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TAILORING THE TASKS OF LOGISTICS SUPPORT ANALYSIS (LSA)

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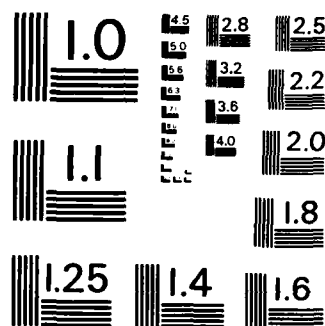
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THESIS

Robert A. Pierce, B.S., M.S.
Captain, USAF

AFIT/GLM/LSQ/85S-64

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DEPARTMENT OF THE AIR FORCE
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Wright-Patterson Air Force Base, Ohio

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TAILORING THE TASKS OF
LOGISTICS SUPPORT ANALYSIS (LSA)

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

Robert A. Pierce, B.S., M.S.

Captain, USAF

September 1985

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R. Allen Pierce

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Abstract

This thesis was an attempt to develop simple, usable guidance for tailoring the tasks of Logistics Support Analysis (LSA). Guidance was developed using the techniques of expert panel review and problem analysis. A trial case, based on a multiple phase nonmajor acquisition program, was constructed to test the validity of the guidance. Eight individuals directly responsible for tailoring LSA participated in the test and were interviewed immediately upon its completion.

Results from the test indicate that the guidance is valid if used for its intended purpose; to make the initial selection of subtasks for a proposed contract. Test participants indicated that the guidance made the job of tailoring LSA easier and that they would use it if it were available. A structural problem with the guidance caused a higher rate of irrelevant task selection than was anticipated. A simple solution to this problem is discussed. Further testing and refinement of the guidance, followed by programming on the Zenith 100 series computer, is recommended.

TAILORING THE TASKS OF LOGISTICS SUPPORT ANALYSIS (LSA)

I. Introduction

General Issue

Logistics support costs have been rising steadily over the past decade. It has been estimated that they comprise about two-thirds of the total life cycle costs of a system. Recent evidence indicates that operational costs often exceed acquisition costs before the system is seven years old (16:23). For this reason, and due to limited resources in today's environment, greater emphasis is being placed on addressing logistics considerations early in the acquisition cycle.

Integrated Logistics Support (ILS) is:

A disciplined approach to the activities necessary to: (a) cause support considerations to be integrated into system and equipment design, (b) develop support requirements that are consistently related to design and to each other, (c) acquire the required support; and (d) provide the required support during the operational phase at minimum cost [9:106].

The ILS approach contains 15 elements such as technical data, supply support, reliability and maintainability, logistics resource funds, and training and training support.

Logistics Support Analysis (LSA) is an analytical technique which integrates and coordinates the ILS elements into a total definition of a system's logistics support requirements. It has been said that logistics

considerations have not been adequately addressed in Department of Defense (DoD) acquisition programs (11). Therefore, the DoD has issued many directives, guides, standards, and specifications in an effort to develop supportable systems and cost-effective logistics support. A primary key to the achievement of this goal is the effective application of Logistics Support Analysis (LSA), which, as presently defined in MIL-STD-1388-1A, is:

The selective application of scientific and engineering efforts undertaken during the acquisition process, as part of the system engineering and design process, to assist in complying with supportability and other ILS objectives [9:106].

LSA is mandated by DoDD 5000.39, AFR 800-8, and AFLCR/AFSCR 800-36. These regulations also task the logistics manager to tailor the LSA to meet program requirements.

LSA shall be used throughout the acquisition cycle to assess and alter system design and to establish and update support element requirements. MIL-STD 1388-1A shall be tailored appropriately and applied in each acquisition program. LSA documentation shall be maintained to serve as the definitive source of data for ILS resource requirements determination [7:50].

LSA will be used to integrate support planning and design and consistency among ILS elements. LSA will start at Milestone 0 and be performed in increasing depth throughout the acquisition phases [4:21].

All Air Force managed acquisition and modification programs will apply LSA. The LSA tasks of MIL-STD-1388-1A will be tailored to meet program requirements [5:2].

Air Force Acquisition Logistics Center (AFALC) personnel have expressed a need for easy to read guidance on how to tailor the tasks for LSA (11).

Statement of the Problem

Guidance for tailoring LSA tasks is available, but the guidance has been more complex and confusing than the task descriptions. Furthermore, existing guidance is a generic "roadmap" and stimulus to potential LSA performance and alerts the DPML/ILSM to consider tailorable solutions, but doesn't provide a step-by-step "cookbook" procedure to implement the required tailoring (11). These circumstances have led many program offices to perform inadequate LSA that is neither timely nor cost-effective. Because task descriptions are extremely complex, program management needs a short, concise tailoring model that can be understood by the individual responsible for applying LSA to acquisition programs.

Explanation of LSA

LSA is an iterative, analytical process that is tailored to the unique requirements of each system/equipment and to the particular phase in the acquisition cycle in which the LSA is initiated. Tailoring of LSA consists of several sequential steps: (a) selection of tasks from MIL-STD-1388-1A, (b) evaluation of the tasks and possible rewording of the tasks, (c) selection of the data elements

for the data base, and (d) selection of the data items to be delivered and the schedule.

The immediate goals of LSA are to evaluate the effects of system design alternatives on life cycle cost and operational readiness, and to improve system supportability through coordinated design and support considerations. The long term goal of LSA is the identification and integration of the qualitative and quantitative logistics support requirements into the system design. When this is done properly, the system exhibits an optimum balance between operational capability, operational readiness, cost, and logistics support resources.

The LSA serves a dual purpose by providing both an LSA process and an LSA Record (LSAR). The LSA process is the methodology through which an end product of optimum supportability is provided. The LSAR is the documentation of data generated and processed during the LSA methodology. Data prepared and documented through the LSA process are of value only if it represents the coordinated efforts of all functional disciplines needed to plan and obtain optimum supportability. The LSA thus serves as the focal point for all data relating to the supportability of a system. All efforts for enhancing this supportability are channeled through the LSA.

LSA Process. The LSA process itself is a twofold function. First, it is an analysis technique for

generating, evaluating, and processing engineering data. Second, it is a management technique for coordinating and integrating the various technical efforts that produce Integrated Logistics Support (ILS) products. These two aspects of the LSA process are inseparable and lay the groundwork for achieving the desired level of cooperation between independent disciplines such as engineering, logistics, and configuration management. The LSA process is conducted through a cooperative interface with all applicable disciplines to help develop and select a cost-effective design and support approach.

LSA Record. The LSA Record (LSAR), as defined in MIL-STD-1388-1A, is a subset of the LSA documentation. The LSA documentation consists of all documented data collected or developed during the LSA process. Typically, the DoD requires the prime contractor(s) to perform the LSA and document the results in the LSAR. The data in the LSAR is under constant review and update by both the contractor and the government. When the system enters test and evaluation, actual measured data is used to update the data base and to validate its contents.

Relationship of ILS, LSA, and LSAR

The logistics manager works in a planning environment and must make decisions that determine the who, what, where, and how a system will be supported. These decisions are made using the ILS approach defined earlier. Program

documentation such as Statement of Operational Need (SON), Program Management Directive (PMD), Program Action Directive (PAD), and acquisition plan assist the logistics manager in determining what acquisition phase(s) the proposed contract includes and which ILS elements are applicable. A key to determining the applicable ILS elements is the logistics manager's relationship with the rest of the management team, the user, and the supporter (AFLC). If the relationship is close, these individuals can make a valuable contribution to helping the logistics manager determine which ILS elements apply and to what extent.

Once the acquisition phase(s) and applicable ILS elements have been determined, the tailoring of the LSA tasks begins. The tailored LSA tasks identify analyses which generate data that is documented in the LSAR. The LSAR, which must also be tailored, is used to generate data deliverables. Data deliverables consist of the information contractually specified for delivery to the government. The contractor data requirements list (CDRL) is the section of the contract that specifies the data deliverables. The logistics manager selects and places on the CDRL data item descriptions (DIDs) to obtain the information necessary to make supportability decisions.

The above process is cyclical: ILS elements, program documentation, and relationships with user and supporter determine what decisions must be made. This leads to the

tailoring of the LSA tasks which identify required analyses that generate data which is documented in the LSAR. The LSAR is used to generate the data deliverables which satisfy the DID requirements of the CDRL. These data deliverables are then used by the logistics manager to help make decisions.

Since the process is cyclical, the logistics manager should be able to go either way through the process in order to tailor the LSA tasks. He should be able to go from ILS elements and program documentation directly to tailoring the LSA tasks or, knowing the information required to make decisions, he should be able to go from the ILS elements and program documentation to DID requirements, followed by LSAR tailoring, and finally LSA task tailoring.

Research Objective

Develop simple, usable guidance for tailoring LSA tasks.

Research Questions

1. What DoD guidance for tailoring LSA tasks is already available?
2. How can existing tailoring guidance serve as a basis for developing more useable guidance?
3. What knowledge and skills will be required to use the proposed guidance?
4. How can the guidance be incorporated into a decision support system?

II. Literature Review

Background

In response to ever rising operations and maintenance costs, the Department of Defense (DoD) initiated Integrated Logistics Support (ILS) in 1964. ILS is:

...a composite of the elements necessary to assume the effective and economical support of a system or equipment at all levels of maintenance for its programmed life cycle [17:356].

Maintenance Engineering Analysis (MEA) was introduced in 1969 to provide a means to identify and integrate ILS requirements as part of the design process. MEA was the forerunner of LSA. The Maintenance Engineering Analysis Record (MEAR) was a manually generated and maintained system used to store data developed through the MEA process.

LSA was established by MIL-STD 1388-1 and 2 dated 15 Oct 1973. MIL-STD 1388-1 defines the tasks and elements for LSA, while MIL-STD 1388-2 defines the requirements for LSAR. The current MIL-STD 1388-1A (10) is the result of an entire rewrite for tailorability of the original MIL-STD 1388-1.

Recent Developments

Since LSA was initiated within the DoD and is relatively new, it comes as no surprise that there is a dearth of substantive information in the literature. This problem was also encountered by Knox and Thede in their research of the subject (13:17). The vast majority of

articles about LSA are very topical in nature and describe what LSA is (15;16;18;23), what it is used for (15;16;18;24), new developments in computerized LSAR (20;21), and benefits derived from its use (20;21).

Forzono and Mitchell worked out a data item "cookbook" for logistics managers. Sixty logistics data items were ranked into high, moderate or low value (10). Unfortunately, the data items were not associated with program phases nor with the LSA process.

Hull and Lockhart studied barriers to implementing ILS in Aeronautical Systems Division (ASD). After they grouped barriers into eight categories, they surveyed both logistics and systems personnel within ASD. Both systems and logistics personnel ranked one barrier as having a large impact:

Logistics Skills: Failure to employ appropriately skilled logisticians during the different phases of the acquisition cycle. Due possibly to a lack of skilled or trained logistics specialists, or to misassignment of available specialists [12:70].

The difficulty of tailoring the tasks for LSA may stem from this lack of properly trained logistics specialists. Due to the high turnover of military personnel in a program office, this seems plausible. In many of the smaller program offices, there is also a high turnover of civilian personnel. Since one person usually must tailor several programs, the problem of unskilled personnel may be compounded.

