Logistic Support Analysis Handbook

James V. Jones

McGraw-Hill, Inc.

New York St. Louis San Francisco Auckland Bogotá Caracas
Lisbon London Madrid Mexico City Milan Montreal New Delhi
Paris San Juan São Paulo Singapore Sydney Tokyo Toronto

FIRST EDITION
THIRD PRINTING

Library of Congress Cataloging-in-Publication Data

Jones, James V.
Logistic support analysis handbook / by James V. Jones.
p. cm.
Includes index.
ISBN 0-8306-3351-0
1. Logistics—Handbooks, manuals, etc. 2. United States—Armed Forces—Procurement—Handbooks, manuals, etc. I. Title.
U168.J66 1989
355.6'212'0973—dc20 89-34647
CIP

For information about other McGraw-Hill materials, call 1-800-2-MCGRAW in the U.S. In other countries call your nearest McGraw-Hill office.

Acquisitions Editor: Larry Hager
Technical Editor: Deborah D. Daly
Director of Production: Katherine G. Brown
Series Design: Jaclyn J. Boone

Printed in Mexico

Logistic Support Analysis Handbook

Dedicated to
my wife, Kim,
my daughter, Catherine,
and my son, Christopher,
whose love, encouragement, and understanding
made this book possible.

Foreword

We in the Logistics Departments of colleges and universities have been looking for an introductory textbook on Logistics Support Analysis (LSA). James V. (Jim) Jones has provided that text as a followup to his other two successful texts: *Integrated Logistics Support Handbook and Design Engineering: Reliability, Maintainability, and Testability*. It provides the beginning logistics baccalaureate student with an excellent overview of the LSA process, which resides in a lengthy and highly technical military standard, MIL-STD 1388.

His objective, which he achieves throughout the text, is to provide a guide for both practicing logistics engineers and young logistics students who are learning the basic principles and concepts of logistics. The text also lends itself to the nonlogistics engineer who wants some basic knowledge on how integrated logistics support (ILS) and LSA fit into their programs. The text provides a detailed discussion of each facet of the LSA process, describing in detail each LSA task and subtask, along with how each task or task group relates to the overall LSA process.

A very important factor of logistics that the text emphasizes is the total systems engineering approach, along with the concept of concurrent engineering, necessary to complete a successful LSA program. The relationship of the ILS disciplines to the LSA process is described in detail. Other engineering discipline contributions and involvement in the LSA program are discussed. The analyses and studies performed by non-ILS organizations, that are an integral part of the LSA process, are also described.

This is a very comprehensive book on LSA. One chapter is dedicated to taking the results of the LSA process and folding it into life cycle costing (LCC), and then using the LCC output to refine the LSA. The text contains a detailed

description of the LSA record. Additionally, a description and example of each LSA summary report are provided. LSA program management is discussed, starting in the proposal stage and continuing through proposal preparation and costing, program startup, program control, and finally, program completion.

Jim Jones is an outstanding logistician. He lectures and conducts training seminars on ILS and LSA both nationally and internationally. As a logistics consultant, he advises and assists both government and contractor organizations in ILS and LSA programs. Additionally, Jim is a logistics adjunct faculty member at National University in Southern California. He is also a valuable member and supporter of the Society of Logistics Engineers (SOLE).

We at Colorado Tech in Colorado Springs, CO, have adopted this text for our LSA course, which is part of our Bachelor of Science Degrees in Defense Systems Management and Logistics Systems Management.

Robert G. Stein, Ph. D.
Dean, School of Arts, Sciences and Management
Colorado Tech

Introduction

Logistics Support Analysis is a key to national security. Weapon systems must be capable of continually performing assigned missions, whether strategic or tactical. The application of logistics support analysis concepts and techniques during the development of weapon systems, or any other system or equipment, is the most viable method available to produce systems that can be efficiently and economically supported. After all, if a system cannot be supported so that it can be depended upon to perform its intended mission when and where necessary, the system is ineffective and, therefore, national security is in jeopardy.

Each system represents a link in the overall national security chain, and this chain is only as strong as its weakest link. Through the use of logistics support analysis, systems are continually analyzed as they are designed and developed in order to identify and correct supportability deficiencies. Additionally, logistics support analysis provides a single source for the identification of all the resources that will be required to support operation and maintenance of the system when it becomes operational. The combination of a supportable design and a detailed logistics support package results in a system that has the ability to continually perform its assigned mission.

