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US Army Yuma Proving Ground: Supporting Our Army at War

COL Stephen Kreider
Commander, US Army
Yuma Proving Ground

Supporting our Army at War by providing the best flexible, responsive, innovative, and diverse set of capabilities and services across the spectrum of natural environments is the primary mission of the US Army Yuma Proving Ground (YPG). Each day we accomplish this at our three test centers: the Cold Regions Test Center (CRTC), the Tropic Regions Test Center (TRTC), and the Yuma Test Center (YTC). Numerous tests take place in the proving ground's harsh, realistic environments for direct and indirect fire systems, munitions of all types, parachutes, helicopters, sensors, radars, unmanned aerial vehicles (UAVs), and much more. The following articles address a small portion of the wide breadth of activities and technology improvements at YPG.

The first article "Adapting to a Changing Threat Is a Team Effort" looks at the significant growth in the area of UAVs, the threat of improvised explosive devices, and other direct support activities in the Global War on Terrorism. The growth of system testing across multispectrums is a common thread in these activities and is driving the technological needs of all the test centers.

The second article summarizes the drive for new vehicle technologies through the execution of the first-ever Tactical Wheeled Vehicle Component Technology Demonstration at YPG in January 2005. This event provided the US Army with the capability to identify key technologies for insertion into the current and future wheeled vehicle fleet.

YPG is one member of the US Army Developmental Test Command (DTC) team, and it is important to understand the linkage and utilization of expertise and technologies across the command. One example of this important teaming within DTC is described in the article on leveraging the US Army Electronic Proving Ground.

COL Stephen Kreider

Specific to our YTC is the article about test methods for personnel parachute systems that encapsulates the numerous programs and technology developments that were presented at the American Institute of Aeronautics and Astronautics Aerodynamic Technology Conference in Munich, Germany, in May 2005. Further north, our CRTC has seen a significant investment in the last couple of years, which we have highlighted with emphasis on their new high-speed test track. With safety a daily focus at all the test centers, the article on replacement of an antiquated mortar clip exemplifies the use of technology in making the test environment safer every day.

Finally, "Leveraging Testing and Training: A Challenge We Are Winning" looks at the growth of training across YPG and the integration of testing and training for a win-win capability. As the access to Soldiers for testing continues to decrease, the ability to leverage Soldiers by working with Warfighters becomes increasingly important.

I hope you find these articles helpful in understanding the capabilities of YPG, how we integrate new technologies, and the lessons learned in providing the best support possible to the US Army at War. We stand ready to support our customer the Soldier in all that we do.

(End)

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Adapting to a Changing Threat Is a Team Effort

Scott Dellicker
Director, Air Combat and Soldier Systems Directorate
Yuma Test Center

Deep in the desert of Yuma, Arizona, the dedicated workforce of the US Army Developmental Test Command is working feverishly at the Yuma Test Center (YTC) to test equipment, tactics, techniques, and procedures in support of our Armed Forces at War. We are looking at solutions to improve the warfighting capabilities of our Soldiers and to help protect them against attacks of all kinds. We have streamlined our test processes to eliminate unnecessary delays in fielding critical equipment. Moreover, we ensure that the performance and limitations of the systems under test are fully understood. We maintain one focus—to assist in fielding capabilities that fully support our Warfighters.

Immediately after the start of Operation Enduring Freedom (OEF), many initiatives were launched to provide new capabilities to our Soldiers in the fight against an enemy different from any we have faced. At YTC, an initial focus was on the development, test, and training for employment of new unmanned aerial vehicles (UAVs) (figure 1). We looked at everything from hand-launched UAVs to new applications of large-scale UAVs such as the Predator system. New UAV deployment techniques were developed and rapidly tested. As soon as we knew the system had strong potential to support the war effort and was safe to operate, troops were brought in to learn the operation of the systems and establish new tactics, techniques, and procedures. The systems were then rapidly fielded in support of OEF and Operation Iraqi Freedom. We have looked at many deployment techniques including hand-launching of aircraft and launching from dune buggies, pickup trucks, and high-mobility multipurpose wheeled vehicles. We have examined deployments from cargo delivery aircraft under parachute and even from hot-air balloons. Each time a new idea was considered, the test team rapidly assessed the safety, performance, and limitations of the concepts, thereby supporting immediate fielding decisions.

We maintain one focus—to assist in fielding capabilities that fully support our Warfighters.

Figure 1. UAV

As the threat of improvised explosive devices (IEDs) emerged, new test capabilities were constructed and new test processes were implemented. On December 23, 2003, the YTC workforce began the construction of the Joint Experimentation Range Complex (JERC) (figure 2). Our goal was to provide as realistic a representation of portions of Afghanistan and Iraq as possible in the shortest time. On January 5,

Figure 2. JERC

Our goal was to provide as realistic a representation of portions of Afghanistan and Iraq as possible in the shortest time.

Figure 3. Bedouin Village

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YPG Hosts Vehicle Technology Demo

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In a bold move to find and acquire the latest vehicle technology industry has to offer, the US Army invited a group of vendors to the US Army Yuma Proving Ground (YPG) for its first-ever Tactical Wheeled Vehicle (TWV) Component Technology Demonstration in mid-January 2005. Overall, 42 vendors from across the Nation showcased 65 technologies for the US Army to consider. The demonstration was hosted by YPG and the Project Manager for Tactical Vehicles (PM-TV) as part of the US Army's Expedited Modernization Initiative Procedure (EMIP) program. The EMIP is designed to identify key technologies for technical insertion and upgrades into TWVs. In its inaugural season, the multistage event was deemed by the hosts to be a major success for the US Army and industry, especially since it included a high percentage of smaller companies that usually do not get the opportunity to display their ideas and technologies at that level.