Knox and Thede surveyed 50 personnel involved directly in the implementation of LSA in system program offices within ASD. Only those programs that had LSA on contract were surveyed. More than half the respondents thought the current LSA process was ineffective (13:41). Several respondents reflected dissatisfaction with the usability and integration of the LSA. Other complaints included: "Should not apply to less-than-major programs" (13:44) and "Directed towards major weapons systems - requires extensive tailoring for less-than-major programs" (13:44). In spite of these comments, 21 of 22 respondents stated that they had tailored tasks/subtasks as recommended in the military standard.

In suggesting improvements to the LSA process, respondents proposed that "(1) more specific instructions (or some type of education/training) be provided describing how to tailor LSA, and (2) LSA not be applied for less-than-major programs" (13:75). Knox and Thede state "tailoring was not a problem because 22 of the 28 programs denoted tailoring of LSA in the Statement of Work" (13:78). This conclusion is questionable since the researchers made no effort to determine if the tailoring was effective. Blanchard warns of this danger in his textbook:

Tailoring refers to the application of the proper level of analysis [sic] for the problem. Too much analysis or too little analysis can be costly [2:138].

In 1981, the Air Force contracted Westinghouse Electric Corporation to prepare an LSA management and application

handbook. The handbook was never adopted for a number of reasons, including the fact that a new military standard with revised tasks was about to be published. The complexity of LSA tasks is evidenced by Appendix A of the handbook which lists tasks, task text, flow diagrams, and task charts of MIL-STD 1388A. The appendix is 548 pages in length (19).

A more recent attempt at a usable document was made by Lawson (14). She describes tasks that are "normally" performed in each phase of the acquisition. Flow charts are also provided to assist in preparing LSA milestones. Unfortunately, Lawson's work is based on the obsolete MIL-STD 1388A, and some of the subtasks are not addressed.

Woodland attempted to determine if LSA process effectiveness could be measured. This 1984 thesis surveyed LSA managers and concluded that the majority of them felt that the LSA process can be measured in qualitative or quantitative terms (22:28). Another objective was to determine what level of effectiveness each program manager associated with his particular program. Woodland concluded that the "vast majority of LSA programs are measuring up to expected levels of performance" (22:31). The research then attempted to identify factors that may aid in measuring levels of LSA effectiveness. The results showed that scheduling and data are the primary concern of LSA managers regarding measurement of process effectiveness (22:36-38).

Based upon completion of formal LSA training, reported effectiveness of the training, reported previous LSA experience, reported familiarity with LSA government documents, and self-reported level of qualification, a weighted index was devised to determine if the LSA managers were qualified to make judgement about the LSA process. According to the index developed, at least 72% of the respondents were qualified for assessing the characteristics of the LSA process (22:46).

The last portion of Woodland's research attempted to determine if individual program requirements had been effectively tailored and levied against the appropriate contractors. Of those responding, 96% reported that the original LSA requirements levied on contract were sufficient to meet the needs of their particular programs. However, there was little if any correlation between original LSA requirements being correctly applied and levels of program effectiveness (22:49).

Woodland also observed that about half of the respondents reported that additional tailoring was required during the life cycle of the program (22:50). A final observation was that 88% of the respondents felt that LSA requirements had been appropriately levied against subcontractors and vendors (22:51). Woodland noted that although his research was limited in scope, a need for a formal program to recruit, educate, and train logistics

analysts to manage LSA development programs exists. He concluded that the Air Force should develop an education program that "was capable of producing efficient and cost effective LSA program managers" (22:53).

Davis and Edwards, in a 1984 thesis, interviewed 36 people currently performing LSA management. From these interviews, they were able to describe a "typical" LSA manager as:

... a GS-12, Logistics Management Specialist, civilian job series 346. The LSA Managers generally have at least a Bachelor's degree and have been to some AFIT continuing education courses that have some applicability to LSA management. The individuals have generally been working at their present jobs for a little over two years and have about two years eight months of relevant LSA experience. They believe they spend a little more than one-fourth of their time performing LSA management responsibilities [3:29].

Of the subjects interviewed by Davis and Edwards, 83.3 percent indicated that their job duties included providing LSA inputs to Statement of Work (SOW). Approximately 47 percent indicated that they tailor LSA requirements to the program and approximately 44 percent evaluate LSA proposals for source selection (3:31). The authors found that all interviewees felt that a new LSA manager could not perform any of 11 LSA job duties identified without some training (3:35). Furthermore, since not all duties are performed frequently by all LSA managers, the authors indicated a need for checklists for seldom performed duties:

... since training could not totally compensate for the tendency to forget when there are long periods between performances [3:35].

The interviewees identified 25 areas of knowledge and skill that were necessary or helpful in doing LSA management. Knowledge of Military Standard 1388-1A was second only to general skills as an indicated need (3:37). Davis and Edwards also found that, at the time of assignment to performing LSA management, only 8 of the 25 knowledge and skill areas were possessed by any LSA manager. Knowledge of Military Standard 1388-1A was not one of the eight. In fact, new LSA managers had no ability in this area (3:40).

Interviewees were asked to indicate what should be included in a course on LSA for new LSA managers. The primary concern of the new LSA manager is to learn "what the LSA process itself really is" (3:41). How to tailor LSA to the individual program was listed by 72.2 percent of the subjects as a necessary topic for an LSA course. This percentage was exceeded only by use of LSAR/output summaries and LSA overview, both of which were deemed necessary by 77.8 percent of the interviewees (3:42).

Davis and Edwards concluded that a lack of an adequate training program on LSA tends "to reduce the effectiveness of LSA as an analysis technique to improve the logistics support of a system" (3:46). They recommended that a course on LSA be developed to "teach new LSA managers the basic concepts of and procedures for LSA management" (3:49).

Another recommendation was to "develop standardized check-lists for LSA managers that they could use for different job duties" (3:50) that are performed infrequently.

The Headquarters, US Army Materiel Development and Readiness Command (HQ DARCOM) published simplified guidance to assist in the application of LSA (6). This March 1984 chart shows the task sections, their purpose, the tasks and subtasks, applicability by acquisition cycle phase, LSAR interface, task relationships, and the applicable data item descriptions (DIDs). The chart is especially useful for relating the tasks/subtasks to the phases of the acquisition cycle. For an experienced logistician who understands LSA, it provides an excellent overall view of the process.

Relationship of Literature to Research

The literature has indicated that personnel responsible for applying LSA feel that it is ineffective and not very usable (3;13). It also indicated that individuals appointed to perform the duties of LSA manager, generally did not have the appropriate background experience or education to provide a solid base from which to build LSA experience. Furthermore, these individuals probably will not receive adequate training while they are responsible for LSA management (3). Another contributing factor to ineffective management may be all the changes that the LSA direction has undergone during its brief history.

From the literature, the need for simple, easy to use guidance for tailoring LSA input tasks, was clearly demonstrated. The literature also provided guidelines as to the knowledge and skills of the personnel who will use the proposed guidance. With these ideas in mind, the researcher focused on a methodology to reach the stated objective.

III. Methodology

Research Strategy

In order to accomplish the objective of this research, the methodology of problem analysis and expert review was applied. This method involves breaking an extremely complex problem into a set of less complex problems which can be individually solved. The solutions to these less complex problems are then integrated into a solution for the original problem. At each step of the process, a panel of experts evaluate the solutions against specified criteria. The final solution is then tested for reliability and validity.

The primary objective of the research was to answer the following research questions and develop simple, usable guidance for tailoring LSA tasks:

1. What DoD guidance for tailoring LSA tasks is already available?
2. How can existing tailoring guidance serve as a basis for developing usable guidance?
3. What knowledge and skills will be required to use the proposed guidance?
4. How can the guidance be incorporated into a decision support system?

The review of literature provided the information as to what guidance is available, what knowledge and skills are

required to adequately perform LSA, and what knowledge and skills the typical individual performing LSA management has. A "typical" LSA manager is a GS-12, Logistics Management Specialist, civilian job series 346. The individual has about two years eight months of relevant LSA experience and spends about one-fourth of his time performing LSA management responsibilities (3:29).

Knowledge of Military Standard 1388-1A was one of 25 knowledge and skill areas considered important for LSA management (3:37). It was one of the areas that LSA managers said they possessed no knowledge of when assigned LSA management duties (3:40). Almost three-fourths of LSA managers interviewed indicated that, if an LSA course were taught, it should include information on how to tailor LSA to the individual program (3:42). The literature review also indicated that existing guidance is not simple enough to be of use to the typical individual responsible for tailoring LSA input tasks (3;11;12;14;19).

Guiding Statements: Investigative Objectives

In order to focus on the primary objective of the research, five investigative objectives were developed:

1. Develop a method to approach the five general categories of tasks, the 15 tasks, and the 77 subtasks.
2. Establish the expert review panel, consisting of experienced personnel in the area of LSA, and develop the criteria for reviewing the guidance developed.

3. In coordination with the expert review panel, develop a trial case, including test procedures and evaluation criteria, for informal testing of the guidance.

4. Conduct and analyze informal test of the guidance using the trial case.

5. Update procedures and reexamine the new step(s). These investigative objectives guided the researcher in developing the specific steps necessary to accomplish the methodology.

Required Steps

The problem analysis and expert review process required the following steps:

1. Identify potential experts for a review panel.

2. Select three experts to act as the expert review panel. Three experts were chosen because the population of experts was small and the selection of an odd number precluded tie votes in cases of disagreement. In order for the expert review process to be effective, the researcher must develop a close working relationship with the experts. Additionally, the number of experts was set at three because that number allowed the researcher to develop the required relationship and still receive a reasonable range of opinion. The close proximity of the experts aided the researcher in obtaining feedback quickly.

3. Establish duties of experts and criteria for evaluating the guidance, trial case, and test. Lists of duties and criteria were developed by the researcher and presented to the panel. An interchange between the researcher and the panel resulted in the final lists of duties and evaluation criteria (see appendices A and B).

4. Address each of the 15 tasks and their subtasks as 15 separate problems. Through problem analysis, it was determined that the complex tailoring problem could best be broken into 15 separate problems or cells. Since the decision process is cyclical (see page 6), the LSA task tailoring could be approached from the ILS elements or the LSAR. The researcher chose to approach the tailoring from the ILS side since it is more straight forward and direct.

5. Develop binary language questions and a method for tracking the logic flow for each of the 15 cells. A U.S. Army LSA application guidance chart was used to ensure continuity within each cell and between cells (6). The Army chart served as an aid in creating the flow of the guidance and allowed the guidance to be related to the phases of the acquisition cycle. Binary language questions can only have two answers, yes or no. They were chosen so that the guidance could be readily transferred to software for Air Force standard personal computers (Zenith 100 series).

There are two ways to approach the list of LSA tasks. One can begin building a list of applicable tasks as one progresses through the tailoring process or one can begin with the complete task list and eliminate tasks as one progresses through the tailoring process. When the tailoring is completed, the tasks remaining are considered appropriate. The researcher chose the latter method since it appeared more comprehensive and amenable to the binary language question approach.

