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AN ANALYSIS OF THE SELECTION CRITERIA AND TRAINING FOR AERONAUTICAL SYSTEMS DIVISION TECHNICAL ORDER MANAGERS

THESIS

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AFIT/GSM/LSY/90S-6

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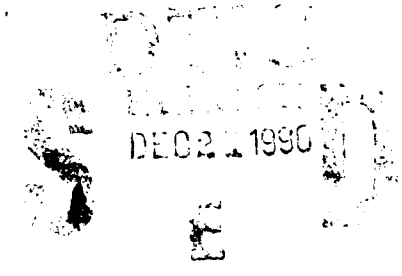

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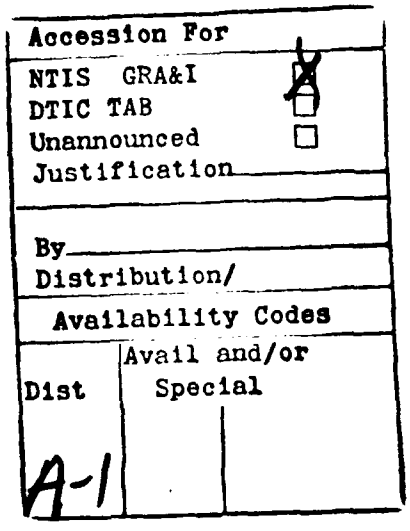

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THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
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In Partial Fulfillment of the
Requirements for the Degree of
Master of Arts in Systems Management

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Captain, USAF

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Of course, my thesis could never have been completed without the understanding support of my husband, Paul. His immeasurable sacrifice and extra parenting have been essential to my success.

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List of Acronyms

AIA	Aerospace Industries Association
ACSN	Advanced Change Study Notice
AFIT	Air Force Institute of Technology
AFOTEC	Air Force Operational Test and Evaluation Center
AFR	Air Force Regulation
AFTO	Air Force Technical Order
AFSC	Air Force Specialty Code
AFSC	Air Force Systems Command
ALC	Air Logistic Center
ALXS	Provisioning Division within the Directorate of Logistics Policies and Programs, Aeronautical Systems Division
ASD	Aeronautical Systems Division
ATOS	Automatic Technical Order System
CALS	Computer Aided Logistics System
CCP	Contract Change Proposal
CDRL	Contract Data Requirements List
CFE	Contractor Furnished Equipment
CFAE	Contractor Furnished Aeronautical Equipment
CSTO	Country Standard Technical Order
DAR	Defense Acquisition Regulation
DCAS	Defense Contract Administration Service
DOD	Department of Defense
DPML	Deputy Program Manager for Logistics
ECP	Engineering Change Proposal
FAR	Federal Acquisition Regulation

FMS	Foreign Military Sales
FOIA	Freedom of Information Act
GS	General Series
ICBM	Inter-Continental Ballistic Missile
IG	Inspector General
IPR	In-Process Review
JUSTIS	Joint Uniformed Services Technical Information Service
LSA	Logistics Support Analysis
MAJCOM	Major Command
MPC	Military Personnel Center
NCO	Non-Commissioned Officer
OJT	On the Job Training
PCS	Permanent Change of Station
PM	Program Manager
PMR	Program Management Responsibility
PMRT	Program Management Responsibility Transfer
PTO	Preliminary Technical Order
RFP	Request for Proposal
SERD	Support Equipment Recommendation Data
SPO	System Program Office
SON	Statement of Need
TAC	Tactical Air Command
TM	Technical Manual
TMCR	Technical Manual Contract Requirement
TO	Technical Order
TOMA	Technical Order Management Agency/Manager

Abstract

This study reviewed the general problem of inadequate training and a lack of selection criteria for technical order (TO) managers within Aeronautical Systems Division (ASD). A questionnaire was administered to the ASD technical order managers in an attempt to determine what they thought were the primary areas, within the training and selection criteria arena, that needed improvement. Their opinions on how to best improve the present system were also solicited. Telephone interviews were also conducted with six defense contractors in an attempt to broaden the input on how best to improve the present ASD technical order manager training and selection process. Based on the questionnaire and telephone interview responses, recommendations were made for improving the present process. These recommendations included the establishment of: a minimum grade criteria, a minimum writing ability criteria (with a training option), prior experience guidelines (with a training option for hands-on experience), a career channel for TO managers to follow, improved continuity objectives, mandatory training classes, improved personal relations emphasis, regular review of training quotas, and an apprenticeship program.

AN ANALYSIS OF THE SELECTION CRITERIA AND TRAINING FOR AERONAUTICAL SYSTEMS DIVISION TECHNICAL ORDER MANAGERS

I. Introduction

This chapter introduces the general problem of inadequate training and a lack of selection criteria for technical order managers within Aeronautical Systems Division. The research objectives are defined with the investigative questions. These questions are answered via the measurement questions which are addressed in this chapter as well as the scope and introductory background of the problem.

General Issue

Technical orders, or TO's as they are commonly called, are critical to the maintainability and supportability of every Air Force weapon system. The person selected to manage these important publications should be qualified, have the best background, and best training possible.

Specific Problem

The people in charge of managing the technical orders, the technical order managers, or TOMA's as they are commonly called, do not always have the best experience or training to qualify them to manage the complex job requirements of being a technical order manager. In fact, the Air Force has

no specific, formal qualification requirements nor specific selection and training criteria for technical order managers. There is no distinct Air Force Specialty Code (AFSC), nor is there a distinct Federal Service Career Series for this job.

Scope

The problems with technical order manager selection and training appear to be Air Force wide. One of the problems is that the technical order managers are often assigned too late in the program. It is very important from the continuity standpoint that the technical order managers be identified early in the program.

> ... the opportunity to influence the technical order acquisition process is diminished as engineering design and the acquisition strategy is solidified. The key to developing quality publications at competitive cost is to allow the process to demonstrate its effectiveness in improving overall system supportability. Very often, the technical order manager is not yet assigned during this process. (6:40)

Another problem with the technical order managers is the informal selection criteria, i.e., they are often hired straight off the flight line based on their hands-on experience using the technical orders. This hiring practice coupled with the lack of specific training requirements for the new technical order managers plays havoc with an already complicated acquisition system - a system which includes negotiating, working with contracting, preparing for program management responsibility transfer (PMRT) and the associated follow-on depot care relationship

with Logistics Command, as well as required familiarity with numerous forms unique to the acquisition field.

This thesis will recommend specific actions to be taken in order to improve the present situation. The problem has been recognized and pointed out for many years; however, no significant Air Force wide change has occurred. A change would have more likelihood of occurring in a smaller organization than a larger one (i.e., Aeronautical Systems Division (ASD) rather than Air Force). Therefore, this study will focus on and make specific recommendations for ASD only. If some of the recommendations proposed herein were to be implemented and proved to be successful in enhancing the scope of training, selection criteria, and ultimately the performance of the ASD technical order managers, it is hoped that further implementation options would be investigated.

For a comparison and as a compliment to the information obtained from the ASD technical order managers themselves, six large aerospace contractors which produce/develop technical orders in high volume were contacted by telephone for interviews on how they select and train their technical order managers. This was done to provide another viewpoint in the development of an approach to training and selection criteria for technical order managers. It was felt that an outside perspective might help avoid both the pitfalls of tunnel vision and the natural tendency to maintain the

status quo - proclivities which could easily beset strictly internal studies.

One aspect of perhaps improving the selection criteria issue is the code identifier added on to the Air Force Specialty Codes and job series' of those persons who have worked with technical orders. This code identifier has been recommended to help the personnel systems more easily identify all persons with technical order user experience so that a pool of such people could be maintained in order to select the best qualified people for the technical order manager jobs. It was felt that the background and research required in the area of personnel (both military and civilian) to address this issue was too vast to attempt to include this aspect in this thesis. This approach to improving the selection criteria is a recommendation for further research.

Investigative Questions

In order to address the general issue of selection criteria and training for ASD technical order managers the following two investigative questions must be answered:

1. What selection criteria should the Aeronautical Systems Division establish for technical order managers?

2. What training should the Aeronautical Systems Division provide for technical order managers?

Measurement Questions

The following questions were asked via questionnaire and telephone interviews in order to answer the Investigative Questions:

ASD Technical Order Manager Questions.

1) What is your grade?

2) What is the highest level of education you have achieved?

3) How long have you been working as a technical order manager?

4) What is the total dollar value of the tech orders you manage?

5) Approximately how many technical orders do you manage?

6) In what capacity have you worked with tech orders prior to your present job (flight line, maintenance, in the System Program Office, etc.)?

7) What kind of technical order acquisition manager-related training have you had?

8) What type of experience did you have to qualify you for this job?

9) What kind of experience, prior to your coming on the job, would have better prepared you for the job you have now?

10) What kind of training would you still like to have in order to improve your present level of job performance?

11) What shortcomings have you witnessed in other technical order managers?

12) What strong points have you witnessed in other technical order managers?

13) Please try to list and explain if necessary all of your duties associated with tech order management (such as negotiations, in-process-reviews, data item description reviews, etc.).

14) Why do you think you were selected for this job?

15) Is there anything that you would like to add that might help improve the training of technical order managers? If so, please elaborate.

16) What do you think should be included in the criteria for selection of technical order managers? (Examples: field experience, Systems 230, negotiation experience, etc.)

Contractor Questions.

1) How do you select your TO managers (or publications managers)?

2) Are there selection criteria? If so, what are they?

3) What type of background for a TO (or publications) manager have you found to be most successful?

4) What type of training do you provide for your TO managers?

5) What experience or training do you feel is most essential to the success of a TO manager?

6) What are the weak points of your current selection and training methods? Strong points?

Background

In order to competently address the issue of technical order managers, a basic understanding of the weapon system acquisition life cycle as well as the technical order acquisition cycle and how it fits in with the weapon system acquisition life cycle is required. The weapon system acquisition life cycle or process normally includes concept exploration, demonstration and validation, full scale development, and production and deployment.

The technical order development cycle is divided into four broad and general phases. These are planning and task identification, preparation and development, printing and distribution, update and changes. The planning and development of technical orders prescribes a development cycle of 20 to 24 months depending on

factors such as complexity of equipment, maintenance concept, text format requirements, etc. (6:39)

"Planning for the acquisition of technical orders should begin with the using command and the preparation of the 'Statement of Need'" (6:39). The Statement of Need (SON) is the document that gets the whole weapon system acquisition life cycle started. If the need is verified, then the first phase, concept exploration, is initiated.

Sometime during the production and deployment phase, program management responsibility transfer (PMRT) occurs. This transfer of responsibility from Systems Command to Logistics Command happens earlier for less complex aeronautical subsystems and armament programs, midway for less-than-major programs such as simulators and tactical missiles and later in the production and deployment phase for major programs.

Prior to PMRT, Systems Command is in the "driver's seat", directing the acquisition management tasks. At a point where these tasks are essentially complete and a timely, orderly and clean transfer of responsibility (4:28-1) can take place, PMRT occurs. This involves technical orders also. Most of the acquisition tasks should be completed, and with the exception of a few residual tasks, Logistics Command takes over responsibility for the technical orders also. Logistics Command is then the "driver" for the depot care of maintaining and supporting the weapon system. However, should a major modification be

directed, Systems Command would, in most cases, be assigned the responsibility for buying and managing the development of the major modification.

Such a major modification could be a Class V (read "Class Five") modification which is the installation or removal of equipment changing the mission capability of the weapon system.

> Assignment of program responsibilities in Class V modification acquisition depends on the nature of the modification and on program management responsibility (PMR) for the system and equipment to be modified. Most often, AFSC will be responsible for developing the equipment providing the new capability. The implementation of the Class V modification will then be assigned to the command with PMR for the system being modified. Because most Class V modifications are directed after program management responsibility transfer (PMRT), AFLC is most often the implementing command. The most likely assignment of responsibilities in program patterns ... would be for AFSC to manage the development program and AFLC to manage the implementation program. (4:35-1,35-2)

The quality of communication and management skills exhibited in the relationship between the Systems Command technical order manager and the Logistics Command technical order manager prior to, during, and after PMRT is critical to the success of the updates to existing manuals occurring on time and at a reasonable cost. Knowledge of the procedures, requirements and status of PMRT is essential.

Several studies have cited the inadequacies of the technical order management world (1,2,8). Minor progress has been made in addressing these inadequacies; however, there is still ample room for improvements, especially in

the areas of technical order manager selection and training criteria.

Fortunately, higher management is aware that there are personnel shortcomings. The ground is ripe for making solid recommendations for improvements to the process of developing a quality technical order manager workforce.

II. Literature Review

Technical orders are Air Force instructions issued through the Air Force Technical Order (AFTO) system for the operation and maintenance of all Air Force equipment (6:19). The AFTO system provides data required by the Air Force for the operation and maintenance of all equipment and ensures availability of this information where and when needed (6:15). The importance of this technical data cannot be underscored enough. Williams and Winn, in their 1980 master's thesis tied it together as follows:

> While it may be obvious that proper weapon maintenance is necessary, what may not be so obvious is the role that is played by the technical data and, more specifically, the technical order. The technical order is where the maintenance procedures are standardized into a body of knowledge. When maintaining complex systems, especially with an increasingly younger and inexperienced work force, standard methods, procedures, and instructions are vital. Conceptually, one can visualize a hierarchy of requirements, starting from the requirement of National Security, to a strong Armed Force, to an effective weapon, to adequate maintenance of that weapon system and, finally, to the requirement for accurate and adequate maintenance procedures supporting that maintenance. (10:2-3)

It follows then, with the very high criticality affixed to the adequacy and accuracy of technical orders, that the person charged as responsible for acquiring them would be likewise viewed and treated as a critical, valued resource. The organization or individual assigned technical order acquisition responsibility is called the TOMA (4:38-1). Although TOMA actually stands for Technical Order Management Agency, the acronym is used interchangeably to refer to the

responsibilities of an organization or an individual as described above.

The TOMA is a staff functional manager appointed by the weapon system program manager (PM) or Deputy Program Manager for Logistics (DPML) early (hopefully) in the program. The TOMA will advise the PM or DPML in a key functional area - that of technical orders.

The TOMA's responsibilities are extensive. Simply put, the TOMA "must procure the most accurate, adequate and cost effective manuals possible within the resources available" (5:2-6). (Manuals, or technical manuals [TMs], are a type of TO.) These responsibilities include:

-initiating and coordinating pre-contract planning for procurement

-preparing, coordinating, and distributing a Technical Manual Management Plan

-preparing inputs to the Statement of Work

-conducting and chairing all technical manual (TM) conferences, meetings, reviews, and other joint agency efforts

-coordinating with the using and supporting commands to ensure participation in all TM acquisition activities

-overseeing a TM quality assurance program

-participating in factfinding/negotiations

-ensuring that contractors develop TMs in the most cost effective manner

-reviewing Support Equipment Recommendation Data (SERD) for any TM impacts

-providing inputs to program budgets for TM development

-authorizing, with the mutual consent of the using and supporting commands, the use of verified preliminary TO's (PTOs) (5:2-7,2-8).

With responsibilities like these, the job of a TOMA obviously requires varied and extensive qualifications. The Air Force Institute of Technology (AFIT) Systems 230 course text describes the characteristics of a proficient TOMA as follows:

> Ideally, the TOMA should be a highly qualified analyst, have some knowledge of configuration management, be a proficient technician and an experienced planner, have an understanding of contracting and appropriate Defense Acquisition Regulation/Federal Acquisition Regulation (DAR/FAR) clauses as they apply to TOs, be a proficient negotiator and coordinator, and most of all, the TOMA should be an efficient manager (6:38).

The criticality of the TOMA is even more apparent in other TOMA responsibilities cited in the literature. According to the joint Air Force Logistics Command (AFLC)/Air Force Systems Command (AFSC) Pamphlet 800-34, "The major obstacle to successful TO management is failure to assign the TOMA early in the program. This results in inadequate planning" (4:38-4). The AFLC/AFSC Pamphlet goes on to say how this inadequate planning can lead to expensive problems, especially since TO cost estimates for major programs are in the $600 - $900 million range. Consequently, TO acquisition deserves full managerial attention (4:38-4).

Williams and Winn, in their 1980 Master's Thesis, give examples of specific problems associated with inadequate TO's at the user organization. These examples include

unnecessary maintenance manhours to research corrections needed, technicians unable to perform the task as directed by the manuals, inaccurate data and increased maintenance manhours expended in troubleshooting equipment deficiencies (10:11-12).

Given the criticality of TOMA responsibilities and the high dollar value of the TO's, one would expect a very sophisticated selection process for TOMAs. Unfortunately, that is not the case at all as several researchers have discovered. Timothy N. Towner, in his 1983 master's thesis, noted this shortfall as well as an additional problem of personnel turnover within the TOMA ranks: ". . . there are no specific job descriptions or qualifications for TOMA personnel, and the TOMA is susceptible to rapid turnover of personnel" (8:39). Billingham and Klassen, in their 1985 master's thesis found a similar deficiency regarding how TO managers are identified:

> There presently exists no single standard or universal method within the Air Force Systems Command to identify TO managers. Each product division has unique requirements for performance, yet none of the product divisions has developed a method to identify those individuals who could meet their performance requirements. Factors such as having previously been a user level maintenance technician, while applicable in all product divisions, were not a common factor possessed by all TO managers within any product division. Experience as a TO manager, a key point of consideration in any selection process, is not even an identifiable skill under the present military personnel system. (1:75-76)

The present system it appears, is not much better: Mr. Chandler "Chuck" Weaver is an RJO Enterprises, Inc. support

contractor working for ASD/ALXS, (the researcher's sponsoring organization and the office which is trying to overhaul the present state of training and selection criteria for ASD technical order managers), who has 20 years of active duty Air Force experience plus 14 years of civil service experience with over 20 years in technical orders. He says from what he has observed in the "real world", generally speaking, when a technical order manager is needed, one is usually obtained by word of mouth. The requiring program manager (PM) or Deputy Program Manager for Logistics (DPML) will ask around at the different program offices for other TOMA's interested in changing programs. If there are no takers, the PM or DPML will then request (from the civilian personnel office) a listing of civilians in the 346 (logistics management specialist) or 1670 (equipment specialist) job series from which to select a technical order manager. Or if a military technical order manager is desired, the PM or DPML will go through the military personnel system requesting a technical order manager. Generally the next person through the military personnel door with some kind of maintenance experience (usually aircraft, electronic, or avionic equipment technicians, and some support equipment technicians) will be assigned to the requesting SPO. If the need is immediate, often the PM or DPML will choose a military overage assigned to the 4950th Test Wing in Area C of Wright-Patterson Air Force Base (9).

