Sim's vital role in training

The role of simulation in training grows in importance as weapons systems get ever more complex and expensive. Paul Bross, a former EADS Eurofighter training executive and chairman of this year's ITEC conference, warns that cutting costs for these systems would be a false economy.

Improving the operational performance of the armed forces, particularly in out-of-country NATO and United Nations' assignments, is a growing challenge that requires transformation initiatives in the national and international environments. Highly complex modern weapons systems call for sophisticated training techniques. This demands adequate training and training aids.

But a driving factor for the armed forces is always cost. In the current economic climate, available or forthcoming technologies for operational and/or training support need to be carefully considered. The development costs of weapon systems are increasing, diminishing the budgets for training and support systems. We have seen a worldwide trend toward shrinking training budgets for defense, and countries are looking at rationalization and transformation to cope with this situation. But training must not be sacrificed. It is paramount that weapon systems be delivered in the future with full support and training capabilities — live, virtual and embedded from day one. An effective operational capability can only be achieved if a sufficient number of armed forces personnel are available and fully trained on the right training systems so they have the right skills.

Training shortfalls must be avoided in all circumstances; it results in failure to achieve the operational task. And training must accurately reflect what we are seeing in the weapons system and the operational world.

The trend of growing computing capacity, increasing graphics power, PC-based simulations and improved image generation will increase the use of these technologies for defense. Virtual reality will dominate training in the future.

Simulation technology assists in getting the best training and exercises and can save a lot of money. In the overall framework of transformation, it can also help develop and test new concepts and processes. In recent years, the technological potential of modeling and simulation tools has been unleashed for decision-making and training in operational command-and-control systems, thereby aiding transformation.

For instance, the German Center for Transformation is implementing joint training programs to reflect the increasingly joint character of present and future operations. It is also adapting and integrating new tactics, techniques and procedures into the training programs, to reflect the joint challenges as well as those of operating in a network-based environment. A strong partnering effort among government, military forces and industry is required to do that.

COMBINED AND JOINT TRAINING

Out-of-country assignments require combined and joint training, i.e., training multinational coalition forces and national forces for international operations. These feature collective exercises, both live and simulation-based, involving multiple organizational levels. Multilevel training needs can be effectively met using multiresolution simulation that can adapt from individual operator training to combined arms training, to joint training, to coalition training. Modeling and simulation technology also provides a foundation for this type of training, bringing simulation closer to operations.

When providing peace support in today's environment, military organizations also face training challenges. From classroom to the field, from theoretical training to practical application, innovative training concepts have to be explored. Worldwide, armed forces engage daily with other agencies to achieve their missions in response to and preparation for disasters and major emergencies, aid to civil authorities, peacekeeping and operations other than war. The capability to respond to the complexity of interagency operations is already a daily requirement, but there is still a training gap in this area. In such environments, standards and interoperability of systems across training and education are important; their application is highly critical. There is a need for a reliable set of training and simulation standards to be adopted by all stakeholders, nationally and internationally.

While some progress has been made toward this goal, more work is necessary. The NATO Modeling and Simulation Group has taken initiatives in this field. The European Defence Agency is also exploring the possible use of a common database for future multi-nation distributed mission operations simulators. At the European level, this would tie all simulator players to a single database and produce a common operational picture. Networked training concepts, such as the U.K.'s Mission Training through Distributed Simulation program, will provide a distributed mission training environment, linking simulation facilities.

Joint multinational forces also are using simulation technology to support military command-and-control processes. The focus here is on supporting the force commander's development of rapid and effective courses of action. Predictive modeling and simulation systems will also assist decision-making and improve mission readiness for multinational peace support missions in complex operational scenarios.

NETWORKED ENVIRONMENTS

With joint multinational forces operating real-time across borderlines, the concept of network-enabled-capabilities (NEC) allows partners in large-scale complex civil and military operations to exchange information. The technical capabilities for operating network-centric environments are growing rapidly. There is a training need to help operators transition from more conventional methods into the NEC-world training environment.

Using reconfigurable, synthetic simulation environments and linking them to other sites will provide superior training capabilities at reasonable cost. Network-centric operations simulations are providing a networked training capability usable for exercise planning, mission rehearsal and training. Network-enabled simulation is the way ahead.

Simulation also plays a major role in flight training, where it has many applications. Military pilot training requires training aids, from conventional classrooms and computer-based desktop trainers to cockpit procedure trainers, interactive pilot stations and full mission simulators. Part-task trainers meet specialized and familiarization training needs. And adding

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Networking flight trainers, such as the Eurofighter simulator, is a growing European mission.

more simulator sorties to the trainer aircraft syllabus has been viewed favorably by pilots. The right mix of live and synthetic training is the name of the game.

Further innovations in this area have been conceived to introduce training commonality across the forces, e.g., the U.K. Military Flying Training System, which will radically transform how that country organizes and delivers pilot training.

If the full replication of hardware and the accurate "form, fit and function" are no longer seen as paramount for sustainable training transfer, then simulations can be configured for a range of platforms. Using low-cost, high-performance commercial off-the-shelf (COTS) products for innovative new designs, viable training solutions can also be found using reconfigurable simulators. Reconfigurable simulators can be deployed at a fraction of the cost of a full-mission trainer. When talking human-machine interface, better known as HMI, some representation of real hardware is still necessary, however.

Another aspect of flying training is embedded training, a function integrated into the overall system configuration. No matter the specific field of application, embedded training can result in an efficient and close-to-reality way of learning that allows operators and maintainers to perform exercises through direct interaction with the real system in training mode. This has already been successfully employed in some trainer aircraft.

Flying training has moved and will move further away from expensive devices to less-costly aircraft and use of high- to medium-fidelity simulators.

The complexity of weapon systems requires cost-effective maintenance training and training aids for maintainers. Since the market is growing toward total support, this area needs considerations on training efficiency and how training is to be delivered. We have seen modern technical training media, synthetic equipment trainers, virtual training, computer-based training and classroom training aids. Higher levels of software and hardware integration, the desire to provide technicians with just-in-time information and the pressure to reduce personnel requirements have increased the need for effective training.

COMPUTING POWER

Increasing computing power and enhanced graphics capabilities of low COTS-based PCs have opened up new possibilities for synthetic trainers. Again, high- to medium-fidelity desktop trainers and simulating systems are needed, covering a wide range of training requirements at an acceptable cost with no negative training effects. Synthetic maintenance training will provide more training efficiency and reduce maintainer training days substantially.

Electronic performance support systems, where e-learning and support data are merged, provide just-in-time training to the front lines, using interactive technical manuals, even on a portable device such as a laptop, for refresher training or task rehearsal. E-learning is transforming training. Training modules use Web browsers for delivery via a defense learning portal.

One element is clear in looking at the multifaceted role that simulation plays in today's militaries: Simulation has brought diverse benefits to military training and can play a powerful role in keeping training costs under control. Countries facing spiraling costs for hugely expensive weapon systems should resist the urge to look at training cuts as low-hanging fruit. They do so at their own risk.

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