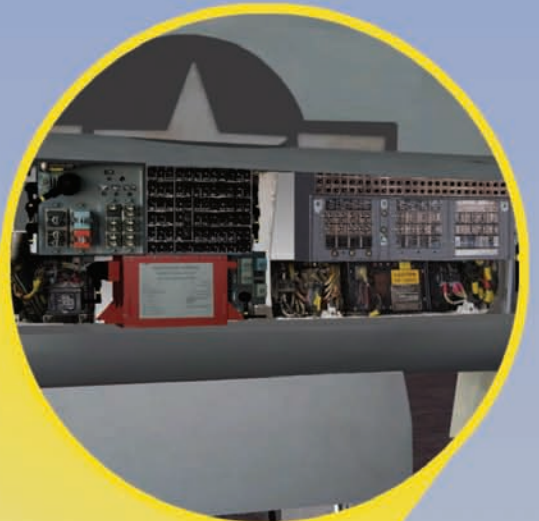
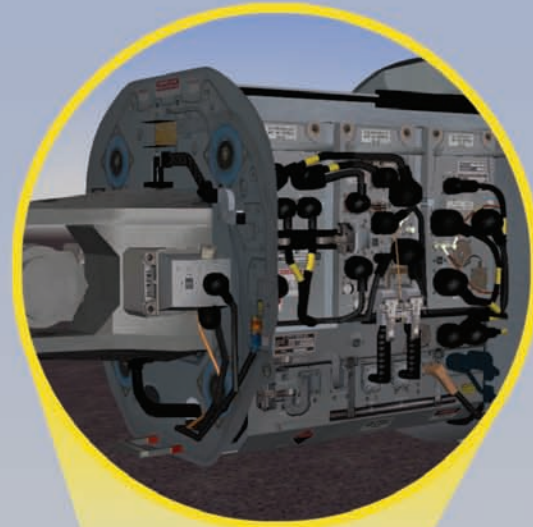


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**Maintenance
Training**

**US Simulation &
Training Industry**

**Training the
Military Driver**

**Simulator Upgrades
& Support**





(Source: US Navy)

Modern training technologies are having a major impact on maintenance training. Trevor Nash takes a look at what industry has to offer and what military forces are opting for.

Seldom considered glamorous, the maintainer is the oil that keeps the military machine functioning. Take away the maintainer and the military machine will grind to a halt.

It is hardly surprising therefore that the training of maintenance personnel is of key importance to the military's ability to remain combat effective in both peace and war. Increasingly, sophisticated platforms demand a maintainer that is able to support equipment under a wide range of conditions. For example, twenty years ago, when effective night-fighting capability was a mere dream, maintainers used the night hours to repair and prepare equipment for the next days operations. Today with the ability to fight the 24-hour war, this luxury has gone.

But it's not just the 24-hour war that has changed things. Today's generation of young men and women that have graduated or who are in the process of being trained as maintenance personnel are different to their forbears. They are highly computer literate

and demand a training regime that addresses this. They also demand an engaging and entertaining training regime. After all, if they have been brought up on X-Boxes, why should they take a retrograde step when it comes to the training environment and the training processes used in that environment?

Before looking at some of the new technologies to train the maintenance technician, it is worth pointing out a number of other dynamics that have changed over recent years. Historically, a weapons platform would be procured and then training issues addressed post-purchase. This training would be prioritised with the operational users taking the lead and maintainers coming a poor second.

This situation has now largely changed, led by programmes such as the F-22 Raptor in the US. From a very early stage, training equipment, courses and procedures for aircrew and maintainers alike, was specified and defined. The result has been that companies such as Boeing and Link have delivered

training equipment long before the aircraft enters operational service. This equipment includes multimedia CBT, 3D mock-ups of specific elements of the aircraft and classrooms for the electronic delivery of courseware. These training elements are encompassed in an extremely sophisticated Training Management System (TMS).

Another factor to emerge over recent years has been the military approach to the long-term professional development of the maintainer. This development not only covers the maintainer's career in the military but also the preparation for a career outside the military. In the UK this approach sees service personnel gaining civilian engineering qualifications as part of their service qualification whilst in the US, this has gone a step further through the award of a Federal Aviation Administration (FAA) licence.

