

A Current Report On . . .

Polaris Training Concepts *

Here are some of the training problems involved in a complex, accelerated weapons system program — and how program contractors can help solve them.

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Training naval personnel for the POLARIS Missile System highlights gradual changes that are taking place in the training of military personnel.

Pointed up are opportunities for industrial firms to assist in training on newly-developed equipment as well as the disclosure of caution signs for companies engaged in research and development programs for the armed services.

This article discusses the training problems associated with an accelerated research and development program and illustrates the contribution of industrial firms in solving these problems.

Specifically, this article is concerned with the Navy's Fleet Ballistic Missile Program, which has a goal of develop-

ing as quickly as possible a submerged launch capability for an intermediate range ballistic missile. Now under development in this Fleet Ballistic Missile Program is the POLARIS Missile. Two considerations over-riding all others in appreciation of the training requirements are: first, naval personnel never before had fired a ballistic missile; and second, the program priority has reduced developmental time.

Any speed-up in hardware development must have a corresponding acceleration in the training of personnel. In any research and development program, the industrial firm is vitally concerned with the successful training of personnel to maintain and operate the

**The opinions and assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the view of the Navy Department or the naval service at large.*

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equipment, in order that the newly-developed equipment will receive fleet acceptance. Delivering equipment that cannot be both maintained and operated by service personnel is unjustifiable.

The approach taken in development of the POLARIS is that success in training personnel would result only from the closest cooperation between the Navy and industry. Specialists from both the Navy and industry have teamed up to insure the successful marriage of the man-machine system. The submarine environment, independence of operations, and the importance of the mission preclude any training short cuts that might jeopardize success. Areas of importance will be discussed as they apply to any research and development program as follows: Job Task Analysis, Human Engineering, Training Equipment, Publications, Training in Contractors' Plants, and Navy Organization.

Job Task Analysis

Job task analysis is the first and most important area to be covered. When completed it becomes the basis for personnel planning, and, only to the extent of accuracy in this phase, can guess work be omitted in the remainder of the training program. The more important contents of the job task analysis will include:

1. Qualitative and quantitative manning requirements.
2. Identification and enumeration of duties and tasks to be performed by the personnel.
3. Knowledge and skills required to perform the individual duties and tasks.

4. Functional responsibilities of personnel, and organizational relationship.

Useful job task analysis for an equipment system under development requires that provision be made for modification as changes occur in the system. In brief, the document provides guidance to: the builders of the component equipment as to the numbers and qualifications of personnel that will operate and maintain the equipment; the Bureau of Naval Personnel in the selection and detailing of personnel and in planning training facilities; and the Director of the Program for allocating space within the submarines.

The task of detailing each job associated with operating and maintaining the POLARIS weapon systems and putting the information in a form that is useful to many users is the work of a combined team of Navy personnel and industrial engineers. In order that the information is made available as early as possible, the research teams consult with project engineers, and then maintain the information on a current basis by close contact within the plants of the major contractors.

The amount of information the researchers gather by each contact with the hardware is no measure of the importance of their task nor of the results experienced analysts can provide in this field. It is the function of the analysis group to formalize the duties of the personnel that will man the system into usable written form as early as possible and then keep the data current as the development program progresses.

Human Engineering

The relegation of the human engineer to the task of locating knobs and visual displays belongs to the past. Here is the opportunity to solve training problems before they are created by faulty design, and more important, to point out those situations that so tax the man-machine relationships that special training is mandatory.

The end product of both the human engineering and the job task analysis effort is so closely related that at times there is no clear line of demarcation. Provision for constant flow of information between the design, job task analysis, human engineering, and training groups is essential and will be a measure of success of the program.

Training Equipment

Requirements for training equipment will be disclosed by the reports of the human engineers, by the job task analysis, and by training personnel with previous experience. Developing training equipment is a field within itself. After a need for training equipment has been determined, it will fall into the category of production hardware, training mock-ups, simulation devices to activate production hardware, or classroom aids such as, cutaway models, charts and projection slides.