6. Review by expert panel of each question and question cell to ensure compliance with established criteria. As each question cell was completed, it was reviewed by the expert panel for compliance with the criteria. If unsatisfactory, questions were rewritten and resubmitted to the panel. This process continued until each cell met the criteria.

7. Review by expert panel of final product (see Appendix C). The final product was reviewed by the panel to ensure continuity between cells and overall flow. Discontinuity between cells and illogical or interrupted flow were corrected at this time.

8. Develop trial case for informal testing. A research and development program that had tailored LSA applied to it was selected. Since the researcher had been assigned as an Integrated Logistics Support Manager (ILSM) for over four and one half years, a small program that he

had worked on was used as the basis for the trial case. This allowed the researcher to construct the case in a realistic manner and to answer questions about the case that were asked by the expert panel. The case was a synopsis of actual program documentation with unnecessary, redundant, and conflicting information removed (see Appendix D).

9. Develop an evaluation standard. Each expert used the developed guidance to tailor the LSA tasks to the trial case. Their individual results were then compared. When a discrepancy occurred, the panel determined if it was due to the guidance or other factors. If the discrepancy was due to the guidance, the appropriate portion of the guidance was rewritten and reviewed by the experts. This process continued until all discrepancies were resolved and an evaluation standard had been established.

10. Conduct informal test of trial case. Hull and Lockhart identified the lack of skilled or trained logistics specialists (12:70) and Davis and Edwards identified what knowledge and skills the typical individual performing LSA has at the time of assignment to these duties. Davis and Edwards also identified what knowledge and skills are required to perform LSA adequately (3:29-40).

Eight typical LSA managers were chosen using the nonprobability sampling technique of purposive judgement. Davis and Edwards typical individuals were not found in sufficient quantities to be used. Individuals selected had

worked with LSA for a minimum of three weeks and a maximum of three years. It was believed that these individuals could contribute the most information since they had enough experience to be able to compare the guidance with existing guidance and, conversely, they would not be able to follow the guidance if it was too complicated. After completing the test, each subject was interviewed (see Appendix E). Eight individuals were selected because of the small population that met the requirements, and the need for the researcher to work personally with each subject. It was felt that eight was a large enough number to obtain the desired information.

11. Test for validity. The results from the trial case were compared to standard results developed earlier. The interview results were compared to the test criteria. They were also studied to determine if there were any trends in the results.

Assumptions and Limitations

Certain assumptions and limitations apply to this research and are recognized as follows:

1. Assumptions

- a. Experts selected had the ability to evaluate the guidance and data objectively.
- b. Interviewees were willing to give accurate answers and were willing participants in the test.

2. Limitations

- a. The number of experts, trial cases, and test subjects was limited by the small population.
- b. Due to the small sample size, statistical tests were not warranted and therefore were not conducted.

IV. Results and Discussion

Introduction

The results and discussion of the interviews will be handled first. The researcher will present and discuss each question separately and note any trends observed. This will be followed by a presentation of the trial case results and a discussion of the guidance. Finally, a statement of opinion, by the expert panel, concerning the validity of the guidance will be discussed. It should be noted that the results of the trial case test raised several questions and the researcher had further numerous discussions with both the expert panel and the trial case participants.

Interview Results and Discussion

The interview guide is Appendix E. Eight individuals participated in the trial case test and were interviewed. Four of the participants said that the format of the guidance was somewhat easier to follow than existing guidance. Three said it was about the same and one said that it was somewhat harder to follow. Although 87.5 percent indicated that the guidance was somewhat easier or as easy to follow as existing guidance, the objective was to develop guidance which was significantly easier to follow. As a result of the test program, a structural problem with the guidance was discovered. This problem and the proposed solution will be discussed later in this chapter.

Five of the participants indicated that the guidance was somewhat more understandable than the existing guidance. Two indicated that it was about the same and one indicated that it was somewhat harder. Most of the participants (87.5 percent) found the guidance at least as easy to understand as existing guidance. As mentioned earlier in this paper (see page 3), LSA tasks are complex and involve a full understanding of a unique vocabulary. The researcher believes that the difficulty in understanding is due to the structural problem of the guidance and the lack of LSA training on the part of the participants. Evidence to support this will be presented later in this chapter.

Four of the participants stated that the job of tailoring LSA was made somewhat easier by the guidance. Three reported that tailoring was about the same degree of difficulty and one declared that it was much more difficult. Some of the difficulty may be due to the structural problem mentioned earlier.

Another observed problem was that some participants were going beyond what the guidance is intended to do. The guidance, as currently constructed, is limited to selecting subtasks that apply to a program. It does not determine who (government, contractor, or subcontractor) will perform the subtasks nor does it evaluate and reword the subtasks to narrow their individual scope. This is clearly stated in the beginning of the guidance (see Appendix C). However, at

least two individuals indicated in follow up interviews that they had been thinking in terms of what subtasks that they would have the contractor perform. When the final question had them review the list of selected tasks, they began to line out additional tasks based on judgement and experience.

Seven out of eight participants (87.5 percent) stated that they would use the guidance to help tailor LSA if it were available. This appears to indicate that the guidance is usable. Several useful suggestions for improvement were made by the test group. Some minor changes were made and are included in the guidance in Appendix C. Three participants had problems with the wording of question number 59. The author agrees that the question needs to be rewritten. Other suggestions brought to light other problems that will be discussed later in this chapter.

Trial Case Results

The subtasks selected by the expert panel comprise the evaluation standard and are shown in Table I. The number and percentage of test individuals who selected each subtask are also shown.

Table I

Panel Versus Test Group Selections

<u>Panel Selections</u>	<u>Group Number</u>	<u>Percent</u>	<u>Panel Selections</u>	<u>Group Number</u>	<u>Percent</u>
102.2.2	7	87.5	302.2.4	4	50.0
103.2.2	8	100.0	302.2.5	7	87.5
103.2.3	7	87.5	303.2.1	6	75.0
201.2.3	2	25.0	303.2.2	6	75.0
202.2.4	6	75.0	303.2.3	6	75.0
203.2.2	3	37.5	303.2.4	6	75.0
203.2.5	6	75.0	303.2.5	3	37.5
203.2.8	3	37.5	303.2.6	5	62.5
204.2.1	4	50.0	303.2.9	2	25.0
204.2.2	6	75.0	401.2.1	4	50.0
204.2.3	4	50.0	401.2.2	4	50.0
301.2.1	5	62.5	401.2.5	6	75.0
301.2.2	5	62.5	401.2.8	2	25.0
301.2.3	7	87.5	401.2.9	5	62.5
301.2.4	5	62.5	401.2.11	6	75.0
301.2.5	6	75.0	501.2.1	4	50.0
302.2.2	4	50.0	501.2.2	3	37.5
302.2.3	6	75.0	501.2.3	5	62.5

Discussion of the Guidance

A general observation about the trial case test results is that the LSA process is not a precise science, but is subjective in nature and requires a high degree of judgement and interpretation. The expert panel members stated that they would be extremely surprised if any of the participants selected exactly the same subtasks that they did. This lack of precision may explain some of the variance observed in Table I.

The researcher decided that any subtask in Table I that was not selected by 50 percent or more of the test participants demanded further investigation. Interpretation of the trial case may partially explain the low number selecting subtasks 201.2.3, 303.2.5, 303.2.9, and 501.2.2. An illustration will suffice to demonstrate this point. Question 19 of the guidance asks if field visits to operational units and support activities are required to help identify and quantify the pertinent supportability factors. Most participants assumed that the item being developed was relatively simple and replacing a similar item in the field. They felt that pertinent supportability factors already had been identified and quantified. Therefore, subtask 201.2.3 would not be required. The expert panel did not make the above assumption. They felt that the contractor should make field visits to identify and quantify the pertinent supportability factors. Similar

illustrations can be made for the other tasks listed above.

Another problem is the lack of adequate training of the participants. Both Woodland (22) and Davis and Edwards (3) have shown that people responsible for managing LSA need more training. The researcher believes that this may be the reason tasks 203.2.2 and 401.2.8 were not selected. None of the participants had received specific LSA training. Some AFIT professional continuing education courses include an overview of LSA, but no specific detailed training is given. Several of the participants expressed a need for a "hands on" type course for LSA. They felt that exercises similar to the trial test case would be more helpful than the lecture type classes that they had attended. This lack of training may have also played a role in the interpretation of some of the subtasks.

The researcher was unable to determine why five participants did not select task 203.2.8. The factors discussed above may have played a role, but no clear reason could be discerned.

Table II shows subtasks selected by the test group but not by the expert panel. The number and percentage of individuals who selected each subtask are also shown.

The researcher decided that any additional subtasks selected by more than 50 percent of the test participants needed further investigation. A problem with the structure of the guidance contributed to, and probably caused, the

Table II

Additional Group Selected Subtasks

<u>Subtask Selections</u>	<u>Group Number</u>	<u>Percent</u>	<u>Subtask Selections</u>	<u>Group Number</u>	<u>Percent</u>
101.2.1	4	50.0	205.2.3	1	12.5
101.2.2	7	87.5	205.2.4	6	75.0
102.2.1	7	87.5	205.2.5	7	87.5
103.2.1	8	100.0	301.2.6	7	87.5
103.2.4	7	87.5	302.2.1	5	62.5
201.2.1	5	62.5	303.2.7	1	12.5
201.2.2	5	62.5	303.2.8	2	25.0
201.2.4	4	50.0	303.2.11	2	25.0
202.2.1	3	37.5	401.2.4	3	37.5
202.2.2	3	37.5	401.2.10	4	50.0
202.2.3	6	75.0	402.2.1	2	25.0
203.2.1	1	12.5	402.2.3	1	12.5
203.2.3	4	50.0	402.2.4	1	12.5
203.2.4	4	50.0	402.2.5	4	50.0
203.2.6	6	75.0	403.2	3	37.5
203.2.7	3	37.5	501.2.4	2	25.0
205.2.1	7	87.5	501.2.5	3	37.5
205.2.2	6	75.0			

inappropriate responses to subtasks 202.2.1, 201.2.2,
202.2.3, 203.2.6, 205.2.1, 205.2.2, 205.2.5, 301.2.6, and

302.2.1. The test participants recognized that there was a problem. Comments such as "This question didn't leave me an option," "I wanted to answer yes and eliminate the subtask but I had to answer no," and "You need a maybe answer" were expressed by five of the individuals. One of them proposed a solution that the expert panel and the researcher agree should be implemented as discussed below.

An example will serve to illustrate the problem. Question 49 of the guidance asks if viable alternative support concepts (including contractor logistic support in total, in part, or on an interim basis) for the new system alternatives have been developed and documented. In order to eliminate subtask 302.2.1, one must answer yes. In the trial case, the end item is classed as a throw away (condemned at organizational level). The only maintenance is visual inspections with the exception of line replacement on training units. Even this must be accomplished with common hand tools. Alternative support concepts have not been developed and documented because they are not required. If one answers no, the subtask is selected. Therefore, a "not applicable" answer needs to be added to several of the questions. When "not applicable" is selected, the appropriate subtask would be lined out.

