TRAINING ANALYSIS FROM AN OPERATOR'S POINT OF VIEW

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It is difficult to single out a group of people and say that their job performance affects the combat readiness of the fleet without mentioning the Operations Specialists in Combat Information Center (CIC). The operators collect, translate, display, evaluate, disseminate data and make recommendations in relation to Anti-air Warfare Surface Warfare, Subsurface Warfare, Electronic Warfare, gunfire support, ship maneuvers, data-link operations and communications. I am not trying to say that they alone do all of these tasks, but it is normally their input that affects the total outcome. The Tactical Action Office (TAO) cannot do their job unless targets are detected and displayed. Surface and Subsurface Warfare would wind up in knuckles (disturbance in the water caused by ships making tight turns that can be mistaken for submarines) without maneuvering boards and NC-2 plotters. The Air Intercept Controllers (AIC) and Antisubmarine Air Controllers (ASAC) are the data and voice links to all aircraft. Many Officers of the Deck (OODs) have been saved from a near miss or going aground by alert operators in CIC.

I am proud of the fact that I was an operator for 20 years in the Navy. The first school I attended in the Navy seemed to set a pattern for things to come. I spent more than two years attending schools and eight years teaching operator training. At least half of my Naval career was spent in schools. I have felt the enlightenment of learning, the satisfaction of teaching, and the frustration of failure. Failure to teach someone a skill you know he is capable of learning can be very frustrating.

I experienced many benefits as a result of the time I spent in school. In 1972 I was awarded the Distinguished Service Medal. I am the only enlisted man to ever receive this nation's third highest award for combat action.

After receiving so much from Navy schools, I feel I am extremely lucky to be able to continue working on training systems in the civilian community.

In this paper I have tried to describe some problems in the training of operators, the reasons why I feel they have occurred, and my recommended solution. The main problems in operator training (as I see them) are the following:

a. training time is limited
b. present teaching methods are out of date
c. little standardization in NTDS programs
d. shortage of qualified instructors aboard ship
e. reduction in training time for qualification of new personnel reporting aboard ship
f. high cost and increasing number of operational consoles.

Training in the Navy is a way of life. The Navy and Naval personnel are very proud of their schools. The Navy schools are one of the reasons I decided to join the Navy. The schools I attended allowed me to perform my job and take pride in my performance. Being able to obtain job satisfaction was a motivating factor to stay in the service.

Rate training is taught primarily in schools. The formal training being performed concentrates on teaching basic knowledge that cannot be picked up easily aboard ship. The instructors assigned to the schools are recommended for instructor training by their previous commands before being assigned to teach at a service school. Each instructor attends an Instructor Training School to develop the needed skills of presenting material to the students. Much effort is expended in preparing sailors for instructor duty. The primary restricting factor to the school is time. Time spent at school is time away from the ship.

Time was not always a problem. Training on the job was always the primary teaching site. Each petty officer is expected to conduct on-the-job training. A portion of each watch is spent in training. The best way to pass a mid-watch was to have a well-planned training exercise. The bridge would always welcome training during slow watches. Ships steaming in company would join in the training exercises. Predeployment training plans determine where the main thrust of the training would be placed during a deployment. New operators are properly introduced to the job they are expected to do in a one-on-one (instructor-to-student) environment. An operator spends many hours under close supervision before he is allowed to operate on his own.

For a long time I felt we had a good balance in training. The schools were teaching the needed information, and everyone

aboard ship was doing his part to ensure good performance by the operators.

As a result of the reduced size of the fleet, an acute shortage of experienced personnel aboard ship and the time to train new men reporting on board forced the fleet to require better trained personnel. The mark was set at requiring (with a minimum indoctrination period) the graduates to be condition III qualified.

Condition III is wartime steaming. To expect a graduate to step aboard ship and, after a couple of watches, be qualified to "fight the ship" leaves everyone with a problem. I feel the fleet is willing to give the schools some additional time for training, but not a great deal.