The purpose of this text is to provide an indepth study of the logistics support analysis process and how it can best be applied to development programs. Chapters 1 and 2 discuss the general areas of integrated logistics support and logistics support analysis as a foundation for subsequent chapters. The detailed tasks of the logistics support analysis process are presented in chapters 3 through 7. Chapter 8 deals with analyses performed by engineering disciplines that form a significant portion of the inputs required to develop a complete logistics support analysis. The process for recording and reporting the results of the

logistics support analysis, the logistics support analysis record, is presented in chapter 9.

The concept of life cycle cost, with emphasis on long-term system support costs, is provided in chapter 10. Chapter 11 addresses the organizational interrelationships necessary for the logistics support analysis process to be successful. Finally, chapter 12 presents issues relevant to acquiring and managing logistics support analysis programs. Additionally, a compendium of reports produced through the logistics support analysis record system, including report descriptions and examples, is provided in Appendix A to demonstrate the extent and potential of the support resource identification process.

The logistics support analysis process is essentially logistics systems engineering. The successful completion of a logistics support analysis program will result in a system that is as supportable as possible and in complete identification of all resources that will be needed to sustain system operation throughout its life cycle.

Acknowledgments

A special thanks to Mr. Jerome F. Kern of LSW, Inc., Landover, Maryland, for his assistance in preparing the LSA Summary Reports that appear in Appendix A. These reports were generated using LEADS™, LSW's proprietary LSA package.

Contents

1

Introduction to ILS

Logistics is the science of planning and implementing the acquisition and use of resources necessary to sustain the operation of military forces. These resources include spare parts, operation and maintenance manuals, tools and test equipment, facilities, and trained personnel. Without logistics, military forces could not operate. Logistics planning does not just happen, nor do resources appear through some mystic process. The science of logistics is dedicated to participating, as an equal partner to design engineering, in the process that produces military systems. The goal of logistics is military systems that optimize resource use while minimizing costs. This is not a goal that is easily attained; however, the process of logistics support analysis provides the vehicle for reaching this goal.

INTEGRATED LOGISTICS SUPPORT

Integrated Logistics Support (ILS) is the organization charged with the responsibility of managing the technical disciplines that plan and develop logistics support for military forces. In general, this means that ILS is the management organization that plans, coordinates, and directs the activities of many technical disciplines associated with the identification and development of logistics support requirements and resources for military systems. These technical disciplines, commonly referred to as the *principal logistics elements*, are dedicated to a specific aspect of the overall logistics support program. The efforts of each element must be orchestrated by a single entity to ensure that the resources needed to sustain operations are available when needed.

The ILS organization is an integral part of the engineering effort that designs military systems. Logistics engineers work hand in hand with other

engineers to ensure that support is considered in the design process. Logistics analyses are conducted to identify ways in which the design can be changed to improve support or supportability. Additional analyses are performed to identify the resources that will be required to support the system when it is used. Logistics support resources are the biggest expense associated with a military system over its useful life, so it is imperative that ILS plan for the most economical use of these resources as possible.

Goals of ILS

The ILS organization has four goals in meeting its responsibilities. These goals, shown in FIG. 1-1, are to cause logistics support considerations to influence the design of a system, to identify and develop support requirements related to and supportive of readiness objectives of the system, to acquire the necessary support, and to provide the required support for the minimum cost.

Logistics Support Analysis

One of the biggest problems that ILS has faced is how to coordinate the activities of these disciplines to achieve the best logistics support package possible. There are endless stories about how the ILS disciplines failed to coordinate information during the design of a weapon system, which resulted in technical manuals that did not match the equipment, spare parts that were not interchangeable with the original equipment, training courses that did not address the actual equipment design, and useless or unnecessary support equipment. In fact, there was no established method for the disciplines to formally communicate, so it is easy to understand why such errors occurred.

Another problem for ILS disciplines was that it was next to impossible to have any input into the design process because of the disjointed methods of collecting and analyzing support information. As a result, the process known as *logistics support analysis* (LSA) was developed.

