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# AIR FORCE HUMAN RESOURCES LABORATORY

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(6) DESCRIPTION OF THE AIR FORCE MAINTENANCE TRAINING DEVICE ACQUISITION AND UTILIZATION PROCESSES


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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of this study was to obtain a definition of the Air Force Maintenance Training Device Acquisition and Utilization process as a realistic baseline for the development of a cost-effective training equipment research and development program. Relevant Air Force documentation was reviewed and the functions, procedures, and interfaces of the system were described. Data were also collected through interviews at major Commands and HQ USAF. A model of the system was developed from these sources. The life cycle concept was used as a framework for describing the process in five phases: (1) identification of requirements, (2) development of specifications, (3) procurement, (4) obligation and support, and (5) retirement. A major conclusion of the study was that procedures exist for the introduction of new technology training devices if the procurement is tried to the normal system

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acquisition process, but that there are specific difficulties when the training equipment is for systems no longer under systems acquisition (i.e., program management has been shifted from Air Force Systems Command to Air Force Logistics Command.)

## SUMMARY

### Problem

The demand for highly trained technicians, to operate and maintain the Air Force's sophisticated systems, has increased at a rapid rate over the last decade. As a result of demands for more cost-effective training equipment, the Technical Training Division, Air Force Human Resources Laboratory, Lowry Air Force Base, Colorado, initiated a comprehensive research project to develop promising areas of simulation technology as it applies to Air Force maintenance training. The purpose of this study was to obtain a better understanding of the Air Force's Maintenance Training Device Acquisition and Utilization process. This information is needed to provide a more realistic baseline for the development of a cost-effective training equipment research and development program.

### Approach

This study required a systems analysis of the Air Force maintenance training equipment management system. A two-phased approach was used. First, relevant Air Force documentation was reviewed and the functions, procedures, and interfaces of the system were described in terms of the applicable documents. Second, data were collected through interviews with major commands (MAJCOMs), and HQ USAF, and the system description derived from the literature was modified to reflect information obtained from the interviews. A model of the system was also developed.

### Results

The Air Force maintenance training device management process is comprised of many systems not necessarily integrated or interfaced. Exceptions, quite often, are the only rule of the process. However, the material included in this report was perceived to be typical, or characteristic, of Air Force procedures.

The life cycle concept was used as a frame of reference for describing the process. It permits integration of key elements (acquisition mode, locus of use, using command, etc.) in the process and lends cohesiveness to its description. The maintenance training equipment life cycle was described in terms of the following five phases: (1) identification of requirements, (2) development of

specifications; (3) procurement; (4) utilization and support; and (5) retirement. Several areas of developing technology were identified both for maintenance training simulators and for training equipment made from operational hardware.

## Conclusions

The life cycle of maintenance training equipment is essentially the same as the life cycle for all types of major equipment in the Air Force. The different requirements associated with maintenance training equipment and major equipment (such as weapon systems) may pose problems in a system designed to treat both with the same process. A major conclusion of this study is that procedures exist for the introduction of new technology training devices (e.g., simulation systems, computer graphics, etc.) if the procurement of the training equipment is tied to the normal system acquisition process. Difficulties can come into play when the procurement of training equipment is contemplated for systems that are no longer under systems acquisition (i.e., program management responsibility has been transferred from Air Force Systems Command (AFSC) to Air Force Logistics Command (AFLC)).

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# DESCRIPTION OF THE AIR FORCE MAINTENANCE

# TRAINING DEVICE ACQUISITION AND UTILIZATION PROCESSES

## Introduction

This technical report describes and documents the Air Force maintenance training device acquisition and utilization processes. It is intended to serve as a source document and baseline of information for maintenance simulation research.

"Over the last decade, Air Force systems and their associated equipment have increased in complexity at an extremely rapid rate. This increase in complexity has produced a corresponding increase in the demand for highly trained technicians to operate and maintain these sophisticated systems. To meet the demands for economical and effective training, simulators have often been proposed as alternatives for expensive, nonflexible operational equipment that is often used for training." [1] Because simulators may provide a large part of maintenance training in the future, explicit procedures need to be developed to support the processes of identifying requirements, for developing specifications, and for procuring, utilizing, and maintaining these devices. Identification of major issues in the current acquisition and utilization processes could facilitate an introduction of new technology in the training environment in a timely and effective manner.

## Classification Schemes for Maintenance Training Devices

There is little agreement within or among the services on definitions for "training devices" and "simulators." A "simulator" is often considered to be any trainer that represents real equipment other than the actual equipment itself. R. B. Miller[2] preferred not to use the term "simulator" on the grounds that it is vague and often misleading.

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[1] Miller, G.G. Some Considerations in the Design and Utilization of Simulators for Technical Training. Brooks Air Force Base, Texas: Air Force Human Resources Laboratory, AFHRL-TR-74-65. August 1974. AD A001 630.

[2] Miller, R. B., A Method for Determining Human Engineering Design Requirements for Training Equipment. WADC-TR-53-1375. Wright-Patterson Air Force Base, Ohio: Wright Air Development Center, June 1953. AD-15.

Kinkade and Wheaton[1] developed a scheme (Figure 1) for classifying training media. In this scheme a training device is defined as "any arrangement of equipment, components, apparatus, or materials which provides conditions that help trainees learn a task." These authors divide training devices into the major categories of training aids and training equipment. Training aids are defined as objects used by instructors to present subject matter. Gary G. Miller adds that training aids (wall charts, closed-circuit television, non-operational mock-ups, etc.) require some form of active student participation.[2]

According to the classification scheme of Kinkade and Wheaton, training equipment can be subdivided into the general classes of whole task trainers and part task trainers. Part task trainers are devices used to teach some segment of a total job task while whole task trainers normally support task integration and consist of either operational equipment or simulators.[3]

In a recent report[4] Fink and Shriver developed a seven-category scheme for classifying maintenance training aids and media. The categories were: classroom demonstrators, nomenclature and parts location trainers, cue discrimination trainers, part-task trainers, trouble-shooting logic trainers, job segment trainers and simulators, and actual equipment trainers and operational equipment. It was found that when supported by suitable illustrations these seven categories were recognizable to Air Force technical instructors. Even so, the authors felt that the considerable definitional overlap between training device categories detracted from the usefulness of the scheme.

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[1] Kinkade, R. G., & Wheaton, G. R. Training Device Design. In H. P. Van Cott and R. G. Kinkade (Eds.), Human Engineering Guide to Equipment Design. Washington, D.C.: American Institutes for Research, 1972.

[2] Miller, G. G., op. cit.

[3] Miller, G. G., op. cit.

[4] Fink, C. Dennis, & Shriver, Edgar L. The Present and Potential Use of Maintenance Training Simulators at Air Force Technical Training Centers. Technical Report, Contract F33615-77-C-0051, 3 January 1978. (In Press)

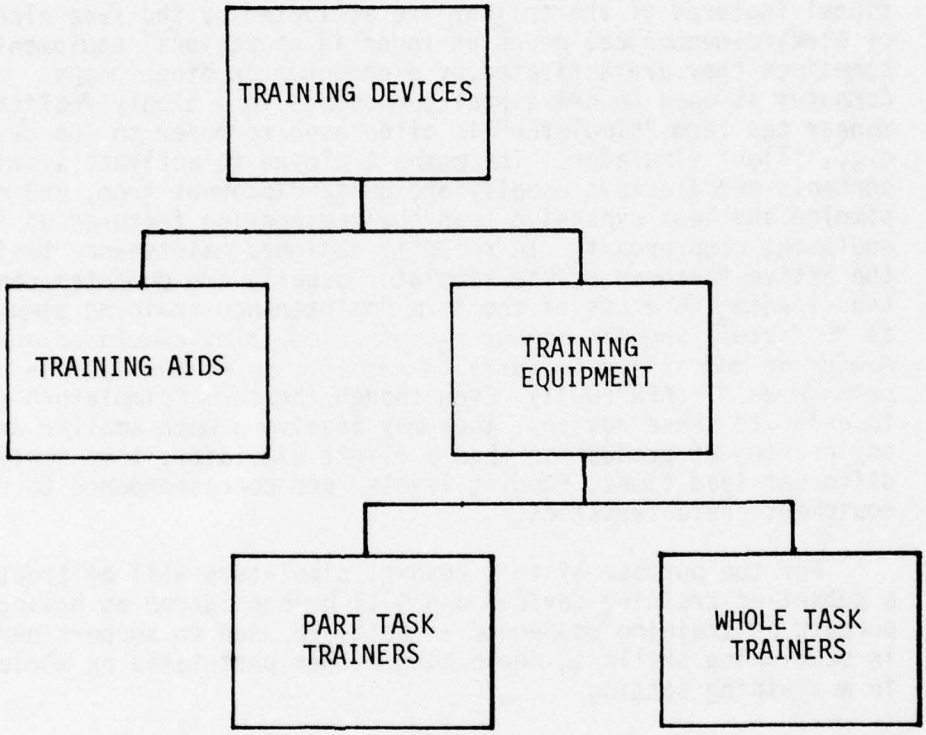



Figure 1: Classes of Training Devices (adapted from Kinkade and Wheaton, 1972)

## Definition of the Term "Simulator"

"Training equipment" sometimes is used to refer to actual equipment or actual equipment components when used in a training rather than the operational environment. Sometimes the displays and operational features of the trainer are activated by the same electronic or electro-mechanical means as found in operational equipment and sometimes they are activated by a computer or other means. When a computer is used to drive real components in a highly realistic manner the term "simulator" is often used to refer to the device: e.g., flight simulator. The means employed to activate a simulator's controls and displays usually are quite different from, and often simpler and less expensive than the engineering features of its real equipment counterpart. In recently designed maintenance trainers the active features of the simulator usually are computer-controlled, thus leading to a use of the term "maintenance training simulator" as *"a device, usually computer-controlled, that simulates operational equipment and allows trainees to practice maintenance tasks or procedures."* (AFR 50-11) Even though the term "simulator" is used to refer to these devices, they may involve a much smaller amount of engineering or production than a flight simulator, thus implying different lead times, funding levels, and correspondence to real equipment characteristics.

For the purpose of this report, simulators will be treated as a subset of training devices and will be considered as having the same purpose as training equipment -- both are used to support personnel in developing skills in performing either part-tasks or whole-tasks in a training setting.

## Approach

A systems analysis of the Air Force maintenance training device acquisition and utilization processes was conducted in two phases. The first phase called for a description of the processes. Relevant Air Force documentation was reviewed including applicable regulations, manuals, specifications, directives, and policy documents. Functions, procedures and interfaces of the processes were described in terms of applicable documents.

In the second phase data were collected through interviews with major commands (MAJCOMs) and Air Force Headquarters. The results of the interviewing were applied to the system description derived from the literature. The system was analyzed and a model was developed in terms of life cycle phases. Certain significant areas of concern were identified.

## Results

Air Force personnel often report that the various activities involved in the Air Force maintenance training equipment acquisition and utilization processes do not interface in any clear way. Since exceptions appear to be the only rule, generalizations that fit all cases or situations cannot be made. Nevertheless, the material included in this report is perceived to be typical or characteristic of Air Force procedures.

### Management of Air Force Maintenance Training Equipment

All Air Force maintenance training equipment is either systems or nonsystems managed. A breakdown of systems managed maintenance training equipment is illustrated in Figure 2. A breakdown of non-systems managed equipment is shown in Figure 3. These categories should not be confused with maintenance training equipment procurement alternatives (locally fabricated, centrally purchased, etc) or classes of equipment (training aids, bench items, etc.).

Air Force regulations define systems managed and nonsystems managed equipment as follows:

> Systems Managed. Per AFR 50-11, this category of equipment is used *"to support training on a specific major system program managed by AFR 800-2. It is also used in classes where another service is the executive manager for designing, developing, and procuring system equipment and an Air Force program office is set up to manage Air Force requirements."* This type of training equipment is normally acquired in conjunction with a new Air Force system through an Air Force Systems Command (AFSC) System Program Office (SPO). As Figure 2 illustrates, systems managed maintenance training equipment is normally configuration managed, i.e., designated

