The Precision Strike Digest

2nd Issue
2014
Vol.27, No.2

"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."

PSA
PRECISION STRIKE ASSOCIATION
Affiliate, National Defense Industrial Association

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.

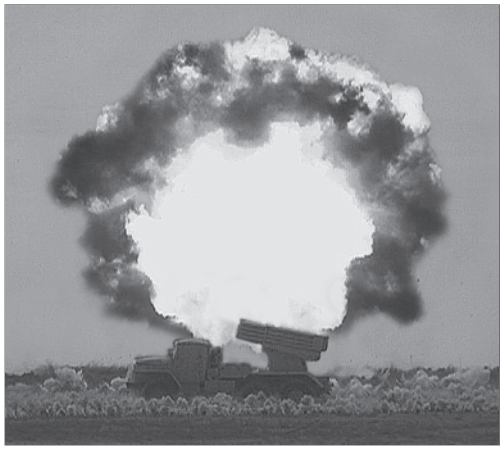
Ensuring the U.S. Military Keeps Its Strategic Advantage

Strength Through Investment—Decisive Strike Capabilities is the focus of the Precision Strike Technology Symposium (PSTS-14) presentations and discussions scheduled for Oct. 21-23, 2014 at the JHU/APL Kossiakoff Center.

PSTS-14 will be conducted at the SECRET//NOFORN classification level. This symposium is sponsored by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, Tactical Warfare Systems.

Maintaining superior military capabilities are essential both to the credibility of America's commitments to allies and partners and to our ability to deter threats. As DoD continues to pursue core objectives laid out in QDR-14, the precision strike community must engage in the investment of capabilities that will give our nation the edge on the battlefield.

PSTS-14 is structured to provide you with insights on critical topics that will showcase opportunities and innovations for the future of warfare. Further, the intent of PSTS-14 is to gain a greater understanding of the capabilities possessed by potential adversaries. Therefore, during PSTS-14, we also will pursue challenges and issues related to NATO, Russia, the Middle East, and the Asia-Pacific Region that require the attention of the precision strike community.



AW PQT-3 Detonation.

This timely and penetrating technology symposium will address the strategic direction for precision engagement to counter global threats – cyber being one of the most serious threats to our national security. Innovation continues to expand the reach and utility of cyberspace, while also introducing new vulnerabilities. Military operations in cyberspace present both great opportunities and significant challenges. Potential vulnerabilities demand that our military builds a world class cyber force.

During PSTS-14, key leadership speakers will highlight several hot topics including Intelligence & Cyber Challenges, Hot Spots in Africa, NATO's Role in the New Security

See **PSTS-14,** Cont. on pg. 14

IN THIS ISSUE

Published by:
The Precision Strike Association
2111 Wilson Blvd - Suite 400
Arlington, VA 22201-3061
tel: 703-247-2565 fax: 703-527-6945
www.precisionstrike.org
email: info@precisionstrike.org;
PSAChair@precisionstrike.org

Chairperson's Column

I want to share with you information on two major NDIA ideas. Early this year, Major General Arnold L. Punaro, USMC (Ret.), Chairman of the NDIA Board of Directors, announced two critical NDIA initiatives to: help the Pentagon sustain the defense industrial base in an era of fiscal constraint; and, to support efforts by Under Secretary of Defense (AT&L) Frank Kendall, Rep. Mac Thornberry, Vice Chairman of the House Armed Services Committee, and other leaders of the House and Senate Armed Services Committees to reform the system for acquiring defense products and services.

In a letter dated May 9, 2014, Punaro provided the following update on both of these efforts.

NDIA's Senior Fellow for Industrial Base Matters, Brett Lambert, continues to make good progress on gathering supply chain information. In addition to describing his goal, timeline, and process during a webinar, Brett briefed several of NDIA's Divisions and our Board of Directors over the past month.

NDIA is still gathering information. After that process has concluded, we will begin the process of analyzing the submitted data. The purpose of Brett's study is to provide the DoD and Congress with specific, actionable information on industrial base vulnerabilities that can feed into Pentagon and Congressional processes for industry sustainment that would not have been identified through the standard government data collection methods.

If you have submitted a questionnaire on a critical or fragile industrial base capability, please accept my thanks for your insights. For those who have not had a chance to do so, please highlight any industrial base vulnerabilities by completing the questionnaire at www.ndia.org/industrialbase/. If you have questions about Brett's effort, please feel free to send an email to industrialbase@ndia.org. Brett is also available to discuss these issues.

In March, the House and Senate Armed Services Committees wrote a letter to NDIA requesting our input to their acquisition reform efforts. Industry, the Pentagon, and the Congress all have reached consensus that reform is not just desirable, it is essential in this period of budget austerity.

In order to properly respond to the request for input, NDIA needs the views and input of our members. Jon Etherton, NDIA's Senior Fellow for acquisition reform, held an event on May 29 where he presented a set of problem areas culled from past acquisition reform efforts, possible root causes of those problem areas, and potential solutions. Participants discussed and refined Jon's list to offer clear guidance and direction for the next phase of his study. Any questions about this initiative can be directed to acquisitionreform@ndia.org. Jon is also available to discuss these issues.

Industrial base and acquisition reform are both critical issues to the Precision Strike community. Your thoughts on these topics are important and I encourage you to share them via the above links.

Suzy Kennedy
Chairperson of the Board
Precision Strike Association

PSAR 2014: Staying Relevant

The Precision Strike Association (PSA) held its Precision Strike Annual Review (PSAR-14) March 18-19, 2014 at the Waterford at Springfield, Springfield, VA.

Organized by Ginny Sniegon, PSA Programs Chair, PSA Programs Vice-Chair, CDR Steven "Sonic" Hejmanowski, USN, Annual Review Co-Chair Dick Rumpf, International Chair, Earle Rudolph and Suzy Kennedy, Annual Meeting Chair, the very successful two-day event held the theme ***Precision Engagement—Staying Relevant in a Dangerous World***.

PSAR-14 focused on the top issues related to evolving threats, advanced technologies, technology surprise, robust investments in science and technology, and adapting acquisition processes for weapons reform. The key to maintaining our Nation's military power projection capabilities is exploiting, extending and gaining advantages in technologies for precision-guided weapons.

A special feature of PSAR-14 was the presentation of the William J. Perry Award that recognizes significant contributions to the development and support of precision strike systems that have led to the strengthening of our vital national security interests. The Honorable John Douglass presented this year's award on behalf of Dr. Bill Perry.