An alternative approach would be to precede each of the task questions with a query as to whether the subject of the task is applicable to the program. If not, one would skip

to the next question. This approach would increase the length of the guidance dramatically. Therefore, the not applicable approach is preferred.

The expert panel identified the complexity of the trial case as another cause for selecting subtasks that should not apply. The case covered several phases of acquisition and the end item was both a throw away item and a maintained item depending upon its use as a support item or a training item.

Subtasks 103.2.4 and 301.2.6 involved interpretation problems as has already been discussed. Subtasks 101.2.2 and 102.2.1 involved primarily training although interpretation may have played a role. Apparently, participants did not realize that the purpose of going through the guidance was to select tasks and subtasks that would eventually determine the LSA strategy for the new system. Furthermore, this strategy would dictate the LSA plan. Interpretation may have played a role because one must judge how involved the LSA is for a particular program and whether or not a formal LSA plan is required. The expert panel did not think a formal plan was necessary for the trial case item.

The researcher could not explain why all participants selected task 103.2.1 (establish review procedures). The trial case stated that the government would provide the contractor with the procedures for conducting all reviews.

The expert panel nor the researcher could find a reason to consider establishing review procedures when they already exist.

It is interesting to note that only three of the participants selected subtask 403.2. This sub ask applies only to contracts with production. There was a logic error in the guidance which meant that a multiple phase program that did not include production would not eliminate the subtask. The trial case was this type of program. Most of the participants realized that the trial case did not include production and eliminated the subtask. The logic error has been corrected in the version of the guidance in Appendix C.

Table III shows, for each test case participant, the number and percentage of the standard subtasks selected. The participants are ranked by experience with the least experienced at the top and the most experienced at the bottom. It also shows the number of additional subtasks that were selected by each individual.

Some trends become apparent from Table III and the other results. The inexperienced participants scored a higher percentage agreement with the expert panel. However, they also picked several more additional tasks than the other individuals. Too much LSA is not cost effective and may be as damaging as too little LSA. If program managers perceive that LSA is too costly, they will be unwilling to

Table III

Participant Agreement with Panel Selections

<u>Participant</u>	<u>Additional Tasks Selected</u>	<u>Number Agree/Total</u>	<u>Percent</u>
1	26	30/36	83.3
2	27	31/36	86.1
3	15	21/36	58.3
4	13	24/36	66.7
5	24	26/36	72.2
6	14	25/36	69.4
7	15	15/36	41.7
8	4	5/36	13.9

use it. Follow up interviews indicated that if a participant did not understand a subtask, the tendency was to select it. This was true of most of the participants.

Many of the additional tasks selected were due to the structural "not applicable" problem discussed earlier. This problem would not have increased the percentage agreement. "Hands on" type training, as discussed earlier, probably would increase the percentage agreement and decrease the number of additional subtasks selected.

Statement of Validity

The following statement concerning the validity of the guidance was furnished by the expert panel.

The methodology presented by the researcher is valid with certain limitations. The methodology will not replace experience and training in the LSA process. However, with the addition of the "not applicable" option to the methodology, there is reason to believe the methodology could be a useful "tool" to tailor LSA to a program in an effective and efficient manner. While it does not present a "cookbook" solution to the LSA for a program, it will lead or prompt the applier of the LSA process to consider the entire LSA process as it applies to a specific program. This will be a valuable improvement to the application of LSA [11].

V. Conclusions and Recommendations

In this chapter, the researcher presents the conclusions drawn from the research effort, some recommendations to improve the guidance, and some recommendations for further research.

Conclusions From the Research

The major objective of this research was to develop simple, usable guidance for tailoring LSA tasks. To obtain the objective, Guidance was developed using the techniques of expert panel review and problem analysis. The guidance was tested using a trial case. The vast majority (87.5 percent) of the participants in the trial case test stated that they would use the guidance if it were available. The conclusion is that the guidance is valid if used for its intended purpose; to make the initial selection of subtasks for a proposed contract.

Indirectly, this research supports the recommendations of both Woodland (22) and Davis and Edwards (3). A "hands on" type of training program should be developed to train LSA managers. No matter how well the guidance works, the user must know what he/she is doing for it to be effective.

Recommendations to Improve the Guidance

The guidance should be refined to incorporate the "not applicable" response as discussed earlier. This should make

the guidance more effective by reducing the number of unnecessary subtasks selected.

Another refinement would be to incorporate the application by acquisition cycle phase portion of the US Army LSA guidance chart (6). This would reduce the confusion some participants had as to which subtasks normally apply to which phases of the acquisition cycle.

Question number 59 should be rewritten to be more understandable. In this vein, the guidance should be further tested. The researcher received excellent suggestions for improving the guidance from the trial case participants. As the guidance becomes more refined, the user comments will help to fine tune it so that it will become a more effective tool.

Recommendations for Further Research

In addition to more testing to refine the guidance, it should be expanded to include the next step of the LSA tailoring process; evaluation and rewording of tasks. This would make the guidance a much more powerful tool.

The guidance should be computerized. This would make it more useful because other information, such as definitions, could be included. It might even be possible to have the guidance evolve to where an LSA manager could input several parameters such as phase(s) of the acquisition cycle, maintenance concept, and supportability constraints, and receive an output listing the LSA tasks/subtasks

appropriate for the program.

A near term goal is to program the guidance on the standard Air Force Zenith 100 computer. This should be relatively easy to accomplish since that is what the researcher intended when the guidance was constructed. Once the program is written, it might be possible to interface it with the Computer Generated Acquisition Documents System (CGADS). CGADS is a prototype computer-based system designed to standardize and automate the generation of Air Force acquisition documents. Once the tasks were selected and reviewed, they could be entered into the CGADS system and included in the automated statement of work.

Appendix A: Expert Panel Duties

1. Provide the researcher with a biographical sketch of each expert on the panel.
2. Review each of the 15 cells and the final product in accordance with the evaluation criteria set forth in Appendix B.
3. Review the trial case and make recommendations for improvement.
4. Review the informal interview guide and make recommendations for improvement.
5. Provide the researcher a list containing names and phone numbers of individuals who may be used for the trial case study. These individuals should be responsible for tailoring LSA tasks as part of their job. They should have previously tailored LSA tasks for at least one program but no more than three programs. At least five of these individuals will participate in the trial case study.
6. Use the proposed guidance in Appendix C to tailor the LSA tasks for the trial case in Appendix D. The results of this effort shall be the panel standard for the trial case study.
7. Analyse results of the trial case study and informal interviews. Compare the case study results with the panel standard and provide the researcher with a statement of opinion as to the validity of the proposed guidance. Make recommendations for improving or using the proposed guidance.

Appendix B: Evaluation Criteria

1. Is the guidance clear?
2. Is the guidance concise?
3. Does the guidance flow in a logical manner?
4. Does the guidance address all tasks and subtasks?
5. Has each task/subtask been addressed adequately?
6. Are there any known situations not covered by the guidance?

7. Checklist

<u>TASK/SUBTASK</u>	<u>ADEQUATELY</u>	<u>ADDRESSED?</u>	<u>COMMENTS (IF NO)</u>
101 Development of early LSA strategy			
101.2.1	yes	no	
101.2.2	yes	no	
102 LSA plan			
102.2.1	yes	no	
102.2.2	yes	no	
103 Program and design reviews			
103.2.1	yes	no	
103.2.2	yes	no	
103.2.3	yes	no	
103.2.4	yes	no	
201 Use study			
201.2.1	yes	no	
201.2.2	yes	no	
201.2.3	yes	no	
201.2.4	yes	no	
202 Mission hardware, software, and support system standardization			
202.2.1	yes	no	
202.2.2	yes	no	
202.2.3	yes	no	
202.2.4	yes	no	
203 Comparative analysis			
203.2.1	yes	no	
203.2.2	yes	no	

Checklist (continued)

<u>TASK/SUBTASK</u>	<u>ADEQUATELY</u>	<u>ADDRESSED?</u>	<u>COMMENTS</u> <u>(IF</u> <u>NO)</u>
203.2.3	yes	no	
203.2.4	yes	no	
203.2.5	yes	no	
203.2.6	yes	no	
203.2.7	yes	no	
203.2.8	yes	no	
204 Technological opportunities			
204.2.1	yes	no	
204.2.2	yes	no	
204.2.3	yes	no	
205 Supportability and supportability related design factors			
205.2.1	yes	no	
205.2.2	yes	no	
205.2.3	yes	no	
205.2.4	yes	no	
205.2.5	yes	no	
301 Functional requirements identification			
301.2.1	yes	no	
301.2.2	yes	no	
301.2.3	yes	no	
301.2.4	yes	no	
301.2.5	yes	no	
301.2.6	yes	no	

Checklist (continued)

<u>TASK/SUBTASK</u>	<u>ADEQUATELY</u>	<u>ADDRESSED?</u>	<u>COMMENTS</u>	<u>(IF</u>	<u>NO)</u>
302 Support system alternatives					
302.2.1	yes	no			
302.2.2	yes	no			
302.2.3	yes	no			
302.2.4	yes	no			
302.2.5	yes	no			
303 Evaluation of alternatives and tradeoff analysis					
303.2.1	yes	no			
303.2.2	yes	no			
303.2.3	yes	no			
303.2.4	yes	no			
303.2.5	yes	no			
303.2.6	yes	no			
303.2.7	yes	no			
303.2.8	yes	no			
303.2.9	yes	no			
303.2.10	yes	no			
303.2.11	yes	no			
303.2.12	yes	no			
401 Task analysis					
401.2.1	yes	no			
401.2.2	yes	no			
401.2.3	yes	no			
401.2.4	yes	no			

Checklist (continued)

<u>TASK/SUBTASK</u>	<u>ADEQUATELY</u>	<u>ADDRESSED?</u>	<u>COMMENTS (IF NO)</u>
401.2.5	yes	no	
401.2.6	yes	no	
401.2.7	yes	no	
401.2.8	yes	no	
401.2.9	yes	no	
401.2.10	yes	no	
401.2.11	yes	no	
402 Early fielding analysis			
402.2.1	yes	no	
402.2.2	yes	no	
402.2.3	yes	no	
402.2.4	yes	no	
402.2.5	yes	no	
403 Post production support analysis			
403.2	yes	no	
501 Supportability test, evaluation, and verification			
501.2.1	yes	no	
501.2.2	yes	no	
501.2.3	yes	no	
501.2.4	yes	no	
501.2.5	yes	no	

Appendix C: LSA Guidance

Tailoring of LSA consists of several sequential steps: a) selection of tasks from MIL-STD-1388-1A, b) evaluation of the tasks and possible rewording of the tasks, c) selection of the data elements for the data base, and d) selection of the data items to be delivered and the schedule.

This guidance will help you in selecting the tasks from MIL-STD-1388-1A. It consists of a series of questions that require yes/no answers followed by instructions for task selection. Do not skip questions unless the instructions tell you to. You will need MIL-STD-1388-1A, a pencil, and a straight edge to complete the exercise.

