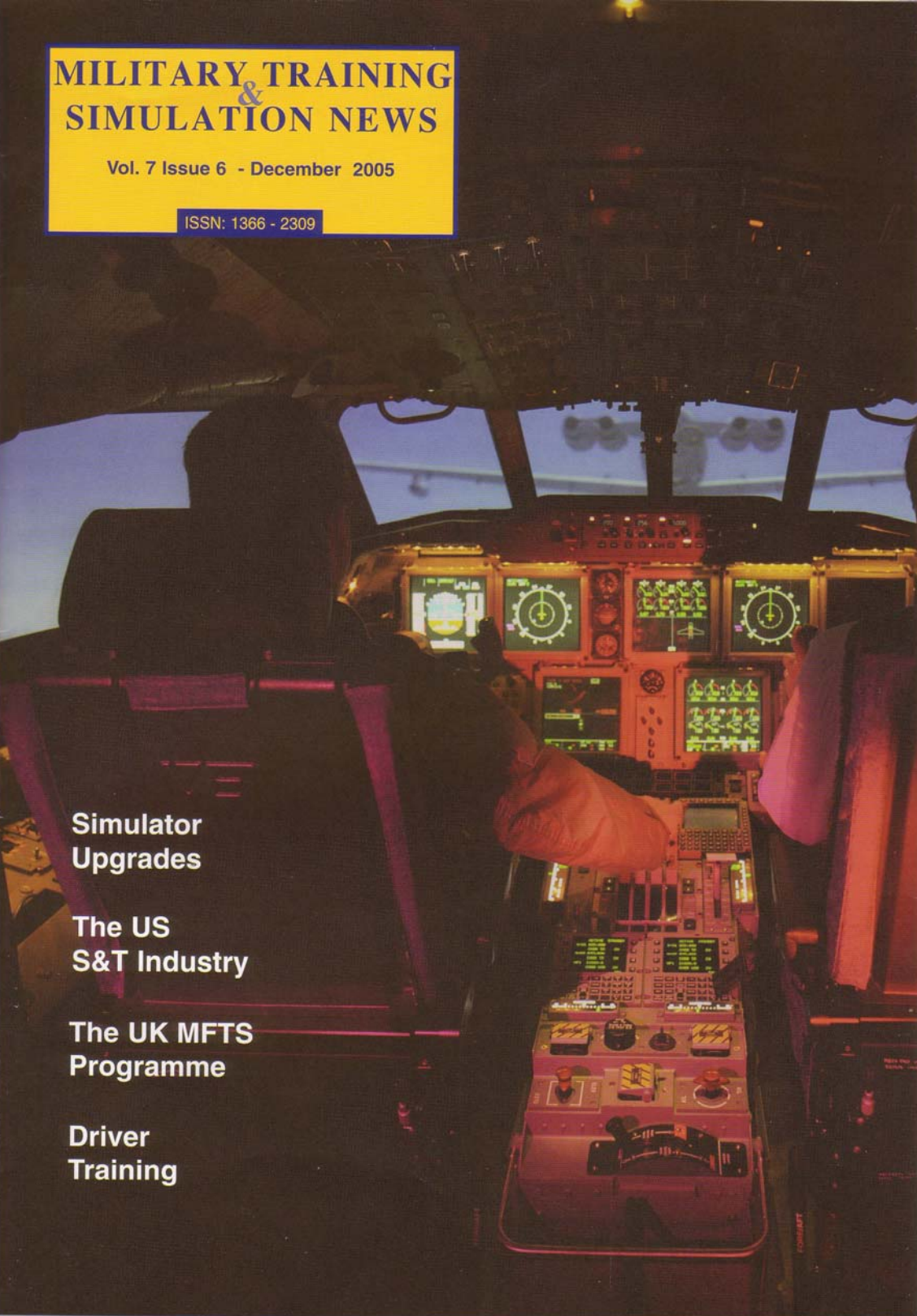


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**Simulator
Upgrades**

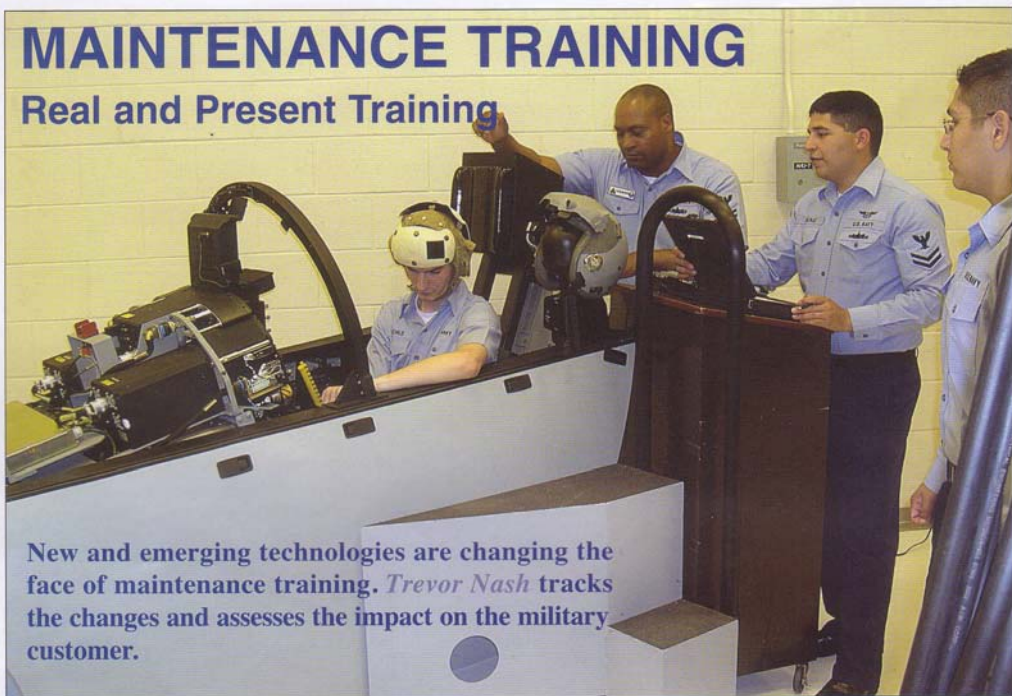
**The US
S&T Industry**

**The UK MFTS
Programme**

**Driver
Training**

MAINTENANCE TRAINING

Real and Present Training



New and emerging technologies are changing the face of maintenance training. *Trevor Nash* tracks the changes and assesses the impact on the military customer.

(Source: US Navy)

In the dim and distant past, maintenance training took a back seat to operational training. The black art of maintenance was conducted well away from the watchful eye of the system operator and frequently during unsociable hours when the operator was off watch.

Training was limited to using old or retired equipment which the maintenance chief had begged, borrowed or stole to make a training tool. The typical maintenance classroom of a few years ago would be littered with cut-away sub-systems and wall mounted posters. Using old equipment, manuals, a chalkboard and reference to a poster was as good as it got for many of today's senior military maintainers.

Fast-forward 20 years and today's modern maintenance classroom looks more like a modern C4SRI centre. Individual desks have multi-screen PCs which provide the student with the option of learning in concert with an instructor or by himself in a self-paced session. This environment can also be networked to allow joint or group learning and may also be linked to the hardware training systems as in the case with the Royal Air Force's (RAF) Aircraft Power Systems Trainer (APST) at RAF Cosford.

According to the Italian Societa Italiana Avionica (SIA), "complex aircraft systems do need professional training not only for operators but also for maintenance technicians. Professional maintenance training [historically] always included on-the-job (OJT) training sessions which implied having an aircraft available, hangar tools and personnel." This approach concludes the SIA, is costly and may result in damage to key equipment.

The SIA goes on to say that, "using a simulation environment helps trainees learning maintenance procedures through interactive exercises." As such, the organisation has developed a Distributed Maintenance Training Infrastructure (DMTI) to allow, "students to freely move around and enable them to inspect objects just as they would in the real world." The other major benefit of such simulations is that the instructor can inject faults as required; something that is not always possible on the real equipment.

Global Change

In Canada, Atlantis Systems Corporation has had many years involvement in providing maintenance training devices to a host of users across the globe. The company has recently received a \$2 million follow-on contract to upgrade the Canadian Forces' five Integrated Maintenance Training Systems (IMTS) for the F/A-18. Laurence Esterhuizen is the Director Marketing at Atlantis and offers this view on why the maintenance market is so buoyant.