Generally speaking, any analysis method or technique that addresses logistics support or that is used to identify logistics support resources is a logistics support analysis. However, the term LSA now has a more specific meaning. The LSA process was developed with four goals in mind (FIG. 1-2). The first goal is to use the results of the LSA process to influence the equipment design process to consider supportability requirements; that is, to use LSA to identify ways of making the weapon system easier to support. The second goal is to identify

- Support Influence Design
- Identify and Develop Resource Requirements
- Acquire Necessary Support
- Provide Required Support for Minimum Cost

Fig. 1-1. ILS goals.

1. Cause *logistics support* considerations to influence *design.*
2. Identify support *problems* and cost *drivers early.*
3. Develop logistic support *resource requirements* for system *life.*
4. Develop a *single* logistics support *database.*

Fig. 1-2. LSA goals.

the support problems and items that drive the cost of support early enough in the design process to change the design to fix or eliminate support problems. The third goal is to develop a complete set of projections of the total support resources that will be required to support the weapons system or equipment over its complete life cycle. The final goal of LSA is to develop and use a single database for all analyses.

These goals should not be surprising because they are a continuation of the goals that have traditionally been pursued by the ILS organization. Prior to LSA, each ILS discipline collected, analyzed, and stored data for its own use. The result was a mismatch of information or lack of continuity, which caused some of the problems just noted. By using a single database, each discipline can be assured that the information being used is the same that others are also using, and the results that one discipline generates is readily available to others.

The LSA process can be successful only if applied to a program where these goals can be achieved. There are two methods of planning logistics support: sequential and integrated. The difference between these two methods occurs when the support system is designed in relationship to the design of the equipment. LSA cannot be effective if applied using the sequential method because the first two goals—support influencing design and identification of problems and cost drivers early—are not possible because the system design is complete before the support planning begins. Therefore, the integrated method must be used to realize the full benefit of the LSA process.

There are two distinct areas in LSA: doing the analyses, and recording the results. Too often, logisticians get caught up in the documentation part of LSA and forget that the real purpose of LSA is to perform the analyses. The LSA program is structured in a manner that allows detailed identification of specific requirements for each program. This structure enables tailoring of requirements to match the specific complexity of weapon system or equipment being designed, and it encourages emphasis on analyses, rather than merely filling in the boxes on data sheets. LSA has proven to be a significant step forward in ILS planning and the development support resource requirements.

PRINCIPAL LOGISTICS ELEMENTS

The ILS organization contains technical disciplines that specifically address the support aspects of maintenance planning; manpower and personnel; supply

Maintenance Planning
Manpower and Personnel
Supply Support
Support and Test Equipment
Training and Training Devices
Technical Documentation
Computer Resources
Packaging, Handling, Storage, and Transportability
Facilities
Reliability and Maintainability

Fig. 1-3. Principal ILS elements.

support; support and test equipment; training and training devices; technical documentation; computer resources; packaging, handling, storage, and transportability; facilities; and reliability and maintainability. These areas, as illustrated in FIG. 1-3, are commonly referred to as the principal elements of ILS. Each of these elements is the responsibility of an ILS discipline that is staffed with logistics engineers trained in that specialty.

Maintenance Planning

Much of the support of military systems is centered around maintenance of equipment. A primary function of ILS is to develop a concept for the maintenance program to support a military system and then to plan the detailed maintenance actions that must occur to support the system. The way maintenance is performed on equipment does not just happen. It is the result of extensive planning and preparation that starts during the preconcept phase and continues through full-scale development.

The maintenance planning process begins with the *maintenance concept*, which is a statement of general guidelines to be used in developing the maintenance plan for an item of equipment. The guidelines established by the maintenance concept are the foundation for maintenance planning. Areas addressed by the maintenance concept include: a strategy for allocation of maintenance tasks to the different levels of maintenance, the repair policy with regard to similar

Maintenance tasks at the organizational level will be limited to unscheduled removal and replacement of failed modules or components and scheduled maintenance that can be accomplished without the aid of special tools or support equipment. Intermediate-level maintenance will have the capability of repairing electronic, electromechanical, and hydraulic assemblies, including the replacement of failed components. Overhaul, refurbishment, and fabrication of structural parts will be accomplished at the depot level. Maximum use will be made of existing tools, support equipment, test equipment, and associated support resources.

Fig. 1-4. Typical maintenance concept.