The last three pages of the guidance are a listing of the LSA tasks/subtasks. Line out undesired tasks/subtasks as directed by the guidance. When you are instructed to line out a task, all subtasks under that task should be lined out. When the exercise is completed, the subtasks remaining on the list are the desired LSA tasking that should be evaluated in step b of the tailoring process described above.

Throughout the guidance, the term system refers to the system/equipment being developed. This guidance only helps to determine what LSA tasks should be accomplished. For each program, it must be determined if the Air Force, the contractor, or the subcontractor will accomplish the selected tasks. If the proposed contract covers more than one phase of the acquisition cycle, begin with question 6.

1. Does the proposed contract cover only the preconceptual phase (i.e. is it only a feasibility study)?

yes -- Line out all tasks on the list except tasks 101, 201, and 203. In addition, line out subtasks 101.2.2 and 203.2.7. Go to question 7.

no --- Go to the next question.

2. Does the proposed contract cover only the concept exploration phase?

yes -- Line out tasks 401, 402, 403, and subtasks 205.2.5, 501.2.2, 501.2.3, 501.2.4, and 501.2.5. Go to question 7.

no --- Go to the next question.

3. Does the proposed contract cover only the demonstration/validation phase?

yes -- Line out tasks 402, 403, and subtasks 501.2.4 and 501.2.5. Go to question 7.

no --- Go to the next question.

4. Does the proposed contract cover only the full-scale development phase?
yes -- Line out task 403 and subtasks 203.2.1, 203.2.3, 203.2.6, 205.2.1, 205.2.2, 205.2.4, 205.2.5, 302.2.1, 303.2.12, and 501.2.5. Go to question 8.
no --- Go to the next question.
5. Does the proposed contract cover only the production and deployment phases?
yes -- Line out tasks 101, 102, 201, 203, 204, 205 (except subtask 205.2.3), and subtasks 302.2.1, 302.2.2, 303.2.4, 303.2.5, 303.2.8, 303.2.12, and 501.2.1. Go to the next question.
no --- Go to the next question.
6. Is the system a commercial off-the-shelf item?
yes -- Go to question 12.
no --- If production and deployment phases only, go to question 12. All others go to the next question.
7. Has a proposed LSA strategy for the new system and proposed support analysis tasks and subtasks to be performed early in the acquisition program been determined?
Note: This information must be furnished to the contractor if he is tasked to develop an LSA plan.
yes -- Line out subtask 101.2.1. Go to the next question.
no --- If preconceptual phase only, go to question 16. All others go to the next question.
8. Has subtask 101.2.1 been accomplished?
yes -- Go to the next question.
no --- If full-scale development phase only, line out subtask 101.2.2. All go to the next question.
9. Does the proposed contract cover more than one phase of the acquisition cycle?
yes -- Go to the next question.
no --- If full-scale development phase only, line out subtask 101.2.2 if you have not already done so. All go to the next question.
10. Did you answer no to question 7?
yes -- Go to the next question.
no --- If full-scale development phase only, line out subtask 101.2.2 if you have not already done so. All go to the next question.

11. Has an LSA plan previously been developed by the contractor or the Air Force?
yes -- Line out subtask 102.2.1. Go to the next question.
no --- If concept exploration phase only, line out subtask 101.2.2. All go to the next question.
12. Are design reviews required?
Note: MIL-STD-1388-1A is not the primary implementation document. Other MIL-STD's or statement of work requirements must be included to define the total requirements.
yes -- Go to the next question.
no --- Line out subtask 103.2.2. Go to the next question.
13. Are program reviews required?
Note to question 12 applies.
yes -- Go to the next question.
no --- Line out subtask 103.2.3. Go to the next question.
14. Are LSA reviews required?
Note to question 12 applies.
yes -- Go to the next question.
no --- Line out subtask 103.2.4. Go to the next question.
15. Did you line out subtasks 103.2.2, 103.2.3, and 103.2.4 (questions 12 thru 14)?
yes -- Go to the next question.
no --- Go to question 17
16. Has the government established review procedures for the reviews in tasks 103.2.2, 103.2.3, and/or 103.2.4?
Note: If you answer yes, the procedures must be provided to the contractor.
yes -- Line out subtask 103.2.1. If production and deployment phases only, go to question 21. All others go to the next question.
no --- If production and deployment phases only, go to question 21. All others go to the next question.

17. Have pertinent supportability factors such as mobility requirements, deployment scenarios, mission frequency and duration, basing concepts, and anticipated service life been identified?

Note: Output required as input data for tasks 202, 203, and 301.

yes -- Line out subtask 201.2.1. Go to the next question.

no --- Go to question 18.

18. Have the pertinent supportability factors identified in question 17 been quantified?

Note to question 17 applies.

yes -- Line out subtask 201.2.2. Go to the next question.

no --- Go to the next question.

19. Are field visits to operational units and support activities required to help identify and quantify the pertinent supportability factors?

yes -- Go to the next question.

no --- Line out subtask 201.2.3. Go to the next question.

20. Did you answer no to questions 17 or 18?

yes -- If preconceptual phase only, go to question 25. All others go to the next question.

no --- Line out subtask 201.2.4. If preconceptual phase only, go to question 25. All others go to the next question.

21. Have quantitative supportability design constraints, based upon support standardization considerations, been determined?

Note: MIL-STD-1388-1A is not the primary implementation document. Other MIL-STD's or statement of work requirements must be included to define the total requirements.

Note: Output from task 201 or equivalent is required as input for this subtask.

Note: Output is required as input data for task 205.

yes -- Line out subtask 202.2.1. Go to the next question.

no --- Go to the next question.

22. Have supportability, cost, and readiness characteristics of standardization approaches been identified?

Notes to question 21 apply.

yes -- Line out subtask 202.2.2. Go to the next question.

no --- Go to the next question.

23. Have standardization approaches which have utility due to cost, readiness or supportability considerations been identified?

Notes to question 21 apply.

yes -- Line out subtask 202.2.3. Go to the next question.

no --- Go to the next question.

24. Have the risks associated with each design constraint (see question 21) been documented?

Notes to question 21 apply.

yes -- Line out subtask 202.2.4. If full-scale development phase only, go to question 26. If production and deployment phases only, go to question 39. All others go to the next question.

no --- If full-scale development phase only, go to question 26. If production and deployment phases only, go to question 39. All others go to the next question.

25. Have existing systems and subsystems useful for comparative analysis with new system alternatives been identified?

Note: Output from task 201 or equivalent is required as input to this subtask.

Note: Output is required as input data for tasks 204, 205, 301, and 501.

yes -- Line out subtask 203.2.1. Go to the next question.

no --- Go to the next question.

26. Has a baseline comparison system representing characteristics of the new system for (1) projecting supportability related parameters, making judgments concerning the feasibility of the new system supportability related parameters, and identifying targets for improvement, and (2) determining the supportability, cost, and readiness drivers of the new system been determined?

Notes to question 25 apply.

yes -- Line out subtask 203.2.2. If full-scale development only, go to question 28. All others go to the next question.

no --- If full-scale development only, go to question 28. All others go to the next question.

27. Have the operation and support costs, logistic support resource requirements, reliability and maintainability values, and readiness values of the comparative systems been identified?

Notes to question 25 apply.

yes -- Line out subtask 203.2.3. Go to the next question.

no --- Go to the next question.

28. Have qualitative supportability problems on comparative systems which should be prevented on the new system been identified?

Notes to question 25 apply.

yes -- Line out subtask 203.2.4. Go to the next question.

no --- Go to the next question.

29. Have supportability, cost, and readiness drivers for the new system based on comparative systems been determined?

Notes to question 25 apply.

yes -- Line out subtask 203.2.5. If full-scale development phase only, go to question 31. All others go to the next question.

no --- If full-scale development phase only, go to question 31. All others go to the next question.

30. Have unique supportability, cost, and readiness drivers for the new system (resulting from subsystems or equipment in the new system for which there are no comparable subsystems or equipment in comparative systems) been determined?

Notes to question 25 apply.

yes -- Line out subtask 203.2.6. If preconceptual phase only, go to question 32. All others go to the next question.

no --- If preconceptual phase only, go to question 32. All others go to the next question.

31. Are updates to comparative system descriptions and their associated parameters required?

Notes to question 25 apply.

yes -- Go to the next question.

no --- Line out subtask 203.2.7. Go to the next question.

32. Have the risks and assumptions associated with the use of the comparative systems and their associated parameters and drivers been documented?

Notes to question 25 apply.

yes -- Line out subtask 203.2.8. If preconceptual phase only, go to question 96. All others go to the next question.

no --- If preconceptual phase only, go to question 96. All others go to the next question.

33. Have design technology approaches to achieve supportability improvements on the new system over existing systems been established?

Note: Output from task 203 or equivalent is required as input to this subtask.

Note: Output is required as input data for task 205.

yes -- Line out subtask 204.2.1. Go to the next question.

no --- Go to the next question.

34. Are updates to the design objectives required as new system alternatives become better defined?

yes -- Go to the next question.

no --- Go to question 36.

35. As new system alternatives become better defined, has an update requirement to the design objectives been established?

Notes to question 33 apply.

yes -- Line out subtask 204.2.2. Go to the next question.

no --- Go to the next question.

36. Have additional funding requirements, risks associated with the established design objectives, development and evaluation approaches needed to verify the improvement potential and any cost or schedule impacts to implement the potential improvements been identified?

Notes to question 33 apply.

yes -- Line out subtask 204.2.3. If full-scale development phase only, go to question 39. All others go to the next question.

no --- If full-scale development phase only, go to question 39. All others go to the next question.

37. Have quantitative supportability characteristics resulting from alternative system design and operational concepts including efforts to eliminate design rights limitations been identified?

Note: Output from tasks 202, 203, 204, and 303 or equivalent is required as input to this subtask.

Note: Output is required as input data for tasks 301, 302, 303, 401, and 501.

yes -- Line out subtask 205.2.1. Go to the next question.

no --- Go to the next question.

38. Have supportability, cost, and readiness objectives for the new system been established and associated risks, as well as supportability risks associated with new technology identified?

Notes to question 37 apply.

yes -- Line out subtask 205.2.2. Go to the next question.

no --- Go to the next question.

39. Have supportability and supportability related design constraints of the new system for inclusion in specifications, other requirements documents, or contracts as appropriate been established?

Notes to question 37 apply.

yes -- Line out subtask 205.2.3. If full-scale development phase and/or production and deployment phases, go to question 42. All others go to the next question.

no --- If full-scale development phase and/or production and deployment phases, go to question 42. All others go to the next question.

40. Have any constraints that preclude adoption of a NATO system to satisfy the mission need been identified?

Notes to question 37 apply.

yes -- Line out subtask 205.2.4. Go to the next question.

no --- Go to the next question.

41. Have procedures been developed to update supportability, cost, and readiness objectives and to establish supportability, cost, and readiness goals and thresholds as new system alternatives become better defined?

Notes to question 37 apply.

yes -- Line out subtask 205.2.5. Go to the next question.

no --- Go to the next question.

42. Have the functional requirements for new system alternatives in both peacetime and wartime operational environments been identified and documented?

Note: Output from tasks 201, 203, and 205 or equivalent is required as input to this subtask.