The Naval Tactical Data System (NTDS) has to receive at least some of the credit for the training problems. Only three ships carried NTDS for a long time. Most reports from the NTDS ships were good. Everyone wanted to get aboard one, but only a few were allowed. To correct some initial problems and keep the NTDS programs running, changes were being made faster than the school could keep up with, resulting in the output of outdated information. As we were about to get everything together, a new display console hit the street. Most people liked the new console better. The school now had a problem. The school was teaching the equipment. This knob does this when you throw it, see. The school even threw in some information about the computers but somehow never got around to teaching the operators their job. It could have been the way operator training has always been taught, or that the instructors (most instructors had never been aboard an NTDS ship) did not know the jobs. Primarily, the schools started teaching the new consoles and the differences between the consoles. Other events occurred to add to the problem such as:

a. The programmer responsibility was changed from Navy officers to civilians, creating a new learning period for the civilians.

b. Four consoles are being used in the fleet today and more are being developed. To operate a piece of equipment effectively, personnel must become intimately involved with the controls. Since the equipment becomes a part of the operator (an extension of his need for information), he must be able to extract the needed information without looking at the controls or breaking his line of concentration. Each new console has rearranged the operator controls, which means more time and money spent in retraining.

c. Two different program centers are writing programs with little standardization. Four major program developments have occurred, each with some modification, with each program changing the operator controls. For an example, on the east coast the operators are taught the Utility Mode which expands the operator's capability to perform needed functions. All of the smaller ships on both the east coast and west coast have the Utility Model. The west coast teaches Split Labels which does basically the same thing, but there is no changing of modes. All the large ships, east and west coast, use them. It has been planned to teach all operators on one coast. Wonder which program they will teach? There is an estimated requirement to teach 3,000 students a year. Starting a class each week which lasts for 3 weeks (very minimum training time) means that we have to contend with 60 students per class x 3 weeks = 180 students in training every day. Each student needs a minimum of 4 hours on a console each day, which equals 720 equipment hours. Allowing for 16 hours a day, 45 consoles are needed, up and running all the time, every day.

To teach the proper program, we could split the class into those going to the east coast and those going to the west coast. Then, divide each of these groups into four or five units to allow for console differences. We need 8 to 10 mockups totally dedicated for operator training. Each mockup would require at least 6 or 8 consoles to allow for a difference in student load. A total of 80 consoles would be required allowing for downtime and growth. My estimate, based on a recent study, indicates that the cost of using shipboard equipment to train operators is approximately $1 million per station, or $80 million. Of course the cost may go down a bit if purchases are made in quantity.

I have confidence in the Naval school system, and since the two programming centers have shown signs of coordinating their efforts our next program development effort should be one of the best. Instructional System Development (ISD) and the systems approach to training are the best things to come along to help operator training. As ISD is incorporated into the schools and the instructors become more familiar with it, I feel our teaching methods will work themselves out.

Given that this is true and the instructors have improved their teaching techniques, the remaining problem is the number of consoles in use in the fleet. One solution

might be to pack the schools with all types of consoles found in the fleet and teach the trainee on the one he has aboard his ship. Even if money and space were available, this shotgun technique is bound to fail. It is now time to analyze the problem in a logical manner.

We need a training program to bring the student up to a defined level of proficiency. To do this we need to measure the student's ability to perform required tasks. We need a program that is objective and adaptive to the student's needs.

The use of operational programs seriously limits the teaching capabilities of any training system. The basic requirements needed to teach the operators their performance skills have not changed; they are still the same as when NTDS was first introduced. Some additional requirements have been added, but the basic needs of the system that require manual input and modification have not changed. The basic requirements for the operator to perform his task are needed — nothing else. Teaching operator techniques establishes a need for the operator to obtain information from the console or to give inputs to the system. These basic tasks have not changed and could be any or all of the following:

a. entering new tracks
b. tracking targets
c. obtaining bearing and range to a target.