The EMIP process and related technology demonstration are unique attempts by the US Army to identify what the technology industry already possesses that could be leveraged into the US Army's fleet of TWVs, for both currently fielded systems and future systems under development. The EMIP places an emphasis on technologies that provide solutions in the following warfighting capability areas:

- Safety
- Survivability
- Reliability, Maintainability, and Sustainability
- Distribution and Mission Enhancements

Although the US Army is interested in learning about any ideas/concepts to improve the TWV fleet, the EMIP process is intended to address technologies that can be available for production within 6 months of verification testing and are new to the US Army.

"This demonstration definitely exceeded our expectations for a first-year event," BG Patrick J. O'Reilly said on the final day of demonstrations. O'Reilly, Program Executive Officer for Combat Support and Combat Service Support, said observation teams saw some technologies from smaller companies they might not otherwise have seen. "This was not just a static display we see in other places. We actually got to drive the equipment and see it in action, which made the event tremendously more valuable for us. It was definitely worth coming out to Yuma, not only because of the favorable weather and expansive ranges, but also because the proving ground has a similar environment to Southwest Asia, where American Soldiers are currently engaged."

"This demonstration definitely exceeded our expectations for a first-year event,"..."This was not just a static display we see in other places. We actually got to drive the equipment and see it in action,"... "(the) event emphasized to the vendors the seriousness of the US Army's commitment"

Observation teams from across the US Army witnessed the entire demonstration. They took notes, asked questions, and were greatly involved with all of the equipment they observed. During the 4-day process, O'Reilly joined other general officers such as MG Brian I. Geehan, Commander of the US Army Transportation Center and Chief of Army Transportation, in the often hands-on and up-close demonstrations of new technologies being displayed on the roads and ranges of YPG. At various times during the week of demonstrations, vehicle suspensions were remotely raised and lowered, and tires deflated and inflated automatically. Vehicles chased each other around the range, showing off a collision alarm system. A Wisconsin industry gave demonstration rides in a new air-conditioned high mobility multipurpose wheeled vehicle, while a large trailer hitch, designed by a North Carolina company to reduce connection time and energy, drew a crowd. A Texas firm presented an engine coolant designed to last for 750,000 miles or 7 years. One Michigan company bounced suspension demonstration trucks over rough terrain, and another displayed a new oil recycling device.

On hand to witness some of these demonstrations was LTG Claude V. Christianson, Department of the Army Deputy Chief of Staff for Logistics (G-4). Because the battlefield is changing, the US Army's truck fleet must meet new requirements, Christianson said. First, force protection for the crew and passengers must be a consideration. Second, the crew must have network communications capability. Third, the cost to operate these vehicles has to be reduced. Finally, US Army TWVs must be easier to maintain, he stated.

BG Kathleen Gainey, Director of Force Protection and Distribution, was ever-present during demonstrations throughout the week. Because this event was a market survey, not a source selection or a test, it allowed involvement and not just data collection. Another interested visitor at the proving ground during the week was MG William M. Lenaers, Commanding General of the US Army Tank-automotive and Armaments Command. He, too, took a first-hand look at some potential technology. "One of the great things about this event," O'Reilly said, "was that it allowed representatives of many Army organizations involved in the process to come together, in one place, simultaneously to learn what industry has to offer the Army."

BG Gainey would later mention at the Tactical Wheeled Vehicle Symposium in Monterey, California, that "the EMIP provided a good forum for the Tactical Wheeled Vehicle Board of Directors to cross-talk." Not only did these officers get to interact with the technology directly, but their presence at this inaugural event emphasized to the vendors the seriousness of the US Army's commitment to this process. Senior-level administrative participation is expected to continue in the future.

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YPG Leverages EPG Capabilities

Scott Dellicker
Director, Air Combat and Soldier Systems Directorate
Yuma Test Center

Synergy, leveraging, virtual, Total Quality Management, Lean Six Sigma: you have all heard the buzzwords over several decades. It seems that every time we turn around we must contend with another new management term or direction for the sake of improving efficiency. However, what really drives efficiency are not the buzzwords, the terminology, or even management direction, it is necessity. It is necessity that drove the US Army Yuma Proving Ground (YPG) to form a robust teaming relationship with the US Army Electronic Proving Ground (EPG).

The management of YPG and EPG recognized years ago that the two test centers do not compete for work; they serve different customer bases and have unique facilities. Until there was a clear necessity to team, the desired teaming relationship sat mostly dormant.

In support of the combat automotive mission, EPG has provided mobile electromagnetic interference support for various test efforts over several years. During Stryker testing, YPG was reliant on EPG for the tactical communications technical expertise and troubleshooting beyond the operator's preventive maintenance cycle schedule, especially so in support of the Stryker Mortar Carrier B Excursion and Initial Operational Test and Evaluation. To ensure the success of the Stryker test program, EPG stationed a team at YPG to assist in the operation, maintenance, and configuration management of the tactical communications systems organic to the various Stryker platforms. The assistance of EPG and the readiness of tactical communications systems such as the single-channel ground and airborne radio system; the Enhanced Position Location Reporting System; the Advanced Field Artillery Tactical Data System; and the Force XXI Battle Command, Brigade-and-Below had a direct effect on the successful execution of a number of Stryker test efforts.

