The Precision Strike Digest

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"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.

PRECISION ENGAGEMENT – Staying Relevant In A Dangerous World

Key to maintaining our Nation's military power projection capabilities will be exploiting, extending and gaining advantages in technologies for precision-guided weapons. **The 2014 Precision Strike Annual Review** (PSAR-14) will provide the precision strike community with a compendium of the most pressing near-term topics central to our theme.

A "must attend" review for all government and industry engaged in precision strike, PSAR-14 will focus on top issues related to evolving threats, advanced technologies, technology surprise, robust investments in science and technology, and adapting acquisition processes for weapons reform.

As in the past, PSAR-14 will showcase the Military Departments and International Precision Weapons Sessions. Numerous stand-alone presentations will be featured that will address precision engagement and the need to remain relevant.

A new hot topic will be the National Laboratories Panel. Sandia, Lawrence Livermore, Los Alamos, and MIT Lincoln Laboratory have confirmed panelists. Dr. John Fischer from OSD Research and Engineering will moderate the panel.

Admiral Cecil Haney, USN
Commander
USSTRATCOM

Lieutenant General
David Halverson, USA
Deputy CG
U.S. Army TRADOC

James "Hondo" Geurts
Acquisition Executive
USSOCOM

Dr. Paul Kaminski,
Chairman
Defense Science Board

PSA is honored to present Lieutenant General David Halverson, USA, to keynote the opening day of PSAR-14 and James "Hondo" Geurts to keynote the second day's program. General Halverson, Deputy Commanding General/Chief of Staff, U.S. Army Training & Doctrine Command, will

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Vice-Chairman's Comments

As we move through 2014, The Precision Strike Association (PSA) reflects upon the great success we experienced during our annual classified technology symposium. The 2013 Precision Strike Technology Symposium encouraged key dialogue between Department of Defense and industry leaders as they provided an update of emerging technology enablers critical to precision strike.

As our military faces an environment of austerity, our Nation's defense industrial base will be forced to adapt. All anticipate there will be a shift in the way the Pentagon procures goods and services, but it is unclear how this transformation will emerge.

There are numerous challenges ahead for the precision strike community, the defense industry and our Nation as a whole. The PSA exists to facilitate the government-to-industry, government-to-government and industry-to-industry dialogue.

Only though effective communication will we fully understand the needs and capabilities of our collective community. Only through open dialogue will we effectively address the challenges before us. That is the beauty of our association. We provide the environment for this critical communication.

PSA remains committed to delivering outstanding forums with high-impact government and industry leaders presenting topics of great significance to the precision strike community. I encourage each of you to join us at our upcoming 2014 Precision Strike Annual Review where you will have the opportunity to interact with an unrivaled lineup of speakers during both their formal presentations and more personally during our professional networking breaks.

I believe PSA has had a positive impact in providing solutions to our warfighters in the past and I look forward to our continued service in their support. 2014 promises to be another exciting year.

LTC Ken Britt, USA (Ret)
Vice-Chairman of the Board
Precision Strike Association

PSA to Conduct Executive Luncheons

The Precision Strike Association will launch on March 14, 2014 a series of PSA Executive Luncheons with Senior DoD and Military leaders. Attendance is strictly limited to senior company executives from within PSA's Corporate Membership so as to encourage a candid dialogue between the speaker and attendees.

PSA is honored to have Vice Admiral David A. Dunaway, Commander, Naval Air Systems Command, to lead off the Executive Luncheon Series. He assumed command of NAVAIR in Patuxent River, MD in September 2012. From September 2007 to January 2009, Dunaway served as the Commander of the Naval Air Warfare Center (Weapons Division) at China Lake and Point Mugu, CA., and as the NAVAIR Assistant Commander for Test and Evaluation. His next flag assignment was as Commander, Operational Test and Evaluation Force in Norfolk, VA., from January 2009 to August 2012.

The events will be held periodically throughout the year with the speaker, date and location for each additional luncheon to be determined later.

To learn more about the PSA Executive Luncheon Series, please contact Earle Rudolph (Earle.Rudolph@mbda-us.com) or Angie De Kleine (adekleine@NDIA.ORG).

PSTS-13 Wrap-Up

What an outstanding and beneficial venue stated many who participated in the 2013 Precision Strike Technology Symposium (PSTS-13) at the JHU/APL Kossiakoff Center on Oct. 22-24, 2013!

Our three-day SECRET/NOFORN PSTS-13 provided an excellent opportunity to engage in defense strategy and priorities, as well as key security challenges related to threats to our Nation in the areas of cyberspace, cruise missiles, and WMD proliferation. Further, PSTS-13 allowed the precision strike community to keep pace with requirements and capabilities of advancing adversaries as we focus on DoD's strategic shift.

PSTS-13 was orchestrated by the Precision Strike Association's Programs Committee co-chaired by **Ginny Sniegon** and **Lieutenant Colonel Darien Hammett, USAF**, and conducted by Tri-Chairs **Dr. John Walter**, **Captain (Ret.) Larry Burt, USN**, and **Michael Bawden** with assistance from several **PSA Board Members** and the **PSA Advisory Council**. Chairperson of the Board **Suzy Kennedy** welcomed the participants and the JHU/APL Assistant Director Tim Galpin presented the JHU/APL Welcome.

