



"From Cruise Missiles Association to Precision Strike Association we have been dedicated to advancing the art and science of precision engagement concepts and technology for more than 20 years."

VISION STATEMENT

We aspire to be the premier association dedicated to advancing the art and science of precision engagement concepts and technology.

To accomplish this, we will promote the development of systems and procedures in order to locate, fix, track, target, and attack fixed, moving, and relocatable targets.

We recognize that battlespace management, the network within which it functions, and the adjunct command and control requirements are crucial to success on the battlefield.

PSA has a global perspective and welcomes international participation.

PSTS-11: Global Challenges for Precision Strike

Kill Chain Challenges and Opportunities to Counter U.S. Global Threats are foci of Precision Strike Technology Symposium (PSTS-11) discussions scheduled for October 26-27, 2011 at the JHU/APL Kossiakoff Center.

PSTS-11 will be conducted at the SECRET/US ONLY classification level. This symposium is sponsored by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, Strategic & Tactical Systems.

This timely and penetrating technology symposium will address the many diverse constants of change and complexity of our national security landscape, as well as the strategic direction for precision engagement to counter global threats.

PSTS-11 is structured to provide some of the most critical national security challenges facing our great Nation today and tomorrow—giving attendees a snapshot of advanced precision strike technologies and potential opportunities and solutions to counter America's global threats plus strong definition by senior government



Ambassador John Bolton — Former U.S. Ambassador to the U.N.



The Honorable Robert O. Work Under Secretary of the Navy

and industry leaders of what's needed for our brave warriors.

With respect to the latter, two very distinguished leaders will address the precision strike community at PSTS-11 — Ambassador John R. Bolton, former U.S. Permanent Representative to the United Nations, and The Honorable Robert. O. Work, Under Secretary of the Navy.

Bolton will kick off PSTS-11 by focusing on many of our overarching national security global challenges. Ambassador Bolton spent many years in public service with a concentration on research related to U.S. foreign and national security policy. He is a prolific writer of numerous books related to the political landscape, continuously writing articles and commentary from his unique global perspective.

Robert O. Work will keynote PSTS-11 on the opening day, addressing the kill chain challenges to counter strategic naval threats and highlight the future of maritime unmanned air systems and the air-sea battle. During

See **Global Challenges**, Cont. on page 14

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Chairman's Column

On June 2, the Precision Strike

Association hosted a golf tournament at

Andrews Air Force Base in partnership with a tremendous organization, Hope for the Warriors (www.hopeforthewarriors.com). Robin Kelleher, the President, CEO and Founder of Hope for the Warriors, kicked off the event in the morning and former Governor and Senator from the Commonwealth of Virginia, the Honorable George Allen, addressed the group at the luncheon following the golf tourney. By all accounts PSA's first golf event in years was a success. I have to extend thanks to our corporate sponsors for their enthusiastic support of our association and our wounded veterans. Lockheed Martin, ITT Corporation, ATK, Kaman Precision Products, MBDA Missile Systems, Pratt & Whitney, Vectronix, America's Vet Dogs / Guide Dog Foundation, Lone Star Aerospace, Marotta Controls and Tekla Research were instrumental in the outing's success. Very special thanks goes out to ITT's Maureen Koerwer, a Director on our Board, who stepped up and did a phenomenal job organizing this event. It was the optimum mix of business, pleasure and charity.

Just around the corner on October 26-27 we have our Precision Strike Technology Symposium, focusing on "**Kill Chain Challenges and Opportunities to Counter U.S. Global Threats**". At PSTS-11 you will hear about the global challenges to our national security from Ambassador John Bolton plus a plethora of hard hitting and relevant topics regarding the future of precision strike from key government leaders. See the PSTS brochure or visit our website,

www.precisionstrike.org, for a more detailed list of incredible topics and remarkable speakers. Make sure you sign up early – this is one event you will not want to miss. I guarantee you will not be disappointed. I look forward to seeing you at The Johns Hopkins University Applied Physics Lab's Kossiakoff Center, Laurel, MD in October for PSTS-11.



Andy McHugh
Chairman of the Board
Precision Strike Association

CALL FOR NOMINATIONS

The Precision Strike Association calls for nominations for candidacy to 9 seats on its Board of Directors. All applicants must meet the following criteria for consideration by the nominating committee in order to serve:

1. Must be an individual or corporate member of PSA – and in good standing.
2. Must be able to attend at least two (of four) Board meetings and **actively participate** in the standing or ad hoc Board committees (the latter which can be selected based on personal interest).

For more information on nominating a candidate for a position on the Board of Directors, download and fill out an application from <http://www.precisionstrike.org> and submit the printed and signed application to the nominating committee via Dawn Campbell, PSA Executive Director via fax or mail at dcampbell@precisionstrike.org no later than Tuesday, September 6, 2011.

George Allen Addresses Precision Strike Summer Golf Outing

After a seven-year hiatus, the Precision Strike Association (PSA) on June 2nd reinstated its popular summer golf tournament, with a percentage of the proceeds going to the *Hope for the Warriors* organization (See related article on page 5).