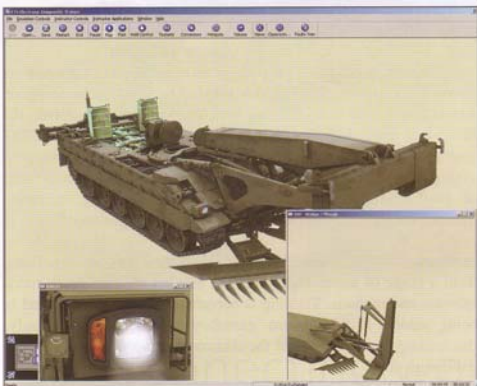
"The growth in the market is being partly fuelled by the erosion of the skills base; baby boomer retirement, and with that, their experience and skills, that need to be replaced," explains Esterhuizen. "Coupled to that is the nature of the young trainee being recruited: he or she is typically from the gameboy, interactive, computer and cellphone younger generation, who can easily grasp the training concepts mechanized by IMTS and similar systems. IMTS deliberately targets that "demographic" very effectively, and enables freeplay, "what-if" scenario training far more conveniently than [older] Simulated Aircraft Maintenance Trainer (SAMT) or Composite technology - or the real aircraft itself, for that matter.

Today's generation of school leavers is very in-tune with the kind of technology embodied in IMTS."

Products such as IMTS and APTS are very popular in that they make the best use of modern dynamic 3D graphics as well as replications of the platform itself. This provides the trainee with a full "form, fit and function" environment in which to train.

But is not just about better training, it's also about cost reduction. Libraries of graphical models can be re-used or used across different maintenance training simulations. Orlando-based DiSTI has developed its GL Studio-which has rapidly gained acceptance across the maintenance training world. Developed as an object-oriented rapid visual prototyping tool, GL Studio synthesises photographs, 3D graphical models and logic behaviour to create Reusable Simulation Objects (RSO). The results are stunning and the company has been successful on a number of programmes, including the F/A-18 SAMT, primed by American Systems Corporation.

VP Marketing at DiSTI is Michael Sivret. "The F/A-18 SAMT is just one example of how next generation maintenance trainers will allow people to train on major aircraft, shipboard or vehicle systems at a fraction of the cost of procuring original equipment," he explains. "Maintenance personnel will be able to perform both operational checkouts and troubleshooting on a desktop, laptop or via the web."



The British Army's Titan vehicle includes a variety of different maintenance training materials.

(Source: VEGA)

As to their view of low-cost maintenance trainers, Atlantis' Esterhuizen tells *MT&SN*, "we see IMTS as opening the doors to affordable maintenance training: while Composite Aircraft Maintenance Simulators are prohibitively expensive (somewhat explaining their scarcity), IMTS promises to be a completely different story. So yes, we are bullish about the prospects for high-fidelity maintenance trainers like IMTS, and we think IMTS-like systems will be adopted in much greater numbers than any previous maintenance simulators."

Cost Conscious Customers

But it's not all about aircraft. NGRain has recently seen its 3D graphics based maintenance simulators delivered to the US Army's training schools. These new maintenance trainers, replacing the US Army's earlier Universal Maintenance Simulators, are fully interactive and therefore allow students to perform tasks at their own pace. They also allow instructors to set tasks and monitor performance.

US company Research Triangle Institute (RTI) has also supplied the US Army with a number of maintenance training devices for its ground vehicles. The company says its products, "have saved the US Army millions of dollars both in initial acquisition costs and in continuing life-cycle costs."

One of the largest maintenance training programmes to surface recently has been that for the F/A-22 Raptor at Sheppard AFB in Texas where construction is underway on a brand new \$19.7 million training centre. Training will commence in the new 119,000 square foot facility in 2008.

Chief Master Sergeant Ron Wilson from the 82nd Training Group, says four primary Air Force specialties will train at the facility, including crew chiefs, armament, avionics and propulsion technicians. "This will be the initial skills training centre for the F/A-22 Raptor," he comments.

Just short of 150 airmen will go through maintenance training At Sheppard AFB in fiscal year 2008 with student loads increasing as more aircraft become operational.

