

The question then arises, "Why haven't we begun to explore the use of the digital computer as an instrument of automatic test equipment?" The answer is threefold; first of all, we (the government) have not had any significant, solid experience with this technique . . . experience that would enable us to definitize our requirements to any great depth; secondly, you (the contractor) are hard pressed to meet compressed delivery dates and, unless our requirements are definitized explicitly, you cannot be expected to dispatch your resources to areas of research in hardware development contracts; and thirdly; it is a matter of fact that, up to very recent times, logistic support, maintenance engineering and maintainability were not the most appealing disciplines to design engineers, and most creative engineers were more concerned and fulfilled by getting a system to meet performance requirements than they were in developing procedures for maintenance testing.

With regard to the last item - Here is an area where both of us can do something. We must erase the stigma that logistic engineering is something of lesser importance than design engineering. We can do this by launching and promoting career development programs for logisticians. Gentlemen, contracts are lost every week due to poor Integrated Logistic Support Proposals. The only way we're going to rectify this is by sending the proposal rhetoricians out for coffee and let logisticians develop your ILS Proposals.

Consequently, a system such as a training device may have met all of the performance specifications but failed miserably in its design for maintainability. That is why both of us, the contractor and the Center, must begin now, to get serious about maintenance and to recognize that the only answer to maintaining complex systems is through automatic testing; but in doing so, we shouldn't think only of peripheral support equipment.

We at the Center are asking you for your help in solving the problem of automatic testing. You can do this by putting your creative elements to work on the maintenance problem and responding in your technical proposals accordingly. In studying the problem, I suggest that as an impetus you consider the spiralling life cycle costs of training devices; consider that 75% of training device active maintenance downtime is spent in fault localizing and isolating; consider that the complexity of equipments has "mushroomed" at a disproportionate rate compared to the maintenance technician's capabilities; and consider the poor maintenance technician who must live with your equipment. In considering the problem, I ask you to remember that the best maintenance man could, very well, be a part of your training device.

## IMPROVING CONTRACTOR/NAVTRADEVVCEN RELATIONSHIP DURING CONTRACTOR MAINTENANCE PERIOD

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NAVTRADEVVCEN and the contractor have basically different goals that should, and can, lead to a common objective, namely a reliable effective training device that will be utilized. The major goal of the contractor is understandably profit. Contrary to the belief of some con-

tractors, government does not consider "profit" a bad word. In fact, it is a worthy goal. The primary mission and function or "goal" of NAVTRADEVVCEN is to fulfill a training requirement of "our customer," the user command. A good "end product" can lead to more sales, hence, hopefully higher profits for industry, and understandably leads to fulfillment of NAVTRADEVVCEN's primary mission and function.

An "end product" is no longer defined as equipment that meets engineering specifications at delivery. A good "end product" now is defined as equipment capable of performing its function with reasonable reliability and maintenance effort throughout "equipment life." This concept is quite apparent in the specifications now set forth in the Integrated Logistic Support (ILS) Bulletin 40-1A used in most major procurements today. This awareness of some degree of contractor responsibility for device operation throughout "equipment life" is a factor in the importance of the "Contractor or Interim Support Period" and hence the NAVTRADEVVCEN/Contractor relationship between the Contractor Technical Representative (CTR) and the NAVTRADEVVCEN Field Engineering Representative (FER).

To define areas of possible improvement, we must first define approximate parameters of function and responsibility. Then we can discuss pertinent problem areas. The overall of this paper will be the following five main topics.

1. DEVICE LIFE CYCLE WITH NAVTRADEVVCEN
2. PURPOSE OF THE "INTERIM SUPPORT PERIOD"
3. NAVTRADEVVCEN FIELD ENGINEERING REPRESENTATIVE
4. CTR - FER RESPONSIBILITIES
5. PROBLEM AREAS TO IMPROVE

#### DEVICE LIFE CYCLE WITH NAVTRADEVVCEN

Device "Life Cycle" with NAVTRADEVVCEN is defined here as the period of time from initial contact with a training requirement until device disposal. Of this life cycle the NAVTRADEVVCEN, Field Engineering Directorate, is concerned with this device from contract award until device disposal on matters concerning all aspects of support of the equipment. NAVTRADEVVCEN FER's will be involved then in support of most major devices throughout the operational phase of the device life cycle. Much of the success of our field support program is dependent on the establishment of a true capability on the part of our FER to support this equipment. The CTR is a vital link in establishment of this capability during the "Contractor Maintenance" or Interim Support Period (ISP).