A new component added to this year's event at the Andrews AFB golf course was a guest luncheon speaker: the Honorable George Allen. The Former Governor and U.S. Senator of Virginia spoke on various critical issues, including the National Security Environment, Defense Issues, Industry Concerns, Advanced Technologies and Energy Initiatives.

The son of a former NFL head coach, Allen started his professional career as a law clerk in Southwest Virginia. Allen then served Virginia in the state legislature, as the 67th Virginia Governor, and in both bodies of the U.S. Congress, winning election to the Senate in 2000. He lost his re-election bid in 2006 to Democrat Jim Webb by fewer than 10,000 votes. On January 24, 2011, Allen announced his intention to seek the Republican nomination in the 2012 election for the U.S. Senate seat he previously held.

A self-described "Common Sense Jeffersonian Conservative," as Virginia's Governor, Allen put into practice many of the ideas and concepts of Thomas Jefferson.

Since leaving the U.S. Senate, Allen has continued to advocate for the issues and ideas he has always fought for. He launched the American Energy Freedom Center, whose mission is to advocate positive ideas for American jobs, economic prosperity and promote increased freedom, opportunity, and competition in the development and use of our vast energy resources. Allen also serves as the Reagan Ranch Presidential Scholar for the Young America's Foundation.

In his recently released book, *What Washington Can Learn from the World of Sports*, he presents solutions that can work to put people across America in a position to compete and succeed in achieving their dreams.

Allen has addressed the precision strike community before where he has proven himself to be extremely knowledgeable in matters of great importance to PSA's constituency.



PSA Programs Chair Ginny Sniegon, George Allen & PSA Event Chair Maureen Koerwer



After lunch, Allen thanked the golfers and PSA for supporting Hope for the Warriors, which he said is "a great organization that is supporting our troops." He then covered a myriad of topics in a short time and fielded questions from the audience.

Allen said we need to focus on national defense in the face of many threats, including terrorism and cyber attacks. "National security needs to be pre-eminent," he stated.

Allen said he was honored to spend time with "fired-up, creative leaders serving our country and providing innovations. Our troops need to have the most technologically advanced armaments and equipment and the best intelligence when they are trying to protect our freedoms. Precision strike weapons are playing an increasingly positive, beneficial and effective role in our defense plans."

Allen compared the military to the game of football. He said a good offense needs precision weapons; the special teams need special forces; and, unmanned systems and good intelligence are important for the strategic defense of the homeland.

"Drones and robotics save lives and are less costly to purchase and maintain. They are adaptable and provide an agile defense. Drones are also being used to secure our

borders and to reduce collateral damage,” Allen noted.

“What the Precision Strike Association does is uniquely American and very important to us.” He said it “is great to see the defense industry represented here, shoulder-to-shoulder with our military personnel.”

Allen also discussed the need to develop a winning energy game plan that includes practical conservation, better utilization of coal for generating electricity, research into alternative aircraft fuels, more oil and natural gas exploration along the U.S. coastlines and nuclear energy.

“I say you never punt on the first snap of the ball, but our country has been punting on energy policy since the 1970s...We ought to be taking advantage of our natural resources. But the sanctimonious social engineers running everything look at all these resources as a curse, and the people hurt the most are low and middle income families,” Allen stated.

Added Allen: “I am sick and tired of America being jerked around by hostile dictators and oil cartels when

we have the energy resources under our land and in our waters. It is high time that we unleash our American energy resources.”

He called the massive national debt “a dangerous vulnerability to our country,” saying the U.S. Constitution should mandate a balanced budget. “We need to get back to basics, rein in the Federal budget. A balanced budget will force us to stay focused on priorities, such as national defense.”

He also doesn’t believe in continuing resolutions. “Contractors do the job on time or don’t get paid. That’s the way it ought to be in the Congress.”

Allen called the 2012 presidential election “pivotal” in determining the future of the country. In saying that this nation is based “on a foundation of principles, opportunity for all, freedom and personal responsibility,” he said the key issue facing all Americans is “will our children inherit a country that has the same level of opportunity that we have?” ■

We would like to thank the following sponsors for the PSA Summer Golf Event

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GOLF STANDINGS

Winning Team – Combined Team Score 61

Dale Spencer, Kaman Precision Products

Steve Dowling, DTRA

Tim Trayers, JSF Program

Dean Oliveri, Booz Allen Hamilton

2nd Place – Combined Team Score 62

Jim Joy, Military consultant

Ken Crowell, Military consultant

Noel Pinkard, Military consultant

Doug Kinsey, Military consultant

3rd Place – Combined Team Score 64

Scott Bishop, Lockheed Martin

Kenny Gele, Lockheed Martin

Heather Penny, Lockheed Martin



The Green Bombers capitalized on the Precision Fires of Long Drive Contest Winner Dean Oliveri with great team approach shooting and clutch putting to record a gross score of eight under par for a winning net of 61.