Lieutenant General David Halverson, USA, kicked off the annual event keynoting the opening day of PSAR-14. As Deputy Commanding General/Chief of Staff, U.S. Army Training & Doctrine Command, he focused on TRADOC's role in the new security environment, discussing precision fires for strategic land power.

Lieutenant General David Halverson, USA

He said future precision fires will require lethal and non-lethal effects and a wide range of area, near precision to precision capabilities so as to minimize collateral damage. "By 2025, we should be able to integrate and deliver precision fires through combat proven targeting processes, providing agile, adaptable and scaleable effects," he said.

Halverson said we need both kinetic and non-kinetic solutions. "I am a big supporter of electric fires for ground forces. We are working closely with the Navy on this," he said, adding that the latter can be used for crowd control and dispersion.

"This group needs to focus its science and technology capabilities to leverage kinetic and non-kinetic capabilities to produce the overmatch advantage that we need," Halverson believes.

Next up on the podium was **Brigadier General Jon Thomas, USAF**, Deputy Director, Future Joint Force Development, J-7, Joint Staff, who outlined the key issues the U.S. faces in the new strategic environment in terms of joint concepts development and joint warfare. "I would submit that the challenges we face today are not limited to the state actors…We must be prepared across the full range when we talk about contested battlespace," he believes.

Brigadier General Jon Thomas, USAF

He said there are four key challenges: operational access; learning the lessons from the last decade of war; integrated air and missile defense; and, fiscal constraints on defense spending. Thomas said operational access will require all the U.S. military forces "to work together to maintain freedom of access to the air, sea, space and cyber domains."

Thomas said we will have to defeat air and missile threats through four pillars: air defense; passive defense (dispersion, deception and concealment); attack operations, both kinetic and non-kinetic; and command and control enhancements.

"As the joint force gets smaller, we will go from joint interaction and interoperability to joint interface. We will have no choice but to rely on each other," he added.

Rear Admiral Ron Boxall, USN, Deputy Director, Joint Strategic Planning, J-5, The Joint Staff, addressed the emerging strategic context of national strategies in the face of complex simultaneous challenges in the Far East, North Africa, Central Africa and Latin America. As a result, he said, "the joint force will need the capability to enable and support forced entry at greater operational ranges and greater interoperability and with wider distribution across regions or across the globe."

Rear Admiral Ron Boxall, USN

He said the core theme for the 2014 Quadrennial Defense Review (QDR) is "rebalance" to restore

readiness for the full spectrum of potential conflict and establishment of permanent, pre-positioned and rotational presence balanced with surge capability. The U.S. military must be ready for both known commitments and inevitable surprises while maintaining an efficient "tooth-to-tail" ratio. He said leveraging active, guard and reserves forces will support this rebalance.

Boxall said "advanced technology is our bedrock" and risk mitigation must include investments in standoff strike platforms and weapons, and counter cruise missile and ballistic missile technology. He said new concepts, new organizations and formations and joint forces synergy are essential.

Bill Gertz

Bill Gertz, Senior Editor of The Washington Free Beacon, National Security Columnist for The Washington Times and author of six books, spoke about the threat posed by China. Stated Gertz: "Bottom line. The U.S. has underestimated China's intention, strategy and capabilities for the past 2-3 decades due to political correctness of scholars with benign views of China."

Gertz said "We have a problem. China remains a nuclear-armed communist dictatorship with the goal of dismantling U.S. military dominance in the Western Pacific." He offered a checklist of China's military buildup in short-range and long-range ballistic missiles, anti-missile defenses, anti-satellite capabilities, anti-ship weapons and cyber-warfare.

"China is engaged in a major covert strategic nuclear force buildup, is fielding stealthy surface warships and is cranking out modern and quiet attack and cruise missile-armed submarines like sausages," he added.

This past May, a U.S. grand jury indicted five Chinese military officers on charges of hacking American companies and stealing trade secrets, the toughest action taken by Washington so far to address cyber spying by China.

The need to rebalance the Pentagon's research and engineering investments was the topic of **Principal Deputy Assistant SecDef (R&E) Alan Shaffer**'s briefing. He said the future force must be smaller and leaner yet more agile, flexible, technically-advanced and rebalanced to emphasize Asia-Pacific regions.

Principal Deputy Assistant SecDef (R&E) Alan Shaffer

Shaffer said the new defense R&E strategy moving forward: must mitigate new and emerging threats; affordably enable new or extended capabilities in existing military systems; and, develop technology surprises through science and engineering, including autonomous systems and high-speed weapons that allow for rapid and responsive strike in anti-access/aerial denial (A2/AD) environments.

In August 2014, the Army expects to again test its Advanced Hypersonic Weapon (AHW) Technology Demonstration. The results of that test will help determine the system's future.

The AHW is part of an effort to develop a conventional "Prompt Global Strike" capability. The AHW can be launched from the United States and can hit a target anywhere in the world. It can travel at speeds of Mach 5, about 3,600 mph, or higher.

As part of a November 2011 test, an AHW was launched from the Pacific Missile Range Facility, Kauai, Hawaii, and arrived 30 minutes later at the Reagan Test Site, U.S. Army Kwajalein Atoll, Marshall Islands -- a distance of about 2,500 miles.

Lieutenant Colonel David Koewler, USAF, the Joint Staff lead for the Munitions Requirements Process (MRP), Warfighting Analysis Division, J-8, Joint Staff, discussed how munitions requirements are processed and identified issues, implemented solutions and unresolved matters.

Lieutenant Colonel David Koewler, USAF

He said the overall requirement considers those units needed for combat, the post-combat strategic readiness stockpile and test and training. Koewler said getting the numbers right "is especially important for expensive precision strike weapons." Determining the right number means proper use of intelligence and data management. There's a desire to focus on a select set of munitions, but "we feel its very important to work across all munitions to fully understand the risks," he said.

"The MRP is a portfolio-based approach that looks across a wide range of weapons systems. It considers how many items are needed and the right mix of capabilities. It provides a starting point for the overall munitions procurement dialogues," said Koewler.

Colonel Mark "Gator" Moore, USAF, Director, Combat Force Application (AF/A5R-C, Headquarters USAF, offered a scorecard for precision weapons use in Afghanistan and discussed key preci-

sion weapons for the future.

Colonel Mark "Gator" Moore, USAF

"Overall, they are performing extremely well in Afghanistan despite a challenging environment in terms of geography, climate and the enemy order of battle," said Moore.

