
Space systems — Integrated logistic support

Systèmes spatiaux — Soutien logistique intégré

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 20 *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

This second edition cancels and replaces the first edition (ISO 16091:2002), which has been technically revised.

The main changes compared to the previous edition are focused on the update of concepts.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The Integrated Logistics Support (ILS) programme is the integrated planning and action of a number of disciplines in concert with one another to assure system availability. The impact of ILS is often measured in terms of metrics such as reliability, maintainability, availability, and testability (RMAT), and sometimes system safety. The ILS programme is justified in the space context by improvement of current practices in terms of development of material resources and services essential to support operation and maintenance and to control associated operational risks, particularly in terms of utilization cost and availability.

It is also justified by heightening the awareness of all the programmes and project participants of the need for cost effective preparation, transfer, and management of information needed to operate, maintain, resupply and dispose of a product. This is as well as ensuring the recording of unscheduled events in order to perform essential support analyses.

The ILS approach differs for different types of space programmes or projects and this document permits appropriate tailoring. Consequently, the requirements in this document are applied at the management level, with identification of the objectives to be achieved, rather than with methods and techniques to be implemented to achieve these objectives.

These objectives include:

- a) the participation of the supportability objectives to the system design;
- b) the optimization of the operational and maintenance concepts;
- c) the identification of the required logistic support elements;
- d) the timely delivery of the logistic support elements; and
- e) the determination of the system resilience to unscheduled operational events.

Logistic support is not a new concept. For many centuries, military organizations have utilized logistic support in one form or another to coordinate the activities and resources involved in the maintenance and operation of militarized systems and their support elements, aiming at minimizing operational risks and total life cycle cost while achieving all mission-critical requirements. Integration of logistic support into the programme or project is for coordinating, throughout the life cycle, the activities and resources involved in the preparation and optimization of the system and its support elements, aiming at minimum overall life cycle cost, according to the requirements and operational risks.

The advantages and increased efficiency resulting from integrating the logistic support requires that the logistic support functions be addressed starting from the inception of the system. It also requires that an integrated approach be established between the design and development of the system and the operational requirements to be fulfilled. This approach is designed to ensure the ability to deliver on time and in proper quantity, material resources and services to deploy, operate, maintain and upgrade the system throughout its utilization phase, within cost requirements, in its operational environment. It also helps to ensure that the capability of the organization and resources dedicated to define, collect, manage and handle the information required to control the logistic support functions throughout the system life cycle from the feasibility phase to the disposal phase are fully developed.

Space systems — Integrated logistic support

1 Scope

This document describes the set of management requirements needed to identify and provide logistic support, so the customer can operate and maintain a product in its operational environment for the expected lifetime.

These requirements also aim, throughout the product life cycle, at implementing everything pertinent to the control of risks considered as critical for operational objectives.

The management requirements are applicable to those activities necessary to design, develop, deliver, deploy and manage an organized and structured set of materials and software, services, processes and information dedicated to support the system throughout its life cycle.

This document specifies management, studies, production activities, information management processes and tasks to meet the customer's need for logistic support.

When viewed from the perspective of a specific project context, the requirements defined in this document are tailored to match the genuine requirements of a particular profile and circumstances of a project.

NOTE Tailoring is the process by which individual requirements of specifications, standards and related documents are evaluated, and made applicable to a specific project by selection, and in some exceptional cases, modification of existing or addition of new requirements.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14300-1, *Space systems — Programme management — Part 1: Structuring of a project*

ISO 10789, *Space systems — Programme management — Information and documentation management*

ISO 10795, *Space systems — Programme management and quality — Vocabulary*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions given in ISO 10795 and the following apply. ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1.1

availability

ability of an item to be in a state to perform a required function under given conditions at a given instant of time or over a given time interval, assuming that the required external resources are provided

Note 1 to entry: This ability depends on the combined aspects of the reliability performance, the maintainability performance and the maintenance support performance.

Note 2 to entry: Required external resources, other than maintenance resources, do not affect the availability performance of the item.