Dean Oliveri, Booz Allen Hamilton, Airborne Integration Engineer; Dale Spencer, Kaman Precision Products New Business Technology, Manager; Steve Dowling, DTRA, Director, Counter WMD Technologies Directorate; Tim Trayers, JSF Program, Director, JSF Program Integration

Providing Hope

The Precision Strike Association (PSA) reinstated its popular summer golf outing in June, with a percentage of the proceeds from the 2011 Precision Strike Summer Golf Event going to the Hope for the Warriors organization.

The mission of Hope for the Warriors is to enhance the quality of life for U.S. service members and their families nationwide who have been adversely affected by injuries or death in the line of duty. Hope for the Warriors actively seeks to ensure that the sacrifices of wounded and fallen warriors and their families are never forgotten nor their needs unmet.



Robin Kelleher

Hope For The Warriors is a national, nonprofit organization that supports wounded U.S. service members, their families, and families of the fallen. A group of military wives founded the organization in 2006. They stood together as they witnessed, firsthand, the effects of the war on service members and

their families. Since that time, Hope For The Warriors has grown tremendously in the span of programs offered and the number of wounded and family members assisted. While founded and headquartered in North Carolina, the organization maintains offices nationwide. And the leadership of the organization still remains in the dedicated hands of military wives.

Hope for the Warriors projects include the Above & Beyond program, which provides guidance to wounded service members pursuing reintegration into the civilian sector.

The Warrior's Wish program supports the long-term goal of hope beyond recovery. These wishes fulfill a desire



PSA Event Chair: Maureen Koerwer, Hope for the Warriors: President & CEO Robin Kelleher, PSA Executive Director: Dawn Campbell and Hope for the Warriors Events Coordinator: Andrea Bartlett

for a better quality of life or support a quest for life-gratifying endeavors.

For example, Hope For The Warriors helped a former Marine helicopter pilot who lost a leg and was severely burned while serving in the Middle East. During his years in rehabilitation, he was sustained by a dream of flying again. This past summer, despite his severe injuries, he passed the FAA physical. Hope for the Warriors provided him with the funding to get licensed as a commercial pilot. "He wants to be an airline pilot, to support his family in the way he had planned prior to his accident," said Robin Kelleher who currently serves as the President and CEO of Hope For The Warriors, the organization she co-founded in 2006.

Hope for the Warriors also supported a victim of the November 2009 shooting spree in which an Army psychiatrist allegedly opened fire at a Fort Hood, TX facility where soldiers were processing for overseas deployments. The young soldier shot in the head suffered severe brain injury and with vision impairment, he is unable to drive a car. His mother wished for a golf cart so her son could have a little independence. Her wish came through.

Kelleher says she is grateful that "PSA believes in our mission and supports the manner in which we do our work."

More information on the organization can be found at: <http://www.hopeforthewarriors.org>. ■



Hope For The Warriors, a civilian organization with 501(c)(3) non-profit status, is solely supported by the generosity of individuals, corporations, and foundations in support and appreciation of those who have sacrificed in the name of freedom.

On their own, our service members and their families are awe inspiring in the face of their disabilities and hardships – courageous and resolute. However, it is with the support of a grateful nation that they remain unfaltering in their determination and find hope and purpose beyond recovery. As a united support network, all individuals, whether of great or small means, can find an opportunity to honor those who have willingly sacrificed to defend and protect our freedom.

To accomplish our mission, we have designed special programs that allow and encourage community involvement. We invite you to take part in the inspirational lives of these young men and women and make it known that they never stand alone.

Together, our board of directors, staff, and volunteers work tirelessly to serve those who have sacrificed so much. The integrity of our organization is paramount and therefore our representatives are as honorable and noble as our mission and the people we serve.

Join us in our mission to ensure that "no sacrifice forgotten, nor need unmet."

JAGM Proposals Submitted

Lockheed Martin and Raytheon submitted their proposals for the next phase of the Joint Air-to-Ground Missile (JAGM) program in early June.

JAGM is the next-generation air-to-surface guided missile. Built to replace aging AGM-114 Hellfire, BGM-71 TOW and AGM-65 Maverick missiles, the JAGM program is expected to be worth more than \$6 billion over 20 years.

The two defense industry giants are competing for a 48-month contract to continue development and begin production of the missile. Army officials said the Engineering and Manufacturing and Low-Rate Initial Production contract is worth nearly \$4 billion. The U.S. Army is expected to make a decision on the contract in October.

“Lockheed Martin’s JAGM builds on HELLFIRE, LONGBOW and Javelin,” said Frank St. John, vice president of tactical missiles at



Lockheed Martin's JAGM entry

Lockheed Martin Missiles and Fire Control. “Our JAGM offering will provide U.S. Army, Navy and Marine Corps warfighters with the next product in that line. Our proposed JAGM can provide significant performance advantages,” St. John added. “And with hot, high-volume production lines already in place for HELLFIRE, Javelin and the M299 launcher family, we can provide a critically needed capability at an affordable price.”

Lockheed Martin is partnered with Aerojet (rocket motor), Marvin Engineering (launcher) and General

Dynamics Ordnance and Tactical Systems (multi-purpose warhead),

Raytheon is teamed with The Boeing Company on JAGM. The team enters the competition with a tri-mode seeker incorporating a semiactive laser, uncooled imaging infrared and millimeter wave guidance.