The Lockheed Martin AGM-158 Joint Air-to-Surface Standoff Missile and the extended range AGM-158B JASSM-ER are doing "very well" and "are key to our future from a precision munition standpoint," he added.

Air Combat Command (ACC) is conducting an analysis of alternatives to explore options for a future Hard Target Munition (HTM) that could be employed by legacy fighters as well as the F-22 and F-35. Moore said the final report is due out in the fourth quarter of calendar year 2014. A family of systems is envisioned including a 1,000-lb. penetrator. Options include a boosted 1,000-lb. version incorporating a rocket motor.

David Ochmanek, Deputy Assistant SecDef for Force Development, OUSD (Policy), stated that the 2014 QDR is influenced by ten years of war and sequestration. "Our forces are not nearly as ready as they need to be," he said, "and we have more force structure than we can affordably sustain. Modernization dollars are spread too thin and across too many priorities."

David Ochmanek, Deputy Assistant SecDef for Force Development, OUSD (Policy)

Ochmanek said to buy down risk and improve readiness, the USAF is mothballing the Fairchild A-10 attack planes, the US Army and USMC are reducing their ground force end strengths, and the USN will construct fewer Littoral Combat Ships (LCS).

'As we approach the end game in Afghanistan and think about the future, we see large looming challenges to our ability to project power into A2/AD environments, particularly in the Western Pacific. US forces cannot be assured to dominate everywhere," Ochmanek believes.

But he said the Pentagon is protecting the core assets of future power projection (a next generation bomber, the F-35 and Virginia-class attack submarines) in an era of reduced budgets and is focusing on R&D and procurement of smart weapons that can attack at standoff ranges.

An overview of the Kongsberg Naval Strike Missile (NSM) was the focus of the international precision weapons session. **Ken Albright**, the firm's director of business development, said the NSM was developed to arm Royal Norwegian Navy frigates and coastal corvettes. The NSM was also selected by the Polish Navy for use on its new coastal artillery installations and is a candidate to arm the USN's LCS.

Ken Albright

The missile is completely passive, has proven its excellent sea skimming capabilities and with its advance terminal maneuvers it will survive enemy air defenses. The Autonomous Target Recognition of the seeker ensures that the correct target is detected, recognized and hit, at sea or on land.

As Norway is procuring the F-35, Kongsberg is also developing a new missile, the Joint Strike Missile (JSM), which can be carried externally and internally in the bomb bay of the Joint Strike Fighter. The JSM missile system is designed for both Anti Surface Warfare (ASuW) and Naval Fire Support (NFS) missions.

A new hot topic was the National Laboratories Panel. Sandia, Lawrence Livermore and Los Alamos provided panelists who described how their federally-funded centers do rapid technology development that cannot be performed as effectively by government or contractor resources. **Michael Bawden** moderated the panel.

David Keese, Director, Integrated Military Systems, offered four examples of precision strike R&D work performed by Sandia. They have included: the TACMS-P Precision Strike ACTD, a conventional (non-nuclear) weapon that provides a way to penetrate hardened and shallow buried targets); hypervelocity projectiles for rail and propellant guns; CHAMP (a non-KE precision effects

National Laboratories Panel: Michael Bawden, Dr. Randall Simpson, David Keese, Doug Anson.

project); and, conventional prompt global strike technology development supporting the Army's AHW tech demo.

Dr. Randall Simpson, Associate Program Leader, Weapons & Complex Integration, provided a view of Lawrence Livermore which partners with DoD and industry to develop and transition advanced conventional weapons like concrete busters and other special purpose munitions. A recent project was development of the BLU-129B Precision Lethality Mk-82 500-lb bomb, the Precision Strike Association's 18th William J. Perry Award winner.

Doug Anson, Director, DoD Strategic Development, at Los Alamos offered a glimpse of his lab's work on precision strike. They have ranged from R&D of free electron lasers for shipboard defense to cube satellite and constellation launch (cubesat). Los Alamos supports all national nuclear counter-proliferation lines of operations and national nuclear non-proliferation efforts.

James "Hondo" Geurts

James "Hondo" Geurts, Deputy for Acquisition, U.S. Special Operations Command, keynoted the second day's program, highlighting precision engagement initiatives, both kinetic and non-kinetic and lethal/non-lethal, for the future fighting force. He described how SOCOM's abbreviated procurement scheme has sped the fielding of spec ops equipment and weaponry.

Geurts said eight cubesats (each costing $70,000 and with a service life of 36 months) have been launched for special ops service. He told PSAR-14 attendees there's a need for more non-kinetic precision strike. "That's a whole area we need to get to. There's huge space there, whether cyber, non-lethal or special effects based initiatives. We need to widen our aperture," he stated.

Clothilda "Clo" Taylor

A new face at the annual PSAR event was **Clothilda "Clo" Taylor**, Acting Director, Human Capital Initiatives, OUSD(AT&L), who discussed the Pentagon's program to develop acquisition professionals, enabling them to make critical business decisions that ensure affordability and increase productivity with the ultimate goal of delivering better value to the taxpayer and the Warfighter.

In 2009, as part of defense acquisition reform, the OSD asked AT&L to develop plans to grow and rebalance the acquisition work force. She shared information on recent initiatives "to fix the brain drain of recent years in the acquisition workforce."

Once again **LTC Ken Britt, USA (Ret)**, moderated the **Army Precision Weapons Session**. **Lt. Col. Francis Moss, USA**, HQDA G-8 Force Development, **Colonel Gary Stephens, USA**, Precision Fires Rockets & Missiles, PEO Missiles & Space, and **Tom Balish**, HQDA G-8 Force Development, joined Britt to offer the latest on Army field artillery, rockets, missiles and air-launched precision fires.

Lt. Col. Moss described the field artillery acquisition investment strategy best described as a precision effects budget pare down with hits taken in laser designators, fire support vehicles, radars and towed howitzers. Plans for a wheeled self-propelled howitzer have been scrapped in favor of a Paladin PIM. The PIM (Paladin Integrated Management) is the same gun, same M109A6 fires delivery capabilities, but the hull, the bottom of the vehicle is brand new. The PIM has a higher profile than the current Paladin and was redesigned to accept components of the Bradley Fighting Vehicle, such as the engine, transmission, and tracks. The new cab has more space and the PIM has more armor and can accommodate the common remote operating weapon system , known as CROWS.