Note 3 to entry: In French, the term “disponibilité” is used to denote both the performance and the measure.

3.1.2

configuration

interrelated functional and physical characteristics of a product or service defined in configuration management

[SOURCE: ISO 10007:2017, modified — definition previously stated “...defined in configuration information”]

3.1.3

customer

person or organization that could or does receive a product or a service that is intended for or required by this person or organization

EXAMPLE Consumer, client, end-user, retailer, receiver of product or service from an internal process, beneficiary and purchaser.

Note 1 to entry: A customer can be internal or external to the organization.

[SOURCE: ISO 9000:2015, 3.2.4]

3.1.4

data

information represented in a manner suitable for automatic processing

[SOURCE: IEC 60050-701-01-11:1992]

3.1.5

dependability

<of an item> ability to perform as and when required

Note 1 to entry: Dependability characteristics include availability and its inherent or external influencing factors, such as: reliability, fault tolerance, recoverability, integrity, security, maintainability, durability, and maintenance support.

Note 2 to entry: Dependability is also used descriptively as an umbrella term for the time-related quality characteristics of a product or service, and it may also be expressed as a grade, degree, confidence or probability of fulfilling a defined set of characteristics.

Note 3 to entry: Specifications for dependability characteristics typically include the function the product is required to perform; the time for which it is required that that performance be sustained; and the conditions of storage, use and maintenance. Requirements for safety, efficiency and economy throughout the life cycle may also be included.

[SOURCE: IEC 60050-192-01-22:1992]

3.1.6

document

information and its supporting medium

EXAMPLE Record, specification, procedure document, drawing, report, standard.

Note 1 to entry: The medium can be paper, magnetic, electronic or optical computer disc, photograph or master sample, or a combination thereof.

Note 2 to entry: A set of documents, for example specifications and records, is frequently called “documentation”.

Note 3 to entry: Some requirements (e.g. the requirement of readability) relate to all types of documents, however there can be different requirements for specifications (e.g. the requirement that they be revision controllable) and records (e.g. the requirement that they be retrievable).

[SOURCE: ISO 9000:2015, 3.8.5]

3.1.7

down time

time interval during which an item is in a down state

Note 1 to entry: Down time excludes disabled time due to lack of external resources, but includes maintenance time.

[SOURCE: IEC 60050-192-02-21:1992]

3.1.8

function

intended effect of a system, subsystem, product or part

3.1.9

implementation document

formal response from a supplier to the customer's Project Requirements Document describing how all requirements will be met

[SOURCE: EN 16601-00-01:2015]

3.1.10

industrial organization

identity, interfaces and responsibilities of all participants in the supplier chain for a project

3.1.11

mean time to restoration

MTTR

DEPRECATED: mean time to repair

DEPRECATED: mean time to recovery

expectation of the time to restoration

[SOURCE: IEC 60050-192-07-23:1992]

3.1.12

mission analysis

assessment of the mission as a result of the project with exploration of concepts conforming to expressed objectives to be reached, such as performance, cost, and schedule

3.1.13

process

set of interrelated or interacting activities that use inputs to deliver an intended result

Note 1 to entry: Whether the “intended result” of a process is called output, product or service, depends on the context of the reference.

Note 2 to entry: Inputs to a process are generally outputs of other processes and outputs of a process are generally the inputs to other processes.

Note 3 to entry: Two or more interrelated and interacting processes in series can also be referred to as a process.

Note 4 to entry: Processes in an organization are generally planned and carried out under controlled conditions to add value.

Note 5 to entry: A process where the conformity of the resulting output cannot be readily or economically validated is frequently referred to as a “special process”.

Note 6 to entry: This constitutes one of the common terms and core definitions for ISO management system standards given in Annex SL of the Consolidated ISO Supplement to the ISO/IEC Directives, Part 1. The original definition has been modified to prevent circularity between process and output, and Notes 1 to 5 to entry have been added.

