were retained by the Army and the Marine Corps for their enduring fleet. All M-ATVs going through reset are fielded with the UIK modification.

Issue: Assess the performance and value of the UIK developed in response to an urgent theater requirement for the M-ATV.

Accomplishments:

- Applied decades of test, training and exercise (TT&E) experience to evaluate materiel protection performance of vehicles being used in Iraq and Afghanistan.
- Compared LFT&E results with assessments of combat damage from incidents in Afghanistan to provide insights into the materiel failures and resultant occupant injuries produced during combat incidents.
- Based on analysis of test results and combat data, UIK designs underwent revision.
- Helped operational and intelligence units in theater assess more accurately the threat and combat damage, as well as improve and validate Army practices in LFT& E.
- Initiated the instrumentation purchase and integration of injury criteria to capture head injuries such as TBI

M-ATV with UIK

"JTAPIC analysis drives integration of the MaxxPro Survivability Upgrade (MSU)"

Impact: SLAD's analysis of LF tests and combat events drove the integration of SLAD's design recommendations to upgrade combat locks, gunner's protection kit, floor design, and MSU kit integration to further improve crew protection and fuel fire mitigation. Nearly 3,000 MaxxPro variants were retained by the Army for their enduring fleet.

Issue: LFT&E testing of the MaxxPro DASH baseline vehicle revealed significant design problems

Accomplishments:

- Analysis of LFT&E results cross-walked with combat data to provided understanding of structural failure and occupant injuries
- Analysis showed that MSU would provide significant improvement in force protection and underbody blast (UBB) protection
- The MSU provides protection over the baseline DASH and beyond the MRAP capabilities requirements. DOT&E reported that "one of the most notable upgrades brought to theater in the last year was the MSU", and that "of the MRAP vehicles the DoD retained, the MaxxPro MRAP variants set the standard for UBB protection".

NAVISTAR Dash with MaxxPro Survivability Upgrade (MSU)

"JTAPIC analysis illuminated potential vehicle survivability issue to influence fielding"

Impact: SLAD's analysis of LF test and combat event influenced PM MRAP to cancel the Caiman baseline design. Subsequently, PM MRAP awarded a contract to enhance 1,700 Caiman vehicles with upgraded seat and floor survivability features for improved blast protection, as well as increased mobility.

Issue: Army Test and Evaluation Command (ATEC) asked SLAD to examine combat damage and Soldier injuries and compare to what is tested and assessed during MRAP LFT&E.

Accomplishments:

- Quantified protection levels by comparing vehicle damage and occupant injuries observed in LF to vehicle damage reported in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF).
- Quantified the effectiveness of seat and floor mitigation features of the vehicle that are designed to protect occupants from UBB.
- Lessons learned from theater drove Army evaluation criteria for injuries induced from accelerative loading.
- Informed PM, vendors, the Soldier, and LFT&E community by validating test designs and illuminates potential areas in which vehicle survivability is impacted.

The MRAP Caiman baseline design was canceled in part due to LFT&E and combat event crosswalks.

JTAPIC recommends priorities for fielding solutions to improve platform survivability.

Impact: SLAD's analysis of LF tests and combat events expedited PM MRAP's integration of the transfer case tie down, spall blankets, independent suspension, seat improvements, and Skydex® a priority for the MRAP Cougar vehicle. 100% of Cougar vehicles in theater were retrofitted with the modifications. The Cougar was retained by the Marine Corps for their enduring fleet.

Issue: Because of the rapid acquisition of the MRAP vehicle, not all Cougar design modifications were integrated onto vehicle in theater.

Accomplishments:

- Quantified the effectiveness of various survivability enhancements designed to protect the occupants from UBB attacks ensured potential vehicle design upgrades adequately addressed attack trends and resultant platform survivability
- Provided analysis of theater and LF data to document fielding integration deficiencies to determine the urgency of fielding vehicle survivability enhancements of the Cougar

SLAD analyzes theater attacks and translates them to LFT&E during vulnerability mapping.

Current Operation Incident Report

Lead: JTAPIC PMO
Participating Partners: DIAT, AFMES, NHRC, JTS

The Current Operations Incident Report (COIR) is a detailed operational and injury report of recent incidents in which US SMs were injured while in contact with enemy forces. Once an event occurs, DIAT and NHRC concurrently collect operational/intelligence and casualty information, respectively. NHRC subsequently provides Visual Anatomical Injury Descriptor (VisualAID) diagrams and injury analysis. If there are fatalities, AFMES conducts injury analysis and VisualAID creation. The information is integrated to give a detailed picture of the casualty causing event within the appropriate operational context. This product provides timely and relevant knowledge to CCMD Surgeons and unified action partners who utilize JTAPIC's analysis approach for decision support. The COIR is released to CCMD Surgeons and other stakeholders on a weekly basis, as well as a monthly roll-up of all events, generating other inquiries that are addressed through the JTAPIC partnership.

Legacy Data Collection

Lead: NGIC/CIAD
Participating Partners: NHRC, JTS, DIAT

Legacy data is data available across disparate data sources and in non-standardized formats that has not yet been captured in the JDB due to operational tempo or data inaccessibility. JTAPIC established systems and processes to access and standardize LD to make it accessible within the JDB. NGIC/CIAD and DIAT realize this effort through the dedication of assigned all source intelligence analysts who mine past story boards, review open source media streams, conduct or evaluate soldier interviews, and re-scrub a myriad of other available data avenues. By this process, combat incidents involving injuries were enhanced, supplemented, and in some cases entirely new, previously unidentified incidents were added to the JDB. Considering the level and intensity of combat as well as the likelihood for a paucity of previously databased information, calendar years were prioritized for LD team investigation. Hence, with respect to LD involving mounted combat incidents with injuries: CY 2003, 2004 and 2007 were completed. In 2017, there were 2,578 ground combat incidents added into the JDB with another 13,455 incidents modified in CY17. With a more robust data set, trend analysis, RFI response efficiency, and other support to medical, acquisition, and warfighting communities can be better achieved.

JTAPIC and the Veteran's Benefit Administration (VBA)

Lead: JTAPIC PMO

The VBA processes claims from Veterans for disability benefits where a claimed mTBI or blast injury is not evident in a review of the SM's treatment records. It is the US Department of Veterans Affairs (VA) statutory duty to assist requires an attempt to obtain Federal records when aware of their possible existence. In doing its mission of collecting, integrating, analyzing, and storing operations, intelligence, materiel, and medical data to inform solutions, JTAPIC is in a unique position to provide information to the VBA to inform their decision regarding claims awards. JTAPIC queries the TMDS, Joint Legacy Viewer (JLV), DCIPS, US Transportation Command (TRANSCOM) Regulating and Command & Control Evacuation System (TRAC2ES), Medical Operational Data System (MODS), Risk Management Information System (RMIS), and the JDB by Name, SSN, and conflict dates.

The results are passed to the Senior Advisor, Compensation Service of the VBA, VA for inclusion into the package a SM submits after separating from service and suffering injury or impairment from their service. JTAPIC assists the VBA in their duty to exhaust all sources to verify the presence or likelihood of a SM claim of service-related disability.

The Warrior Injury Assessment Manikin

Lead: RDECOM SLAD
Participating Partners: JTAPIC PMO, NGIC/CIAD, NHRC, JTS, PEO Soldier, AFMES

The Warrior Injury Assessment Manikin (WIAMan) Engineering Office (EO) has leveraged the JTAPIC program over the last 5 years for theater UBB injury information through RFIs to inform the development of the WIAMan anthropomorphic test device (ATD) and associated injury assessment capability. The WIAMan program is leading the effort to develop a military specific ATD to properly assess injury risk in UBB LF testing. SLAD led these RFI efforts, combining injury, event, intelligence, and vehicle information to create a detailed investigation of the injuries and mechanisms resulting from UBB for recent conflicts. The first in a series of RFIs provided a broad overview of UBB events in theater and the resulting injury patterns seen from this type of loading. The second provided more in-depth information on the specific subset of events that were most representative of LF test thresholds.

This RFI series included a deep-dive into specific events and included damage estimates, blast sizes, and injury mechanisms for lower leg and foot injuries. Injury Biomechanics experts within WIAMan and within the JTAPIC partnership collaborated to develop a military version of the civilian Crash Injury Research and Engineering Network (CIREN) biotab methodology, which allows systematic review and coding for analysis of injury causation for specific theater injuries within the dataset. This included collaboration from JTAPIC PMO, medical, intelligence, and materiel partners as injury data, radiology images, event details, and vehicle damage reports were combined to complete the analysis.

Additional RFIs derived from questions arising from previous studies were completed for WIAMan, detailing injuries, radiology, and injury causation for the lower extremity, spine, and pelvis. In 2014 and again in 2016, products addressing additional vehicle types and expanded event parameters were also investigated to ensure injury patterns were fully captured. This information was used by the WIAMan EO to guide the development of the ATD and focus the program by determining the areas of the body where most injuries occurred and where serious injury occurred. This information was also used to compare WIAMan experimental testing results to real-world events to verify that researchers were generating and predicting the appropriate types of injury.

Through the collaboration between JTAPIC, the WIAMan PMO, and academic research performers, theater data was utilized for the development of the WIAMan system to improve UBB vehicle safety for Warfighters in the future.

WIAMan ATD developed for live-fire testing in UBB events.

Example of calcaneus fracture pattern from UBB loading. Artist Autumn Kulaga, RDECOM SLAD

Battlefield Vehicle Forensic Technicians

Lead: NGIC/CIAD

JTAPIC funded OCONUS BVFTs to conduct in theater surveys of battle-damaged vehicles. BVFT assessments allow better understanding, in real time, of the circumstances in which blast injuries and other weapon effects occur, to identify specific weapon(s), and characterize enemy employment TTPs. This effort provides the intelligence community partners clearer understanding of the employment and effect of threat weapons and an ability to characterize IEDs. At the time of the retrograde of forces from Afghanistan, the BVFTs conducted a total number of 8,534 surveys. This data represents a unique collection of information without which many of successful ground vehicle upgrades would not have occurred. BVFT surveys saved millions of dollars for the test and evaluation community by allowing more informed decisions to be made about the need or details for a given LF test. In FY16, the OCONUS BVFT program formally transitioned to NGIC/CIAD.

NGIC/CIAD conducts quarterly training at Fort Polk, LA providing in depth Attack Scene Investigation (ASI) and Battlefield Vehicle Forensic training for deploying forces, the explosive ordnance community, and coalition allies. This training is in partnership with ERDC.

JTAPIC funds two CONUS BVFTs who play an instrumental role in this training conducting forensic exploitation of combat damaged vehicles residing in Army depots at Letterkenney, PA, Sierra, CA, and Redstone, AL. Lessons learned from these CONUS collections are incorporated into improving the scope and scale of available courses. Graduates of the week long BVF course have in turn provided invaluable contributions to the supplementing the JDB and CIDB and an enormous level of goodwill has been realized.

Photos from a Critical Incident Response Team Deployment.

Photos from a Critical Incident Response Team Deployment.

Participants examine crater size at the Attack Scene Investigation Forensic Course.

Computed Tomography in Operational Analysis

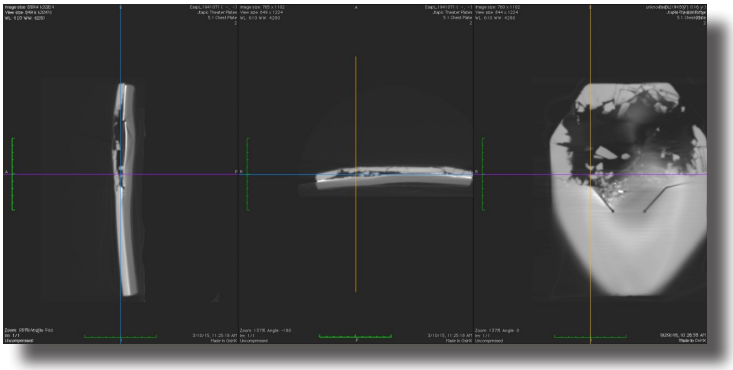
Partner Lead: RDECOM SLAD

As part of an effort to improve efficiency of data collection for fragments and bullets, interrogating damaged PPE, and supporting other research programs, JTAPIC provided funding to SLAD for the acquisition of a turn-key computed tomography (CT) scanner system. SLAD transitioned this standard tool for medical diagnostics and therapeutics to perform a host of new applications.

The CT system's core capability is making highly detailed, three-dimensional measurements of an object's interior and exterior, typically in the human body. At SLAD, CT system applications now include identifying variability in materials in order to understand their failure; quantifying damage; examining the vulnerability of systems; post-processing of threat data; and developing 3-D models for simulation and visualization. Using the CT scanner in this cutting edge manner by SLAD has brought an entirely new depth to the way that JTAPIC is able to consider materiel in the prevention of injury in combat.

To ensure the CT scanner would meet the requirements for both SLAD and JTAPIC, AFMES weighed in on the equipment's salient characteristics. Coordination with radiation safety and contracting offices at White Sands Missile Range (WSMR) ensured the new equipment (which emits radiation) was acquired and brought on-line quickly and safely. The CT scanner resides in a mobile van, permitting imaging at SLAD's experimental facilities and other remote locations. RDECOM SLAD funds the recurring maintenance costs for the equipment.

A CT scan of a body aramor plate.



Multiple views of a body armor plate under CT.

The RDECOM SLAD CT trailer at Aberdeen Proving Grounds.

JTAPIC FUNDED INFORMATION SYSTEMS

The JTAPIC Website
Lead: JTAPIC PMO

The JTAPIC public facing website http://jtapic.amedd.army.mil/ provides unclassified releasable to the public information on the JTAPIC Partnership. Additionally, it offers links for easy access to JTAPIC Information Systems and other resources.

The JTAPIC Analysis and Collaboration System (JACS)

Lead: RDECOM SLAD

Developed and maintained by RDECOM SLAD, the Non-classified Internet Protocol (IP) Router Network (NIPRNet) JACS interface provides a suite of applications to allow customers throughout the DoD to interact with the JTAPIC program, and to support the vital work performed by JTAPIC partners. Three main components comprise the JACS work environment, the Product Library (PL), Analysis Request System (ARS), and File Sharing (FS).

The PL contains a searchable repository of past JTAPIC products and provides a central location to find answers to hard questions. The PL supports creation and search of products, or projects that have descriptions accompanied by data files, analyses, or reports. PL provides a central location to both upload new products and find existing ones. The system allows project creators to choose and monitor which groups of people can view or download the product through privacy settings and a request system that ensures a need-to-know is upheld.

The ARS provides a way for customers to submit requests for analysis to the JTAPIC PMO and track those requests. ARS then provides complete lifecycle management for these requests, including review, notification, tracking, task management, and fulfillment. The system allows JTAPIC partners to communicate, provide partner support for analysis and data products, and to manage the completion of deliverables.