Suzy Kennedy

PSTS-13 was structured to focus on the rebalance to the Asia-Pacific region. This critical symposium's theme ***Precision Strike in the New Strategic Environment at Home and Abroad*** provided in-depth sessions and panels on Intelligence, Cyber, Targeting, Air-Sea Battle, and Nuclear Deterrence. Additionally, more than 25 other riveting critical topics were briefed. Unclassified highlights of the keynote speakers and of the several in-depth sessions and panels are provided here for your awareness:

Vice Admiral Scott Swift, USN

Vice Admiral Scott Swift, USN—Director Navy Staff, CNO—kicked off Opening Day of PSTS-13 by focusing on National Strategy Challenges and Fiscal Realities. Admiral Swift also addressed kill chain challenges in the anti-access/area-denial (A2/AD) environment and touched on concerns during his role as the Commander of the Seventh Fleet until July 2013. He noted that the Asia-Pacific region is of strategic importance with dynamic security challenges. He said as a deterrent and hedge against these challenges, effective strike technologies need to be part of our "tool box".

Alan Shaffer—Acting Assistant Secretary of Defense, R&E, OSD—next discussed S&T Challenges for the Asia-Pacific Region. He talked about the strategy, pace of technology, A2/AD priorities, electronic warfare sophistication, hypersonic research successes, and complexities of our national security environment. Mr. Shaffer articulated that a key element of the Defense Strategic Guidance is to "protect and prioritize key investments in technology and new capabilities, as well as our capacity to grow, adapt and mobilize as needed." Further, he stressed that "the Department can cost-effectively drive innovation in aviation, space, maritime and ground combat systems through prototyping." Mr. Shaffer said "Asia-Pacific rebalance is the foundation of our R&E strategy."

Alan Shaffer

Rear Admiral Mat Winter, USN—PEO for Unmanned Aviation & Strike Weapons, NAVAIR—followed Mr. Shaffer and talked about ways for Meeting Precision Strike Challenges and Opportunities. He focused on the warfighters' demands and stressed the need of finding smarter ways to provide capability as he reflected on the future environment for the integrated battlespace.

Rear Admiral Mat Winter, USN

Rick Smith—Intelligence Session Chair from DIA—set the scene for the Intelligence Session and talked about concerns that keep him up at night. He noted that nations are constructing hardened facilities that protect national leadership, command and control, ballistic missiles, military forces, and WMD at an alarming rate. Further, Mr. Smith noted that due to advances in technologies worldwide, nations were developing next-generation mili-

Rick Smith

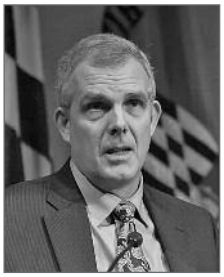
tary capabilities faster, cheaper and more capable than ever before. The U.S. requires cutting-edge technologies from industry to find, characterize, defeat, and perform BDA for a variety of next-generation weapon systems, platforms, and hardened facilities that threaten our national security. Then, Mr. Smith presented his session speakers who addressed classified issues related to China's Long Range Force Projections, the Chinese UGF Program, and Worldwide Threat Trends Affecting Major Acquisition Programs. Mr. Smith's session was extremely informative. He plans to return for PSTS-14, so please mark your calendars for PSTS-14 scheduled for Oct. 21-23, 2014.

Ambassador John Bolton—Former U.S. Ambassador to the U.N.—was the luncheon speaker on Oct. 22. Mr. Bolton focused on Sustaining U.S. Global Leadership and highlighted overarching national security global challenges. He talked about East Asia—particularly China and the complicated existence of North Korea and then expressed his thoughts on a period of extreme vulnerability when the North Korean regime dies. Further, Mr. Bolton highlighted the existing status of situations in Iran, Egypt, Syria, and Israel. Due to the severe threat that is growing every day, Mr. Bolton noted that we must have a strong national security with additional needed resources – not less, and above all, we must be prepared for a range of threats from areas other than the Middle East.

Ambassador John Bolton

The next four presentations by DARPA's **Steve Waller** on Next Generation Air Dominance, **Darcy McGinn**'s AARGM, **Lieutenant Colonels Steve Lindquist**'s J-38 Targeting and **Jamil Syed**'s Geospatially Enabled Targeting, and **Ray Walter**'s Distributed Targeting System cannot be highlighted in this event wrap-up due to classification of the material. For your awareness, targeting issues will be a high focus area at PSTS-14, so please plan to participate in PSTS-14, which will be conducted at the SECRET/ NOFORN classification level.

Dyke Weatherington—Director for Unmanned Warfare, S&TS, OUSD (AT&L)—closed the first day's presentations. Mr. Weatherington addressed ISR support in a changing DoD environment. He talked about how ISR Complements Precision Weapons and the Unmanned Systems Integrated Roadmap. He noted that the good news is that UAS can conduct ISR missions to improve our knowledge in current imagery, moving target, data exploitation, and location updates. Further, he highlighted unmanned systems key challenges and noted that unmanned aircraft systems are vital components for Combatant Commanders. Additionally, Mr. Weatherington addressed the many policy considerations related to autonomy, encryption, data exploitation, innovation, and manned-unmanned teaming.