In addition to the insufficient selection methods and criteria, maintaining continuity of the technical order manager also is a major problem caused by high turnover of personnel. Several sources point out the importance of having unbroken continuity of the TOMA function. AFLC/AFSC Pamphlet 800-34 states, "The TOMA also acts as source selection item evaluator for the TO portion of the RFP (Request For Proposal). Continuity is important here. The TOMA who wrote the TO portion of the RFP is best qualified to evaluate the proposal responses" (4:38-1,38-2). The AFIT Systems 230 (SYS 230, Air Force Technical Order Acquisition and Management) course text also cites continuity problems with the TOMA, especially military TOMA's due to their automatic reassignment rotation back to their "real" job areas.

> Continuity is always a problem for TOMAs. Military personnel generally are assigned to specific program TOMAs for tours of duty of specified duration; when the tour of duty is over, they will be reassigned elsewhere. Assignment of military personnel ordinarily has little relationship to a program acquisition schedule. (6:37-38)

The TOMA's responding to a telephone survey in Billingham and Klassen's research said it takes 12 to 18 months to become a proficient TOMA. Almost 50 percent of the TOMA's interviewed had less than two years experience (1:79). Clearly, continuity is a problem.

Fortunately, the problems with the TOMA identification process and the continuity of the TOMA have not gone unnoticed. Unfortunately, those that have noticed have not

been in a power position to do something about it. Those who are in a "do something" position are usually only aware of personnel problems in a general sense. In a 1979 interview with then Colonel Richard F. Gillis, CX Deputy Program Manager for Logistics, ASD/AFHL (now Major General Gillis, Commander, Warner-Robins Air Logistic Center), Colonel Gillis stated there is "a requirement for more qualified AFLC logisticians upon the establishment of the System Program Office (SPO) cadre" (10:10-11). Even higher level reports point out the problem of quality of acquisition personnel. The 1986 Packard Commission Report says, "Our study convinces us that lasting progress in the performance of the acquisition system demands dramatic improvements in our management of acquisition personnel at all levels within (the) DoD (Department of Defense)" (7:65-66). The Packard Report also touched on the importance of training: ". . . it is vitally important to enhance the quality of the defense acquisition workforce - both by attracting qualified new personnel and by improving the training and motivation of current personnel" (7:65-66). In July 1989, Secretary of Defense, Dick Cheney, submitted a report to the President recommending improved management of military and civilian personnel.

> A dedicated corps of acquisition officers will be established in each of the Services, including distinct sub-specialties in systems development, procurement and logistics. The Secretaries of the Military Departments will present detailed plans for these purposes in October 1989. (3:4)

Secretary Cheney also emphasized the importance of continuity in terms of cost, an important item on every agenda. "Reliable planning, funding, and system configuration, and continuity in management personnel, greatly increase the likelihood that systems will be delivered on time and at projected cost" (3:10).

A logical solution for addressing the continuity and identification problems of TOMA's would be to train a pool of qualified people and install them in TOMA jobs for four year minimum tours. Unfortunately, this area in the TOMA realm has its inadequacies also. Brown and Lyon, in their 1984 Master's Thesis, determined through a telephone survey that 82 percent (of 130 polled) believed the "training and knowledge level of TO acquisition personnel was not adequate" (2:64). Indeed, though the AFIT Systems 230 course text has a section entitled," Training and Experience Requirements" (for the TO manager), there are no requirements listed, only some typical backgrounds of TOMA's (6:37-38). Even the Systems 230 course itself, Air Force Technical Order Acquisition and Management, is not a prerequisite to becoming a TOMA. Billingham and Klassen's research in 1985 showed that less than 28 percent of the 101 TO managers interviewed had taken the Systems 230 course (1:79-80).

> The majority of the respondents stated their only previous TO experience was as user level maintenance technicians. These findings, combined with the fact that TO managers have no extensive training in management principles, support the conclusion that

training can improve the effectiveness of the TO manager. (1:80)

Billingham and Klassen identified five key elements for influencing selection criteria in their master's thesis: formal management/training, prior TO experience, prior management experience, size and complexity of program, and acquisition phase when selection of a TO manager is needed (1:93). They also made the following further recommendations for research: (1) Study AFLC TO management personnel (they only studied AFSC personnel). (2) Establish some standard of measure to judge and compare TO cost, timeliness and useability across acquisition programs. (3) Look at what factors contribute to the lack of action toward improving the evidenced problems (1:95).

Chapter Summary

The preceding paragraphs have established the criticality and costliness of technical manuals and the corresponding criticality of the individual or agency, the TOMA, responsible for acquiring these technical manuals. Three major deficiencies, insufficient selection criteria, lack of continuity, and inadequate training requirements have been discussed regarding the technical order manager. The point was also made that higher level management is aware of the general inadequacies in our personnel policies, if not specifically regarding the TOMA, at least regarding acquisition personnel in general, and all agree that steps need to be taken to improve present policies. Given higher

management's present attitude and awareness, the ground is certainly ripe for good recommendations and subsequent improvements in a presently lacking system. Using the foregoing research and information, and by surveying ASD and non-government technical order managers, plausible selection criteria as well as specific training requirements for ASD technical order managers can be recommended for great savings to the government in terms of dollars and irritation. This will ultimately lead to more efficient and effective use of tax payers' dollars as well as a stronger national defense posture.

III. Methodology

This chapter describes the procedures used in the descriptive study to determine who are the ASD technical order managers (in terms of grade, education and experience), what are their responsibilities (in terms of dollar value and number of technical orders managed as well as requirements involving negotiations, data item descriptions, logistics support analysis, etc.) and how the Air Force can better prepare them to do their jobs. The research method used is justified, the instrument is explained, the populations are defined and the data collection and statistical tests are addressed.

Justification of Research Method

The survey approach was used in this research in order to obtain ideas on how to improve the training and selection criteria for tech order managers. The data was obtained from the ASD technical order managers via mail surveys. Mail surveys were considered optimum because of the large population (84 technical order managers versus one researcher), the added anonymity (respondents would tend to be more honest), and the greater accessibility (many of these technical order managers are travelling almost constantly). It was also thought that the mail surveys would give the respondents more time to think about the issues addressed, discuss the problems with their co-workers

and take the time to verify their facts, such as the dollar value of the technical orders they manage - something they might not readily know. All of these issues clearly justified a mail survey. By contrast, the contractor data was obtained via telephone interviews. The telephone interviews were the most economical and reliable method, given that the respondents were from all over the country and that opinions and general information about past experience were required. The difference in population sizes between the Air Force respondents and the contractors was considered, however, it is not a factor because contractor responses comprised merely a collection of ideas and were not intended to be a representative sample of all the defense contractors' approaches and practices. It was felt that telephone interviewing would greatly decrease the response time. It was also felt that the personal approach would be more effective than a mail survey given that the respondents were recommended by either Mr. Arthur Munguia, thesis advisor, who knew them personally, or were suggested by the contractors themselves who were contacted for interviews.

Instrument

There were 16 measurement questions asked of the ASD technical order managers (see page 5). Questions 1 through 8 were essentially background questions which asked for conscious surface (known automatically, e.g., rank) and some

subsurface level (might take some minimal thought or calculation, e.g., the dollar value of the TO's one manages) data. These questions were asked in order to establish the experience, training, and technical order responsibility (in terms of numbers and dollars) of the TO managers. Billingham and Klassen (1) established the lack of training and selection criterion for technical order managers in their 1985 master's thesis. These eight questions were asked in order to confirm the results of their research as well as the hypothesis of this thesis (inadequate training and selection criterion for technical order managers).

Questions 1 through 5 were structured questions with choices listed from which the respondent could choose just one answer. Question 6 was an open question with examples of suggested answers listed to give the respondent an idea of what was been sought. Questions 7 through 12 were multiple choice questions with an "Other" category given if the choices were not sufficient. The "Other" category was to be elaborated upon at the end of the questionnaire.

Questions 9 through 16 were opinion and judgment questions calling for reflective thought and analysis of all the issues and aspects of the job. These questions are really the crux of the questionnaire and research, i.e., what does the technical order manager think is the most essential in terms of training and past experience in order to best do their job?

Question 13 (Try to list and explain, if necessary, all of your duties associated with technical order management.) was an open question with response examples. This question was a "catch-all" attempt to ensure that all areas of responsibility are being considered in planning for training and selection criteria for technical order managers. Question 14 (Why do you think you were selected for this job?), another open question, was also an attempt to find out what the respondents thought best qualified them for placement in their jobs. Question 15 (Is there anything that you would like to add that might help improve the training of technical order managers? If so, please elaborate.) was also a "catch-all" attempt to prompt the respondents to comment further on any other ideas they might have on improving the present process. Finally, question 16 was the wrap-up (What do you think should be included in the criteria for selection of technical order managers?). This is a critical question - what the people who are actually in the job think others should possess in terms of skills, training, experience, knowledge, etc., to be truly effective.

The validity of the instrument should be evident in the selection of respondents. Current technical order managers were asked what is wrong with the current method of selecting and training technical order managers and what should or could be done to improve it. In addition to their opinions, a variety of contractor technical order (or

publications) managers were asked what works for them. Their responses provided additional ideas for recommendations to improve the current method.

Mr. Chuck Weaver was contacted and asked to review the present survey and offer his expert opinion. He made many valid points about wording and terminology and suggested adjustments in order to produce a more valid final instrument.

A preliminary survey was administered to the technical order managers in one of Mr. Art Munguia's SYS 230 classes. There were 11 respondents who helped out immensely in identifying non-mutually exclusive answers, insufficient answer options, and other general lack of clarity areas.

Sample/Population

The population for the Air Force technical order managers included all known technical order managers in ASD. This population was taken from a list maintained by ASD/ALXS. The fact that a more official list is not available from the personnel office is indicative of the selection criteria inadequacies and will be dealt with in the recommendations section of this thesis.

There were 84 technical order managers on the list and every manager was sent a questionnaire. As stated earlier, only ASD was surveyed because the intention of this research is to make specific recommendations for the establishment at ASD of selection criterion and training requirements for

technical order managers. The data as initially presented in this study will not be statistically generalizable to any population other than ASD technical order managers. It is felt that the proposed recommendations can best be implemented on a trial basis at the Division level rather than at the MAJCOM (Major Command) or Air Force levels. If the recommendations are well received and lead to successes, then additional steps should be taken to further survey and generalize the data to encompass the rest of the Command and Air Force areas where technical orders are managed.

The contractor technical order sample was a convenience sample based on contractors known to have successful technical order management practices. The convenience sample method can be justified because the purpose of surveying the contractors is not to obtain a statistically generalizable sample but to obtain ideas of what does and does not work for non-government agencies.

The contractor sample was taken from an 1989 Aerospace Industries Association (AIA) directory, which lists the members of the AIA Service Publications (technical orders are service publications) Committee of which there are 96 members representing 33 different companies. The contractors contacted were General Dynamics Corporation, General Electric Aircraft Engines, Grumman Aircraft Systems Division, Martin Marietta Corporation, McDonnell Douglas Corporation and Westinghouse Electric Corporation. The specific people contacted were recommended by the thesis

advisor based on his knowledge of their experience and willingness to assist in this research project.

Data Collection

The 84 ASD technical order managers were mailed questionnaires and return envelopes through base distribution in March 1990. A cover letter was attached explaining who the researcher was and why she needed their participation - they were the experts and in the best position to report on the situation. (The cover letter and the questionnaire can be found in Appendix A.) The respondents were asked to reply within five working days of receipt. This was so stated so that those who had been on leave or away on travel would not miss a "deadline." They were also told that their individual responses would not be attributed to them personally - their anonymity would be preserved.

After one month had passed and the responses had stopped trickling in at just under a 50 percent response rate, a reminder letter (Appendix B) was sent out to all the respondents telling them it was not too late to return the questionnaire and how they could get another one if they had "misplaced" their original. This brought the response rate up to 64.3 percent or 54 out of the 84 mailed.

The contractor technical order managers were interviewed via telephone. They were contacted using the "WATS" line in the graduate student administrative office.

The researcher introduced herself, explained the reason for the call and how she had gotten their name, and then asked if they had time to answer a few questions. The researcher then asked the six questions, clarifying differing terminology (most contractors call their technical order managers technical publications or tech pubs managers) and probing further when additional topics of interest were mentioned.

The variables are:

1. The technical order managers' experience.
2. The technical order managers' responsibilities.
3. What they think is important in terms of training.
4. What they think is important in terms of experience.

An assumption of this approach is that the technical order managers are in the best position to evaluate the most essential requirements for superior job performance. It might be argued that their supervisors would have a differing opinion.

This research is also limited in that since only ASD technical order managers were surveyed, the results are not generalizable to the population of technical order managers throughout the Air Force or Department of Defense. The contractor interviews were accomplished in order to get some ideas of how others (with typically more experience and greater continuity) approach the same problem. As stated earlier, the sample taken was simply a focused, small size,

hand picked convenience sample and therefore, not generalizable to the contractor population.

Statistical Tests

Since this is a descriptive study and not an attempt to show causality, the information obtained will be analyzed with frequency analyses. For example, the more frequently chosen "shortcomings" in other technical order managers will be considered an area of needed emphasis, and, likewise, the more frequently selected strong points of other technical order managers will be considered a present training and selection strong suit.

Chapter Summary

This chapter described the procedures used in the descriptive study to determine the identity of the ASD TOMA's in terms of grade, education and experience; their responsibilities in terms of dollar value and number of TO's managed as well as requirements involving negotiations, data item descriptions, logistics support analysis, etc.; and how the Air Force can better train them to do their jobs. The research method was justified, the instruments used explained, the populations were defined and the data collection and statistical tests were addressed.

IV. Findings and Analysis

This chapter gives a brief description of the surveys, a recording of the findings depicted by both pie charts and numerically (Appendix B), and an analysis of the findings in terms of the original questions.

Description of Surveys

There were two surveys conducted in this research. The first instrument used was the six-page questionnaire sent out to all ASD technical order managers. It was accompanied by a cover letter signed by the researcher explaining the questionnaire and the motivation behind it. A copy of this questionnaire and the accompanying cover letter are in Appendix A.

The second survey conducted was a telephone interview with six different defense contractors all of which are large companies with substantial dollar contracts with DOD (Department of Defense) for major systems and less than major systems acquisition. The contractors interviewed were General Dynamics Corporation, General Electric Aircraft Engines, Grumman Aircraft Systems Division, Martin Marietta Corporation, McDonnell Douglas Corporation and Westinghouse Electric Corporation. A copy of the list of questions used to conduct these telephone interviews is in Appendix D.

Questionnaire

As mentioned above, questionnaires were sent to each of the 84 technical order managers in Aeronautical Systems Division. Fifty-four were completed and returned to the researcher for a return rate of 64.3 percent. The following is a recording of the findings as well as an analysis of those findings with respect to the research objectives for each question.

Questionnaire Question 1: What is your grade?

Figure 1 shows the detailed responses to this first question. There were no non-responses or "Other" responses to this question and all respondents were able to answer with one of the options provided. As can be determined from

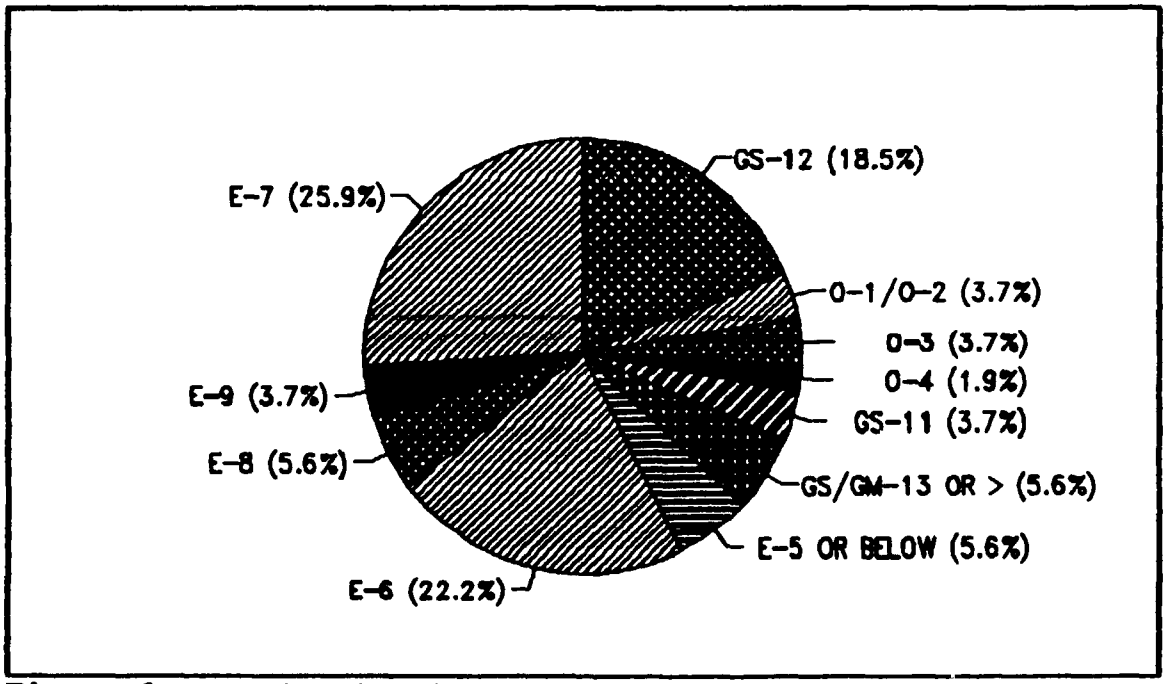

Figure 1. Grade Distribution of Responding Technical Order Managers

Figure 1, the largest group of TO managers were E-7's at 26 percent, followed by E-6 at 22 percent, and GS-12's at 19 percent. There were no O-5's or above and there were no GS-10's or below.