Colonel Stephens said the Multiple Launch Rocket System (MLRS) "is trying to stay relevant in a very disruptive budgetary world." He discussed a future Long Range Precision Fires Program that is undergoing an analysis-of-alternatives (AoA) and is expected to be completed by the end of CY2014. Booster issues are being addressed. The LRPF would reach out to 500 kms. If given the go-ahead, LRPF's

Army Precision Weapons Session

Milestone A would be in FY2015 with two competing contracts awarded the following year for technology maturation and risk reduction.

Balish said the Army is transitioning from the AGM-114 Hellfire missile to the Lockheed Martin Joint Air to Ground Missile (JAGM) while procuring a guided rocket to replace the unguided Hydra, which is an area weapon at best. He said future air-launched weapons considerations center around required lethality, accuracy and cost.

Initial fielding of semi-active laser/millimeter wave radar guided JAGM is slated for 2016. Lockheed Martin recently demonstrated the JAGM dual-mode guidance section engaging a laser-designated moving target during an internally funded flight test at Eglin AFB, FL. Platforms for JAGM will include the AH-64 Apache attack helicopter and MQ-1C Gray Eagle UAS. Lockheed Martin's JAGM is also compatible with other HELLFIRE platforms.

Dr. Scott Maley

Dr. Scott Maley, Deputy Chief, Joint Requirements Assessment Div., J-8, Joint Staff, offered an update on the JCIDS/JROC processes in the face of an uncertain future.

He outlined how the Joint Capabilities Integration and Development System (JCIDS) Manual is helping to improve the process for requirements identification and development. He said the revised JCIDS Manual reflects the new fiscal reality and remains a work in progress with further revisions due out this year. The focus is on robust portfolio management, something "that's been lacking for a while," he said.

Robert Read

Robert Read, a senior industry analyst for manufacturing & industrial base policy (MIBP), discussed the need for industrial base rebalance during a luncheon presentation. He said declining defense dollars means declining production, possible loss of innovative edge and permanent loss of capability.

MIBP aims to ensure access to robust, secure and innovative industrial capabilities to fulfill short- and long-term national security requirements. Read said an assessment of the nation's missile making capability was completed last August for consideration during the budget review process. MIBP will identify those design and production risk areas that need mitigation, he said.

Commander Robert Croxson, USN

Commander Robert Croxson, USN, with NAVAIR's PMA-234, briefed PSAR-14 attendees on the status of the Next Generation Jammer (NGJ) project that is in a 25-month technology maturation and risk reduction phase. Raytheon was selected in January 2014 to provide the replacement for the legacy ALQ-99 system used on the EA-18G Growler airborne electronic attack aircraft.

Built with a combination of high-powered, agile beam-jamming techniques, and cutting-edge solid-state electronics, the tactical jammer will meet the U.S. Navy's current mission needs while providing a cost-effective open systems architecture for future upgrades. Croxson said "NGJ will be a more precise weapon system than the ALQ-99 and will be better suited to defeat and pace the threat."

Commander Michael "Bobby" Orr, USN

Commander Michael "Bobby" Orr, USN, with NAVAIR's PMA-242, and **Lieutenant Colonel Michael "Job" Shand, USMC**, HQMC, discussed Navy and Marine Corps precision weapons procurement, respectively.

Lieutenant Colonel Michael "Job" Shand, USMC

Orr said the ATK-provided Advanced Anti-Radiation Guided Missile (AARGM), a medium range, supersonic air-launched tactical missile, is now in full rate production. AARGM upgrades legacy AGM-88 HARM systems with advanced capability to perform Destruction of Enemy Air Defense missions.

It will be carried on the FA-18C/D, FA-18E/F, EA-18G and Italian Air Force Tornado Electronic Countermeasures/Reconnaissance (ECR) aircraft. AARGM is a U.S. Navy and Italian Air Force international cooperative major acquisition program with the U.S. Navy as the executive agent. An extended range AARGM is under study, said Orr.

Shand discussed the future for USMC precision weapons in a tight budget environment and "a world not getting any safer, and with tech-

nology development not slowing down." But as the Nation's "911 force" the USMC "will continue to posture itself for the full range of combat operations, using operational reach and tactical flexibility," he said.

Dr. Peter Huessy

Finally, **Dr. Peter Huessy**, President, Geostrategic Analysis, provided his take on what's needed for long range and time critical conventional strike against fleeting targets. Such a Conventional Strike Missile would pair space boosters with a prompt payload delivery vehicle and high-speed warhead to attack missile threats or other time-urgent targets in instances when no other strike assets are within range.

He said four pillars for a CSM are: the ability to locate and find perishable targets; establish the right range to target; the ability to overcome defenses; and, have command, control and communications required for battle management.

"My hope is the Obama Administration and the Congress will make the key decisions on what we need to develop and deploy for time critical conventional strike. This is something the United States must have," said Huessy. ■

PSA thanks the following corporations for sponsoring PSAR-14

Aerojet Rocketdyne

American Defense International

BAE Systems

Northrop Grumman

PSA Honors BLU-129/B Team

A highlight of the 2014 Precision Strike Annual Review was the presentation of the Precision Strike Association's 18th William J. Perry Award to the **BLU-129/B Team**.

The prestigious award is presented annually to programs that strengthen the country's national security by applying precision strike capability to Department of Defense systems. The Perry Award recognizes public or private sector leadership or achievement that results in significant contributions to the development, introduction or support of precision strike systems.

The Honorable John W. Douglass, a retired USAF brigadier general and former Asst. Secretary of the Navy (RD&A), provided thoughtful remarks during this year's Perry Award ceremony.

Honorable John Douglass, Former Navy Acquisition Executive, spoke about his time working for William J. Perry.

In 1977, Douglass was named deputy program manager for business and acquisition of the Joint Cruise Missile Project Office, which reported directly to Dr. Perry, then Undersecretary of Defense for Research and Engineering. RADM Walter M. Locke, USN (Ret.), who would be the 1999 Perry Award recipient, was put in charge of the JCMPO.

Douglass said Dr. Perry "took care of his people so they could achieve an advanced technology goal in the face of a tough budget and a tight schedule."

He said the BLU-129/B program also represents Dr. Perry's vision of how to develop advanced weapons since it was clearly a team effort that moved the technology forward.

Douglass, who later in his career served as president and CEO of the Aerospace Industries Association, said he felt like "an old soldier passing the torch on to a new generation, which as a group is better qualified and a lot smarter than we were."