At the beginning of Operation Enduring Freedom, YPG was faced with the challenge of testing unmanned aerial vehicles with advanced sensor technologies for detecting improvised explosive devices (IEDs) and for performing other critical missions. Our first urban test facility, Tombstone, was built, and we began this difficult task. In 2003, we began construction on the Joint Experimentation Range Complex and launched testing of a plethora of technologies for counter-IED efforts as well as counterterrorism and counterinsurgency efforts.

A problem we faced was that our people are great system testers. We understand the broad array of technologies for our primary mission areas of aviation, air delivery, artillery, and automotive testing with a critical focus on natural environments. However, we lacked critical expertise in electronic systems and advanced communications systems. With our sole focus of ensuring that Soldiers receive systems that can be used effectively, we quickly turned to EPG for help.

The mission of EPG is to plan, conduct, and analyze the results of technical tests for command, control, communications, computers, and intelligence systems; signal intelligence; and electronic combat/electronic warfare equipment. What a natural fit to have the system focus coupled with the test environment available throughout the YPG test ranges.

For nearly 2 years, the YPG/EPG team has supported testing of more than 75 different systems, many with multiple variants, to detect, defeat, and neutralize IEDs. Together, we have tested integrated surveillance systems. We have adapted our test facilities and instrumentation. We have successfully developed joint proposals to enhance our collective abilities to ensure that systems are tested thoroughly and that we completely understand the performance and limitations. This is critical to ensure that the systems can be deployed and effectively used by Soldiers. These efforts have led to a range/instrumentation development program to enhance the capabilities at EPG and YPG. The first phase of the program is now fully funded and being executed by a combined YPG/EPG management team.

We continue to expand our partnership in many ways. For example, EPG now has a permanent liaison at YPG. We have successfully integrated this liaison with our organization and are at the beginning stages of expanded cooperation between test centers. Our collective goal with this integration is to provide a more robust test capability for our customers. For example, the air delivery mission is expanding into precision guidance, navigation, and control along with networked information management and command/control. YPG has great expertise in the aerodynamics of parachute systems and in the guidance and control of these systems. By leveraging the capabilities of EPG, we now have the capability to test the complete system. On another effort, the EPG lead brought YPG in to support its efforts for joint interoperability testing. These are two of many examples where a YPG/EPG partnership will pay great dividends for our customers.

Necessity drove us to team with EPG, and it is necessity that will keep this robust team focused on the future. Together, we will face new challenges and opportunities. We will each be able to support our standard customers better, providing a more complete test capability. Together, we will expand into new business areas. Together, we will help ensure that Soldiers receive equipment that is safe and effective.

(End)

Aerodynamic Analysis Test Methods for Personnel Parachute Systems

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US Army Yuma Proving Ground

In the analysis of requirements for new personnel canopies, many issues must be addressed so that a clear picture of canopy performance is presented. These topics include a logical understanding of user requirements, proper instrumentation choices, the development of appropriate test scenarios, and the accurate processing and display of data into a clear and informative format. For both round parachute canopies and gliding parafoil systems, instrumentation needs are for small, lightweight, and affordable data systems. Recent analysis techniques and instrumentation development efforts will be reviewed. This information was presented at the 18th American Institute of Aeronautics and Astronautics Aerodynamic Decelerator Systems Technology Conference held in Munich, Germany, in May 2005, by US Army Test Directors/Project Engineers Ryan Tiaden, Robyn Moskowitz, and Sam Kaesemeyer; by EC III Electrical Engineer Jason Swain; and by US Army Engineer Alan Hart. All are personnel working at the US Army Yuma Proving Ground (YPG).

The ATPS program has a performance requirement to "provide the jumper the ability to maneuver to avoid other jumpers and travel horizontally."

ATPS and SOFTAPS. The Advanced Tactical Parachute System (ATPS) is a complete system replacement for the US Army T-10D main canopy, reserve canopy, and harness. The Special Operations Forces Tactical Advanced Parachute System (SOFTAPS) is a replacement for the US Army MC1-1D that will use the harness and reserve canopy from the ATPS program. For ATPS and SOFTAPS, there are several key requirements that have driven the designs of the systems. These requirements are canopy control, canopy opening time, altitude loss to opening, and steady-state vertical descent rate. The ATPS program has a performance requirement to "provide the jumper the ability to maneuver to avoid other jumpers and travel horizontally." This brief statement does not clearly define what is required by the user as a capability of the system. The challenge was to decide what critical data were necessary for analysis and how to process the data into an understandable and useful format. The SOFTAPS program, on the other hand, has well-defined canopy control criteria. The user provided performance criteria for the forward drive and turn rate. The stated requirements were transitioned into a test plan that was able to produce the analysis and support the quick transition of the test program to operational testing. The primary lesson learned regarding requirements from both of these test programs is that canopy-control requirements must be well-defined early for any personnel parachute system.

Instrumentation. At YPG, there are four primary sources of instrumentation used to characterize personnel airdrop canopy systems: Kineto Tracking Mounts (KTMs), the Telemetry Measurement Unit (TMU) - 2, the WindPack, and the Personnel Instrumentation Package (PPAK). The dynamic performance of personnel canopy drops is measured using optical trackers called KTMs. Dynamic performance parameters include altitude loss, descent rates, and oscillation angles. Each KTM has a precision-tooled stabilized tracking mount with azimuth and elevation encoders sampled along with coordinated universal time once every video frame. The data are coded onto the edge of each video frame. At a minimum, three cameras are used to record the drops in order to generate time space position information data. For personnel canopy drops, four video cameras (30 frames per second) are used for optimum solution geometry and redundancy.

