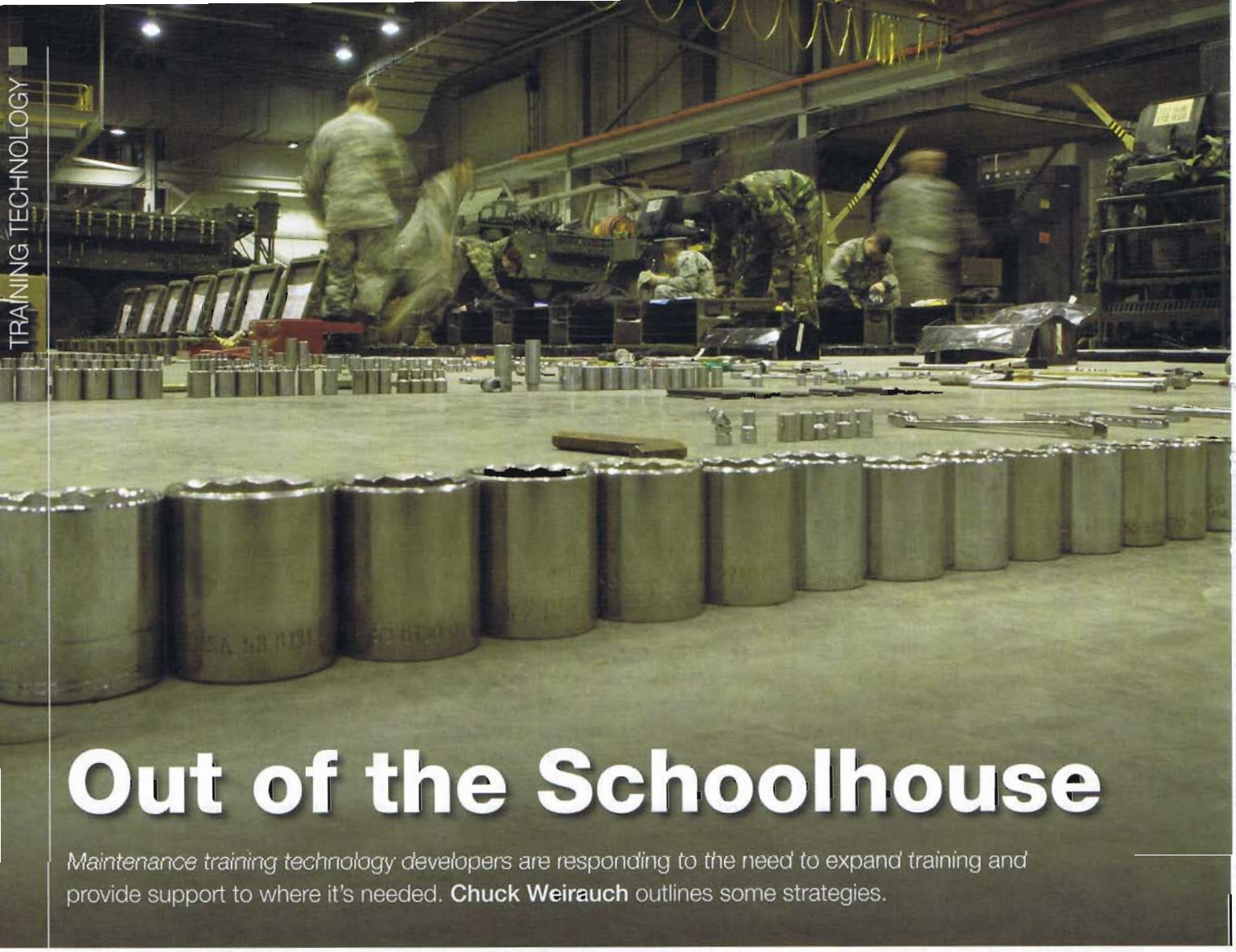

Out of the Schoolhouse

Maintenance training technology developers are responding to the need to expand training and provide support to where it's needed. **Chuck Weirauch** outlines some strategies.

Military systems and equipment are becoming more and more complex and sophisticated, and so are the skill sets maintainers need to diagnose, troubleshoot and repair such hardware, which poses a challenge. Compounding this challenge is a shortage of skilled maintenance personnel. Faced with these challenges, the US military is shifting to of a broader systems knowledge approach for maintenance trainees rather than a traditional platform-specific one; is trending away from large, high-end simulation-based trainers to more desktop and part-task trainers; and providing more mobile training in the field via Web-based courseware and the porting of courseware to mobile devices such as iPads, iPhones and tablet computers.