The first question broken out by the categories officer, civilian and enlisted, has the following percentages respectively: 10, 61, and 29.

Questionnaire Question 2: What is the highest level of education you have achieved?

The responses to the second question are depicted in Figure 2. The largest number of responses was "Some College" with 37 percent. An "Associate's Degree" was the second most popular response with 28 percent, "High School Diploma or the Equivalent" had 13 percent, a "Bachelor's

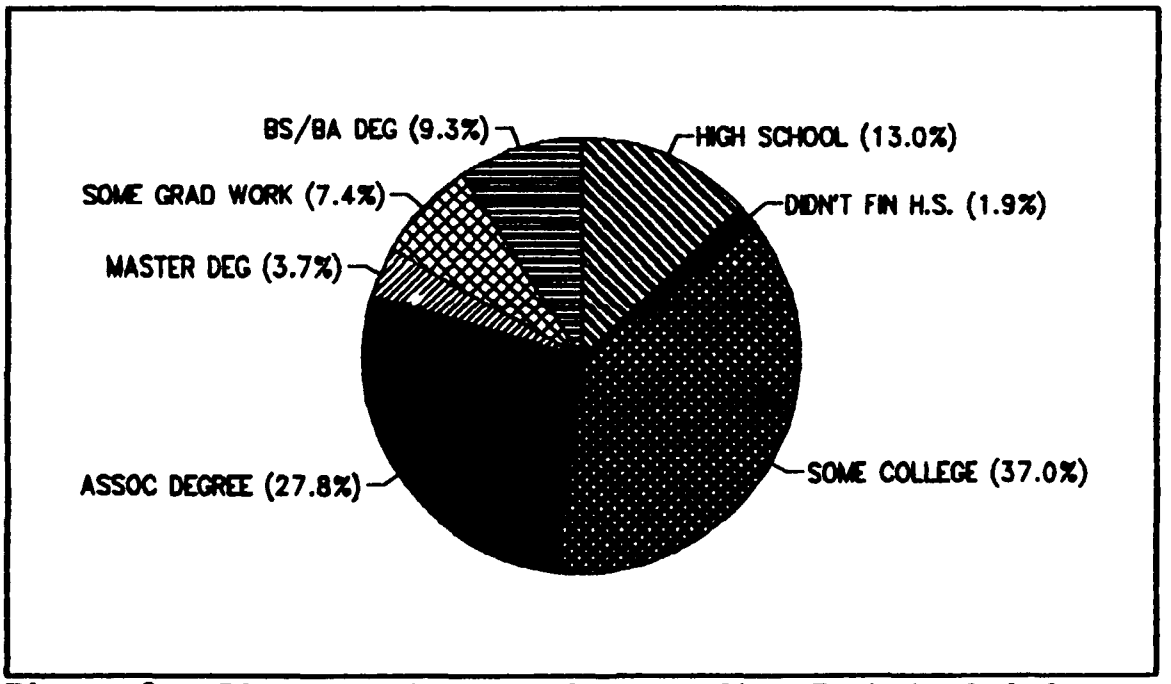

Figure 2. Education Levels of Responding Technical Order Managers

Degree" had 9 percent, and "Some Graduate Work" had 7 percent responding. Only 2 percent did not finish high school while 4 percent had a master's degree. There were no respondents with doctoral degrees and no "Other" responses.

In summary, the second question indicates that most of the technical order managers have some college but not a bachelor's degree as yet.

Questionnaire Question 3: How long have you been working as a technical order manager?

The third question illustrates a fairly experienced pool of T.O. managers as depicted in Figure 3. Sixty-four percent of the respondents had two or more years of experience. The second largest group of respondents

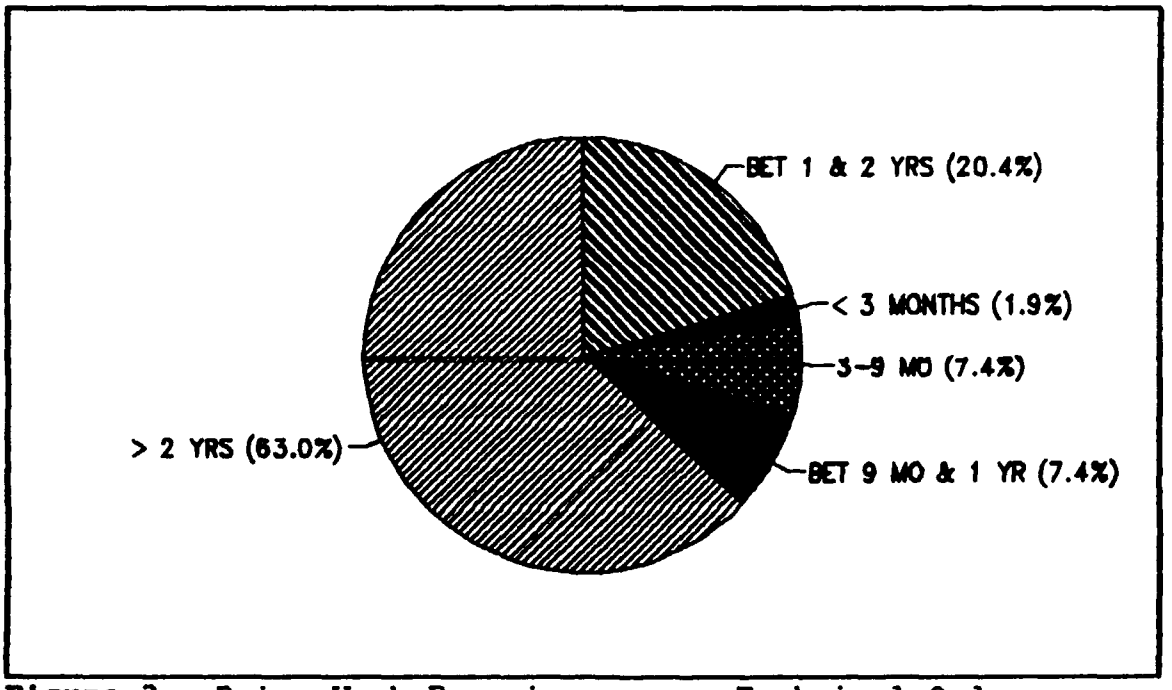

Figure 3. Prior Work Experience as a Technical Order Manager

had between one and two years of experience (20 percent). The responses to the "more than nine months but not more than a year" and "three to nine months" categories were equal at 7 percent each. The less than three months category had only a two percent response rate.

The third question asked about the amount of experience the respondents had as technical order managers. Surprisingly, 64 percent had more than two years of experience. This is surprising because that was one of the concerns in Billingham and Klassen's (1:79) research in 1985. They found that almost 50 percent of the technical order managers had less than two years experience. According to this sample, most of the technical order managers are quite experienced. Though experience is apparently high, continuity within programs might be another issue. Although a majority of the respondents have accumulated a sufficient amount of TOMA experience, it might not have necessarily occurred at their present jobs. The issue of program TOMA continuity was not addressed in this questionnaire.

The increased amount of experience might be explained by the slow down since 1985 in new program initiations as well as the slow down in additional SPO personnel to support these new programs. Or perhaps it can be attributed to the decrease in PCS (permanent change of station) moves for military (in an effort to save funds) leading to a more stable work force.

Questionnaire Question 4: What is the total dollar value of the technical orders you manage?

Figure 4 depicts the responses to the fourth question. The largest number of respondents were in the greater than $25 million category, followed by the $1 million to $4,999,999 category with 25 percent and then the "don't know" category which had 13 percent. The $5 million to $24,999,999 category had an 11 percent response rate, and the $250,000 to $999,999 category had an eight percent response rate. There was one response that said the amount was classified. This response was not listed as an option on the questionnaire.

The dollar amount of technical orders managed is useful information in that this kind of fiscal responsibility

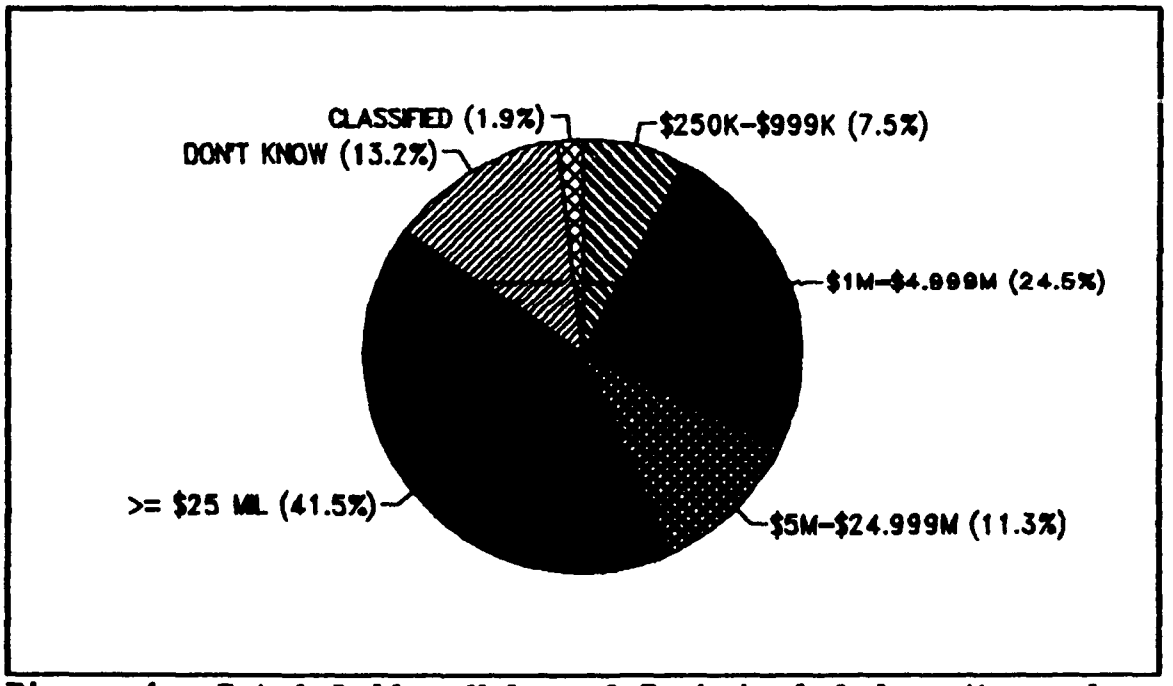

Figure 4. Total Dollar Value of Technical Orders Managed

should get the attention of those that are in a position to emphasize the role and importance of the technical order managers. The fact that 42 percent of the respondents each manage technical orders valued at equal to or greater than $25 million is impressive. This information alone certainly lends them greater credibility.

Questionnaire Question 5: Approximately how many technical orders do you manage?

The fifth question was answered as depicted in Figure 5. The largest number of respondents said they managed between one and 100 TO's (37 percent), followed by 101 to 500 (20 percent) and then the "don't knows" were at 12 percent. The 501 to 1000, the 1001 to 2000, and the 2001-3000 categories each had a nine percent response rate. The

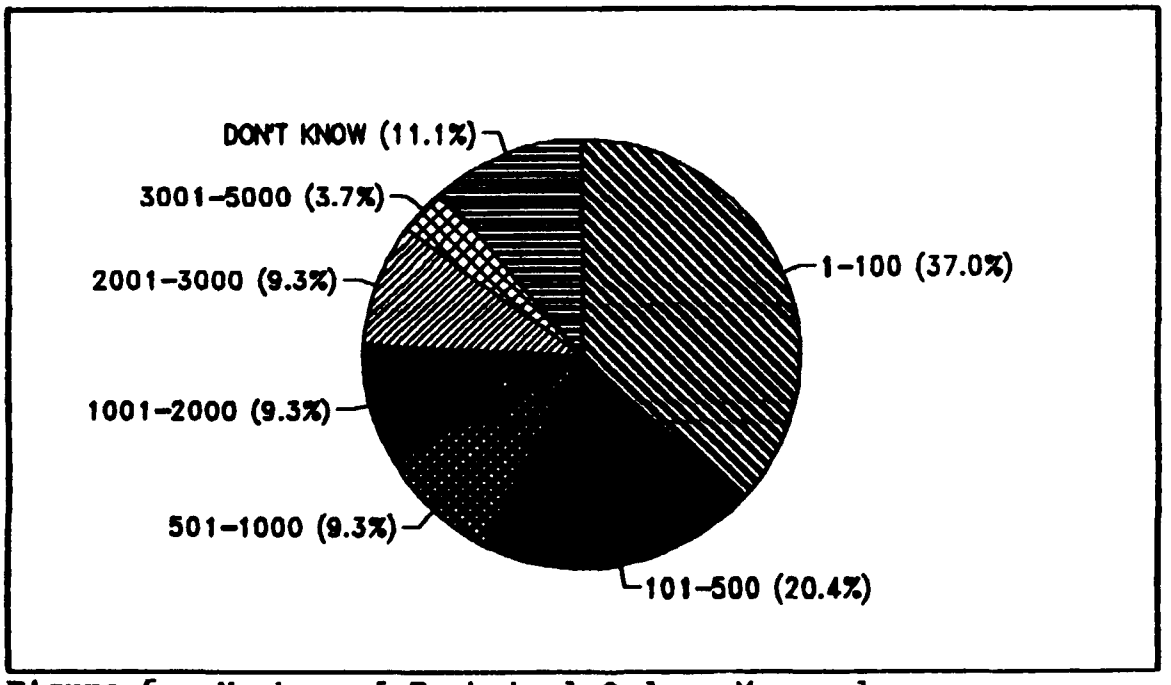

Figure 5. Number of Technical Orders Managed

3001 to 5000 category had four percent responding. No one selected the "more than 5000" category.

The number of technical orders managed is not really a meaningful or useful value outside of their individual contexts. As one of the respondents pointed out,

> The number of T.O.'s managed is not indicative of actual workload. You may have 2000 TO's and be a stable program, i.e., very few new/change pages going through your production system, or it could be very fluid.

So this question did not really generate any additional useful information.

Questionnaire Question 6: In what capacity have you worked with tech orders prior to your present job (flight line, maintenance, in-shop, in the System Program Office, etc.)?

Question six was an open ended question, i.e., there were no answer options listed, the respondents had to generate their own answers. The responses were grouped into similar categories and the left over responses were thrown into the miscellaneous category as illustrated in Figure 6. Most of the responses fell into the "flight line" category with 67 percent of the total answers (36 out of the 54 respondents) falling in this grouping. The next largest group of responses was the "in-shop" with 59 percent (or 32 out of 54). The miscellaneous category was the third largest at 28 percent (or 15 out of 54). This category included such responses as:

- MAJCOM functional manager
- Air Force One Program
- maintained small file of TO's
- used TO's on the job

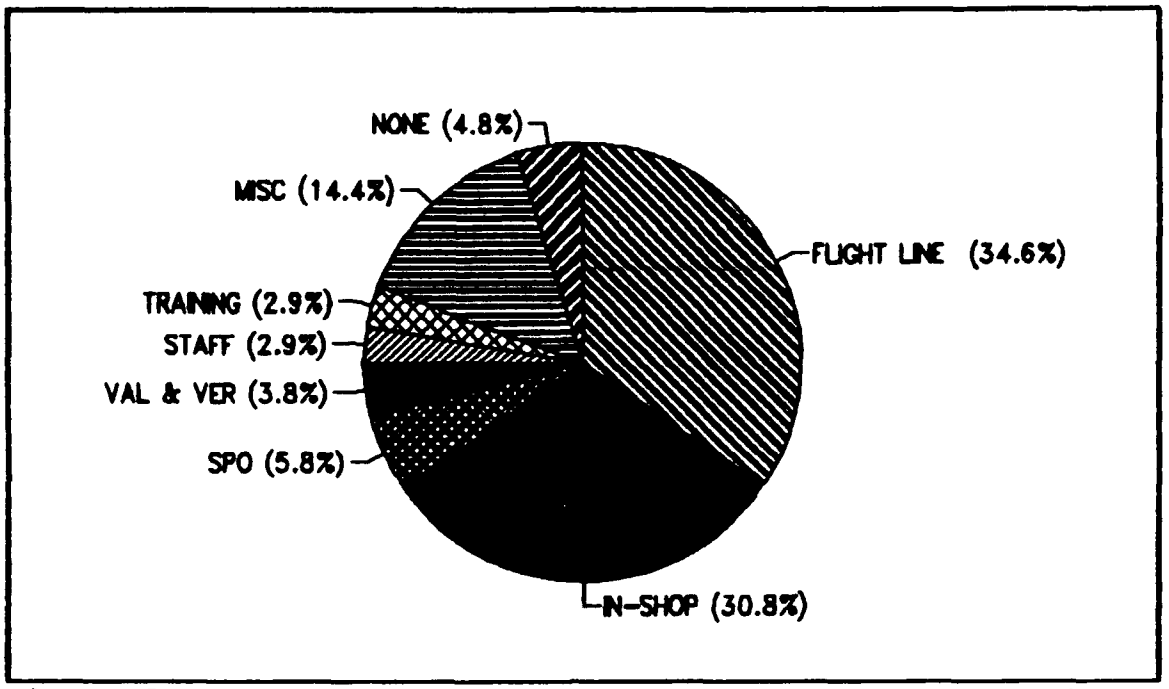

Figure 6. Areas of Prior Experience Working with Technical Orders

- AFOTEC ICBM Test Team
- posting and ordering
- development
- IG Team
- TO distribution office

(Whenever responses are listed in this thesis, the actual words of the respondents are used and/or summarized whenever possible unless otherwise indicated.) The other more common responses were System Program Office (11 percent), none (9 percent), validation and verification (7 percent), staff (6 percent) and training (6 percent).

