AHS International continues to work with our chapter members and US government agencies to adapt to the first time. HELMOT XVII was open to the public, but were planned to be part of HELMOT JMR Phase 1 Industry Day meetings that only able to support the Army-sponsored Army’s conference policy, in 2012 AHS was for the Next Fight

Agreements with small, innovative design houses AVX Aircraft and Karem Aircraft. Technology Investment effort today expects Bell and Sikorsky-Boeing teams to fly their advanced tiltrotor and Technology Demonstration (JMR TD) started in 2010. The Science and Technology (S&T) direction that initiated FVL, and has worked to increase funding for its Joint Multi-Role Flight Technical Society lobbied Senate and House members in 2008 for the Congressional Acquisition System (GFAS) combat-deployed in August 2012 on a battalion of AH-64D attack helicopters. The broadband mid-wave infrared sensor with hyper-temporal processing gave attack helicopter crews real-time situational awareness, identifying and locating enemy fires down to the type and number of rounds fired. It also cured the Apache’s Modernized Target Acquisition Designation Sight (M-TADS) to return fire and gave analysts post-mission intelligence about the enemy. “As soon as they shoot their weapons, they give themselves up,” summarized Dr. Weiland. GFAS has yet to be adopted for the Apache fleet, but Boeing has since developed a GFAS installation A-kit for the new AH-64E Apache Guardian. The sensor could enhance air-to-air targeting accuracy against unidentified targets. Dr. Weiland share his perspective “We don’t want to add another single-purpose sensor. The whole idea is to get multi-uses from them.”

George Logan from ADA outlined the progress made in rotorcraft autonomy and teaming. The VUJT-2 (Video for Unmanned Multi-Role Vertical Transitioning System - VUT) demonstration that gave AH-64D access to UAS imagery in combat led to the upcoming SUMIT (Synergistic Unmanned-Manned Intelligent Teaming) effort. SUMIT capabilities of interest include autonomy in mission task planning and synergistic unmanned-manned teaming. The program will look at improved Human-Machine Interfaces (HMIs) and decision aiding. A SUMIT contract award next summer will build a government-owned simulation tested in Huntsville, Alabama, to integrate alternative HMIs, sensors and image generators in a Future Airborne Capability Environment (FACE) compliant architecture and will focus on how an air mission commander controls a team of autonomous unmanned systems.
Technology for the Next Fight

The AHS HELMOT XVII meeting provided snapshots of efforts to increase the speed, survivability and autonomy of vertical lift.

The first open AHS International Helicopter Military Operations Technology (HELMOT) meeting convened in six years gave attendees in Newport News, Virginia, a sampling of timely developments in US military vertical lift. With most US combat forces withdrawn from Afghanistan and Iraq, rotary-wing technologists heard how Future Vertical Lift (FVL), Degrade Environment Mitigation (D/E-M), Manned-Umanned Teaming (MUM-T) and other initiatives can leverage lessons learned.

Lockheed Martin speaker Don Reed told the audience of a warfighter who credited a particular helicopter with saving his life when it supplied his endangered unit. The Lockheed Martin/Kaman K-MAX Cargo Unmanned Aircraft System (UAS) that Marines took to Afghanistan in 2011 brought supplies to units under fire and routinely delivered loads with 3 m (10 ft) accuracy or better. In one case, the pilotless demonstrator hauled 4,313 lb (1,956 kg) to a mountain landing zone at 15,000 ft (4,600 m). The Army’s Autonomous Technologies for Unmanned Air Systems (AUTIAS) effort subsequently enabled the unmanned helicopter to pick landing zones amid obstacles. Mr. Reed concluded, “If we have this kind of capability today, imagine where we’re going to be tomorrow.”

Unmanned helicopters remain just one area of military opportunities for a rotorcraft industrial base denied big commercial orders by depressed oil prices. AHS International executive director Mike Hirschberg reminded the HELMOT audience that the V-22 Osprey tiltrotor remains the only truly new US military rotorcraft design fielded in the last 30 years and cautioned, “We have to keep the base really solid.” He added, “We work best when we have industry, government and academia all working together.” The Vertical Flight Technical Society lobbied Senate and House members in 2008 for the Congressional direction that initiated FVL, and has worked to increase funding for its Joint Multi-Role Technology Demonstration (JMR TD) started in 2010. The Science and Technology (S&T) effort today expects Bell and Sikorsky-Boeing teams to fly their advanced tiltrotor and compound helicopter demonstrators in 2017, and it continues Technology Investment Agreements with small, innovative design houses AVX Aircraft and Karem Aircraft. Survivable and Smart

Future military rotorcraft nevertheless require practical, affordable technology HELMOT technical chair Allen Walker of the Avionics and Networks Technical Area in the Army Aviation Development Directorate (ADD) advocated a model-based approach to test and qualification and opened the sessions with a warning: “If we can’t integrate it into the system and quality it, it’s going to sit on the shelf.” Granty Thompson from PRCX Systems, LLC, described improved predictive cost analytics and model-based engineering for rotorcraft. The updated TrueRotorcraft tool set developed for the Vertical Lift Consortium and used by the Army’s Aviation and Missile Research, Development and Engineering Center (AMRDEC), started with a Bell Helicopter cost model and drew on Georgia Tech expertise to include test and evaluation costs, Technical Readiness Levels, and Operations and Support costs. According to Thompson, “With each technology, you can define its impact. How is it going to impact fuel consumption, reliability, production costs?”