Note: Output is required as input data for tasks 302 and 401.

Note: If in production and deployment phases, generally applicable to design changes only.

yes -- Line out subtask 301.2.1. Go to the next question.

no --- Go to the next question.

43. Have those functional requirements which are unique to the new system or which are supportability, cost, or readiness drivers been identified?

Notes to question 42 apply.

yes -- Line out subtask 301.2.2. Go to the next question.

no --- Go to the next question.

44. Have any risks involved in satisfying the functional requirements of the new system been identified?

Notes to question 42 apply.

yes -- Line out subtask 301.2.3. Go to the next question.

no --- Go to the next question.

45. Have the operations and maintenance tasks for the new system, based on the identified functional requirements, been identified?

Notes to question 42 apply.

yes -- Line out subtask 301.2.4. Go to the next question.

no --- Go to the next question.

46. Have design deficiencies requiring redesign as a result of the functional requirements and operations and maintenance task identification process been identified and alternatives analyzed?

Notes to question 42 apply.

yes -- Line out subtask 301.2.5. Go to the next question.

no --- Go to the next question.

47. Did you line out all subtasks 301.2.1 thru 301.2.5 (questions 42 thru 46)?
yes -- Go to the next question.
no --- If full-scale development phase or full-scale development phase and production and deployment phases, go to question 50. If production and deployment phases only, go to question 52. All others go to question 49.
48. Are updates for any tasks 301.2.1 - 301.2.5 required?
Note: Tasks may have already been accomplished but updates may be required.
yes -- If full-scale development phase or full-scale development phase and production and deployment phases, go to question 50. If production and deployment phases only, go to question 52. All others go to the next question.
no --- Line out subtask 301.2.6. If full-scale development phase or full-scale development phase and production and deployment phases, go to question 50. If production and deployment phases only, go to question 52. All others go to the next question.
49. Have viable alternative support concepts (including contractor logistic support in total, in part, or on an interim basis) for the new system alternatives been developed and documented?
Note: Output from tasks 205 and 301 or equivalent is required as input to this subtask.
Note: Output is required as input data for task 303.
yes -- Line out subtask 302.2.1. Go to the next question.
no --- Go to the next question.
50. Are procedures required for updating alternative support concepts as system tradeoffs are conducted and the new system alternatives become better defined?
Notes to question 49 apply.
yes -- Go to the next question.
no --- Line out subtask 302.2.2. Go to question 52.
51. Have the procedures in question 50 been established?
yes -- Line out subtask 302.2.2. Go to the next question.
no --- Go to the next question.

52. Have viable alternative support plans for the new system commensurate with the hardware, software, and operational scenario been developed and documented?

Notes to question 49 apply.

Note: If in production and deployment phases, generally applicable to design changes only.

yes -- Line out subtask 302.2.3. Go to the next question.

no --- Go to the next question.

53. Are procedures required to update alternative support plans as tradeoffs are conducted and the new system becomes better defined?

Notes to questions 49 and 52 apply.

yes -- Go to the next question.

no --- Line out subtask 302.2.4. Go to question 55.

54. Have the procedures in question 53 been established?

yes -- Line out subtask 302.2.4. Go to the next question.

no --- Go to the next question.

55. Have risks associated with each support system alternative formulated been identified?

Notes to questions 49 and 52 apply.

yes -- Line out subtask 302.2.5. Go to the next question.

no --- Go to the next question.

56. Have evaluations and tradeoffs between the support system alternatives identified for each system alternative (task 302 or equivalent) been conducted and have new or critical logistic support resource requirements been identified?

Note: Output from tasks 205 and 302 or equivalent is required as input for this subtask.

Note: Output is required as input data for tasks 205, 401, 402, and 501.

Note: If in production and deployment phases, generally applicable to design changes only.

yes -- Line out subtask 303.2.2. Go to the next question.

no --- Go to the next question.

57. Have evaluations and tradeoffs between design, operations, and support concepts under consideration been conducted?

Notes to question 56 apply.

yes -- Line out subtask 303.2.3. If production and deployment phases only, go to question 60. All others go to the next question.

no --- If production and deployment phases only, go to question 60. All others go to the next question.

58. Has the sensitivity of system readiness parameters to variations in key design and support parameters such as R&M, spares budget, resupply time, and manpower and personnel skill availability been evaluated?

Notes to question 56 apply.

yes -- Line out subtask 303.2.4. Go to the next question.

no --- Go to the next question.

59. Are estimates and evaluations of manpower and personnel implications of alternative system concepts in terms of total numbers of personnel required, job classifications, skill levels, and experience level required?

Notes to question 56 apply.

yes -- Line out subtask 303.2.5. Go to the next question.

no --- Go to the next question.

60. Have evaluations and tradeoffs between design, operations, training, and personnel job design to determine the optimum solution for attaining and maintaining the required proficiency of operating and support personnel been conducted?

Notes to question 56 apply.

yes -- Line out subtask 303.2.6. Go to the next question.

no --- Go to the next question.

61. Is the system and/or support alternatives complex enough to require repair level analyses (RLA)?

yes -- Go to the next question.

no --- Line out subtask 303.2.7. If production and deployment phases only, go to question 65. All others go to question 63.

62. Have repair level analyses (RLA) commensurate with the level of design, operation, and support data available been conducted?

Notes to question 56 apply.

yes -- Line out subtask 303.2.7. If production and deployment phases only, go to question 65. All others go to the next question.

no --- If production and deployment phases only, go to question 65. All others go to the next question.

63. Is diagnostic testing of the system required?

yes -- Go to the next question.

no --- Line out subtask 303.2.8. Go to question 65.

64. Have alternative diagnostic concepts to include varying degrees of built-in-test (BIT), off-line-test, manual testing, automatic testing, diagnostic connecting points for testing been evaluated and the optimum diagnostic concept for each system alternative under consideration determined?

Notes to question 56 apply.

yes -- Line out subtask 303.2.8. Go to the next question.

no --- Go to the next question.

65. Have comparisons between the supportability, cost, and readiness parameters of the new system and existing comparable systems been evaluated?

Notes to question 56 apply.

yes -- Line out subtask 303.2.9. Go to the next question.

no --- Go to the next question.

66. Are tradeoffs between system alternatives and energy requirements relevant?

yes -- Go to the next question.

no --- Line out subtask 303.2.10. Go to question 68.

67. Have evaluations and tradeoffs between system alternatives and energy requirements been conducted?

Notes to question 56 apply.

yes -- Line out subtask 303.2.10. Go to the next question.

no --- Go to the next question.

68. Are tradeoffs between system alternatives and survivability and battle damage repair characteristics in a combat environment relevant?

yes -- Go to the next question.

no --- Line out subtask 303.2.11. If production and deployment phases only, go to question 72. All others go to question 70.

69. Have evaluations and tradeoffs been conducted between system alternatives and survivability and battle damage repair characteristics in a combat environment?

Notes to question 56 apply.

yes -- Line out subtask 303.2.11. If production and deployment phases only, go to question 72. All others go to the next question.

no --- If production and deployment phases only, go to question 72. All others go to the next question.

70. Are tradeoffs between system alternatives and transportability requirements relevant?

yes -- Go to the next question.

no --- Line out subtask 303.2.12. Go to question 72.

71. Have evaluation and tradeoffs been conducted between system alternatives and transportability requirements, to include the limiting constraints, characteristics, and environments of each of the modes of transportation?

Notes to question 56 apply.

yes -- Line out subtask 303.2.12. Go to the next question.

no --- Go to the next question.

72. Did you line out all subtasks from 303.2.2 thru 303.2.12 (questions 56 thru 71)?

yes -- Line out subtask 303.2.1. If concept exploration phase only, go to question 91. All others go to question 74.

no --- If concept exploration phase only, go to question 91. All others go to the next question.

73. Have qualitative and quantitative criteria related to the supportability, cost, and readiness requirements for the system been identified for conducting the tradeoffs selected in questions 56 thru 71? Have analytical relationships or models between supportability, design, and operational parameters and those parameters identified for the criteria, been constructed for the tradeoffs selected in questions 56 thru 71?

Note: A no to either question requires a no answer below.

yes -- Line out subtask 303.2.1. If concept exploration phase only, go to question 91. All others go to the next question.

no --- If concept exploration phase only, go to question 91. All others go to the next question.

74. Is a detailed analysis of each operation and maintenance task identified for the new system required?
- Note: Output from tasks 205, 301, and 303 or equivalent is required as input for this subtask.
 - Note: Output is required as input data for task 402.
 - Note: If production and deployment phases, generally applicable to design changes only.
 - Note: Required for technical manuals, training programs, etc.
 - yes -- Go to the next question.
 - no --- Line out subtasks 401.2.1 and 401.2.2. Go to the next question.
75. Are there new or critical logistics support resources required to operate and maintain the new system?
- Notes to question 74 apply.
 - Note: See MIL-STD-1388-1A, pg. 41, para. 401.2.3 for definitions of new and critical resources.
 - yes -- Go to the next question.
 - no --- Line out subtask 401.2.3. Go to question 77.
76. Have the new or critical logistics support resources required to operate and maintain the new system been identifies?
- Notes to question 74 apply.
 - yes -- Line out subtask 401.2.3. Go to the next question.
 - no --- Go to the next question.
77. Are training requirements and recommendations concerning the best method of training (formal classroom, on-the-job, or both) and the rationale for the recommendations required?
- Notes to question 74 apply.
 - yes -- Go to the next question.
 - no --- Line out subtask 401.2.4. Go to the next question.

78. Are alternative design approaches where tasks fail to meet established supportability design goals or constraints for the new system desirable?

Notes to question 74 apply.

Note: A no answer means that you will not accept the system if it fails to meet overall goals or constraints or that you will change the overall goals or constraints to fit the system. A yes answer means that you want the contractor to analyse the total logistic support resource requirements for each task to determine which tasks fail and to propose alternative design approaches to bring task requirements within acceptable levels.

yes -- Go to the next question.

no --- Line out subtask 401.2.5. Go to the next question.

79. Did you answer yes to question 75?

yes -- Go to the next question.

no --- Line out subtask 401.2.6. Go to the next question.

80. Is sectionalization required for transportation of the new system?

Notes to question 74 apply.

yes -- Go to the next question.

no --- Line out subtask 401.2.7. Go to the next question.

81. Is initial provisioning required for any of the support resources of the new system?

Notes to question 74 apply.

yes -- Go to the next question.

no --- Line out subtask 401.2.8. Go to the next question.

82. Is validation of the key information documented in the LSAR through performance of operations and maintenance tasks on prototype equipment required?

Notes to question 74 apply.

yes -- Go to the next question.

no --- Line out subtask 401.2.9. Go to the next question.

83. Do you want output summaries and reports of the subtasks applied from questions 74 thru 82 to satisfy ILS documentation requirements?

yes -- Go to the next question.

no --- Line out subtask 401.2.10. Go to the next question.