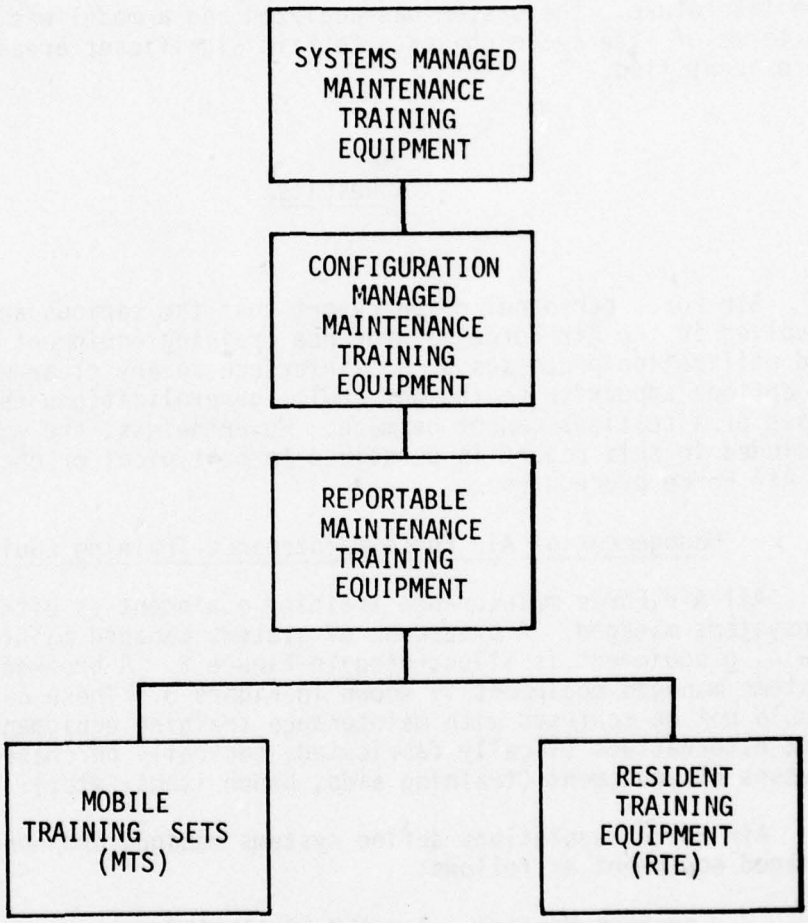



Figure 2: Systems-Managed Maintenance Training Equipment

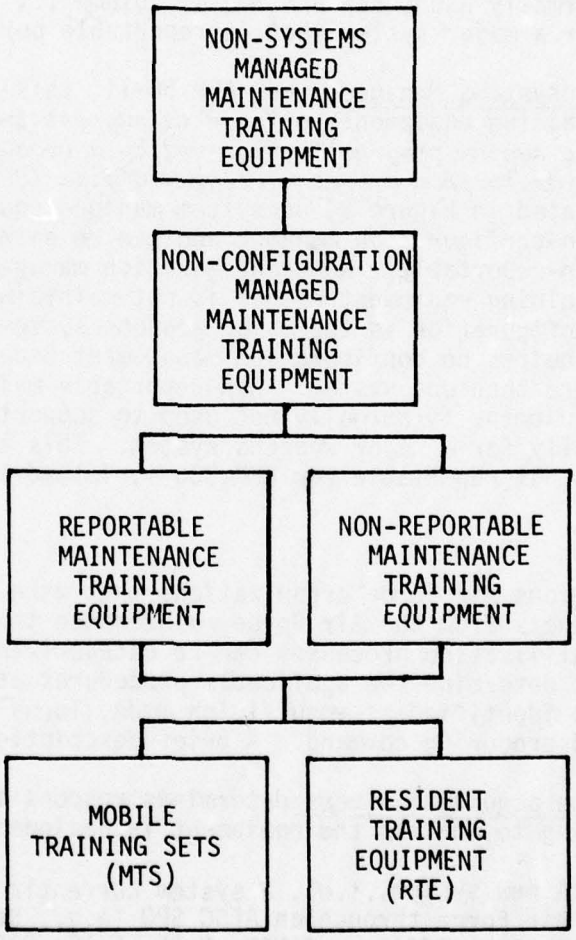



Figure 3: Non-Systems Managed Maintenance Training Equipment

by AFR 65-3 as "configuration items" that must be maintained in the same configuration as the major weapons system it supports. Systems managed maintenance training equipment is also reportable, i.e., maintenance training equipment normally used, per AFM 300-4, Volume II, to support training for a major system that is reportable per AFR 65-110.

Nonsystems Managed. Per AFR 50-11, this type of maintenance training equipment is *"used to support training on more than one system program or procured by a procurement agency separate from a System Program Office (SPO)."* As illustrated in Figure 3, nonsystem managed equipment is normally non-configuration managed and can be either reportable or non-reportable. Non-configuration managed maintenance training equipment either is not maintained in the same configuration as the major weapons system it supports or requires no configuration management because it supports more than one system. Non-reportable maintenance training equipment is normally not used to support training specifically for a major weapons system. This type of equipment is not reportable per AFM 300-4, Volume II, and AFR 65-110.

The various Air Force organizations that make inputs to and receive products from the Air Force maintenance training device acquisition and utilization processes can be categorized according to the factors that determine the applicable procedures at each stage. These factors were identified as acquisition mode, locus of use, using command, and procuring command. A brief description follows.

*The acquisition mode* determines responsible agencies according to whether the equipment is designed to support:

- A new system, i.e., a system currently being procured by the Air Force through an AFSC SPO (e.g., Strategic Air Missile Systems Office - SAMSO, F-16, F-15, E3A Air Warning and Control Systems - AWACS, etc.).

- A system out of acquisition, i.e., a major system currently in the Air Force inventory for which program responsibility has been transferred (Program Management Responsibility Transfer - PMRT) per AFR 800-4 from AFSC to AFLC. Examples of such weapons systems are the B-52 and F-111.

- Several systems, to support fundamental and level 3 training causes that are system independent.

The locus of use determines responsible agencies according to whether equipments are:

- Mobile Training Sets (MTS), for the Field Training Detachments (FTD).

- Resident Training Equipment (RTE), for the technical training centers.

The using command may be:

- Strategic Air Command (SAC)

- Tactical Air Command (TAC)

- Air Training Command (ATC)

The procuring command may be:

- Air Force Logistics Command (AFLC)

- Air Force Systems Command (AFSC)

A frame of reference that integrates these various factors was required to lend cohesiveness to the description of processes. The life cycle concept was selected for this purpose.

## The Maintenance Training Equipment Life Cycle

The life cycle of Air Force maintenance training equipment was organized into five phases, represented in Figure 4. These are

Phase I Identification of Requirements

Phase II Development of Specifications

Phase III Procurement

Phase IV Utilization and Support

Phase V Retirement

A description of the processes involved in each phase follows.

### Phase I - Identification and Development of Maintenance Training Equipment Requirements

The acquisition process begins with the identification of a training equipment requirement. This requirement may be identified at any level of command.

Responsible Agencies. The organization responsible for identifying maintenance training equipment requirements varies depending upon whether the maintenance training equipment is associated with:

acquisition of a new system

a system out of acquisition

several systems

The following organizations normally have primary responsibility for identifying maintenance training equipment requirements: the 3306th Test and Evaluation Squadron (TES/AFT) for major weapons system mobile training sets (MTS); Technical Training Centers for resident training equipment and all other mobile training sets; and the 3901 SMES/MBT for equipment for SAC training facilities. Table 1 shows organizational responsibility for identification of maintenance training equipment and acquisition mode under which it is procured.

The "X" axis of the matrix in Table 1 identifies the equipment as RTE, MTS or SAC training facility equipment. The "Y" axis of the

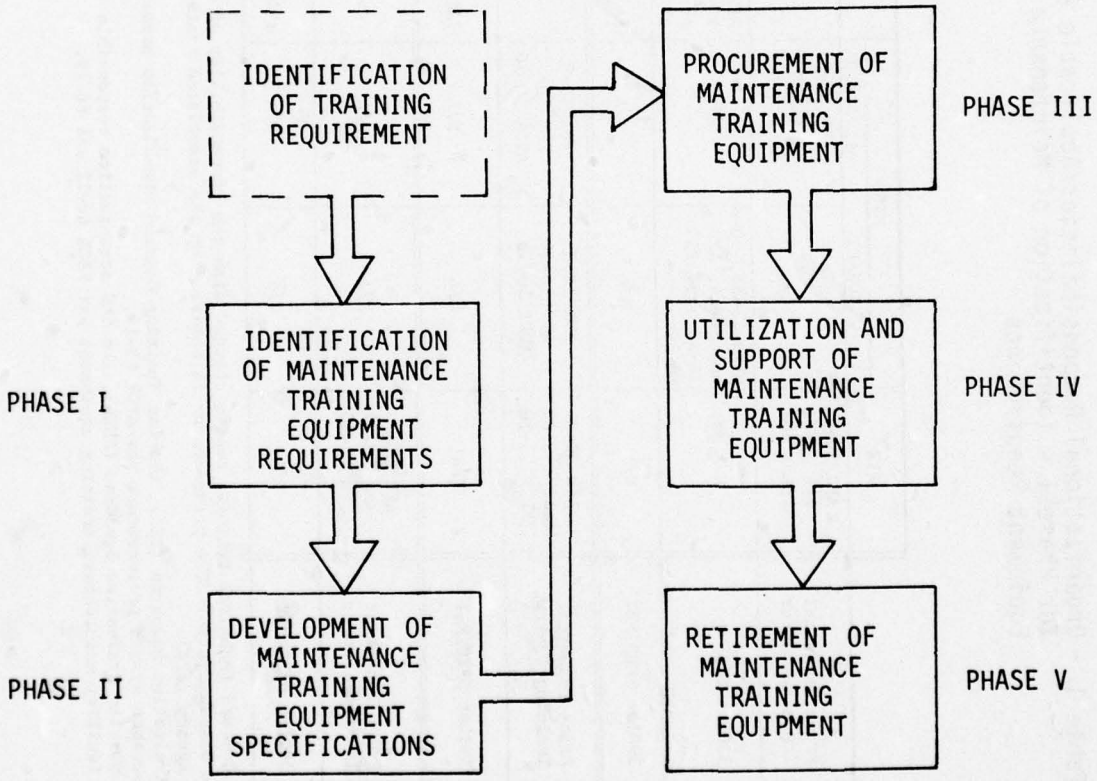



Figure 4 - Phases of the Maintenance Training Equipment Life Cycle

Table 1 - Organizational Responsibilities/Applicable Regulations for Phase I - Identification of Maintenance Training Equipment Requirements

| | | RTE | MTS | | SAC TRAINING FACILITY |
|---|---|---|---|---|---|
| | | | AIRCRAFT | ALL OTHER | |
| ASSOCIATED WITH A NEW SYSTEM | Prime Technical[1] Training Center | AFR 50-8<br>AFP 50-58<br>ATCR 50-30 | N/A | AFR 50-8<br>AFP 50-58<br>ATCR 50-30 | N/A |
| | 3306th TES[2] | N/A | AFRs 23-36, 50-8 and 80-14, AFP 50-58 and ATCR 80-14 | N/A | AFRs 23-37, 50-8 and 80-14<br>AFP 50-58 and ATCR 80-14 |
| | 3901st SMES/MBT[3] | N/A | N/A | N/A | SACRs 23-6, 66-12 & 66-19 |
| ASSOCIATED WITH A SYSTEM OUT OF ACQUISITION | Prime Technical Training Center | AFR 50-8<br>AFP 50-58<br>ATCR 50-30 | AFR 50-8<br>AFP 50-58<br>ATCR 50-30 | AFR 50-8<br>AFP 50-58<br>ATCR 50-30 | N/A |
| | 3901st SMES/MBT | N/A | N/A | N/A | SACRs 23-5, 66-12 & 66-19 |
| ASSOCIATED WITH SEVERAL SYSTEMS | Prime Technical Training Center | AFR 50-8<br>AFP 50-58<br>ATCR 50-30 | N/A | N/A | N/A |
| | 3901st SMES/MBT | N/A | N/A | N/A | SACRs 23-5, 66-12 & 66-19 |

1 - The Air Training Command technical training center charged with the responsibility of managing and training on a new weapon system. The prime center is assisted by the associated centers and the Responsible Test Agency (RTA).

2 - 3306th Test and Evaluation Squadron (TES), the Air Training Command organization normally designated RTA for new aircraft weapon system procurements per ATCR 80-14.

3 - 3901st Strategic Missile Evaluation Squadron (SMES), the SAC organization responsible for management of all SAC training facility maintenance training equipment per SACR 66-12 and 66-19.

matrix identifies the Air Force organizations normally responsible for identifying maintenance training equipment under the three acquisition modes.

The "SAC Training Facility" column of the "X" axis requires clarification. Most SAC Intercontinental Ballistic Missile (ICBM) wings have Team Training Branches (TTBs). The TTBs are responsible for training missile maintenance teams and normally use training equipment. This training equipment cannot be classified as RTE (normally associated with a Technical Training Center (TTC)) or MTS (normally associated with a Field Training Detachment or FTD).

The cells of the Table 1 matrix identify, where applicable, the regulation(s) that specify the procedures to be followed in identifying a requirement or the authority to do so. An "N/A" entry means the organization is normally not involved in the identification of this type of maintenance training equipment under the condition given in the "Y" axis.

Procedures. The requirement for training equipment is derived from an identified training need through procedures specified for Instructional Systems Development (ISD), per AFR 50-11, *"all training equipment requirements must be developed according to Instructional Systems Development."* The requirement must be stated in functional or performance terms that define the training equipment by describing training tasks and objectives to be supported, logistic requirements, environmental requirements, etc. The training capability of each type of device requested must be stated in terms of tasks it will train and number of devices required. Functional requirement statements must be specific and detailed to support development of the training equipment specifications in Phase II of the maintenance training equipment life cycle.

Although AFR 50-11 makes the identification of training equipment requirements a part of the Instructional Systems Development (ISD) process, the Air Force, for a variety of reasons, has not yet fully defined the ISD procedures for identifying these requirements. ATCR 50-30 (12.6, p. 5) states that *"when identified, the requirement must be subjected to a rigorous evaluation not only to validate the requirement but to determine the specific equipment most suitable to satisfy the requirement."*

The evaluation process includes, but is not limited to consideration of

learning objectives

cost

projected use

simulation

design

make or buy alternative

anticipated quantity.

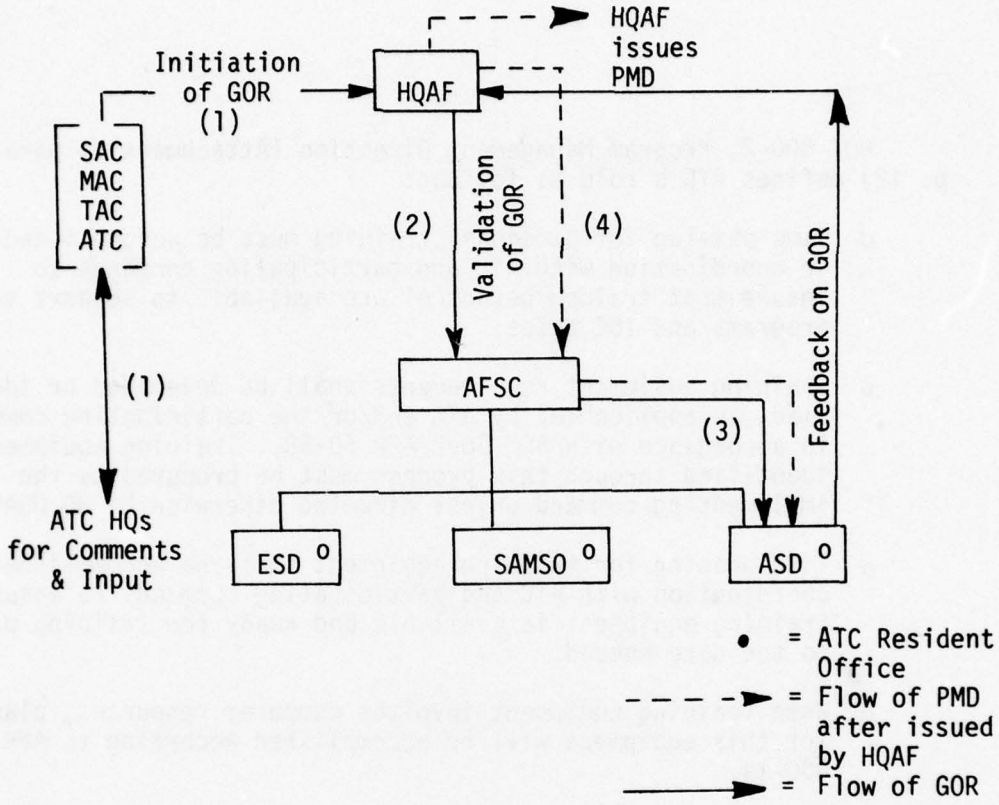
The procedures used by various organizations, the extent to which they are related to the ISD effort, differ.