He added: "There is a completely different challenge to national security today, but the problems of moving technology forward sadly have not changed. It's still difficult to deal with the U.S. Congress, unstable funding, over-reached technology goals, underestimated costs and sometimes not the best of leadership. But one element we can control, to break the mold, is applying the vision of Dr Perry. Put the best people on the program, help them cooperate and make sure they move things to the Warfighter quickly."

Douglass said it was "a great pleasure" for him to draw the analogy between Dr. Perry's vision for the JCMPO and the BLU-129/B.

In announcing this year's Perry Award winner, PSA Vice-Chairman LTC Ken Britt, USA, (Ret) said: "At an urgent, strategic time in our nation's history, the joint Air Force

Research Laboratory, Air Armament Center and 46th Test Wing (now the Armament Directorate, Air Force Life Cycle Management Center and 96th Test Wing, Air Force Test Center), Lawrence Livermore National Laboratory, and the Aerojet Rocketdyne Corporation team provided exemplary technical innovation and cost affordability to meet the vital needs of our Warfighters."

The award honors the immediate and long term impact the BLU-129/B has had and will have on combat operations. Until the introduction of the BLU-129/B, there was no munition capable of being safely deployed near friendly soldiers and non-combatants.

The award also honors the impressive public and private sector partnership that led to this technological advance. The accomplishments of this team are truly a testament to the criteria of this award and honor Dr. William J. Perry.

The first BLU-129/B Precision Lethality Mk-82 500-lb bomb was delivered to Afghanistan in 2011. The weapon represents a new class of innovative munition integrating disruptive technologies that significantly reduce collateral damage while enhancing near-field blast lethality.

The ability to couple sophisticated guidance systems with weapons that have more accurate lethal footprint has been profound. By making the effect of the weapon commensurate with the accuracy, the BLU-129/B design team provided the military with a highly effective munition for fighting in close quarters. This unique combination of enhanced effectiveness and reduced collateral damage is being used to neutralize threats and to prosecute adversaries stationed near damage-sensitive areas, allowing targeting of areas previously considered off limits.

Delivery of the BLU-129/B was the culmination of 18 months from inception to fielding of dedicated effort by the team members. The design architecture of the BLU-129/B made an old Mk82 weapon system new and rapidly gave the Warfighter a new and needed capability.

The technologies applied were the product of the Joint DoD/Department of Energy Munitions Technology Development Program executed out of OUSD(AT&L)/S&TS/LW&M. The BLU-129/B project is a prime example of what can be achieved when multidisciplinary teams from several institutions in the government and private industry work toward a common goal. And it serves as a blueprint for future research and technology transfer of engineered munitions.

Suzy Kennedy, Chairperson of the Board, Precision Strike Association, said "the collaboration and cooperation between industry and government in developing the BLU-129/B is a hallmark of what Bill Perry stood for and is the heritage of PSA." She also said merging advanced technology and cost affordability are equally important. "The BLU-129/B was able to combine both these things and is providing a very cost-effective technology solution for the Warfighter," said Kennedy.

The Perry award was accepted by **Major General John A. Macdonald, USA (Ret.)** and **Dr. Randall L. Simpson**, who leads non-nuclear weapons efforts at the Lawrence Livermore National Laboratory.

Macdonald said: "We faced tactical problems in Afghanistan and needed a technology push. The tactical issue became a strategic problem. This is wonderful technology. A wonderful team put it together and provided it to the Warfighter."

He said it was frustrating not to put a weapon on a target because of collateral damage fears. "We now have the right weapon system. I am excited to be part of this event today, excited about what the BLU-129/B team did."

Dr. Simpson said team members conferred with Dr. Perry who said the concept 'looked good" and encouraged them "to go for it." He added: "I am most proud of the individuals in this room who made it happen, on time and on budget. We as government labs were able to partner and cue up industry as well to see if we could transition advanced technology to the Warfighter."

Named after the former U.S. defense chief and precision strike weapons advocate, others to have received the prestigious Perry Award include: Dr. Perry, the first recipient (1997); former Vice President Dan Quayle (1998); RADM Walter M. Locke, USN (Ret.) (1999); The Johns Hopkins University, Applied Physics Laboratory (2000); NAVSTAR Global Positioning System Joint Program Office (2001); Rep. James V. Hansen (R-UT) (2002); Terry Little, a well-respected acquisition reform pioneer (2003); USAF/USN/Boeing JDAM Program Team (2004); U.S. Warriors of Operation Enduring Freedom and Operation Iraqi Freedom (2005); The Tactical Tomahawk Team (2006); The Small Diameter Bomb Team (2007); Guided Multiple Launch Rocket & High Mobility Artillery Rocket System Team (2008); and, U.S. Special Operations Command Stand-Off Precision Guided Munitions (SOPGM) Quick Reaction Team (2009); the Sniper Advanced Targeting Pod (2010); the Project Dragon Spear Joint Acquisition Task Force (2011); Massive Ordnance Penetrator (MOP) Team (2012): and, the JAMS/Lockheed Martin Helfire II Team (2013) ■

The 2014 Dr. William J. Perry Award, which recognizes superb contributions to precision strike systems, was awarded to the BLU-129/B Team that includes the joint Air Force Research Laboratory, Air Armament Center and 46th Test Wing, Lawrence Livermore National Laboratory, and the Aerojet Rocketdyne Corporation. The Precision Strike Association has bestowed the Perry Award every year since 1997. The award was presented at a luncheon on the first day of PSA's 2014 Precision Strike Annual Review held March 18-19, 2014, in Springfield, VA.

(l-r): Ken Britt, PSA Vice Chairman; Dr. Randall Simpson, Lawrence Livermore National Laboratory; John Myers, VP Tactical Systems, Aerojet Rocketdyne; Dr. John Wilcox, Director for Munitions Directorate, AF Research Laboratory; Major General John MacDonald, USA (Ret.); and, Suzy Kennedy, PSA Chairwoman

John Myers, VP Tactical Systems, Aerojet Rocketdyne, accepts the Perry Award on behalf of Aerojet Rocketdyne

(l-r): Jose Gonzalez, OSD/ATL, Office of Land Warfare; Dr. Randall Simpson, Lawrence Livermore National Laboratory; John Myers, VP Tactical Systems, Aerojet Rocketdyne; Dr. John Wilcox, Director for Munitions Directorate, AF Research Laboratory; Major Joann Kenneally, USAF, CENTCOM; and, Major General John MacDonald, USA (Ret.)