Around four years ago, the US Air Force hosted the inaugural Tiger Team meeting at Luke AFB. Subsequently touring a number of USAF, US Navy, US Coast Guard, Army and

Army National Guard aviation bases, the Tiger Team was looking how to use military training to help service personnel gain the FAA's Airframes & Propulsion (A&P) licence for use outside the military. Despite some early problems, the DoD is now providing the US aviation industry with a large number of commercially qualified A&P technicians.

One of the major changes to maintenance training to occur over recent years has been the move away from using real equipment to simulated systems. Historically, the under funded maintenance training regime was populated by training systems built from real equipment. Cut-away equipment, working models and disassembled components were all that the trainee technician had to train on.

Today, processing power and improved graphics have provided a digital environment in which the computer provides 3D dynamic training on the desk-top. But has this meant the end for the real platform or real component parts? It would appear not as even with the state of the art F-22 training system, the USAF are now using one of the original flight programme test aircraft for maintenance training.

In April, a former flight test F-22 landed for the last time at Eglin AFB in Florida to become a maintenance training aid. Captain William Cooke USAF is the 325th Maintenance Operations Squadron Maintenance Training Flight Commander at Eglin.

Form Fit & Function

"Previously, the 43rd Aircraft Maintenance Unit was required to provide an operational

F-22A for maintenance training," says Captain Cooke. "Access to several components required removal of panels that must be replaced through a lengthy recovery process, which led to significant aircraft downtime. This (ground instructional trainer aircraft) will significantly reduce those requirements and allow more aircraft availability for the 43rd to accomplish flight training, while allowing maintenance training simultaneously."

Considering the high-tech nature of F-22 training delivered on a suite of new training equipment, it may surprise some that the USAF still opts for an actual aircraft on which to train. On the positive side of the equation, accessing Line Replaceable Units (LRU) on a real platform provides the student with a real idea of form, fit and function and some of the difficulties in accessing components and replacing them. Some argue that the scraping of knuckles cannot be replicated on a computer screen (see Boxed Text).

On the downside is the cost of maintaining the platform current with front line platforms. When training on operational equipment there is also a massive cost involved in terms of damage and the unavailability of the platform for operational needs. It is perhaps no wonder that desk-top or hybrid desk-top and 3D mock-ups are now being used more frequently either to replace real equipment or to prepare technicians better so they spend less time on the real equipment.

"Although I can see a need for exposing the student to the real platform," explains VEGA's Alex Lever, "synthetic or emulated maintenance training is reducing in cost whilst

CH-47 MAINTENANCE TRAINING

Boeing has received a \$1.7 million contract from the U.S. Army's Aviation and Missile Command to transform a retired CH-47D Chinook helicopter into a maintenance training device.



"The new trainer will improve Army maintenance effectiveness by adding the ability to insert simulated 'faults' or 'malfunctions' into maintenance training," said Michael McGaugh, director of rotorcraft training for Boeing Integrated Defense Systems. "This is designed to enhance diagnostics and problem-solving skills for Army technicians."

Boeing will deliver the training system, which includes an instructor operator station as well as hydraulic and electrical power systems, to the US Army National Guard's Eastern Area Aviation Training School at Fort Indiantown Gap, Pennsylvania, in March 2008. The system will support the school's training programme for Chinook helicopter maintenance technicians.



fdsf
fdsa
(Source:)

functionality is increasing. Such systems help to prepare the student before moving onto the real equipment."

US Army Experience

Earlier this year, the US Army's Transportation School at Fort Eustis in Virginia, selected NGRAIN to supply desktop 3D interactive training for its Detroit Diesel 12V71 engine course. In describing how the new system is being used, Joe Thornton, Chief Maintenance Terminal Department at the Transportation School says, the "school is able to enhance existing training and significantly improve students' base knowledge of the 12V71 engine prior to physically working on it."