#### PURPOSE OF THE "INTERIM SUPPORT PERIOD"

The government does not have the capability of supporting a new device immediately on delivery due to lack of parts, documentation, and technical knowledge. The contractor is, therefore, required to provide device maintenance during the ISP to assure device availability to the user command. During this ISP a concentrated effort must be made to transfer support from the contractor to government personnel. This effort must be in areas of both technical knowledge and ability to provide logistic support.

The contractor should also verify adequacy of technical and parts documentation, support and test equipment, as well as type and quantity of on board spare parts. These are important functions that often do not receive proper emphasis during the ISP. Additionally, an attempt should be made to define and eliminate any design defects of the equipment.

#### NAVTRADEVVCEN FIELD ENGINEERING REPRESENTATIVE

To cooperate in preparing the NAVTRADEVVCEN FER for the role of device support you need to know basically who he is and what his job is. The figures below represent averages of the East Coast, Central, and West Coast Regional Office FER's.

AGE - 39.3 years  
ELECTRONIC EXPERIENCE - 16.6 years  
FORMAL COLLEGE - 34.7 semester hours  
FORMAL ELECTRONIC SCHOOLS - 2.4 years  
TRAINING DEVICE EXPERIENCE - 8.9 years

From these figures it is apparent the average FER is mature, well schooled, and has the necessary experience to comprehend new devices and perform assigned functions during and after the ISP. Basic NAVTRADEVVCEN Field Service Support to user commands consists of:

1. SPECIALIZED MAINTENANCE
2. TRAINING MAINTENANCE PERSONNEL
3. LOGISTIC SUPPORT
4. INSTALLATIONS
5. MODIFICATIONS
6. ON SITE OVERHAUL
7. MAINTENANCE ENGINEERING
  - a. PLANNED MAINTENANCE SYSTEM
  - b. QUALITY ASSURANCE AND REVALIDATION
  - c. MAINTAINABILITY AND RELIABILITY
8. DOCUMENTATION AND SOFTWARE UPDATING AND VERIFICATION

In addition to these field support functions, he provides Management Support to cognizant NAVTRADEVVCEN personnel. This is in the form of Acceptance Testing, Monitoring Performance of Equipment and Contracted Services, and Evaluation of Equipment and/or Support Services or Material.

#### CTR - FER RESPONSIBILITIES

One final piece of information is required before discussing problem areas. This is the responsibilities of CTR and FER prior to, and during, the ISP.

##### CTR Responsibilities

1. Install and "De-Bug" the device. Performed prior to the start of the ISP.
2. Maintain the equipment and provide On the Job Training (OJT) to government personnel.
3. Manage the Contractor's Logistic Support Program.

4. Maintainability verification which includes:  
Support equipment  
Parts - type and identification  
Technical data and drawings  
Publications
5. Elimination of possible design deficiencies and documentation of same.
6. Witness the Maintainability Demonstration to prove the government has, indeed, achieved the capability of maintaining the equipment.

**FER Responsibilities**

1. Primary duty is to become proficient in the theory of operation and maintenance of the device.
2. Secondary duty is providing Management Support to cognizant NAVTRADEV-CEN personnel through work assignments from the Regional Office and recommendations to primary responsibility codes concerning:  
Acceptance Testing  
Logistic Support  
Documentation  
Training Requirement Evaluation by the User  
Contractor Performance
3. Directed to assist the CTR in every way possible in accomplishing required functions.

It is important to point out the FER does not speak for the Contracting Officer and cannot make binding commitments. He may, however, speak for the Project Engineer or Support Co-ordinator at his request on a specific problem.

**PROBLEM AREAS TO DISCUSS AND IMPROVE**

1. Better training needed for NAVTRADEVVCEN FER's.  
In the past this training requirement was not clearly defined and often the training received depended on the individual FER's ability to impose on the CTR for OJT. Contractually a requirement existed to train "government" personnel. We feel this includes NAVTRADEVVCEN FER's; however, some contractors have interpreted this to be "Navy" technicians.
  - a. NAVTRADEVVCEN should advise the contractor officially by letter or other means concerning this training requirement. The next revision of ILS Bulletin 40-1A will specify this requirement.
  - b. Contractor should advise his people to put forth a conscientious effort to train the FER as he will become the stabilizing key to the overall device support plan in years to come as changes are required and a turn over in assigned maintenance crews is experienced.
2. Need better communication with the Contractor Plant, primarily engineering and parts personnel.  
Prior to 1965, the NAVTRADEVVCEN Field Service force worked for various contractors and were contracted to NAVTRADEVVCEN. These people had direct access to the technology available at the contractor's plant. A trade off of this line of communication was necessary to implement the present support

program. Experience indicates the only time this communication is a serious consideration is during the first few months after device delivery.

