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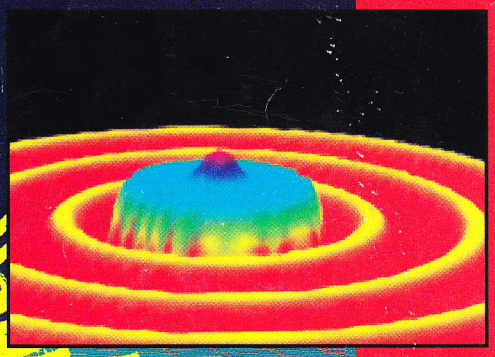
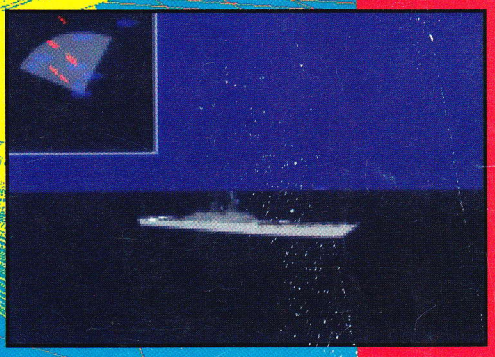
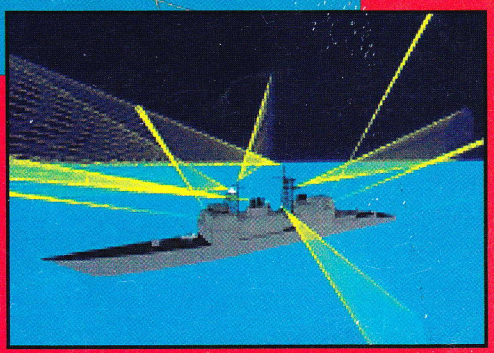
SIMULATION







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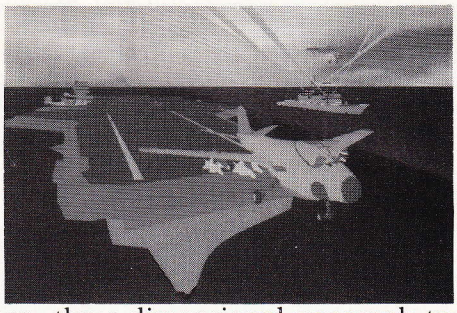
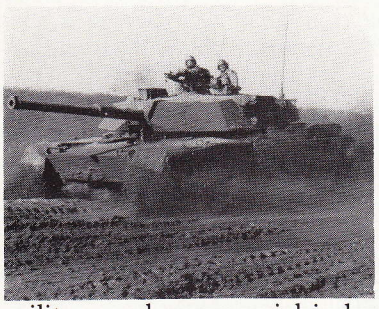
Special Effects



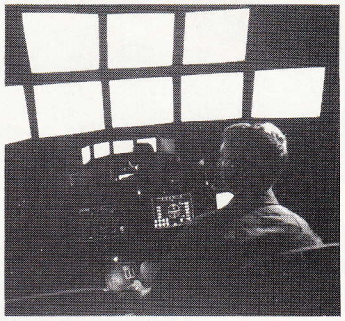
The U.S. Navy views the science of virtual reality as a way to graphically portray what cannot be seen with the naked eye—the arcane world of radar and infrared sensor beams and antenna patterns. Computers form the basis for virtual reality and its applications to electronic warfare research by the service, even to precisely assessing effectiveness against stealthy targets. This user-in-the-loop, three-dimensional approach to research is vastly different than Saturday morning television cartoons. The synthetic environment is at once illusory and artificial, yet so real in other ways that it can cause metabolic changes in the human body. Even a new lexicon surrounds this science, where multiple sensory information such as sight, sound or touch is used to enhance realism. Virtual reality also is called cyberspace for the synergy between man and machine. ***Cover Story: Page 14***

Cue The Grunt!