Lockheed Martin’s unmanned Kaman K-MAX helicopter built a knowledge base of Cargo UAS operating experience in support of more autonomous rotorcraft. (Lockheed Martin photo)

Radiance Technologies chief technology officer Dr. Peter Weiland recounted the evolution and integration of the Ground Fire Acquisition System (GFAS) combat-deployed in August 2012 on a battalion of AH-64D attack helicopters. The broadband mid-wave infrared sensor with hyper-temporal processing gave attack helicopter crews real-time situational awareness, identifying and locating enemy fires down to the type and number of rounds fired. It also read the Apache’s Modernized Target Acquisition Designation Sight (MTADS) to return fire and gave analysts post-mission intelligence about the enemy. “As soon as they shoot their weapons, they give themselves up,” summarized Dr. Weiland. GFAS has yet to be adopted for the Apache fleet, but Boeing has since developed a GFAS installation kit for the new AH-64E Apache Guardian. The sensor could enhance air-to-air targeting accuracy against UAVs, Dr. Weiland shared Army perspective: “We don’t want to add another single-purpose sensor. The whole idea is to get multi-uses from them.”

George Logan from ADD outlined the progress made in rotorcraft autonomy and teaming. The VJU-2 (Video for UAS for Improving Interoperability and Teaming Level II) integration that gave AH-64Ds access to UAS imagery in combat led to the upcoming SUMIT (Synergistic Unmanned-Manned Intelligent Teaming) effort. SUMIT capabilities of interest include autonomy in mission task planning and synergistic unmanned-manned teaming. The program will look at improved Human-Machine Interfaces (HMIs) and decision aiding. A SUMIT contract award next summer will build a government-owned simulation tested in Huntsville, Alabama, to integrate alternative HMIs, sensors and image generators in a Future Airborne Capability Environment (FACE)- compliant architecture and will focus on how an air mission commander controls a team of autonomous unmanned systems.

“If we have this kind of capability today, imagine where we’re going to be tomorrow.”

Scott Wigginton from the Army ADD provided a FACE overview and noted, “We’re trying to get capabilities out to the warfighter faster.” Current software typically saddles military programs with uncooperative solutions that don’t easily work across different platforms, and each software block can consume 18 to 33 months of integration time. The FACE consortium of government and industry answers such shortcomings with a common operating environment defined by strict legal standards. The objective is to maximize interoperability and re-kindle competition with a layered software architecture that works on any FACE-compliant platform. “FACE is the interface, not the functional capabilities you need,” explained Wigginton. The Army is investigating FACE as an open architecture for the digitized UH-60V, and the Navy looks to apply the standard to the updated MH-60S mission computer during Seahawk service life extension programs. FACE is also a foundational element of the FVL avionics architecture.

Pending firm technical requirements, FVL is expected to provide some kind of optimally manned capability. Boeing technical fellow Dr. Tom Dubois offered the HELMOT audience his perspective on vertical lift and unmanned systems. He explained that a self-ferrying FVL able to “tether” on another aircraft, air-refuel automatically, and conduct dynamic Intelligence, Surveillance and Reconnaissance (ISR) without a pilot will need an Autonomy Level For Unmanned Systems (AULS) of 7 or higher. Dubois observed, “You are going to need a much tighter coupling between mission systems and flight control.”

Morgan Davidson of Utah State University described integration work aimed at an Autonomous Rotorcraft Remote Weapon System. The university-affiliated Space Dynamics Lab research center specializes in sensors, cryogenic systems and data processing, and it helped the Army Aviation Applied Technology Directorate (AATD) test a geo-aware, vibration-cancelling airborne remote sniper system (AKRS). AKRS tracking was tested on a Vigilante
UAS in 2008, and the system subsequently fired a rifle from a UH-1 testbed. As an integrated ISR asset, ARSAS can take targets from and push targets to a network. Follow-on technology can also be applied to a remote door gunner position on a manned helicopter or on some optionally manned aircraft. Plans call for firing trials on a Black Hawk in the first half of 2017.

Bell Helicopter unveiled its V-280 Valor JMR Technology Demonstrator in September, stating that it was 65% complete. This photo was taken Aug. 1 (Bell Helicopter photo).

