INTRODUCTION TO THE CONFERENCE

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I would like to welcome you to this Eighth NAVTRAEQUIPCEN/Industry Conference. These conferences were initiated in 1966 concurrent with the relocation of the Center from Port Washington to Orlando. The motivation which led to the establishment of the first conference, namely improved communication between Government and Industry, is as valid today as it was then. In fact, with the increased emphasis being placed on synthetic training by the Congress and Department of Defense, the need for effective communication to identify and resolve problem areas in simulation technology and training methods is essential to insure the optimum effectiveness of training systems which are being developed.

In setting the theme for this year's conference, I will briefly summarize the progress which has been made in the past quarter of a century, enumerate the design concept currently being specified for new acquisitions, and make a projection about what we might expect in future training systems.

To review the progress in the past quarter of a century, I have selected to trace the development of operational flight trainers for fighter aircraft. Devices in other warfare areas such as the surface and submarine programs have experienced similar trends.

The advances in training concepts for the operational flight trainer are related to operational flight trainer cost, operational aircraft cost and quantities. The operational flight trainer has progressed from a fixed-base system (no motion), with an analog computer solving a rather limited set of flight equations, to today's trainers, with 6-degree-of-freedom motion systems driven by general-purpose digital computers solving twelve first-order difference equations of motion. These latest systems also have a narrow-angle visual attachment with either a model board or a computer generated image system which is used to provide training in the takeoff and landing phase of flight.

The system developments in simulation technology have generally followed advances resulting from other development efforts such as miniaturization, solid state devices and integrated circuits. These developments in component technology precipitated the change from AC to DC analog computers and then to the digital computers of today.

The advent of the economical high-speed digital computer of the late sixties led to the development of digitally controlled alphanumeric stroke-writing graphic displays. The introduction of this system into the instructor's area replaced the analog type devices and the discrete digital circuitry, and provides direct two-way communication between the trainee and the computer. These CRT instructor communication systems have been a standard requirement on major training device systems for some time.

The powerful processing capability of today's general purpose computer, coupled with the low "bit" cost of mass storage systems, has opened the avenues for advances in many areas of training methodology. In particular, the training features of demonstration problems, adaptive training and performance evaluation are not only technically feasible but also economical. The addition of these features has advanced the basic capabilities of these devices to the point where the term "trainer" is no longer an accurate descriptor; they should be referred to as "computer base training systems."

Based on the developments of the past, current training device acquisitions incorporate the requirement for one or more of the following features:

a. Automated training functions, which include preprogramed demonstrations, self-paced learning, adaptive training, and performance evaluation. Computer based and controlled instructional functions provide uniform and objective training.

b. The use of Higher Level Languages (HLL). These programing languages offer ease and standardization of programing documentation as well as being economically attractive.

c. The multi-computer configurations. This system configuration permits the division of the computational load by subsystem as well as enhancing system reliability and maintainability. In addition, this computer system concept improves the manufacturing and checkout process.

d. The general-purpose computers, which are elements of most of today's weapons systems, are incorporated into training devices to permit direct use of the operational programs. This concept enables the operational program to be used without modification, thereby enabling the trainer to keep current with operational program changes.

e. Laser technology is being specified for various types of weapon firing training systems. These concepts provide effective training without consuming ammunition.

Before turning to some projections relating to new concepts in training systems of the future, I will review a number of problem areas which still plague trainer development and which result in reduced training effectiveness as long as they go uncorrected. The major areas of concern are:

a. Obtaining valid operational system data including test data in a timely manner.

b. Developing and implementing a model of the operational system and its environment which satisfies the training need.

c. Improving the effectiveness and efficiency of the checkout and test methods and procedures for both hardware and software.

You will note that these problem areas apply to the specific field of training device development. They are for the most part created by the requirement of designing a system to meet a specification, i.e., effectively representing the operational system. Resolution of these problem areas is a jointly shared responsibility of Government and Industry. Substantial progress in these areas is necessary if the full potential of training devices as instructional systems is to be achieved, especially in light of the substitution goals which have been established.

Now to an assessment of what the future holds for training systems; the brief review of the past quarter century provides the key to the future. The digital computer development in terms of increased speed, increased direct access and mass storage memory, and significantly lower costs has opened the door to the increased use of the computer subsystem for other than the traditional modeling functions of the trainer. This subsystem will effectively be a mechanized instructor. The computer system will execute the lesson plans with step-by-step instructions to best obtain the specific behavioral objectives. It will also evaluate trainee performance and provide reinforcement for the closed-loop learning process to a greater degree than current systems. Although the advantages of such capabilities are attractive, there is an associated expense. The development of the algorithm that defines the essential evaluation criteria for the desired operator proficiency is a complex and time-consuming task.

The other major area that shows promise is the development of visual systems with improved resolution and increased field of view. A substantial amount of experimentation, analyses and creativity will be required to achieve those performance goals. The addition of training capability for tactical tasks involving visual cues to trainers will fill a long standing requirement.

In the next three days, papers will be presented which cover the area of visual systems, motion systems, computer and software, sensor simulation, navigation, logistics, and training methodology. I would like to congratulate all authors on their responsiveness to the conference theme. Through your efforts, the next generation of training systems will be more effective in imparting knowledge and skills to the trainees. The exploitation of these new concepts is particularly important if these training systems are to be given a more substantial role in maintaining operational readiness in the future.

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.