84. Do you want the data in the LSAR updated as better information becomes available?
- yes -- If demonstration/validation phase only, go to question 91. All others go to the next question.
 - no --- Line out subtask 401.2.11. If demonstration/validation phase only, go to question 91. All others go to the next question.
85. Is it necessary to assess the impact of introducing the new system on existing systems (weapon, supply, maintenance, transportation)?
- Note: Output from tasks 303 and 401 or equivalent is required as input for this subtask.
 - Note: Output is required as input for task 403.
 - Note: If production and deployment phases, generally applicable to design changes only.
 - yes -- Go to the next question.
 - no --- Line out subtask 402.2.1. Go to the next question.
86. Will additional manpower and personnel skills be required for the new system?
- Notes to question 85 apply.
 - yes -- Go to the next question.
 - no --- Line out subtask 402.2.2. Go to the next question.
87. Is it required to assess the impact on system readiness from the failure to obtain required logistic support resources to operate and support the new system?
- Notes to question 85 apply.
 - yes -- Go to the next question.
 - no --- Line out subtask 402.2.3. Go to the next question.
88. Is it necessary to conduct survivability analyses to determine changes in logistic support resource requirements based on combat usage?
- Notes to question 85 apply.
 - Note: Applies to both weapon and support systems.
 - yes -- Go to the next question.
 - no --- Line out subtask 402.2.4. Go to the next question.

89. Did you line out all subtasks 402.2.1 thru 402.2.4 (questions 85 thru 88)?

- yes -- Line out subtask 402.2.5. If production and deployment phases are included in the proposed contract, go to the next question. All others line out subtask 403.2 and go to question 91.
- no --- If production and deployment phases are included in the proposed contract, go to the next question. All others line out subtask 403.2 and go to question 91.

90. Is a plan (and its associated cost) which identifies logistic support resource requirements for the system throughout its remaining life (along with the method to satisfy the requirements) necessary?

Note: Output from task 402 or equivalent is required as input for this subtask.

- yes -- Go to question 93.
- no --- Line out subtask 403.2. Go to question 93.

91. Should the contractor be required to provide a test and evaluation strategy for verification of supportability, identification of potential test program limitations, and the effect on the accuracy of the supportability assessment?

Note: Output from tasks 203, 205, and 303 or equivalent is required as input for this subtask.

- yes -- Go to the next question.
- no --- Line out subtask 501.2.1. Go to the next question.

92. Should the contractor be required to provide a test and evaluation plan for supportability to include test and evaluation objectives, criteria, procedures/methods, resources, and schedules?

Note to question 91 applies.

- yes -- If concept exploration phase only, go to question 96. All others go to the next question.
- no --- Line out subtask 501.2.2. If concept exploration phase only, go to question 96. All others go to the next question.

93. Should the contractor be required to develop corrections for supportability problems uncovered during test and evaluation and to update the support plan, logistic support resource requirements, LSAR data, and LSAR output reports?

Note to question 91 applies.

yes -- If demonstration/validation phase only, go to question 96. All others go to the next question.

no --- Line out subtask 501.2.3. If demonstration/validation phase only, go to question 96. All others go to the next question.

94. Should the contractor develop detailed plans to measure supportability factors on the new system in its operational environment?

Note to question 91 applies.

yes -- If full-scale development phase only, go to question 96. All others go to the next question.

no --- Line out subtask 501.2.4. If full-scale development only, go to question 96. All others go to the next question.

95. Should the contractor conduct a comparison of achieved supportability factors with projections, identify any deviations between projections and operational results, give reasons for the deviations, and recommend changes (design, support, or operational) to correct deficiencies or improve readiness?

Note to question 91 applies.

yes -- Go to the next question.

no --- Line out subtask 501.2.5. Go to the next question.

96. Look at your task/subtask list. Do you have all the required input tasks or equivalent data for the tasks/subtasks you have selected. Use the chart below to assist you. If in doubt, review the questions indicated.

TASK	TASK(S) REQUIRED AS INPUT	PERTINENT GUIDANCE QUESTIONS
102	101	7-10
202	201	17-20
203	201	17-20
204	203	25-32
205	202,203,204,303	17-36,56-73
301	201,203,205	17-20,25-32,37-41
302	205,301	37-41,42-48
303	205,302	37-41,49-55
401	205,301,303	37-41,42-48,56-73
402	303,401	56-73,74-84
403	402	85-89
501	203,205,303	25-32,37-41,56-73

You have now completed the task selection portion of the LSA tailoring process.

TASK/SUBTASK LIST

- 101 -- Development of an early LSA strategy
 - 101.2.1 -- LSA strategy
 - 101.2.2 -- Updates
- 102 -- LSA plan
 - 102.2.1 -- LSA plan
 - 102.2.2 -- Updates
- 103 -- Program and design reviews
 - 103.2.1 -- Establish review procedures
 - 103.2.2 -- Design reviews
 - 103.2.3 -- Program reviews
 - 103.2.4 -- LSA review
- 201 -- Use study
 - 201.2.1 -- Supportability factors
 - 201.2.2 -- Quantitative factors
 - 201.2.3 -- Field visits
 - 201.2.4 -- Use study report and updates
- 202 -- Mission hardware, software and support system standardization
 - 202.2.1 -- Supportability constraints
 - 202.2.2 -- Supportability characteristics
 - 202.2.3 -- Recommended approaches
 - 202.2.4 -- Risks
- 203 -- Comparative analysis
 - 203.2.1 -- Identify comparative systems
 - 203.2.2 -- Baseline comparison system
 - 203.2.3 -- Comparative system characteristics
 - 203.2.4 -- Qualitative supportability problems
 - 203.2.5 -- Supportability, cost, and readiness driver
 - 203.2.6 -- Unique system drivers
 - 203.2.7 -- Updates
 - 203.2.8 -- Risks and assumptions
- 204 -- Technological opportunities
 - 204.2.1 -- Recommended design objectives
 - 204.2.2 -- Updates
 - 204.2.3 -- Risks

- 205 -- Supportability and supportability related design factors
 - 205.2.1 -- Supportability characteristics
 - 205.2.2 -- Supportability objectives & associated risks
 - 205.2.3 -- Specification requirements
 - 205.2.4 -- NATO constraints
 - 205.2.5 -- Supportability goals and thresholds
- 301 -- Functional requirements identification
 - 301.2.1 -- Functional requirements
 - 301.2.2 -- Unique functional requirements
 - 301.2.3 -- Risks
 - 301.2.4 -- Operations and maintenance tasks
 - 301.2.5 -- Design alternatives
 - 301.2.6 -- Updates
- 302 -- Support system alternatives
 - 302.2.1 -- Alternative support concepts
 - 302.2.2 -- Support concept updates
 - 302.2.3 -- Alternative support plans
 - 302.2.4 -- Support plan updates
 - 302.2.5 -- Risks
- 303 -- Evaluation of alternatives and tradeoff analysis
 - 303.2.1 -- Tradeoff criteria
 - 303.2.2 -- Support system tradeoffs
 - 303.2.3 -- System tradeoffs
 - 303.2.4 -- Readiness sensitivities
 - 303.2.5 -- Manpower and personnel tradeoffs
 - 303.2.6 -- Training tradeoffs
 - 303.2.7 -- Repair level analyses
 - 303.2.8 -- Diagnostic tradeoffs
 - 303.2.9 -- Comparative evaluations
 - 303.2.10 -- Energy tradeoffs
 - 303.2.11 -- Survivability tradeoffs
 - 303.2.12 -- Transportability tradeoffs
- 401 -- Task analysis
 - 401.2.1 -- Task analysis
 - 401.2.2 -- Analysis documentation
 - 401.2.3 -- New/critical support resources
 - 401.2.4 -- Training requirements and recommendations
 - 401.2.5 -- Design improvements
 - 401.2.6 -- Management plans
 - 401.2.7 -- Transportability analysis
 - 401.2.8 -- Provisioning requirements
 - 401.2.9 -- Validation
 - 401.2.10 -- ILS output products
 - 401.2.11 -- LSAR updates

- 402 -- Early fielding analysis
 - 402.2.1 -- New system impact
 - 402.2.2 -- Sources of manpower and personnel skills
 - 402.2.3 -- Impact of resource shortfalls
 - 402.2.4 -- Combat resource requirements
 - 402.2.5 -- Plans for problem resolution
- 403 -- Post production support analysis
 - 403.2 -- Post production support plan
- 501 -- Supportability, test, evaluation, and verification
 - 501.2.1 -- Test and evaluation strategy
 - 501.2.2 -- Objectives and criteria
 - 501.2.3 -- Updates and corrective actions
 - 501.2.4 -- Supportability assessment plan (post deployment)
 - 501.2.5 -- Supportability assessment (post deployment)

Appendix D: Trial Case

1. You have been selected to participate in a trial case study involving the tailoring of LSA tasks for Air Force acquisition programs. The purpose of the trial case is to determine if the LSA guidance will help you tailor LSA tasks.
2. After reviewing the trial case documentation, follow the LSA guidance provided to tailor the LSA tasking. When completed, you should have a list of the LSA tasks/subtasks that should be applied to this trial case. Contact the researcher as instructed for a follow-up interview lasting approximately 10 minutes. Thank you very much for your cooperation.
3. The trial case is for a personnel lowering device (PLD) and consists of information obtained from system program office documentation.

Introduction/Objective. The current family of personnel lowering devices (PLD) was developed to satisfy a Southeast Asia operational requirement. The quick response development effort resulted in a family of dissimilar devices, all of which are bulky, uncomfortable, and cumbersome. Other problems are the inability of the PLD to interchange between all combat operationally ready aircraft. As a result of these problems, development of a small PLD, with emphasis placed on human factor engineering,

reliability and simplicity of use, is being initiated.

The objective of the program is to develop a PLD capable of lowering to the ground a downed aircrew member who has landed in trees during parachute (ejection) descent.

General Background. The current family of personnel lowering devices (PLD) is a result of a development effort conducted in 1966. A total of 18 proposals, including items then in use by three foreign governments were evaluated. All of the devices evaluated were of the friction brake type. None of the proposed designs included provisions for integration with the aircrew member's personal equipment. In 1969, Ling Tempco Voight (LTV), indicated they were unable to include a PLD in the A-7 aircraft. An installation was done at ASD locating the line in a container attached to the crewmember's leg at the rear of the calf. This installation has not been pursued except as a concept. At the same time, in 1969, consideration was being given to a PLD in the F-15 ejection seat. Contractors were investigating a possible installation in the seat cushion.

An in-house ASD development effort was started in 1972 and concluded with an IOT&E that ended in February 1980. Aircrew members cited that the overall bulk of the PLD restricted body movement and the increased weight on the front of the survival vest, when magnified by G-Forces, caused discomfort and fatigue. One-handed hookup operations

were also difficult. The IOT&E report concluded that the proposed PLD did not demonstrate any improvement in the operational effectiveness or operational suitability compared to the current family of PLDs. The development effort was placed in inactive status until this effort began.