“Instead of cobbling together bits and pieces of hardware from legacy programs, we offer a fully integrated tri-mode seeker that provides an exceptionally reliable, low-risk path to engineering and manufacturing development,” said Bob Francois, Raytheon’s vice president of advanced missiles and unmanned systems. “Rather than complicating matters by using a cooled seeker, we worked in close concert with our customers to determine smarter and simpler ways to arrive at a superior system solution. The uncooled seeker on the Raytheon-Boeing JAGM is just one example of that.” Boeing’s Carl Avia said “it is possible to give

the warfighter a single rocket motor solution capable of withstanding the rigors of fixed- and rotary-wing flight.”

JAGM will offer the warfighter improved lethality, range, operational flexibility, supportability and cost savings compared with older, Cold War-era weapons. JAGM is scheduled for integration on the F/A-18 E/F Super Hornet; the AH-64D Apache Longbow; the MH-60R Seahawk; the AH-1Z Super Cobra; the MQ-1C Gray Eagle; and the OH-58 CASUP Armed Reconnaissance Helicopter. ■

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CALL FOR NOMINATIONS

Precision Strike Association's (PSA) Richard H. Johnson Technical Achievement Award (the Johnson Trophy) is named after the first recipient, and presented annually to recognize an individual from public or private sector for outstanding personal technical achievements resulting in significant contribution to precision strike systems.

Dick Johnson, who was awarded the trophy posthumously, was an exemplar of such achievements, having personally led the design or redesign of more precision strike airframes than any contemporary. In a number of conflicts over the past two decades, the majority of weapon airframes employed were Johnson's designs. His designs, or imitations of them, appear in nearly every nation's military where precision strike systems are employed. Dick never managed a large group, or ran a program. He was a highly productive engineer whose life was marked by decades of innovation and record breaking, as well as a record breaking pilot.

The trophy is awarded each year based on deliberations of a distinguished jury of industry, government and military members, and of the PSA Nominating Committee, and is awarded at the annual Precision Strike Technology Symposium (PSTS) to be held 26-27 October, 2011 at the Johns Hopkins University Applied Physics Laboratory in Laurel, MD. Nominations for the Johnson Trophy are open to any US or allied individual.

CRITERIA FOR SELECTING THE ANNUAL AWARD RECIPIENT ARE:

Primary Considerations

- Notable technical innovation in the field of precision strike which advanced the defense of the United States
- Contributions as an individual
- Technical contributions which advanced state of the art

Secondary Considerations; a legacy of personal technical innovation and accomplishment which:

- Transcends a single program
- Has been widely felt by the warfighters who defend the United States
- Has influenced other technologists as measured by factors such as imitation and mentoring
- Have made precision strike systems more widely available to warfighters who defend the United States

Other Considerations

- A record of innovation found in publications, patents, and similar public domain sources
- Contributions outside the field of precision strike
- Recognition of accomplishments by other awards and honors
- Cost effectiveness of innovations which reduced the cost of precision strike.

SUBMIT NOMINATIONS by downloading a form from our website at www.precisionstrike.org and sending it to Dawn Campbell, Executive Director—Precision Strike Association: dcampbell@precisionstrike.org. Please include your name and contact information. The more information you provide, the easier it will be for the committee to make a decision. For more information about Dick Johnson, the award or to download a PSTS-11 brochure, please visit our website or call 703-247-2590. Nomination deadline August 15, 2011.

PSA Summer Golf Event





The Joint Insensitive Munitions Technology Program

Protecting our Warfighters and sustaining the mission through a joint science & technology program focusing on enabling Insensitive Munitions technologies

By William H. Ruppert, IV and David A. Olson

Historical Imperative: Protect our Warfighters

Late in the morning on June 29, 1967, the USS Forrestal, the U.S. Navy's first 'supercarrier,' was positioned off of Vietnam preparing to conduct bombing runs, when a Zuni rocket was accidentally launched from one aircraft, shooting right through the fuel tank of another aircraft. It did not explode, but it did set off a large fuel fire.

"The heat of the fire exploded a bomb on the flight deck approximately ninety seconds after the fire began, and a second bomb exploded a few seconds later. These explosions severely damaged the carrier and killed several sailors on the flight deck. The fuel tanks of several other planes ruptured, adding to the intensity of the blaze. The exploding bombs created several holes in the flight deck, allowing fire and smoke to spread into the interior of the ship.

Forrestal's crew feverishly battled and eventually extinguished the fire. It took over twenty-four hours to extinguish the fires that spread below the flight deck. The losses caused by this incident were high. One hundred thirty-four sailors were killed by the fire, and 161 more were injured. Over twenty aircraft were lost. The damage forced Forrestal to suspend combat operations and conduct temporary repairs in the Philippines before returning to the US for permanent repair. Repairs to the ship cost approximately \$72 million, and took approximately two years to complete.[i]"

Figure 1 –
Crewmembers
Fighting Fires
on the
USS Forrestal



This is one of the most dramatic examples of what can happen when weapons systems with 'sensitive' munitions exposed to threat caused by external stimuli. There are scores of other examples in US History, such as the Port Chicago in 1944, S.S. Grandcamp in 1947, Camp Doha, Kuwait in 1991, and many others.