Identification of Requirements to Support New System Acquisitions. The acquisition of new systems follows a System Acquisition Life Cycle (SALC) beginning with the concept and continuing through first delivery. Requirements for maintenance training equipment to support new systems are identified early in the SALC. HQ ATC/TTR has the responsibility to ensure that definitive training equipment requirements are included in equipment and systems programs.

The SALC begins with the issuance of a General Operational Requirement (GOR)[1] initiated by any command (e.g., AFLC, AFSC, ATC, MAC, TAC). Since developing and validating maintenance training equipment requirements is an HQ ATC responsibility, a copy of the GOR is sent to HQ ATC to determine its training impact. Comments prepared by HQ ATC are coordinated with the GOR originator, and all necessary revisions are made before the final version is sent to HQ USAF for approval.

Following receipt of comments on the approved GOR from the appropriate AFSD Division Office, HQ USAF issues a Program Management Directive. The PMD assigns areas of responsibility to various organizations, including ATC. Figure 5 summarizes the GOR process.

[1] GORs were previously referred to as ROCs (Required Operational Capability). HQ USAF/RDQM (OPR for AFR 57-1) message change (dated 1 September 1977) to AFR 57-1 changed the term from ROC to GOR.




Note 1 - The GOR may be initiated and coordinated by any major command and should incorporate any necessary comments or inputs from other commands (e.g., ATC).

Note 2 - HQ AF validates the GOR.

Note 3 - AFSC determines which AFSC Division office will have program management responsibility for the system. That Division office will address any and all comments concerning the GOR to HQ AF.

Note 4 - Upon review of the GOR and all relevant comments HQ AF will issue a Program Management Directive (PMD).

Figure 5 - Generalized Operational Requirement (GOR) Process

HOI 800-2, Program Management Direction (Attachment V, para. 21, p. 12) defines ATC's role as follows:

- o Time phasing for personnel training must be accomplished in coordination with ATC and participating commands to insure that trained personnel are available to support test programs and IOC dates.

- o Training equipment requirements shall be developed or identified, as applicable, by ATC and/or the participating command in accordance with AFM 50-2/AFP 50-58. Training equipment identified through this process must be procured by the implementing command unless directed otherwise by HQ USAF.

- o Time phasing for training equipment shall be accomplished in coordination with ATC and participating commands to ensure training equipment is available and ready for training prior to the date needed.

- o When training equipment involves computer resources, planning for this equipment will be accomplished according to AFR 800-14.

Once the printed system is assigned to the appropriate AFSC Division, a SPO is established by the AFSC. ATC's Resident Office in each division tracks the status of every system. If the system is large enough, the SPO and HQ ATC assign a Resident Office Director to act as liaison between them.

The SPO drafts the initial Program Management Plan (PMP) drawing on inputs from various organizations. Section 11 of the PMP deals with personnel and training and its content requires inputs from ATC, operating commands, and other participating organizations. According to AFSCP 800-3 (Attachment 4, para. 12, pp. A4-5, 9 April 1976) the PMP must *"summarize personnel training required to meet system/equipment tests and operational and support activities; cross-reference the summary to other sections, to reflect related actions and/or authorizations; and should include the major items of required training equipment, and associated aerospace ground equipment, with activation schedules."*

Before the PMP is issued the major involvement of HQ ATC is to monitor the system through the initial stages of the conceptual phase in the SALC. After the PMP is issued, HQ ATC becomes more actively

involved. Various activities during the validation and full-scale development phases for the major weapons system result in products that may provide HQ ATC with information on training and training equipment needs. Table 2 summarizes these inputs to maintenance training equipment requirement identification.

Table 3 shows the identification of MTE requirements for major systems by organization and type of equipment. The "X" axis of the matrix breaks out the equipment as RTE, MTS, or MTE for SAC training facilities. The "Y" axis shows the Air Force organization that normally identifies the requirement for maintenance training equipment. Within the matrix cells are examples of the weapon systems procured by each Air Force organization for each type of MTE.

The following discussion details the procedures used in identifying maintenance training equipment requirements for new systems by each of the three primary responsible organizations.

Technical Training Center (TTC) Procedures. The first step in the development of training equipment requirements by the TTCs is an analysis of training needs. Through this analysis the type of training equipment (actual hardware/trainers/test equipment/etc.) that will be required to support training is determined.

The second step is to determine the quantity of equipment required. This depends on the requirements for trained personnel, the amount of course time allocated to practical exercises, and the training schedules.

The first two steps of the ISD process provide critical information. The first step (according to AFP 50-58, p. 1-1) is to analyze the system requirements in order to develop a list of tasks required to perform jobs within the system. Step 2 is to define education/training requirements. The output of Step 2 is a list of task and knowledge statements usually in the form of a tentative specialty or course training standards. This list provides the basis both for course planning and for developing functional requirements for maintenance training equipment.

Steps 3, 4, and 5 of the ISD process (develop objectives and tests; plan, develop and validate instruction; and conduct and evaluate instruction) also provide valuable inputs to maintenance training equipment requirement identification and functional requirement development.

| Conceptual Phase | Program Decision | Validation Phase | Full-Scale Development Phase |
|---|---|---|---|
| - ATC Input to ROC before Final Draft Submitted to HQAF<br>- ATC Resident Office monitors system in AFSC Division Office<br>- ATC Resident Office has Resident Officer assigned to monitor individual system by SPO and ATC HQ<br>- Preliminary Systems Specifications | ATC input to Section II of PMP | Systems Specifications<br>Maintenance task and skill analysis<br>Integrated logistics data information files<br>Maintenance engineering analysis data<br>Optimum repair level analysis report<br>Integrated Logistics Support Plan<br>AGE Plan (Support Plan)<br>Test participation<br>ISD<br>↓<br>Inputs for the identification of Training Equipment requirements developed during the validation and full-scale development phases of the systems acquisition life cycle. | |

Table 2 - System Acquisition Cycle Conceptual/Validation/Full-Scale Development Phases Inputs to Identification of Maintenance Training Equipment Requirements

| Associated with a New System | MTE / AF Organization | RTE | MTS | | MTE for SAC Training Facilities |
|---|---|---|---|---|---|
| | | | Aircraft | All Other | |
| | PTTC | F-15 MX<br>F-16 E-3A | F-15 | N/A | N/A |
| | 3306 TES/AFT | N/A | AMST<br>F-16 E-3A<br>ATCA STS<br>EF-111A | MX<br>ALCM<br>GLCM<br>AARB | GLCM<br>ALCM |
| | 3901st SMES | N/A<br>SAC MTE is specifically for SAC training facilities and is not considered RTE or MTS | | | MX |

ACRONYMS

MTE - Maintenance Training Equipment

RTE - Resident Training Equipment

MTS - Mobile Training Sets

PTTC - Prime Technical Training Center

3306th TES - Test & Evaluation Squadron

3901st SMES - Strategic Missile Evaluation Squadron

GLCM - Ground Launch Cruise Missile

ALCM - Air Launch Cruise Missile

ATCA - Advance Tanker Cargo Aircraft

STS - Space Transport System

AMST - Advanced Medium Short Take-off and Landing Transport

AARB - Advanced Aerial Refueling Boom

Table 3 - Identification of Maintenance Training Equipment Requirements Associated with the Acquisition of a Major System

The process is constrained by the lack of systems data available through SPO/contractor channels and the early milestone established by the SPO for ATC to identify training equipment requirements. As a result, prime and associate center personnel have to develop training equipment recommendations from a very limited data base, primarily data purchased from the contractor and previous ATC experience with similar weapons systems.

ATCR 50-30 (para. 12, p. 5) "Developing and Validating Training Equipment Requirements" provides the criteria by which the maintenance training requirement should be evaluated and the format for the Training Equipment Justification to be sent to ATC/TTRE (per ATCR 50-30, Attachment 2).

ATCR 50-30 includes the following criteria by which training equipment requirements should be evaluated.

- o Learning Objectives. Learning objectives form the basis for training equipment requirements. Training equipment requirements must be developed, evaluated, and justified in consonance with the specific learning objective of the course. When the course training standards are available, the evaluation should include a detailed analysis of how the proposed equipment ensures the attainment of these standards, as opposed to the use of alternative training media that may require a smaller commitment of resources.

- o Cost. Estimate the total cost of ownership, consider all tradeoffs, and select the most cost-effective item.

- o Projected Use. To reduce cost and realize maximum benefits, training equipment should be selected to satisfy initial special training requirements with follow-on to update continuing resident courses.

- o Requirements for Basic Resident Courses:

  (a) Training equipment for basic resident courses should be selected to provide training in fundamentals/principles rather than maintenance or operation of a specific system.

(b) Requirements for new equipment are based on course changes requiring the teaching of new techniques or procedures and should include an evaluation of all on-hand equipment and modification possibilities rather than new procurement.

(c) Requirement for items needing replacement due to obsolescence, maintenance, or supply problems should be time-phased to coincide with requirements to update training equipment to teach new techniques or procedures.

(d) When there are several items from which to choose, and they can all satisfy the training objectives, select the most cost-effective.

o Design. Training equipment design is influenced directly by the functional statement of the requirement, specifications, and statement of work. These documents should be aimed at developing training equipment that is easy to operate and maintain, has a high degree of reliability, and satisfies the requirement without including nice-to-have features or functions.

o Make or Buy. Always consider the capability of the ATC shops to fabricate equipment to satisfy the requirement. Consider the availability of technical data and parts in time to allow fabrication of the equipment by the date needed.

o Quantitative Requirement. Consider

- Class size, student to equipment ratio and total number of students that must have simultaneous access to the equipment.

- Shifts of operation.

- Joint use between courses.

- Joint use between training and maintenance.

- Similar or suitable substitute equipment on hand or programmed.

- Use of host-base equipment by FTD.

- Downtime for maintenance.

- Centralization of field training for low trained personnel requirements (TPRs).

- Centralization of training and training equipment at resident schools for AFSCs with low TPR and high value equipment.

- Return of operational equipment to the operational inventory.

o Support Requirements:

- Facilities, projected availability date.

- Operating cost.

- Requirement for configuration management.

- Maintenance (personnel/training).

- Technical data.

- Spares/repair parts (initial and follow-on).

- Support Equipment (SE) maintenance/joint utilization, etc.

o Simulation. Simulation offers one of the most cost effective means of satisfying training equipment requirements to support training for complex expensive systems or equipment. The use of simulators should always be a primary consideration in identifying training equipment requirements.

3306th Test and Evaluation Squadron (3306TES/AFT) Procedures. The 3306 TES usually identifies mobile training set requirements for major new weapon systems. As ATC's Test and Evaluation Squadron, it is involved in the Development, Test, and Evaluation (DT&E) of the system during the validation phase of the SALC. The 3306TES uses DT&E products as input for the ISD process and ultimately for the identification of maintenance training equipment requirements.

When the 3306TES is assigned RTA authority, its initial responsibility is to write a system ISD plan. This plan is sent to HQ ATC for approval and publication. HQ ATC then assigns personnel from the prime center, Field Training Group, using command, or other sources as

directed by the Military Personnel Center (MPC) to the 3306TES for the ISD team.

The 3306TES procedures for identifying requirements for new systems maintenance training equipment are well documented. The major goal of these procedures is to provide a maximum of objectivity and traceability. Three forms (ATF Form 1, Form 2 (TEST), and Form 3 (TEST) were developed to implement ISD steps. They provide traceable recommendations where training requirements are established against specific training objectives. A numbering/documentation system tracks all recommendations to their source and provides the necessary rationale for training equipment selection.

To analyze system requirements (ISD Step 1), subject matter experts may have a printed data base such as technical data, contractor maintenance instructions, or task/skill analysis. When performing ISD on a new system there may be only limited information on resource constraints, the target population, and the maintenance concept. Some SMEs have to establish their own data base. They may use personal evaluations, blueprints, interviews, or other sources. ATF Form 1 is used to document step-by-step maintenance instructions in the absence of an adequate data base, which is defined as sequential maintenance instructions covering a maintenance task.

To define training requirements (ISD Step 2) SMEs must identify conditions and/or criteria; determine target population; and identify present capabilities of the target population. AFT Form 2 (TEST) is used to document task descriptions and establish training requirements.

The training requirements portion of the Rationale Checklist, ATF Form 2b (TEST) is used as a guide while screening the data base to determine Training Requirements (TR). The remainder of ATF Form 2b (TEST) is used to document the decisions made throughout the ISD process. If, after analysis, it is determined that training requirements exist, then the complete AFT Form 2 (TEST) will be filled out. To maximize objectivity for media choice an analogram is completed. The "Rationale Checklist" and the training media analogram are used to guide the SME in making training media selections.

The purpose of ATF Form 3 (TEST) is to compile all the behavioral requirements from the ATF Form 2 (TEST) that have media selected against them that the SME cannot manufacture locally. All behavioral requirements for one type of media or item of training equipment will be compiled in as few ATF Form 3s (TEST) as possible. The major types

(groups) of media used in this package are: transparencies; slides, chart; diagrams; illustrations/drawings; models/cutaways; video tapes; trainers/simulators; actual equipment. The criteria used in determining media source include consideration of:

- o skill level required as a result of training
- o target population
- o job required realism
- o peculiar safety hazards
- o malfunction engineering (fault programming necessity)
- o criticality
- o hands-on requirement
- o availability of hardware
- o environmental hazard
- o SME's past experience

A Training Equipment Recommendation Review Board (TERRB) is held to review and coordinate the ATC requirements prior to presenting them to the SPO. The TERRB chairman is selected by HQ ATC. Participants beside the 3306TES SMEs may include HQ ATC training manager and resources manager, the 3785th Field Training Group, the SPO training equipment manager, prime center plans and resources personnel and, usually, associate center plans and resources personnel. The 3306TES presents at the TERRB:

- o ATF Form 3
- o Proposed course chart
- o Proposed course training standards

The TERRB produces a consolidated package of recommended training equipment that is submitted through the prime center to HQ ATC/TTRE for submittal in turn to the SPO.