Figure 1. Riser Strain Link

For measurement of opening-shock loads, strain links fitted into the canopy risers of the system are used (figure 1). The strain links consist of a metal full-bridged strain patch and amplifier. To avoid running electrical wires down the jumper's arms crossing the canopy release for data recording (as was done previously with mannequins), a unique in situ telemetry unit was developed. The Hardened Subminiature Telemetry and Sensor System was a triservice program led by the US Army to develop a miniaturized radiofrequency (RF) telemetry system to fit in, and transmit sensor data from, the fuze of an artillery round. It was adapted into a usable system for YPG personnel parachute missions. The TMU-2 consists of three circular printed circuit boards, each measuring approximately 1.25 inches in diameter (figure 2). One board is a voltage regulator, one a pulse-code modulation (PCM) encoder, and one an RF transmitter. These circuit boards are stacked on top of each other and packaged in an aluminum can with connector interfaces on the top. The form factor of the

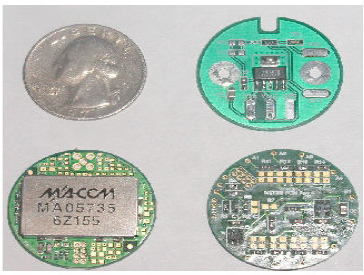

Figure 2. TMU-2

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Cold Regions Test Center

Linda Spears
Physical Scientist

Today, the importance of natural environmental testing is being driven home by real-world military actions in Iraq and Afghanistan. The future may take the American military to other areas of the world, and the Cold Regions Test Center (CRTC) is focused on providing technical test capabilities and services to ensure that military equipment operates in cold regions around the world. The CRTC realistically combines cold regions battlefield conditions of temperature and terrain, state-of-the-art instrumentation, and the technical expertise needed to guarantee adequate testing of today's sophisticated military equipment. This testing approach, centered on realistic operations in the natural environment and supported by expert capabilities, has made the CRTC the Department of Defense's premier cold weather test facility.

The CRTC is a highly flexible and dynamic test center with access to more than 670,000 acres

The CRTC is a highly flexible and dynamic test center with access to more than 670,000 acres of ranges on Fort Greely, Alaska. These ranges include 254,000 acres of impact area. The CRTC is also the designated user of the special-use airspace over these ranges. Ranges can easily accommodate test firing of extended range munitions, cross-country mobility over a variety of terrains, and simulated military missions (figure 1).

Figure 1. CRTC Range

The CRTC ranges offer a combination of climate, terrain type, and vegetation typical of a cold ecoregion. Alpine vegetation, tundra, and muskeg bogs can be found along with rolling hills, steep slopes, and cliffs. The winter climate is characterized by periods of below-zero temperatures that last from several days to several weeks with lows occasionally plunging below -60 °F. The region has an average annual snowfall of 52 inches, which remains through the winter with little or no melting and limited winter sunlight. Summertime temperate conditions with nearly 24 hours of daylight provide excellent conditions for testing in a moderate environment, yet year-round snow and ice fields can still be found at the highest elevations. The environment available for testing provides the synergistic effects of temperature, wind, snow, and terrain in a large controlled land and airspace range, truly representing the winter warfare environment.

To make full use of this demanding environment, the CRTC offers support facilities, cross-country trails, direct and indirect fire ranges, assault strips, drop zones, instrumentation and network support, full-time meteorological support, and, most importantly, a professional staff, qualified and experienced in technical fields and cold weather operations—people who live and work in the cold environment.

The Bolio Lake Test Complex is a secure complex that contains administrative facilities as well as a dining facility and barrack-style lodging for as many as 72 military personnel, a cold-start facility, audiovisual and technical editing support, network operations, and cold and warm storage facilities. The CRTC also operates an ammunition supply point on the range and a large maintenance facility, fabrication shop, and instrumentation facility on the cantonment area of Fort Greely.

Figure 2. Mobiliy Test Complex

The CRTC has developed a mobility test complex to complement existing cross-country trails. This complex consists of a 3.2-mile paved oval test track, skid pad, slopes, lateral acceleration pad, split-Mu (friction) course, as well as maintenance and office buildings (figure 2). The test track is designed to accommodate a 20-ton

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YPG Invents Safer and More Efficient Mortar Clip Device

Yolie Canales
Public Affairs Specialist

An employee at the US Army Yuma Proving Ground, who was grievously injured several years ago while operating a mortar, did a great deal of soul searching, wondering if a safer way of loading and firing a mortar could be developed for test purposes. The result was the formal establishment of a team of employees to develop a new mechanical mortar clip to replace the older, less reliable version.

"The objective of the new design is to prevent the cartridge from slipping prematurely while a gunner positions the round on top of the muzzle in preparation for firing," said Wayne Schilders, Chief of the Weapons Operations Division. With the old clip, the gunner could only see the nose of the round protruding from the tube. This new clip closely simulates how troops in the field use mortars, instead of hanging it by the fuze as with the old clip.

The invention was the result of a team effort (figure 1). Larry Bracamonte, Chief, with Johnny Clark, test director, who oversaw the majority of the simulation. Tim Knabel, engineer, designed the new MRD and made the necessary changes, and Red Phillips was a consultant for EC III.

During testing, a template with spacers is used to make height adjustments for different projectiles. Gunners use this template to make sure they secure the round in the right location. "The purpose for using this method during testing is because in test and evaluation, we have to do the operation to simulate what they do in the field," said Bracamonte. For gunners, this new MRD is far safer and more efficient than the old clip because there was a problem with inadvertent drops before the crew was ready and under adequate cover.