So have we learned from history? Yes, so that we are not doomed to repeat it. The Forrestal incident caused a major shift in military thinking on how it was prepared for these types of events, including changing fire protection systems and procedures, how it handles and stores munitions on flight lines, and how weapon systems are designed and built.

All four services have made incremental improvements to de-sensitize munitions to prevent unintended initiation. The Joint Insensitive Munitions Technology Program (JIMTP) seeks to build on these improvements for increased protection of the warfighter and further sustainment of the mission.

Insensitive Munitions Required by Law

On December 12 2001, Congress recognized the need for Insensitive Munitions and codified it into law, requiring that "The Secretary of Defense shall ensure, to the extent practicable, that munitions under development or procurement are safe throughout development and fielding when subjected to unplanned stimuli. [ii]"

This gave the Office of the Secretary of Defense (OSD) the impetus to institutionalize an Insensitive Munitions program that the Department of Defense (DOD) had been working on since the Forrestal incident. OSD created a dynamic, highly coordinated Insensitive Munitions Program through a series of directives and policy memorandums that is administered at the highest levels of the Department.

As part of this, "...The Services (were required to) support and fund the ...Insensitive Munitions Science and Technology enhancement.[iii] "The OSD required acquisition officials to assess all of their weapons systems according to test standards standardized by the Joint Requirement Oversight Council (JROC)" [iv], and document these assessments in a Insensitive Munitions Plan of Action and Milestones (POA&Ms) for all munitions and Insensitive Munitions technology development efforts.

In other words, the OSD put a high priority on developing safe, insensitive munitions early in their lifecycle, and funded the JIMTP to create new technologies that enable weapon systems to meet these goals.

The JIMTP

Since its inception in 2007, the JIMTP has utilized the expertise of the entire weapon system community, including DOD, Department of Energy (DOE), and private industry to develop enabling technologies for new weapon systems, or for improving existing weapon systems. This can include changes in the packaging, non-energetic parts, the energetic fills within the munitions, and other novel approaches.

The JIMTP provides Insensitive Munitions technologies with an end goal of being transitioned to the Army, Navy, Marine Corps and Air Force munition systems. The JIMTP invests mostly in applied technology/research and advanced technology development, with the understanding that Insensitive Munitions is not an independent requirement, but part of an overall desired capability of an entire weapon system.

The JIMTP utilizes the service Program Executive Office's (PEO) Insensitive Munitions strategic plans to determine technical needs and shape priorities. In the DoD munitions portfolio there were 772 non-compliant munitions identified for procurement in FY2011/2012. 141 of these munitions were identified as a priority by the PEOs. Of these, approximately 124 have components that are targeted for improvement by the JIMTP.

Complex problems are best solved by breaking them down into smaller pieces. In JIMTP, this is accomplished by dividing the program into five Munitions Area Technology Groups (MATGs).

MATG I – High Performance

Rocket Propulsion

MATG II – Minimum Signature

Rocket Propulsion

MATG III – Blast-Fragmenting Warheads

MATG IV – Anti-Armor Warheads

MATG V – Large Caliber Gun Propulsion

These five groupings are the highest priorities for developing Insensitive Munition-compliant weapon systems. The MATGs are formal groups that have one chairperson and two to three co-chairpersons that include representatives from all the major service laboratories. MATGs are tasked with 1) coordinating, establishing, and maintaining five-year technology development plans and roadmaps, 2) coordinating biannual meetings to review technical

and programmatic details of each funded and proposed efforts, 3) developing and submitting Technology Transition Agreements in coordination with appropriate PEOs for insertion in their Insensitive Munitions Strategic Plans, and 4) interfacing with other MATGs and Insensitive Munitions science and technology projects as appropriate. The JIMTP Technical Advisory Committee (TAC) (consisting of senior DOD and DOE laboratory representatives and senior Munitions PEO representatives) provides oversight, policy, direction and priorities of the JIMTP during its annual meeting.

Over the last 5 years, each of the MATGs has worked with the acquisition community to develop roadmaps for insertion of technology into weapon systems. These roadmaps take into account 5, 10, and 15 year goals that focus the program on incremental and substantial improvements to reactions to potential threats. As one would expect, the short-term goals focus on easier to accomplish tasks, where the longer-term goals require substantial investment in new and novel technologies.

Threats, Tests and Reactions

Insensitive Munitions are defined as 'munitions that reliably fulfill their performance, readiness and operational requirements on demand, and that minimize the probability of inadvertent initiation and severity of subsequent collateral damage to weapon platforms, logistic systems and personnel when subjected to unplanned stimuli.'