A handful of tasks would allow most operators to perform their job in a condition III environment. There is no NTDS equipment anywhere dedicated to individual NTDS operator training. That bears repeating! There is no NTDS equipment anywhere dedicated to individual NTDS operator training!! Even if four mockups were available with four different types of equipment, the training center schools would be fighting for their use. The NTDS operator schools are lucky to get one mockup for training.

To divert the soaring cost of shipboard equipment and to obtain a usable training console that would allow for a learning environment, I propose an adaptive training console. An adaptive training console would not only adapt to the needs of the student but also to hardware and software changes at a minimum cost. A console designed just for teaching! Let's take a look at it. First, a student/training system interface is needed. An off-the-shelf CRT and keyboard will do nicely. Introductory information, student sign-on/off, new material, some teaching and testing of knowledge subjects, review of past performance, and student status will be conducted.

Using a preparatory station is very cost-effective. While the primary station is being used by a prepared student, a smaller, cheaper station is preparing the next student. The primary training station will also have an interface, CRT, keyboard, and the Adaptive Training Console (ATC). The ATC presents and configures itself according to the level of the student.

After identifying the basic jobs of the operator, the training system presents the job and the need for information from the console or a need to input data. To this point the console is blank. No knobs, switches, alerts, controls, or alarms (see Figure 1). As the need for a switch, knob, alert, control, or alarm arises, it will be presented by the training system (see Figure 2).

As the student's knowledge and skill builds, so does the console. This training system is designed to give prompts to the student when needed. It is easily adapted to other equipment design for training, data readouts, and IFF control boxes. A line printer will be furnished for hard copy printouts.

After the basic skills are learned, the console adapts to the required operational console. The ATC adapts to the individual needs of the student by presenting the likeness of the console aboard his ship to the student. Each ATC has the capability to duplicate the functions of each console being used in the fleet (see Figure 3).

The adaptive training console can be reprogrammed by the training center to adapt to hardware and software changes as long as the basic functions do not change. A change in operator functions would require minor software modification.

The adaptive training console will give the schools a base from which to establish the most effective operator training available. The adaptive training console may very well be the last console the school will buy!!