The FS is part of the JACS work environment that supports storage, search, and tracking of files. File Sharing provides a way for all JTAPIC partners working on a project to upload files to one location. The system allows partners to upload and download files, while retaining all versions of all files and keeping track of all activities related to the projects and the files within each project. To support the sensitive, classified nature of much of the analysis produced by JTAPIC, a mirrored version of JACS is available on the Secret IP Router Network (SIPRNet). Data is regularly migrated from the unclassified version of JACS to the classified system.

Altogether, JACS provides a cutting-edge suite of applications for customers and JTAPIC partners alike, and performs a vital role in supporting the actionable analysis that gives decision-makers the concrete findings they need.

The JTAPIC Database

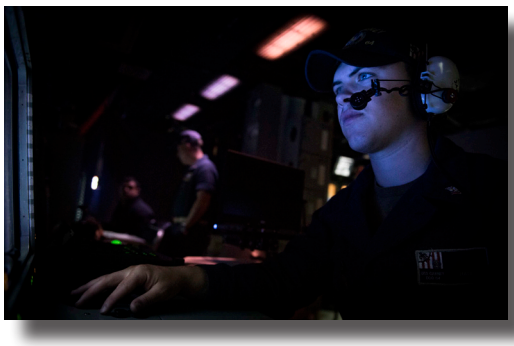
Lead: NGIC/CIAD

Through the integration of operational incidents and accidents JTAPIC identifies current/emerging capability gaps, operational requirements, and protection efficacy to correct hazards to prevent a future reoccurrence.

The JDB was created and is currently maintained by the NGIC/CIAD. The JDB is nested within the CIDB and supports the JTAPIC mission by

providing “a secure information management system that provides an environment to collect, integrate, analyze, and store both classified and unclassified information.” JDB users access data for the purpose of analyzing and disseminating actionable information to inform solutions that prevent or mitigate injury through the full range of military operations. The system accommodates access and data exchange within the JTAPIC partnership. Additionally, through use of role-based access protocols the system provides select external customers with access to approved JTAPIC data while affording appropriate protection for PII/PHI and intelligence/threat information.

JTAPIC contributes over two million dollars annually towards the ongoing JDB effort. These funds are used for the employment of software developers, quality assurance, and system engineers. Usability and satisfaction with the JDB was much improved during CY 2017 with positive feedback received from across the user community.



Standing watch in the combat information center. Photo Credit: PO1 Ryan Kledzik.

There were 26 new customer applications or upgrades to the JDB released during CY17 including:

Added 5 reports (incidents, event, platform, weapon, and person)

Prepared 6 additional JDB reports (Person Injury, Person PII Injury, Person PII PPE, Person PPE, Person-Weapon-Platform, and Platform-Weapon reports – all released 22 January 2018)

Added JDB management reports (Active Users, Account Expiration, and Feedback reports)

Updated draft Data Dictionary with new core data field definitions

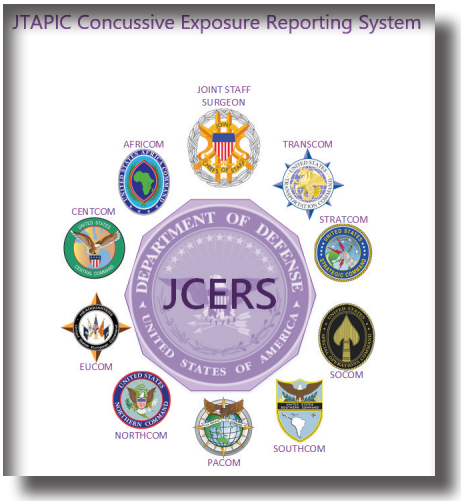
Added new fields to JDB (i.e. person type, Returned to Duty [RTD] status source, and date added/modified date) and continued to add data fields to JDB Flex Search as needed.

The JDB continually evolves to meet the needs of JTAPIC Partners and customers alike.

JTAPIC Concussion Event Reporting System (JCERS)

Lead: JTAPIC PMO

JCERS is a web-based application intended to facilitate the reporting of PCEs from the combatant command (CCMD) level to JTAPIC in accordance with DoDI 6490.11. This system is designed to provide as simple a method as possible for PCE reporting compliance, taking into account the limited personnel resources that CCMD level staff may have. The JTAPIC PMO staff leveraged commercial off the shelf products (MS Access) as the backbone for data storage and input and MS SharePoint and INTELINK solutions for hosting and credential validating which saved the DoD substantial funding typical for development and roll out of similar applications.



A screen shot of the JCERS portal.

Software Program Spotlight:

The Visual Anatomical Injury Descriptor

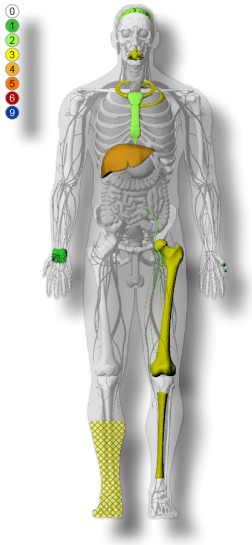
Lead: RDECOM SLAD

The VisualAID tool was developed by SLAD to provide a consistent method for visualizing injury within case studies and analyses. VisualAID allows the user to apply injury codes using the AIS (Association for the Advancement of Automotive Medicine [AAAM], AIS 2005 Update 2008, Chicago, IL) codes and localizers to record traumatic injury and visualize injury locations and severities on a virtual human body. The JTAPIC program has supported and funded the development of VisualAID and the diagrams have been used in many analysis products since its creation in 2009. The need for an injury diagram first arose during a JTAPIC meeting when partners were briefing case studies that included graphic images of the injuries sustained by in-theater casualties.

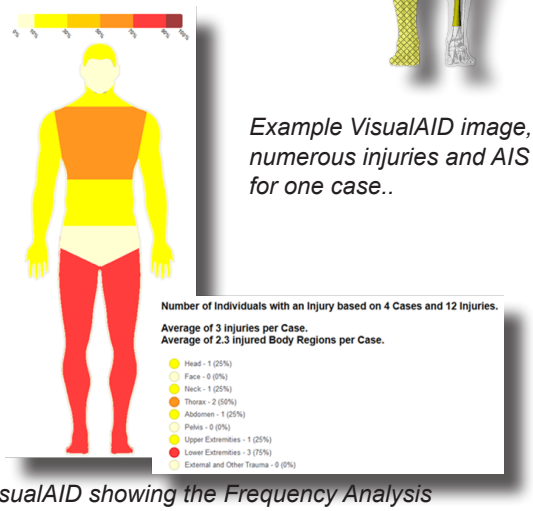
VisualAID provides a more consistent method for communicating injury and incorporates more information, such as severity, into the images while removing the issue of sharing graphic images of our injured Warfighters. Continued development of VisualAID now includes analysis features where multiple sets of injuries can be viewed together. Not only has it allowed for faster diagram creation with the incorporation of AIS codes, but it has also decreased analysis time by allowing analysts to group multiple cases together to investigate injury counts, overall severities, and percentages. VisualAID is currently being utilized by multiple groups internationally and improvements and new features are in development. Current users of VisualAID outside the DoD include the National Highway Traffic Safety Administration (NHTSA) and the National Transportation Safety Board (NTSB).

Capabilities within VisualAID include:

- Illustrates injured anatomical structures or AIS codes on human anatomy.
- Performs injury frequency analysis across body regions and types of anatomic structures for multiple cases.
- Creates images that describe trauma using a reference anatomy.
- Displays AIS-coded damage from ballistic, blunt trauma, and blast insults.
- Facilitates rapid-turn around analysis and data reporting.
- Illustrates massive wounding as a substitute to medical trauma images.
- Provides visualization and aids validation of trauma coding performed by AIS coders.
- Provides users the ability to learn anatomy and the severity of injuries described by AIS.



Example VisualAID image, displaying numerous injuries and AIS severities for one case..



VisualAID showing the Frequency Analysis feature, where multiple cases are displayed together to investigate injury frequency by body region.

JTAPIC Physical Evidence Database

Lead: RDECOM SLAD
Participating Partners: AFMES, NGIC/CIAD

Since 2008, SLAD performs forensic analysis on recovered combat evidence in support of JTAPIC. SLAD receives evidence recovered from SMs who have been KIA/DOW from the AFMES, occasionally from WIA SMs via MEDCOM, and from enemy attacks via NGIC/CIAD. SLAD analyzes recovered combat evidence, event details, and injuries to determine prevention and mitigation strategies for Warfighters. To support this effort, SLAD created, developed and maintains the PEDB. This database is accessible to registered JACS. The PEDB contains records for 22,434 pieces of evidence recovered between 2002 and 2017. The majority of the evidence (20,060 pieces) was recovered by the AFMES from SMs that died in support of contingency or combat operations. The remaining evidence was recovered in and around vehicles involved in combat events by the NGIC/CIAD or in body armor by PM SPIE. The PEDB can be queried to find all information collected for each piece of evidence. This information includes the provider, mass, dimensions, density, recovery location, shape factor, description, predominant materials, source, photos, and three-dimensional scans (if completed). For select evidence of interest, qualitative metallurgy results from Scanning Electron Microscopy- Energy Dispersive X-ray Spectroscopy (SEM-EDS) is provided and quantitative metallurgy results from Inductively Coupled Plasma- Atomic Emission Spectroscopy (ICP-AES) is provided.

PEDB data is the only link for Materiel Developers to ensure their body armor and materials can stop operationally relevant threats.

Example of a fragment contained within the JTAPIC PEDB.

PEDB Successes

In FY11, the ATEC used the PEDB in their evaluation of the Tactical Tux, which the Rapid Equipping Force (REF) used to inform their decision to field 22 tactical tuxes.

In FY11, MCoE used the PEDB to inform M&S conducted by SLAD to determine the mitigation potential of ballistic boxers. This RFI determined that 159 SMs could have potentially benefited from this protection. This RFI was used by MCoE as decision support to issue an expedited fielding of the ballistic boxers.

In FY12, SLAD used the PEDB to characterize the fragment and small arms threat striking the head to provide researchers working on the Behind Helmet Blunt Trauma Program (BHBT) with an understanding of the prevalence of particular threats of interest
.
In FY13, PM Infantry Combat Equipment (PM ICE) used the PEDB to help guide their design for the new Modular Scalable Vest.

In FY12 and FY17, The Technical Cooperation Program (TTCP) Chair of Technical Panel 5 (TP5) used the PEDB to assist with a comparative analysis of combat evidence recovered by the US and the United Kingdom (UK).

In FY13 and FY14, NSRDEC used the PEDB to determine the relevant fragment sizes to use in M&S efforts to better understand how to develop a new, modular body armor system..

JTAPIC Partners are currently developing a standard operating procedure (SOP) to define best practices for the transfer, identification, electronic storage, and warehousing of physical evidence extracted from autopsies, site exploitations, and battlefield forensics. Its completion will streamline physical evidence processes and ensure control of physical evidence is properly managed. The NGIC/CIAD covers the funding for a full time contractor charged with providing subject matter expertise on physical evidence extracted during autopsy.

Forensic Encyclopedia Program (FEP)

Partner Lead: NGIC/CIAD

JTAPIC funding contributes to the development of procedures, tools, technologies and training that support the identification of a weapon system after it has been used in an attack. The FEP is led by the NGIC/CIAD in partnership with the ERDC, the US Army Ordnance School at Fort Lee, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), and the Defense Forensic Science Center (DFSC). DoD, Department of State (DoS), and Department of Justice (DoJ) agencies collaborate with this partnership to: research threat weapon systems, munitions, and IEDs used in attacks based on forensic data; identify the nature and location of the threat for future mission planning; and improve understanding of weapons effects against current protection systems. The FEP is a cumulative repository for threat identification comprised of forensic identification systems such as the Forensic Encyclopedia Result Retrieval and Evaluation Tool (FERRET), Crater Algorithm Design for Explosive Charge Analysis (CALDERA) and the Vehicle-Borne IED (VBIED) Post Event Results (VIPER) Tool. Collectively, FEP provides decision support primarily of a classified nature to armored vehicle programs and dismounted soldier protection systems.

Database Spotlight:

JTAPIC PMO Supports the Expeditionary Medical Encounter Database

JTAPIC funding supports the NHRC Expeditionary Medical Encounter Database (EMED) as well as the information technology (IT) infrastructure of the NHRC Medical Modeling, Mission Support and Simulation (M&S) Team. In return, these efforts provide back support to the M&S Team's vital JTAPIC activities. As with all living databases, IT resources are required to maintain data and also for the input of new data. Early in development, the EMED featured data entry screens with drop down menus to assist with injury coding. These same screens and pull down menus assist the nurse coders when coding JTAPIC cases and also store the information for quality assurance/quality control (QA/QC) processing and returned to JTAPIC for inclusion in the JDB. The current EMED capability is compliant with all Health Insurance Portability and Accountability Act (HIPAA) Privacy Act regulations that apply to a Covered Entity (CE), the designation that NHRC currently holds, and applies strict, limited access controls to keep all data secure. Prior to NHRC's involvement with JTAPIC, NHRC gathered and coded combat injuries from theater to build out the current EMED. Through the current combat injuries and the JTAPIC LD effort, the EMED is being augmented with additional combat cases and associated AIS codes and in return, JTAPIC benefits from the cases that EMED contains coded from the original paper medical records which capture injury information at Role 1 and 2 at in theater medical treatment facilities (MTF). The EMED is an input into the larger Expeditionary Medical Knowledge Warehouse (EMedKW) that supports NHRC's tri-service approved operational medical support planning software: the Joint Medical Planning Tool (JMPT) and the Medical Planner's Toolkit (MPTk). JTAPIC has provided data to support the construction of a special operations patient condition occurrence frequency (PCOF) table within the JMPT and MPTk.

ALLIES OF THE UNITED STATES

In addition to representation throughout the DoD, the JTAPIC Program collaborates with US Allies in many international forums

Technical Cooperation Program (TTCP)

The TTCP is an international organization that collaborates in defense, scientific and technical information exchange; program harmonization and alignment; and shared research activities for the five nations of Australia, Canada, New Zealand, the United Kingdom and the US (FVEY). JTAPIC is annually represented at the TTCP Land Systems (LND) Technical Panel Five (TP5) – Personnel Survivability and Vulnerability meeting where major collaborative projects are established and monitored in priority areas of defined mutual national interest. Recently, discussion included the challenges of urban warfare, fragmentation injuries, body armor coverage and vital structure injuries, SM functional capacity measurements, validation of the “golden hour” in combat surgery, and methodology for placement of TTCP products in the JTAPIC PL and acquiring access to select JTAPIC products by FVEY Allies.

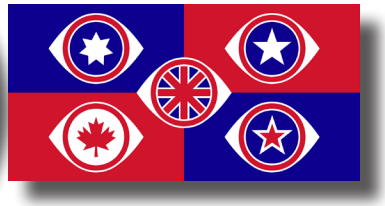
Armor/Anti-Armor Threat Coordinating Group (TCG)

Hosted at NGIC, the TCG attracts a broad range of DoD organizations and Allies representing mounted, and for the first time in FY18, dismounted ground force stakeholders. These annual conferences discuss capabilities and requirements, bringing together systems developers, PMs, and the intelligence and medical communities. Briefings and discussions synchronize future dismounted force protection efforts while ensuring an understanding of the current and future threats allowing JTAPIC to stay at the forefront of emerging DoD endeavors.