Steve Waller

Darcy McGinn

Lieutenant Colonel Steve Lindquist, USAF

Lieutenant Colonel Jamil Syed, USAF

Ray Walter

The second day's keynote address by **Lieutenant General Bradley Heithold, USAF**, on New Precision Strike Capabilities for Global SOF Needs, as well as briefings by **Brigadier General Chris Weggeman, USAF**, on Digital Interoperability, **Dr. John Wilcox** on Arming Current & Next Generation Aircraft, **Brigadier General Jon Thomas, USAF**, on Future Joint Force Development, and **Jay Kistler's** EW Challenges for the Asia-Pacific Region were both classified and sensitive and cannot be discussed here. However, four of the second day's presentations contained unclassified focus areas that are highlighted below:

Bill Dries—Air Force Air-Sea Battle Team Lead—moderated the Air-Sea Battle Panel. The Air-Sea Battle concept was presented by the four Service O-6 Air-Sea Battle leads—**Colonel Bob Valin, USAF, Captain Phil DuPree, USN, Colonel Chip McLean, USMC**, and **Colonel Jack Goetz, USA**. **BG Jon Thomas, USAF**, also participated.. The presentation featured a description of the concept, from its development timeline, to its central and supporting ideas. Examples of anti-access / area denial threat systems were explored, with details described of how the Air-Sea Battle concept addresses these capabilities. A question and answer session

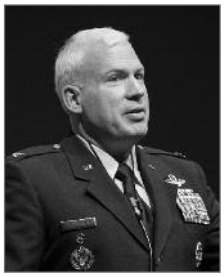
Dyke Weatherington

Jay Kistler

Lieutenant General Bradley Heithold, USAF

Colonel West Anderson, USAF (Ret)

Brigadier General Chris Weggeman, USAF



Colonel Norm Worthen, USAF

Dr. John Wilcox

Dr. Linton Wells

Brigadier General Jon Thomas, USAF

Peter Huessy

Air-Sea Battle Panel (l-r): Brig Gen Jon "Ty" Thomas, USAF,Captain Phil DuPree, USN, Colonel Bob Valin, USAF, Colonel Jack Goetz, USA, Colonel Chip McLean, USMC, and Bill Dries, Moderator

allowed participants to delve more deeply into the classified aspects of the concept.

Dr. Linton Wells—Director, Center for Technology & National Security Policy, NDU—discussed the Strategic Shift and Rebalancing to Asia & Defense Strategy Adjustments. Dr. Wells noted that in addition to the United States' strategic rebalancing to focus more on the Indo-Asia-Pacific, the pace of technological change is forcing reconsideration of many aspects of precision strike and ISR. For example, he explained that if computing power per unit cost is doubling about every 18 months, by mid-2015 there will be a 100% increase, by 2020 1,500% and by 2030 more than 100,000%. Linear projects cannot work in this environment. These technology issues have strategic implications that are matters for policy-makers, ambassadors and commanders—not just technical experts. Dr. Wells informed the audience that the U.S. needs to bring together all aspects of national power to focus on "globally integrated operations" supported by "cross-domain synergy" to use cyber and space effectively with land, sea and air activities.

Colonel West Anderson, USAF (Ret)—Director, Barksdale Field Office at Boeing—talked about Precision Strike Bombers in the Pivot to the Pacific. West Anderson focused on the U.S. challenges in any significant conflict or operation within the Pacific theater and the criticality U.S. Long Range Strike bombers will play in any conflict scenario. Specifically, he articulated the tremendous challenge the U.S. has with regard to operating distances within the Pacific theater and how the growing Chinese air defense capability and anti-access capability, as well as anti-ship ballistic capability, will limit close-in operations from the relatively few operating bases and distances within the theater. Anderson's briefing clearly illustrated the full span of current U.S. bomber precision and operational capability the bombers present and that any U.S. operation will likely rely heavily on U.S. long-range combers in the first phase of any Pacific scenario. Finally, the briefing discussed the importance of modernizing the current U.S. bomber fleet of B-1, B-2, and B-52 bombers and what current Boeing modernization programs are underway as well as the increase in combat capability that results from these modernization programs.

Colonel Norm Worthen, USAF—Chief, Nuclear Planning, Policy & Strategy Division, Assistant Chief of Staff for Strategic Deterrence & Nuclear Integration, HQ USAF—delighted the audience with his thoughts about the Nation's Strategic Posture for Global

Deterrence. He noted that because actors in the security environment continue to find nuclear weapons relevant, we need to develop a more nuanced understanding of the dynamics of deterrence while fielding capabilities that will continue to deter adversaries and assure our allies and partners in our increasingly complex, multi-nodal world. Colonel Worthen highlighted several deterrence principles developed by his organization. Key among them is that stability is the objective of deterrence. He explained that the flexibility and visibility afforded by conventional- and nuclear-capable bomber aircraft and their weapons are uniquely stabilizing in a regional context, and the importance of Air Force contributions to extended deterrence and assurance will only grow as we pivot toward Asia-Pacific. Colonel Worthen concluded by proposing that deterrence is not a legacy mission that can be conducted with legacy forces that we allow to age into obsolescence, and that the Air Force is committed to modernize and recapitalize long-range strike platforms and weapons to meet today's and tomorrow's deterrence challenges.