The art of the small—miniaturization—is having an impact on simulation, with distributed field-deployable systems that connect to networks and exchange information in real time. These electronic chess boards use live soldiers as players, carrying data and telemetry devices while the war game tracks their tactical movement. The $3 billion-plus annual simulation market offers huge advances both to the military and commercial industry. Mission simulation enables planners to conduct rehearsals of attacks minutes before they begin. ***Theme: Page 26***

The Production Line



Conceptual weapons are being test-driven in combat simulation even before they are developed. This determines their effectiveness, and thus the impact on the real-world battlefield. Procurement decisions can be based on this performance, as soldiers practice unconstrained warfare from anywhere in the world. A common digital data base allows simulation participants to move, shoot and communicate in relation to one another. An integral aviation test bed component replicates flight dynamics and weapons effects. ***Science & Technology: Page 33***

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Embedded Training Offers Savings, Improved Learning

By Maj. Richard A. Druffner, USA, and Capt. Raymond J. Lewis, USA (Ret.)

A new strategy and technology synthesis developed by U.S. Army experts from commercial programs is paving the way for embedded training in automated systems. This would enable users of electronics ranging from personal computers to field artillery controls to learn to use their systems without separate training facilities.

The Army could realize substantial cost savings from decreased training resource requirements and lower materiel system development costs for training capability. Some estimates of these military savings run as much as $4 billion over the next 20 years. Combat proficiency, a hard-to-measure, yet important, criterion, additionally may show quantum improvement.

The commercial sector also could benefit, reducing its corporate training costs substantially. Some companies, such as AT&T, DuPont and TRW, already are using aspects of this technology synthesis. DuPont alone estimates that its savings have totaled more than $100 million.

Companies unable to understand fundamental paradigm changes about learning, new training techniques and technology may see their income ebb if demand declines for business-as-usual automation training products in favor of the embedded training strategy, analysts observe.

A new Army methodology maps a route for implementing the concept into systems.

Embedded training provides that automation technology should have the capability to train users about the concept understanding and processes required by a system. To explore this concept, the Army created an embedded training team at the Combined Arms Command for Training to explore system design, training analysis, technologies and strategy.

The team pursued a new paradigm mandating that learning is more important than training. Training events are useful, but developing technology that can be used every spare minute to coach, correct and support the soldier in learning correct behavior/performance is a desired priority.

The Army Research Institute; the Simulation, Training and Instrumentation Command; and the Training and Doctrine Analysis Command all are contributing research. Training analysis reports, especially field tests from the Tactical Systems Test and Validation at Fort Hood, Texas, are analyzed to determine user needs.

The result is a clear picture of these needs and the nature of what embedded training must do for the soldier/user. This already has led to analysis of available technologies for selecting a set of those best suited. Experts analyzed both commercial and military technology efforts. After identifying available capabilities, the unsatisfied needs were war-gamed into a system with ideal performance. Then, commercial sources again were studied.

The Army discovered that it has been ignoring an entire class of technology that precisely meets its most urgent and unsatisfied training requirements. This need is a type of technology that is known as performance support systems, but it also is known as electronic performance support systems and knowledge support systems. Several corporations are pursuing significant development of this technology, including COMWARE Corporation, Cincinnati, Ohio; LB&M Associates, Incorporated, Lawton, Oklahoma; Gloria J. Gerry, Cincinnati; and Ziff Institute, Boston, Massachusetts. Many other organizations such as AT&T, IBM, American Express, DuPont, TRW and the U.S. Coast Guard have been applying the technology successfully for some time with proven results.

Using this concept to introduce embedded training brings into focus several paradigm shifts:

- Operational and training functions are merging.
- Embedded training is a strategy of selecting a suite of technologies precisely chosen to satisfy needs.
- No one solution necessarily is embedded training. Embedded training is the collective group of means chosen to induce learning.
- Learning is more important than training. Training, on-the-job training, on-the-spot corrections and mentoring only are means of inducing learning to occur.
- Learning occurs constantly. Training events occur occasionally. Training events are useful, but using performance support systems technology in Army systems is more effective for individual sustainment training.
- One-to-one training is more effective than one-to-many presentation training for individuals. This makes exploiting performance support systems technology a development priority in Army automated systems.
- Technology, like training, is a means to induce learning. Use only the technologies that make sense based on need.