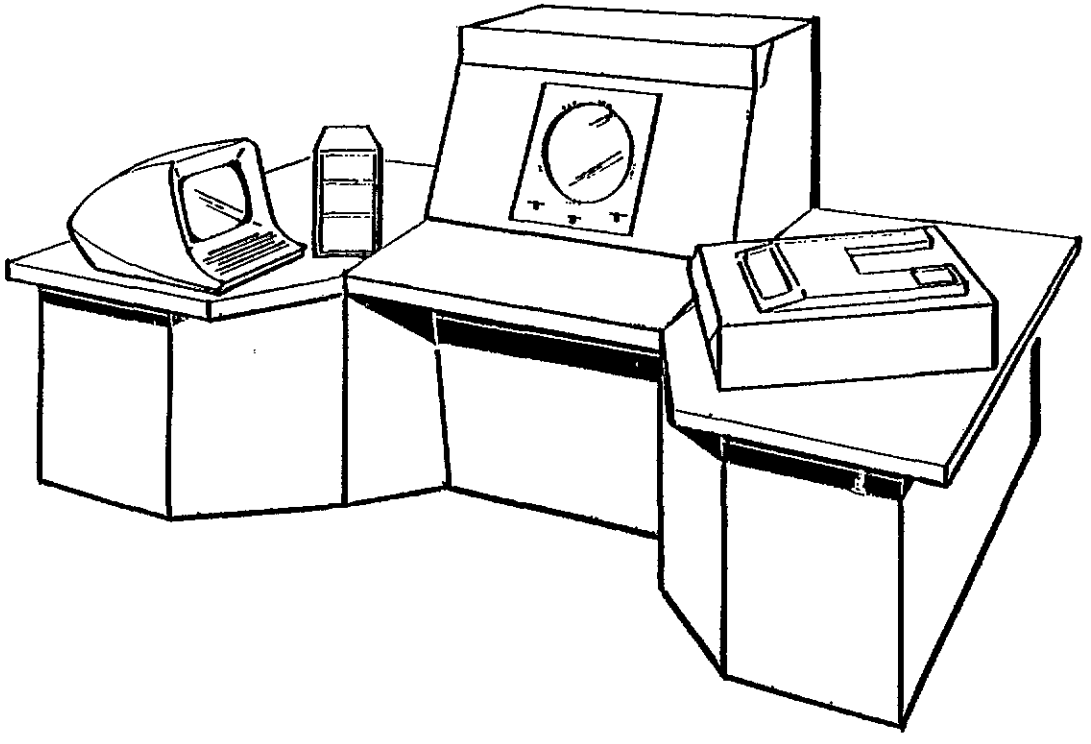

Figure 1. ATC Prior to Learning
(All controls are blank prior to the need.)

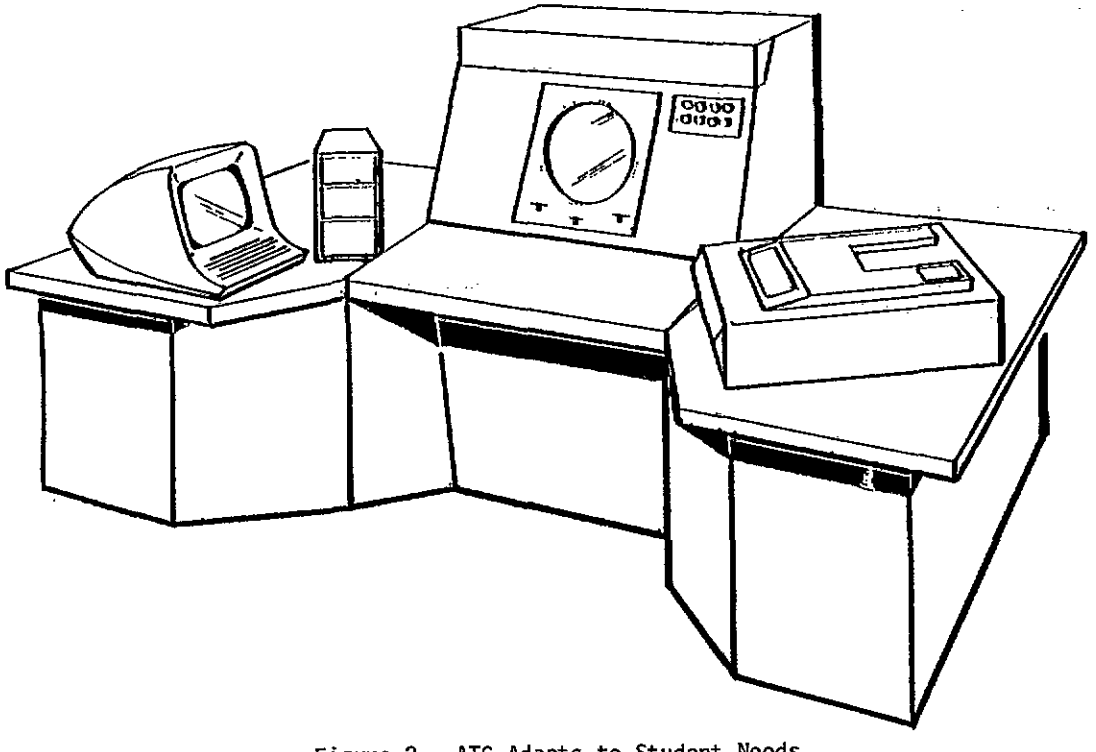

Figure 2. ATC Adapts to Student Needs
(As the need for controls is taught, the controls are presented.)