Most topics presented by numerous speakers on the third day of PSTS-13 were related to nuclear deterrence and therefore were classified. These topics focused on Integrated Intelligence for Precision Strike presented by DIA, Testing Against Hard & Deeply Buried Targets briefed by OSD, Future Technologies for Hard & Deeply Buried Targets & WMD defeat briefed by DTRA, Technology Transfer for Conventional Prompt Global Strike presented by Sandia, Tomahawk Interoperability discussed by PMA-280, and Conventional Prompt Global Strike presented by OSD. Only the luncheon address remarks and segments of the Nuclear Panel can be addressed in this wrap-up and are reflected below:

Peter Huessy—President, Geostrategic Analysis—presented very sobering remarks during the luncheon about Stopping the Nuclear Cascade: Terror Sponsoring States and Nuclear Proliferation. Huessy talked about future prospects of a cascade of nuclear weapons proliferation as "Iran and North Korea permanently elude the stricture of nuclear arms control and become full-fledged nuclear powers." He expanded his focus to address the new nuclear threat, the poisonous coalition, goals of terrorist coalition, China as terror accomplice, Russia's role as the biggest arms supplier to both Iran and Syria. And, of course, North Korea's goals are deadly. He stated that the highest-ranking North Korea defector disclosed in a private interview that "Pyongyang's nuclear weapons will be the shield behind which they will use force to reunify the Korean peninsula." In closing, Huessy noted that Iran and Syria seek to create their own "empires"—whether it is masters of a region, the Middle East or the Islamic World. He stated "as a country, we have to decide whether we believe such objectives can be contained or deterred, or whether ending this empire of terror should be our objective. And most critically, we have to face squarely the question—how much time do we have to accomplish these tasks?"

The last agenda item addressed during PSTS-13 was the Nuclear Panel that was moderated by **Steve Callicutt**—Director, Capability and Resource Integration, USSTRATCOM. Mr. Callicutt opened the Panel by noting that "while our current nuclear force remains *safe, secure, and effective*, it is in need of significant modernization that spans every weapon, delivery platform and the supporting infrastructure. This is occurring in a financial environment where even basic sustainment of our aging systems and nuclear complex is becoming increasingly difficult." In response to this challenge, Mr. Callicutt talked about the key findings and the strategy that serves as a baseline for future investment decisions.

Then, Mr. Callicutt presented the panelists who discussed the challenges we face. Panelists included **Dr. Michael Kuliasha**—Director of Nuclear Technologies for DTRA; **Steve Goodrum**—Assistant Deputy Administrator for Stockpile

Nuclear Panel (l-r): Steve Callicutt, Moderator; Col (s) Kelvin Townsend, USAF; Captain Johnny Wolfe, USN; Steve Goodrum; Dr. Michael Kuliasha and Greg Hulcher

Management at the NNSA; **Greg Hulcher**—Director for Strategic Warfare in OSD; **Captain Johnny Wolfe, USN**—Navy's Technical Director at Strategic Systems Programs, and, **Col (s) Kelvin Townsend, USAF**, A10/A10C.

Unique perspectives covered by the panelists included Nuclear Weapons Effects and Survivability, Sustaining the Nuclear Security Infrastructure, Nuclear Systems, Global Strike Requirements & Operations/Nuclear Deterrent & Triad Perspectives, and Naval Nuclear Systems Requirements and Investments.

Numerous speakers and participants thanked the Precision Strike Association for conducting a superb symposium. They were grateful to PSA for providing the opportunity to display all the great government teamwork that is taking place. ■

Aerojet/Rocketdyne

ATK

Boeing

Marrotta

Kudos for Precision Strike Contributions

Advanced Hypersonic Weapon Work Caps Career

The chief engineer of Conventional Prompt Global Strike programs at Sandia National Laboratories has been honored for his outstanding personal and technical contributions to precision strike systems.

Gary Polansky, an engineer in Sandia's Flight Systems Department, won the 2013 Precision Strike Association Richard H. Johnson Technical Achievement Award for his technical leadership of several hypersonic flight systems and hypersonically delivered warhead systems. The award was presented Oct. 23, 2013 at the annual Precision Strike Technology Symposium at the Johns Hopkins University Applied Physics Laboratory in Laurel, MD.

Gary Polansky

"Gary's engineering skills have led to an era of technological innovation for Sandia's conventional global strike programs that have culminated in the success of the Advanced Hypersonic Weapon," said Eric Schindwolf, deputy director of Strike Systems & Aerospace Technologies at Sandia. "This award recognizes Gary's amazing 30-year engineering career at Sandia and his exceptional contributions to develop cutting-edge technology to protect our national security."

The award is given to a public or private sector person for their contributions to precision strike systems. It is named for Richard H. Johnson, an aircraft and missile designer who worked for the former Dallas-based Temco Aircraft, Texas Instruments, Raytheon and other defense companies during his career. Johnson

See **CONTRIBUTIONS,** Cont. on pg. 8

CONTRIBUTIONS, Cont. from pg. 7

received the first Johnson Trophy posthumously for leading the design or redesign of more precision strike airframes than any contemporary designer.

Polansky's career-long achievements resulted in the first successful test flight of the Advanced Hypersonic Weapon (AHW) from Sandia's Kauai Test Facility in Hawaii in 2011. The glide body flew nearly 2,500 miles across the Pacific Ocean to a precision impact in the Kwajalein Atoll.

Gary Polansky

(l-r) David Keese, SNL, Gary Polansky, and Suzy Kennedy, PSA Chairperson

The successes of the team have led to further development of the AHW concept for the U.S. Army Space & Missile Defense Command and of hypersonic boost-glide technologies for other potential Department of Defense applications.