Clip improvements went through several versions. "It took awhile until we came up with a device that simulated gripping the projectile like a real hand," said Clark.

"We went through lots of trial and error. We had to get lots of feedback from the gunners, such as what they liked and disliked," said Knabel. "The first couple of versions weren't perfect. There were times it took three versions before something actually worked. We'd sit down and have reviews and go over the design," he said. He went on to say that the gunners were the ones with the most important input and that the new clip simulates how the Soldier would hand-drop it, which includes the length of the drop, time, and speed.

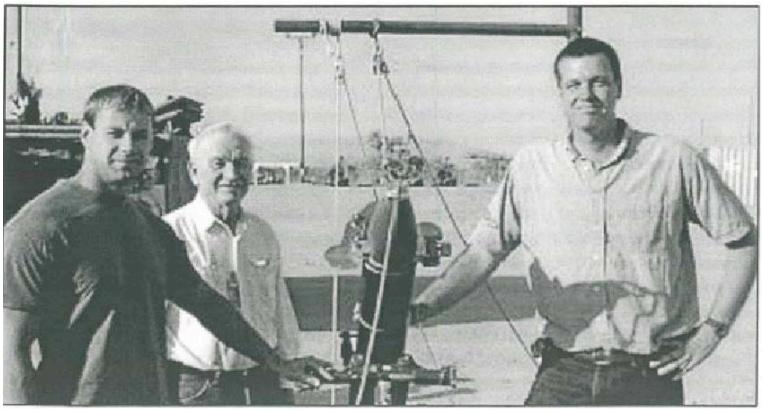

Figure 1. Left to right: Tim Knabel, Red Phillips, and Johnny Clark. In addition to Larry Bracamonte, Wayne Schilders made the necessary changes. Red Phillips was a consultant for EC III.

Replacing an old mortar clip used for more than 20 years is the new mortar release device (MRD). Unlike the old clip that fastened to the side of mortar rounds through the fuze wrench slots, the new one is attached by way of a small rod inserted into a hole in the fuze, which actually clamps to the projectile body. The new device works for all standard caliber mortars: 120, 81, and 60 mm.

Mortars and Mine Branch, Munitions and Weapons Division, and Schilders worked

"The objective of the new design is to prevent the cartridge from slipping prematurely while a gunner positions the round on top of the muzzle in preparation for firing,"

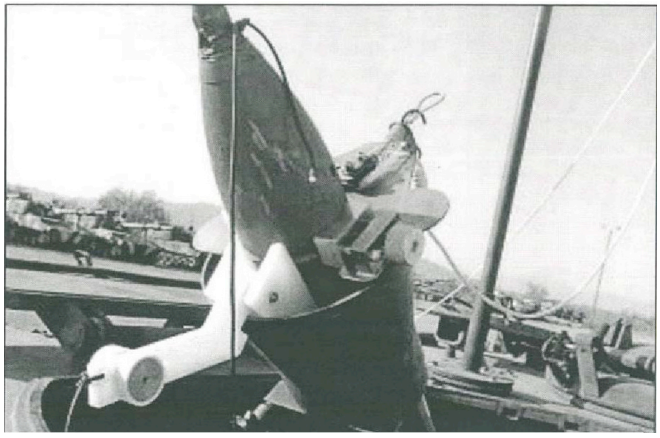

Figure 2. MRD holding an inert 120-mm mortar round at the muzzle of the tube.

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Leveraging Testing and Training: A Challange We Are Winning

LTC Shane Dietrich
Commander,
Yuma Test Center
and Mr. Hugh Lottinger
Chief, Range Operations
Yuma Test Center

The vast arid terrain and restricted airspace of the US Army Yuma Proving Ground (YPG) have never been more relevant and attractive to test weapon systems and to train deploying forces than now. Since the beginning of Operations Enduring Freedom and Iraqi Freedom, the airspace and ranges at YPG are busier than ever (figure 1) with an unprecedented demand for better airspace management and control of personnel downrange.

YPG has seen a steady increase in training activities over the past few years. Many testers are of the mindset that testing and training do not mix.... We believe that they can coexist and complement each other

YPG has seen a steady increase in training activities over the past few years. Many testers are of the mindset that testing and training do not mix. Every conflict between a test activity and training event is one more reason fueling that belief. However, we believe that they can coexist and complement each other—if done correctly. A few of the testing and training activities that currently coexist at YPG include the following:

- The realistic urban environment at the Joint Experimentation Range Complex (JERC) for counter-improvised explosive device (IED) technology testing and unit training.
- Nineteen squadrons of fast movers within 100 nautical miles of Yuma, Arizona, routinely using YPG-restricted airspace.
- Predeployment exercises for Marine Wing Support Squadrons.
- The Special Operations Terminal Attack Controller Course (SOTACC) to train special operations forward air controllers.
- Special Operations Forces Military Freefall School.

Figure 1. Ranges at YPG

- Unmanned aerial vehicle (UAV) operations.

It is more important now than ever that we safely manage the increased growth in airspace activity and the growing number of personnel on the range. Range control at YPG has focused very well on range management, but it became clear that as the SOTACC and UAV missions grew, a gap existed in visualizing the three-dimensional air picture. What if we were to incorporate aviation expertise into range control?

We selected a Marine Corps aviator and operations officer, with airline experience, to serve as a range operations manager. After a year of hard work, the results are evident. We have improved coordination and briefings to the aircrews participating in testing and training, improved relationships and coordination with range scheduling and air traffic control personnel at Marine Corps Air Station Yuma, and improved YPG range operations with the YPG Air Combat and Soldier Systems Test Directorate.