A clear technology road map requires an infrastructure to guide the implementation. With a capstone concept technology synthesis that would integrate learning and operational function, subsequent needs were precepts to guide implementation and development. This led to a follow-on analysis, which determined that the Army procures three generally related classes of automation technology: personal computers, weapons/vehicle systems and other electronics.

The technology synthesis would require adaptation to have a set of precepts unique to each class of technology. This analysis illustrates that other attempts at embedded training solutions have not acknowledged that the concept was too broad and the target too diverse. This new knowledge allows the use of a process very similar to object-oriented analysis. This provides smaller object precepts that,

by themselves, are understandable and achievable within current technology.

The final result of these analyses and resulting technology synthesis concepts is the ability to integrate existing research to portray clear relationships linking available concepts to the new embedded training strategy. This clarifies the means of approaching system design and software technology to the corporate developer. This same type of information also reveals a standard menu of attributes that requirement document writers could use in a consistent manner to articulate their needs clearly, even if unaware of the actual nature of new technologies.

The concept of embedded training increases in importance as technology grows more elaborate. With systems increasing both in capability and in complexity, users would require more training time to master newer devices or components. The embedded training strategy permits automated system operators to learn as they use their systems.

Not only does this reduce the learning time by eliminating a separate training period, it also helps the user obtain maximum results during operation. Incorporating this approach also enables planners to focus system development on an object-oriented course, which is crucial with rapid prototyping.

The military's growing reliance on commercial-off-the-shelf products increases the usefulness of embedded training. Mixing and matching technologies to assemble a system requires performance support systems. Rapid prototyping and other non-linear acquisition methods similarly mandate some embedded training approach.

One commercially available example of an embedded training approach is COMWARE Corporation's knowledge support systems software, which helps computer operators use Microsoft Word. This supplemental software will interrupt a user who is having trouble performing a function, such as formatting, with a message acknowledging the user's plight. The same window might ask the user what he or she is trying to do and if help is desired. A subsequent message might even offer to do the task for the user.

This software performs an embedded training task by telling the user the steps needed to complete a difficult function. It also may offer a mirror window so that the user can practice performing the function without affecting the original on-screen document. An effective embedded training system is both proactive and reactive. It can predict when a user is in trouble before the user even realizes it, and it then can recommend a solution.

The Army embedded training team is active in a program of education and information interchange. The aim is to build a growing group of well-educated leaders who can comprehend the new paradigms on operational function, learning and state-of-the-art technology and how to bring this approach effectively to the military procurement system.

Significant gains have been made toward the embedded training strategy. Program successes include the Comanche helicopter program, the all source analysis system (ASAS) IV effort and the training and development under way on the strategic theater Army command and control system (STACCS) program.

The team introduced the concept to the Army's general-purpose personal computer users one year ago. This effort is being expanded to include weapons system procurement personnel, with workshops providing instruction on writing strategies that incorporate this embedded training approach. The next step will be to introduce the concept to personnel involved with electronic systems that do not fall into either of these two areas.

The Army now has a common terminology and structure to write embedded training into requirements documents. As the embedded training strategy continues to become institutionalized within the Army, the focus team hosts regular, synchronizing, free, open-forum conference/demonstrations; ensures on-site briefing, education and assistance on request; and provides one-on-one assistance to training, combat and materiel developers involved in writing requirements for parts of life cycle system management model processes.

Another current effort is the development of an embedded training action plan to synchronize efforts for changing regulatory guidance. This also would incorporate all other guidance into one convenient reference.

This single advance in plotting the exploitation of a new branch of technology—performance support systems—as well as a clear procurement strategy for technologies, ultimately may affect the entire military and business community.

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