The process discussed above is time-constrained and driven by milestones which ATC does not establish but must support. The 3306TES has identified seven milestones, illustrated in Figure 6, which must be met in a timely fashion, on a typical ISD/training equipment (TE) identification timeline.

Trained maintenance personnel are needed to support First Aircraft Delivery. Training must begin at least three months prior to aircraft delivery (Milestone 7). Three months are required for training equipment delivery checkout and coordination (Milestone 6). Design, fabrication, and testing of training equipment can take two years from contract award to delivery (Milestone 5). It takes approximately six months from the time the training equipment request is given to the SPO until the specifications are ready to be issued (Milestone 4). The point at which HQ ATC must provide the consolidated list of ATC training equipment requirements is usually prior to the system production decision. It takes approximately two months of internal ATC coordination including the TERRB before a consolidated list of training equipment requirements can be drawn up (Milestone 3). To reach the TERRB on an average system takes about nine months of ISD (Milestone 2). Three months are needed to assemble and train the ISD team, and to collect data for analysis.

The entire process from the arrival of people for the ISD team until trained maintenance technicians are available, takes, on the average, a little more than four years.

3901SMES/MBT Procedures. The 3901SMES/MBT is becoming involved to some degree in the new MX ICBM currently under development. To date, however, they have not been involved in the initial procurement of MTE in conjunction with a new weapons system. The Minuteman system was introduced in 1962 prior to the development of ISD or the establishment of the 3901SMES.

The process, per BSD 59-17C, for identifying maintenance training equipment requirements for the Minuteman consisted of tasking the prime contractor to develop Training Equipment Planning Information (TEPI); reviewing the TEPI to develop a Training Equipment Requirements Guide (TERG); conducting a Training Equipment Guidance Conference to supply guidance to the contractor on items of training equipment identified in the TERG; and documenting in a Training Equipment List (TEL) all equipment and components identified in accordance with the TERG. Currently, according to SAMSO/MNTP, a new SAC regulation is being developed to meet the same requirements as those in BSD 59-17C for the MX.

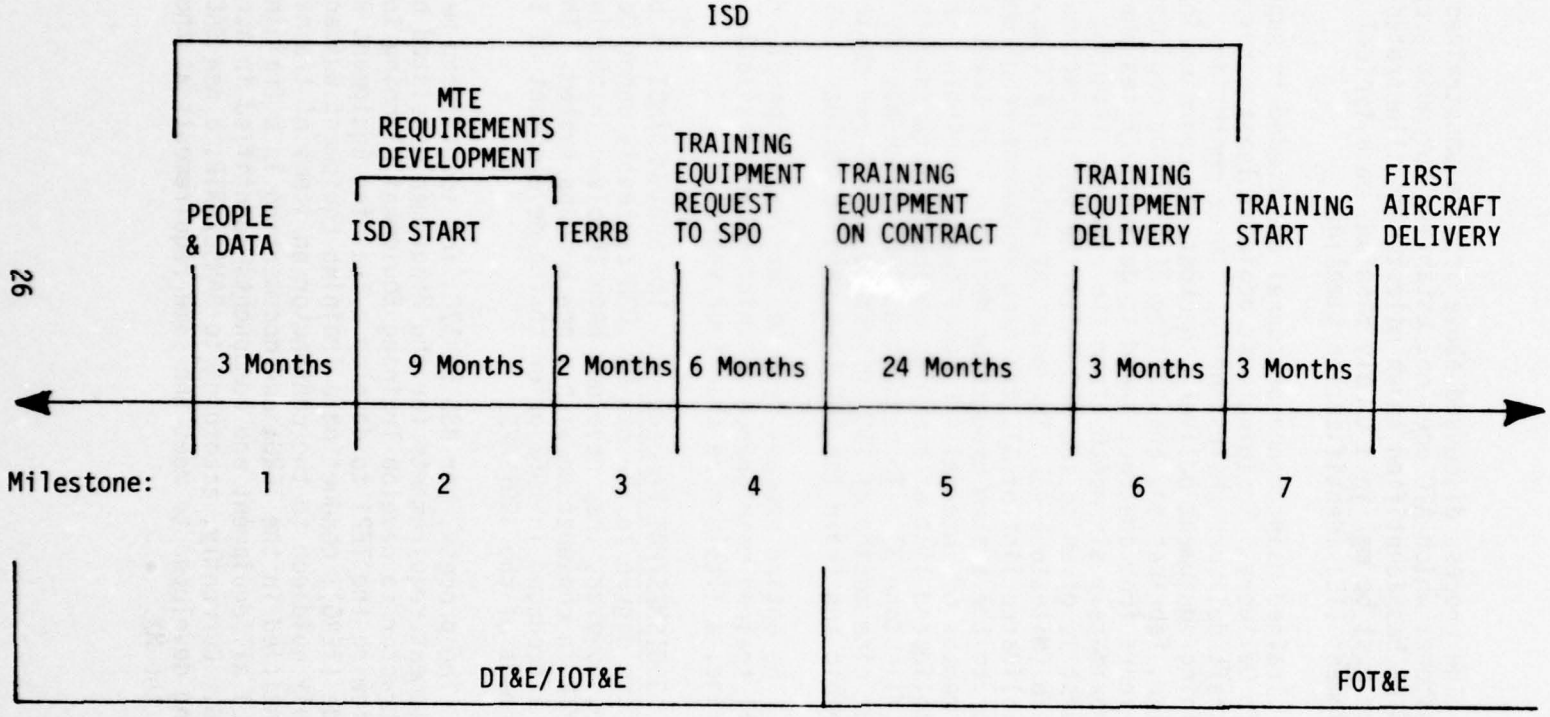



Figure 6 - Maintenance Training Equipment
Identification Lead Time Requirements

The SAMSO methodology for developing system requirements is the Systems Requirement Analysis (SRA), a functionally oriented process that results in products used as inputs systems documentation. These include the Quantitative and Qualitative Personnel Requirements Information (QQPRI), the TEPI, and the Technical Orders (TOs) prepared by the contractor. The QQPRI, the TEPI and the TOs sequence the functions stated in the SRA in a system description fashion. The SRA, particularly the Task and Skill Analysis, is also used by the Air Force as an input for the Instructional Systems Development (ISD) effort (refer to Figure 7). Form C of the SRA for the Minuteman dealt with the maintenance tasks and are still in use. The Form C function, however, has been replaced by the Logistics Support Analysis (LSA) to be used with the MX. LSA was developed from Military Standards 1338-1 and 1338-2. It states the maintenance tasks that need to be trained and identifies the training equipment to support them. Form E of the LSA is for "Support equipment, special tools or training equipment description and justification."

Compilation of this document is initiated sometime during the validation phase of the SALC and is prepared by the contractor.

Identification Requirements to Support Systems Out of Acquisition or Several Systems.

Technical Training Centers (TTCs) Procedures. The Resource Management Branch of the Technical Training Center reviews and validates requirements for all training equipment in connection with each system or training program change. This is accomplished through review of engineering change proposals and may result in a need for a standard Air Force item or a new or improved trainer to be procured. The type of equipment and estimated cost determines the channels for procurement.

An instructor or course supervisor may identify a need for maintenance training equipment resulting from obsolescence or damage to existing equipment. Currently, however, instructors receive no training on how to determine training equipment requirements.

Once the need for training equipment has been identified for a system out of acquisition, the course supervisor must submit an AF Form 601b to the Training Branch. This Form justifies the need for the training equipment through the defining of: the Specialty Training Standard (STS) elements it will support; the number of students it will be used to train; the number of hours the equipment will be utilized.

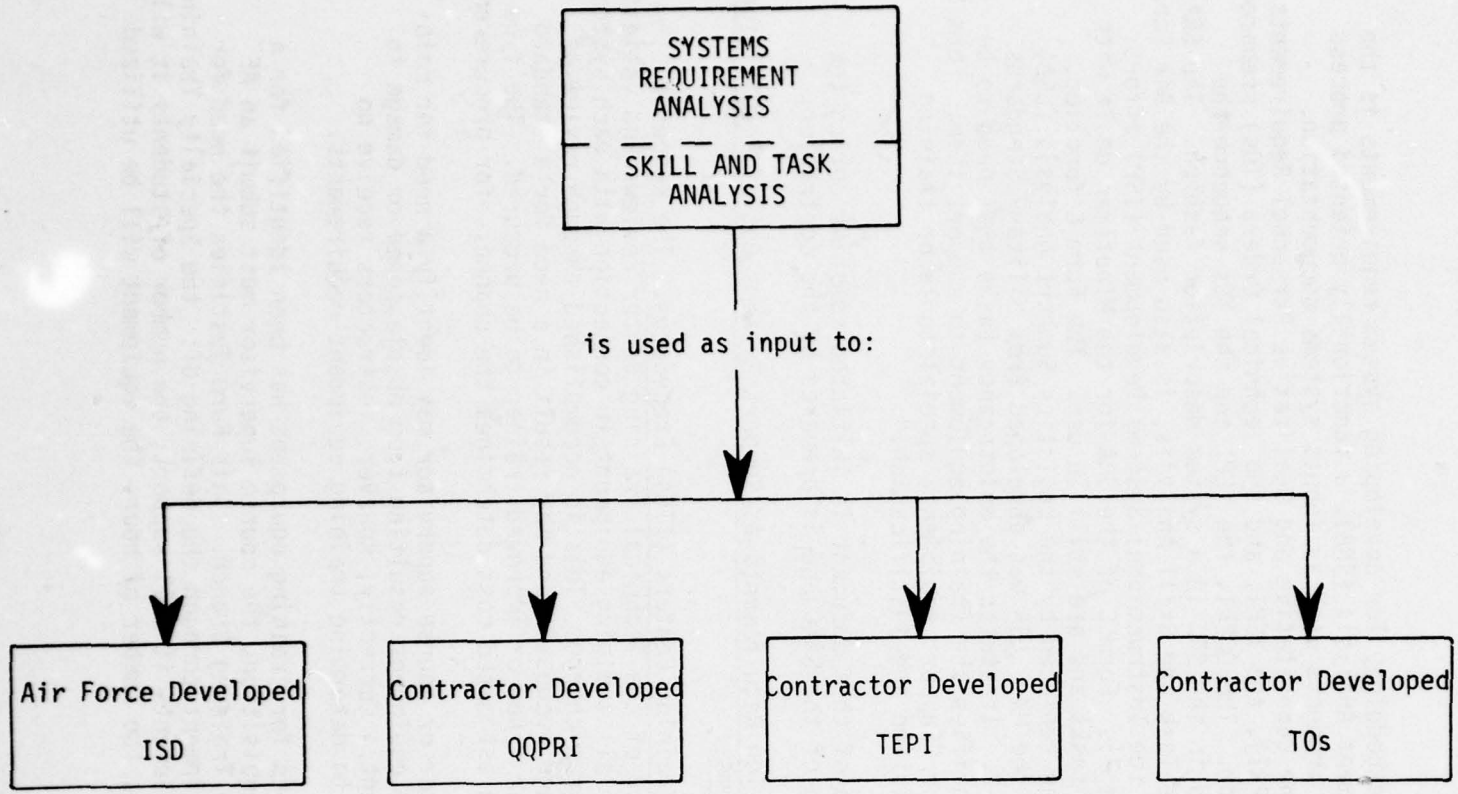



Figure 7 - Systems Requirement Analysis (SRA) Documentation and the Processes They Support

3901SMES/MBT Procedures. It is the Maintenance Training Section's responsibility according to SACR 23-5 to *"recommend requirements for ICBM maintenance and munitions trainer and support equipment requirements for training devices to the Directorate of Missile Maintenance and Directorate of Munitions HQ SAC."* This is accomplished through the review of contractor Engineering Change Proposals (ECPs) and Ogden Air Logistics Center Engineering Change Summary (ECS). Comments and recommendations are forwarded to SACSO or Ogden ALC for inclusion in Configuration Control Board actions as required.

The contractor initiates either a weapons system or trainer ECP which is forwarded to various organizations including the 3901SMES/DOM. The 3901SMES/DOM determines whether the ECP impacts the maintenance of the system. If so, then the ECP is forwarded to the 3901SMES/MBT (Maintenance Training Section). Review of Trainer ECPs by the 3901SMES/MBT involves verifying nomenclatures and serial numbers, and determining which Wings are impacted. Where the ECP requires clarification, MBT may contact the contractor directly by phone. If, however, the ECP contains incorrect nomenclature, serial numbers, etc., or if maintenance training equipment requirements need to be identified, then comments and recommendations are conveyed by MBT to SACSO (SAC Systems Office). A similar process of review is conducted for weapons system ECPs. If maintenance training equipment is affected and not addressed, then MBT notifies SACSO that a Training Equipment Supplement to the ECP is required. SACSO will inform the contractor of this requirement, and the contractor will issue an ECP revision. All of MBT's comments pertaining to maintenance training equipment requirements are conveyed to SACSO, who act as MBT's representative at the Configuration Control Board (CCB). The CCB will not approve any ECP that impacts but does not address training equipment.

Phase II - Development of Maintenance Training Equipment Specifications.

The development of specifications for fabrication is a SPO responsibility and is usually performed through a contractor. The specifications are derived from the functional requirement statements. The contractor (either the prime system contractor or one chosen through competitive bid) works in conjunction with the SPO and using command, e.g., ATC, SAC, to develop the specifications.

The majority of maintenance training equipment specifications are developed in conjunction with the acquisition of a new system. The procedures are the same for systems out of acquisition, although the procuring agencies may differ, e.g., AFSC or AFLC. All maintenance training equipment specifications are prepared in accordance with Military Standard 490.

The SPO may choose one of several options for the development of specifications as iterated in Military Standard 490. Normally a two-part specification is used: Part I is Type B1 Prime Item Development Specification and Part II is Type C1b Prime Item Product Fabrication Specification.