Senior Cooperation Forum – Army (SCF-A)

The SCF-A, Formerly Senior National Representatives - Army hosts annual meetings to address universal themes encountered by the US and its Allies in combat. JTAPIC is represented in the Threat Intelligence and Analysis Group (TIAG), Combat Incident Analysis Group (CIAG) at the working group level. In the CIAG, JTAPIC collaborates with other North Atlantic Treaty Organization (NATO) representatives to examine best practices for attack scene investigation, to share concepts for evaluating threat weapon systems, and determine data sharing methodology between countries so information flows efficiently for mutual benefit.

U.S. Army Europe and other NATO Commands gathered fot the annual Senior Army Leaders Meeting.
Photo Credit: Tony Sweeney



FY17 ANALYSIS PRODUCTS

The products described below and all JTAPIC products can be accessed at the JACS Product Library. Information on obtaining an account and help on accessing JACS can be found at our public web site: http://jtapic.amedd.army.mil.

Neck Armor Protective Enhancement (NAPE) Pad Injury and Event Analysis (17-009S)

Lead: RDECOM SLAD
Participating Partners: NHRC, DIAT, AFMES, PM SPIE

Summary: To investigate the performance of NAPE protection in theater combat events, JTAPIC analyzed cases associated with returned NAPE protection as well as Warfighter injuries to the neck area. The case analysis portion included both KIA (N=8) and WIA (N=18) cases, looking at any damage recorded to the NAPE and investigating the injuries sustained by the Warfighter. Additionally, theater data from multiple years was analyzed to assess the incidence of WIA neck injury in combat events. The classified results of this RFI provided tangible evidence of the effectiveness of the NAPE pad in combat, as well as data on how frequently the NAPE pad is worn.

Aviation Survivability Development and Tactics (ASDAT) Combat-related Injury Retrospective Study, Stage Black Hawk, 2003–2014, Volume I (15-044S)

Lead: USAARL
Participating Partners: NHRC, AFMES

Summary: Historically, aircraft survivability evaluation methodologies focused on what happened to the aircraft in combat events, with limited consideration given to personnel casualties resulting from combat-induced aircraft losses. The ASDAT team requested the JTAPIC Partnership conduct an analysis of injuries sustained by US SMs in combat aviation events for improved occupant survivability recommendations. Additionally, the study would identify whether the crew could continue to perform their duties (post-injuries) and if they could egress the aircraft unassisted.
On behalf of JTAPIC, USAARL's Survivability Analysis Team (SAT) is conducting a multi-stage retrospective analysis. Stages Black Hawk is complete with Chinook, Apache, Kiowa Warrior, and consolidated to follow. Stage Black Hawk assessed UH-60 series aircraft involved in combat aviation damage incidents from 2003–2014. SAT SME reviewed information from each event. The incidents with casualties were broken down into direct or indirect events. Direct events resulted in ballistic penetrating injuries, and indirect events resulted in blunt force trauma injuries (catastrophic crashes, hard landings). Survivability was assessed by analyzing AIS-coded injuries.

Stage Black Hawk identified trends and areas for improvement in future aircraft design, crash-worthiness, and occupant survivability. Improved techniques and training could result in fewer combat aviation casualties. USAARL conducted classified briefings with JCAT and JASP on ASDAT findings for Stage Black Hawk.

A UH-60 Black Hawk helicopter, assigned to Task Force – Iron Eagle, prepares to lift off.
Photo Credit: Nicholas Rau

Blast Injuries by Body Region - Blast Injury Prevention Standard Recommendation - BIPSR (16-024N)

Lead: NHRC
Participating Partners: NGIC/CIAD, DIAT, AFMES, SLAD, JTS

Summary: This product provides an update to an earlier JTAPIC product (12-161N) and displays the total frequency of combat blast injuries and the total frequency of those injured for the time period 1 January 2013 through 31 December 2015. Blast injury was defined as any injury resulting from explosive weapons or devices. The group was stratified by posture (mounted vs. dismounted). The single most severe blast injury AIS description per individual is provided, along with the number of blast injuries for each SM. Lastly, the frequency and proportions for each of the customer specified body regions, body sub-regions, and injury type are provided. Brief information is also given on combat aviation events to include the number of events and the number of resulting WIA and KIA. This analysis was conducted based on a request from the BRPCO. MRMC and the MITRE Corporation in their work with BIPSR Process Stakeholders to identify and prioritize the development of needed Blast Injury Standards Report (BIPSR) based on real-time injury data. BRPCO is performing a re-prioritization of blast injury types remaining in the BIPSR process queue.

There were a total of 1445 WIA with 5850 blast injuries over the time period, 559 WIA were dismounted (suffering 2638 injuries) and 886 were mounted (suffering 3212 injuries). Overall, the highest proportion of injuries were to the face (28%, 1650/5850), followed by head (24%, 1373/5850). The lowest proportion of injuries was to the neck (1%, 60/5850). Specific subgroups were provided per the customer request and included auditory, minor traumatic brain injury, moderate traumatic brain injury, burns, ocular, pelvic/urogenital, serious traumatic brain injury, skull fracture, and severe traumatic brain injury. Investigation into these specific categories revealed that the most common was auditory injury (20%, (1148/5850), followed by minor traumatic brain injury (16%, 918/5850). With the exception of moderate traumatic brain injury (6%, 321/5850), all other subcategories represented less than or equal to 2%. In general, mounted WIA SMs tended to have fewer injuries than dismounted WIAs. Spinal injuries were more common in mounted SMs, and >80% were acute strains with no fracture or dislocation.

Blast, impact simulations could lead to better understanding of injuries and body armor.
Photo Credit: Randy Montoya

PPE Injury Analysis for USMC OAD (16-030S)

Lead: NHRC
Participating Partners: PM SPIE, DIAT, SLAD

Summary: This RFI provided the distribution of enemy weapon types that contacted dismounted Marine troops in OEF between 1 January 2011 and 31 December 2014. Only Marines injured “outside the wire”, beyond the confines of a defended installation were included. For those KIA and those WIA, weapon type was broken down by time of day (day = after full sunrise and night=after full sunset), year, AIS injury severity, maximum AIS, AIS body region and injury type. VBIEDs were excluded as they were a clear overmatch if within the lethal radius. Victim-operated under-foot IEDs were also excluded because of the unique upward blast effect for which body armor can offer little protection.

Weapon types included were small arms through medium/general purpose machine gun, rocket propelled grenade, recoilless rifle, mortar, artillery rocket, IED with an intended fragmentation effect, grenade and person-borne IEDs, such as suicide vest (usually constructed with a fragmentation component). Additionally, for WIA SMs, injury mapping was provided on a subset of those identified with penetrating injuries to the abdomen or thorax greater than an AIS severity of 2.
This product is part of an OAD study that informs the Marine Corps PPE Combat Development Integrated Product Team (CD-IPT) as they develop a PPE capability development document (CDD). The overarching goal of the IPT is to determine the survivability value of PPE and compare that with its cost in mobility. In addition to the product described here, SLAD will deliver a separate, related product providing modeling to examine PPE effectiveness against a spectrum of enemy weapons with particular focus on the side SAPIs.

The population for this product consisted of 339 Marine WIAs with 1187 injuries and 45 KIAs with 541 injuries. In both WIA and KIA, over 90% of all injuries occurred during the day time regardless of weapon type. The majority of WIA injuries of an AIS 3 (serious) or greater could be attributed to one particular weapon type and the same was true for the KIAs. The injury mapping of WIAs with penetrating injuries to the abdomen or thorax revealed no confirmed side entrance wounds. There were 193 abdominal and thoracic injuries in 34 KIAs with an AIS severity 2 or greater, which accounted for 36% of all KIA injuries and occurred in 76% of all KIAs.

Hard Armor Protection Analysis RFI (16-025)

Lead: RDECOM SLAD
Participating Partners: AFMES, PEO Soldier, NGIC/CIAD, NHRC, JTS

Summary: Researchers at RDECOM SLAD, through partnership with JTAPIC program, performed an in-depth examination of the injuries sustained by casualties with damaged plates that were returned through TMD/PM SPIE. The purpose of this analysis was to determine the type and severity of any injuries sustained from the back-face deformation of the plate and to provide a better understanding on how ESAPI and ESBI plates were performing against small-arms threats in-theater. Additionally, to provide a clear understanding of each event scenario, an event summary including small arm weapon type, bullet type, and engagement range, if known, were included in this analysis.

This analysis examined 26 total casualties, 12 WIA and 14 KIA. Of the 12 WIAs, two sustained behind-armor blunt trauma (BABT) injuries as a result of the permanent plate deformation, both injuries were minor in severity. All 14 KIAs sustained injuries caused by a bullet that resulted in death. In addition, 7 of the 14 sustained minor BABT injuries as well. A minor severity injury, such as contusions, abrasions, and lacerations, was confirmed by the AFMES to be the highest AIS severity injury caused by BABT for the casualties in this dataset.

This RFI combined injury information with deformation data to complete a deep dive case analyses for each small arms fire event scenario corresponding to a returned plate. The conclusions resulting from this RFI informed PM SPIE as well as materiel developers and lethality experts on the protection level provided by hard armor plates.

Each plate is thoroughly inspected for damageprior to issuance. Photo Credit: 1LT Ian Shay

House Armed Services Committee (HASC) IED Casualty Trends (16-041B)

Lead: NGIC/CIAD
Participating Partners: DIAT

Summary: In response to questions from COL Nancy Parson, Director, Patient Care Integration, OTSG for a briefing to the HASC, this product details how IED casualties and incidents are reported, the number of IED casualties from 2014 to 22 December 2016, and injury trending in IED casualties. OTSG was provided a list of reporting sources used to identify IED casualties and incidents, aggregate data charts showing the number of US military SM IED casualties and incidents per quarter for the time-frame. Additionally, JTAPIC analysis found no significant upward trend in IED casualties for the given time frame once mass casualty outliers are excluded.

DoDI 6490.11 CCMD Compliance (17-002N, 17-016N)

Lead: JTAPIC PMO

Summary: DODI 6490.11 "DoD Policy Guidance for Management of Mild TBI/Concussion in the Deployed Setting" requires operational commanders to submit a Significant Activity Report containing data on individuals sustaining PCE, including distance from the blast, where applicable, and confirmation of factors that impact the ability to modify TTPs. JTAPIC provided compliance data for medical record documentation, correct use of appropriate ICD codes for initial diagnosis and first follow up evaluation within 24hrs for those individuals that were diagnosed with a potentially concussive event of those individuals exposed to a blast and/or diagnosed with a potentially concussive event in accordance with 6490.11.

This information was used by the Deputy Assistant Secretary of Defense (DASD) for Health Readiness Policy and Oversight (HRP&O) as the basis of a request to the JSS for assistance in resumption of PCE reporting by all CCMDs. Operational reporting of PCE exposure is important to identify SM's exposure to PCEs ensuring proper evaluation, treatment, and monitoring for short and long term effects of mild TBI/concussion.

Burn Casualty by Military Occupational Specialty (MOS) Analysis (17-003B)

Lead: DIAT

Summary: This product summarizes JTAPIC analysis of dismounted US combat casualties receiving thermal burn injuries incurred between 1 January 2011 and 31 December 2016. The subset of casualties receiving burn injuries is compared against all dismounted US combat casualties, for whom JTAPIC analyzed injury data is available, to determine proportion of casualties receiving burn injuries, and the proportion of burn injuries compared to all combat injuries. The product also provides descriptive statistics that further summarizes frequency, proportion, and distribution of burn injuries to dismounted US combat casualties by MOS, casualty mission profile at the time of injury, and weapons inflicting casualties. JTAPIC conducted the analysis in support of the NSRDEC Fire Resistant clothing research.

The 601st Aviation Support Battalion executing Combat Lifesaver training in preparation for deployment.

Occupant Protection Study: Stage HMMWV (15-067N, 17-011N, 17-017N)

Lead: USAARL
Participating Partners: SLAD, NHRC, JTS

Summary: TARDEC requested information on accidents (collision, rollover, and collision with rollover) and casualties in ground vehicles from 2010 through 2015. With a primary focus on occupant survivability. The products are quantitative and qualitative retrospective studies analyzing four Army vehicle platforms broken up into stages by vehicle type: HMMWV, MRAP, Stryker, and the Family of Medium Tactical Vehicles (FMTV). The findings of these studies will be used by TARDEC in developing their crash and rollover standards. After the initial RFI, 15-067N, was delivered to TARDEC additional questions were answered in addendums (17-011N and 17-017N).

The products provide univariate and multivariate analyses of HMMWV accidents, casualties, and AIS-coded injuries. Accident narratives were read to determine the cause of the accident (maneuvering, other vehicle, excessive speed, or environmental/materiel), and sequence of events leading up to and following the accident. The accidents were grouped into one of four causes: maneuvering, excessive speed, other vehicle, or environmental/materiel issues.

Collisions accounted for more than half of the accidents (61%) and casualties (55%) and almost half of the injuries (49%) in stage HMMWV. Though rollovers comprised less accidents than collisions (36%), they resulted in more fatalities, more injuries per occupant, and more severe AIS-coded injuries. The product also analyzed the relationship between restraint use (restrained or unrestrained) and outcome (fatal or nonfatal) and found that within the HMMWV study population unrestrained casualties were more likely to be fatal. In the nonfatal casualties, the AIS-coded injuries in unrestrained occupants were more severe than the injuries in restrained occupants.

Marines drive HMMWVs along a trail during counter improvised explosive device training. Photo Credit: Sgt Chris Garcia.

Occupant Protection Study: Stage MRAP (16-020N)

Lead: USAARL
Participating Partner: SLAD, NHRC, JTS

Summary: The second phase in the TARDEC Occupant Protection Study used the study design and combined template from the three Stage HMMWV as the basis for comprehensive analysis of MRAP accidents from 2010-2015.

Unlike in HMMWV accidents, rollovers accounted for the majority of accidents (86%), casualties (87%), and injuries (90%) in stage MRAP. Also, much of the detailed information about the events and casualties was unknown. Driver actions (maneuvering) accounted for 67% of the known causes of accidents. Though restraint use was not a statistically significant contributor of fatalities in MRAP accidents in this study, the injuries in the unrestrained occupants were more severe than restrained occupants

The master driver for the 3rd Special Troops Battalion, 3rd Infantry Division Resolute Support Sustainment Brigade, backs up a M-ATV. Photo Credit: SGT Elizabeth White.