A Growing Need

According to Joe Labalbo, Deputy Product Manager for the Ground Combat Tactical Trainers (GCTT) division of the US Army's Program Executive Office for Simulation, Training and Instrumentation (PEO STRI), the service is looking for skill-based maintenance training solutions that are less systems-specific, with a broader application so that maintainers would be able to fix anything in a product line, for example. The Army's Combined Arms Support Command (CASCOM) Sustainment Center of Excellence is in the process of developing such courseware, he pointed out. Overall, the Army is moving away from big, expensive hands-on trainers and more towards desktop and part-task trainers, Labalbo said.

"With skill-based training, it just makes more sense to train theory as opposed to the 'this is the specific platform brake assembly that you are going to be working on' approach to maintenance training," Labalbo pointed out

And that approach will become more critical when manufacture soon ceases for the current production variants of the Abrams tank and Bradley Fighting Vehicles, and next-generation variants feature even more sophisticated operational systems. One answer to this problem is that these new variants will have advanced embedded diagnostics technology for training maintainers, Labalbo said. The result is that there will be less interest and funding for maintenance training solutions for these vehicles in the near-term, he added.

However, the Army's wheeled vehicle fleet will be getting much more attention, with a variety of part-task maintenance trainers for Tactical Wheeled Vehicles (TWVs) for electrical and braking systems potentially being funded

Above
The U.S. military is facing a shortage of skilled maintenance personnel.
Image credit: U.S. DoD/Myles Cullen.

within a year or two, Labalbo reported. PEO STRI also hopes to gain funding for MRAP vehicle fleet suspension and automatic fire suppression system maintenance trainers in the near future.

Distributed

The Research Triangle Institute, or RTI, Inc., is the Army's prime contractor for the Army's Abrams, Bradley and High Mobility Artillery Rocket System (HIMARS) maintenance programs. According to RTI VP for Training, Sam Field, one of the latest maintenance training trends is the porting of courseware to the Web and hand-held and mobile devices, something his firm is in the process of implementing. With the aid of 3D simulation via these media, maintainers can do the same job and practice the same skills that they could in more fixed training devices, he explained. Providing such training to maintainers in the field is becoming more important as maintainers have less time to do more, Field pointed out.

"One of the challenges is that we are asking these individuals to handle a broader array of tasks on a variety of systems that are changing more rapidly, and they are really not going to have the time to come back to a brick-and mortar institution to take a systems-specific course," Field said.

"We have to get these maintainers to the point to where they have become self-motivated and effective mentors of their own instruction and abilities, knowledge and skills, and they really understand the theory behind the systems," Field continued. "Another industry challenge is how we get them through the novice stage to a better level of understanding very rapidly so that when it comes to the time to apply their skills to a different context or different equipment, their skills and confidence are readily portable to the new situation."

3D

One training provider that is developing maintenance training courseware that can be delivered to the field via the Web and mobile devices is San Francisco-based Heartwood, Inc. The company's business approach to providing 3D virtual training courseware is to "author once, deliver many ways" to enable training anytime, anywhere on any device.

One of the company's most recent Web and mobile-device-delivered solutions as a vendor to Raytheon Integrated Defense Systems is a virtual maintenance part-task trainer for the Patriot ballistic missile radar system. Under Raytheon's Patriot contract, the PC-based trainer has recently been delivered to the Army's Fort Bliss, TX schoolhouse, where it is currently undergoing evaluation by the Army. The PC game-based trainer employs the Unity gaming engine and is a part of the Patriot Multi Echelon Training System that Heartwood has submitted to the GameTech 2011 conference awards competition.

According to a Heartwood release, previously maintainers read manuals and watched videos of others performing repairs to learn how to troubleshoot and repair the radar system. The game based trainer allows users to learn by doing; clicking on 3D simulations to open panels, make electrical connections and learn correct maintenance procedures while being provided with audio and on-screen written instructions. The radar maintenance trainer has been ported to iPads and other hand-held devices so that maintainers can easily access the system for refresher training in the field after they complete the course.

"Definitely retention rate is increasing, sometimes doubling for our customers, since the maintainers are actively involved with the equipment through 3D simulation," said Heartwood Cofounder and VP for Sales and Marketing Neil Wadhawan. "Today's soldier does not focus by reading all the time. This technology also helps pass on such systems knowledge to the next generation of maintainers."