The Type B1 Specification is applicable to a complex item such as launcher equipment, fire control equipment, training equipment, etc. *"A prime item development specification may be used as the functional baseline for a single item development program or as part of the allocated baseline where the item covered is part of a larger system development program."* (MIL STD 490) The specification states the detailed performance, design, development and test requirements for the prime item. Technical interchange meetings are conducted with the SPO, contractor and ATC participation to make sure that functional requirements for the maintenance training equipment are included. In addition, preliminary and critical design reviews are conducted by the SPO in conjunction with ATC and/or the using command.

AFR 50-11 states that the using command ISD personnel must be included in source selections, as well as preliminary and critical design reviews. This is to ensure that the proposed equipment meets the ISD identified training goals and that the design offers a cost-effective training method. The contractor is provided with inputs and guidance necessary to develop detailed equipment specifications per Military Standard 490 and to establish firm cost estimates.

The Preliminary Design Review (PDR) evaluates the progress, consistency and technical adequacy of the selected design and test approach, and to establish compatibility with program requirements and preliminary system designs.

The final design of the training equipment is reviewed during the Critical Design Review (CDR). This is the last opportunity the SPO and using command have to modify the training equipment design before fabrication begins. The SPO can alter the design at this point if cost constraints or changes in the configuration of the system dictate. *"The CDRs should be conducted on each configuration item to determine the acceptability of detail design, performance and test characteristics depicted by the design solution specified in the draft product specification, accompanying drawings, and other engineering documentation."* (AFR 800-14, Vol. II, pg. 4-8, para. d)

After it approves the prime item development specification, the System Program Office must submit a contract change notice with a statement of work (SOW) to the contractor for fabrication of the maintenance training equipment. Internal SPO coordination and specifications development take at least six months from the time the SPO receives the functional requirements until the training equipment specification goes out on contract for fabrication.

Usually within 30 days of the contract award the SPO conducts a Training Equipment Guidance Conference (TEGC) with contractor and ATC representatives to assure common understanding of the statement of work (SOW) and training equipment requirements.

During fabrication the contractor must develop the second part of the specifications (Type C1b, Prime Item Fabrication Specification), which states the requirements for manufacture and acceptance of the prime item. *"Type C1b specifications are normally prepared for procurement of prime items when: a detailed design disclosure package needs to be made available; it is desired to control interchangeability of lower level component and parts; and service maintenance and training are significant factors."* (MIL STD 490; pg. 5, para. 3.1.3, 3.1.2)

3306TES Procedures. The 3306TES presents the performance requirements for maintenance training equipment to the Prime Center and HQ ATC at the TERRB. Following HQ ATC approval of the maintenance training equipment requirements a series of technical interchange meetings are conducted with the SPO and contractor, e.g., TEGC, PDR, CDR, etc. The subject matter experts of the 3306TES who identified the training equipment requirements through a detailed ISD effort, work closely with

the contractor in developing, reviewing and refining the specification. This close coordination between the SMEs and the contractor during specification development, plus the extremely detailed and documented training objectives supplied by the SMES, result in the development of an exceedingly refined package of maintenance training equipment specifications.

SAMSO Procedures. SAC maintenance training equipment specifications are developed through the close collaboration of the Strategic Air Command Systems Office (SACSO), the 3901SMES/MBT, AFSC's Space and Missile Systems Office (SAMSO), and the contractor. The processes are similar to those used by the 3306TES with SAC organizations offering assistance in the technical interchange meeting for specifications development.

Phase III - Procurement of Maintenance Training Equipment

No one set of Air Force procedures exists for procuring maintenance training equipment. The type of equipment being produced and the way it is being managed at the Air Force level dictates the procedures to be followed. Table 4 identifies the various procedures followed for the type of equipment being procured, how the equipment is being managed at the Air Force level (HQ USAF, AFSC, AFLC), and the regulations governing procurement procedures.

Generally, the procurement procedures for maintenance training equipment are contained in the following Regulations:

- AFR 800-2 for training equipment being procured for a new weapons system.
- AFRs 100-8 and 100-18 for standard CEM (communication-electronic-meteorological) training equipment.
- ATC Supplement 1 to AFM 300-12 for standard ADP (automatic data processing) training equipment.
- AFM 67-1 for standard Air Force material other than CEM or ADP equipment.
- ATCR 50-22 for locally manufactured or fabricated training equipment.
- AFR 57-1 and ATC Supplement 1 for new training equipment requirements requiring R&D.

| | | | AFSC | | AFLC (ALC or EMO) | LOCALLY FABRICATED |
|---|---|---|---|---|---|---|
| | | | SPO | DIVISION | | |
| ASSOCIATED WITH NEW SYSTEM | Requires R & D | | AFR 800-2 | N/A | N/A | N/A |
| | No R&D | Standard AF Material or Off-The-Shelf Purchase | N/A | N/A | AFMs 57-1, 67-1 AFR 100-8,100-18 & 300-12 | N/A |
| | | Air Force Unique | N/A | N/A | N/A | ATCR 50-22, AFM 67-1 |
| ASSOCIATED WITH SYSTEM OUT OF ACQUISITION OR SEVERAL SYSTEMS | Requires R & D | | N/A | AFR 57-1 or 57-4 | N/A | N/A |
| | No R&D | Standard AF Material or Off-The-Shelf Purchase | N/A | N/A | AFMs 57-1, 67-1, AFR 100-8,100-18 & 300-12 | N/A |
| | | Air Force Unique | N/A | N/A | N/A | ATCR 50-22, AFM 67-1 |

Table 4 - Organizational Responsibilities/Applicable Regulations for Phase III Procurement of Maintenance Training Equipment

- o AFR 57-4 for major modifications of existing training equipment.

- o AFR 27-15 and ATC Supplement 1 for all air vehicles used for training equipment.

Procedures. The following discussion describes Air Force maintenance training equipment procurement procedures in terms of whether the training equipment being procured is associated with a new system, associated with a system out of acquisition, or with several systems.

Associated with a New System. AFSC through the appropriate SPO normally manages procurement of all maintenance training equipment required to support training for a new, or system-managed system. The SPO is responsible for determining how the equipment is going to be procured and for assigning actual procuring responsibility to the appropriate organization. Per AFR 50-11, the SPO

- o Plans, organizes, coordinates, budgets, schedules, directs, and controls all system managed training equipment package efforts. This includes ensuring that the management of training equipment is clearly stated and included in the Program Management Plan (PMP) per AFR 800-4.

- o Obtains and consolidates requirements for all items to be included in the statement of work. Screens requirements to eliminate unnecessary duplication, and coordinates with:

  1) The using commands, to identify and choose all items in a training package. They also approve the performance and design specifications before contractor or in-service construction efforts are started.

  2) AFLC to ensure that centrally procured Government-Furnished Equipment (GFE), logistics support data, initial spares, and repair parts are identified and purchased on a timely basis.

- o Prepares and justifies budget estimates, financial plans, and necessary program documents; provides necessary assistance to and coordinates with each activity that has programming and budgeting responsibility for a package item.

- o Ensures that problems adversely affecting the design, development, procurement, delivery, performance and logistics support of training equipment are promptly resolved, keep HQ USAF Office of Prime Responsibility (OPR), using command, and supporting command advised of training equipment status.

- o Coordinates maintenance concepts with the using command and AFLC. If the using command and AFLC disagree on the maintenance concept for a trainer, both provide their position and rationale to HQ USAF/LGY for resolution.

The new system's prime contractor normally provides all system-specific training equipment. The AFSC SPO ensures that the prime contractor provides it per AFR 800-2.

Procedures for test, inspection and acceptance of maintenance training equipment procured to support a new system are described here in terms of ATC. The procedures are identical for any other command (SAC, TAC, etc.) procuring training equipment for their own use.

AFR 800-15 states that ATC will *"participate with AFSC, AFLC, AFTEC, and the operating commands in the development of human factors engineering (HFE) inputs to test plans for test programs conducted in accordance with AFR 80-14."* AFR 80-14 specifies ATC responsibilities in greater detail as follows:

- o *"Participate in system acquisition from publication of the formal Air Force requirements document through DT&E (Development Test and Evaluation) and OT&E (Operational Test and Evaluation).*

- o *"Prepare a test plan to support AFTEC and MAJCOMs during T&E (Test and Evaluation), providing qualified personnel to test teams as required by PMDs or test directives, and compile and verify the training data, training programs, curricula, training standards and activities."*

The key test, inspection and acceptance events in the Procurement phase of the maintenance training equipment acquisition process are:

- o In-Process Reviews
- o Functional Configuration Audit (FCA)
- o Physical Configuration Audit (PCA)
- o Installation and Checkout Plans
- o Acceptance

In-Process Reviews. The SPO and ATC conduct in-process reviews or inspections at specified time intervals while the contractor is fabricating the equipment. The frequency of these reviews, e.g., after 33% of the device is fabricated, 50% fabricated, etc., depends on the complexity of the equipment being fabricated. The purpose of the reviews is to ensure that the equipment is fabricated per the design and specifications.

Functional Configuration Audit (FCA). ATC conducts a formal examination of functional characteristics' test data for the maintenance training equipment, prior to acceptance, to verify that the equipment has achieved the performance specified in its functional specifications.

Physical Configuration Audit (PCA). The PCA is conducted to determine if all the pieces of the equipment have been produced according to specifications. Per AFR 65-3 the "as-built" equipment is examined against its technical documentation in order to establish the equipments initial product configuration identification.

Installation and Checkout Plan. The contractor prepares an Installation and Checkout Plan. Per ATCR 800-1, *"the contractor's installation and checkout plan will be reviewed by the SPO and ATC, with technical assistance from the contractor, as required, for the purpose of ensuring that all specifications, interface, and local support requirements have been considered by both the Air Force and the contractor."*

Acceptance. Acceptance of the training equipment by ATC requires an ATC team effort. Per ATCR 50-30, *"ATC provides a training equipment acceptance team composed of representatives from HQ ATC and centers and wings as appropriate for each training equipment acceptance demonstration. ATC/TTR or ATC/DO, as appropriate, is responsible for forming the team for acceptance of new training equipment. ATC/LGM is responsible for acceptance of modified training equipment. The training*

*equipment acceptance team prepares and distributes ATC Form 514, ATC Training Equipment Acceptance Demonstration Checklist. The training equipment acceptance team ensures preparation and disposition of applicable AFTO forms, in accordance with TO 00-20-7 and the list of systems and subsystems under configuration management system (ACMS/ SCMS) applicable to accepted training equipment (AFSC provides representation for acceptance teams for communication-electronics training equipment for which AFCS has maintenance responsibility)."*

AFSC provides funding for all maintenance training equipment supporting training on a new Air Force system. These funds are managed by the appropriate AFSC SPO (F-15, F-16, MX, etc.) for training equipment associated with a new system per AFR 800 series regulations.

Associated with a System Out of Acquisition or with Several Systems. These types of maintenance training equipment can be either system or non-system managed. A need for training equipment for a system out of acquisition (PMRTed per AFR 800-4) can result from:

- A major modification for a system that results in a need for additional or modified training equipment.
- A cut by AFSC SPOs of monies budgeted to procure training equipment for a new weapons system that results in delivery of insufficient training equipment to ATC, SAC, etc. during new system acquisition. Training equipment budgets, almost without exception, have at least been considerably cut for most of the new systems now being procured by the Air Force.
- "Worn-out" or damaged operational equipment used as training equipment that must be completely replaced; for example, electronic equipment used for training that has had its printed circuit boards removed and replaced hundreds of times by students. This equipment was originally designed to have its circuit boards removed and replaced perhaps only six or seven times during its life cycle. It is not "studentized" and will malfunction and eventually have to be replaced.

Once a command identifies the need for additional or improved maintenance training equipment, the command must determine if the equipment:

- o requires R&D
- o is a major modification to existing equipment
- o is a standard Air Force item
- o can be locally manufactured
- o is an aircraft

Once it has made these determinations, the command can select the appropriate procurement procedure. Each of the above will be addressed individually.

Equipment Requiring R&D. In the past, most maintenance training equipment procured for a system out of acquisition has been operational equipment where R&D is normally not required. However, with the advent of simulation, more and more maintenance training simulator requirements are being identified, and simulators normally require engineering research and development.

The procedures, per AFR 50-11, for procuring maintenance training equipment requiring R&D are as follow:

- o The command identifying the need for new equipment will prepare a General Operational Requirement (GOR)[1] per AFR 57-1 and submit it to HQ USAF for approval. These requests must be supported with proper justification. The requirement for and use of equipment must be clearly identified in directives, course control documents, or instructional development plans.
- o HQ USAF will:
  1) Evaluate and approve the training equipment requirement.

[1] GORs were previously referred to as ROCs (Required Operational Capability). HQUSAF/RDQM (OPR for AFR 57-1) message change (dated 1 September 1977) to AFR 57-1 changed the term from ROC to GOR.

2) Assign procurement management responsibility according to AFR 800-2 and PMDs (Program Management Directives). Normally procurement management responsibility will be assigned to AFSC. Within AFSC, the requirement will become the responsibility of ESD if the equipment is electronic, ASD if aircraft related, and SAMSO if missile related.

3) Approve all budget estimates and buying programs.

4) Issue procurement and budget authorizations as necessary.

o AFSC will:

1) Chair and conduct all conferences with other commands.

2) Prepare statements of work (SOW) and specifications as directed in coordination with all participating commands.

3) Recommend to HQ USAF the article to be procured. Recommendations will include both development and production schedules.

4) Assume responsibility for all engineering, procurement, and program management until management responsibility is transferred to AFLC per AFR 800-4.

5) Provide reports on procurement status to the HQ USAF OPR every four months.

o AFLC will:

1) Establish and maintain liaison with AFSC to provide logistics support and prepare to accept management responsibilities.

2) Provide logistics support to all training equipment.

3) Furnish initial spares and repair parts support for equipment procured by AFSC.

4) Develop, approve, publish, and revise equipment Tables of Allowance (TAs).

Funding for maintenance training equipment requiring R&D and designed either to support a system out of acquisition, i.e., PMRT from AFSC to AFLC (per AFR 800-4), or to support more than one system is provided by AFSC.