(l-r): Kip Hamilton, Dr. Randall Simpson and Mitch Moffett receive the Perry Award on behalf of the Lawrence Livermore National Laboratory.

(l-r): Mitch Moffet, Lawrence Livermore National Laboratory; Dr. Randall Simpson, Lawrence Livermore National Laboratory; Dr. John Wilcox, Director for Munitions Directorate, AF Research Laboratory; Major General John MacDonald, USA (Ret.); John Myers, VP Tactical Systems, Aerojet Rocketdyne; and, Kip Hamilton, Lawrence Livermore National Laboratory

Major General John MacDonald, USA (Ret.), accepts 18th W.J. Perry Award on behalf of the Air Force Research Lab, Air Armament Center & 46th Test Wing.

USN to Deploy EM Railgun

The U.S. Navy plans to install and test a prototype electromagnetic railgun made by General Atomics aboard a Joint High Speed Vessel (JHSV) in Fiscal Year 2016, marking the first time an EM railgun will be demonstrated at sea.

EM railgun technology uses an electromagnetic force - known as the Lorenz Force - to rapidly accelerate and launch a projectile between two conductive rails. This guided projectile is launched at such high velocities that it can achieve greater ranges than conventional guns. It maintains enough kinetic energy that it doesn't require any kind of high explosive payload when it reaches its target.

High-energy EM railguns are expected to be lethal and effective against multiple threats, including enemy warships, small boats, aircraft, missiles and land-based targets.

"The electromagnetic railgun represents an incredible new offensive capability for the U.S. Navy," said USN Rear Adm. Bryant Fuller, the Navy's chief engineer. "This capability will allow us to effectively counter a wide-range of threats at a relatively low cost, while keeping our ships and sailors safer by removing the need to carry as many high-explosive weapons."

EM Railgun Prototype

EM railgun technology will complement current kinetic weapons currently onboard surface combatants and offer a few specific advantages. Against specific threats, the cost per engagement is orders of magnitude less expensive than comparable missile engagements. The projectile itself is being designed to be common with some current powder guns, enabling the conservation of expensive missiles for use against more complex threats.

"Energetic weapons, such as EM railguns, are the future of naval combat," said USN Rear Adm. Matt Klunder, the Chief of Naval Research. "The U.S. Navy is at the forefront of this game-changing technology."

This demonstration is the latest in a series of technical maturation efforts designed to provide an operational railgun to the fleet.

Since 2005, the Navy and its partners in industry and academia have been testing railgun technology at the Naval Surface Warfare Center in Dahlgren, VA, and the Naval Research Lab where the service has a number of prototype systems.

The final operational system will be capable of launching guided, multi-mission projectiles to a range of 110 nautical miles against a wide range of threats. The series of tests are designed to capture lessons for incorporation into a future tactical design and will allow the Navy to best understand needed ship modifications before fully integrating the technology.

The Navy is using the JHSV because of its available cargo and topside space and schedule flexibility. Because JHSVs are non-combatants, there is no plan to permanently install a railgun on any ship of the class.

A final decision has not been made on which ship classes would receive a fully operational railgun. ■

IOC for Griffin Missile

The US Navy has achieved initial operational capability (IOC) on the MK-60 Patrol Coastal Griffin Missile System that includes the Raytheon Griffin missile. The MK-60 system includes a proven laser targeting system, a Navy-designed launcher and battle management system combined with the Griffin missile.

IOC follows extensive maritime testing that began in March 2012. "Griffin is a mature, lightweight precision weapon that delivers reliable operational effectiveness to the warfighter," said Raytheon's Mike Jarrett.

The combat-proven Griffin AGM-176A is an aft-eject missile designed for employment from platforms such as the C-130 aircraft. The Griffin BGM-176B is a forward-firing missile that launches from rotary- and fixed-wing aircraft, ground-launch applications and maritime platforms. The Griffin missile is 43 inches long, weighs 33 pounds, has a 13-pound warhead, and is in production today.

Meanwhile, Raytheon recently demonstrated its latest variant of the Griffin missile, the Griffin Block III, with a series of test shots culminating in several direct hits against a variety of static and moving targets.

The Griffin already uses an advanced GPS and semi-active laser guidance. The Griffin Block III introduces an improved semi-active laser seeker and a new Multi-Effects Warhead System. ■

USN Develops Spike Mini Munition

New technology and innovative weapons don't always come out of the private sector. Sometimes they are developed from within a military service. Case in point: Spike, a forward firing miniature munition designed, developed, and tested at the Naval Air Warfare Center Weapons Division (NAWCWD) at China Lake, CA.

A five-pound, 24-inch long and 2-inch diameter multi-purpose system, it can be launched from the ground or the air, and is being developed to be shoulder-fired. Spike is a miniature guided missile that uses an electro-optical seeker to acquire, lock on, and fly to a target. It is armed with a high explosive fragmentation warhead.

Spike on target.

Several Spike missiles can be loaded on a single mount to engage multiple targets. The ultimate goal is to field Spike either as a program of record or through a rapid development and delivery effort.

Spike was conceived, designed, developed and tested at NAWCWD. To date, about 26 advanced development all-up test missiles have been built and tested by the NAWCWD team. More than 10 successful full-scale guided missile tests have been completed, including a counter-unmanned aerial vehicle (UAV) demonstration.

Spike ready to fire.

The idea for the mini-munition demonstration was hatched at a counter-UAS exercise in which the Army Research and Development Engineering Command (ARDEC) from Picatinny Arsenal was one of several participants. The Picatinny team was demonstrating the Palletized Protection System (PPS) that uses a radar to detect airborne and ground-based targets and cue a mounted camera. Discussions led to the idea of putting Spike in the loop to engage detected targets.

Spike could handle counter-UAV missions.

Integration of Spike with PPS was successfully demonstrated at NAWCWD China Lake against an airborne target.

Greg Wheelock, a NAWCWD technical lead, said this demonstration proved that ARDEC could have a potential new kill mechanism to accomplish their counter-UAV mission. "The fact that Spike was developed by the Navy and is government-owned makes it even more attractive because we have the ability to quickly modify the system to meet their specific requirements," he said. NAWCWD continues to work with the Army to refine requirements.

The NAWCWD team has also demonstrated that Spike could be a good gap-filler in a layered defense against small boat swarms. Wheelock said "Spike is not going to blow those boats out of the water, but it can take the boat out of commission. What we lack in warhead size is compensated for in accuracy, and we have the ability to put that charge where it will have the most effect."