Validation and verification (val/ver) is a procedure where the TOMA, the contractor and the user ensure the technical order is clearly and properly written and illustrated. The three parties actually witness a

technician using the technical order and verify that the desired task was properly accomplished.

In question 6 it should be noted that the answer categories overlap, that is, the respondents could pick more than one response, whereas, in the first five questions, only one response could be chosen. This means that in order to get the percentages in the pie to add up to 100, the percentages shown in Figure 6 must be based on the total number of responses and not the total number of respondents. There were 54 respondents, but many wrote more than one answer so the total number of answers recorded and categorized was 104. For example, 36 of the 54 respondents cited flight line experience which is a 67 percent rate. But there were 104 total answers and 36 out of 104 is 35 percent which is what Figure 6 indicates. It was felt that the most useful part of the response analyses would be the pie charts because of the ease with which one can determine the most frequent responses just by quickly glancing at them. So, although the percentages would be different if based on the number of respondents rather than the number of responses, when compiled into a pie chart, the slice of pie would be the same relative size in either case.

Obviously, the most frequent work experience/ backgrounds for the ASD technical order managers is in the area of in-shop and flight line maintenance as determined from the responses to question 6. This viewpoint should

also be remembered when reviewing the backgrounds for other technical order managers as suggested by these TOMA's.

Questionnaire Question 7: What kind of technical order acquisition manager-related training have you had?

The responses to the seventh question are depicted in Figure 7. The most popular training course was SYS 230 Air Force Technical Order Acquisition and Management (37 percent), followed by SYS 100 Introduction to Acquisition Management (34 percent), then AFALC 001 Deputy Program Manager for Logistics (DPML) Course (16 percent), SYS 225 Acquisition Logistics (6 percent), Systems 028 Introduction to Configuration Management (6 percent), and none (1 percent). As in question 6, the answer categories to this question overlap, i.e., more than one answer could be given.

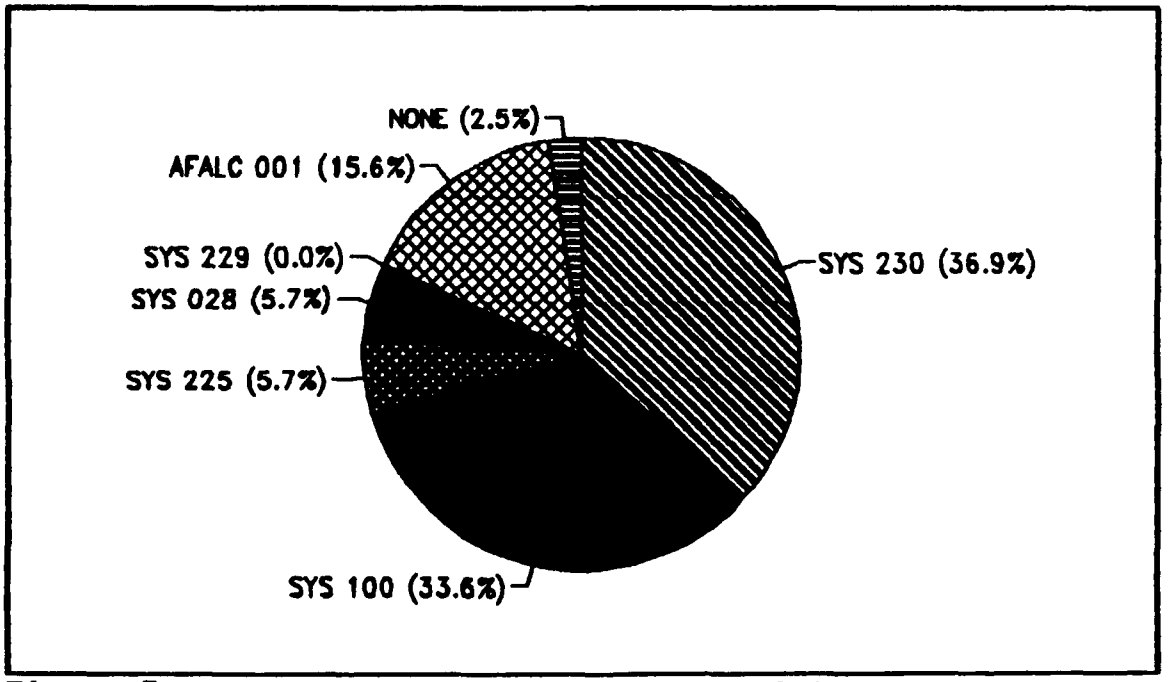

Figure 7. Related Training Courses Completed

Question 7 responses indicated that 83 percent (or 45 out of the 54 respondents) have taken SYS 230 Air Force Technical Order Acquisition and Management. This is an encouraging ratio considering that only 64 percent of the respondents have worked as a TOMA for two years or more. Those that had not taken the class vociferously expressed concern that TOMA's are not given priority over non-TOMA's in the class attendance. The SYS 100 Introduction to Acquisition Management percent was quite high also at 76 percent. AFALC 001 the DPML course had quite a high attendance rate at 35 percent.

Questionnaire Question 8: What type of experience did you have to qualify you for this job?

Question 8 responses are displayed in Figure 8. The

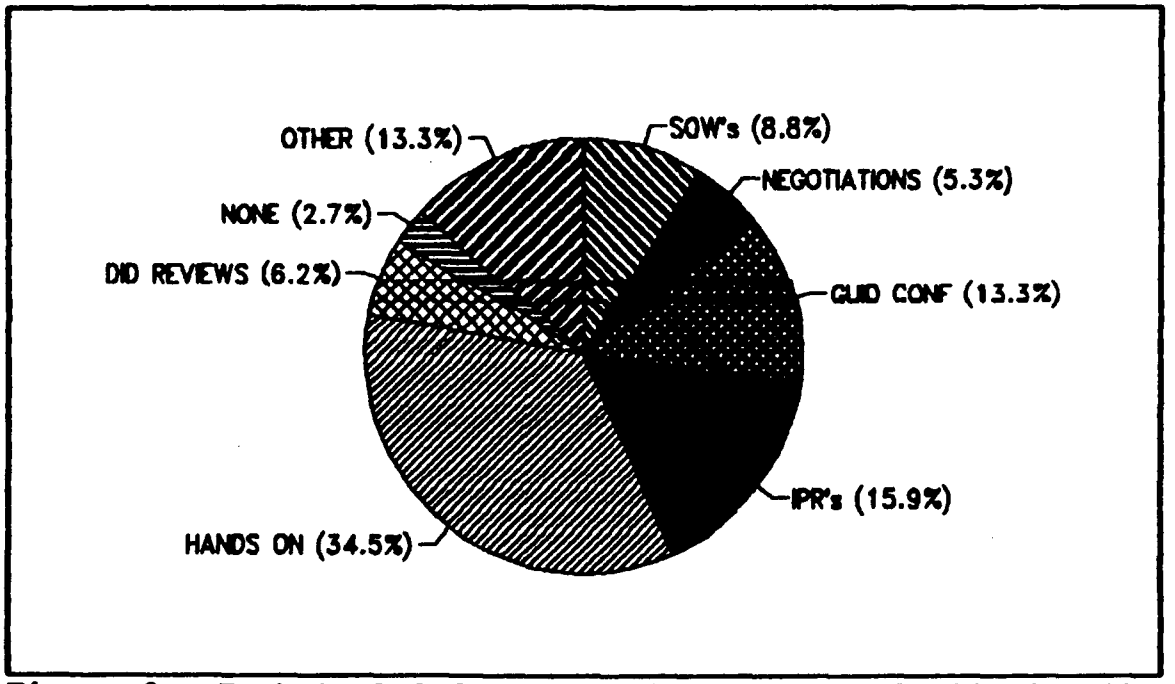

Figure 8. Technical Order-Related Experience Qualifying the Technical Order Managers for Their Jobs

most common type of experience was "hands-on" (72 percent), followed by "in-process reviews" (33 percent), guidance conferences (28 percent), and the "other" category (28 percent) which included:

- verification/validation
- prepublication reviews
- inspection team
- avionics instructor- staff
- no elaboration
- maintenance background, common sense
- DCAS - electronics QAS (Quality Assurance)
- TO specifications and standards review/tailoring/OPR
- Writing data item descriptions
- TMCR-86-01 author (Tech Manual Contract Requirement)
- TO acquisition policy
- source selection
- some LSA review
- represented TOMA at meetings, conferences etc.
- training program selectee based on merit in previous jobs and education level

The last four categories were statements of work (18 percent), data item description review (13 percent), negotiations (11 percent), and none (6 percent). Again, as explained in question 6, percentages in Figure 8 are based on total number of responses while the percentages listed above are based on the total number of respondents.

The eighth question was quite a subjective one in that it asked the TO managers to list what experience they thought had qualified them for the jobs they now held. Seventy-two percent said their hands-on experience had qualified them. This is expected because most of the ASD TO managers are hired because they have hands-on experience using technical manuals/orders. Other large categories were the in-process reviews and the guidance conferences at 33

and 28 percents respectively. These answers are significant because they reflect what the respondents feel are areas related to what they know now, i.e., what experience most qualified and hence helps them now in the performance of their jobs. So, in essence, what the respondents are saying here is that hands-on knowledge of technical orders, as well as in-process review and guidance conference experience are essential to being a technical order manager.

Questionnaire Question 9: What kind of experience, prior to your coming on the job, would have better prepared you for the job you have now?

The ninth question had a fairly equal distribution of responses as indicated in Figure 9. The most common response was negotiations (44 percent - based on the number

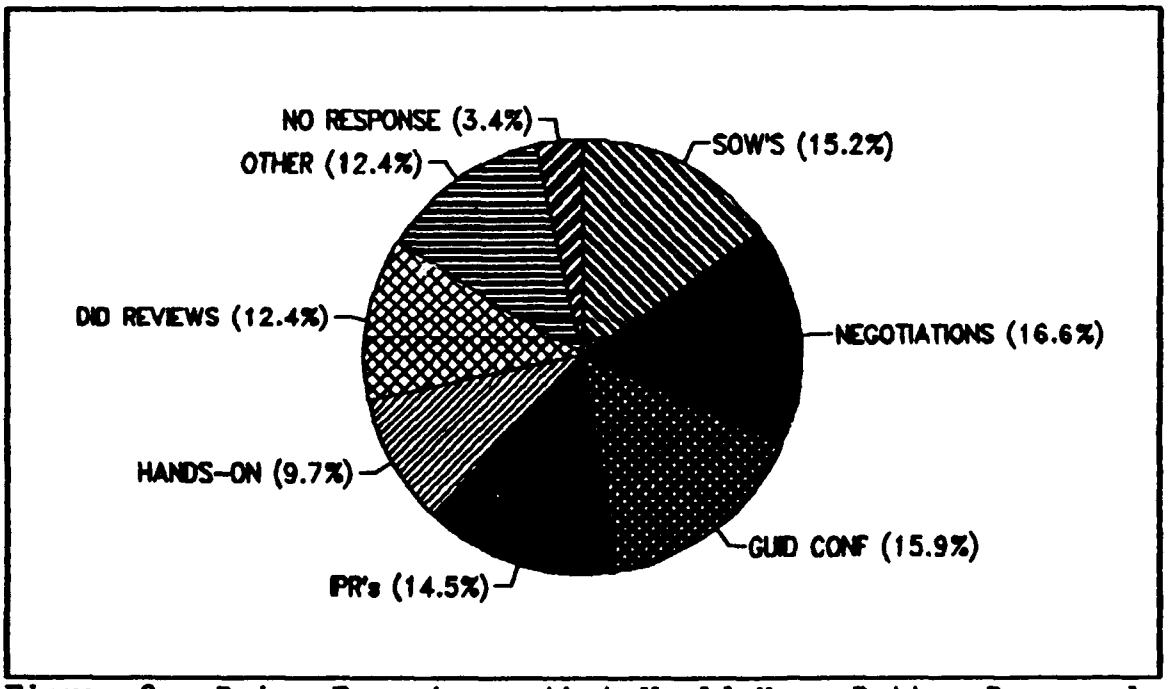

Figure 9. Prior Experience that Would Have Better Prepared the Technical Order Managers

of respondents - see question 6 for further explanation), followed by guidance conferences (43 percent), statements of work (41 percent), in-process reviews (39 percent), and other (35 percent) which included:

- Attendance in Systems 230
- participate in using command's preparation of Statement of Need
- management experience, administrative experience (letter generating, coordination, etc), experience in contracts, logistics, dealing with contractors, conducting meetings
- complete all training courses offered at AFIT
- training on how to understand contracts- experience in TO preparation format and some of the more important Mil-Spec guidelines that are used
- familiarization with specs used in the TO world, different forms being used, concepts and policies, i.e., overview of what TO acquisition is about
- proposal cost review analysis
- program manager, contracting, manufacturing/ production systems, software engineering
- quality assurance experience
- running a large day-care center for 3 - 5 year olds, this would have given me more insight in how to deal with the various Air Logistics Centers

The next most frequently chosen category was data item description reviews (33 percent), hands-on experience (26 percent) and no response, i.e., nothing was selected or written in (3 percent).

The last "other" comment listed above needs to be addressed. Since the researcher has been on both sides of the AFLC/AFSC wall, an experienced, albeit it subjective, explanation for the comment will be suggested. The Systems Command TOMA is expressing an often felt frustration about the seemingly impossible task of satisfying the Air Logistic Command (ALC) personnel. They (the ALC's) always want what they do not need or more than what they do need and they

take it very personally when they cannot get what they want. (This is from the frustrated System Command TOMA's viewpoint.) Now the other side of the coin is the ALC person's view. This person is frustrated because Systems Command insists on spending money on things they do not want and refuses to purchase things they feel they need for the follow-on support of the weapon system for which the ALC is responsible. No matter how stringently the ALC lobbies for its way, the SPO can still choose to ignore their desires prior to PMRT because the SPO has the final word since they control the funding. This situation has often proven incredibly frustrating to the ALC personnel because they often do not feel that the SPO has their (the ALC's) best interests at heart. This is because after PMRT the SPO will largely disband except for those working the residual tasks. The SPO personnel will then move to other SPO's and not have to contend with any of their decisions, while the ALC people are left holding the "bag." This so-called "bag" contains contracts and agreements that the ALC never wanted in the first place but that they now have to live with. After bumping heads unsuccessfully with several SPO personnel whom the ALC employee did not feel had their best interests at heart (or perhaps did not even consider them in their decisions), the ALC personnel could start to get a bit frustrated, resentful, and yes, even childish when dealing with their "inconsiderate" SPO counterparts. Unless there is good leadership at the SPO Director and DPML level as

well as the ALC Program Manager level to set the example and the climate, the above scenario will continue adding to personnel frustrations and program costs.

Question 9 also gets more into the central issue of this thesis and again, as in question 8, it asks a subjective question. The respondents were asked to circle what areas of prior experience would have better prepared them for their present jobs. This question is very significant in that it should point to the areas that are presently lacking as far as selecting prepared people to be technical order managers. Forty-four percent of the respondents listed negotiations as an area of experience that would have better prepared them. A drawback of this response is that "negotiations" is never specifically defined. Legally, only certified contract negotiators are allowed to negotiate with the contractor. So why do so many TOMA's want more training in negotiations? The researcher proposes that because the contracting officer must come to the TOMA for cost, time required, and other data requirements in order to prepare for negotiations, the TOMA is often asked to contribute and participate in an area of expertise the TOMA knows very little about. The contracting officer does not have time to train every TOMA in the essentials of negotiating techniques but a basic understanding of such would help the TOMA's immensely in their collaborations with the contracting officer.

The hands-on choice was relatively infrequently chosen at 26 percent. This corresponds to the responses to question 8 where 72 percent said they were qualified for their jobs because of their hands-on experience. In other words, those that were not chosen on the basis of their hands-on experience feel that experience would have better prepared them for their jobs. Unfortunately, not many of those with the hands-on experience have had an opportunity to get versed in the more SPO-oriented activities such as those listed here -- negotiations, guidance conferences, etc.

This question could have been slightly slanted in that there were six provided answers. The answers were a best attempt to list the full range of technical order manager-related duties and not just the areas that the researcher thought might be lacking, i.e., "hands-on experience" (which the researcher felt was an area in which most of the TOMA's were experienced) was listed as well as "negotiations" which was an area in which the researcher thought the TOMA's might feel inadequate. There was also an "other" answer option and it was chosen by 35 percent of the respondents. Because of the variety of responses given in the "other" category, it is not felt that the respondents were "guided" into their answers on this or any other question.

Questionnaire Question 10: What kind of training would you still like to have in order to improve your present level of job performance?