	Threats					
	FUEL FIRE Such as a truck or an aircraft on a flight deck	NEARBY HEAT Such as fire in adjacent magazine, store or vehicle.	BULLETS Such as small arms from terrorists or combat	FRAGMENTS Such as from bombs, artillery, or IEDs	SYMPATHETIC REACTION Such as detonation of adjacent stores	SHAPED CHARGE JET RPG, Bomblets, ATGMs
	Fast Cookoff FCO	Slow Cookoff SCO	Bullet Impact BI	Fragment Impact FI	Sympathetic Detonation SD	Shaped Charge Jet SCJ
	Tests					
	Liquid Fuel Fire	Slow Heating 3.3 °C/hr	50 Cal M2AP 3 round burst	18.6 gram fragment 8300 +/- 300 fps	Detonation of a single donor	81-mm Precision shaped charge
Passing Reactions	BURNING	BURNING	BURNING	BURNING	EXPLOSION	EXPLOSION

Reactions	Detonation/ Partial Detonation	Explosion	Deflagration/ Propulsion	Burn	No Sustained Reaction
	Type VII	Type III	Type IV	Type V	Type VI

Figure 2 – Summary of Threats, Tests, and Reactions

Munitions are considered insensitive munition compliant when they have met the passing criteria for each of the threats as defined by the JROC. Munitions need to be tested according to the Joint Insensitive Munitions Test Standards [iv], and the reaction of the munition during the test needs to be evaluated by service-specific Insensitive Munitions boards. Figure 2 summarizes each of these.

In the case of the USS Forrestal, most of the initial damage was caused by bombs ‘cooking off’ from the burning fuel that was spilled on the deck. Cook-off is caused by raising some portion of the energetic fill — either the fuze, booster or the main explosive fill (Figure 3) — to exceed its decomposition temperature. If the fuze is in place, the higher temperature will build up pressure within the bomb, causing a more violent reaction. In order to make bombs safer, several improvements can be made, including using a fill with a higher decomposition temperature, insulating the bomb, and allowing the bomb to vent excess pressure. Technologies for insulating the bomb have been in place for decades. This is usually accomplished with an intumescent coating that has char that expands when exposed to fire. The expanded char can provide several minutes of additional time before the bomb cooks-off. Bomb venting can be accomplished at the fuze end of the bomb by adding a thread liner sleeve that melts below the decomposition temperature. After it melts, the pressure from inside of the bomb expands and pushes the fuze out. This, in combination with new explosive fills, can result in a bomb simply burning like fuel, rather than detonating in a fire.

Figure 3 – MK84 General Purpose Bomb



Other threats, such as impacts from bullets and fragments or sympathetic detonation can be handled through internal liners or external packaging that protects the bomb right up to the point of loading it on an aircraft. Shaped jet charge is by far the most difficult threat to defeat because of the high temperatures and velocity of the shaped jet.

Invention of the Year: The M795

The JIMTP provided support to Product Manager (PM) Combat Ammunition Systems (CAS) to develop the M795 155mm projectile. This is the first munition that has passing reactions to all Insensitive Munitions tests, including the Shaped Jet Charge.



Figure 4 – Army Soldiers and Marines will use the new M795

The main contributor to this improvement is the change of the energetic fill from TNT to IMX-101. This is the first JIMTP technology to be fielded – several thousand of the projectiles are scheduled to be deployed over the next few years, eventually completely replacing the existing system.

Both the Army and Marine Corps will benefit from the new IMX-101 formula, slated to replace traditional TNT in large-caliber projectiles like the 155mm high-explosive.

One example of this is the reaction of the M795 to the slow cook-off test. During a slow cook-off test, the IMX-101 (Insensitive Munitions Explosive 101)-loaded projectile is exposed to high temperatures over an extended period. Instead of blowing up like the traditional explosive fill, Trinitrotoluene (TNT), the IMX101 simply melted and expanded out of the top of the munition as seen in Figure 5.



Figure 5 – The M795 after the slow cook-off test

The improved M795 is scheduled for delivery to deployed Army and Marine Corps units. Numerous tests have proven that IMX-101 is a safer alternative to TNT in the Army and Marine Corps’ existing large-caliber projectiles, especially during transportation, storage and loading.

While the material cost for IMX-101 is higher than TNT, the price will fall as the Army produces more quantities in coming years. However, the real cost savings will come with the improved logistics of the new explosive, which will cost a significant amount less than the Army currently pays to transport and store TNT [v].

SUCCESS: Lives Saved

Afghanistan, September 12th, 2009. A Mine Resistant Ambush Protected (MRAP) Vehicle with a patrol from the Army’s 10th Mountain Division was hit by a very powerful Improvised Explosive Device (IED). The IED ruptured the vehicle’s hull and fuel tank, which engulfed the vehicle interior in flames-to include sixteen M768 60mm mortar cartridges that were carried inside the cabin with the seven-man crew. Although several soldiers were seriously injured in the ambush, all survived. The survival of the crew has been credited to the Insensitive Munitions features of the M768 cartridges.



Figure 6 – Interior view of the MRAP vehicle after the fire. An unexploded shell body from a M768 cartridge can be seen at the lower left.