Wheelock and his team continue to seek new ways of improving the missile. One redesign element involves going from a fixed wing and canard rail-launched system to a folding control surface, tube-launched capability. Wheelock said he sees value in moving to a common tube system that would accommodate all launch options so the missile doesn't have to change configurations.. ■

News Briefs

Vehicle-Mounted Laser

The US Army has for the first time used a vehicle-mounted high-energy laser to successfully engage more than 90 mortar rounds and several unmanned aerial vehicles.

The Army High Energy Laser Mobile Demonstrator, or HEL MD, underwent multiple test events late last year, at White Sands Missile Range, NM.

Vehicle-mounted Army Laser

This was the first full-up demonstration of the HEL MD in the configuration that included the laser and beam director mounted in the vehicle. A surrogate radar, the Enhanced Multi Mode Radar, supported the engagement by queuing the laser.

The HEL MD is being developed to show directed-energy force-protection capabilities against rockets, artillery and mortars. It is also intended to protect against unmanned aerial vehicles and cruise missiles.

The demonstration and testing confirmed the capability of a mobile solid-state laser weapon system to counter mortars and UAVs, officials said. The recent testing utilized a 10-kilowatt class laser. In the future, a 50-kW class laser will be integrated into the HEL MD platform. Boeing is the prime contractor for the HEL MD program. ■

Buff's Smart Weapons

Boeing will continue to increase the B-52 bomber's effectiveness and versatility under a new USAF contract that calls for the aircraft's smart weapons capacity to expand by 50 percent.

Under the $24.6 million agreement, Boeing will develop a modification to existing weapon launchers so the aircraft can carry smart weapons in the bomb bay, allowing aircrews to use the B-52's entire weapons capacity.

Boeing will produce three prototype launchers for test and evaluation. Initial capability is expected in March 2016, and potential follow-on efforts could add additional weapons and allow a mixed load of different types of weapons.

Following the upgrade's first phase, the B-52s will be able to carry 24 500-pound Joint Direct Attack Munitions (JDAM) or 20 2,000-pound JDAMs. ■

MBDA Develops NextGen Anti-Ship Missile

MBDA has started demonstration and manufacture of the FASGW(H)/ANL (Future Anti Surface Guided Weapon (Heavy)/ Anti Navire Léger) missile.

The jointly funded Anglo-French contract valued at more than £500 million (€600 million) was awarded to MBDA by the UK DE&S (Defence Equipment & Support) on behalf of the French and UK MoDs. The work will complete joint assessment and missile design work funded by the two nations in cooperation since 2009.

It will benefit the capability and export potential of European helicopter platforms which will integrate the FASGW(H)/ANL system over the coming years.

FASGW(H)/ANL will equip the

FASGW

Royal Navy's AW159 Lynx Wildcat helicopters and the French Navy's maritime helicopters. Weighing around 100kg, this modern primarily anti-ship missile will destroy from safe standoff ranges vessels ranging from FIAC (Fast Inshore Attack Craft), through medium sized FAC (Fast Attack Craft) up to large vessels such as Corvettes. This missile also has a surface attack capability against coastal and land targets.

This joint programme will deliver an enhanced capability to replace existing and legacy systems such as

CALENDAR OF EVENTS

Precision Strike Technology Symposium (PSTS-14)

Date: October 21-23, 2014

Theme: Strength Through Investment — Decisive Strike Capabilities

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

This symposium will be conducted at the SECRET//NOFORN level on all three days.

Sponsorship and exhibit opportunities are available for PSTS-14 —for more information email info@precisionstrike.org or visit our website: www.precisionstrike.org

the UK-developed Sea Skua and the French-developed AS15TT anti-ship missiles. ■

DAGR Missile Scores

Lockheed Martin recently demonstrated the ability of its DAGR missile to launch from an Apache AH-64D helicopter and repeatedly hit the target during a series of Air Worthiness Release (AWR) live fire flight tests at Eglin AFB, FL.

In each of 16 flight tests, a DAGR missile locked onto the laser spot illuminating the target before launch. Upon launch, each missile flew between 1.5 and 5.1 kilometers and hit the target within one meter of the laser spot. The flight tests confirm DAGR's ability to safely launch and separate from a moving, diving platform without degrading aircraft or weapon performance.

DAGR incorporates HELLFIRE II technology into a 2.75-inch/70 millimeter guidance kit that integrates with legacy Hydra-70 rockets. Its lock-on-before-launch mode ensures the missile identifies the correct target prior to launch. Multiple DAGRs can be fired in rapid succession at different targets using different laser codes from multiple designators.

The result is a laser-guided missile that puts a 10-pound warhead within one meter of the laser spot, defeating high-value, non-armored or lightly armored targets while minimizing collateral damage.

Lockheed Martin has conducted more than 40 DAGR guided flights from ranges of 1 to 6 kilometers. DAGR has also been launched from the AH-6 Little Bird, the OH-58 Kiowa Warrior and ground-based HELLFIRE/DAGR pedestal launchers.

Jordan Purchases APKWS

The USN recently signed an agreement with the Jordan for the first international sale of the Advanced Precision Kill Weapon System (APKWS). It includes procurement of the weapons as well as logistics and engineering support for integration on the Jordanian CN-235 gunship. BAE Systems plan to deliver APKWS to the Jordanian Kingdom in 2016.

APKWS modifies unguided 2.75-inch rockets with a semi-active laser guidance section to transform the rockets currently used in the Jordanian fleet into low-cost, precision-guided munitions.

Currently employed from USN MH-60 Seahawk and USMC UH/AH-1 Light Attack helicopters, APKWS has been successfully demonstrated from a variety of fixed wing platforms capable of firing the weapon in comparable flight regimes.

IOC for Sniper ATP-SE

The USAF has deployed initial Lockheed Martin Sniper Advanced Targeting Pod - Sensor Enhancement (ATP-SE) pods to support combat operations.

An enhanced Sniper ATP, Sniper ATP-SE provides fighter and bomber aircraft with advanced modes for non-traditional intelligence, surveillance and reconnaissance; improved combat identification; expanded air-to-air and maritime capability; and two-way data link communication.