Data Support for OSD (17-018B)

Lead: DIAT
Participating Partners: NGIC/CIAD

Summary: JTAPIC produced this quick-turn analytical product in response to an urgent RFI submitted by Office of the Secretary of Defense Cost Assessment and Program Evaluation (OSD CAPE). The product presents summary data and analysis of all mounted and dismounted US military combat casualties incurred between 2001 and May 2017 during the course of OEF, OIF, Operation New Dawn (OND), Operation Inherent Resolve (OIR), and Operation Resolute Support (ORS). It presents summary data tables depicting total US Mounted and Dismounted combat casualties by year, status (KIA/DOW and WIA), and generalized inflicting weapon type (small arms, grenades, rocket-propelled grenades and recoilless rifle, IEDs and mines, indirect fire, and those injured by undetermined and unique one–off weapons). It then delves deeper into the aggregate totals to break out and compare mounted combat casualties to dismounted combat casualties, as well as dismounted Army casualties to dismounted Marine casualties. While the product is unclassified and for official use only, most of the data is used to generate it resides on classified systems, therefore, it is only posted to the classified JACS.

Close Combat Casualty Prevalence (17-019S)

Lead: DIAT

Summary: This product provides data and analysis in support of MCoE efforts to quantify the prevalence of casualties incurred during close combat engagements. It presents the same data and analysis as provided in 17-018 – Data Support for OSD, with the addition of total casualties, both hostile and non-hostile, reported by the DCIPS, during the same period of analysis (1 November 2001 – 23 May 2017). Employing raw DCIPS data, the product presents summary data and analysis of all reported US Military casualties incurred, including ground, aviation, and maritime, hostile and non-hostile, during the course of OEF, OIF, OND, OIR, ORS. These total casualties are aggregated by year and type (hostile, non-hostile) and status (Deceased, Injured/Ill). It provides further detail on distribution of all US Army casualties, reported by DCIPS as hostile casualties, by major MOS groupings (Infantry, Armor/Cavalry, Engineers, etc.). A deeper drill down presents the distribution of DCIPS reported US Army hostile casualties assessed as dismounted by major MOS grouping. The product also uses JTAPIC-analyzed data to present more concrete detail on US Military mounted and dismounted combat casualties by year, status, (KIA/DOW and WIA), and generalized inflicting weapon type (small arms, grenades, rocket-propelled grenades and recoilless rifle, IEDs and mines, indirect fire, and those injured by undetermined and unique on-off weapons). It then delves deeper into the aggregate totals to break out and compare mounted combat casualties to dismounted combat casualties, as well as dismounted Army casualties to dismounted Marine casualties. While the product is unclassified and for official use only, most of the data used to generate it resides on classified systems, therefore, it is only posted to the classified JACS.

Ground Combat Systems Overpressure Injury Analysis (16-040N)

Lead: RDECOM SLAD
Participating Partner: NGIC, AFMES, NHRC

Summary: TACOM LCMC, in response to increased visibility and discussion of overpressure injuries, requested evidence related to overpressure related injuries from enemy attacks against the M109A6 Paladin Self-Propelled Howitzer Systems (SPHS), Bradley, Abrams, and Stryker during OIF and OEF. JTAPIC's investigation indicated that the given threat did not cause primary blast injuries in the above current ground systems. Additionally, JTAPIC materiel partners affirmed that blast overpressure measurements attained from LF tests on ground vehicle systems generally do not exceed injury thresholds for mounted personnel.

FY17 DATA PRODUCTS

Data Support for OSD, Follow-on Analysis (17-021S)

Lead: DIAT

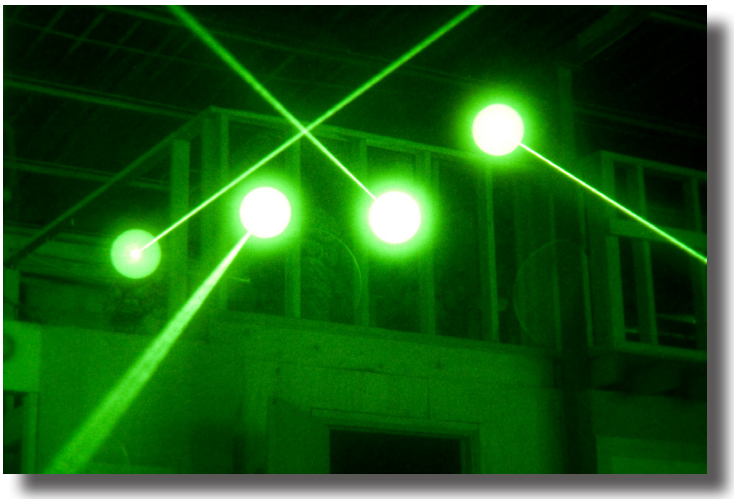
Summary: This data-only product provides a limited dataset covering dismounted US military combat casualties incurred during the time-frame of January 2011 through May 2017. The unclassified for official use only (FOUO) data was extracted and downgraded from classified data sources. JTAPIC provided analyzed data detailing when and where casualties were received, inflicting weapons, engagement ranges, distance from blast devices, and specific injuries incurred, when available. The dataset consists of thirty discrete data fields for each combat casualty. General casualty demographics data, include branch of service, service component, rank, gender, Primary and Duty MOS, and unit of permanent assignment. This data product also provided reported and assessed mission and task of the unit involved in the casualty-producing engagement.

Laser Related Threat-Injury Analysis (17-008N)

Lead: NHRC
Participating Partners: DIAT

Summary: As follow-on analysis to 16-026B - Laser Related Threats, this JTAPIC product provides a distribution of laser injuries sustained in OIF and OEF between 1 March 2008 and 31 July 2016. The analyzed data extract supplies operational characterization of 191 laser exposure incidents for which casualty and injury information could be integrated, then stratified by ground and air incidents. Operational parameters of the exposure event, reported laser characteristics and medical observations found for each instance of exposure, as well as any information that could be determined about the use of protective eye wear were included to inform decisions regarding PPE requirements and usage, and to gauge the true battlefield threat from lasers.

For the purposes of AIS coding, the following rules were applied: SMs must have had a medically documented eye injury via report of a funduscopic examination with the lesion being attributed to laser exposure. Headache was only coded if the SM noted that the headache began immediately after laser exposure. JTAPIC analysts reviewed medical documentation for 281 personnel exposed to laser radiation in the 191 cited incidents, finding 37 individuals with medically documented symptoms. Post-exposure headaches was the predominant reported after-affect. Ten of these individuals were in aircraft and 27 were ground based. Of all the injuries, four (4) were not experiencing headache and none of the injuries exceeded an AIS severity of one (1).



Infrared lasers and night-vision optics at Camp Ramadi, Iraq. Photo Credit: SGT Mike MacLeod.

BECIR Data for DoD Trauma Registry (17-020N)

Lead: JTAPIC PMO
Participating Partner: JTS

Summary: JTS requested the transfer of the BECIR data set collected by the JTAPIC PMO since 2012 in support of DoDI 6490.11 for incorporation into the JTS DoD Trauma Registry (DoDTR), Neuro-Trauma Module. The JTAPIC PMO medical staff provided a transfer of more than 20,000 mTBI related records developed as a result of BECIR mTBI reporting to the JTS by secure means.

Stryker Analysis (14-032)

Lead: NGIC/CIAD
Participating Partners: NHRC, JTS, AFMES, SLAD

Summary: TACOM LCMC requested that JTAPIC provide injury analysis comparing vehicle occupant amputations that occurred in Stryker Flat-bottomed Hull (FBH) in Iraq (2004 - 2011), and Afghanistan (2009 - 2011) versus Stryker DVH in Afghanistan (2011 - 2014). The result was the compilation of a comprehensive, usable data set for incidents involving Stryker that could be queried expeditiously to answer emerging survivability and lethality questions during all portions of the Stryker life cycle. In addition to vehicle details, the dataset includes all available coded injuries occurring within the Stryker platform from 2004 through 2014. Information derived from this data set was provided to PM Stryker leadership and armor/survivability team to inform the Stryker Development program, General Dynamics Land Systems (GDLS), ATEC, DOT&E, and RDECOM SLAD of injury analysis and Army Materiel Systems Analysis Activity (AMSAA) in support of Stryker FBH/DVH fleet mix study. Currently, this data set is the basis for two new requests for comparison of injuries between FBH and DVH attacks/casualties and the basis for a subsequent white paper detailing findings.

VBA PCE Exposure Requests Lead: JTAPIC PMO

Participating Partners: USAARL

In support of the VBA, JTAPIC investigated 12 SM cases during FY17 for the purpose of validating claims for the award of disability payment related to sustaining a mild TBI or PCE exposure during service related activities. JTAPIC PMO staff and partner organizations queried multiple database systems such as TMDS, JDB, Medical Situational Awareness in the Theater (MSAT), DCIPS, Transportation Command Regulating and Command and Control Evacuation System (TRAC2ES) and the HMSS database in an attempt to validate potential exposures. JTAPIC has investigated 70 SM cases to date.

Iraqi Security Forces and Coalition partners provided fire support to assist the Syrian Democratic Forces.
Photo Credit: SPC Anthony Zendejas.

25th Infantry Division Strykers arrived at Camp Taji, Iraq, to complete the Stryker Brigade's mission in that region.
Photo Credit:

SPOTLIGHT: HISTORICAL PRODUCTS

PPE Collection Rate series (2011-2015)

Lead: PM SPIE
Participating Partners: AFMES

Summary: An OCJCS memorandum dated 28 March 2011: Recovery and Return of PPE for KIA SMs states that JTAPIC will provide quarterly reports on Service PPE return rates and advancements in PPE development to the OCJCS. AFMES provided data this recurrent product including the number of forensic pathology investigations, broken down by service, and number of cases which had the SM's PPE returned for inclusion into AFMES' forensic investigation. PPE returns were further broken down by service. Advancements in PPE development and technology initiatives as a result of the JTAPIC PPE return program continue today, albeit limited of late due to both low operational tempo and PPE return rates.

Green on Blue Threat Analysis (2013-2014)

Lead: NGIC
Participating Partners: RDECOM SLAD, DIAT, NHRC, AFMES, JTS

Summary: The Green on Blue Threat Analysis Update focuses on the comparison and analysis of Green on Blue attacks, attacks by Afghan soldiers on US or Coalition troops, in Afghanistan between 1 January 2014 and 31 August 2014 in Afghanistan during OEF. Blue Force operational aspects were analyzed in order to detail the attack location, force protection measures, security posture, and unit affiliation of those involved in the attack. Intelligence information in regards to the shooter and weapon specifications were also researched and analyzed to determine possible motives. Medical data was analyzed by JTAPIC to understand gunshot entrance locations and patterns with respect to different parameters. The product provided key insight into the Green on Blue threat and provide customers at the tactical, operational, and strategic levels the trends and vulnerabilities to aid in decision making processes, especially in regards to force protection and security enhancements for a post-2014 Afghanistan.

EOD Bomb Suit Analysis Series (2015)

Lead: DIAT
Participating Partners: PM SPIE, RDECOM SLAD, AFMES, NGIC/CIAD, NHRC, OAD/COAST, JTS

Summary: JTAPIC partners created a two-product comprehensive analysis of performance of the EOD bomb suit in theater events. This first-ever analysis of incidents where the EOD bomb suit was employed considered the threat – such as type and size of device, fragmentation, employment method, type of explosive, etc. - as well as synopsis of incident, and any resulting SM injury. This RFI supported development of the EOD Generation II bomb suit, and allowed the program office to make an assessment of the effectiveness of the current performance requirements (e.g., protection against fragmentation, overpressure reduction, etc). Previous performance requirements for this protective system considered only material properties and performance not directly related to levels of protection and injury mitigation.

The EOD bomb suit .Photo Credit: PV2 Vincent Fausnaught.

MCCDC USMC Requirements Data (2016)

Lead: NHRC
Participating Partners: JTS, AFMES, NGIC/CIAD

Summary: MCCDC requested JTAPIC provide combat injury data for seated passengers of combat and tactical vehicles attacked by under-vehicle mines, IEDs, and roadside attacks not including shape charge threats. Differentiating by vehicle (e.g. M1114 HMMWV, M-ATV, Light Armored Vehicle [LAV], etc.), and further by under-vehicle attacks from roadside attacks JTAPIC provided a global summary for all known occupants in vehicles. Furthermore, when known, JTAPIC provided indication if seatbelts/restraints or any other protection-related equipment and TTPs were followed at the time of attack. The purpose was to evaluate whether injury trending differed for USMC personnel who are larger than the 50th percentile male as compared to those who are smaller than the 50th percentile male as defined by the US NSRDEC, 2010 Anthropometric Study of USMC Personnel. The product examines casualty status, number of injuries, severity of injuries and body region of injury to determine if there is a statistically significant association with height and weight. Classified results of this unique study have identified new areas for investigation and collaborative effort.

Combat Engineer Casualties during Handheld Device use

Lead: DIAT

Summary: This product provided statistical answers on dismounted combat engineer casualties incurred between 2001 and 2017. Dismounted combat engineer casualties were determined by filtering casualties based on their MOS for engineer designators of 12B/12A and 21B/21A. Narrative descriptions within operational reporting were reviewed to determine the likelihood of handheld detector use during the time of injury. The response was provided to the RDECOM to assist in future handheld device (HHD) development and use for Army engineers.

House-Borne IED Scenarios for Experimentation Support

Lead: DIAT

Summary: This product a series of scenarios developed to test robotic capabilities for use in booby-trapped structures. The scenarios were developed based on a review of actual combat incidents involving booby-trapped structures against US forces. The scenarios were delivered to the Maneuver Battle Lab for use in experimental testing of robotic capabilities being developed at the MCoE.

Stepped Off the Cleared Path Analysis

Lead: DIAT

Summary: This series of products resulted from DIAT analysts noticing a number of IED casualties resulting from SMs stepping off an already cleared path. DIAT conducted an initial analysis of IED casualties from 1 January 2012 through 30 September 2012 and found that nearly 10% of the casualties occurred from a SM stepping off a cleared path. The JTAPIC PMO sent out a memorandum with a distribution that included JIDO (formally JIEDDO), Center for Army Lessons Learned, Marine Corps Center for Lessons Learned, TRADOC, and CENTCOM G3.

The following recommendations were highlighted:

1. Deploying units should develop standardized TTPs for marking cleared paths at IED vulnerable areas/vulnerable points (VA/VP).

2. Programs of Instruction should include IED VA/VP analysis in pre-mission planning, as well as marking and avoiding techniques in routine patrol and small unit drills, and counter IED (C-IED) instruction.

3. Develop and implement a standardized materiel solution to provide semi-persistent marking of cleared lanes to allow for careful and precise movement in high IED threat environments.

4. Command and control should consider modifying unit reporting requirements to include confirmed use of HHDs and presence or absence of IED marking to improve situational awareness and communication of observed and suspected IED/indicators.

Results and recommendations were further briefed at the Joint Staff/J8 Capabilities Meeting at the Pentagon on 30 November 2012. Follow-up analyses continued through 2013 resulting in two additional memorandums 11 July 2013 and 24 December 2013. Changes in unit missions and activities as a result of the JTAPIC products rendered monitoring stepped off cleared path incidents unnecessary.