Polansky holds a doctorate from the University of Texas and has worked for more than 30 years at Sandia in national security, nuclear energy and environmental programs. Polansky has authored or co-authored more than 50 technical publications in computational physics, nuclear technology and hypersonic systems.

He has made key contributions to many program areas, including aerospace systems, space nuclear power and propulsion, nuclear energy and nuclear materials management.

In addition to the AHW, Polansky has provided Sandia with technical and management leadership of hypersonic flight systems and hypersonic-delivered warhead systems for NASA, DARPA, the USAF and the USN.

In 2006, Polansky led the development and rocket sled testing of Kinetic Energy Projectile (KEP) warheads for the USN. Three successful tests demonstrated the viability of the concept in a prototype configuration and established the technical basis for future KEP warheads.

Polansky also led the technical team that conducted sled track tests of an advanced fuze for high-speed penetrators. He was instrumental in developing new rocket sled, payload-separation technology that enabled the longest ever free flight of a separated vehicle to target impact.

Gary Polansky and Suzy Kennedy, PSA Chairperson

Though the newly developed fuze did not function as intended, the test delivered conditions that were groundbreaking in their precision for the initial test of the high-speed penetrator in its delivery vehicle.

In 1990, Polansky helped develop high-performance nuclear thermal propulsion for the Strategic Defense Initiative Organization. This team performed several successful reactor experiments showing the feasibility of an advanced nuclear fuel.

Throughout his career, Polansky has sustained his involvement in aerospace nuclear safety by advising the Interagency Nuclear Safety Review Panel, which reports to the White House on space missions that carry radioactive materials. His work directly supported presidential-level decisions to launch the Pluto New Horizons and Mars Science Laboratory space missions. ■

PSA would like to thank
Lone Star Aerospace
for sponsoring PSTS 2013

Exhibitors:
Aeorjet Rocketdyne, ATK, The Boeing Company, Marotta Controls, Inc., NWEC

Effective Unmanned Precision

Modern warfare is increasingly demanding. Gone are the days of indiscriminate kinetic effects. In today's 24/7 news cycle and increasingly litigious environment, collateral damage is a non-starter. Yesterday's munitions, 500 and 2000-pound bombs, provide the equivalent of a sledgehammer versus the required precision of a surgeon's scalpel.

As Unmanned Aerial Systems (UAS) are increasingly utilized for high value targeting, the U.S. has turned to precision missiles. Hellfire and other missiles provide precision, but are a costly overmatch for most targets and provide limited carriage options on UAS.

The increasing requirement for precise and cost effective UAS strike capabilities has been heretofore unmet. Leaning on a long tradition of providing affordable precision, ATK has the elegant solution: the Hammer and Hatchet mini-munitions.

Precision is increasingly key given today's engagement criteria. Weapons accuracy is an imperative, with the global news cycle poised to capture any lapse in targeting precision; a near miss is a non-starter. Increasingly, weapon effectiveness is paramount as precision strikes require decisive effectiveness against targets at first engagement - while mitigating collateral effects.

A precise but ineffective strike further complicates follow-on efforts, wasting resources and fleeting opportunities. The procession towards mitigating collateral damage risk is driving industry to smaller and smaller warheads, but this is at odds with required lethality requirements.

Hatchet Attacks Scud Launcher

ATK is addressing both by miniaturizing warheads through leveraging proprietary enhancements to create lethality-enhanced effects (LEO). The ATK-optimized LEO warhead offers larger warhead lethality in a precise miniature package. Precision today means first strike lethality with no collateral damage, period.

Hammer and Hatchet are highly effective precision munitions that provide lethal effects without collateral damage risk. By matching the "bullet" to the target, ATK effectively rebalances the cost-curve while providing UAS operators with many multiples of current target servicing capacity. ATK's Hammer and Hatchet both incorporate a SAL seeker, an ATK-optimized warhead (LEO) with its proven electronic safe and arm device, creating leading edge capabilities.

ATK's Hammer is a small glide weapon weighing in at 16-lbs. Hammer provides tailorable effects in a small package to increase the operator's ability to effectively target a wide-range of target sets. Beginning in late 2013, ATK and the U.S. Army will test Hammer's capability on the Shadow. A single Shadow can carry up to four Hammers.

Hatchet is ATK's miniature glide weapon weighing seven pounds that is designed for precision and effectiveness against soft targets. Utilizing scalable rotary launchers, UAS can carry small multiples of Hatchets to well over 100 per aircraft. The ability to prosecute over 100 precision targets with limited collateral risk is a game-changing advancement in precision strike capabilities. ATK will undertake trials that include captive carry testing followed by guide-to-hit tests with inert weapons. Live warhead testing will conclude in mid to late 2014.

Hammer and Hatchet are progressing through development to meet the growing requirement for unmanned systems armed overwatch capabilities. These gliding, precision mini-munition weapons incorporate the features necessary to arm unmanned systems. ■

AGM-88E AARGM –
Proven Support of Air Dominance and Precision Strike

Maintaining air dominance in the presence of advanced, mobile air defense threats represents a challenge for the US and our Allies. The U.S. Navy, the U.S. Marine Corps and the Italian Air Force have an answer: the Advanced Anti-Radiation Guided Missile, AARGM.