The self-paced or instructor led training system is also available on CD-ROM to allow students to take training with them into the field.

"Today's young soldiers are much more computer orientated [than their predecessors]" explains Thornton. "These students prefer an interactive 3D simulation of a marine diesel engine to passively watching a traditional slide presentation. The NGRAIN solution not only captures their attention better but allows them to retain the knowledge."

Thornton's comments about the computer orientation of students has not been lost on VEGA which is developing the operator and maintenance training for Watchkeeper in the UK. Part of its maintenance training package will be delivered on gaming consoles and PDAs. As indicated earlier, modern training technology is expected by today's student but the benefits of simulation are clear for all to see.

"Simulation offers economical [and] effective means for training maintenance personnel to ensure the safe, trouble free operation of today's increasingly complex systems found in military...aircraft," said Atlantis' Gord Coulman in his paper on Integrated Maintenance Training Systems (IMTS) at last year's I/ITSEC in Orlando. "The best of these systems employ high-fidelity computer



To maintain currency and knowledge and to prevent skill-fade, maintenance technicians must receive plenty of recurrent training either on-the-job, in the classroom or via self-paced learning.
(Source: US Navy)

simulations of aircraft systems and ground-based maintenance equipment and allow trainees a high degree of interactivity."

Atlantis has manufactured a number of IMTS trainers for customers around the world. Using 3D replications of aircraft systems and PC-based courseware, the company has built systems for platforms such as the F/A-18, E-6A, F-15 and S-70A. The company says IMTS provides, "a full range of trouble-shooting and maintenance actions."

In the US, American Systems Corp (ASC) has provided the US Navy with the Simulated Aircraft Maintenance Trainer (SAMT). Along with fellow partners SIMTECH and DiSTI, the product features the latter's GLStudio, an object orientated rapid virtual prototyping tool. GLStudio digitally synthesises pictures, 3D models and behavioural logic to create 3D

interactive reusable simulation objects. The results are some stunning, photo-realistic components which really does bring the simulation to life.

Hi-Fidelity Approaches

DiSTI's latest success has been with AAI where it has been selected to provide GLStudio for the USAF's T-25 SECT upgrade programme through prime contractor, AAI Corporation (see news item in this issue). Earlier this year, the company was selected by Unitech to provide GLStudio-based SLEP maintenance training for the US Navy LCAC vehicle.

"We are seeing more and more customers opt for desk-top 3D maintenance training

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Main Landing Gear

The US F-22 Raptor programme has created a range of maintenance and flight crew training systems using state-of-the-art training technologies.

(Source: Boeing)

Like many, DiSTI will be chasing the soon to be released F-35 maintenance training request for tender. This programme has the potential to be massive with a core requirement in the US and many other F-35 partner customers around the world.

In conclusion, we have seen that maintenance training has now come of age with technology being leveraged to achieve highly interactive courseware that can be delivered over the web or on lap-tops or desk-top PCs.

This training can be instructor-led or self-paced. Although digital 3D training environments are

growing in popularity, it seems that many training establishments still demand the full-scale real aircraft on which to train.

systems," explains Mike Sivret, DiSTI's VP Sales & Marketing. "Our business has been growing accordingly and we are now increasing our sales into Europe and Asia. The technology that many maintenance training instructors have been asking for is now here."

C-17 MAINTENANCE TRAINING

In September, AAI Services Corporation was awarded more than \$14 million in new contracts by the US Air Force to support AAI-produced maintenance training systems installed at C-17 Globemaster III air bases.

AAI Services will upgrade fielded C-17 training devices to Block 16 concurrency levels and provide ongoing engineering and management services.

The new awards bring the company's C-17 maintenance training device programme backlog to \$85.6 million.

AAI supports 27 maintenance training devices for Air Force C-17 transport squadrons based at Charleston Air Force Base in South Carolina, McGuire Air Force Base in New Jersey and McChord Air Force Base in Washington, as well as an Air National Guard unit at Jackson, Missouri.

DiSTI's GLStudio is a central part of the US Navy's F/A-18 Hornet SAMT training system.

(Source: DiSTI)