Marines stand by for a fire mission in a Light Armored Vehicle.
Photo Credit: LCpl William Chockey.

Holley/Sickle Stick Efficacy

Lead: DIAT
Participating Partner: OAD/COAST

Summary: This product provided analysis of the efficacy of the Holley/Sickle Stick, developed by the USMC as a C-IED enabler. Marine Gunnery Sergeant Floyd Holley developed the Sickle Stick in 2010 as an aid in detection and/or confirmation of IEDs while providing far greater standoff distance than performing finger sweeps of suspected emplacement sites. The study examined EOD after-action reports for dismounted IED encounters in Afghanistan between March 2011 and July 2013. JTAPIC analysts categorized these encounters in terms of Holley/Sickle Stick Presence and use as mentioned. Then they compared detonation rates of incidents in which the stick was used against those in which it was not present or not used. Based on the findings of this study, JTAPIC recommended the DoD explore the Holley/Sickle Stick as light weight, low cost addition to the standard suite of all C-IED tools.

A marine sweeps the area a metal detector near Boldak, Afghanistan.
Photo Credit: Sgt Austin Long.

Soldiers mark a found mortar round during a route clearance.
Photo Credit: SGT Nikayla Shodeen.

JTAPIC PARTNERS

JTAPIC PMO

The JTAPIC PMO is currently headquartered at the MRMC at Fort Detrick, MD. The PMO provides oversight of administrative, technical, analytical, and project and product management conducted within JTAPIC to include planning, programming, budgeting, and execution of all JTAPIC program operations. In addition to the JTAPIC Director and Deputy Director, the PMO consists of program analysts, product manager, nurse analysts, and a resource manager all with subject matter expertise in several JTAPIC related fields.

Armed Forces Medical Examiner System

Mission:

Investigate deaths,
Identify the fallen,
Improve readiness.

Vision:

Be the global leader in comprehensive and innovative medico-legal services enhancing the readiness, sustainability, and survivability of those we serve.

Support to the JTAPIC mission is but one aspect of AFMES support to the DoD. The Office of the Armed Forces Medical Examiner (OAFME) is the operational component of AFMES and conducts forensic pathology investigations worldwide in accordance with Title 10 US Code 1471. Board certified forensic pathologists, forensic anthropologists, medico-legal death investigators, and forensic photographers are always available and deployment can be accomplished worldwide in 4-48 hours, depending on location providing complete, multi-faceted forensic investigation.

In addition to performing these investigations, OAFME conducts mortality surveillance on all US SMs and administers training programs for forensic pathology fellows, pathology residents, medical students, military investigators, and mortuary affairs personnel.
AFMES also operates the DoD DNA Registry, which consists of the Armed Forces Repository of Specimen Samples for the Identification of Remains (AFRSSIR), and the Armed Forces DNA Identification Laboratory (AFDIL). AFRSSIR stores blood stain cards and maintains a database on all SMs to assist in their retrieval for human remains identification. DNA specimens are also collected from civilian government employees and civilian contractors who support military missions in hostile foreign environments. Similarly, AFDIL provides worldwide scientific consultation, research and education services in the field of forensic DNA analysis to the DoD and other agencies, and is instrumental in helping identify deceased SMs from both current and past conflicts.
AFMES' Division of Forensic Toxicology is DoD's centralized laboratory which performs routine toxicological examinations on Class A, B and C military aircraft, ground and ship (sea) mishaps in which no fatalities occur (referred to as incidents); OAFME cases to include all military aircraft, ground and ship (sea) accidents involving fatalities; selected military autopsies; biological specimens from AFOSI, CID and NCIS criminal investigations; blood for legal alcohol and drug tests in DUI and DWI medico-legal determinations; blood and urine in fitness for duty interrogations; and selected cases of national interest. The division also performs quality oversight of the DoD Drug Testing Program through certification, proficiency testing and inspections.

Naval Health Research Center

Mission:

To optimize operational readiness and Warfighter health by informing DoD policy through research excellence.

Vision:

To be the premier deployment health research center for the DoD.

NHRC optimizes the operational readiness and health of our armed forces by conducting research, development, testing, and evaluation to inform DoD policy. NHRC is the DoD Deployment Health Research Center since 1999. NHRC's research spans the spectrum from physical readiness to joint medical planning, to WW recovery and behavioral health interventions, all focusing on the health, readiness, and well-being of our nation's military members and their families while being operationally relevant and driven by fleet requirements. Core research areas include operational readiness and health, military population health, and operational infectious diseases. We are one of eight laboratories within the BUMED and affiliated with the Naval Medical Research Center (NMRC) in Silver Spring, Maryland. NHRC supports military mission readiness with research and development that delivers high-value, high-impact solutions to the health and readiness challenges the US military population faces on the battlefield, at sea, on foreign shores, and at home.

NHRC's MMMSS has been involved with JTAPIC since 2007 and is currently the only active JTAPIC Navy partner. Historically NHRC's primary JTAPIC contribution was to code combat injuries using the AIS system and provide this information back 8 weeks of the combat injury. NHRC's staff of certified nurse coders, many of whom have a history of military service, deployment or civilian trauma center experience complete every case. Over the years, NHRC has become integral in using various sources to identify casualties and assist JTAPIC intelligence partners with the integration of the casualty and the event information. This event/casualty integration is what makes the data that JTAPIC produces unique and of significant importance. NHRC now frequently provides epidemiological support to JTAPIC analysis products. The epidemiology group has also submitted and presented abstracts to the Military Health Research Symposium that showcase the medical component JTAPIC products.

Naval Health Research Center's (NHRC) Warfighter Performance Laboratory and the immersive virtual reality environment where naval researchers discuss how they use science and technology to improve the health, readiness, and resilience of service members. Photo Credit: Regena Kowitz.

The Warfighter Performance Laboratory at NHRC. Photo Credit: Regena Kowitz.

Research, Development & Engineering Command - Survivability/Lethality Analysis Directorate (formerly Army Research Lab/SLAD)

Mission:

Provide innovative research, development and engineering to produce capabilities for decisive overmatch to the Army against the complexities of the current and future operating environments in support of the Joint Warfighter and the Nation.

Vision:

To be the Army's enabling command in the development and delivery of capabilities that empower, unburden and protect the Warfighter.

SLAD is the premier source of expertise in survivability/lethality and vulnerability analysis (SLVA) for senior leaders, developers and evaluators helping to ensure US personnel and equipment survive and function effectively in hostile circumstances.

RDECOM SLAD focuses on technology areas critical to strategic land dominance across the spectrum of operations. SLAD provides critical links between the scientific and military communities and marshals internal and external science and technology assets to fulfill the requirements defined by or requested by the Soldier. Equally important, the laboratory assists users in understanding the implications of technology on doctrine and in defining future needs and opportunities.

SLAD focuses on the integration of SLVA of Army systems and technologies across the full spectrum of battlefield threats and environments through analysis tools, techniques, and methodologies. SLAD's mission is to discover, innovate, and transition S&T capabilities that (1) improve technologies being developed to meet critical and Army-unique needs; (2) provide decision makers and SMs with accurate and detailed awareness of materiel capabilities; and (3) link institutional and operational forces by means of a powerful shared toolset that simplifies and improves their decision making.

SLAD accomplishes this mission through the development of models, conducting ballistic experimentation, and by being the EA for the Army's Title 10 US Code (10 USC) LF objective. Per Army Regulation (AR) 73-1, SLAD supports the AMC's objectives of providing SLVA and evaluation support over the life cycle of major Army systems and to ensure the Soldier is survivable against the full spectrum of battlefield injury mechanisms. AR 73-1 states that:

"T&E provides an understanding about how the system meets (or continues to meet) the user intent, serviceability, and suitability for inclusion (or continuation) in the Army, and whether the system provides (or continues to provide) appropriate survivability against emerging validated threats. Survivability addresses the capability of military forces to avoid or withstand hostile actions while retaining the ability to fulfill their primary mission(s). It is a key element of knowledge when proposing to acquire a system, since threats attempt to exploit aspects of the system in order to defeat our forces. Understanding how the system can defeat active enemy actions is critical. Creating a capability to survive an enemy attack is one way of creating survivability; working to deny the enemy the opportunity to conduct an attack is another that can be exercised through doctrine or TTPs. Thus, the efficacy of any approach in the operational context also must be addressed."

AR 73-1 continues to say that one purpose of T&E is to perform special studies and make recommendations regarding TTPs, or design modifications to reduce vulnerability, enhance Soldier survivability and mitigate injuries. In addition to LF testing, this type of study is accomplished through the JTAPIC partnership,

where SLAD is focused on system assessment in the context of mission accomplishment, performance, safety, health hazard, operational effectiveness, operational suitability, and survivability.

As the DOD experts for personnel vulnerability, SLAD is in a unique position to connect test results and requirements to combat performance. SLAD takes an active role in working with JTAPIC partners to provide this technical expertise and assistance in support of ongoing operations. SLAD's goals within the JTAPIC partnership are to extend its SME to help mitigate the risk of Soldier injury and acquire systems that will survive and/or be highly lethal in all environments against all battlefield threats. Through the identification of threat data from JTAPIC intelligence partners, and characterization of injury data from JTAPIC medical partners, SLAD effectively connects this data to materiel performance to identify cause and effect. Information gained from analysis of combat data informs recommendations of techniques to reduce ballistic vulnerabilities, enhance system and complex target survivability, and ensure optimum effectiveness of the system. Of utmost importance, SLAD's analyses support formal evaluation, user requirements development, and validates test data derived from Operational and LFT&E of production systems.

SLAD's partnership with JTAPIC allows for expedited materiel improvements in the field to enable operational readiness concomitant with the capability to counter new threats. SLAD's responsibility, within JTAPIC, to accomplish these objectives include:

- Conduct analysis of materiel performance and injury outcomes based on data available through the JTAPIC partnership to provide SLVA recommendations for materiel performance and personnel survivability.

- Perform analysis of combat event data through comparison to test events, reverse engineering, experimentation, M&S, and/or research.

- Provide SMEs for materiel performance, injury analysis, injury coding, and the analysis of radiology to provide an understanding of injury biomechanics, as required.

- Identifying how systems are damaged in events and correlate the system damage to injuries to inform decision support.

- Manage, maintain and develop the JACS.

- Manage, populate and maintain the JTAPIC PEDB with physical evidence/fragments obtained from combat events. Perform material characterization and maintain forensic custody and storage of the physical evidence/fragments.

- Assist in development and maintenance of analytic tools, databases, or other web-based or desktop software applications as required.

SLAD's contribution to the JTAPIC program specifically relate to the areas of: forensic material analysis, event recreation, injury and wound analysis of combat casualties, vehicle vulnerability analysis, and PPE analysis. SLAD uses modeling and analysis to reconstruct selected combat events using the Operational Requirement-based Casualty Assessment (ORCA) model that allows SLAD to predict effects on personnel, both stand-alone and as integrated into the MUVES-S2 ballistic vulnerability model for assessing mounted and dismounted personnel in various levels of protection. SLAD also reverse engineers combat events, providing useful threat, injury predictions and materiel, performance data to materiel developers for vehicles and personnel protective equipment. Combat analysis, M&S, and engineering analysis allows SLAD to explore the ramifications of materiel design and compare the effectiveness of materiel in its actual combat context. Comparison of modeling and engineering results to post-event data collected from theater is used to help understand the event and gain insight into expected outcomes given changes in the scenario (e.g. different armor solutions).

Marine Corps Combat Development Command - Operations Analysis Directorate

Mission:

Provide oversight for the Marine Corps on all matters pertaining to studies and operations analysis, assist the Marine Operating Forces and other Marine Corps agencies with operations analysis support, and conduct a continuing program of studies and analyses to assist the Marine Corps in making combat development, programmatic, and warfighting decisions.

COAST is the Current Operations focused branch of OAD with the mission to train and deploy operations research analysts.

The Deputy Commandant (DC) for Combat Development and Integration (CD&I) and the MCCDC fully integrates Marine Corps concepts and requirements based warfighting capabilities; including doctrine, organization, training, materiel, leadership and education, personnel and facilities in order to ensure the Marine Corps is properly organized, trained and equipped now and in the future.

The OAD within MCCDC is the Marine Corps' focal point for operations research, analytic support and studies management. It provides critical support to the operating forces and the Marine Corps Force Development System by blending a comprehensive understanding of military operations with advanced analytic and decision-making tools, to include a wide range of computer-based models and combat simulation. These tools are employed to assist DC, CD&I with his mission of creating and maintaining combat ready Marine Air-Ground Task Forces (MAGTF). OAD executes and provides oversight for the Marine Corps on all matters pertaining to operations analysis, and M&S in order to provide support to organizations across the Marine Corps and to assist in making force development, programmatic, and warfighting decisions.

There are six analysis branches within OAD. Of the six branches, the Current Operations Analysis Support Team (COAST) and the Analysis Branch are the conduits to JTAPIC. COAST prepares, deploys, and analytically supports operations research analysts deployed to various forward deployed Marine Commands. COAST is currently deploying two analysts to Task Force 51 – 5th Marine Expeditionary Brigade in Bahrain. While analysts from COAST have participated in Marine Corps related JTAPIC requests for support, like the operational assessment of the Holley Stick, the most common support for JTAPIC comes in the form of a Marine Corps operational perspective/data and operations research and Marine Corps-related feedback at JTAPIC meetings. Marine Corps operational data is derived from the current operations update briefs provided daily by the Deputy Commandant for Plans, Policies, and Operations on the Secure Internet Protocol Router Network. As needed, this data is supplemented by reach-back analysis projects underway by COAST in support of the forward deployed analysts.

The OAD and COAST relationship with JTAPIC is one of mutual support. JTAPIC has answered requests for support for OAD, and in turn, OAD helps the ten other organizational members of JTAPIC to understand and capture Marine Corps operations in order to provide the best possible answers for the customers of JTAPIC.

US Marines assigned to the 26th Marine Expeditionary Unit (MEU) offload gear from alanding craft in Djibouti.
Photo Credit: Cpl. Jonathan Sosner.

Dismounted Incident Analysis Team

Mission:

The MCOE provides trained, agile, adaptive and ready Soldiers and Leaders for an Army at war, while developing capabilities for the Maneuver Force and the individual Soldier and providing world-class quality of life for our Soldiers, Civilians, and Army Families.

The DIAT mission is to analyze US dismounted, casualty-producing combat incidents by fusing data from combat operations, intelligence, medical, and individual PPE associated with dismounted events. The integrated data are analyzed to produce JTAPIC products detailing combat activities and consequences that inform warfighters, combat developers, training developers, and doctrine writers in an effort to prevent future casualties

Since 2009, DIAT provides support to JTAPIC with four personnel each at MCoE, Fort Benning, and NGIC, Charlottesville, VA through the Warfighter Focus Indefinite Delivery/Indefinite Quantity (IDIQ) contract vehicle.

DIAT's Support Role to NGIC and MCoE

DIAT leverages the unique capabilities inherent at each location to provide a wide range of support functions to the JTAPIC Program.