Situational awareness with training units maneuvering downrange has vastly improved by increasing range control staffing and adding other control measures, which are a necessity given that 1,200 Soldiers and Marines are on the ground up to six times a year and more than 100 visiting test customers on most days (figure 2).

Leveraging testing and training is a means to maximize available resources. Mr. Walter Hollis, Deputy Under Secretary of the Army, Operations Research, was the emphasis behind our initial effort to collect and display instrumented data into the YPG Distributed Test Control Center from Multiple Launch Rocket System platforms participating in the successful XVIII Airborne Corps Joint Air Ground Center of Excellence exercise more than a year ago. However, most of our successes are due to the efforts of our determined test directors and project engineers coordinating (on their own) with available training activities.

Figure 2. Foward Operating Base

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Adapting to a Changing Threat Is a Team Effort

(continued from page 2)

2004, 14 days after work began, 1.5 miles of paved roadway with specific features such as guardrails were ready for testing of systems designed to detect and defeat IEDs. Construction continued while testing was under way, and 28 days after starting, a robust test capability had emerged. This test range encompasses 14.1 miles of roadway and more than 240 buildings, providing a wide representation of urban and rural environments experienced in theater (figure 3). The urban area represents portions of Baghdad, Iraq, and possesses specific features that allow us to mimic techniques used by insurgents for attacks against our forces.

This capability has supported the evaluation of more than 150 different technologies for detecting, defeating, and neutralizing IEDs to date.

This capability has supported the evaluation of more than 150 different technologies for detecting, defeating, and neutralizing IEDs to date. We have seen many systems that had little or no potential to support our forces, and these were discontinued. Many demonstrated great potential and were modified until their performance provided an appropriate margin of protection or a new capability.

The efforts for the Combating Terrorism Technology Task Force against IEDs are unique in that private industry is encouraged to test ideas and systems at minimal cost. This concept facilitated assessments of technologies from all facets of industry. In addition, we have successfully reduced our test data analysis processes to provide nearly instantaneous answers to decision makers. Fielding decisions can now be made in days instead of months.

At other locations within YTC, efforts continue to expand into the test and evaluation of integrated surveillance systems. The most notable system tested was the Persistent Threat Detection System, which provided new surveillance sensors and platforms integrated into a command and control system. Under normal conditions, a system of this complexity would have been tested over several months or even a few years to fully identify system safety and performance. However, the Department of Defense (DOD) team executed a robust test effort in under 45 days to include making system modifications throughout the test effort to enhance capabilities for the Soldier.

Figure 4. LCMR

Other activities included the development and testing of the Lightweight Counter Mortar Radar (LCMR), which is a compact radar with the unique ability to locate firing systems over a 360-degree span (figure. 4). Testing at YTC led to the successful fielding of the LCMR. We are currently supporting the production acceptance testing.

Many other initiatives for complete integrated force protection and early warning systems are being tested. For example, the Counter Rocket, Artillery, and Mortar System is currently under way with the goal of providing our Soldiers with early warning and interdiction of enemy indirect fire.

The development and test teams continue to dedicate their lives to ensure that our Nation's Warfighters have the capabilities they need to execute their missions. They continue to work diligently testing, improving, and fielding systems. Testing continues with our workforce exerting extraordinary efforts, often working 16 hours a day, 7 days a week, with multiple shifts. Many organizations are involved including the Naval Explosive Ordnance Disposal Technology Directorate, Naval Air Warfare Center; the DOD Combating Terrorism Technology Task Force; US Army Rapid Equipping Force; US Army Electronic Proving Ground; US Army Developmental Test Command; US Army Test and Evaluation Command; and numerous others. These professionals, teamed with the men and women from YTC, continue to dedicate their personal lives for the welfare of the Soldiers in the field who are making amazing sacrifices to protect the freedoms of this great Nation.

(End)

YPG Hosts Vehicle Technology Demo

(continued from page 3)

In the months since the demonstration ended, the EMIP process is ongoing. The PM office has continued to observe technology presentations around the country by vendors who were unable to attend the January 2005 event at YPG, and the YPG administrative and planning team continued to refine the processes that were used to prepare for the next demonstration in January 2006. One lesson learned was that a number of the vendors had a limited understanding of what YPG is or what capabilities were available. This led to complications when vendors wished to change their demonstrations after they arrived because they had a better understanding of what was available. In addition, a number of vendors were unclear about the overall EMIP process, both what was required from them and what they could expect in return. In response to these issues, the PM-TV sponsored an Industry Day in May 2005 in Warren, Michigan, to brief future potential demonstrators on EMIP. Personnel from YPG were invited to attend, and the capabilities of YPG were presented along with highlighted areas where vendors should focus attention during the planning stages for demonstrations. More than 100 vendor representatives were present.

Planning and coordination between YPG and the PM office was ongoing and it continued through the Component Technology Demonstration which took place January 23–26, 2006. Someday soon, young men and women will be driving around thebattlefields of today and tomorrow in the US Army TWVs made better by technologies that were first seen by US Army management under the clear skies of Yuma, Arizona.

(End)

(continued from page 5)

TMU-2 is comparable to a 35-mm film canister, requiring only external power, sensors, and an antenna for operation. The system is capable of encoding eight 0- to 5-volt analog inputs into one PCM stream. The output from the strain links is transmitted by the TMU-2 to a ground station for recording. The advantages of a TMU-2 compared to a traditional recorder on the jumper are weight and safety. The

Figure 3. YPG WindPack

TMU-2 weighs only a few ounces and is small enough to be located on the riser with the strain link.