Lockheed Martin won the USAF's ATP-SE competition in 2010. The firm has manufactured more than 100 Sniper ATP-SE pods. The USAF and Air National Guard will deploy Sniper ATP-SE on the A-10C, B-1, F-15E and F-16 Blocks 30, 40 and 50. ■

PSTS-14, Continued from page 1

Environment, Russian Military Power in Europe—Doctrine & Capabilities, Asia-Pacific Rebalance, Bomber Force Structure, Conventional Prompt Global Strike, B61-12, and Nuclear Deterrence. Additionally, presenters will address numerous other riveting critical challenges and issues related to the new security environment regarding what is needed for our brave warriors.

Nearly 40 distinguished leaders have been invited to address the precision strike community at PSTS-14. They hail from USAFRICOM, USEUCOM, USSOCOM, USSTRATCOM, OSD, the Joint Staff, the Services, NAVAIR, Air Combat Command, AFRL, DARPA, DIA, DTRA, NGA, NNSA, NSA, DOE Laboratories, the American Foreign Policy Council, JHU/APL and Industry. More than 30 of these speakers are already confirmed.

The Third Edition of the *Precision Strike Digest* will highlight our keynote speakers. Please review page 15 of this issue for a snapshot of all the topics that will be addressed during PSTS-14. Additionally, a special award ceremony will be conducted to present the 6th Richard H. Johnson Technical Achievement Award to a worthy precision strike recipient.

Please bring your cleared associates to share in this very important and timely symposium. We look forward to having you join us. ■

Please Join Us for One of the Best Technology Symposiums of Its Kind!

PRECISION STRIKE TECHNOLOGY SYMPOSIUM (PSTS-14)

21-23 OCTOBER 2014

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

SECRET//NOFORN Classification Level

Strength Through Investment—Decisive Strike Capabilities

PSTS-14 Showcases Eight Hot Topics

Intelligence Session
Cyber Threat & Challenges
Hot Spots in Africa—USAFRICOM's Overview
Developing Technologies—Sandia, Lawrence Livermore & Los Alamos
NATO's Role in the New Security Environment
Russian Military Power in Europe—Intentions, Doctrine & Capability
B61-12, Conventional Prompt Global Strike & Changing Strategic Interests
Bomber Force Structure

Other Riveting Critical Topics

- Precision Strike Challenges and Opportunities
- Strengthening Decisive Strike Capabilities
- Resurrecting Peace Through Strength
- Sustaining U.S. Global Leadership
- Strategic ISR—Defense Strategy Adjustments
- Long Range Anti-Ship Missile (LRASM)
- Special Operations Forces Perspectives on Precision Strike
- Technology Surprise—Need for Rebalance of R&E Investments
- High Energy Laser Technologies and Applications
- Potential of Multiphase Blast Weapons to Enhance Near Lethality in Precision Strike
- Area Effects Munitions Roadmaps, Precision Miniature Munitions, and IAMD Study
- The Converging Technologies of Electronic Warfare
- Next Generation Jammers Technologies
- Electromagnetic Spectrum Dominance
- Web-Based Point Mensuration
- Air-Sea Battle Implementation Update
- Arming Current & Next Generation Aircraft—Counter A2/AD
- Army Long-Range Precision Fires
- Modular Autonomous Counter-WMD System Development & Roadmap
- Global Reachback for Targeting Support

Special Award Ceremony:

6th Richard H. Johnson Technical Achievement Award

PRECISION STRIKE ASSOCIATION CORPORATE MEMBERS

Aerojet
American Defense International, Inc.
ATK
BAE Systems E & IS
Cyber Clarity, Inc.
Ellwood National Forge Company
Exelis
Global Recruiters of Huntsville
Honeywell International
Kaman Precision Products
L-3 Communications, Fuzing & Ordnance Systems
Leidos
Lockheed Martin Washington Operations
Lone Star Aerospace
Marotta Controls Inc.
MBDA, Inc.
Motion Engine, Inc.
Northrop Grumman Corporation
Orbital Sciences Corporation
Pratt & Whitney
Raytheon Company
RIX Industries
SynEnergy, Inc.
Systron Donner Inertial
The Boeing Company
The Johns Hopkins University Applied Physics Lab
Theissen Training Systems, Inc.
Williams International

If your company name is missing, please email: **PSAchair@precisionstrike.org**

The Precision Strike Digest is an important vehicle for the Precision Strike Association to share information and to engage in discussion. You have an opportunity to share your passion about a particular Precision Strike topic. *The Precision Digest* is published three times a year. Please contact PSA Chair for Communication Earle "Rudy" Rudolph (earle.rudolph@mbda-us.com), if you would like to have an article included in *The Precision Strike Digest*.

Membership Application – Precision Strike Association

The undersigned, desiring to support and cooperate in the activities of the Precision Strike Association, applies for Membership:

Organization		Website	
Contact Name		Title	
Street Address			
City	State	Zip Code	Country
Telephone		Fax	E-mail

Corporate Membership

Annual membership dues are based on your organization's defense-related revenue. This includes both prime and subcontracts for products and services. Please select your dues category below.

☐ Less than $1 million $100 ☐ $1 million-$9.9 million $300 ☐ $10 million and over $750

Individual Membership **(mailing outside of the US)*

☐ 1 Year $40 ☐ 2 Years $75 ☐ 1 year Allied $50* ☐ 2 years Allied $85* ☐ 3 Year Government – Free

$15 per annum of dues is for a one-year subscription to National Defense magazine for the paid memberships. The government membership includes a free subscription to National Defense magazine.

Payment: ☐ Check *(Payable to Precision Strike Association)*

☐ Visa ☐ M/C ☐ Amex ☐ Diners Club

Card #	Exp. Date
Signature	Date

Please Mail to:
Precision Strike Association
2111 Wilson Blvd - Suite 400
Arlington, VA 22201-3061
Phone: 703-247-2565 / Fax: 703-527-6945
e-mail: PSAChair@precisionstrike.org ;
zmartinez@ndia.org

Tax deductibility, membership activation Members are entitled to deduct all of their dues, either as a business expense or as a charitable contribution if the dues are not business related. Members are encouraged to rely on the advice of their tax advisers. PSA is an integral part of NDIA, which is a 501(c)3 association, federal ID 53-0196547. No amount of dues goes toward lobbying. Membership status is conferred only upon receipt of payment.

PRECISION STRIKE ASSOCIATION
Affiliate, National Defense Industrial Association

Precision Strike Association
2111 Wilson Blvd - Suite 400
Arlington, VA 22201-3061

PRSRT STD
U.S. Postage
PAID
Permit #20
Leonardtown, MD
20650