AARGM expands critical anti-radiation capability of military forces from a single function Suppression-of-Enemy-Air-Defense (SEAD) weapon to a multi-mission Destruction-of-Enemy-Air-Defense (DEAD) strike weapon.

EA-18G Growler fires AARGM

The supersonic, air-launched tactical missile system is a complement to the U.S. Navy's legacy HARM program. The AARGM design consists of a new seeker head and a modified control section, while retaining the existing HARM rocket motor and warhead.

Additional capabilities included autonomous emitter detection and ID and target geo-location. The versatile dual-mode seeker and lethal active terminal guidance provides unmatched capability against current and projected integrated air defense and time-critical-strike targets.

AARGM's GPS/INS system provides collateral damage control capability, and the ability to operate in a highly restrictive rules-of-engagement environment. An onboard Weapon Impact Assessment (WIA) sensor provides Battle Damage Assessment (BDA) information back to the strike aircraft platforms.

The AARGM is a U.S. Navy and Italian Air Force international cooperative major acquisition program with the U.S. Navy as the executive agent. AARGM is produced by the Defense Electronic Systems Division of Alliant Techsystems (ATK), headquartered in Woodland Hills, California.

AARGM came from a successful small business innovation research contract that transitioned into a successful Advanced Capability Technology Demonstration (ACTD). The ACTD was so successful that AARGM transitioned to a program of record entering System Design and Development in 2003. Low Rate Initial Production (LRIP) was awarded in 2008 with Initial Operational Capability and Full Rate Production (FRP) achieved in 2012.

This year ATK delivered its 100th production missile. AARGM is deployed in multiple theaters with the USN and USMC.

AARGM is currently deployed on U.S. FA-18C/D Hornet aircraft, and on the Super Hornet aircraft (FA-18 E/F & EA-18G Growler). It is completing integration with the Italian Air Force's Tornado ECR aircraft.

AARGM is a game-changer, maintaining "assured offense" and air dominance for US and Allied modern strike aircraft.

The US Navy and Italian Air Force partnership has forged new ground in efficient development of this precision capability, providing the modern warfighter unprecedented first pass DEAD capability, thus allowing US and Allied forces to meet their military objectives around the world, even in the today's challenging environments. ■

HUD for Soldiers in Test

A revolutionary helmet mounted display system designed to provide soldiers and Special Forces personnel with more real-time visual data than ever before is exceeding expectations in field testing with US military researchers.

The Q-Warrior, the latest iteration of our helmet-mounted display technology, looks like a pilot's head-up display but has been specially designed for the soldier who needs unique capabilities, such as identifying hostile and non-hostile forces, as well as coordinating small unit actions.

Designed and built by engineers at Electronic Systems business in Rochester, Kent, Q-Warrior introduces a high transmission and high luminance see-through display that incorporates a high-resolution color, collimated display to allow the use of symbols and video to blend intuitively with the user's view of the world. Waypoints, other points of interest and targets can all be displayed overlaid on the real view of what's actually out there.

Q-Warrior also features a large eye-motion box to allow the soldier to make relatively large movements of his or her helmet while continuing to maintain his view of the display. ■

USN Tests IRST on Super Hornet

The U.S. Navy recently tested, for the first time on a Boeing F/A-18 Super Hornet aircraft, the Infrared Search and Track (IRST) sensor that will find hard-to-detect targets over long distances.

Boeing and Lockheed Martin are developing and integrating IRST, an essential upgrade to the combat capability of the Navy's Super Hornets.

"Adding an advanced infrared sensor to the Super Hornet broadens the Navy's warfighting ability," Navy F/A-18 Program Manager Capt. Frank Morley said. "Combined with the Super Hornet's advanced radar and the Growler's electronic attack radar jamming ability, IRST will allow the fleet to dominate the skies in all threat environments."

"We continually evolve the aircraft to outpace future adversaries," says Tim Adrian, IRST F/A-18 program manager. "When radar isn't an option, this upgrade allows operators to locate targets and deploy the best weapon for the mission."

The IRST system is being developed under a $135 million contract awarded in 2011 and is currently planned to be deployed by 2017. The technology was initially tested last year on a Boeing King Air test aircraft, which helped reduce costs by advancing the technology before installation on Super Hornets.

"The success of this first flight and the test flights before it highlights the maturity of the next-generation IRST system that Lockheed Martin and Boeing are delivering to the U.S. Navy today to support Navy Carrier Strike Group objectives," said Ken Fuhr, director of fixed wing programs at Lockheed Martin Missiles and Fire Control.

The combat-proven Super Hornet provides unequaled air dominance and precision strike capability. The EA-18G Growler, derived from the Super Hornet, is the United States' newest and most advanced airborne electronic attack platform. The Navy plans to fly these aircraft until about 2040. ■

USN tests Infrared Search and Track (IRST) sensor on F/A-18 Super Hornet.

News Briefs

Smart Weapons Market Worth $5.3B by 2018

The global smart weapons market is valued at $3.6B in 2013 and is expected to reach $5.3B in 2018, according to ASD Reports, a marketing forecast firm.

The US is the most attractive market for smart weapons. It is a matured market with most of the market leaders situated in the US. The U.S. smart weapons market is valued at $1.6B in 2013 and is expected to reach $1.8B in 2018. The second-largest market is the Middle East, where the market is expected to increase from $351million in 2013 to $712 million in 2018.