The WindPack (figure 3) is a YPG-developed instrument package that contains a differential Global Positioning System (GPS) receiver and memory card to record position and velocity as it falls under canopy. The canopy used is an extremely stable trilobe design, and the entire package is weighted to 22 pounds to match typical personnel canopy descent rates. To measure the wind characteristics (horizontal and vertical components) of the same column of air as the article under test, the WindPack is dropped immediately after the test load. The WindPack data are used in post-processing to subtract out the winds to produce a no-wind trajectory. A previous study comparing WindPack data to a 3-degrees-of-freedom simulation verified the inertial effects of the WindPack to be negligible within the error accuracies of the test, thus allowing the WindPack to operate as a truth source.

The PPAK is a YPG-developed instrument system that contains a carrier-phase differential GPS receiver and memory card to record position and velocity of the jumper's fall under canopy. The system also contains a digital compass to record the jumper's heading. With these data and other data sources, the jumper's position, altitude, velocity, heading, no-wind corrections, and jumper canopy control can be correlated. The jumper's trajectory can be plotted, and the effect of a canopy control input can be measured.

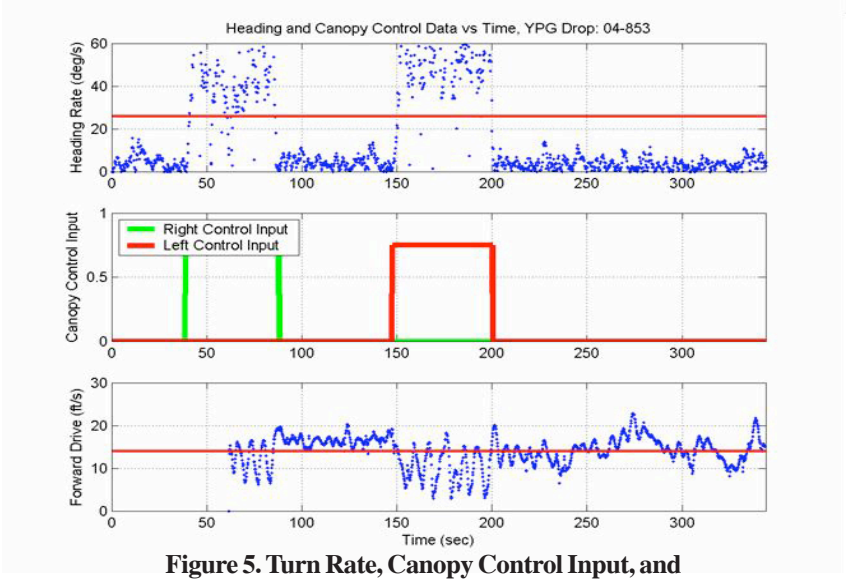

Figure 5. Turn Rate, Canopy Control Input, and Forward Drive of the System in a No-Wind Condition

Data Analysis. A plot of the horizontal velocity components (north and east) of a jumper's trajectory in a wind (blue) and a no-wind (red) condition is shown in figure 4. The gliding characteristic of a vendor's candidate for the ATPS main canopy is indicated by the donut shape of the no-wind data: the data are never zero and always of about the same magnitude, indicating there is always a positive glide.

Also correlated in time and altitude to the trajectory data are the jumper's heading and turn rate. This was an important data set for SOFTAPS because of performance requirements for the turn rate and descent rate of the jumper when flying into the wind. For determining the jumper's heading with respect to the wind, the difference between the jumper's PPAK digital compass and the Windpack's horizontal velocity vector was used. A strip chart presenting the jumper's heading rate, jumper canopy control input, and forward glide, or drive is shown in figure 5. The resulting performance due to the SOFTAPS canopy control inputs was observed, and a clear correlation to the performance requirements was demonstrated.

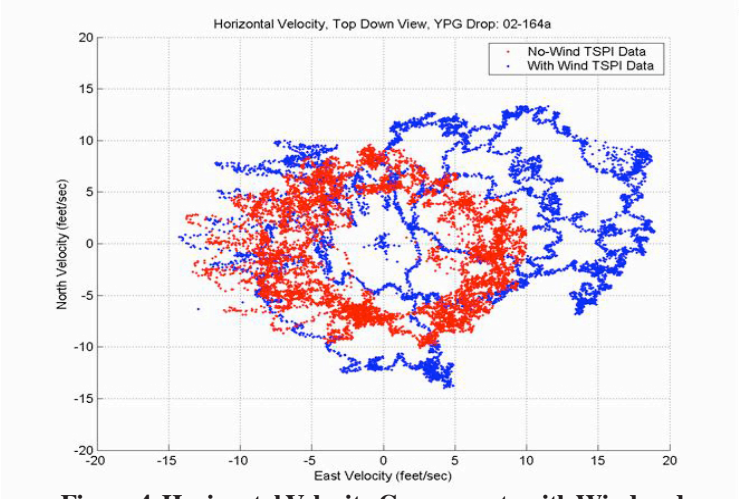

Figure 4. Horizontal Velocity Components with Wind and with Wind Removed

Conclusions. When testing personnel or cargo parachute systems, many system performance characteristics must be well understood as well as the overall reliability of the system. Great attention must be paid early in a test program to the definition of performance requirements to ensure they are measurable and testable. The

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Cold Regions Test Center

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vehicle traveling at 82 miles per hour. Cross-country and small unmanned vehicle test courses will also be incorporated into the mobility complex.

provides an opportunity for testing at an accelerated pace. Similarly, programs such as the Marine Corps Expeditionary Fighting Vehicle and the Mongoose Minefield Breaching System find the

Figure 3. Stryker Vehicle at CRTC

All CRTC facilities and commonly used ranges are connected via high-speed network with access to the Defense Research and Engineering Network, the US Army Test and Evaluation Command Test Integration Network to support distributed testing, and the University of Alaska Arctic Region Supercomputing Center.