The M768 incorporates several Insensitive Munitions features, including new energetic materials in the fuze and shell body. It also contains a plastic fuze adaptor that melts in an accidental fire, allowing the fuze to separate from the cartridge. This relieves internal pressure and prevents detonation of the explosive fill. After the MRAP had stopped burning, the wreckage was examined and all of the mortar shell bodies were intact, proving that none of them had gone “high order” in the fire. Also lying in the wreckage were the remains of the fuzes that had separated from the cartridges as designed. Separation of the fuze allowed the Picatinny Arsenal Explosive 21 (PAX-21) explosive fill to burn rather than explode.



Figure 7 - Shell bodies and separated M783 fuzes from M768 cartridges recovered from the vehicle after the fire.

The M768 cartridge, Full Materiel Released in 2006, is one of the early success stories in a larger Insensitive Munitions Strategic Plan that PEO Ammo is implementing to develop and produce safer ammunition throughout its portfolio. The PEO’s Project Managers have instituted POA&Ms for improving Insensitive Munitions characteristics for their assigned munitions through improvements in packaging, explosive fills, propellants, and fuzes for all calibers, up to and including 155mm [vi].

Although the M768 was not a JIMTP program, it is a great example of how Insensitive Munitions improvements can save lives. The JIMTP and PM CAS are teaming again to improve the M768 even more to protect the munition (and the warfighter) against other threats. This will be done by changing the fill from the first-generation insensitive explosive, PAX-21, to an even less sensitive composition, IMX-104.

Conclusion: A Lot of Challenges Remain

The US munition inventory continues to see improvements in the responses to unplanned stimuli. Successful projects such as the M795 and M768 demonstrate both the feasibility and benefits of having IM systems. These systems provide increased safety, operational efficiencies, and logistical advantages for the warfighter. While continued progress is desired, complex and challenging problems remain for the foreseeable future as systems attempt to address some of the more difficult threats.

A comprehensive and coordinated approach: identifying technology gaps in the IM Strategic Plans, providing innovative technical solutions in the JIMTP, transition-

ing technologies through the Program Managers, and integrating the technologies with the contractors, are all required if these demanding challenges are to be met.

The munition community has worked very diligently and been very successful in providing solutions to the IM threats. Continued success is needed if all munitions are to defeat all IM threats.

While the ultimate goal is to have a fully IM compliant inventory, it is important to remember that with each incremental Insensitive Munition improvement, a safer weapon is being placed in the hands of the warfighter.

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CALL FOR NOMINATIONS

On January 17, 2012 the Precision Strike Association will award the fifteenth annual **William J. Perry Award** during the Precision Strike Winter Roundtable. **Nominations are being accepted for this prestigious award through November 4, 2011.**

William J. Perry Award Requirements: In recognition of superb contributions to precision strike systems, the Precision Strike Association and the William J. Perry Award recognize public or private sector leadership or achievement that results in significant contributions to the development, introduction or support of precision strike systems. The recipient must have made significant contributions that have led to the strengthening of our national security by direct application of precision strike capabilities to DoD systems and/or to the enhancement of our industrial technology base for application to precision strike technology.

To submit a nomination, please use the following link: http://www.surveymonkey.com/s/PSA_2012-WJPAWARD (you will be directed to another site “Survey Monkey” to complete the nomination process—please fill in all of the necessary fields). All nominations must be submitted on-time to be considered.

News Briefs

250-Pound Paveway

Raytheon has re-introduced its 250-pound Paveway laser-guided precision munition to the warfighter inventory. Paveway is a kit that transforms “dumb” bombs into precision guided weapons. The 250-pound weapon, which is now designated the GBU-58, is currently undergoing testing on the Hawker-Beechcraft AT-6 and other counter-insurgency aircraft. GBU-58 is currently integrated on the Super Entendard and the Mirage 3. The Paveway family of weapons is integrated on more than 17 aircraft in 42 countries, and Raytheon has delivered more than 350,000 of the systems. ■

AARGM Flight Tests

ATK's Advanced Anti-Radiation Guided Missile (AARGM) recently completed an initial flight integration test on the Boeing EA-18G Growler electronic warfare aircraft and has completed multiple flight hours of integration testing on FA-18E/F Super Hornet aircraft. This series of successful captive-carry tests is part of the process to validate the compatibility of AARGM with these platforms and to pave the way for all U.S. Navy strike aircraft to leverage AARGM's defense suppression capability. With continued successful flight performance, AARGM is expected to complete the Navy's Operational Test Readiness Review and transition into initial operational test and evaluation later this year. ■

JDAM Contracts

Boeing has received contracts totaling \$100 million for two types of Joint Direct Attack Munition (JDAM) kits. The U.S. Navy awarded the company an \$8 million contract that represents the first major pro-

duction order for Laser JDAM kits. The contract is for low-rate initial production of 700 laser sensor kits for the Navy's direct-attack moving target capability weapons requirement. The USAF announced a \$92 million contract for more than 4,000 Lot 15 JDAM kits. This follows an \$88 million contract awarded for the first 3,500 tail kits in the same lot. After the Laser JDAM was identified as an urgent operational need in early 2007, Boeing completed the weapon's development and testing cycle in less than 17 months. JDAM is a low-cost guidance kit that converts existing unguided free-fall bombs into near precision-guided weapons. In addition to conventional JDAM and Laser JDAM applications, the JDAM Extended Range configuration—currently in demonstration with an international customer—is designed to increase the stand-off range to approximately 40 miles. ■