The tenth question was responded to as indicated in Figure 10. The most frequently chosen response was SYS 225 Acquisition Logistics (65 percent), followed by SYS 028 Introduction to Configuration Management (44 percent), SYS 229 Test and Evaluation (35 percent), AFALC 001 Deputy Program Manager for Logistics (DPML) Course (26 percent) and "Other" (28 percent). (Again, as in question 6, the percentages in Figure 10 are based on the total number of responses while the percentages given in the text are based on the number of respondents.) The "Other" responses included:

- an introductory course to test and evaluation (not necessarily 229)
- SYS 230 needs to be changed to be TOMA friendly and a

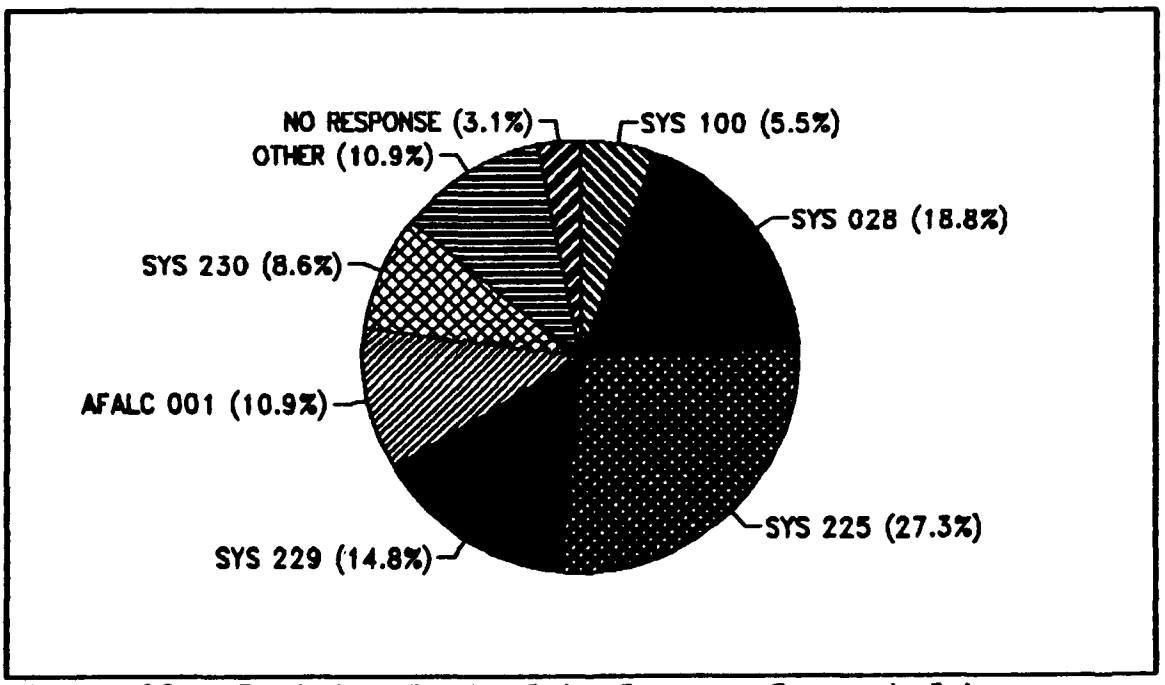

Figure 10. Training Desired to Improve Present Job Performance

good OJT program needs to be made and used
- need more mil-spec application knowledge
- SYS 006 Intermediate System Acquisition
- following a training plan that is made just for technical order managers along with a 797 for the records
- technical writing classes (for evaluating paper TO's), computer programming classes (for evaluating digital TO's, LOG 260 Provisioning Mgmt, LOG 224 Logistics Mgmt, SYS 227 Financial Mgmt in Weapon System Acquisition, SYS 200 Acquisition Planning and Mgmt
- seminars dealing with current issues - CALS/JUSTIS (Computer Aided Logistics System/Joint Uniform Services Technical Information System), distribution statement, AFR 80-34 requests/FOIA (Freedom of Information Act), i.e., protection of data, LSA, TM 86-01
- LOG 260, SYS 370, Provisioning and Data Management
- SYS 200
- some type of program that would better prepare us for tech order pricing
- LSA/LSAR (Logistics Support Analysis Requirements) training - reason - the TO's and nearly all the other areas of logistics originate from LSA - so it's imperative to know what LSA requirements to put on contract and what these requirements will provide us

The frequency of "other" responses indicates a sincere interest in improved training. The comments seem to indicate a desire for more practical information/training that will prepare them for what they are currently doing in their jobs. Words like "TOMA friendly" (meaning perhaps, more in line with what the TOMA "needs" to know - not what is "nice" to know), CALS/JUSTIS, FOIA, LSA, tech order pricing, all seem to point to the current, and likewise, not well understood, issues. Clearly, the present training opportunities should be looked at from this perspective.

The remaining responses included SYS 230 Air Force Technical Order Acquisition and Management (20 percent), SYS 100 Introduction to Acquisition Management (13 percent), and the non-responses which constituted only seven percent of

the total answers. The percentages of TOMA's who want to take SYS 230 or SYS 100 correspond with the percentages of those who have already taken the courses as determined in question 7. In other words, 76 percent had already taken SYS 100 and 13 percent still wanted to take it and likewise, 83 percent had already taken SYS 230 and 20 percent still wanted to take it. (Admittedly, there is some overlap in the SYS 230 percentages, perhaps attributable to those who would like to repeat the course.)

Question 10 addressed the training desired by the technical order managers to improve their present job performance. This is an important question because of the higher experience level of responding technical order managers. Based on the level of experience they have (most being over two years) what kind of training (or in what area do you still feel weak) would you still like to have in order to improve your present level of performance. Consistent with the previous answers, most of the respondents wanted training in the acquisition logistics area (SYS 225). This is consistent because most of them have backgrounds on the flight line and maintenance shops and are weak in the System Program Office/acquisition logistics area. SYS 028 (Introduction to Configuration Management) and SYS 229 (Test and Evaluation), both common SPO domains, were also frequently chosen.

Questionnaire Question 11: What shortcomings have you witnessed in other technical order managers?

The eleventh question was responded to as indicated in Figure 11. These responses were quite equitably distributed with lack of acquisition background getting the most responses (72 percent - based on the number of respondents - see question 6 for further explanation) followed by lack of negotiation experience (61 percent), lack of cost evaluation experience (56 percent), lack of data item description experience (52 percent), lack of statement of workexperience (50 percent), lack of tactfulness in dealing with people (48 percent), lack of in-process review experience (39 percent), lack of guidance conference experience (39 percent), lack of configuration background (39 percent),lack of knowledge of technical orders (31 percent), and "other" at 17 percent.

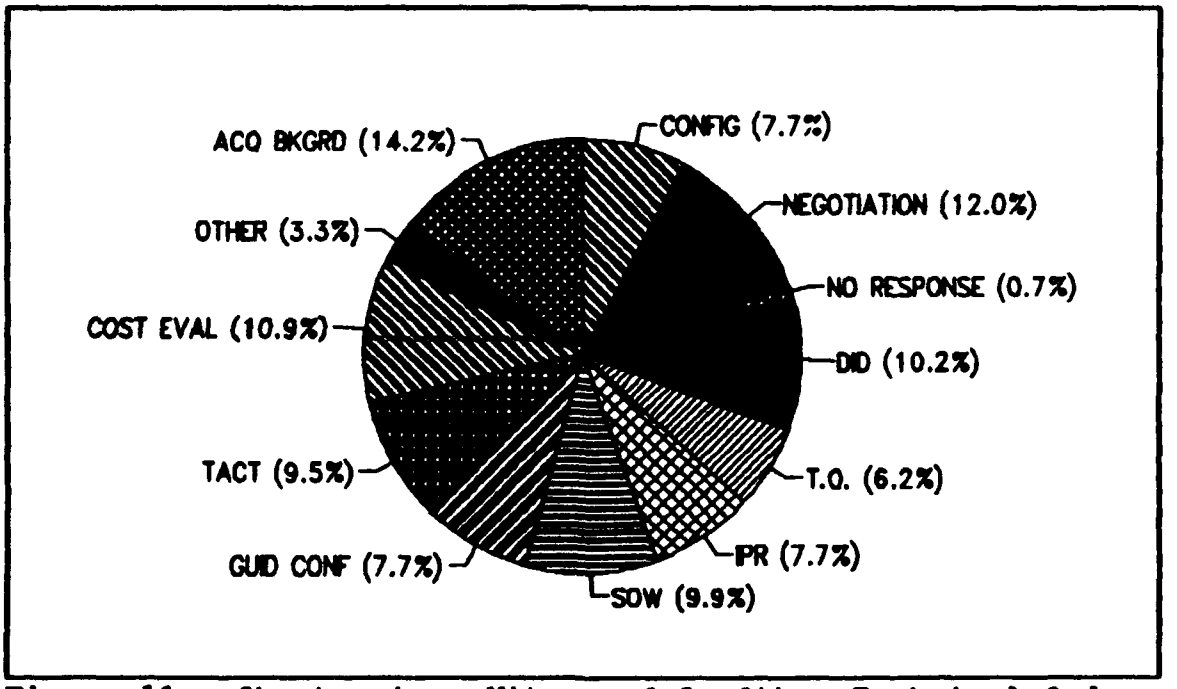

Figure 11. *Shortcomings Witnessed In Other Technical Order Managers*

Some of the other responses included:

- lack of training/experience in dealing with bureaucracy and matrix mgmt in SPO
- lack of overall experience in everyday happening in military such as how to conduct yourself in the presence of senior service personnel and aircraft industry mgmt
- PMRT planning
- lack of ability to make a decision - "You can always count on SPO TOMA for a definite maybe!"

Five of the nine "other" responses did not elaborate. The only remaining responses were in the "no-response" category of which there was only 4 percent.

Question 11 is attempting to find out in what areas the respondents have witnessed other technical order managers' weaknesses. This question assumes the TOMA's are knowledgeable enough to recognize shortcomings of their own. The weakness of the question might be found in that the respondents are most likely to recognize shortcomings only in areas that they are knowledgeable in themselves, i.e., they might not recognize an inadequate knowledge of configuration management if they are weak in that area. Consequently, an important category of knowledge could conceivably be overlooked because not enough TOMA's have the experience to recognize the shortcoming. However, this is not considered a major issue because of the high percentage of experience of the respondents. Another possible weakness of this question is that the frequency of selection of the shortcomings might not directly correspond to the actual frequency of occurrence. Possibly, those who cited the lack of cost evaluation knowledge as a shortcoming, witnessed

this shortcoming in the same person so the frequency is misrepresented by the number of witnesses who saw the same person rather than the number of actual TOMA's with this shortcoming. As mentioned in the previous paragraph, the answers are fairly evenly distributed.

The largest category selected in question 11 is acquisition background with 72 percent, again consistent with previous findings. The majority of the options, as the majority of the TOMA's duties, had to do with the SPO responsibilities. The only option, other than "other", that was not exactly SPO related was the "lack of knowledge of technical orders". The percentage citing this shortcoming was relatively low but not insignificant at 31 percent.

Questionnaire Question 12: What strong points have you witnessed in other tech order managers?

The responses to the twelfth question are portrayed in Figure 12. The most frequently chosen answer was knowledge of technical orders (67 percent - based on the number of respondents - see question 6 for further explanation), followed by tactfulness in dealing with people (59 percent), acquisition background (43 percent), in-process review experience (43 percent), guidance conference experience (37 percent), statement of work experience (33 percent), cost evaluation experience, configuration experience, knowledge of negotiation techniques, and data item description experience, all at 30 percent each. The least often chosen category was the "other" category which was chosen only nine

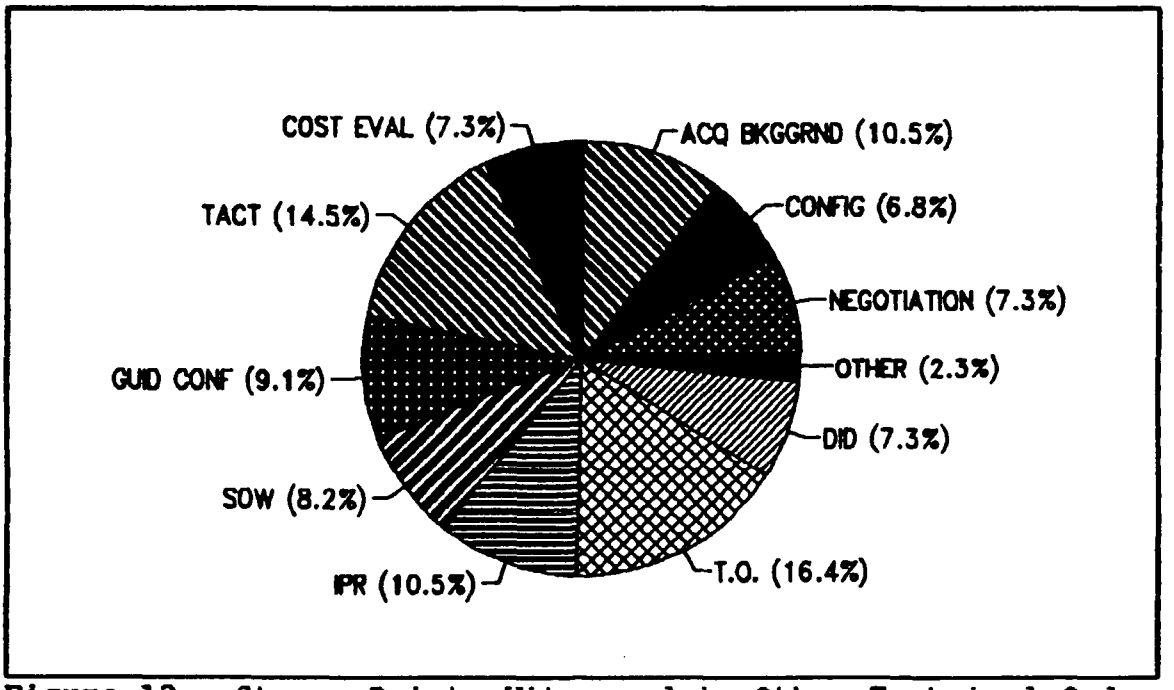

Figure 12. Strong Points Witnessed in Other Technical Order Managers

percent of the time. Three of these "other" choosers did not elaborate. Elaboration on the "other" choice includedgood technical background and effectively managing within the bureaucracy and matrix management of the SPO.

This question is an attempt to determine what the technical order managers feel are important strong points to have as well as how many other TOMA's have they witnessed with these strong points. In other words, in what areas are we doing well? (There are the same possible weaknesses and assumptions in this question as cited in question 11 above.) Again, technical order experience and acquisition background come out strong as being important to the successful technical order manager. A rather surprising strong showing came from "tactfulness in dealing with others." This

characteristic is obviously an important element of the successful technical order manager yet it is often overlooked while the more technical and quantifiable features such as years of experience and training completed are concentrated on.

Questionnaire Question 13: Please try to list and explain, if necessary, all of your duties associated with technical order management.

Question 13 was an open-ended question that was trying to determine the mix of duties assigned to most ASD TOMA's and to also see if any large categories were possibly excluded in the list of choices to the previous questions. There were three examples of answers given in the questionnaire: negotiations, in-process-reviews, and data item description review. These three suggestions were respectively the fourth, first and fifth most often chosen answers (as indicated in Figure 13) so it is not felt that the suggestions unfairly biased the answers (as might have been the case if the answers were the three most often chosen).

Again, as in question 6, more than one answer could be given by each respondent. Consequently, the percentages referred to in the text are different from those in the chart because the chart percentages are based on totalanswers given versus the text percentages which are based on the number of respondents.