Major Modifications to Existing Equipment. The procedures outlined in AFR 57-4 apply whenever a major modification is necessary to any Air Force equipment. These modifications could include maintenance training equipment. Normally, when an Air Force system is updated via a retrofit configuration change per AFR 57-4, the associated training equipment is included as part of the system modification. The exception to this rule occurs when maintenance training equipment needs major improvement not associated with a major modification of the prime system(s). The approving authority for modifications varies depending on the type of modification as follows:

- Class I modifications are approved by the appropriate MAJCOM.
- Class II and III modifications are approved by AFSC.
- Class IV modifications are approved by AFLC.
- Class V modifications must be approved by HQ USAF.

This procedure can be time-consuming and, as previously stated, is seldom used when modifying maintenance training equipment.

Standard Air Force Material. If the training equipment qualifies as a standard item per AFR 80-14, it is normally procured through AFLC. The material management systems involved are Unit Forecast Authorization Equipment Data (UFAED) and Equipment Authorization Inventory Data (EAID). The procedures to be followed and applicable regulations vary depending on the type of standard material being acquired.

- o Communication-Electronic-Meteorological (CEM) - standard CEM training equipment is normally procured per AFRs 100-8 and 100-18.

- o Automatic Data Processing (ADP) - standard Air Force ADP training equipment is procured per AFM 300-12 and ATC Supplement 1 to AFM 300-12.

- o Other Standard Air Force Material - Other standard Air Force material being used as end items for maintenance training equipment may be procured per AFM 67-1. Air Force standard material can be either locally or centrally (depot) purchased or funded.

AFLC provides funding for all maintenance training equipment if equipment has been qualified as an Air Force standard item or material per AFR 80-14 and adequate reprocurement data are available.

It should be noted that, per AFR 50-11, *"training equipment bought by AFSC or AFLC must be treated as 'Investment' centrally purchased (CP) and issued to the using Air Force activity without repayment. Initial logistics support items not in the supply system, which are identified as Stock Fund components, Budget Codes 1 and 9, will be issued as reimbursable. Items must be recoded 'LP' (locally purchased or funded) or given a division of the Air Force Stock Fund only to permit proper and timely financial planning."*

Local Fabrication of Maintenance Training Equipment. ATCR 50-30 states that commands should *"always consider the capability of ATC shops to fabricate equipment to satisfy the requirement."* The "ATC shops" referred to are the Training Equipment Branches of the Technical Training Wings or TCHTW/TTS. With regard to training equipment, the Training Equipment Branches, per ATCR 50-22:

1) *"Provide feasibility studies, design studies, and prepare technical information packages."* The feasibility study *"verifies the capability of the facility to perform the requested work and determines the most economical material that will best accomplish the desired results."* The design study is *"accomplished jointly by training services and ISD training personnel to determine*

*in greater detail than the feasibility study if proposed training equipment will effectively and efficiently accomplish the desired results. It normally includes a man-hour estimate, bill of materials, engineering drawings, and documentation of essential experimental work accomplished. A design study is not necessary when sufficient information or engineering drawings are available."*

2) Fabricate training equipment not available through normal sources of supply, and moficiation and maintenance (beyond the capability of the local maintenance activity) of locally manufactured training equipment.

The procedures used in obtaining locally fabricated training equipment are specified in ATCR 50-22. The ATC training equipment fabrication services are not restricted to ATC organizations. All non-ATC organizations forward request for local fabrication of training equipment, per ATCR 50-22,to ATC/TT for approval. If approved, ATC/TTR determines if the support can be provided, gives final approval, assigns the work, and designates charges to be billed the requesting agency. Requests for training equipment branch services are normally initiated on an ATC Form 375 per ATCR 50-22. When fabrication of training equipment is being requested, a Training Equipment Work Order Request Pakcage must be compiled. The contents of this package depend upon the nature of the service being requested. If the package is for fabrication of nonexpendable items, it will consist of (per ATCR 50-22):

- o ATC Form 375
- o Copy of the approved training equipment requirements justification letter required by ATCR 50-30.
- o AF Form 601b, Custodian Request/Receipt (AFM 67-1).
- o DD Form 1348-6, Non-NSN Requisition (Manuals), (AFM 67-1, Volume II), except for items included in the Table of Allowance (TA 014) or which have a current stock number assigned.

Requests for expendable items will consist of an ATC Form 375 only.

The requesting procedures at the Technical Training Centers for training equipment services for fabrication of non-expendable training equipment, per ATCR 50-22, are as follows:

- Package is submitted to school operations division for proper documentation, validation of need date and any contention that a training degradation would result if the need date is not met. The package is also reviewed by the logistics division to ensure maintainability, supportability, and safety if applicable.

- School commanders must approve all requests.

- Training Equipment Branch reviews package for compliance with governing directives and forwards package to EMO.

- EMO processes requests in accordance with the procedures specified in AFM 67-1 for final approval or disapproval. All training equipment costing more than $1,000 must be approved by HQ ATC. EMO assumes responsibility for obtaining this approval. The approved package is then forwarded by EMO to the Training Equipment Branch.

- Training Equipment Branch chief coordinates package and forwards it to Workload Control for processing. If package is for "first of a kind training equipment," a copy of ATC Form 375 is forwarded to Center/LGX for coordination. Logistics Division forwards copy of ATC Form 375 to Center/MA who assigns it a Writing Maintenance Monitor from the appropriate Work Center to serve as coordinator with Training Equipment Branch during development and acceptance phase to ensure maintainability and supportability.

When ATC training equipment branches are requested to fabricate training equipment, the command with acquisition responsibility furnishes funds through an obligation authority (OA) per AFR 50-11. This obligation authority covers the purchase of parts coded LP and Government Furnished Equipment (GFE) items assigned to a division of the Air Force Stock Fund. Funding for these services

varies depending on the Air Force organization requesting the fabrication of the training equipment. The specific funding procedures are detailed in ATCR 50-22 as follow:

- The ATC Training Equipment Branch assumes costs for service provided ATC activities and other commands suporting ATC (per AFM 172-1, Volume I). Locally manufactured training devices are managed as nonstock fund items and issued without charge. Stock fund components used in fabrication from supply are issued on a reimbursable basis.

- Air Force organizations covered by AFR 11-4 support agreements provides funds for services and commodities unique to the tenant on a basis of net additional cost, e.g., civilian temporary hire for overtime, locally funded material, and contractual services specifically related to support of the tenant.

- Non-ATC organizations without support agreements provide funding on the basis of net additional cost.

Aircraft Procured as Maintenance Training Equipment. Occasionally, aircraft are required for maintenance training. The procedures governing procurement of aircraft as maintenance training equipment are specified in AFR 27-15 and ATC Supplement 1 to AFR 27-15. When a TTC identifies a need for an aircraft, a justification for it is submitted to ATC/TT per AFR 27-15. Upon ATC/TT approval, the request is forwarded to HQ USAF for approval and procurement per AFR 27-15. Many times the aircraft requested is not obtained. This occurs most often when the requested aircraft is still part of the T/A of an operational unit. Often a substitute aircraft is acceptable; e.g., a B-52E in lieu of a B-52G or H. These aircraft are normally obtained from Davis-Monthan AFB.

## Phase IV - Utilization and Support of Maintenance Training Equipment

The utilization and support phase of maintenance training equipment covers all activities occurring during the useful life of the equipment. AFR 50-11 states that the maintenance training equipment using commands will "ensure the effective use of assigned training equipment."

The support activities conducted during the utilization phase have well documented procedures. These activities include:

- o Configuration Management
- o Maintenance
- o Inventory, Utilization and Status Reporting

### Configuration Management

Maintenance training equipment supporting training for a major system is configuration managed. All training equipment that is configuration managed is also systems managed, i.e., it is used to support training on a specific Air Force system. Therefore, its configuration must be representative of the system it is supporting, and as changes are made in the configuration of the system, the training equipment must be modified accordingly. AFR 50-11 states that "training equipment designated as configuration items (CIs), by AFR 65-3, are maintained according to the system or equipment it represents or supports. Changes in configuration are validated according to AFM 50-2. Configuration items are modified according to AFR 57-4." For these reasons, all applicable Air Force configuration management policies are applicable, to some degree, to maintenance training equipment.

AFR 65-3, which specifies Air Force configuration management policy, defines configuration management as a process that "identifies, controls, accounts for and audits the functional and physical characteristics of systems, equipments, and other designated material items developed, produced, operated and supported by DOD components."

Responsibility for configuration management of maintenance training equipment in the Air Force is assigned to the agency that uses or is responsible for the equipment. Normally, only two organizations are primarily responsible for configuration management of Air Force maintenance

training equipment, the Resources Management Groups of ATC's Technical Training Centers (TTCs) and SAC 3901SMES/MBT, as illustrated in Table 4.

Training equipment that is configuration managed by ATC's TTCs is configured according to the system or equipment it represents or supports. Per AFR 50-11, "changes in configuration are validated according to AFM 50-2: and configuration items are modified according to AFR 57-4." Specific ATC responsibilities are outlined in ATCR 50-30.

SAC Training Facility maintenance training equipment configuration management is the responsibility of the 3901SMES/MBT. Their configuration management responsibility is delineated in SACR 23-5. Specifically, they are (per SACR 23-5) to "review contractor Engineer Change Proposals (ECPs) and Ogden Air Logistics Center (ALC) Engineering Change Summaries (ECSs) and forward comments and recommendations to SACSO or Ogden ALC for inclusion in CCB (Configuration Control Board) actions as required" and "insure that applicable weapons system modifications are incorporated in training devices."

Configuration management is applied during the entire life cycle of a program and consists of three subfunctions, per AFR 800-3:

1) *An identification function to record the characteristics of a configuration item, usually in the form of specifications which document the results of the system engineering process and design engineering.*

2) *A control function to process each change to a configuration baseline (identification which is formally designated and fixed as a specific time to serve as a control reference).*

3) *An accounting function to track and provide status of each identified baseline and changes.*

Configuration Identification. The identification subfunction of configuration management incolves the use of baselines established with verified technical documentation in the form of specifications, engineering data, and related lists. The following are the major configuration identification activities that occur during the acquisition cycle.

- During the Conceptual Phase the Functional Configuration

Identification (FCI) is established. This identification serves as a description of the functional characteristics required throughout the CI's life cycle, i.e., its functional baseline.

- The Allocated Configuration Identification (ACI) is established during either the Advanced Development/ Validation or Full-Scale Development Phase. The ACI consists of a performance oriented specification prepared in accordance with MIL-STD-490 (Section 6) and serves as the performance baseline for the CI.

- The Product Configuration Identification (PCI) is established during the Production Phase. This identification specifies the necessary "build-to" of form, fit and function requirements. The product baseline is established for the CI with the PCI.

- Part numbering, serialization and nomenclature are important parts of the identification subfunction and are completed prior to the deployment of the CIs per AFR 65-3.

A detailed description of this subfuntion may be found in AFR 65-3.

Configuration Control. Configuration control is probably the most important configuration management subfunction for maintenance training equipment. It satisfies two primary objectives: first, it prevents unnecessary or marginal changes; second, it expedites the approval and implementation of necessary changes. AFR 65-3 states that there are four criteria for changing a CI and they are:

- Correct Deficiencies

- Satisfy Change in Operational or Logistic Support Requirements

- Effect Substantial Life Cycle Cost Savings

- Prevent or Allow Slippage, as Desired, in an Approved Schedule

| | MTS & RTE | SAC TRAINING FACILITY EQUIPMENT |
|---|---|---|
| ATC's Technical Training Centers' Resources Management Groups | AFRs 65-3 & 50-11<br>AFM 50-2<br>ATCR 50-30 | N/A |
| SACSO and 3901st SMES/MBT | N/A | AFRs 65-3 & 50-11<br>SACR 23-5 |

Table 5 - Organizational Responsibilities/Applicable Regulations for Configuration Management of Maintenance Training Equipment

All changes to CIs are initiated through an Engineering Change Proposal or ECP. AFR 65-3 states that "DOD components shall assure that contractors and in-house activities prepare ECPs in accordance with MIL-STD-480 or MIL-STD-481." MIL-STD-480 requires a complete analysis of the ECP to determine its impact in the event that it is implemented. This impact analysis will include consideration of the following factors:

- o All Known Interface Effects
- o Changes Required in the Functional/Allocated/ Product Baselines of the CI
- o Impact on Integrated Logistic Support
- o Estimated Cost Impact

MIL-STD-481 specifies the procedures for preparing an abbreviated ECP. These procedures require limited analysis of the impact of the ECP on interfaces, integrated logistic support, or costs. When this standard is used, it places the major responsibility for impact analysis on the procuring agency.

AFR 65-3 specifies that a Configuration (Change) Control Board (CCB) will be established by each DOD component to "provide for proper change evaluation, processing, approval/disapproval and implementation" of an ECP. The CCB membership will include representatives from all affected activities including training. Each organizational representative presents the official position of his organization regarding the ECP. Training representatives ensures that the impact of the ECP on training and training equipment is ascertained and addressed in the ECP.

CCB/ECP decisions are implemented by means of a Configuration Control Board Directive (CCBD) which serves as the formal record of the decision. The CCBD will include (per AFR 65-3):

- o Concurrence/Non-Concurrence of Each Member and His Official Position on the ECP
- o Established Implementation Need Date
- o Recommended Contractual Method of Implementation

When completed and issued, the CCBD serves as the directive for the applicable procuring agency and any other involved agency affected by the ECP as approved or disapproved. Figure 8, from AFR 65-3, illustrates the significant events in processing ECPs and the relative sequencing of those events.

The evaluation of an ECP will include determining the effect of the ECP on training equipment. When an ECP does impact the configuration of training equipment, normally a Training Equipment Supplement (TES) is prepared and included in the ECP. Often, the ECP impact on training equipment is ascertained when initially prepared and a TES is included. When an ECP does impact training equipment, and its impact is not addressed in the ECP; the CCB should identify the requirement for the TES and disapprove the ECP and request the preparation of a TES.

ATC Configuration Control Procedures. When ATC provides training in support of a major system, they will normally have several representatives on that system's CCB. These representatives include individuals from both HQATC and the prime Technical Training Center (TTC) providing the training (such as Chanute TTC for the F-111). Both HQATC and the prime TTC are responsible for reviewing the ECPs, determining the impact on training equipment, providing comments and recommendations at the CCB for incorporation in the CCBD.

