

## INTRODUCTION TO THE CONFERENCE

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Welcome to the Naval Training Equipment Center's Industry Conference. This year's conference represents a major milestone. It is the tenth conference which the Center has sponsored. The primary conference goal is the same today as it was in 1966; improved communication between government and industry. It is gratifying to note that the number of participants has increased substantially from all sectors of the training equipment community. In 1966, the year of the first conference, 193 attended representing 14 government agencies and 49 private companies. In that year the Center had just completed the FY 1966 training equipment procurement program valued at \$71 million. By comparison, the attendance at this year's industry conference is expected to be 600 with 100 government agencies and 150 industries being represented. The Center's research, development, acquisition, and modification program for FY 1977 totaled over \$270 million.

The training device program has experienced substantial growth during the past 10 years. The rate of growth has accelerated in the most recent years and the forecasts are for a continuation of this trend. The selection of the theme for this year's conference, "Resource Conservation Through Simulation," focuses attention on the important role that simulation has played and will continue to play in resource conservation policy and plans. Although the oil embargo of 1973 focused major attention on the conservation of fossil fuels through increased use of simulators or trainers, that is not the only area that deserves our attention. The training devices themselves have increased in complexity to support the complex operational systems in the inventory. Advances in technology have enabled inclusion of many training tasks not previously possible. The long established role of trainers for familiarization, normal, and emergency procedural training has been expanded to include increased operator and team training for the tactical employment of the weapon system. The single greatest advance in this area has been the inclusion of visual tasks which have been made possible by both government and industry research in this high-risk and technically complex area.

I would like to cover three major areas where simulation technology contributes to resource conservation. The first and most obvious area involves the use of simulation

technology in individual, team and multi-platform tactical training systems to conserve energy, personnel, weapons, and supplies. The second area relates to the optimization of trainer system design for a stated set of functional requirements that would minimize space and power requirements. The third conservation area relates to the application of advanced simulation technology to reduce personnel manning requirements for training systems.

Let us look in somewhat greater detail at the role that simulation plays in the area of operator, team, and multiplatform tactical training systems. The chess-like war gaming, or Kriegsspiel introduced by Reisswitz in 1824, was used to develop and evaluate strategy and tactics. Today, the Army's Combat Arms Tactical Training System, a real-time, digitally controlled device, is used for staff training at the battalion level. A typical exercise simulates a tactical problem involving approximately 6,000 men and 1,100 vehicles. Advancements in simulation technology that supported war gaming were not motivated by resource conservation; but rather by the logistics of conducting large-scale exercises which were impractical and sometimes prohibitive.

The simulation technology developed because of this impracticality provided the basis for today's operator and team training devices where energy conservation is a specific objective. At the single and multi-unit tactical training level, use of such systems as the Antisubmarine Warfare tactical trainers, and the Tactical Advanced Combat Direction and Electronic Warfare training complexes leads to significant resource savings when compared with the resources required for the corresponding operational training.

In the introductory remarks to the last year's conference, I reported on the capabilities of training devices in the inventory. The resource savings in men, fuel, weapons, and supply support for equivalent operational training (143,000 weapons; 140,000 flight hours; 140,000 ship hours; and 21,000 submarine hours) is staggering for one year. Comparative ratios for energy conservation range from 10:1 up to 100:1 depending upon the platform type. Associated manpower savings approximate 5:1 for aircraft, 25:1 for submarines, and can exceed 50:1 for surface ships. These factors are compounded

by the multiple support and target platforms participating in the exercises. Resource savings attributable to simulation technology are estimated to preclude billions of dollars of costs annually.

The space and power requirements of trainers have been increasing steadily. For example, the addition of visual and motion systems\* to basic flight and weapons system trainers within the past few years has influenced this trend. Therefore, the second area where simulation can effect savings in resources is through the optimization of the trainer design itself. Advances in digital technology such as micro-miniaturization, large scale integration and compact and low-cost mass storage systems have lead to reduced space and power requirements. The computer-generated imagery systems, for example, require much less power and space than a camera model board system given comparable system training performance. The use of commercially developed components and systems with proven performance, maintainability and reliability reduces development risk, time and cost. These practices conserve critical developmental resources such as design engineering and the associated manufacturing and testing activities.

The third area where simulation contributes to the conservation of resources relates to reductions in the staffing levels for training systems. The power of the digital computer coupled with its low cost permits the incorporation of instructional

system features previously performed by operators and instructors. The advantages to be accrued from the judicious application of CAI and CMI to major training systems have not been fully exploited. The application of these features is not without agony, however. In order to implement the instruction system through computer software, the courseware must be defined in full detail, at best this is a difficult task.

Another area where simulation technology will lead to reduced staffing requirements is through utilization of voice synthesis technology. Machines that listen and react to trainee orders, or talk to the trainee based on information available in the computer, reduce the requirement for operators. The basic concept has already been validated in the laboratory.

Significant progress has been made in simulation technology since the first conference was held in 1966. The utilization of training devices in the inventory has resulted in substantial savings of resources. The role that simulation will play in the future is probably beyond our capability to comprehend. The goal of this conference then, is to act as a catalyst and substantially enhance the training process and operational readiness while making substantial reduction in the resources required to conduct that training. The papers that will be presented in the next 2-1/2 days report on a broad spectrum of subjects relating to simulation and training.

#### ABOUT THE AUTHOR

MR. G. VINCENT AMICO has been Director of Engineering at the Naval Training Equipment Center since 1971. He graduated from New York University with a Bachelor of Aeronautical Engineering in 1941. He was awarded a Masters in Business Administration from Hofstra College in 1954 and a Master of Science in Engineering from Florida Technological University in 1973. Mr. Amico worked on the design of naval aircraft as a stress analyst and project stress engineer with the Curtiss-Wright Corporation from 1941 to 1945. He entered the Armed Forces in 1945 and was assigned to the Static Test Unit of the Structures Laboratory at Wright Field as a structure research engineer. Upon leaving the service in 1947, Mr. Amico joined Republic Aviation Corporation with responsibility for preliminary design of missile and advanced aircraft systems. He joined the Center in the fall of 1948 as a project engineer in the Flight Trainers Branch. Since then he has progressed through the engineering organization, holding positions as Head of the VA-VP OFT Branch; Head of the Aviation Trainers Division; Deputy Director and Chief Engineer of the Special Projects Office and Director of the Sea Warfare Trainers Department. During this time, he was responsible for the development and production of a wide variety of training devices in all warfare areas. Mr. Amico is a member of Tau Beta Pi and Alpha Pi Mu Honorary Engineering Fraternities, American Society of Military Engineers, Society for Experimental Stress Analysis, Research Society of America, Sigma Xi, the American Institute for Aeronautics and Astronautics, and the Armed Forces Communications and Electronics Association. He was past Chairman of the New York section of the Institute of Aerospace Science and the Orange Chapter of the Armed Forces Communications and Electronics Association. Mr. Amico holds two patents and has presented a paper to the Institute of Radio Engineers on Synthetic Training for Space Flight. He co-authored a paper on "The Application of System Dynamics Techniques to the Modeling of the Military Training System" for The Seventh Annual Simulation Symposium.