The most common duty listed was in-process-reviews (65 percent), followed by guidance conferences (44 percent),

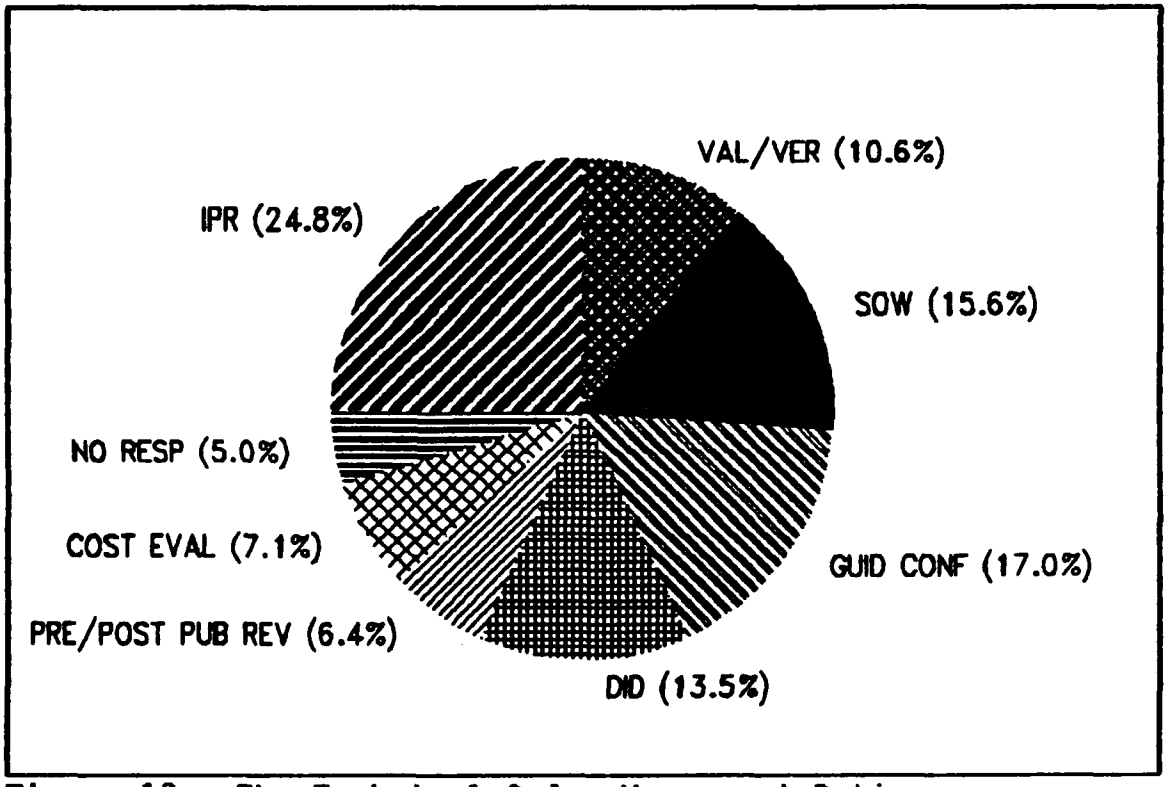

Figure 13. The Technical Order Managers' Duties

statements of work (41 percent), validation/verification (39 percent), negotiation and data item description (both 35 percent), cost evaluation (19 percent), pre/post publication reviews (17 percent), and no response (13 percent). There was a large number that fell into the "other" category and because of its size and variation, this category was not placed on the pie chart in Figure 13. The following is a list of the "other" responses that were given by more than one person:

- review ECPs/CCPs/ACSN
- SERDs
- TO specifications and standards
- TMCR 86-01 author/tailor
- TO acquisition policy
- technical interchange policy
- program management

- ensure contractor complies with specs
- scheduling
- data call input
- fact find
- LSAR reviews
- inputs to PMRT planning
- Form 27, AFTO 22's
- TO revisions/updates/changes
- personnel mgmt
- briefings/preparation
- FMS CSTO's
- publication/delivery of TO's
- CDRL deliveries/packages
- source selections
- budgeting/funding
- requirements identification
- support equip. coordination/acquisition
- CFAEs/CFEs
- "everything"
- TO review boards

This question uncovered some responses that had not been listed as options in previous questions: validation/ verification (val/ver) and the pre/post publications review tasks. The val/ver was especially significant because it was cited by 39 percent of the respondents. With the exception of the "hands-on" experience, the answers to this question correspond to those in question 9 which asked what kind of prior experience would have better prepared the TOMA's for their present jobs (see Figure 9). Both sets of responses are rather evenly distributed and the slightly larger groups include in-process-reviews, negotiations, guidance conferences, statements of work and data item descriptions. The only area left out of Figure 9 is val/ver, and this is possibly because val/ver was not listed as an option in question 9. The point of highlighting the relationship between the two questions is that the

respondents are saying that they need more experience in almost every area in which they work as technical order managers (the exceptions being cost evaluation and val/ver). Obviously, there is room for improvement in the training area.

Questionnaire Question 14: Why do you think you were selected for this job?

Question 14 elicited some varied responses as indicated in Figure 14. The most common response was that the selection was based on the individual's experience (30 percent - based on number of respondents - see question 6 for further explanation), followed by the response that the individual was available or they volunteered (20 percent), or based on their maintenance background (15 percent), or

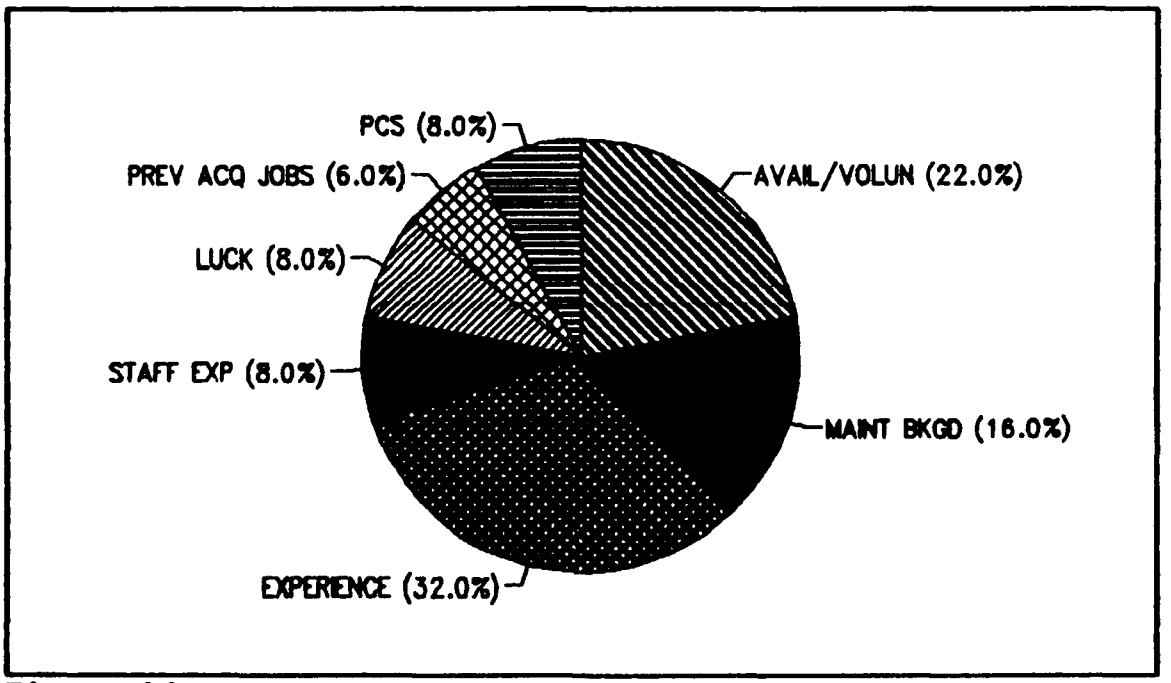

Figure 14. Why the Technical Order Managers Were Selected for Their Jobs

based on a PCS (permanent change of station) move, luck or staff experience (7 percent each), or based on previous acquisition jobs held (6 percent). There were quite a number of varied "other" responses that were not included in the pie chart in Figure 14 because their volume would have dwarfed the other slices. The "other" responses included the following (the numbers in parentheses after a responses indicate frequency of occurrence if greater than one).

- common sense
- willingness to work (2)
- most qualified within the program
- aircraft background (2)
- tech order experience (2)
- management experience
- old boy network
- good record (2)
- humanitarian assignment
- best trainee candidate at the time
- varied weapon system and aircraft background
- completed SYS 230
- previous civil service experience (DCAS)
- verification team member and manager
- SPO experience
- F-16 avionics system experience
- most qualified
- don't know
- no response (2)

Question 14 is a subjective one in that the respondents are being asked to speculate on why they were chosen for their jobs. The majority of their answers indicated either maintenance background or some type of experience. Only a small percentage indicated luck, PCS, availability, etc., which is encouraging because one would like to think that most of these critical positions are filled with qualified people and not just available ones. The limitation of this question is that it asks those getting moved around and it

does not get the viewpoint of the people who do the moving. The commanders of product divisions, SPO directors, program managers and military and civilian personnel people might have a different view of why the respondents are where they are other than "luck." And such responses as "common sense" and "willingness to work" are probably not reasons, in and of themselves, that someone was chosen as a TOMA. As the system for selecting TOMA's improves, one would probably see an improvement in the responses to this question (an improvement being defined as more respondents saying they were chosen because of their background and experience and less saying they were chosen because of luck and the fact that they were available).

Questionnaire Question 15: Is there anything that you would like to add that might help improve the training of tech order managers? If so please elaborate.

Question 15 was open ended and produced such a variety of responses that it was not feasible to group the responses into a pie chart. The large majority of the responses were well thought out and positively intentioned. Obviously, the TOMA's took the question seriously and made some very positive comments. The following is a summary of those comments, grouped by the general category into which they fell. Asterisks have been placed beside the more pivotal issues raised which are addressed following the list. (Though most of the comments are summarized, an attempt was made to use the respondents' own words as much as possible and to avoid interpretation where the meaning was not clear.

Hence, the incomplete sentences and occasionally incorrect English.)

Training

- every TO manager should have to take SYS 230 early on (3 comments on this)
- training needs to be more extensive - include all aspects of tech order management - and timely (2)
- ASD/ALXS has developed an excellent training plan but needs more emphasis on contract evaluation and negotiation
- need cost evaluation, negotiation and SOW preparation training during first year as a TOMA
- new training program developed by ASD/ALXS will be great
- need formal training plan for TOMA's
- need training/emphasis on latest reg and mil-spec changes
* - need more practical seminars like the ones ALXS is currently running and less formal AFIT classroom training
- people need to understand the software and equipment they're buying TO's for - software changes to OFP's and support equipment have a significant impact on TO changes
- need training up front - not several years into the job (3)
- need training prior to assignment (2)
- send personnel to acquisition related school prior to becoming a TOMA - SAS 006 Intermediate System Acquisition course at Brooks AFB provides a Systems Command approach
- training should be a higher priority item - currently it's hit-or-miss - often TOMA's can't get in needed classes because they're filled with GS-5 secretaries et al. who will never use the info
* - the AFIT courses are too restricted by quotas so that the enlisted people who really need the training are bumped out by the professional students
- training needs to be more flexible to fit the TOMA-in-training's background and program, e.g., a program acquiring only digital data will have little use for training in plate negative inspections, etc.
* - SYS 230 still didn't tell me what I need to manage day-to-day - might be my organization's fault but I still don't know what's expected of me and what I'm authorized to do
* - need courses that give you more practical experiences such as conducting IPR's and guidance conferences
- design training courses for specific areas of TO acquisition, i.e., munitions, CFE/CFAE (contractor furnished equipment/aeronautical equipment) notices,

SERDs, interface between the ASD product division and the ALC's, the ALC's capabilities and their TO acquisition processes, also their TO maintenance systems [ATOS (Automatic TO System)]
- TOMA's should have approximately 6 months general experience in the TO acquisition area, then be sent to SYS 100 and 230 - after another year or so, they should be sent to SYS 225
- best teacher is experience for both TOMA and acquisition world - this just takes time (3)
- need a simplified handbook for trainees - the basic process is not that complicated but the guidance and regs are overwhelming
- need a good training plan and adding 797's to TO manager's 623a for military enlisted to follow
- all TOMA training concepts and plans have been "eye-wash and lip-service" in the past

Experience
- need to ensure flight line/maintenance experience of TOMA's - gives them a better feel of what TO's are needed and what they should include
- eliminate those below the rank of TSGT - not enough experience

Career Channel
- need a career channel for TOMA's
- need AFSC/skill for TOMA's
* - military TOMA's should be protected from being yanked out of their career fields and made to be cops, cooks, chapel aides, etc. or returned to their old career fields
* - AFSC should be established to ensure TO managers are not lost due to PCS
- need an AFSC for TOMA's at the grade of master sergeant and above

Apprenticeship
* - team up a new TOMA with an experienced one (4)
* - need an apprenticeship program to cultivate TOMA's

* - more interaction and supervision by an experienced TOMA

General
- need "cradle to grave" (source selection to PMRT) commitment of personnel (TOMA's) in order to get experts
- centralized TOMA office is not a good idea - each situation is different - especially with contractors
- ALC's need to provide slots in the programs to allow their individuals to learn the process of doing TO

acquisition and support equipment - need to rotate TOMA's between ALC and AFSC

The above suggestions/comments obviously stress training (with emphasis on SYS 230 and the timeliness of taking the classes) and an apprenticeship program where a more experienced TOMA is teamed up with a more novice TOMA. The training emphasis seems to be on the more practical side of TOMA duties, i.e., "Exactly what am I supposed to be doing day-to-day?" There was also a mention of an inability to get into the AFIT classes because of quotas. The TOMA's who really need to go might not get to because their organization has used up its allotment of training slots for the year.

In the career channel grouping above, a key issue was raised - retention. It was suggested that military TOMA's be protected from being pulled into other career fields and that an Air Force Specialty Code (AFSC) should be established to ensure TOMA's are not "lost" when they PCS. Another benefit of the TOMA AFSC would be the record of TOMA experience being readily available in the personnel computer. Presently, if the Military Personnel Center (MPC) wanted to know who had TOMA experience, they could not tell except by going through individual performance reports.

Another excellent idea brought up in the comments listed above was to have some kind of apprenticeship program for TOMA's. This could be within a SPO if it is a large program or between two SPO's at relatively the same place in

the acquisition cycle for the smaller SPO's. To be assigned to a more experienced TOMA whom one could call upon for advice and recommendations would be a tremendous help for the less experienced TOMA's. And what a simple and inexpensive way to take advantage of the Air Force resources already in place.

A general comment listed above that also needs to be addressed is the suggestion that the TOMA's be rotated between AFLC and AFSC (Systems Command). This would allow the AFLC people to learn early the process of TO acquisition. It would probably also improve AFLC/AFSC relations since working side-by-side can often lead to a greater understanding and empathy for each other. This suggestion would be much more expensive because of the travel and per diem costs associated with the relocations. A good idea but only if there are sufficient funds to support it - an unlikely case.

Questionnaire Question 16: What do you think should be included in the criteria for selection of tech order managers?

Question 16 was one of the capstone questions of the questionnaire. It is asking what the people out in the trenches think should be the basis for selection for the jobs they now have. There was quite a variety of answers, the majority of which are depicted in Figure 15. As in question 6, there was an overlap of answers and the percentages given on the chart are based on the total answers covered in the chart, whereas in the following

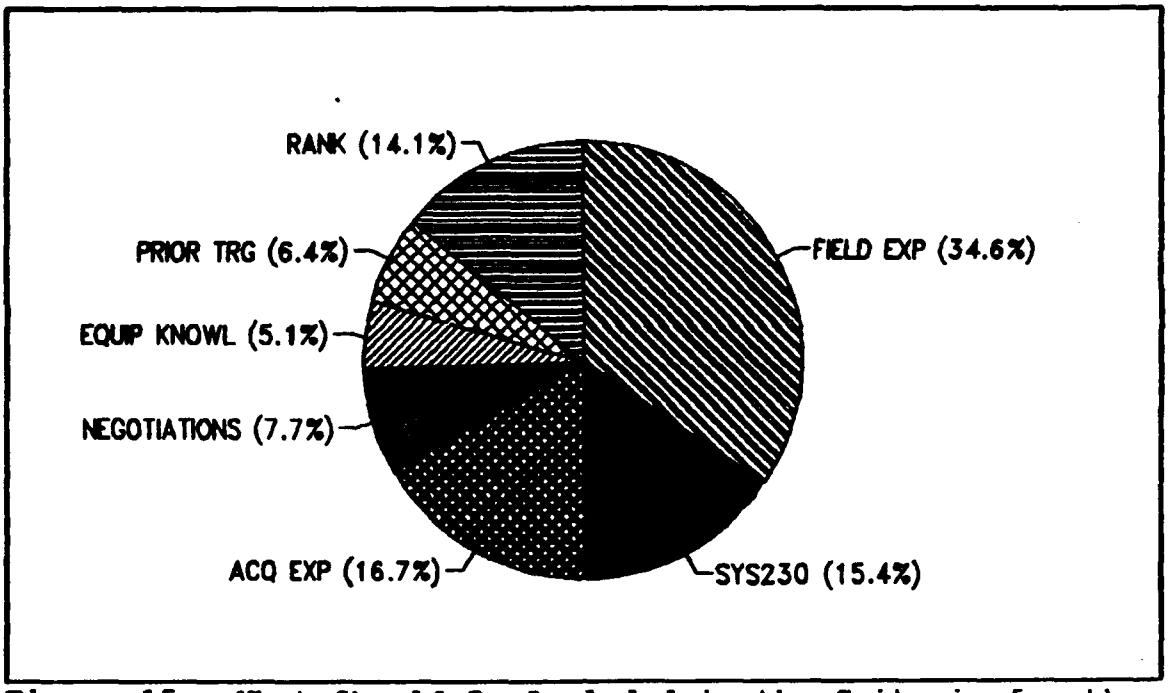

Figure 15. What Should Be Included in the Criteria for the Selection of Technical Order Managers

elaboration of the responses, the percentages given are based on the respondents. For example, field experience makes up 35 percent of Figure 16 but there were 27 respondents citing this area which is 50 percent. See the explanation in question 6 for further clarification.

Field experience was by far the most common requirement listed with 50 percent of the respondents citing this, next was acquisition experience with 24 percent citing its necessity, followed by SYS 230 at 22 percent, rank at 19 percent, negotiations experience at 11 percent, training prior to starting TOMA responsibilities at 9 percent, and knowledge of the equipment the TOMA is responsible for with 7 percent. There were 8 respondents who failed to answer this question. The "other" category which was not included

in Figure 15 because it would have dwarfed the other pie slices, included the following (numbers in parentheses following the responses indicate the frequency of response when greater than one).