System Description. The PLD shall consist of an adequate line, rope, cable or webbing and a mechanical contrivance (if required) which can be used by an aircrew person to lower himself/herself at least 75 feet from a tree or other high place. The PLD shall have a lowering capability of a minimum of 107 pounds, a maximum of 350 pounds, and the complete assembled PLD shall weigh 1.0 pound or less. The PLD shall be designed to fit in a survival vest/G-suit/flight coverall pocket or, preferably, in a location off the person. It shall have suitable adaptable components for quick attachment to the parachute harness that will not interfere with the wearing of the parachute in any way nor cause injury or undue discomfort to the wearer while being worn in all aircraft, being ejected from the aircraft, upon separation from the seat, at opening shock, or during landing. Hookups and all operations shall be designed for one hand operation by either hand. The rate of descent shall be a variable rate up to a maximum fixed safe rate and controllable by the user to enable intermittent stops during the descent. Safety devices and connecting parts shall be

such that a check for proper assembly can be readily accomplished. Additionally, the PLD will be compatible with all Air Force ejection seats and interchangeable between F-4, A-10, F-15 and F-16 aircraft, with retrofit to all ejection and non-ejection Air Force aircraft.

Acquisition Cycle Phases. This is a new effort and there are no existing contracts for PLD development. NATO systems have been tested and did not satisfy Air Force requirements. No other development effort is underway nor contemplated within NATO. The development effort will consist of two phases. Phase I (lasting approximately one year) will be an investigation by multiple contractors into a number of alternatives to determine the best possible location(s) and configuration for a new PLD. Prototype hardware will be available at the end of Phase I. Phase II (lasting approximately one and one-quarter years) will be a full-scale development with two or more of the most promising approaches. Phase II requires a preliminary design review (PDR) and a critical design review (CDR). LSA reviews will be conducted concurrently with program and design reviews. The government will provide the contractor with the procedures for conducting all reviews. Production is not included as a part of this contract. In summary, this contract includes the concept exploration, demonstration/validation, and full-scale development phases of the acquisition cycle.

Reliability and Maintainability (R&M) Interface. With a 350 pound load suspended, the descent control of the PLD will be actuated. The force required on the lowering control to initiate descent shall not exceed the strength capabilities of more than the 5th percentile female, as outlined in MIL-STD-1472C, paragraph 5.4.4, for one handed use (left hand). This test shall be repeated using a 107 pound weight.

The above tests shall also be successfully completed after the PLD has been submitted to stated conditions of low temperature, high temperature, salt, fog, humidity, vibration, shock, acceleration, sand and dust, drop, and rain. The PLD shall be mounted to simulate intended use and subjected to 25 complete (full extension) lowering cycles using a 200 pound load. After this test, the PLD shall again pass the tests of the previous paragraph. The PLD must also pass an ultimate load test and be demonstrated by a representative sample of the user population (5th percentile female through 95th percentile male) to determine compliance with the development specification.

Logistics R&M will be tested during IOT&E in accordance with the maintenance concept and technical data (see maintenance planning).

Maintenance Planning (MP). The maintenance concept is that for operations the PLD will be a one time use throw away item at the organizational level. Maintenance should be limited to visual inspection only. The 25 cycle reliability

requirement is for training purposes. A LCC study will determine if it is more cost-effective to throw away PLDs used for training after one use (as is currently done) or if they should be maintained for at least 25 cycles. If PLDs are to be maintained for 25 or more cycles, the line will have to be rewound. The line might also have to be replaced periodically. No special tools or support equipment will be required to perform these tasks and the maintenance manhours must be considered in the LCC study.

Support Equipment (SE). No new support equipment will be developed for this program. Any required maintenance must be accomplished using existing SE or common hand tools.

Supply Support (SS). LSA shall be performed on the PLD development program. The PLD will be brought into the inventory as an Economic Order Quantity (EOQ) item. No development of special provisioning documentation is required. SA-ALC will be responsible for budgeting and funding for initial and follow-on spares. ASD will budget and fund for initial production quantities.

Packaging, Handling, and Transportation (PHT). No special packaging, handling, or transportation will be required for this program. Contractors will mark or label bar codes according to MIL-STD-129 on all unit, intermediate and shipping containers for items having National Stock Numbers.

Technical Data. A development manual will be provided by the contractors for evaluation during IOT&E. The contractor

shall also provide test reports, acceptance test procedures, acceptance test report, development specification, product fabrication specification, DTC/LCC documents, integrated support plan, design study, trade study report, system safety reports, material deficiency notices, level I drawings at preliminary design review (PDR), and level II drawings at critical design review (CDR).

The Air Force may exercise an option to this contract whereby the contractor shall fabricate a final preproduction configuration of the PLD, incorporating any changes resulting from the DT&E/IOT&E programs, for use in a combined functional and physical configuration audit (FCA/PCA). Under this option, the contractor shall also provide a military specification, level III drawings, and the LSAR.

Facilities (FA). Existing facilities are adequate to support all requirements.

Manpower Requirements and Personnel (MRP). Existing personnel are adequate to support all requirements.

Training and Training Support (TTS). The PLD will utilize training similar to that required for existing PLDs. ATC will provide formal training to support the test program, if required.

Logistics Support Resource Funds (LSRF). The DPML/ILSM shall ensure that the proper amount of resource funds are planned and programmed to include monitoring the status of

resource funding, by support and participating commands, for the ILS elements for which they are responsible.

Logistics Support Management Information (LSMI). A primary source of information will be the output of the LSA. In addition, a work breakdown structure (WBS) will be developed for the PLD and the program will be tracked on both the Aeronautical Equipment Management Information System (AEMIS) and the Acquisition Logistics Management Information System (ALMIS).

Computer Resources Support (CRS). There are no computer resources support requirements for this program.

Energy Management (EM). The PLD has no impact on energy management.

Survivability. The PLD has no parts or processes that are survivability critical.

ILS Test and Evaluation (ILS T&E). The overall objective of the PLD test and evaluation program is to provide answers to the critical questions and areas of risk to support a production decision. This will be accomplished through the DT&E and IOT&E programs. A total of 30 units from each contractor will be available for DT&E and IOT&E testing. A minimum of six per contractor will be available to the Air Force for DT&E and a minimum of 15 per contractor will be available for IOT&E.

The objectives of DT&E will be to:

- a) identify deficiencies in the test articles and verify

conformance to the development specifications, b) identify how test articles meet reliability and maintainability specifications, c) determine if the PLD is safe and ready for IOT&E, d) provide data with which to assess operational hazards, e) provide data for the estimate of logistics support of the test article, f) provide data for aircrew training requirements, g) ensure design integrity through specific operational environmental ranges, h) ensure compatibility with user aircraft, and i) determine the functional adequacy and evaluate performance specification requirements.

The objectives of IOT&E will be to:

a) evaluate the operational effectiveness and suitability of the PLD, b) identify any operational effectiveness and suitability deficiencies, c) recommend and evaluate desirable changes in production configuration, and d) evaluate the adequacy of technical publications, maintenance procedures, and support equipment.

AFLC will provide required logistics support planning for the DT&E and IOT&E test efforts, provide inputs to the test plans, serve as a member of the test plan working group, and provide equipment modification procedures (TCTO) if required.

Appendix E: Interview Guide

I. Demographic

A. Biographical

1. Name (optional)
2. Rank or GS rating
3. Job title
4. AFSC or civilian equivalent
5. Office symbol

B. Educational Background

1. Degree(s)
2. Continuing education that applies to LSA

C. Experience

1. LSA experience
2. How long at present job

II. Response to Guidance

- A. The following three questions will be answered using a scale of 1 to 5 where 1 means much easier, 2 means somewhat easier, 3 means about the same, 4 means somewhat more difficult, and 5 means much more difficult.

1. Was the format of the guidance easy to follow?

1 2 3 4 5

2. Was the guidance understandable in comparison with existing guidance?

1 2 3 4 5

3. Did the guidance make the job of tailoring LSA tasks easier?

1 2 3 4 5

4. Would you use this guidance to tailor LSA if it were available to you?

yes no

a. If no, why not?

5. Do you have any suggestions for improving the guidance?

Appendix F: Biographical Sketches

James E. Harris

Mr. Harris is currently the Director of Logistics Support Analysis (LSA) for the Air Force Acquisition Logistics Center (AFALC). He is a graduate Aerospace Engineer with over 15 years experience with the Air Force Logistics Command. Mr. Harris has worked at Warner Robbins Air Logistics Center in the area of Aircraft Structural Integrity and at Oklahoma City Air Logistics Center in the areas of fatigue analysis and logistics (B-1A System Management Office). Prior to becoming the Director of LSA, Mr. Harris was the Director of Logistics Engineering and the Chief of the Lessons Learned Applications Division for the AFALC.

Kenneth L. Morris

Mr. Morris is currently the Chief of Logistics Support Analysis (LSA) Application Division for the Air Force Acquisition Logistics Center (AFALC). He served as the Air Force Logistics Command representative to the Office of the Secretary of Defense Manpower, Reserve Affairs, and Logistics working group responsible for the preparation and publication of MIL-STD-1388-1A/2A. Mr. Morris has guest lectured on LSA at the Air Force Institute of Technology. He assists program offices in developing and managing LSA programs.

William C. Walker

Mr. Walker is a Logistics Management Specialist currently assigned to the Directorate of Logistics Support Analysis (LSA) at the Air Force Acquisition Logistics Center (AFALC). He holds a Bachelor of Science degree from Central State University, Oklahoma, and a Masters of Science degree from the Air Force Institute of Technology. Mr. Walker's 20 years of service includes assignments in aircraft maintenance, the AFLC Management Intern Program, and the Lessons Learned Directorate.

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VITA

Captain Robert A. Pierce was born on 14 April 1947 in Penn Yan, New York. He attended Cornell University, Ithaca, New York, earning a Bachelor of Science degree in Animal Science in September 1969. In May 1973, he received a Masters of Science degree in Reproductive Physiology from the University of Connecticut at Storrs. He worked as a Research Associate for the Population Information Program, George Washington University Medical Center, Washington, D.C., and as a Research Assistant for the Cornell University Animal Science Research Center, Harford, New York. Captain Pierce served as an enlisted member in the United States Army Reserve from February 1970 until he joined the United States Air Force in May 1979. After completion of Officer Training School at Lackland AFB, Texas, he was commissioned Second Lieutenant and assigned to the Air Force Acquisition Logistics Division (AFLC), Wright-Patterson AFB, Ohio. Captain Pierce served as an Integrated Logistics Support Manager (ILSM), ensuring supportable/maintainable designs were incorporated in 22 programs in the Life Support System Program Office. He entered the School of Systems and Logistics, Air Force Institute of Technology, in June 1984.

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This thesis was an attempt to develop simple, usable guidance for for tailoring the tasks of Logistics Support Analysis (LSA). Guidance was developed using the techniques of expert panel review and problem analysis. A trial case, based on a multiple phase nonmajor acquisition program, was constructed to test the validity of the guidance. Eight individuals directly responsible for tailoring LSA participated in the test and were interviewed immediately upon its completion.

Results from the test indicate that the guidance is valid if used for its intended purpose; to make the initial selection of subtasks for a proposed contract. Test participants indicated that the guidance made the job of tailoring LSA easier and that they would use it if it were available. A structural problem with the guidance caused a higher rate of irrelevant task selection than was anticipated. A simple solution to this problem is discussed. Further testing and refinement of the guidance, followed by programming on the Zenith 100 series computer, is recommended.

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