[SOURCE: ISO 9000:2015, 3.4.1]

3.1.14

programme

group of projects managed in a coordinated way to obtain benefits not available from managing them individually

[SOURCE: ISO 14300-1:2011, 3.2]

3.1.15

project

unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirement, including the constraints of time, cost and resources

Note 1 to entry: An individual project can form part of a larger project structure and generally has a defined start and finish date.

Note 2 to entry: In some projects the objectives and scope are updated and the product or service characteristics defined progressively as the project proceeds.

Note 3 to entry: The output of a project can be one or several units of product or service.

Note 4 to entry: The project's organization is normally temporary and established for the lifetime of the project.

Note 5 to entry: The complexity of the interactions among project activities is not necessarily related to the project size.

[SOURCE: ISO 9000:2015, 3.4.2]

3.1.16

project phase

part of a total project during which activities are performed to attain a designated objective as one of a series of distinct steps in carrying out a project that together constitute the project life cycle

3.1.17

project requirements documents

documents, including all normative references, that establish requirements

Note 1 to entry: Examples of project requirements documents include, but are not limited to, standards, management specifications, technical specifications, statements of work and data requirements lists.

Note 2 to entry: This does not include the contract and associated terms and conditions.

3.1.18

resource

any physically or conceptually identifiable entity whose use and state at any time can be unambiguously determined

[SOURCE: IEC 60050-715-02-01:1992]

3.1.19

space element

product or set of products intended to be operated in outer space

3.1.20**specification**

document stating requirements

EXAMPLE Quality manual, quality plan, technical drawing, procedure document, work instruction.

Note 1 to entry: A specification can be related to activities (e.g. procedure document, process specification and test specification), or products (e.g. product specification, performance specification and drawing).

Note 2 to entry: It can be that, by stating requirements, a specification additionally is stating results achieved by design and development and thus in some cases can be used as a record.

[SOURCE: ISO 9000:2015, 3.8.7]

3.1.21**supplier**

organization that provides a product or a service

EXAMPLE Producer, distributor, retailer or vendor of a product or a service.

Note 1 to entry: A supplier can be internal or external to the organization.

Note 2 to entry: In a contractual situation a supplier is sometimes called "contractor".

[SOURCE: ISO 9000:2015]

3.1.22**support elements**

hardware and software products, together with the necessary human resources, which are essential to enable the system to achieve its required performance from delivery to disposal

EXAMPLE Electrical ground support equipment.

Note 1 to entry: Some items, during different phases of the project, can start as part of the system and later, modified as necessary, become support elements.

3.1.23**system**

set of interdependent elements constituted to achieve a given objective by performing a specified function

Note 1 to entry: The system is considered to be separated from the environment and other external systems by an imaginary surface which cuts the links between them and the considered system. Through these links, the system is affected by the environment, is acted upon by external systems, or acts itself on the environment or the external systems.

[SOURCE: ISO 14620-1:2002, 3.1.28]

3.1.24**system of systems**

integration of existing and/or new systems into an over-arching system with capabilities that are greater than the sum of the capabilities of the constituent component systems

3.1.25**system safety**

application of engineering and management principles, criteria, and techniques to optimize all aspects of safety within the constraints of operational effectiveness, time, and cost throughout all phases of the system life cycle

3.1.26**task**

specific piece of work to be done

3.1.27

work breakdown structure

hierarchical representation of the activities necessary to complete a project

[SOURCE: EN 16601-00-01:2015, 2.3.230]

3.1.28

work package

group of related tasks that are defined down to the lowest level within a work breakdown structure

Note 1 to entry: Grouping of tasks related to a same product and a same supplier.

[SOURCE: ISO 16601-00-01:2015]

3.2 Abbreviations

The following abbreviated terms are defined and used within this document.

BITE	built-in test equipment
ILS	integrated logistic support
LSA	logistic support analysis
OEM	original equipment manufacturer
PHST	packaging, handling, storage and transport
WBS	work breakdown structure

4 Fundamentals requirements of integrated logistics support

4.1 Project context

The following aspects shall be considered:

- a) Logistic support shall be provided throughout the utilization phase and requires, especially throughout the early phases of the project or programme, the management of specific activities of design and development (called logistic activities), in close relation with the other activities, such as safety, dependability, and quality assurance (SD&QA).