Recent conflicts across the globe have emphasized the need for precision attacks and standoff surgical strikes. There is an imperative need to avoid collateral damage and at the same time provide combatant commanders with a weapons capability that could create an immediate positive effect on the battlefield. These needs are met by smart weapons.

Smart weapons range from precision-guided artillery rounds and precision-guided bombs to precision-guided standoff missiles. Anti-armor weapons comprise of anti-tank and anti-structure missiles. Lately, multi-mission capable missiles, which could be used in a variety of operations, are widely developed and produced, thus reducing logistics and providing single, easy-to-use solutions for a variety of missions.

Guided munitions are bombs that are fitted with any one of the following guidance systems: inertial navigation system, global positioning system, laser beam guidance, terrain mapping, radar guidance, infrared imaging, and video guidance systems.

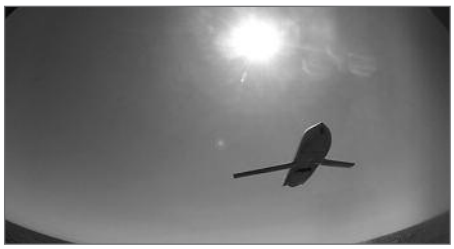
JDAM (Joint Direct Attack Munition) by The Boeing Company, Paveway by Raytheon and AASM by Sagem of France are a couple of widely procured guided munitions.

Guided rockets fulfill the armed forces' requirement for tactical and operational support. The larger rockets launched from MLRS (Multiple Launch Rocket System) platforms serve as accurate strike weapons across long distances of more than 50km. ■

LRASM Flight Testing

Lockheed Martin is conducting Long Range Anti-Ship Missile (LRASM) flight-testing in support of the Defense Advanced Research Projects Agency (DARPA) and Office of Naval Research (ONR) program.

LRASM in Flight Test



LRASM in Flight Test

LRASM is an autonomous, precision-guided anti-ship standoff missile leveraging the Joint Air-to-Surface Standoff Missile Extended Range (JASSM-ER) heritage, and is designed to meet the needs of USN and USAF warfighters in a robust anti-access/area-denial threat environment.

Armed with a 1,000-pound penetrator and blast-fragmentation warhead, LRASM employs a multi-mode sensor, weapon data link and an enhanced digital anti-jam global positioning system to detect and destroy specific targets within a group of ships.. ■

New Seeker Technology

Raytheon has completed a successful field test of an advanced Electronic Support Measure (ESM) seeker installed in a Block IV Tomahawk missile as part of the company's new product improvement program.

The ESM seeker incorporates a state-of-the-art processor and antenna to locate and track moving and fixed emitting targets. The seeker's capability was validated in a realistic high-density environment after seven months of testing in anechoic chambers.

A major enhancement introduced with the Tomahawk Block IV missile includes a two-way satellite data-link that enables a strike controller to redirect the missile in-flight to preprogrammed alternate targets or more critical targets.

The new multi-mode seeker technology would allow the Navy's Surface Action Group to fire Tomahawks from sanctuary and defeat mobile threats at long range.

The USN late last year celebrated the delivery of the 3,000th Tactical Tomahawk Block IV missile. ■

LM Demos JAGM Dual-mode Guidance Section

Lockheed Martin recently demonstrated the Joint Air-to-Ground Missile (JAGM) dual-mode guidance section engaging a laser-desig-

nated moving target during an internally funded flight test at Eglin Air Force Base, FL.

The rail-mounted JAGM guidance section flew six kilometers, engaged its precision-strike, semi-active laser and hit the moving target. The flight test, which was part of Lockheed Martin's internal research and development program, is an important risk reduction milestone critical to Lockheed Martin's performance on the U.S. Army's 27-month Continued Technology Development (CTD) program.

Prior to the flight test, Lockheed Martin completed an extensive Critical Design Review demonstrating that the dual-mode design meets all customer-specified requirements.

The dual-mode seeker features the HELLFIRE precision-strike semi-active laser and the all-weather fire-and-forget LONGBOW millimeter wave radar sensors demonstrated in prior JAGM guided flights.. ■

Next-Gen Guided Projectile for USN

BAE Systems has received a $33.6M contract from the Office of Naval Research (ONR) to develop and demonstrate a Hyper Velocity Projectile (HVP).

The HVP is designed to provide lethality and performance enhancements to current and future gun systems. The objective of the first phase is to produce a concept design and development roadmap towards fully guided flight demonstrations.

BAE Systems, along with teammates United Technologies and Custom Analytical Engineering Systems (CAES), will develop and demonstrate a modular, low drag HVP.

The modular design will allow the HVP to be configured for multiple gun systems and to address different missions.

Work on the HVP contract is expected to begin immediately, with its initial phase to be completed by June 2014. ■

Northrop Grumman and Trex Team

Northrop Grumman will collaborate with Trex Enterprises to bring celestial navigation technology to the precision targeting capability.

Trex Enterprises has developed and matured the core technology for providing a highly accurate celestial navigation subsystem for use in military products and scientific applications. Northrop Grumman has entered into a licensing agreement with Trex Enterprises that allows Northrop Grumman to produce and integrate this celestial navigation capability into ground targeting systems that offer greater precision in locating targets.

Trex Enterprises is a diversified high-technology company specializing in cutting-edge technical solutions and products to improve performance across the electromagnetic spectrum. ■

Longbow Demos Littoral Attack

The U.S. Army, USN and Lockheed Martin recently conducted Longbow missile demonstration firings to showcase the missile's ability to counter littoral threats, making the weapon an effective candidate for potential use in operational shipboard launches.