According to NGRAIN CEO Paul Lindahl, his company has recently been involved in delivering maintenance training to the field through various 3D simulation-enhanced training courseware programs. The most recent effort this January is the delivery of two Virtual Task Refresher (VTR) solutions to the US Naval Surface Warfare Center (NSWC) as part of the SAIC team. The VTR solutions will provide the Joint Forces Training and Support Branch with highly detailed vehicle parts and procedure familiarization and be designed by NGRAIN to provide vehicle operators with the information they need to perform critical field expedient repairs during field operations.

The VTR solutions will be provided to the NSWC schoolhouse as classroom courseware. They will then also be distributed to vehicle operators in the field through the NSWC's online Learning Management System and ported to Toughbook laptop computers. Using the laptops, maintainers will use them as guides to perform repairs on vehicles during field operations.

"Currently there is no schoolhouse training available at the level that is needed because of the number of vehicles that are being fielded," Lindahl said. "Such issues are being created by operational tempo in Iraq and Afghanistan, in particular, where the maintainers are involved with equipment that they have never even seen before. So we have taken the 3D simulation technology, made it very nimble, and taken it to the field. "

Another recent NGRAIN 3D maintenance training course destined for use in the schoolhouse and in the field, this time by the US Army's Transportation School at Fort Eustis, VA is the Virtual Task Trainer (VTT) for the P-100 diesel pump system. This trainer will allow maintainers to virtually practice the installation, maintenance and repair of the pump. The Army will be distributing the VTT to other schools and to units deployed in the field in various formats and online. There are perhaps more than 17,000 of these pumps deployed at various locations, Lindahl said.

Above
3D courseware – virtual maintenance part-task trainer for the Patriot ballistic missile radar system.
Image credit: Heartwood, Inc.

"What is happening in the military around the world is a shortage of skilled workers," Lindahl said. "They have to do more with less, and they just don't have the skill sets. So the people who are doing the maintenance are much less specialized than they used to be. So what you do is provide them with training in the field if they are unskilled in maintaining the equipment."

Reconfigurable

At I/ITSEC 2010, Kratos Defense & Security Solutions introduced what the firm believes is a new concept, a reconfigurable maintenance trainer. The Maintenance Blended Reconfigurable Avionics Trainer (MBRAT), reflecting a rotor craft's instrument panel, consoles and overheads using a blend of computer touch screens alongside physical controls, is designed as a part-task rotary aircraft systems trainer for maintenance personnel. The MBRAT was developed by DEI Services Corporation, which was acquired by Kratos last year. The initial MBRAT employs UH-60 Blackhawk avionics software, but the trainer is designed so that it can be reconfigured with other rotary wing aircraft packages such as the CH-47 Chinook and other helicopter types employed by the US Army. While the MBRAT currently hosts avionics systems, it can also be configured with aircraft electrical systems packages.

According to Jose Diaz, Kratos/DEI VP, the MBRAT fits into the 'walk' phase of Army training, a step beyond desktop trainers and before high-fidelity full-flight simulators. The MBRAT allows maintainers to master the more complex aircraft systems and understand the full operational capabilities of the rotary wing platforms while developing the ability to maintain, troubleshoot and repair the systems without tying up the high-end FFS, he explained. DEI has developed common software for the MBRAT that was derived from other training systems the company has provided for the military, providing a cost-savings advantage, Diaz pointed out.

"Platforms have become more and more complex, and onboard systems more integrated with each other," Diaz said. "So a much higher level of maintenance training is required now as systems become more and more sophisticated, and more time is needed to master maintenance skills."

3D Stereo Projection

Also at I/ITSEC 2010 was Christie Digital's Christie HoloStage Mini projection display system configured to be utilized as a maintenance trainer. The Holostage projected a 3D stereoscopic image of an Army vehicle engine. Featured were a head-tracking device to monitor the user's eye points of focus and an optical tracker to monitor the user's hand and finger movements while the person manipulated the projected 3D engine parts. While the HoloStage is a projection system and not a maintenance trainer per se, the exhibit showcased the system's capability to be employed for that function.

According to Dave Kanahele, director of Christie's Simulation Solution Management, another maintenance training application might be a 3D stereo projection of an F-22 jet fighter engine, for example. The HoloStage Mini system can be employed for several other maintenance training applications according to customer needs and requirements, he pointed out. Christie considers maintenance training as just one area where 3D stereo projection technology can be applied to enhance training effectiveness and reduce training costs, he added. ms&t