This is hardly the place for a discussion of the merits of the various training equipments employed for each of the various types of training situations encountered; however, the economical disbursement of funds between the categories of training equipment can be

come critical to any program. In general, the following will be found to hold true:

a. Basic training will employ all the training equipment and training aids available from production hardware to visual projections. This type of training is primarily performed in the classroom.

b. Maintenance training requires actual hardware that permits the personnel to see, feel, and hear the problem through. The production equipment may be mounted for accessibility or may have synthetic inputs to permit operation, and may have provision for interjection of malfunctions and evaluation of student performance. Design for the latter is an area where expense and assurance of success has created skeptics but it is an area of promise for future development. It should be noted that diversion of production hardware for training is usually expensive, employs equipment not specifically designed for training, probably entails hard usage, and takes a unit that may be needed for operational use.

c. Operational training does not necessarily require the same level of individual technical skills associated with maintenance training. When feasible, however, maintenance personnel are combined with operators of equipment, for complete knowledge of the system necessary for maintenance enhances their operations capabilities, and by combining operations and maintenance functions a savings in total number of personnel required may be achieved. Equipment best suited for operations training may be synthesized training mock-ups that look and function as the actual hardware, but is often cheaper to pro-

duce and more rugged for continual hard training use.

d. Team training in the operation of a weapon system may be obtained on the installed shipboard equipment, or it may be mocked up ashore. The limitation on the availability for training of installed shipboard equipment is apparent; however, the high cost of reproducing a weapons system ashore for team training, utilizing either production hardware or synthetic devices, makes necessary the consideration of alternate possibility.

Developing and producing effective training equipment is a field that many industrial firms have entered. Ideas are at a premium, for seldom is a straightforward solution to a problem available and failure in the design of the training equipment can be much worse, from a training viewpoint, than having no special training equipment. The U. S. Naval Training Device Center, Port Washington, New York, is a unique service organization, staffed for the development and procurement of training aids and devices, and is probably the world's most qualified organization in this field.

Publications

Publications that effectively portray the maintenance and operation of equipment are much easier to write about than to come by. This is understandable; where procurement personnel and industrial firms become so engrossed in delivering hardware, the importance of the operation and maintenance manuals becomes secondary. As the manuals are the basis for training programs and pro-

vide the foundation knowledge for both operation and maintenance of the equipment, they should be primary concern. Preliminary manuals are required with, or prior to, initial equipment delivery, and final versions should be forthcoming as soon as operational experience permits. Stressing the importance of relying on firms with experience in producing technical publications for the final version of manuals would seem unnecessary, but shelves full of ineffective manuals attest to this oversight.

Maintenance manuals in the Navy are usually written to the level of personnel with several years' background and special schooling on the equipment. Personnel with no previous experience on the equipment and with only a limited knowledge of the fundamentals involved find the maintenance manuals almost incomprehensible. This has led to the requirement for "Bridge the Gap" publications. This type of publication which is a combined training and simplified maintenance manual, is addressed to the technician with a high school education, technical schooling in basic fundamentals only, and without previous experience on the equipment. Considering the turnover of personnel, the purpose and importance of "Bridge the Gap" publications in the indoctrination of personnel to any complicated weapon system cannot be overestimated.

Factory Training

Training of Navy personnel in the plants of industrial firms takes on new importance as the period between design and delivery of hardware to the fleet is shortened. It is a requirement

that is readily apparent to industry when faced with the problem; however, such programs often are approached by industrial firms with misgivings. Only with the actual experience of having officers and enlisted technicians in the plants is this misgiving eliminated.

The mutual understanding by both the Navy and the industrial firms of the importance of fleet acceptance of any newly-developed equipment is the starting point; acceptance in the final analysis means successful service operation and maintenance of the equipment in its designed function.

Factory training can take on many forms but the two predominant types involve either several highly skilled technicians observing the final assembly and check-out of equipment or larger numbers of personnel of varying skills undergoing formal courses of instruction. Further word will be said about the former, for this is the type of training that industrial firms appear to fear unnecessarily. Carefully chosen, highly skilled personnel are selected for this type of instruction. Experience has proven that these men will impart helpful suggestions for making the newly-developed equipment more adaptable for

service use, rendering their short stay in the industrial plant invaluable.

Navy Organization

Training within an organization as large as the Navy is a subject that could fill a volume; however, for the purposes of this article, the following basic separation of training responsibility is of interest. Training in individual skills is the responsibility of the Chief of Naval Personnel, whereas the operational team training is the responsibility of the appropriate fleet commander.

A final consideration—by continual peace time training for wartime operations, Navy personnel became intimately associated with and experienced in all fields of training. This does not qualify them as experts, but does result in knowledge sufficient for forming strong opinions and making recommendations; so industrial firms should expect them. The deliverance of the training director from complete frustration can be found in the writings of John Stuart Mill, "If any opinion is compelled to silence, that opinion may, for ought we can certainly know, be true. To deny this is to assume our infallibility."

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