The CRTC has tested everything from clothing designed to keep Soldiers warm in the coldest temperatures to cutting-edge vehicles and weaponry. When using Soldier-operators whenever possible, the CRTC has provided data and information that improved Army equipment and made it more effective for cold weather performance. Changes to equipment may be simple, such as rerouting a heating duct to improve performance of the rotary steering assist on the Stryker vehicle (figure 3) or complex, such as changes to software algorithms to improve vehicle recognition on the Wide Area Mine. In addition, the CRTC has suggested changes to tactics, techniques, and procedures with respect to warmup procedures at startup when temperatures are below 0 °F.

Although often only considered because of ideal cold conditions, the area, in fact, offers all the advantages of several natural environment types, which include warm (as high as 90 °F) summertime temperatures, spring and fall transition seasons, lakes, rivers, and riparian environments. As an added benefit, around-the-clock summer sunlight ability to continue testing through winter and into spring with the availability of running rivers, frozen soil, and snow appearing in order to realistically assess the capabilities of the system.

This environment provides a clear-cut opportunity to combine testing and training. As the Army embraces the benefits of doing this, the CRTC is positioned to support the concept with the facilities, ranges, and testing experience needed.

(End)

YPG Invents Safer and More Efficient Mortar Clip Device

(continued from page 7)

According to Schilders, Bracamonte, and the gunners, they have been happy with the new device. “We are pretty satisfied with the smaller caliber mortars, the 60 and 81 mm, so far. They seem to work very well,” said Carlos Padilla, artillery tester, adding that it is much safer and more efficient. “We just have to make sure that we tighten it properly. Everything has to be constrained, and with the help of the second gunner, everything is tightened up and there are no gaps before we fire the projectile.”

There is still a problem with the 120-mm mortar. It uses a heavier projectile and mechanically is taking more trial and error to figure out, according to the team.

“However you look at it, this is an improvement over the old system from a safety and testing standpoint,” said Bracamonte. Perhaps the new device may become obsolete in the near future, because the team is open to new ideas and sees many opportunities for improvements. “Safety is the number one priority for the gunners and that is our main goal,” said Bracamonte.

Time will tell which parts will wear out. It is the members of the gun crews that will determine which parts need replacement. “We are depending on them to keep us informed of any discrepancies they may encounter,” said Bracamonte.

The MRD is something the team at YPG designed and developed. (Figure 2) The gunners tested it, and their input played a big role in the final product. “Basically, this device is not found at your local Sears or Wal-Mart. It is a gunner tool,” said Schilders.

The new device has been shared with YPG’s counterpart, US Army Aberdeen Test Center, located at Aberdeen Proving Ground, Maryland. “We have shared with them how we came up with the design and what the results have been so far,” said Bracamonte.

“For us, it means it’s a safer clip and, as I said before, our number one priority is safety. What we do out here is dangerous,” continued Bracamonte. “Our Soldiers aren’t going to get equipment and munitions until we put our stamp of approval (on them).”

“We went through lots of trial and error to figure this one out,” said Bracamonte. “It took us an entire year, but we got there.”

(End)

Leveraging Testing and Training: A Challange We Are Winning

(continued from page 8)

Several excellent examples include the following:

- Coordination with SOTACC to divert available orbiting F-18 sorties to provide the Counter Rocket, Artillery, and Mortar test team the necessary fixed-wing aircraft required to evaluate software performance in distinguishing aircraft from threat mortars and rockets.
- The use of deploying Special Operations Forces (SOF) and US Marine unit UAV training to

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Aerodynamic Analysis Test Methods for Personnel Parachute Systems

(continued from page 10)

development of appropriate instrumentation can assist in measuring the test variables.

Postscript. The Precision Airdrop Technology Conference and Demonstration (PATCAD) was created to provide a forum for the international air delivery community to share experiences and technologies as they apply to precision-guided airdrop. The intent of this forum is to encourage communication and collaboration between companies working with common technical requirements. The first biennial conference was held at YPG on September 11, 2001. In 2003, 230 participants attended from 11 countries. From October 17–20, 2005, the 3rd PATCAD sponsored by the US Army Natick Soldier Center and North Atlantic Treaty Organization was held at YPG.

(End)

Leveraging Testing and Training: A Challange We Are Winning

(continued from page 11)

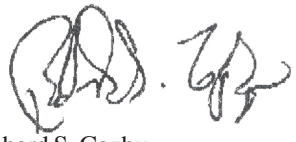
support sensor work at the JERC site.

- The use of the JERC facilities and IED threat devices to train deploying convoys on a noninterference basis with testing.
- The opportunity for SOF snipers serving as instructors at the YPG-based Department of Defense Military Freefall School to get familiarized with the XM-8 while providing feedback to the project manager after formal testing.

In the future, as more test personnel experience the benefits of coexisting with training, we will see an increase in the number of leveraged training and testing activities. As successful testing and training activities occur and relationships grow, planned and coordinated use of training resources will allow for greater use of onboard instrumentation and true integration of training activities into test events.

(End)

FOR THE COMMANDER:



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