120mm Roll-Controlled Guided Mortar

General Dynamics Ordnance and Tactical Systems has successfully demonstrated a tactical version of the company's 120mm Roll Control Guided Mortar (RCGM) at Yuma Proving Grounds, AZ. The 120mm RCGM is a low-cost, guided mortar that provides precision-strike capability using standard M934A1 mortar components, GPS guidance, M734A1 fuze components and patented Roll-Controlled Fix Canard (RCFC) technology.

Live, tactical 120mm RCGM rounds were used in the demonstration and all of the rounds were successfully guided to within 10 meters of their target at ranges of 1,000 to 5,000 meters. The test demonstrated the RCGM capability in height-of-burst, point detonation and delay fuze modes, and demonstrated the rounds' ability to perform at hot, ambient and cold temperatures. ■

CALENDAR OF EVENTS

Precision Strike Technology Symposium

Date: October 26-27, 2011

Theme: Kill Chain Challenges and Opportunities to Counter US Global Threats

Location: Johns Hopkins University Applied Physics Laboratory—Kossiakoff Center, Laurel MD

This symposium will be held at the SECRET/US Only Classification Level

Precision Strike Winter Roundtable and William J. Perry Award Ceremony

Date: January 17, 2012

Theme: Precision Strike in an Era of Affordable Constraints

Location: Crystal Gateway Marriott, Arlington, VA

Sponsorships and exhibit opportunities available for all events—for more information email info@precisionstrike.org or visit our website: www.precisionstrike.org

Global Challenges

Continued from page 1

his career, he has held a wide range of command, leadership, and management positions. Currently, he serves as the deputy and principal assistant to the Secretary of the Navy and acts with full authority of the Secretary in the day-to-day management of the Department of the Navy.

Significant PSTS-11 topics will highlight two dynamic sessions that will address intelligence threats related to Cyber, Kinetic, Directed Energy, DRFM and advanced technologies for Precision Strike Systems including Irregular Warfare, combat and MOUT engagements, laboratory initiatives, Tomahawk, NAVAIR's Offensive Anti-Surface Weapon, DARPA missile projects, and DTRA science and technology.

Review page 15 of this issue for a snapshot of major topics already confirmed for PSTS-11. ■

PSTS-11 Program Highlights

PRECISION STRIKE TECHNOLOGY SYMPOSIUM (PSTS-11)

26-27 OCTOBER 2011

SECRET/U.S. Only

*The Johns Hopkins University Applied Physics Lab
Kossiakoff Center — Laurel, MD*

**Kill Chain Challenges and Opportunities
to Counter U.S. Global Threats**

Two Hot-Topic Sessions

**Intelligence—Cyber/Kinetic/Directed Energy/DRFM
(DIA, JHU/APL, ONI, ONR & ASD(R&E))**

**Weapons Systems Technologies for Precision Strike
(ASD(R&E), AFRL, China Lake, PEO (U&W), N88, DARPA & DTRA)**

Four Keynote Addresses

National Security Global Challenges

Kill Chain Challenges for Asia-Pacific Stability

**Kill Chain Challenges to Counter Naval Threats & Future of the Air-Sea Battle
Afghan & Iraq Lessons Learned / Precision Fires / Precision Engagement Solutions**

Numerous Riveting Technical Topics

- Top Weapons Systems Capability Gap Assessment
- Special Ops Precision Strike Challenges & Needs—Planning for the Unplanned
- Targeting Issues in the CENTCOM AOR
- Future of Precision Weapons
- Long-Range Strike Family of Systems
- SWITCHBLADE—The Magic Bullet
- Horizontal Integration of the Weapon Kill Chain
- How ISR Compliments Precision Weapons—Unmanned Systems Roadmap
- Integrating Kinetic & Cyber Effects to achieve desired Warfare Outcome
- Integrating Data Link Requirements Across the Kill Chain
- Kill Chain & T&E—How well are Weapons meeting Effective/Suitable Ratings
- Boosted Penetrator Studies
- Red Team's Role in Requirements Development & S&T Transition
- Warfare Integration & Precision Engagement
- Precision Strike Technologies Across Multiple MAs & Munitions for 2025+
- Tomahawk in the 21st Century
- Future Surface/Air-to-Surface Anti-Ship Missiles-including OASuW
- DARPA HTV-2
- Army's Missile Systems Issues
- Hard Target Munition

Special Award Ceremony

Richard H. Johnson Technical Achievement Award Ceremony

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I hereby apply for membership in the Precision Strike Association. My understanding is this entitles me to invitations to appropriate Association activities, the quarterly newsletter and other benefits.

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