- a. CTR can become the link that provides direct communication during the ISP. With a reasonable degree of cooperation, NAVTRADEVVCEN FER can request technical information from the factory via the CTR.
3. Problems in support or equipment design are not always properly defined. CTR has a tendency to play down potential problem areas, probably because he feels defining these areas may cause his employer some additional expense. In some cases this is wrong, and he may even cost his employer money by not defining problem areas. This attitude is probably made more acute by a tendency of the FER to class everything as a "contractor responsibility."
  - a. NAVTRADEVVCEN should provide the FER with better guidance concerning what is required per contract specifications.
  - b. The CTR and FER should join in an effort to detect and define problem areas and refer "definition of responsibility" to the respective Contracting Officers in those cases that are not obvious.
4. CTR has very limited knowledge of the NAVTRADEVVCEN Field Organization and, therefore, does not interface smoothly. Some CTR personnel have no knowledge of the role of the NAVTRADEVVCEN Regional Office or who may be considered key personnel in these offices. The total support concept during the ISP requires interface between the CTR and the Regional Office, as well as, with the assigned FER.
  - a. Contractors should advise their field people to contact the cognizant Regional Office either by phone or in person when reporting to a site. At this time the Regional Office can brief the man concerning functions and personnel involved in the interface between NAVTRADEVVCEN and contractor in the field.
5. Documentation of equipment changes is not always available on site. Many times contractors will install Engineering Change Notices (ECN) on the equipment, but documentation required to maintain this area that was affected is not available until the final prints are delivered. Field Change Orders (FCO) affecting general purpose digital computers may or may not be forwarded to the device by the contractor. These FCO's are usually furnished to the device contractor by the computer manufacturer.
  - a. Contractor should provide preliminary or rough draft prints to the site when ECN's are installed that adequately provide information necessary for equipment maintenance.
  - b. Contractor should have a set procedure to assure computer FCO's are forwarded to the device site. Most computer vendors will send FCO's directly to NAVTRADEVVCEN if instructed to do so by the device contractor.
6. Probably our most serious problem in supporting a device concerns parts or "lack of parts." This is especially true during the ISP. Typically we have a device "down," the trouble has been located, but we don't have the proper part on hand to fix the equipment. The cry for "more parts" is common. It is impossible to carry as "on board" stock every possible part that could malfunction. The proper approach would seem to be a more critical

selection of parts to be carried on board rather than any major increase in total inventory.

- a. The CTR and FER should combine to carry on a continuing critical evaluation program of usage data and critical items to revise recommended "on board" spares.
- b. Contractors should make a greater effort to provide faster service in repair of "repairable items" and in providing parts not carried "on board."

One more important point is submitted that will improve contractor/NAVTRADEVcen Relations; the User Command is the customer of NAVTRADEVcen, and we will strive to satisfactorily assist in solving their training requirements. NAVTRADEVcen is the customer of the contractor, and, as such, the contractor must strive to satisfy NAVTRADEVcen to have a "happy customer." The locally assigned FER represents NAVTRADEVcen at the level of contact with the contractor's field service personnel.

### **SYSTEM ANALYSIS OF THE ADMINISTRATION OF CONTRACTOR-CONDUCTED TRAINING WITHIN THE ILS (INTEGRATED LOGISTIC SUPPORT) CONCEPT**

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#### **SUMMARY**

This paper describes the Naval Training Device Center's program for the administration of contractor-conducted maintenance and operator training during the conceptual, contract definition and acquisition phases of a training device procurement program.

The paper is based on NAVTRADEVcen Bulletin 40-1A of July 1968, "Integrated Logistic Support of Training Devices," which defines the Center's objectives and requirements for contractor-conducted training within the integrated logistic support concept.

The ILS maintenance engineering analyses records (MEAR's), and in particular, the Personnel Planning Summary, Exhibit VI MEAR of Bulletin 40-1A are emphasized in this paper. The goal of the Personnel Planning Summary analysis is early definition of training device support personnel requirements and the development of required contractor-conducted maintenance and operator training courses to meet those requirements.

The administration of contractor-conducted maintenance and operator training within Bulletin 40-1A and ILS is described as an ordered, consistent and predictable process of analysis, definition, development and implementation. The goals of ILS contractor-conducted training are twofold: 1) to qualify the maintenance and operator personnel to adequately maintain and operate the specific training device; and 2) to provide training materials that are adequate for the military training agency holding the device to conduct maintenance and operator retraining throughout the device life-cycle.