Commenting on F/A-22 training, Boeing's Pam Valdez, the F/A-22 Training System Manager, said training devices will provide training for fuels systems, armament, flight controls, avionics, seat and canopy, structures, landing gear, hydraulics and power plant systems. The schoolhouse will also have an area for fibre optics and connector repair, she said. "The showcase of the curriculum will be the (Air Education and Training Command) developed courseware," Valdez explains. "The courseware will be installed in 14 computer-based classrooms to train students on 31,000 maintenance tasks."

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Atlantis Systems Corporation has supplied its F/A-18 IMTS to the Canadian, US and Australian forces.

(Source: Atlantis)

Earlier this year at the groundbreaking ceremony for the new training centre, Colonel Douglas Railey, from the F/A-22 Support Center at Wright-Patterson AFB in Ohio, said the groundbreaking laid the foundation for the future of F/A-22 Raptor maintenance training for the Air Force. With the delivery of Raptors to Tyndall AFB, Nellis AFB, Edwards AFB and Langley AFBs, Colonel Railey said the new fighter needs a new, efficient and effective way to create maintainers. "The maintainers will be just as technical and sophisticated as the aircraft they will maintain," commented Colonel Railey.

The issue of the actual maintainer raised by Colonel Railey is picked-up by Atlantis' Laurence Esterhuizen. "As the demographic issue is looming in most parts of the world, it appears that the need for a more intuitive way to train diagnostic and troubleshooting for weapon systems will be paramount," he says. "IMTS now has proved itself in the CF and RAAF - and soon the USN - and is cheaper to acquire, maintain and support. It is scalable from laptop all the way to 3D aircraft replica, so it's also pretty flexible.

"It should be pointed out that Atlantis has developed a unique methodology for translating OEM data needed to build the individual high-fidelity system simulations, the key to making IMTS useful as a trainer. IMTS is not a "reverse-engineered" simulator by any means - it is a set of close-coupled, highly accurate simulations, grounded in OEM procedural and performance data, that exactly match the performance and characteristics of the aircraft or weapon system itself."

European Angles

In the UK, VEGA has been involved in maintenance training since 1995 when the company delivered the Sea Harrier Maintenance Trainer for the Royal Navy. Although having seen growth in this sector, the company believes that maintenance training still remains, "the poor sister of operator training when it comes to the provision technological support."

Company spokesman, Mark Gunning says that in some quarters, there is still a conservative approach to the subject. "There still remains a train of thought that maintenance training has to take place on real equipment. To a point, this is true. There will always be a need for the physical fidelity of hands-on the non-synthetic equipment. However, delivering maintenance training through a synthetic environment such as our emulations, does provide each maintainer with their own virtual system to maintain where they can

learn the correct diagnostic procedures in a safe and controlled environment. These diagnostic lessons are not dependent on real equipment and so the maintainers can be trained on whole system faults - and how to deal with them - without the need for the real equipment."

Vega has also found that the modern client is looking to use maintenance training products outside of the classroom. These include providing simulations that can be utilised at point of use to rehearse the required maintenance procedure and use performance support tools that provide refresher training or new information as and when required.

Looking to the future, VEGA believes that technology will continue to imbue maintenance training systems with innovative and novel ways of learning.

"The technologies that we believe will be adopted in the near future are those that deliver performance support at the point of use," explains Gunning. "Providing refresher training at the point of use is needed in helping to combat problems such as "skill fade".

Electronic Performance Support Systems (EPSS) are extending this concept to the extent that some of the training is replaced altogether by electronic support when the relevant activity is being undertaken.

"At a simple level this could mean training devices that link to Interactive Electronic Technical Manuals," he says. "An example of this is the maintenance training that we been able to deliver via PDAs for the Royal Navy Command Support System (RNCSS) operators. However, in more ambitious forms, the support system should be able to tailor its approach to the capabilities of the individual and will be able to intelligently reference databases of previous individual and collective experience."

To conclude then, today's maintenance technicians are benefiting from a range of technologies that are making training much more relevant and realistic. Training is becoming more affordable and is being tailored to the modern 'gameboy generation.' Increasingly, this training is moving out of the classroom and into the operational environment.



Open GL from DISTI is starting to change the face of maintenance training.

(Source: DISTI)