- contracting process (3)
- hard working/motivated (3)
- ability to travel (3)
- business practices/strategy (2)
- configuration background (2)
- in-process-reviews knowledge (2)
- cost evaluation knowledge (2)

* - writing ability (2)
* --at least college-level English - have seen TOMA's who can not construct good sentences or spell well - both of which should be second nature to people reviewing books which are going to the field

- speaking ability (2)
- validation/verification experience (2)
- be able to work well with and communicate with people (2)
- common sense (2)
- SYS 100 (2)
- AFALC 001 (2)
- team player (2)
- data item description experience
- statement of work experience
- guidance conference experience
- tactfulness in dealing with others
- software development knowledge
- new systems knowledge
- computer knowledge
- ability to think on one's feet
- ability to handle stress
- stability to stay with program
- ability to work in office and contractor environment
- SYS 200/SAS 006
- one week at the main operating base
- experience a negotiation with a fully qualified TOMA
- command maintenance understanding - TAC does things differently from SAC
- active use and participation in TO change process (AFTO 22's etc)
- field experience helpful but not necessary
- aggressive and willing to learn regs, contracts, and timing
- understand mil specs and be familiar with them
- SYS 225
- TO file maintenance experience
- management experience training

- administrative experience training
- minimum of an associate's degree
- clean record
- volunteer
- hand picked/interviewed
- fair chance at the job - advertize in Air Force unit bulletins - use resumes
- should not get job simply because one has worked with TO's
- extrovert but not harsh or abrasive
- be an organizer
- team player
- engineering data knowledge
- LSA knowledge
- test and evaluation knowledge

An expansion is in order on the "rank" category cited by 10 of the respondents. One respondent thought one should not become a TOMA before the third term of enlistment. Several said they should be senior NCO's (non-commissioned officers) or civilian GS-12's or above. Several said officers should not be TOMA's because they are usually in the job for too short of an amount of time and they usually do not have the maintenance background required. One commented that a second lieutenant should never have the job because they do not usually have enough experience. Several mentioned the reluctance of contractors to deal with anyone with a rank less than master sergeant.

Another comment that needs to be addressed is the writing ability of the TOMA. It was suggested that TOMA's all at least have a college-level English capability. This requirement is certainly a reasonable one given the extensive reviewing and writing tasking placed on TOMA's.

Telephone Interviews

In an attempt to get an outside perspective, six defense contractors were contacted and interviewed by telephone to determine their selection and training criteria for technical order managers. The following is a synopsis of the interviews, grouped by question - not contractor.

Telephone Interview Question 1: How do you select your TO managers?

Question 1 prompted the following responses from the contractors. (The listed responses are a best effort at directly quoting the respondents, hence the sometimes awkward syntax.)

- the ideal candidate has a sound technical background, generally in electronics (Westinghouse), some have computer science backgrounds

- engineering writers (as opposed to technical writers), a lot of writers have engineering degrees

- look for experience, ability to relate to people, NOT illustrators - we're going to writers with an engineering background, want people who will like the job

- look for people-skill managers

- hired from technical writers, hired strictly on technical skills - can teach them how to write but CAN'T teach the technical skills - longevity is a big advantage

- hired from within, hire technically oriented people - engineers, technicians, maintenance people with technical backgrounds - turnover in Air Force is a problem

This question was an attempt to determine how the contractors select their technical order managers - what they considered important when looking for the "right"

person. There was quite a variety of answers to this question. Most of the contractors are looking for good technical skills because they say they can teach people how to write but they cannot teach the technical skills. Several commented about how the continuity of their work force was a big advantage over the more mobile Air Force. They know what their people have been doing and for how long whereas some of the Air Force personnel being considered for jobs as TOMA's have been on such varied assignments that they are almost an unknown entity. It is not unusual for contractor personnel to stay on the same job for ten years or more whereas that is almost unheard of in the Air Force.

Telephone Interview Question 2: Are there selection criteria? If so, what are they?

Question 2 prompted the following responses:

- Virtually all have four year degrees

- Nothing formal, usually want a degree or equivalent

- Not necessary - all people have at least eight years of technical experience and two years of direct supervisory experience before they are eligible

- "grass roots" knowledge, an understanding of automation, experience as to writers or illustrators

- strong technical skill background in publications area, extensive experience at writing, people skills to empower people and enable them to support the customer

- promote the best technical people and give broadening assignments to them in contracting, programmatic experience, get them to where they can respond for a support type of product line

This question was trying to identify any structured or formal selection criteria the contractors might use in

selecting their technical order managers. Surprisingly, there were no formal criteria followed by any of the contractors. There were some "generally followed" rules such as four year degrees or the equivalent but none were strictly followed and most of the rules of thumb were very vague such as "strong technical background." The general profile followed was strong technical background alone and then these people were usually given some career broadening exposure and supervisory experience before or during their first assignment as a technical order manager.

Telephone Interview Question 3: What type of background for a TO manager have you found to be most successful?

Question 3 was responded to as follows:

- good written and oral communication skills, even liberal arts folks can succeed with some technical background

- it more depends on the individual, a lot of times a technician will make a better writer than an engineer - very varied

- mechanical comprehension/capability, language skills - writing and verbal and meeting ability

- hardworking, good people skills, good work ethic - these kind of people migrate toward the requirements section and do technical and financial negotiations - mostly OJT to fully understand the work required

- college is essential coupled with the pragmatics of the flight line and broad experience - have successfully trained an undertaker, electrical engineer, mechanical engineer, technician - lots of NCO's with lots of maintenance experience

This question attempted to determine if there was a common background or denominator for the "ideal" contractor technical order manager. The backgrounds of the most

successful contractor technical order managers were varied but the common denominators seemed to be a good education (usually defined by some kind - not necessarily technical - of four year degree), good verbal skills, strong work ethic, and strong technical background or understanding of the product.

Telephone Interview Question 4: What type of training do you provide for your TO managers?

Question 4 was answered as follows:

- We have a full catalog of training courses with cross-actional analysis and problem solving - more than 250 courses

- No formal TO training, a lot of management training

- OJT - they're all graduates of a two year technical school or have had prior military experience or associated technical writing experience

- at the writing level we offer writing skills classes, also quality analysis and materials training - a lot of OJT or voluntary courses in computer literacy

- Used to have week long formal training class but now are in a lower level of hiring and have also dropped the training course - use strictly OJT

- OJT and mentoring, some leadership training and Total Quality Management training

This question was an attempt to determine the types of training programs provided by the contractors. The responses varied from OJT (on the job training) only to extensive classrcom opportunities. The question falls short of really determining what exactly happens and concentrates more on what is "offered." A more probing interview would be necessary to find out how often the technical order managers actually do go to classroom training and how easy

it is to get into the classes. For instance, the Air Force could respond about their full range of professional continuing education courses offered through AFIT, but the individual Air Force TOMA's have some def'nite complaints about their inability to get into these classes. The extent of the training programs within the contractors polled seemed to vary proportionately with the size of their program. If the people interviewed personally managed large dollar defense contracts, their technical order programs were quite extensive and if they handled smaller dollar contracts, they relied mainly on OJT.

Telephone Interview Question 5: What experience or training do you feel is most essential to the success of a TO manager?

Question 5 elicited the following responses:

- Need hands on experience, day-to-day maintenance definitely - need that along with high technical skills

- prior military experience, more than a four year degree - combination of technical skills and people and business schooling, contracting and business law and accounting

- people skills, leadership, interpersonal skills, time management

- quite a few have associate's degrees or other degrees in business - lends a lot to their capabilities

- to know that LSA (Logistics Support Analysis) is not a cure-all

This question attempted to determine the most essential prerequisite to successful technical order managers. The responses, as can be seen above, were quite varied. Hands-

on experience, people skills and a good education seemed to be the common denominators however.

Telephone Interview Question 6: What are the weak points of your current selection and training methods? Strong points?

Question 6 prompted the following responses:

- weak - financial management ability - need more exposure to the balance sheet
- strong - supervisory assessment program (This is a program used by Westinghouse Electric Corporation for assessing and training supervisors and is a recommended area for further research.)

- weak - don't have a complete TO department - just small groups of 10 - 15 workers - not as big a pool to choose from
- strong - school of hard knocks

- weak - exposure to business aspects comes suddenly to a TO manager - can't really prepare anyone for it - no set training
- strong - interviewing process, promotion review board - if the person does well they'll be rewarded

- weak - vision - grappling with data base information - the wave of the future - both the government and contractors are struggling to avoid bad decisions regarding computer aided logistics systems
- strong - good experience - employees have chosen the field as a career and have been in the field for a long time

- weak - most difficult to convince people to change over to requirements (the office that primarily deals with customer requirements) - no more money - same grade - just more challenging

This question was intended as a catch-all to determine if there were any outstanding features to be emulated or pitfalls to be avoided by learning from the contractors' experience. Most of the points cited are familiar to the Air Force such as the weakness in the lack of vision and the strength in the school of hard knocks. But one weakness

brought up by several contractors and not given much weight in the Air Force either is the lack of financial background among their technical order managers. This was an area of concern for the contractors because they operate based on the bottom line - they have to make a profit or they go out of business. The Air Force does not put much emphasis on this area because they are a non-profit organization. This seems to be a disconnect because if the Air Force is negotiating with people whose objective is the bottom line, it should follow that they would put much emphasis on understanding the contractors' viewpoint in order to better negotiate with them. Some strengths cited that the Air Force does not share with the contractors are the interviewing process and the depth of experience.

One of the strengths mentioned by Westinghouse Electric Corporation is the use of a supervisory assessment program for evaluating the management skills of potential supervisors in order to make recommendations and prognoses on the supervisors' performances. According to Mr. Mike Pfeifer of Westinghouse in Hanover, Maryland, this type of program has been widely used in industry for the last 30 to 40 years. It was devised in World War II by the military to select the best officers for promotion and command. It involves role playing in individual and group exercises that are indicative of the future problems the potential

supervisors might face. The company that Westinghouse contracts with to sponsor the program is Development Dimensions International in Pittsburg, Pennsylvania. The person who presently heads the department that Westinghouse works with is Mr. Bill Byham and he can be reached at (412) 257-0600.

Chapter Summary

In the preceding chapter, the responses to the ASD technical order managers' questionnaires and the responses to the contractors' telephone interviews have been reported and analyzed with respect to the research objectives. These findings and analyses will be used to draw conclusions and make recommendations.

V. Conclusions and Recommendations

This chapter addresses the significance of the results of the survey and the practical implications of those results. Recommendations for improved technical order manager selection and training methods as well as follow-on or revised studies are then made.

Conclusions

The results of the survey are significant in that they confirm most of the premises on which the thesis is based and they also suggest some critical areas to be looked at in terms of improvement of the present technical order manager selection and training process within Aeronautical Systems Division. Based on the research conducted, it was determined that ASD does not have a selection criteria for selcecting TOMA's nor does it have a formal training program for the TOMA's. However, ASD/ALXS is actively developing a training program.

The following conclusions and recommendations are based on the responses to the questionnaire completed by 64.3 percent of all ASD technical order managers as well as the telephone interviews conducted with six major defense contractors. The general topic order of conclusions and recommendations follows the same order as the question topics addressed in the questionnaire.

Grade of TOMA's. The survey results indicated that the majority of the ASD technical order managers are enlisted (63 percent). This is significant in terms of training allotments by grade. Perhaps the applicable training allotments (exactly what is applicable will be addressed in a later paragraph) should be reviewed to ensure that they coincide with the grade distribution of technical order managers. The large percentage of military technical order managers (72.3 percent) should perhaps also be analyzed in terms of continuity, i.e., does being military degrade the continuity of the TOMA or are the civilians equally as mobile among the different SPO's? Continuity was a big issue according to the contractors and one of their best strong points.

Education Level of TOMA's. Education level also seems to be important to the contractors. Many insist on a four year college degree of some kind or an equivalent. More basic than the college degree though, are the essential writing and communication skills required of all TOMA's. Several comments were made by the TOMA's that basic writing skills need to be improved - at least to a college English level due to the large amount of writing and effective communication skills required of all TOMA's. Perhaps a writing effectiveness test should be administered through ASD/ALXS once one is chosen as a TOMA, and if the performance is substandard, a rudimentary English class should be required. AFIT offers these kinds of tests and

classes for their new graduate students as do many local area colleges and universities.

Prior Work Experience As TOMA's. The majority (63 percent) of the TOMA's had more than two years of TOMA-related experience. This experience lends credibility to the survey results because most of the responding TOMA's have been TOMA's long enough to make knowledgeable recommendations. Because questionnaire question 3 did not differentiate between total experience as a TOMA and experience as a TOMA only within their present program, the issue of continuity (which is brought up by several respondents) cannot be addressed in light of the questionnaire data, i.e., the percentages of TOMA's with more than two years experience in their present programs cannot be determined from the questionnaire data. The continuity issue can be addressed, however, in general terms, based on the comments of several respondents.

Dollar Value of Technical Orders Managed. Most (66 percent) of the TOMA's manage more than $1 million worth of technical orders. On the basis of financial responsibility alone, it is worthwhile to ensure these technical order managers are as carefully selected, experienced and trained as possible.

Number of Technical Orders Managed. The number of technical orders managed is not a good indicator of the level of responsibility assigned to the TOMA. This is because the number of technical orders is not necessarily

directly related to the dollar value or the amount of effort required to properly manage the technical orders.

Prior Technical Order Experience. Most of the responding TOMA's had either flight line (67 percent) and/or in-shop (59 percent) experience working with technical orders.

Related Training Courses Completed. Most of the respondents had taken SYS 100 (76 percent) and/or SYS 230 (83 percent). These are encouragingly high percentages given the fundamental importance of these courses in acquisition and technical order management. Although encouraging, there is still room for improvement.

Technical Order-Related Experience Qualifying the TOMA's for Their Jobs. Most (72 percent) of the TOMA's thought the technical order-related experience which qualified them for their jobs was their hands-on experience using technical orders.

Prior Experience That Would Have Better Prepared the TOMA's. Most of the answers (75 percent) given by the respondents indicated that the respondents felt they would have been better prepared if they had had more experience in the typical SPO activities such as in-process reviews, guidance conferences, negotiations, statements of work and data item description reviews. Those who did not already have hands-on experience using technical orders felt that experience would have better prepared them for their jobs.

Training Desired To Improve Present Job Performance. If the TOMA's have not had SYS 230 (Air Force Technical Order Acquisition and Management) or SYS 100 (Introduction to Acquisition Management), they want to take the courses. Otherwise, SYS 225 (Acquisition Logistics), SYS 028 (Introduction to Configuration Management), and SYS 229 (Test and Evaluation) are the courses the TOMA's most desire to improve their present job performances.

Shortcomings Witnessed In Other TOMA's. The shortcomings cited were primarily in the SPO-related activities field although the lack of knowledge of technical orders as a shortcoming witnessed in other TOMA's was not insignificant. Again, this seems to point to shortcomings in the SPO background and understanding of TOMA's responsibilities.

Strong Points Witnessed In Other TOMA's. Knowledge of technical orders is considered to be a TOMA strong point. Tactfulness in dealing with others is another strong point according to the ASD TOMA's. The later strong point needs to receive more emphasis based on its strong showing among the ASD TOMA's who consider it essential to good TOMA performance.

Duties of the TOMA. The ASD TOMA's duties are many and varied, primarily consisting of in-process-reviews, statements of work, validation/verification, negotiations, data item descriptions, cost evaluations, and pre/post publication reviews.

Why the TOMA's Were Selected For Their Jobs. Most of the ASD TOMA's feel they were selected for their present jobs on the basis of their experience and/or maintenance background. Quite a few felt they were chosen on the basis of their being available or a volunteer. As the TOMA selection process improves, this question should reflect more answers along the lines of experience and training and less along the lines of luck.

How To Improve the Training of TOMA's. The TOMA's indicated a strong desire for more practical training, i.e., how to actually do their jobs done as opposed to the history of technical orders. It was suggested that practical experiences such as conducting in-process reviews and guidance conferences be actually played out in the classes. There also is a strong desire for informal seminars (that do not require a training quota reserved far in advance) to address current issues of concern to TOMA's.

The Selection Criteria for TOMA's. The ASD TOMA's believe the selection criteria should still be largely based on hands-on experience working with technical orders. They also feel that the acquisition background is very important for TOMA's and they realize that to find this combination of experiences is difficult at best. The best course of action then is to select the potential TOMA's based on their field experience and grade and then have a structured, realistic training program and apprenticeship approach to best educate and guide the TOMA's through their early years.

Recommendations

Selection Criteria.

Grade. TOMA's should be of a sufficient grade to give them credibility when they are dealing with the contractors. Recommended minimum grades are Master Sergeant if enlisted, a GS-12 if civilian, and a Captain if and officer unless the officer has prior enlisted experience in which case they could be a lieutenant.

Education Level. A bachelor's degree should be strongly encouraged, there by ensuring at least a college-level competency in English. As a minimum, a competency test should be given to all TOMA's whether or not they have a college degree, measuring their ability to write well-constructed sentences and evaluate the same. If the TOMA demonstrates a need for improved writing skills, alternative sources to improve their skills should be offered such as courses already offered through AFIT, or some of the surrounding colleges and universities (Wright State University, University of Dayton, Sinclair College, etc.).

Prior Experience. The most essential requirement of a successful technical order manager is a basic and thorough understanding of technical orders and how they are used. For this reason, it is recommended that the primary basis for selection of technical order managers continue to be hands-on experience using them. The SPO functions and acquisition techniques can be learned with adequate methods

as recommended herein, but the basic technical background and understanding must come from experience.

Career Channel. A career channel is needed for TOMA's. This would involve establishing a separate Air Force Specialty Code for military and a separate job series identifier for civilians (this is also an area recommended for further research). This would allow the respective personnel departments to easily query their systems for lists of persons with TOMA experience. The TOMA career field would then need to be given some kind of priority to make it immune from the often indiscriminate requirements for undermanned or hard to fill positions such as security police, chaplain aides or cooks.

Continuity. To improve the continuity of TOMA's, a policy should be established or perhaps even a contract signed between the personnel establishment and the new TOMA, obligating the TOMA for at least four years to that program office. (The life of the program would be preferable but hard to insist upon.)

Training.

SYS 230 and SYS 100. These two classes are the bare essentials for any new TOMA. They should be attended by all TOMA's after their first six months but prior to the end of their first year as a TOMA. They should not be scheduled immediately upon becoming a TOMA because the TOMA's need to have enough time on the job for the classroom teachings to be meaningful. TOMA's should be given priority

for SYS 230 over all other attendees regardless of quota allotments.