SAC Configuration Control Procedures. The only maintenance training equipment employed at SAC ICBM training facilities are associated with the Minuteman. (The Titan uses no training equipment: all training is conducted on actual hardware at the Titan sites.) There are five organizations involved in the review of all Minuteman ECPs:

- o 3901st SMES/MBT
- o SACSO
- o SAMSO
- o Prime TTC (Chanute)
- o ATC Resident Office at Norton AFB (ATC/XPQN)

Although each of the above organizations reviews all Minuteman ECPs, all are not members of the Minuteman CCB. Per ATCR 800-1, Volumes I and II,

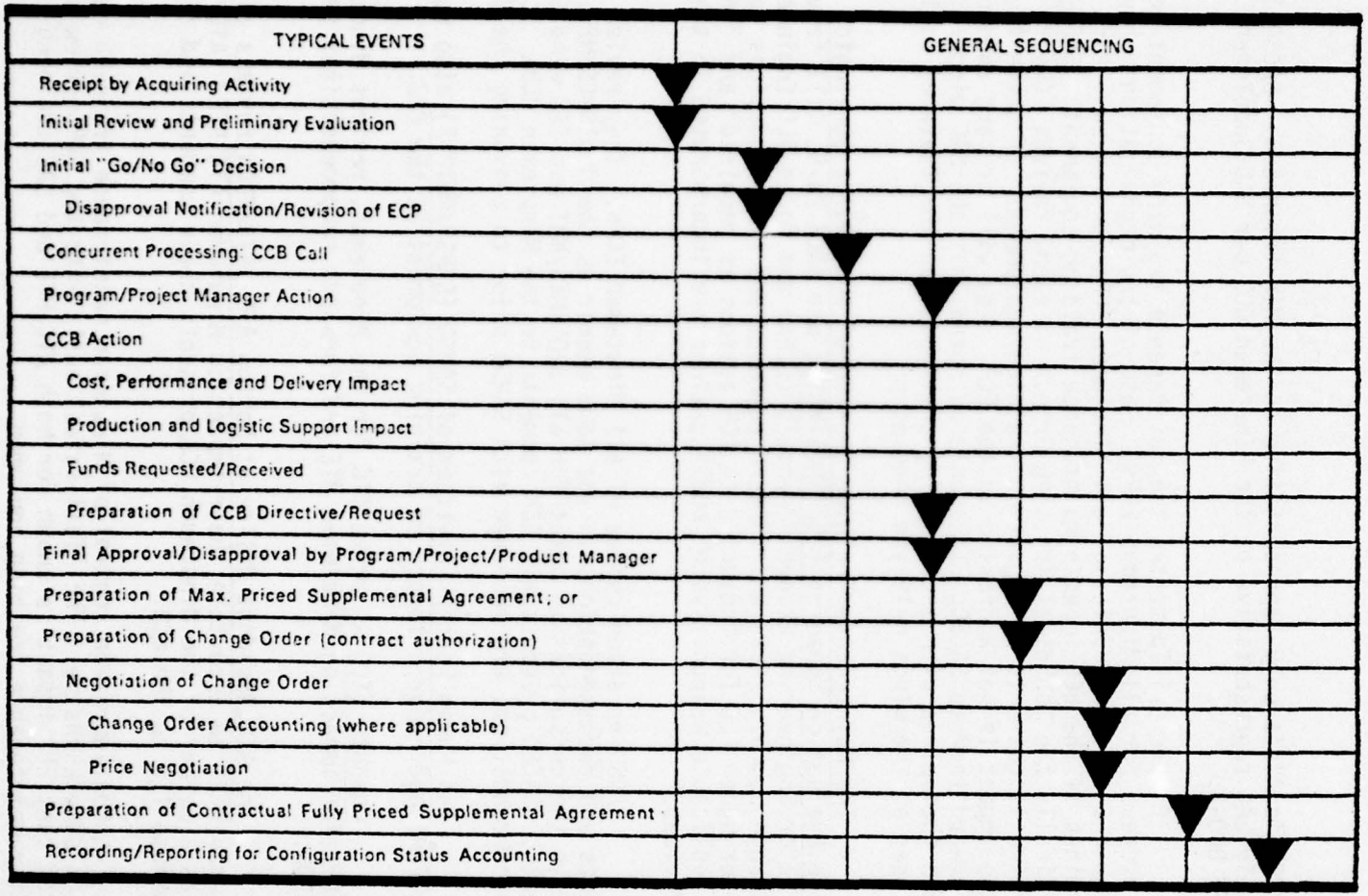



Figure 8 - Significant and General Sequencing of Events in Processing ECPs adapted from AFR 65-3

ATC/XPQN is ATC's only representative on the Minuteman CCB. SACSO is the only SAC representative on the Minuteman CCB per SAC Supplement 1 to AFR 800-2.

Figure 9 illustrates the maintenance training equipment review process for all Minuteman ECPs. Each of the organizations shown in Figure 8 receives copies of all Minuteman ECPs for review. Each determines if the ECP impacts maintenance training equipment. SAC wings, specifically the Technical Training Branch of each, reviews ECPs to determine if there is an impact on training equipment. If there is, and the impact is not addressed in the ECP, they will prepare comments and forward them to SACSO. It should be noted that the SAC wings/TTB concern themselves with ascertaining the impact on the training equipment used at the wings only and none other.

The Maintenance Training Section of the 3901st Strategic Missile Evaluation Squadron (3901SMES/MBT), per SACR 23-5, will "review contractor Engineering Change Proposals (ECPs) and Ogden ALC Engineering Change Summary (ECS) and forward comments and recommendations to SACSO or Ogden ALC for inclusion in CCB actions as required" and "ensure that applicable weapons system modifications are incorporated in training devices."

SACSO receives copies of all Minuteman ECPs. They review the comments and recommendations in the same manner as the 3901SMES/MBT. SACSO is the consolidation point for all 3901SMES/MBT and SAC wing ECP comments. SACSO presents all ECP comments to the Minuteman CCB. Most ECP recommendations are resolved with SAMSO prior to convening the CCB.

The Human Factors Division of SAMSO (SAMSO/MNTP-2) also reviews ECPs and reports impact on training equipment at the CCB.

Chanute TTC, as prime TTC for the Minuteman, reviews Minuteman ECPs for impact on Minuteman RTE and forwards recommendations to ATC/XPON.

The ATC Resident Office at Norton AFB (ATC/XPQN) reviews all Minuteman ECPs to ascertain their impact on Minuteman ATC RTE. ATC/XPQN, as a member of the Minuteman CCB, presents their comments and those of Chanute TTC to the CCB.

Configuration control of Minuteman maintenance training equipment is comprehensive. The "fail-safes" built into the ECP review procedures that ECP impact is known for both ATC RTE and SAC training facility maintenance training equipment.

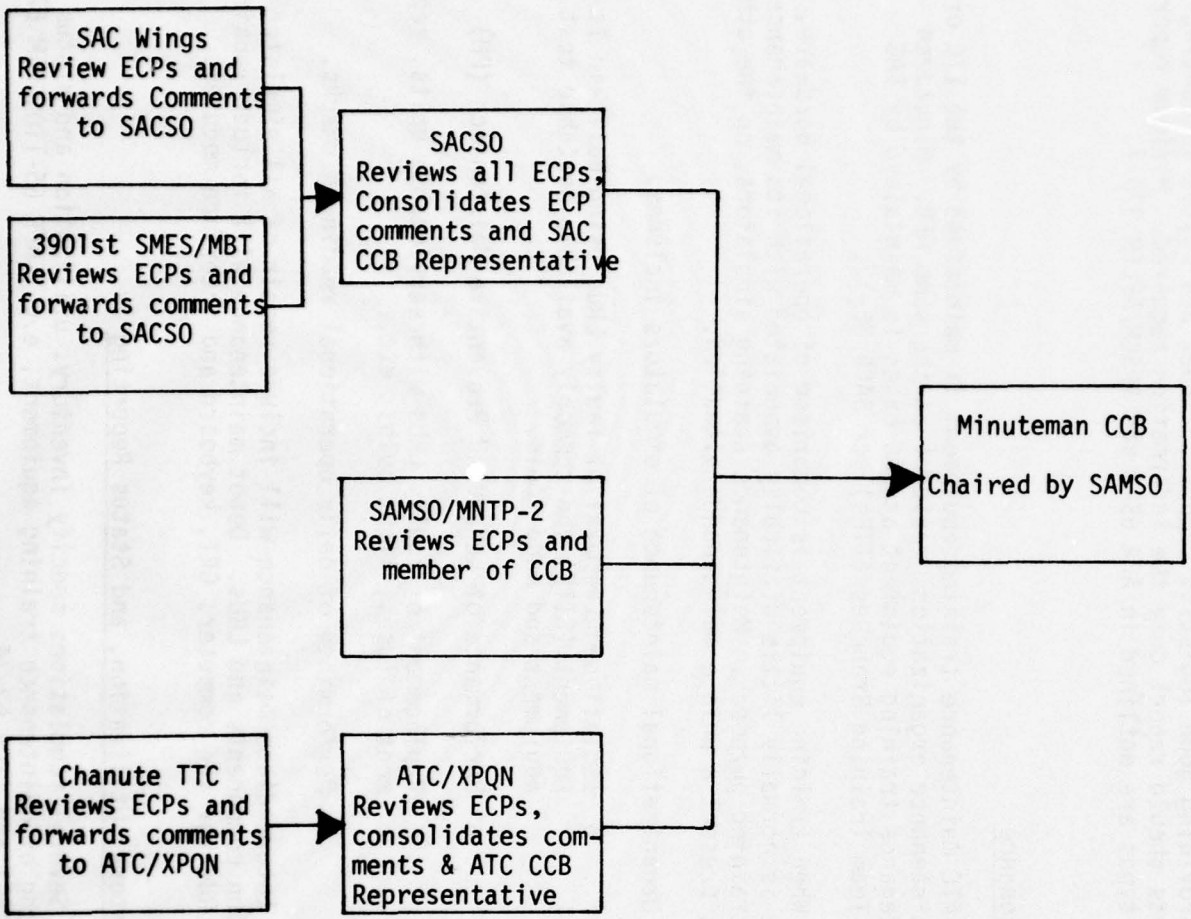



Figure 9 - Configuration Control of Minuteman Maintenance Training Equipment

Configuration Status Accounting. Per AFSCP 800-3, "status accounting evolved from a need to properly document the exact configuration of military equipment and the chronology of the changes made to it." Status accounting involves monitoring change implementation and providing good logistics support. Index and status accounting reports should report only the information required. Minimum report data types are outlined in AFR 65-3 and AFSCM/AFLCM 375-7.

## Maintenance

ATC maintenance training equipment is maintained by the TTC or by maintenance organizations resident at the same AFB. Minuteman maintenance training equipment at SAC bases is maintained by SAC wing Team Training Branches (TTBs) per SACR 66-12.

When training equipment is comprised of operational hardware, there is normally little difficulty associated with its maintenance for training purposes. Maintenance training simulators, on the other hand, present a unique maintenance situation.

Organizational maintenance of simulators includes:

- Isolation and removal of faulty LRUs using Built-in Test Equipment (BITE) and commonly available portable test equipment and hand tools.
- Performance of scheduled Preventive Maintenance (PM)
- Replacement of faulty LRUs with serviceable units, replacement of fuses, light bulbs, etc.
- Performance of daily operational readiness checks.

Intermediate maintenance will include repair of all simulated test station components and LRUs. Depot maintenance will include repair of all LRUs for the computer, CRT, keyboard and interface modules.

## Inventory, Utilization, and Status Reporting

Several regulations specify inventory, utilization and status reporting of maintenance training equipment, e.g., AFR 65-110, AFM 67-1, AFM 66-1 and ATCR 52-14.

AFR 65-110, Chapter 5 (Trainer Equipment Inventory, Utilization, and Status Reporting) identifies the requirement to include all reportable training equipment in three reports, e.g.,

- o Base Trainer Equipment Inventory, Utilization and Status Summary Reports.
- o Command Trainer Equipment Inventory, Utilization and Status Reports.
- o Worldwide Trainer Equipment Inventory, Utilization and Status Reports.

Each of the above reports include much the same data. Published monthly, these reports list (among other data) the number of hours all reportable training equipment was:

- o Available for Training
- o Scheduled or Projected to be Used for Training During the Month
- o Actually used for Training During the Month
- o Down for Maintenance

Instructions for recording information for each of the above reports is contained in AFM 65-272, and instructions for processing and transmitting training equipment data, in AFM 171-272, Volumes I and II. These reports are used for several purposes, including:

- o Managing the procurement, allocation, modification and disposition of training equipment in the Air Force inventory.
- o Preparation of the USAF Special Training Equipment Program (STEP) document.
- o Managing training programs and monitoring training equipment utilization.
- o Computing spares and logistical support for training equipment.
- o Establishing training equipment maintenance program.

AFR 67-1 specifies the requirement for and procedures associated with a Custodian Authorization/Custodian Receipt Listing (CA/CRL). Only recoverable (nonexpendable) maintenance training equipment is reported or included in this listing. When a maintenance training equipment requirement is identified to base supply, it is listed as "Due-Out" on the CA/CRL by the Equipment Custodian (EC). When the equipment is received, the requesting EC will update the CA/CRL to reflect the equipment as being "On-Hand". The maintenance training equipment remains listed on the CA/CRL as "On-Hand" until the equipment is formally retired. The CA/CRL includes, among other data, the following:

- o Federal Stock Number (FSN)
- o Nomenclature
- o Number in Use
- o Number Authorized (per TA)
- o Unit Price
- o "On-Hand" or "Due-Out"

AFM 66-1, Volumes I and II specify the requirement for and procedures associated with the Monthly Maintenance Order/Plan prepared monthly by instructors. The report includes projected utilization and maintenance scheduling for all training equipment, reportable and non reportable. It is submitted to the maintenance organization maintaining the equipment so that they can schedule the training equipment for preventive and scheduled maintenance.