Air Vehicle Survivability engineer Tim Rosse from the AADT mission systems branch examined the challenge of total aircraft survivability and said, “The way we’re doing business now does not support the integrated survivability idea.” Where stand-alone systems now detect threats, lookouts, solutions should also integrate situational awareness and decision making with other survivability measures. The Aircraft Survivability Integrated Product Team (AS IPT) representatives from AMRDEC, the Army’s Communications-Electronics Research, Development and Engineering Center (CERDEC), the Air Force Research Laboratory (AFRL) and other authorities. It seeks multi-layered, affordable Engineering Center (CERDEC), the Air Force Research Laboratory (AFRL) and other authorities. It seeks multi-layered, affordable

Army aircrafts wish to use degraded visual environments include enhanced survivability, the science and technology of DVE Mitigation was addressed by ADD program manager Kris Kuck and test pilot and assistant program manager Maj. Paul Flannigan. DVE-M integrates see-through sensors, cockpit symbology and modernized control laws (MCLAWS) to take pilots through the full spectrum of DVE conditions. “What works in brownout may not work in whiteout and may not work in fog, said Kuck. The DVE-M program seeks answers for a 30° solution applicable to multi-ship (AFRL) and other authorities. It seeks multi-layered, affordable

Phase I DVE-M component technology demonstrations were flown in brownout conditions at Yuma Proving Ground in August and will extend to snow, fog and rain conditions in Europe next year. Confidence in the DVE-M program was addressed by ADD program manager Maj. Paul Flannigan. DVE-M integrates see-through sensors, cockpit symbology and modernized control laws (MCLAWS) to take pilots through the full spectrum of DVE conditions. “What works in brownout may not work in whiteout and may not work in fog, said Kuck. The DVE-M program seeks answers for a 30° solution applicable to multi-ship

Brian Ehringer, chief of engineering for the Bell V-280, told the HELMOT audience how the Valor JMR demonstrator draws on V-22 experience to provide a third-generation tiltrotor that can evolve into a family of FVL platforms. The advanced tiltrotor with its straight wing and fixed engines was designed for affordability. The wing skin, for example, is fabricated from composite broad goods without costly tape or tool placement. Broad goods used on propeller yokes meanwhile cut parts count by 75% and cost by 50% compared with more complicated V-22 components.

By the time of the HELMOT meeting, the V-280 Valor JMR demonstrator was more than 65% built. Wing and fuselage were mated in April and engine and tail propeller at West Palm Beach, Florida, in part as a risk-reduction article for the SB-1. The Defiant team is simultaneously building both the SB-1 demonstrator and its Propulsion System Test Bed at West Palm Beach and aims for a JMR first flight by the end of 2017. Where the SB-1 uses familiar Honeywell T700 turboshifts, the bigger FVL will need the power of FATE. Requirements for a utility FVL (Capability Set 3) are yet to be set, but an FVL attack variant could marry tandem cockpits to the same dynamics. Shidler observed, “Our perspective is to drive the requirements down, so it becomes a real affordable aircraft.”

Karem aircraft vice president Dr. Ben Tigner provided an overview of Optimum Speed Tilt Rotor technology for FVL. The OSTR with light, stiff blades and rotor speeds variable over a 2:1 range promises high propulsive, aerodynamic and weight efficiencies to carry more, over greater distances with less power. “We draw the DNA of the V-22, but the OSTR tail rotor is more efficient than even the rotary-wing world,” noted Tigner. “On-station times should not be measured in minutes. They need to be measured in hours.”

“Tiltrotors are more efficient in brownout conditions than airplanes,” said Karem’s FVL Capability Set 3-compliant configuration is the KVL-Defiant. Karem hopes to run a full-scale powered single-rotor test stand. Whatever their shape, fast, agile, smart new rotorcraft will be highly integrated, affordable and supportable systems. HELMOT XVII technical chair Allen Walker reminded the AHS audience, “We’re living in very challenging times… If it was easy, they wouldn’t need us to do it.”

Sikorsky-Boeing’s analysis of the FVL Medium Assault and Attack requirements currently support two different aircraft with a high degree of commonality (Sikorsky-Boeing graphic).
Army aviation wants to use degraded visual environments to enhance survivability. The science and technology of DVE Mitigation was addressed by ADD program manager Kris Kuck and test pilot and assistant program manager Maj. Paul Flannigan. DVE-M integrates see-through sensors, cockpit symbology and modernized control laws (MCLAWS) to take pilots through the full spectrum of DVE conditions. “What works in brownout may not work in whiteout and may not work in fog,” said Kuck. The DVE-M program seeks answers for a 300° solution applicable to multi-ship firing trials on a Black Hawk in the first half of 2017.

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