NGIC: Analysts are located at the NGIC within the Combat Analysis Branch (CAB) that supports the CIAD and perform a variety of intelligence functions supporting JTAPIC as well as mission functions at NGIC.

MCoE: Analysts are located at the MCoE within Soldier Division/TRADOC Capability Manager-Soldier (SD/TCM-S) supporting the Capabilities Development and Integration Directorate (CDID). With these analysts embedded in CDID, JTAPIC has a direct link to support transfer of JTAPIC knowledge products across Warfighting enablers.

CDID's mission states that CDID "Determines and develops future force capabilities across Doctrine, Organization, Training, Materiel, Leadership Development, Personnel, Facilities and Policy (DOTMLPF-P), resulting in a trained and ready maneuver force fully integrated into the Army, Combined and Joint Warfight …to maintain the battlefield primacy of our SMs and the formations in which they fight."
JTAPIC maintains a finger on the pulse of Soldier requirements and capabilities by having analysts working within SD/TCM-S. SD and TCM-S represent every Soldier in the Army as the user representative to the TRADOC Commander. They develop and manage capabilities for everything a Soldier wears, carries or consumes. JTAPIC products help inform on requirements for future capabilities as well as performance of current capabilities.

Program Manager Infantry Combat Equipment

Mission:

PM ICE is a dedicated and proactive team which ensures all Marines are equipped with the best available material solutions to meet validated requirements, by developing, fielding, and sustaining infantry combat equipment to enhance the performance, capability, survivability, and mobility of Marines.

Vision:

The vision of MCSC is, "To serve as the Commandant's agent for acquisition and sustainment of systems and equipment used to accomplish the Marine Corps' warfighting mission".

PM ICE supports the collection of Marine Corps information and damaged PPE for the JTAPIC Program. Working closely with its Army counterpart, PM SPIE/TMD, PM ICE engineers provide supplementary support and knowledge to JTAPIC's effort when answering questions pertaining to materiel performance and capabilities.

PEO Soldier/Project Manager for Soldier Protection and Individual Equipment

Mission:

The mission of PEO Soldier is to develop and provide superior and sustainable integrated clothing and equipment that protects Soldiers and helps them perform their missions in a rapidly changing global environment. The PEO Soldier-developed and -fielded clothing and equipment protects Soldiers from environmental threats such as heat, cold, inclement weather and insect-borne diseases. The clothing and equipment also provides Soldiers with state-of-the-art protection against threats associated with ballistics: blast overpressure, fragmentation and heat.

Vision:

Equipping and protecting America's Soldiers

PEO Soldier acquires, fields, and sustains affordable integrated state-of-the-art equipment to improve Soldier dominance in Army operations today and in the future. For the past decade, PEO Soldier has provided Soldiers with capabilities to ensure they remain decisive and dominant throughout the full spectrum of military operations. Our Army conducts offensive and defensive operations, stability operations and civil support operations with Soldiers equipped and trained to use the very best equipment and capabilities that PEO Soldier can provide.

Since the Terrorist Attacks on 11 September 2001, the Army has been operating in many challenging environments. We have been conducting operations in Iraq and Afghanistan while simultaneously performing humanitarian assistance missions or contingency operations. As our forces withdraw from Iraq and Afghanistan, we remain vigilant in ensuring that our SMs are equipped to be effective wherever our nation's interests dictate. PEO Soldier is making a deliberate effort to integrate technologies for the Soldier as a System. As our Soldiers evolve, PEO Soldier works hard to provide system solutions that provide the greatest capabilities.

PEO Soldier manages more than 450 products and programs. Four PM Offices, PM SPIE, PM Soldier Sensors and Lasers, PM Soldier Warrior and PM Soldier Weapons are dedicated to providing the very best equipment to increase combat effectiveness, save lives, and improve quality of life.

For JTAPIC, PM SPIE oversees testing, fielding, and technical analysis of PPE - hard armor plates, helmets, and soft armor as well as other Soldier equipment. This equipment is designed to increase survivability of SMs from blast, blunt trauma, and ballistic impacts. In this role, SPIE continually explores new technology and designs with the potential to enhance Soldier protection and easing overburdened SMs with lighter weight, multi-functional materials.

To assess the effectiveness of currently fielded systems, SPIE collects and analyzes PPE returned from the field that have been involved in either combat incidents or accidents. Theater collection teams interface with deployed units to collect battle-damaged PPE and to gather as much information regarding the circumstances of how the PPE was damaged. The PPE is then shipped to SPIE's TMD, a team of highly skilled engineers and scientists. TMD performs a detailed analysis of all damaged PPE using the latest high-tech scientific methods to determine how well the PPE protected the Soldier against the encountered threat. TMD coordinates with JTAPIC partners to create a thorough case study of all damaged PPE performance, taking into consideration injury data, event circumstances, and threat analysis. This allows SPIE to identify potential vulnerabilities and provides direction for future research and design efforts.

Additionally, TMD interfaces with academia and industry to focus on advanced material research as well as dynamic defeat mechanisms and modeling capability. The TMD team also works with law enforcement and other Federal agencies on personal protection research & development, and standardization of testing protocols.

Joint Trauma System

Mission:

Provide evidence-based process improvement of trauma and combat casualty care, to drive morbidity and mortality to the lowest possible levels, and to provide evidence-based recommendations on trauma care and trauma systems across the DoD.

Vision:

That every Soldier, Sailor, Airman and Marine injured on the battlefield or in any theater of operations will be provided with the optimum chance for survival and maximum potential for functional recovery.

JTS efforts are supported by the collection and analysis of data maintained in the DoDTR, formerly the Joint Theater Trauma Registry. The DoDTR is the data repository for DoD trauma-related injuries. The goal of the DoDTR is to electronically capture information about the demographics, injury-producing incident, diagnosis and treatment, and outcome of injuries sustained by US/Non-US military and US/Non-US civilian personnel in wartime and peacetime from the point of wounding to final disposition.

The DoDTR supports US military performance improvement initiatives with global-wide collection and aggregation of combat casualty care epidemiology, treatments and outcomes. DoDTR data enables JTS to conduct performance improvement studies and gap analyses for medical capabilities to direct ongoing and future combat casualty care research, trauma skills training, and direct combat casualty care. DoDTR data analysis was instrumental in proving the Golden Hour evacuation policy saves lives. DoDTR data also provided the supporting evidence to prompt a doctrinal change of Army flight medics from emergency medical technician (EMT)-Basic to an EMT-Paramedic to improve the survivability of combat casualties.

DATA ACQUISITION: Mine medical records to abstract, code, and enter critical trauma data into the DoDTR for use in support of JTS' mission.

DATA ANALYSIS: Develop queries and provide data from the DoDTR in response to RFIs and Conduct classified and non-classified analysis.

DATA AUTOMATION: Supports IT for the DoDTR and data-related special projects. Designs and implements special-project database applications, related architecture, and documentation. Handles documentation needs for JTS to maintain compliance with the DHA.

PERFORMANCE IMPROVEMENT: Coordinate PI activities across the spectrum of trauma care. Participates in the development, maintenance, and adherence to Clinical Practice Guidelines. Develops PI course content and training, and resolves trauma system patient care issues.

EDUCATION: Develop and conduct pre-deployment training of the CENTCOM JTTS teams, DoDTR user training, and JTS staff training. Develops educational products for CCMD trauma system development. Secures continuing education credits and coordinates performance improvement and other trauma related courses.

In support of JTAPIC, JTS provides AIS coded injury data on WIA SMs for incident analysis by the JTAPIC partnership. JTS provides the AIS codes with a standardized description and localizer codes, the outcome status of the injured SM such as: RTD or Non-RTD, and the calculated ISS for inclusion in the JDB.

JTAPIC redirected RFIs to JTS when it was determined information requested was not available in the JDB including: Early Transmission of Vital Signs, Surgical Procedures in ROC 2 and 3, and Future of Combat Casualty Care Update which is currently under review at JTS and AFMES.

JTS closely monitors injury trends regarding amputations and genitourinary injuries from Iraq and Afghanistan.

US Army Aeromedical Research Laboratory

Mission:

To deliver scientific solutions that save lives and increase performance of Army aviators, the airborne Soldier, and ground Warriors.

Vision:

Be recognized as the Army's focal point for research and expert consultation on biomedical, physiological, and psychological issues affecting our aviators and Soldiers.

USAARL, one of six research laboratories within MRMC, was established at Fort Rucker in 1962 to accomplish research in support of Army Combat Aviation and airborne activities, and to provide a central aeromedical research/reference library.

Today, USAARL's research focuses on blunt, blast, and accelerative injury and protection; crew survival in military helicopters and combat vehicles; en route care environment; human operator health and performance in complex systems; and sensory performance, injury, and protection.

Specifically, USAARL's programs:

- Develop improved spinal injury criteria and health hazard assessments;
- Focus on determining the effects of developmental injury protection equipment and provide pathological and medical data to improve Soldier survival;
- Include testing and evaluating aeromedical evacuation equipment;
- Research aeromedical, psychological, behavioral, and neurocognitive effects on health, performance, safety, and effectiveness in the aviation operational environment, and aeromedical aspects of flying in degraded visual environments;
- Address human performance optimization and enhancement of situational awareness;
- Evaluate the psychological, cognitive, and sensory requirements associated with manned-unmanned teaming operations;
- Assess health hazards of directed energy on Soldier performance; and
- Address current and emerging operational visual, auditory, and vestibular stress, and injury protection.

The Laboratory's highly skilled workforce consists of rated aviators, medical professionals, doctoral- and masters-level researchers, and research technicians. USAARL researchers seek to enhance force readiness and effectiveness by preventing or minimizing health hazards created by military systems, doctrine, and tactics. Specifically, they identify, investigate, and solve medical- and health-related problems that compromise SMs'/aviators' safety and/or prevent them from performing the mission. The Laboratory's unique mix of scientific personnel successfully conduct critical research for solving operationally specific medical problems and provide military developers with information and expertise to enhance the performance and safety of future Army systems.

Training familiarizes Soldiers and their working dogs with air medical evacuation procedures.
Photo Credit: Charles Rosemond

National Ground Intelligence Center

Mission:

NGIC provides All Source and Geospatial Intelligence on foreign ground force capabilities and related military technologies and integrates with Mission Partners to ensure the US Army, DoD, Joint, and National level decision makers maintain decision advantage to protect the US and interests abroad.

NGIC performs the following in support of the JTAPIC mission:

- Acts as the lead Intelligence element and coordinates all intelligence support to the JTAPIC Program.
- Investigates and analyzes all attacks on US vehicles, infrastructure, dismounted personnel, and when practical, foreign forces, to determine the weapon used, its employment and effect.
- Maintains trained and deployable quick reaction teams that will be capable of conducting worldwide mounted incident investigations.
- As the Army's Center of Excellence for BVF and ASI, develops US Army Training and Doctrine Command- approved training, TTPs, and supports developing doctrine in the area of Operational and Intelligence reporting on ASI and BVF on combat incidents involving vehicles.
- Executes operational and tactical control of JTAPIC Program-resourced Mounted Incident physical evidence collectors.
- Populates, manages and maintains the CIDB and populates, manages and maintains the JDB environment to include PII.
- Provides Operational and Intelligence data on attacks against US vehicles and infrastructure and provides Intelligence data on attacks against US personnel to the JTAPIC Program.
- Performs event reconstruction on mounted combat events via M&S.
- Identifies trends in enemy design, development, manufacture, procurement, and use of weapons.
- Identifies to the JTAPIC Program the possible new use of enemy weapons or changes in TTPs.

NGIC's general military intelligence mission focuses on foreign ground forces from the operational through small-unit level, maintaining detailed knowledge of current foreign ground force capabilities as well as a focus of five, 10 and 20 years in the future. It includes irregular and conventional warfare analysis examining foreign ground forces from a perspective that includes battlefield operating systems, doctrine, TTPs, training, maintenance, logistics and order of battle.

NGIC has highly-skilled specialists such as physicists, chemists, computer scientists, mathematicians and engineers in diverse fields from aeronautics to robotics - along with M&S experts, and other technical specialists who evaluate the capabilities and performance data on virtually every weapons system used by a foreign ground force, including chemical and biological weapons and future weapons concepts.

In the summer of 2001, NGIC moved to the state-of-the-art Nicholson Building, a newly-constructed facility approximately eight miles north of Charlottesville, Virginia. After the events of September 11, 2001, the 9-11 commission and the government increased the size and funding for the intelligence community expanding the NGIC workforce to more than 1,200 employees. As a result of the 2005 US DoD's Base Realignment and Closure (BRAC) decisions, Rivanna Station not only houses NGIC but the Joint Use Intelligence Analysis Facility where the NGIC, Defense Intelligence Agency (DIA), National Geospatial Agency (NGA), National Security Agency (NSA) and others work in an environment of cooperation, integration and synchronization across numerous interagency and government entities.

Marine Corps Intelligence Activity

Mission:

MCIA is the Intelligence Support and Coordination Center for USMC Intelligence, Surveillance and Reconnaissance Enterprise. MCIA produces all-source intelligence, provides intelligence services, and conducts intelligence and counterintelligence operations in support of current and future operations and force development.

Vision:

The Marine Corps' 24/7 single point of access for all-source intelligence reach-back support.

MCIA, located at Hochmuth Hall in Quantico, VA, provides tailored intelligence and services to the Marine Corps, other services, and the Intelligence Community based on expeditionary mission profiles in littoral areas. It supports the development of service doctrine, force structure, training and education, and acquisition. MCIA participates in the development of JTAPIC analysis products providing intelligence information as requested.

Engineer Research and Development Center

Mission:

The USACE ERDC helps solve our Nation's most challenging problems in civil and military engineering, geospatial sciences, water resources, and environmental sciences for the Army, Department of Defense, civilian agencies, and our Nation's public good.

Vision:

To be the world's premier public engineering and environmental sciences research and development organization

ERDC's work in military engineering provides warfighters with innovative technologies and capabilities to enable force protection and maneuverability. For example, ERDC has led the way in developing novel, lightweight, rapidly-constructed protection systems that can be expediently deployed in remote locations. We've also developed survivability decision aids to allow for rapid assessment of current protection postures, as well as provide enhanced designs to increase defense against attacks. We also solve problems in the area of force projection, including novel bridging concepts, lightweight matting solutions, enhanced construction technologies, and automated planning and design solutions.

Meanwhile, ERDC's work in Geospatial Research and Engineering recognizes that success in the battlespace environment depends heavily on location and spatial relationships and geographical data and information. ERDC provides warfighters with the data, analytic tools, information, and decision framework capabilities to ensure superior situational awareness. ERDC arms warfighters with information superiority so they can accurately and quickly gauge effects on personnel, platforms, sensors, and systems.

ERDC is the newest JTAPIC Partner and its specific role is emerging.