ATCR 52-14 specifies the requirement for and procedures associated with the Programmed Training Equipment Report. This report is prepared semi-annually (December and July) by center/TTGORs. It lists the following for all reportable and nonreportable training equipment:

- o Number Required (whether on-hand or not)
- o Number Programmed
- o Number On-Hand

This listing makes outstanding training equipment requirements readily discernible. When the number on-hand equals the number programmed, the trainer is dropped from the next report.

| | | RTE | MTS | | SAC TRAINING FACILITY |
|---|---|---|---|---|---|
| | | | AIRCRAFT | ALL OTHER | |
| ASSOCIATED WITH A NEW SYSTEM | Prime Technical Training Center | X | N/A | X | N/A |
| | 3306th TES | N/A | X | N/A | N/A |
| | 3901st SMES | N/A | N/A | N/A | X |
| ASSOCIATED WITH A SYSTEM OUT OF ACQUISITION OR WITH SEVERAL SYSTEMS | Prime Technical Training Center | X | X | X | N/A |
| | 3901st SMES | N/A | N/A | N/A | X |

Table 6 - Organizational Responsibilities for Development of Functional Requirements Supporting Maintenance Training Equipment Specifications

## Phase V - Retirement of Maintenance Training Equipment

The maintenance training equipment life cycle ends with the retirement of the equipment. The retirement process is also referred to in applicable regulations as "reporting excess" training equipment.

Maintenance training equipment is retired when training equipment is replaced, a course is eliminated, or an Air Force system is retired.

Different organizations are involved in the retirement of training equipment depending on whether the equipment involved is an ATC or SAC responsibility.

### Retirement of ATC Maintenance Training Equipment

The procedures for retiring ATC training equipment are specified in ATCR 50-30. Once an equipment custodian has determined the need to retire a trainer, the trainer will be reported as excess to the center/TTGOR. This retirement report will include the following information:

- Identification Data (FSN, nomenclature, serial number, etc.)
- Quantity being Retired
- Unit Cost
- Condition
- Training Course(s) Affected
- Reason Why Item is Considered as Excess
- Recommended Disposition

The center/TTGOR will first determine if the training equipment in question can be used anywhere in the Wing. If it can be used elsewhere in the Wing, the center/TTGOR will transfer the equipment to the new user according to center policies. If there is no potential use for the equipment in the Wing, the center/TTGOR will report the equipment as excess in accordance with AFM 67-1 and ATCR 50-30. The same information listed above will be included in the report. When the Wing reports a complete MTS as excess, they must include a separate disposition request for each trainer, training aid, or equipment included in the MTS.

HQATC will determine if there is a need for the potentially excess training equipment at any other centers. If another center does require the training equipment, HQATC will coordinate transfer of the equipment to its new user. If there is no requirement for the training equipment with ATC, HQATC will coordinate the retirement of the equipment from the ATC inventory.

Retirement of SAC Maintenance Training Equipment

All SAC Wing Technical Training Branches report excess training equipment to the 3901SMES/MBT. The 3901SMES/MBT determines if the equipment is required elsewhere in SAC either in whole or in part. If only part of the trainer is required, the 3901SMES/MBT retires only the unneeded portion of the training equipment. The 3901SMES/MBT then informs Ogden ALC of the excess equipment and coordinates its disposal. The 3901SMES/MBT also informs SAC/LGSER of the equipment retirement to ensure that the equipment is deleted from the appropriate TA(s).

## Conclusions

Historically, maintenance training equipment has been operational hardware. With the increased use of alternative training equipment media, e.g., simulators, new areas of concern have arisen. One significant need is the identification of ways to reduce the time required for completing the various steps in the acquisition process. Formatting functional requirements per Military Standard 490 has been one important advance in this area.

### Acquisition

Training equipment associated with new system is tied to the time frame and technology of the system being developed. Normally, all maintenance RTE and MTS are delivered to the appropriate command at least three months prior to the initial delivery of the new system. This permits three months for the TTCs and FTDs to train the necessary support personnel. Several critical events must be accomplished prior to this delivery date:

- Selecting and acquiring ISD personnel - 3 months
- Perform ISD - 9 months
- Preparation of RFP and award of contract by SPO - 10 months
- Development, production of equipment by contractor - 24 months
- Equipment delivery and acceptance - 3 months

The time frame estimates included in the above are based on comments from HQ USAF, AFSC, ATC, AFHRL, and other historical data. Some Air Force organizations feel that the entire training equipment process cannot begin before the new system's configuration is frozen with the production decision. Even if the training equipment requirements are identified well in advance of the Production Decision, their procurement is not initiated.

Timely delivery of maintenance training equipment presents a problem whether the equipment is a simulator or operational hardware. If the training equipment is composed of operational hardware, it can be produced at the same time other system's hardware is produced. System production can extend well beyond delivery of the first system. Therefore,

production of training equipment may not begin until after the first system is delivered.

If the training equipment involves a simulator, the problems may be compounded. Depending upon system complexity and associated software/courseware, simulators may require a more lengthy R&D process.

If a training equipment requirement is identified for a system out of acquisition and the equipment requires R&D, the only procurement alternative open is the time-consuming GOR process (AFR 57-1). The training requirement may have disappeared before the training equipment is delivered.

## Configuration Management

Most configuration managed training equipment is constructed of actual components of the system it is supporting. Specific advantages of configuration managed MTE are:

1) Assurance that students will be training on equipment that is configured similarly to the equipment that they will be required to maintain when they complete training. The complexity of tasks to be taught and the skill level desired from training must be considered in determining whether this is necessary. Whole-task training and high skill level attainment may best be handled through configuration managed training equipment.

2) Spare parts are easily obtained from depot.

3) Maintenance TOs are maintained for configured trainers.

4) When modifications are necessary, funding is more easily obtained for modifying configured training equipment.

Non-configured training equipment has two primary advantages. First, training organizations may modify non-configured system equipment to suit specific training requirements. Second, the non-configured equipment may be less expensive to maintain.

## Maintenance

Few problems emerged for the maintenance of training equipment other

than spares provisioning for non-configuration managed equipment. Little experience has been gained with regard to maintenance of simulators. The hardware/software components of a simulator present unique training equipment maintenance problems. It should be noted, however, that the experience of other services (Navy, Marines, etc.) with simulators has demonstrated that simulators should be less costly to maintain than training equipment comprised of operational hardware.

## Inventory, Utilization and Status Reporting

There are few issues associated with maintenance training equipment inventory and status reporting. Current Air Force policy requires utilization reporting only of the number of hours training equipment is either scheduled or actually used.

Many Air Force personnel feel that utilization reporting should address additional areas, e.g., validity of the training equipment. Maintenance training equipment requirements are often identified and specified before the ISD process is completed. The value of such training equipment may be questionable. If training equipment is procured that does not adequately support the training need, additional training equipment may be requested and procured. The multiple training equipments procured for a requirement that may have been satisfied by one item of training equipment are likely to be reported as utilized.

## Retirement

Maintenance training equipment retirement procedures are comprehensive and there is little chance that a needed trainer could be unthinkingly retired from the Air Force inventory. When operational hardware trainers are retired, there is little chance that the equipment would be required elsewhere to support other training needs. Maintenance training simulators, however, usually use general purpose computers, CRTs, keyboards, and visual display panels with almost universal applicability. Additional procedures or policies may be required to ensure the best utilization of excess simulation training equipment.

## Summary Conclusions

The acquisition and utilization of maintenance training equipment is best conceived of as a process within a larger system, rather than a separate system. Adequate procedures exist within the framework of the systems acquisition process for procurement of maintenance training equipment. Procurement procedures for this kind of equipment are less clear once the systems acquisition process is complete and the system is operational.

Many unresolved areas of concern were identified during the conduct of this study on the maintenance training device acquisition and utilization process.

Some typical concerns that arose during the course of this study are listed below as a suggestion of further avenues for research and development on simulation for maintenance training.

1) Development of criterion objectives for trainers.

2) Determination of cost-effectiveness of training equipment.

3) Development of criteria for determining simulator designs.

4) Development of adequate criteria for selection of training equipment media.

5) Solution to the problem of when and where to initiate the ISD process for trainers.

6) Development of appropriate system documentation to facilitate ISD.

7) Determination and documentation of functional requirements (need for model specifications).

8) Determination of hardware requirements (specifying exactly or to some degree what the training equipment should look like).

9) Solution to problems with acquiring trainers for systems no longer in systems acquisition.

10) Development of R&D requirements to procure maintenance simulator systems.

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## Acronyms and Abbreviations

| | | | |
|---|---|---|---|
| ACI | Allocated Configuration Identification | AFSCR | Air Force Systems Command Regulation |
| AC&W | Aircraft Control & Warning | AFTEC | Air Force Testing and Evaluation Command |
| ADP | Automatic Data Processing | AGE | Aeronautical Ground Equipment |
| ADPE | Automatic Data Processing Equipment | ALC | Air Logistics Center (of AFLC) |
| AF | Air Force | ALCM | Air Launch Cruise Missile |
| AFALD | Air Force Acquisition Logistics Division | AMST | Advance Medium Skill Transfer |
| AFB | Air Force Base | ASD | Aeronautical Systems Division (of AFSC) |
| AFHRL | Air Force Human Resources Laboratories | ATC | Air Training Command |
| AFSC | Air Force Communications Systems (Command) | ATCA | Advance Tanker Cargo Aircraft |
| AFLC | Air Force Logistics Command | ATCM | Air Training Command Manual |
| AFLCR | Air Force Logistics Command Regulation | ATCR | Air Training Command Regulation |
| AFM | Air Force Manual | AWACS | Airborne Warning & Control System |
| AFNG | Air Force National Guard | BITE | Built-In Test Equipment |
| AFP | Air Force Pamphlet | BSD | Ballistic Systems Division (of AFSC) |
| AFR | Air Force Regulation | CA | California (official Post Office abbreviation) |
| AFSC | Air Force Systems Command | | |
| AFSCP | Air Force Systems Command Pamphlet | CA/CRL | Custodian Authorization/ Custodian Receipt Listing |

| | | | |
|---|---|---|---|
| CCB | Configuration Control Board | ECS | Engineering Change Summary |
| CCBD | Configuration Control Board Directive | EMO | Equipment Management Office |
| CDR | Critical Design Review | ESD | Electronic Systems Division (of AFSC) |
| CEID | Contract End Item Detail (Specification) | FCA | Functional Configuration Audit |
| CEM | Communication-Electronic-Meteorological | FSN | Federal Stock Number |
| CEMO | Central Equipment Management Office | FTD | Field Training Detachment |
| CI | Configuration(Managed) Item | GFE | Government Furnished Equipment |
| CP | Centrally Purchased | GLCM | Ground Launch Cruise Missile |
| CRISP | Computer Resources Integrated Support Plan | GOR | General Operational Requirement |
| CRT | Cathode Ray Tube | HFE | Human Factors Engineering |
| CRWG | Computer Resources Working Group | HOI | Headquarters (AF) Operating Instruction |
| DOD | Department of Defense | HQ | Headquarters |
| DSARC | Defense System Acquisition Review Council | ICBM | Intercontinental Ballistic Missile |
| DT&E | Development Test and Evaluation | IL | Illinois (Official Post Office abbreviation) |
| EAID | Equipment Authorization Inventory Data | IOC | Initial Operation Capability |
| EC | Equipment Custodian | ISD | Instruction Systems Development |
| ECP | Engineer Change Proposal | JPR | Job Performance Requirements |

| | |
|---|---|
| LOX | Liquid Oxygen |
| LP | Locally Purchased |
| LRU | Line Replaceable Units |
| LSA | Logistical Support Analysis |
| MAC | Military Airlift Command |
| MAJCOM | Major Commands |
| MBO | Management by Objectives |
| MD | Maryland (Official Post Office abbreviation) |
| MI | Mississippi (Official Post Office abbreviation) |
| MIL-STD | Military Standard |
| MPC | Military Personnel Center |
| MTE | Maintenance Training Equipment |
| MTS | Mobile Training Set |
| MX | Missile "X" |
| NE | Nebraska (Official Post Office abbreviation) |
| OA | Obligation Authority |
| OJT | On-the-Job Training |
| OPCOM | Operational Command |
| OPR | Office of Prime Responsibility |
| OT&E | Operational Test and Evaluation |
| PCA | Physical Configuration Audit |
| PCI | Product Configuration Identification |
| PCSP | Programmed Commercial System Program |
| PDR | Preliminary Design Review |
| PM | Preventive Maintenance |
| PMD | Program Management Directive |
| PME | Precision Measurement Equipment |
| PMP | Program Management Plan |
| PMRT | Program Management Responsibility Transfer |
| POI | Program of Instruction |
| PRAM SPO | Product Reliability, Availability and Maintainability System Program Office |
| PTTC | Prime Technical Training Center |
| QQPRI | Qualitative and Quantitative Personnel Requirements Information |
| R&D | Research and Development |
| RFP | Request for Proposal |

| | |
|---|---|
| ROC | Required Operational Capability |
| RTA | Responsible Test Agency |
| RTE | Resident Training Equipment |
| SAC | Strategic Air Command |
| SACR | Strategic Air Command Regulation |
| SACSO | Strategic Air Command Systems Office |
| SALC | System Acquisition Life Cycle |
| SAMSO | Strategic Air Missile System Office |
| SAMT | Simulated Aircraft Maintenance Trainer |
| SE | Support Equipment |
| SIMPSO | Simulator System Program Office |
| SME | Subject Matter Expert |
| SOW | Statement of Work |
| SPO | System Program Office |
| SRA | Systems Requirement Analysis |
| STA | Skill and Task Analysis |
| STEP | Special Training Equipment Program |
| STS | Shuttle Transportation System |
| TA | Table of Allowance |
| TAC | Tactical Air Command |
| TCHTW | Technical Training Wing |
| TEGC | Training Equipment Guidance Conference |
| TEL | Training Equipment List |
| TEPI | Training Equipment Planning Information |
| TERG | Training Equipment Requirement Guide |
| TERRB | Training Equipment Recommendation Review Board |
| TES | Training Equipment Supplement (to an Engineering Change Proposal-ECP) |
| TO | Technical Order |
| TPR | Trained Personnel Requirements |
| TR | Training Requirements |
| TTB | Team Training Branches (SAC Wing) |
| TTC | Technical Training Center |
| TX | Texas (Official Post Office abbreviation) |
| USFED | Unit Forecast Authorization Equipment Data |

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