During the demonstrations, multiple Longbow missiles were fired from a launch fixture provided by the USN aboard a 65-foot surface craft. The launches represented a variety of progressively more complex scenarios, with the missiles successfully engaging multiple incoming high-speed boat targets at a range of six kilometers.

The fire-and-forget Longbow missile uses millimeter-wave guidance to lock onto targets before or after launch. The demonstrations were the first vertical launches of the Longbow missile and the first lock-on after launch of a Longbow missile against maritime targets. The tests were conducted near Eglin AFB, FL. ■

Carl-Gustaf Standard Issue for US Army

Saab's man-portable weapon system Carl Gustaf is now a US Army Program of Record, becoming standard issue to Light Infantry units.

CALENDAR OF EVENTS

Precision Strike Annual Review (PSAR-14)

Precision Engagement — Staying Relevant in a Dangerous World

Date: March 18-19, 2014

Location: Waterford at Springfield – Springfield, VA

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.

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

The Carl Gustaf weapon system is currently in use in more than 40 countries worldwide. Anticipating future operational needs, Saab is constantly working to make it even better with a new, lighter weight, version currently under development. Furthermore, advances are also being made to the Carl Gustaf ammunition family with the recent release of the new 655 CS (Confined Space) High explosive anti-tank (HEAT) round. ■

Carl Gustav

Longbow Demos Littoral Attack

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Naval Longbow

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$449M for JASSM Production

Lockheed Martin recently received two production contracts totaling $449 million from the USAF for continued production of the Joint Air-to-Surface Standoff Missile (JASSM) and the Extended Range (ER) variant.

The Lot 11 and Lot 12 contracts include production of 340 baseline missiles and 100 ER missiles. The contracts also include systems engineering, logistics support, tooling and test equipment. ■

PSAR-14, Continued from page 1

focus on TRADOC's role in the new security environment. Mr. Geurts, USSOCOM's Deputy for Acquisition, is expected to highlight precision engagement initiatives for the future fighting force.

We are hoping that Admiral Cecil Haney, USN, will join us as well to bring us up to speed on his vision of our Nation's strategic interests. His discussion is expected to provide a tremendous challenge as we orchestrate our classified Precision Strike Technology Symposium (PSTS-14) scheduled for Oct. 21-23, 2014 at the JHU/APL Kossiakoff Center.

Further, Dr. Paul Kaminski, (Chairman of the Defense Science Board) is expected to join us to make special remarks about Defense and Industry Links in an Era of Constrained Resources.

Additionally, we are delighted that several defense visionaries including Alan Shaffer, David Ochmanek, Rear Admiral Ron Boxall, USN, and Brigadier General Jon Thomas, USAF, will address the strategic environment and national strategies.

A special feature of PSAR-14 will be presenting the **William J. Perry Award** to a very deserving individual or team of experts who have made significant contributions to the development and support of precision strike systems that have led to the strengthening of our vital national security interests.

The **BLU-129/B Team** has been selected for the **2014 William J. Perry Award**. Dr. Paul Kaminski—Chairman of the Defense Science Board—is expected to present the William J. Perry Award on behalf of Dr. Perry during the special ceremony that will take place during the PSAR-14 Luncheon Ceremony on March 18, 2014 at the Waterford in Springfield, VA.

Please join our distinguished speakers as they highlight key national security challenges facing our great nation. Please see page 15 of this *Precision Strike Digest* for a snapshot of major topics to be addressed during PSAR-14 scheduled for March 18-19, 2014. ■

Please join us!

PRECISION STRIKE ANNUAL REVIEW (PSAR-14)

will focus on

Precision Engagement – Staying Relevant in a Dangerous World

18-19 March 2014

Waterford at Springfield – Springfield, VA

Confirmed/Invited Defense Leadership & Congressional Speakers include:

Dr. Paul Kaminski – Chairman, Defense Science Board & Former USD(AT&L)

Admiral Cecil Haney, USN – Commander, USSTRATCOM

Lieutenant General David Halverson, USA – Deputy CG, U.S. Army TRADOC

James "Hondo" Geurts – Acquisition Executive, USSOCOM

Showcasing

- Military Departments & International Precision Weapons Sessions
- Congress—Defense—Industry Links in an Era of Constrained Resources
- Key Challenges in the New Strategic Environment
- TRADOC's Key Role in the New Security Environment
- National Strategies—Emerging Strategic Context
- QDR-14 Implementation—Connecting Relevance to Resources
- Technology Surprise—Need for Rebalance of R&E Investments
- Precision Engagement for the Future Fighting Force
- Munitions Requirements Process Update
- National Laboratories Panel—Sandia, Lawrence Livermore, Los Alamos & Lincoln Lab
- Acquisition Program Success—Defense Acquisition Workforce Upgrade
- JCIDS/JROC Processes Update—Robust Integration in an Uncertain Future
- Need for Industrial Base Rebalance in Pacific Pivot
- Long Range Anti-Ship Missile (LRASM) Demonstration
- Precision Weapons Technologies—Next Generation Jammer
- Conventional Prompt Strike
- United States Strategic Interests

Special Highlight

Presentation of 18th Annual William J. Perry Award to
BLU-129/B Team

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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

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