Interpersonal Relations. It is recommended that renewed emphasis be placed on this often overlooked area. Classes in the base Social Actions office could be looked at to see if they address the importance of tactfulness in dealing with people. Or, as suggested above regarding the college-level English competency, area colleges and universities offer many of these interpersonal relationship type classes and attendance at these classes should be encouraged.

Training Quotas. The quotas allotted to the different organizations for the attendance of training classes should be periodically reviewed to ensure they coincide with the numbers and grades of the TOMA's who have not yet attended SYS 230.

Apprenticeship Program. Every new TOMA should be paired up with another more experienced TOMA who has had experience at the same stage of the acquisition life cycle as the new TOMA is now in. The senior TOMA could be in the same program office for those larger programs or just in a similar program for those in smaller SPO's. This apprenticeship relationship should be a great benefit to the new TOMA's especially during the first six months or until they are able to get to the SYS 230 and SYS 100 classes. This is a relatively inexpensive program with great potential benefit.

Providing Hands-On Experience. For those TOMA's who have not had a sufficient or perhaps even any actual hands-on experience working with technical orders, they could still get this experience without having to move to another base. An agreement could possibly be worked out with the 4950th Test Wing in Area C of Wright-Patterson Air Force Base to cooperate in providing broadening experience tours (much like those tours sponsored by Systems Command - under the same name - for acquisition officers and engineers) for those TOMA's who need the hands-on experience.

Further Recommendations For Research

In order to get another perspective on what is important as far as the training and selection criteria of technical order managers, it is recommended that their supervisors also be polled. They might have differing opinions on what is and is not important.

An excellent and timely topic in which to do further research would be the specialty codes identifying technical order managers within the personnel system. The Air Force Specialty Code (AFSC) establishment procedures could be studied as well as the procedures for establishing a civilian job series identifier. Details could be looked at and then recommendations made as to what kind and how much experience should warrant obtaining these specialty codes.

If another questionnaire similar to the one conducted herein is administered, it is recommended that "negotiations" be specifically defined. As the term was used in the ASD TOMA questionnaire, it could be interpreted in several different ways.

Again, if another questionnaire similar to the one conducted herein is administered, the questions should be made as structured as possible to aid in ease of data compilation and analysis. The frequently offered responses to the unstructured questions could be offered as options in the newer questionnaire.

And finally, the supervisory assessment program that is used by Westinghouse Electric Corporation for assessing and training their supervisors should be further investigated. This is a sophisticated and successful program used by industry to evaluate, make recommendations, and provide prognoses for potential supervisors. The Air Force could greatly benefit from the usage of this system.

Chapter Summary

This study reviews the general issue of inadequate training and selection criteria for technical order managers in Aeronautical Systems Division. Based on questionnaire responses from the Aeronautical Systems Division technical order managers as well as telephone interview responses from six defense contractor technical order managers, conclusions were drawn about the present status of the training and

selection criteria. Recommendations were then made on how to improve the training and selection criteria for the ASD technical order managers.

Appendix A: Cover Letter and Accompanying Questionnaire

15 Mar 90

LSG

Questionnaire for ASD Technical Order Managers

1. I am a graduate student at the Air Force Institute of Technology and have chosen to focus my thesis research on how to improve the selection criteria and training for technical order managers in Aeronautical Systems Division. I am working with ASD/ALXS in an effort to improve the present shortfall in this area.

2. I'm trying to find out from you, the technical order managers, how you can be better prepared and trained for the important jobs that you do. You know better than anybody else what kind of training and background are essential in the crucial world of tech order management.

3. Please take the time to fill out the attached questionnaire and return it to me in the attached return envelope within five working days of receipt. We will be using your input to determine the best combination of selection criteria and training methods for all ASD technical order managers. Your participation is completely voluntary, but your input is important!

4. Your individual responses will be combined with others and will not be attributed to you personally. If you have any questions or concerns, please call me at extension 54437.

5. Thank you for your assistance in improving the vital area of technical order management.

NANCY M. DEMING, Captain, USAF
School of Systems and Logistics
Air Force Institute of Technology

2 Atchs
1. Questionnaire
2. Return Envelope

ASD Tech Order Manager Questions

1) What is your grade?

1) O-1/O-2
2) O-3
3) O-4
4) O-5 or above
5) GS-7/8
6) GS-9/10
7) GS-11
8) GS-12
9) GS/GM-13 or above
10) E-5 or below
11) E-6
12) E-7
13) E-8
14) E-9
15) Other (Please specify at end of survey.)

2) What is the highest level of education you have achieved?

1) Did not complete high school
2) High school diploma or equivalent
3) Some college (Completed at least one college course with a grade of C or above--excluding Professional Military Education.)
4) Associate degree
5) Bachelor degree
6) Some graduate work (You already have a batchelor degree and you have completed at least one graduate level course with a grade of B or above.)
7) Master degree
8) Doctoral degree
9) Other (Please specify at end of survey.)

3) How long have you been working as a technical order manager?
1) Less than 3 months
2) 3-9 months
3) More than 9 months but not more than a year
4) Between 1 and 2 years
5) 2 years or more

4) What is the total dollar value of the tech orders you manage?
1) Less than $25,000
2) $25,000 - $99,999
3) $100,000 - $249,999
4) $250,000 - $999,999
5) $1,000,000 - $4,999,999
6) $5,000,000 - $24,999,999
7) $25,000,000 or more
8) Don't know

5) Approximately how many technical orders do you manage?

1) 1-100 3) 501-1000 5) 2001-3000 7) More than 5000
2) 101-500 4) 1001-2000 6) 3001-5000 8) Don't know

6) In what capacity have you worked with tech orders prior to your present job (flight line, maintenance, in-shop, in the System Program Office, etc.)?

7) What kind of technical order acquisition manager-related training have you had?

1) SYS 230 AF Technical Order Acquisition and Management
2) SYS 100 Intro to Acquisition Management
3) SYS 225 Acquisition Logistics
4) SYS 028 Intro to Configuration Management
5) SYS 229 Test and Evaluation
6) AFALC 001 Deputy Program Manager for Logistics (DPML) Course

8) What type of experience did you have to qualify you for this job?

1) Preparation of Statements of Work
2) Negotiations
3) Guidance Conferences
4) In-Process Reviews
5) Hands-on experience using technical orders
6) Data-item-description Reviews
7) Other (Please elaborate at end of questionnaire.)

9) What kind of experience, prior to your coming on the job, would have better prepared you for the job you have now?

1) Preparation of Statements of Work
2) Negotiations
3) Guidance Conferences
4) In-Process Reviews
5) Hands-on experience using technical orders
6) Data-item-description Reviews
7) Other (Please elaborate at end of questionnaire.)

10) What kind of training would you still like to have in order to improve your present level of job performance?

1) SYS 100 Introduction to Acquisition Management
2) SYS 028 Introduction to Configuration Management
3) SYS 225 Acquisition Logistics
4) SYS 229 Test and Evaluation
5) AFALC 001 Deputy Program Manager for Logistics (DPML) Course
6) SYS 230 AF Technical Order acquisition and Management
7) Other (Please specify at the end of the questionnaire.)

11) What shortcomings have you witnessed in other technical order managers?

1) Lack of acquisition background
2) Lack of configuration background
3) Lack of negotiation experience
4) Lack of Data Item Description experience
5) Lack of knowledge of technical orders
6) Lack of In-Process Review experience
7) Lack of Statement of Work experience
8) Lack of Guidance Conference experience
9) Lack of tactfulness in dealing with people
10) Lact of cost evaluation experience
11) Other (Please elaborate at the end of questionnaire.)

12) What strong points have you witnessed in other tech order managers?

1) Acquisition background
2) Configuration background
3) Knowledge of negotiation techniques
4) Data Item Description experience
5) Knowledge of technical orders
6) In-Process Review experience
7) Statement of Work experience
8) Guidance Conference experience
9) Tactfulness in dealing with people
10) Cost evaluation experience
11) Other (Please elaborate at the end of the questionnaire.)

13) Please try to list and explain, if necessary, all of your duties associated with technical order management (such as negotiations, in-process-reviews, data item description review, etc.)

14) Why do you think you were you selected for this job?

15) Is there anything that you would like to add that might help improve the training of tech order managers? If so, please elaborate.

16) What do you think should be included in the criteria for selection of tech order managers? (Examples: field experience, Systems 230, negotiation experience, etc.)

END OF QUESTIONNAIRE

In the space provided below, please elaborate on any questions in which you selected "Other" for a response. Please write the question number and then state your elaboration.

Appendix B: Reminder Letter to ASD TOMA's

1 May 90

This is just a reminder for those of you who have received my questionnaire on tech order management issues but have not yet taken time to fill it out. It's not too late!

Some of you filled out a preliminary questionnaire for me. If you did, I still need you to fill out this one. The preliminary one was just to work out the bugs and make sure my questions were asking what I wanted them to ask.

If you have already filled out the questionnaire and returned it to me, please ignore this reminder and place this paper in your nearest recycling bin.

If you haven't received the questionnaire or have misplaced it, please give me a call at extension 58989 or 878-6706 and I'll be glad to forward a new one to you.

To date, about 50 percent of the questionnaires have been returned to me. Please take the time and opportunity to voice your opinion about the tech order management situation.

Thanks again for your help.

Nancy M. Deming, Captain, USAF
School of Systems and Logistics
Air Force Institute of Technology

Appendix C: Summary of Questionnaire Responses

ASD Tech Order Manager Questions [The numbers in parentheses to the right of the answers are the numbers of respondents (54 total) that selected the answer.]

1) What is your grade?

1) O-1/O-2 (2)
2) O-3 (2)
3) O-4 (1)
4) O-5 or above (0)
5) GS-7/8 (0)
6) GS-9/10 (0)
7) GS-11 (2)
8) GS-12 (10)
9) GS/GM-13 or above (3)
10) E-5 or below (3)
11) E-6 (12)
12) E-7 (14)
13) E-8 (3)
14) E-9 (2)
15) Other (Please specify at end of survey) (0)

2) What is the highest level of education you have achieved?

1) Did not complete high school (1)
2) High school diploma or equivalent (7)
3) Some college (Completed at least one college course with a grade of C or above--excluding Professional Military Education.) (20)
4) Associate degree (15)
5) Bachelor degree (5)
6) Some graduate work (You already have a bachelor's degree and you have completed at least one graduate level course with a grade of B or above.) (4)
7) Master degree (2)
8) Doctoral degree (0)
9) Other (Please specify at end of survey.) (0)

3) How long have you been working as a technical order manager?

1) Less than 3 months (1)
2) 3-9 months (4)
3) More than 9 months but not more than a year (4)
4) Between 1 and 2 years (11)
5) 2 years or more (34)

4) What is the total dollar value of the tech orders you manage?

1) Less than $25,000 (4)
2) $25,000 - $99,999 (0)
3) $100,000 - $249,999 (0)
4) $250,000 - $999,999 (4)
5) $1,000,000 - $4,999,999 (13)
6) $5,000,000 - $24,999,999 (6)
7) $25,000,000 or more (22)
8) Don't know (7)

5) Approximately how many technical orders do you manage?

1) 1-100 (20) 3) 501-1000(5) 5) 2001-3000(5) 7) More than 5000(0)
2) 101-500 (11) 4) 1001-2000(5) 6) 3001-5000(2) 8) Don't know(6)

6) In what capacity have you worked with tech orders prior to your present job (flight line, maintenance, in-shop, in the System Program Office, etc.)?

Flight Line (36)
In-Shop (32)
SPO (6)
Val/Ver (4)
Staff (3)
Misc (15)
Training (3)
None (5)

7) What kind of technical order acquisition manager-related training have you had?

1) SYS 230 AF Technical Order Acquisition and Management (45)
2) SYS 100 Intro to Acquisition Management (41)
3) SYS 225 Acquisition Logistics (7)
4) SYS 028 Intro to Configuration Management (7)
5) SYS 229 Test and Evaluation (0)
6) AFALC 001 Deputy Program Manager for Logistics (DPML) Course (19)
None/No Response (Not an answer/choice) (3)

8) What type of experience did you have to qualify you for this job?

1) Preparation of Statements of Work (22)
2) Negotiations (6)
3) Guidance Conferences (15)
4) In-Process Reviews (18)
5) Hands-on experience using technical orders (39)
6) Data-item-description Reviews (7)
7) Other (Please elaborate at end of questionnaire.) (15)
None/No Response (Not an answer/choice) (3)

9) What kind of experience, prior to your coming on the job, would have better prepared you for the job you have now?

1) Preparation of Statements of Work (22)
2) Negotiations (24)
3) Guidance Conferences (23)
4) In-Process Reviews (21)
5) Hands-on experience using technical orders (14)
6) Data-item-description Reviews (18)
7) Other (Please elaborate at end of questionnaire.) (18)

10) What kind of training would you still like to have in order to improve your present level of job performance?

1) SYS 100 Introduction to Acquisition Management (7)
2) SYS 028 Introduction to Configuration Management (24)
3) SYS 225 Acquisition Logistics (35)
4) SYS 229 Test and Evaluation (19)
5) AFALC 001 Deputy Program Manager for Logistics (DPML) Course (14)
6) SYS 230 AF Technical Order Acquisition and Management (11)
7) Other (Please specify at the end of the questionnaire.) (14)
No Response (4)

11) What shortcomings have you witnessed in other technical order managers?

1) Lack of acquisition background (39)
2) Lack of configuration background (21)
3) Lack of negotiation experience (33)
4) Lack of Data Item Description experience (28)
5) Lack of knowledge of technical orders (17)
6) Lack of In-Process Review experience (21)
7) Lack of Statement of Work experience (27)
8) Lack of Guidance Conference experience (21)
9) Lack of tactfulness in dealing with people (26)
10) Lack of cost evaluation experience (30)
11) Other (Please elaborate at the end of questionnaire.) (9)
No Response (2)

12) What strong points have you witnessed in other tech order managers?

1) Acquisition background (23)
2) Configuration background (15)
3) Knowledge of negotiation techniques (16)
4) Data Item Description experience (16)
5) Knowledge of technical orders (36)
6) In-Process Review experience (23)
7) Statement of Work experience (18)
8) Guidance Conference experience (20)
9) Tactfulness in dealing with people (32)
10) Cost evaluation experience (16)
11) Other (Please elaborate at the end of the questionnaire.) (5)

13) Please try to list and explain, if necessary, all of your duties associated with technical order management (such as negotiations, in-process-reviews, data item description review, etc.)

In-Process Reviews (35)
Guidance Conferences (24)
Statements of Work (22)
Validation/Verification (21)
Data Item Description (19)
Negotiation (19)
Cost Evaluation (10)
Pre/Post Publications Review (9)
No Response (7)

14) Why do you think you were you selected for this job?

Experience/Background (16)
Available/Volunteer (11)
Maintenance Background (8)
Staff Experience (4)
Permanent Change of Station (4)
Luck (4)
Previous Acquisition Jobs (3)

15) Is there anything that you would like to add that might help improve the training of tech order managers? If so, please elaborate.

16) What do you think should be included in the criteria for selection of tech order managers? (Examples: field experience, Systems 230, negotiation experience, etc.)

Field Experience (27)
Acquisition Experience (13)
Systems 230 (112)
Rank (10)
Negotiations Experience (6)
TOMA Training Beforehand (5)
Equipment Knowledge (4)

Appendix D: Contractor Telephone Interview Form

COMPANY_____

LOCATION_____

INDIVIDUAL_____

DATE_____ TIME_____

Contractor Questions

1) How do you select your TO managers?

2) Are there selection criteria? If so, what are they?

3) What type of background for a TO manager have you found to be most successful?

COMPANY_____

4) What type of training do you provide for your TO managers?

5) What experience or training do you feel is most essential to the success of a TO manager?

6) What are the weak points of your current selection and training methods? Strong points?

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Vita

Captain Nancy M. Deming [redacted]. She graduated from Edneyville High School in Edneyville, North Carolina in 1977 and attended Clemson University in Clemson, South Carolina, graduating with a Bachelor of Science in Chemical Engineering in May 1982. Upon graduation, she received a commission in the USAF and served her first tour of duty at Tinker AFB, Oklahoma. She served as the Deputy Chief, Operations Branch, Acquisition Division, Materiel Management Directorate, Oklahoma City Air Logistics Center. She also served as the Competition Advocate for the same organization. Later, she worked as a buyer in the Commodities Division in the Contracting and Manufacturing Directorate. In October 1986 she was transferred to Wright-Patterson AFB, Ohio where she was assigned to the B-1B System Program Office as a Depot Activation Manager. In January 1988 she was selected to be the Wing Executive Officer for the 2750th Air Base Wing. She served in this position until entering the School of Systems and Logistics, Air Force Institute of Technology, in May 1989.

[redacted]

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13. ABSTRACT (Maximum 200 words) This study reviewed the general problem of inadequate training and a lack of selection criteria for technical order (TO) managers within Aeronautical Systems Division (ASD). A questionnaire was administered to the ASD technical order managers in an attempt to determine what they thought were the primary areas, within the training and selection criteria arena, that needed improvement. Their opinions on how to best improve the present system were also solicited. Telephone interviews were also conducted with six defense contractors in an attempt to broaden the input on how best to improve the present ASD technical order manager training and selection process. Based on the questionnaire and telephone interview responses, recommendations were made for improving the present process. These recommendations included the establishment of: a minimum writing ability criteria (with a training option), prior experience guidelines (with a training option for hands-on experience), a career channel for TO managers to follow, improved continuity objectives, mandatory training classes, improved personal relations emphasis, regular review of training quotas, and an apprenticeship program.

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