Unexploded ordnance is a common find on a construction site in Afghanistan after years of war. (Official USACE courtesy photo/released. Photo Credit: Todd Lyman)

SPOTLIGHT: JTAPIC TEAM MEMBERS

CAPT Mark D. Clayton, PhD, US Public Health Service – Director

JTAPIC PMO
Fort Detrick, MD

CAPT Clayton received a BS in Chemistry from the University of Kentucky. In 1998, he received a Ph.D. in Organic Chemistry for his work on fullerene fragments from Louisiana State University. In that same year, he was commissioned as a 2nd Lieutenant as an Environmental Science Officer (ESO, 72D) in the Army Reserves. After graduate school, CAPT Clayton accepted a Lead Chemist position with General Electric Appliances where he earned a Six-Sigma Green Belt. Subsequently, he was an Assistant Professor of Chemistry at Delta State University in Cleveland Mississippi, and later at Eastern Kentucky University.

CAPT Clayton's active duty career began in 2004 as an Environmental Science Officer with the Army in the Current Operations cell and later with the Industrial Hygiene Field Services Program at the U.S. Army Center for Health Promotion and Preventive Medicine-Main. In 2007, he was assigned to JTF-GTMO in Guantanamo Bay Cuba a Preventive Medicine Chief for the Joint Detention Group. From 2008 to 2009 he served as the Deputy of Safety for Safety at the U.S. Army Medical Research Institute for Infectious Diseases under the U.S. Army Medical Research and Materiel Command (USAMRMC). In 2009, CAPT Clayton transferred to the U.S. Public Health Service as a Scientist Officer and was assigned to the Indoor Environments Division at the Environmental Protection Agency.

In December of 2010, CAPT Clayton accepted a position as a Science Officer and in August of 2011 became the Deputy Director for Grants

CAPT Mark Clayton

Management with the Congressionally Directed Medical Research Programs under U.S. Army Medical Research and Materiel Command.

On 1 August 2017, CAPT Clayton became the Director for the Joint Trauma Analysis and Prevention of Injury in Combat.
Some of CAPT Clayton's Awards include the Presidential Unit Citation, the Meritorious Service Medal with two oak leaf clusters, the Army Commendation Medal, the Army Achievement Medal with two oak leaf clusters, the Afghanistan Campaign Medal, several U.S Public Health Service (USPHS) and service ribbons, the USPHS Field Medical Readiness Badge, the Airborne badge, the Air Assault Badge and is a member of the U. S. Army Medical Department's Order of Military Medical Merit.

Brad Scott - Senior Operations Analyst

DIAT, MCoE
Fort Benning, Georgia
(Contracted through Engility Corporation)

Mr. Scott has been associated with the DIAT since its inclusion as a JTAPIC partner in 2009. Since that time, Brad has been an integral part to the success of JTAPIC's dismounted analytical effort. His contributions include determining data requirements and structure, data collection tools, and numerous JTAPIC answers to RFIs and analytical products.

When JTAPIC funded the requirement for dismounted analysis there was very little prior development of the data requirements needed to conduct this type of analysis. Mr. Scott developed the data requirements and the data structure to support DIAT's dismounted analysis for JTAPIC. This work was instrumental in the development of a working database that has become the backbone of JTAPIC's dismounted analysis. The data requirements and data structure continue to evolve over time as the parameters of combat change and JTAPIC customers ask new questions, but the initial work by Mr. Scott set the stage for success.

Important to JTAPIC's mission of mitigating injuries in combat is the integration of data from multiple sources. Mr. Scott leverages his 27 years of military operations and intelligence experience as well as his combat deployments to gather incident associated reporting in order to obtain the data required for analysis. He verifies the data and integrates data from multiple sources. Often during analysis of an incident, information gaps are discovered that require data from sources other than available from traditional reports. Brad was instrumental in developing the WW and unit post-deployment debrief tools and processes as a way to fill these information gaps. Master interview questions designed to cover all aspects of a combat mission are tailored for specific incidents in order to fill information gaps. This effort helps ensure that JTAPIC has the required data for incident analysis.

Mr. Scott is the primary analyst on most of JTAPIC's dismounted products and responses to RFIs. His analytical work contributed to identification of capability gaps in areas of materiel development as well as TTPs. In many cases (e.g., sickle stick, stepped off cleared path, patrol dispersion intervals), he provided recommendations to mitigate injuries to our Warfighters.

Brad Scott is critical to JTAPIC's mission. As a result of Brad's outstanding analytical products, timely responses, and his professional interaction with customers, JTAPIC enjoys a reputation for quality dismounted analytical products. Customers have trust and faith in Brad's ability to deliver products that exceed expectations. His work as a DIAT operations analyst not only reflects well on JTAPIC, but it is impacting our Warfighters as well as agencies supporting our warfighting efforts.

Mary Clouser, Ph.D., MPH

Research Epidemiologist (Contractor)
Medical Modeling, Simulation & Mission Support
Naval Health Research Center

Dr. Mary C. Clouser

Dr. Clouser currently serves as the principal lead of the epidemiology team guiding studies that examine clinical health outcomes of military deployment injury, to include both physical and mental health issues. In particular, she has an interest in studying ways to prevent injury and has been instrumental in many JTAPIC analysis products. She holds several degrees: a Ph.D. in Epidemiology, an M.P.H., a B.A. in Classics, and a B.A. in Anthropology.

Stephanie L. Snead - Chief of the Warfighter Survivability Branch (WSB)

RDECOM SLAD
Aberdeen Proving Ground, Aberdeen, Maryland

Ms. Stephanie Snead

Ms. Stephanie Snead is the Chief of the WSB within SLAD. Her leadership philosophy is to strive to set clear and compelling goals, to empower people to have authority over their work and to foster a family-friendly, positive, safe work environment built on integrity and trust. She received a BA in Mathematical Physics from Sweet Briar College, and a MS in Stochastic Modeling from George Washington University. She has served as an analyst and team leader, and as system leader for SLAD's effort to characterize, model and analyze the vulnerability and lethality of the Army Tactical Missile System, the Guided Multiple Launch Rocket System, and the Future Combat System. She has served as chief of the Ground Mobile Branch, the Software Development Branch and is currently the chief of the Warfighter Survivability Branch. One of the functions of the WSB is to serve as SLAD's technical and programmatic lead for the JTAPIC program.

Sarah N. Coard - Vulnerability Analyst

RDECOM SLAD
Aberdeen Proving Ground, Aberdeen, Maryland

Ms. Sarah Coard

Ms. Coard earned her Bachelor of Science in Biology from Towson University, and her Master of Science degree in Biotechnology from The Johns Hopkins University, with a specialty in Biodefense. Ms. Coard performs personnel survivability and vulnerability/lethality analyses of ground combat vehicles, personnel protection equipment, and lethality systems to inform the evaluation of defense acquisition programs. Sarah serves as the lead personnel injury analyst for various acquisition category (ACAT) A military ground systems for the Army, Navy, and Marine Corps, which includes the MRAP Family of Vehicles, Bradley, Medium Tactical Vehicle Replacement, and the JLTV, as well as ground missile systems. Her analyses focus on providing ballistic vulnerability reduction recommendations to enhance both crew and vehicle survivability by improving the understanding, design and performance of ground combat systems through testing and the analysis of combat data. Ms. Coard has served as an analyst for JTAPIC since 2009, and the lead SLAD Representative since 2015, where she analyzes available operational data from near real-time combat attacks. Her analyses have resulted in reassignment of vehicle platforms, validation of LF testing processes, implementation of new injury assessment criteria, and prioritization of battlefield survivability enhancements.

Aimee Chapman, M.P.H, B.S., C.A.I.S.S

Clinical Team, Department of Medical Modeling, Simulation and Mission Support
NHRC, Point Loma, CA

Ms. Aimee Chapman

In addition to medical data abstraction and injury scoring Ms. Chapman manages clinical datasets and collaborates with the IT Department and Epidemiology group to ensure data security for accurate reporting and quality management. Prior to her work at NHRC, Ms. Chapman was involved in injury analysis at the University of California, San Diego - Burn Center, where she developed an interest for trauma coding and analysis. Aimee is a graduate of the Liberty University Masters of Public Health program in Virginia where her research focus was in women's health with an emphasis on nutrition. She earned her Bachelor's degree in Biology from the University of California, Riverside with an emphasis in Medical Biology. Ms. Chapman is a certified by the AAAM a globally recognized scale for injury scoring, as an AIS coding specialist.

Jennifer Dudek, MPH - Injury Epidemiologist, Survival Analysis Team

Injury Biomechanics Division, USAARL, Ft Rucker, Alabama
(Contracted through Laulima Government Solutions, LLC)

Ms. Dudek joined the JTAPIC team at USAARL in August 2016. She brought her experience and expertise as an injury epidemiologist previously working for the Arizona Department of Health Services. Though her background is in Microbiology and Infectious Disease Epidemiology, she found a passion for analyzing injuries in the hopes of preventing future accidents. She is a dedicated member of the JTAPIC team on Fort Rucker. Jennifer completed her B.S. in Psychology at Armstrong Atlantic State University in 2008 and a M.P.H. in Epidemiology from Armstrong Atlantic State University in 2010.

Francis M. Brady, RN, BA

Product Manager
JTAPIC PMO, Fort Detrick, MD

Mr. Mike Brady

Mr. Brady is a military service veteran and former Combat Medic and Anti-Submarine Warfare Technician. He holds a Bachelor's Degree in Emergency and Disaster management, and a Certificate in Forensics from the American Military University. He also holds an Associate of Science in Nursing from the State University of New York and an Associate of Applied Science from the City University of Washington State. He is a member in good standing of the Epsilon Pi Phi Honor Society for Emergency and Disaster Management. Mr. Brady is the JTAPIC PMOs Product Manager and is responsible for several areas of importance such as being the principal POC for the DoD concussion reporting system, the JTAPIC PMOs agreements specialist, hand receipt and inventory coordinator and backup RFI manager and Space Utilization Coordinator. In his free time he works as an instructor for First Aid, CPR, AED, Wilderness and Dive Medicine.

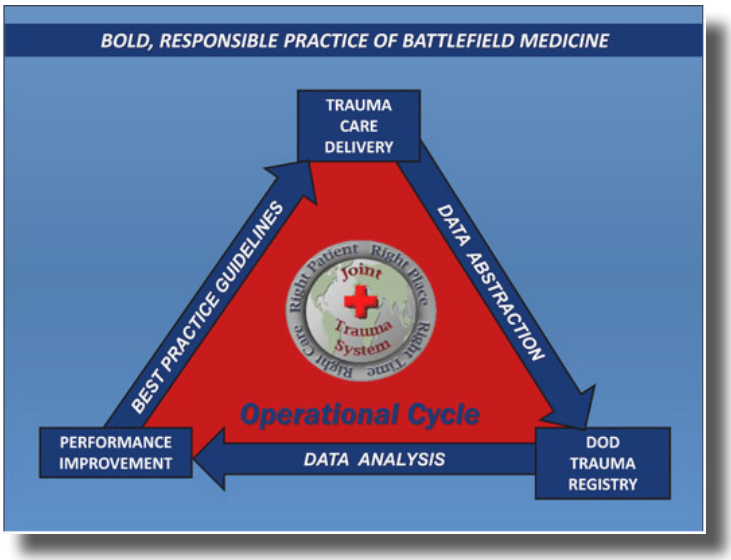
Mary Ann Spott, PhD, MPA, MSIS, MBA, RHIA - Deputy Director

JTS/ISR
Joint Base San Antonio, Fort Sam Houston, TX

Dr. Mary Ann Spott

Dr. Mary Ann Spott joined the JTS in 2006 as its first Director to spearhead the development of the DoD's first and only trauma system and trauma patient registry. Dr. Spott developed the strategic vision for trauma operations across DoD and was instrumental in building the trauma system from the ground up. Mary Ann has also provided a long-range plan for developing a trauma system and patient registry. This plan included the establishment of the DoDTR, formerly known as JTTR, Performance Improvement, Data Acquisition, Data Analysis, Data Automation, and Education Branches.

As the DoD expert in trauma registries, Dr. Spott is a primary resource for battlefield injury information requirements. This has been acknowledged internationally, as she was instrumental in NATO's ongoing development of its own trauma registry and formally consulted on development of the United Kingdom's military Trauma Registry. Dr. Spott plays a key role in establishment of educational programs as related to injury care and management for DoD. She served on the American Trauma Society's (ATS) Board of Directors as the Chairman for the Trauma Registry and Data Council. In this role, she was responsible for the redesign of the Trauma Registrar's Course, on-line training, and the ATS' national certification examination for registrars. As one of the original members of the JTAPIC Partnership, Dr. Spott provided knowledge of registry development in the creation of the JDB. In 2008, the JTS hosted a Lean-6 Sigma review of the JTAPIC program, which she was a lead facilitator.



The JTS Operational Cycle..

A Combat Aviation Brigade medic reviews a patient's medical records during a patient transfer in Afghanistan.
Photo Credit: SSgt Sandra Welch.

JTAPIC ASSISTS PRESTIGIOUS AWARD WINNER

Article: Face of Acquisition: Lead Engineer Takes Unconventional Path to Get Marines Better Body Armor

By Ashley Calingo, Office of Public Affairs and Communication, Marine Corps Systems Command (MCSC)

MARINE CORPS BASE QUANTICO, Va. -- Flora “Mackie” Jordan’s path to becoming an award-winning body armor engineer for the Infantry Combat Equipment team at Marine Corps Systems Command happened by chance.

“It was kind of accidental, but serendipitous,” said Jordan of her introduction to MCSC. “After graduating from college, I applied to the Naval Acquisition Development Program, and they can place you at any one of over 100 locations. I think it was just pure luck that [MCSC] happened to be looking for a body armor engineer.”

After graduating from McGill University in 2011 with a degree in civil engineering and minor in environmental engineering, Jordan had to choose between various job prospects. Ultimately, Jordan—a young woman whose first brush with the military was as a nuclear engineering intern with the Navy—chose to go with the Marines.

“I was torn between my technical passion—environmental engineering—and patriotism and wanting to give back to those who give so much to this country,” Jordan said. “This job just sounded so cool and unlike anything I’ve ever done or thought I could ever do. It sounded like a challenge and was something I just couldn’t turn down.”

In her relatively short tenure at MCSC—Jordan recently celebrated her five-year work anniversary at the command—the 28-year-old has led the team that introduced a lightweight body armor system that is just as effective as, but 45 percent lighter than, the body armor Marines currently use.

The research, data collection and testing period leading up to the system’s final iteration was a lengthy one, and Jordan sometimes collected data in unconventional—albeit effective—ways. Jordan and the team used data collected from products developed by the Joint Trauma Analysis and Prevention of Injury in Combat Program to ensure design changes did not have a negative impact on materiel performance by introducing new vulnerabilities. In order to help fine-tune the requirements, Jordan found herself—dressed in full gear—marching alongside Marines during a field exercise in the southern Californian desert.

“I was in body armor the whole time, I was eating MREs, we were sleeping in tents,” Jordan said of the week-long exercise. “It was a very miserable experience, but it really gave me an understanding of how Marines use the gear, what the issues are, and helped me gather the data we really needed.”