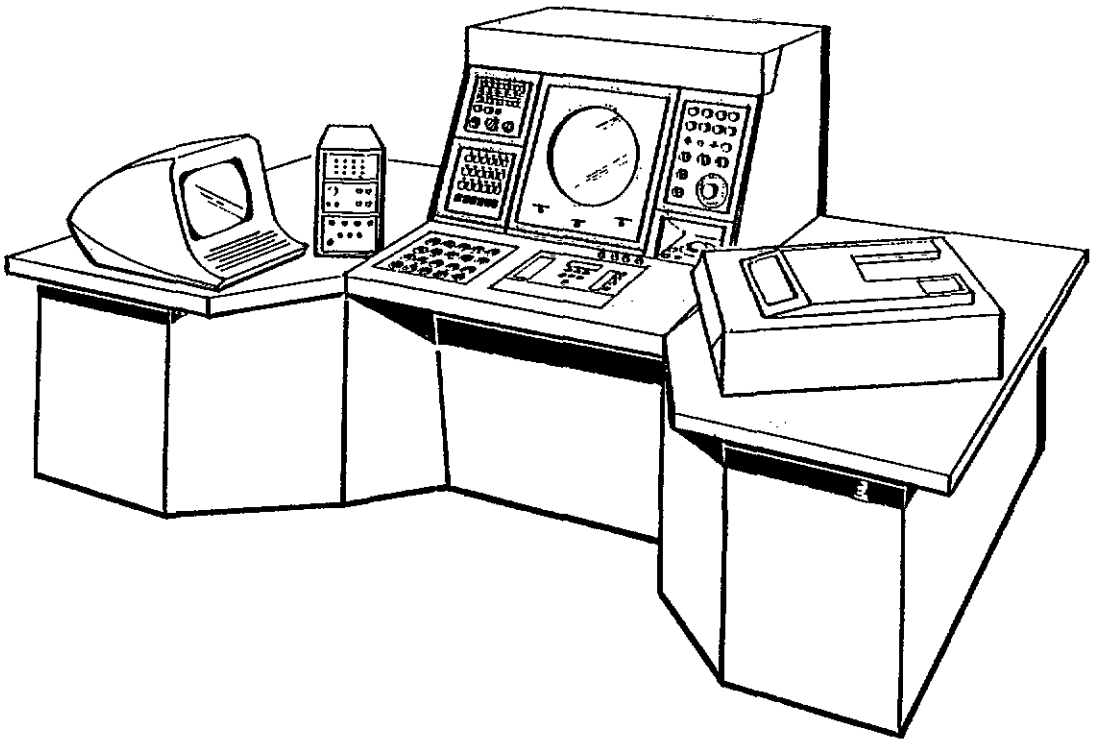

Figure 3. ATC Duplicates Student's Shipboard Equipment

ABOUT THE AUTHOR

MR. LARRY H. NOWELL is a member of the technical staff, Advanced Systems Department. He is writing the syllabus for the Ground Controller Approach-Computer Training System (GCA-CTS) and the Air Intercept Controller (AIC) Laboratory System which incorporate self-paced, individualized, computer-assisted instruction and automated speech recognition and generation technology. He was on-site project coordinator for the design of an instructional system for teaching Naval Tactical Data System (NTDS) operators basic input skills. He also participated in a study for Naval Training Equipment Center (NAVTRAEQUIPCEN) which reviewed AIC training at the Fleet Combat Training Center/Pacific (FCTCP). He was a Senior AIC/AICS instructor there and rewrote the basic AIC and NTDS AIC courses, designated the requirements for a trainer, and aided in the design of its housing. Mr. Nowell's education includes Radar "A" and "B", NTDS User, AIC/AICS, and Instructor Training schools plus digital computer program training. He received the Distinguished Service Medal while on the USS Chicago.