Data collection sessions like these helped Jordan and her team identify specific issues Marines face while wearing body armor. It also helped to put themselves in a Marine’s frame of mind when coming up with solutions to their feedback.

After several iterations, Jordan’s team developed a modular body armor system that was lightweight and more comfortable, gave Marines better mobility, and could be customized to fit Marines of every size and body type. Jordan and her team also verified compatibility with other fielded equipment, like the USMC pack system.

Flora "Mackie" Jordan and the modular body armor system her team developed with the assistance of JTAPIC Analysis Products.

"Marines are at the center of everything we do," said Jordan. "From a design standpoint, we took into account a lot of human factors and how Marines wear it and move with it on. We looked at its compatibility with packs when Marines are hiking, or how well it holds up to different environmental conditions—from flames to extreme cold to maritime."

Jordan and her team's hard work did not go unnoticed. Jordan was recently awarded the prestigious Samuel J. Heyman Service to America "Promising Innovations Medal" from the Partnership for Public Service for her work on lightweight body armor. Also known as "the Sammies," the annual awards recognize federal employees who are responsible for noteworthy and inspiring accomplishments, highlighting excellence in the federal workforce.

"When the request for Sammies nominations came out, one person jumped out in my mind, and that was Mackie," said Nick Pierce, team lead for the individual armor team at MCSC who nominated Jordan for the award. "Mackie's impressive with the speed at which she moves—she stays focused on making positive changes that would impact Marines the most. Mackie really values the direct feedback she gets from Marines. She's also a big player within the team and will help with anything."

In addition to being this year's youngest honoree, Jordan is also the first civilian Marine to ever win a Sammie in the award's 16-year history.

In her off time, Jordan is currently pursuing her Masters in Engineering Management at George Washington University. She also regularly volunteers at Science, Technology, Engineering and Mathematics events to "let kids know what opportunities are out there and help them understand their capabilities better." Jordan relishes in the idea of "changing the world for good, or making an impact in the world."

At MCSC, Jordan says the most rewarding thing about her job is knowing how her work impacts Marines in a positive way.
"Honestly, working with Marines, getting a chance to hear what they have to say and trying to make a difference that makes their lives a little easier—whether it's by making their body armor lighter, or making it slightly more comfortable so it's not causing them pain, or even just giving them something that they're looking for in a system—that's the biggest reward," she said.

JTAPIC on the deck of the USS Mesa Verde.

JTAPIC Partner Meeting with MG Lein, CG USAMRMC, June 2016. Fort Detrick, MD.

THE WAY FORWARD

In recent months, a considerable effort initiated by the JTAPIC PMO and supported by the MRMC is underway to complete JTAPIC's transition from an army-centric Program to a joint enterprise entity. The near term objectives for JTAPICs evolution into a truly joint organization include: pursuing close alignment with Special Operations Command who support persistent, networked and distributed Global Combatant Command operations in order to protect and advance our Nation's interests; to build future surge capacity within each CCMD; to reposition and restructure the JDB as a the premier joint database for combat and accident analytics; to expand JTAPIC's scope within the DHA's mission as a DoD Combat support agency; to integrate the JTAPIC mission and capabilities into the operational purview of all services from the DoD level, and to engage civilian agencies, US Allies and academia for the prevention and mitigation of injury in a more diverse range of operational activities; and to discover new avenues to share and gain knowledge for the betterment of the Warfighter.

U.S. Army Soldiers from Alpha Company, 1st Battalion 77th Armored Regiment, prepare for an early training attack. Photo Credit: SGT Charles Probst.

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Crew member of the Coast Guard Cutter Chock salutes the flag during morning colors at the US Naval Academy in Annapolis, Maryland. Photo Credit: PO3 Ronald Hodges.

APPENDIX ACRONYMS

---- ## ----

3-D 3-Dimensional

---- A ----

AAAM Association for the Advancement of Automotive Medicine
AFB Air Force Base
AFDIL Armed Forces DNA Identification Laboratory
AFMES Armed Forces Medical Examiner System
AFOSI Air Force Office of Special Investigations
AFRSSIR Armed Forces Repository of Specimen Samples for the Identification of Remains
AIS Abbreviated Injury Scale
AMSAA Army Materiel Systems Analysis Activity
AOR Area of Operations
AR Army Regulation
ARDEC United States Army Armament, Research Development and Engineering Center
ARL Army Research Laboratory
ARS Analysis Request System
ASA/ALT United States Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASDAT Aviation Survivability Development and Tactics
ASI Attack Scene Investigation
ATC United States Army Aberdeen Test Center
ATD Anthropomorphic Test Device
ATEC Army Test and Evaluation Command
ATF Bureau of Alcohol, Tobacco, Firearms and Explosives
ATS American Trauma Society
AW2D Army Wounded Warrior Debrief

---- B ----

BABT Behind armor blunt trauma
BDA Battle Damage Assessment
BECIR Blast Exposure Concussion Incident Report
BES Battlefield Exposure Sensors
BFVT Battlefield Forensic Vehicle Technicians
BIPSR Blast Injury Prevention Standards Recommendation
BRAC Base Realignment and Closure
BRPCO Blast Research Program Coordinating Office
BUMED Navy Bureau of Medicine and Surgery

---- C ----

CAC Common Access Card
CAB Combat Analysis Branch
CAISS Certified Abbreviated Injury Scale Specialist
CALDERA Crater Algorithm Design for Explosive Charge Analysis
CCDR Combatant Commander
CCMDs Combatant Commands
CDD Capability Development Document
CDID Capabilities
CD-IPT Combat Development Integrated Product Team
CE Covered Entity
CENTCOM United States Central Command
CIAG Combat Incident Analysis Group
CID United States Army Criminal Investigation Command
CIDB Combat Incident Database
C-IED Counter-Improvised Explosive Device
CIREN Crash Injury Research and Engineering Network
CJCS Chairman, Joint Chiefs of Staff
COAST Current Operations Analysis Support Team
COIR Current Operations Incident Report
CONUS Continental United States
CSS Combat Service Support
CT Computed Tomography
CY Calendar Year

---- D ----

DASD (HRP&O) Deputy Assistant Secretary of Defense for Health Readiness and Policy Oversight
DBV Double V-Hull
DCIPS Defense Casualty Information Processing System
DEK Drivers Enhancement Kits
DFSC Defense Forensic Science Center
DHA Defense Health Agency
DHP O&M Defense Health Program Operations and Management
DIA Defense Intelligence Agency
DIAT Dismounted Incident Analysis Team
DMDC Defense Manpower Data Center
DNA Deoxyribonucleic Acid
DoD Department of Defense
DoDD Department of Defense Directive
DoDI Department of Defense Instruction
DoDTR Department of Defense Trauma Registry
DoJ Department of Justice
DoS Department of State
DOT&E Director of Operational Test & Evaluation
DOTMLPF-P Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities and Policy
DOW Died of wounds
DTM Directive Type Memorandum
DUI Driving Under the Influence
DVH Double V Hull
DWI Driving While Intoxicated

---- E ----

EA Executive Agent
ECH Enhanced combat helmet
EMED Expeditionary Medical Encounter Database
EMEDKw Expeditionary Medical Knowledge Warehouse
EMR Electronic Medical Record
EMT Emergency Medical Technician
EO Engineering Office
EOD Explosive Ordnance Disposal
ERDC Engineer Research and Development Center
ESAPI Enhanced Small Arms Protective Inserts
ESBI Enhanced Side Ballistic Inserts
ESEP Exchange of Scientists and Engineers

---- F ----

FAST Field Assistance in Science and Technology
FBH Flat Bottom Hull
FEP Forensic Encyclopedia Program
FERRET Forensic Encyclopedia Result Retrieval and Evaluation Tool
FMTV Family of Medium Tactical Vehicles
FOUO For Official Use Only
FS File Sharing
FVEY Five Nations of Australia, Canada, New Zealand, the United Kingdom and the United States
FY Fiscal Year

---- G ----

GDLS General Dynamics Land Systems
GSW Gunshot Wound

---- H ----

HASC House Armed Services Committee
HBCT Heavy Brigade Combat Team
HEADS Head-borne Energy Analysis and Diagnostic System
HHDs Handheld Detectors
HIPAA Health Insurance Portability and Accountability Act
HMMWV High Mobility Multipurpose Wheeled Vehicle

---- I ----

IAW In accordance with
I-BESS Integrated Blast Exposure Sensor System
ICD International Classification of Disease
ICP-AES Inductively Coupled Plasma-Atomic Emission Spectroscopy
ID Infantry Division
IDIQ Indefinite Delivery Indefinite Quantity
IEDs Improvised explosive devices
IOTV Improved Outer Tactical Vest
IPT Integrated Product Team
ISS Injury Severity Score
IT Information Technology

---- J ----

JACS JTAPIC Analysis and Collaboration System
JASP Joint Aircraft Survivability Program
JCAT Joint Combat Assessment Team
JCERS JTAPIC Concussive Event Reporting System
JDB JTAPIC Database
JIDA Joint Improvised-Threat Defeat Agency
JIDO Joint Improvised-Threat Defeat Organization
JIEDDO Joint Improvised Explosive Device Defeat Organization
JLV Joint Legacy Viewer
JMPT Joint Medical Planner's Tool
JSS Joint Staff Surgeon
JTAPIC Joint Trauma Analysis and Prevention of Injury in Combat
JTS Joint Trauma System
JTTR Joint Theater Trauma Registry
JTTS Joint Theater Trauma System

---- K ----

KET Known Event Tracker
KIA Killed in Action

---- L ----

L3 ATI L-3 Applied Technologies Inc
LAV Light Armored Vehicle
LF Live Fire
LFT&E Life Fire Testing and Evaluation

---- M ----

M&S Modeling and Simulation
MAGTF Marine Air Ground Task Force
M-ATV MRAP All-Terrain Vehicle
MCCDC OAD Marine Corps Combat Development Command Operations Analysis Directorate
MCoE Maneuver Center of Excellence
MCSC Marine Corps System Command
MEDCOM United States Army Medical Command
MHSRS Military Health System Research Symposium
MODS Medical Operational Data System
MOS Military Occupational Specialty
MOU Memorandum of Understanding
MPTk Medical Planners Toolkit
MRAP Mine-Resistant Ambush Protected
MSU MaxxPro Survivability Upgrade
MTBI Mile Traumatic Brain Injury
MTF Medical Treatment Facility

---- N ----

NAPE Neck Armor Protective Enhancement
NATO North Atlantic Treaty Organization
NCIS Naval Criminal Investigative Service
NGA National Geospatial-Intelligence Agency
NGIC CIAD National Ground Intelligence Center/Combat Incident Analysis Division
NHRC Naval Health Research Center
NHTSA National Highway Traffic Safety Administration
NIPRnet Non-classified Internet Protocol Router Network
NSA National Security Agency
NSRDEC Natick Soldier Research, Development, and Engineering Center
NTSB National Transportation Safety Board

---- O ----

O&M Operations and Management
OAD/COAST Operations Analysis Directorate/Current Operations & Analysis Support Team
OAFME Office of Armed Forces Medical Examiner
OCO Overseas Contingency Operations
OCONUS Outside the Continental United States
OEF Operation Enduring Freedom
OFS Operation Freedom's Sentinel
OIF Operation Iraqi Freedom
OIR Operation Inherent Resolve
OJCS Office of the Joint Chiefs of Staff
OMA Operation Maintenance, Army
OND Operation New Dawn
ORCA Operational Requirement-based Casualty Assessment
ORS Operation Resolute Support
OSD Office of the Secretary of Defense
OSD CAPE Office of the Secretary of Defense Cost Assessment & Program Evaluation
OTSG Office of the Surgeon General

---- P ----

PBAC Program Budget Advisory Committee
PCE Potentially concussive event
PCOF Patient Condition Occurrence Frequency
PEO Program Executive Office
PEO Soldier Program Executive Office Soldier

PHI Protected Health Information
PII Personal Identifiable Information
PL Product Library
PM Program Manager
PM ICE Program Manager Infantry Combat Equipment
PM SPIE TMD PM Soldier Protection and Individual Equipment Technical Management Directorate
PMO Program Management Office
POG Protective Outer Garment
POM Program Objective Memorandum
PPE Personal Protective Equipment
PUG Protective Undergarment

---- R ----

RDEC Army Research, Development, and Engineering Centers
RDECOM US Army Research, Development and Engineering Command
REF Rapid Equipping Force
RFI Request for information
RMIS Risk Management Information System

---- S ----

S&T Science and Technology
SAPIs Small Arms Protective Inserts
SAT Survival Analysis Team
SBCT Stryker Brigade Combat Team
SCUBA Self-Contained Underwater Breathing Apparatus
SD/TCM-s Soldier Division/TRADOC Capability Manager-Soldier
SEM-EDS Scanning Electron Microscopy-Energy Dispersive X-ray Spectroscopy
SIGACT Significant Activity
SIPRnet Secret Internet Protocol Router Network
SLAD Survivability and Lethality Analysis Directorate
SLVA Survivability and Lethality Vulnerability Analysis
SM Service member
SME Subject Matter Expert
SOP Standard Operating Procedure
SPHS Self propelled Howitzer system
SSN Social Security Number

---- T ----

T&E Testing and Evaluation
TACOM LCMS Tank-Automotive and Armaments Command Life Cycle Management Command
TARDEC Tank Automotive Research, Development and Engineering Center
TBI Traumatic brain injury
TCG Threat Cooperation Group
TCT Theater Collection Team
TIAG Threat Intelligence and Analysis Group
TRAC2ES TRANSCOM Regulating And Command and Control Evacuation System
TRADOC United States Army Training and Doctrine Command
TRANSCOM United States Transportation Command
TTCP LND TP5 The Technical Cooperation Program Land Systems Technical Panel 5
TTPs Tactics, Techniques and Procedures
TUSK Tank Urban Survival Kits

---- U ----

UBB Under-belly Blast
UIK Under-body Improvement Kit
US United States
USA United States of America
USAARL SAT United States Army Aeromedical Research Laboratory Survivability Analysis Team
USAF United States Air Force
USAMRMC United States Army Medical Research and Materiel Command
USC United States Code
USMC United States Marine Corps
USN United States Navy
UW Unconventional Warfare

---- V ----

VA/VP Vulnerable Areas/Vulnerable Points
VBA Veteran's Benefit Administration
VIPER Vehicle-Borne IED Post Event Results
VisualAid Visual Anatomic Injury Descriptor

---- W ----

WIA Wounded in Action
WIAMAN Warrior Injury Assessment Manikin
WSB Warfighter Survivability Branch
WSMR White Sands Missile Range
WTU Warrior Transition Unit

Green smoke marks positioning when maneuvering during a dismounted patrol.
Photo Credit: CPT Cory Titus

Students evaluate the wreckage after an underbelly IED at the Attack Scence Investigation Forensics Course.

http://jtapic.amedd.army.mil/

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