NOTE In the context of this document, safety is synonymous with system safety.

- b) Integrated logistics support (ILS) activities shall be part of the project or programme activities and integrated into its phasing and planning, in order to ensure their consideration in the development of the system. These activities shall be adapted depending on the project or programme organizational and technical effort to address the identified critical items.
- c) In particular, the system design activities, during the initial system development phase and design change activities during the system utilization phase, shall lead to a concurrent definition of the system and its associated support elements. The system definition shall be based on initial operational and maintenance concepts, in order to integrate the customer's requirements. The system definition effort shall be started as soon as possible, in order to ensure self-consistency.
- d) The management of logistic activities is therefore integrated into the project or programme management requirements: this document takes into consideration the existence of a set of space standards and complements it by developing the ILS requirements.

- e) The management of logistic activities throughout the system life cycle shall clearly demonstrate:
 - i) that the safety, dependability and quality assurance criteria are taken into account within the product's operational environment of use;
 - ii) the suitability, coherence and continuity of the logistic support; and
 - iii) the ability to control the risks specific to the performance of operation and maintenance tasks.
- f) One of the main aspects of the operational objective is to ensure and maintain the product performances through its utilization in its environment of use and up to its disposal. The purpose of the logistic support elements is to optimize the system's life cycle cost while maintaining compliance with all safety-critical and mission-critical requirements.
- g) The project or programme team can apply the life cycle cost concept when trading off development costs versus later utilization phase support and disposal costs.
- h) The requirements specified herein shall be responded to by the supplier in his implementation documents.

4.2 Integration Logistics Support main concepts

4.2.1 Integration Logistics Support concept

Integrating the logistic support into a project or programme is achieved by considering the following aspects:

- a) integrating the customer's requirements into the design of the system and its support elements;
- b) integrating the logistic support activities into the project management organization; and
- c) integrating the logistic support elements requirements together.

EXAMPLE The maintenance documentation describes the maintenance actions identified in the maintenance plan.

4.2.2 Integrated Logistics Support planning

- a) The ILS planning assumes that the required external resources (including both maintenance and other resources) will be provided to the system in its intended operational environment.
- b) The ILS planning identifies the required internal resources that will be provided by the logistic support system to maintain the system in its required operational state, and in its intended operational environment.
- c) The ILS planning addresses both the mission-critical and safety-critical supportability activities of the ILS programme. ILS planning establishes the activities for achieving the maintenance concepts and requirements throughout the system utilization phase. The planned logistic support activities include, but is not limited to:
 - i) planned levels of repair;
 - ii) estimated repair times;
 - iii) testability tools;
 - iv) support equipment inventory;
 - v) estimated manpower and skill levels; and

- vi) available support facilities.
- d) The ILS planning should result in a set of supportability activities that are commensurate with the system's unit-value/mission-criticality and logistics support data content/maturity. This type of planning is sometimes referred to as a capability-based process tailoring. An example of space systems unit-value/mission-criticality category definitions and guidance for tailoring capability-based ILS processes are provided in ISO/TS 18667.

4.2.3 Life cycle cost

- a) The system life cycle cost of the system is the sum of the acquisition costs, the operation costs, the maintenance costs, and the disposal costs.
- b) The risk of not maintaining system life cycle cost within budget is driven by inherent and extrinsic risks linked to the system and to the technological, natural, and human environment in which it is utilized.
- c) The ILS process includes the management of these risks as part of the project's overall risk management programme. In the case of the system life cycle cost risk analysis, the ILS assists the trade-off between the cost to meet safety dependability, and quality assurance requirements, and the achievement of optimized performance for the system. The general synopsis shown in [Figure 1](#) illustrates the complementary nature of this trade-off.
- d) ILS is also involved in addressing human factors, through analyses of operation and maintenance tasks. These analyses are notably based on operability (in particular the man/machine interfaces and ergonomics), maintenance ability (e.g. qualification, skills, task duration, workload) and environment (e.g. noise, environmental conditions, organization) criteria.

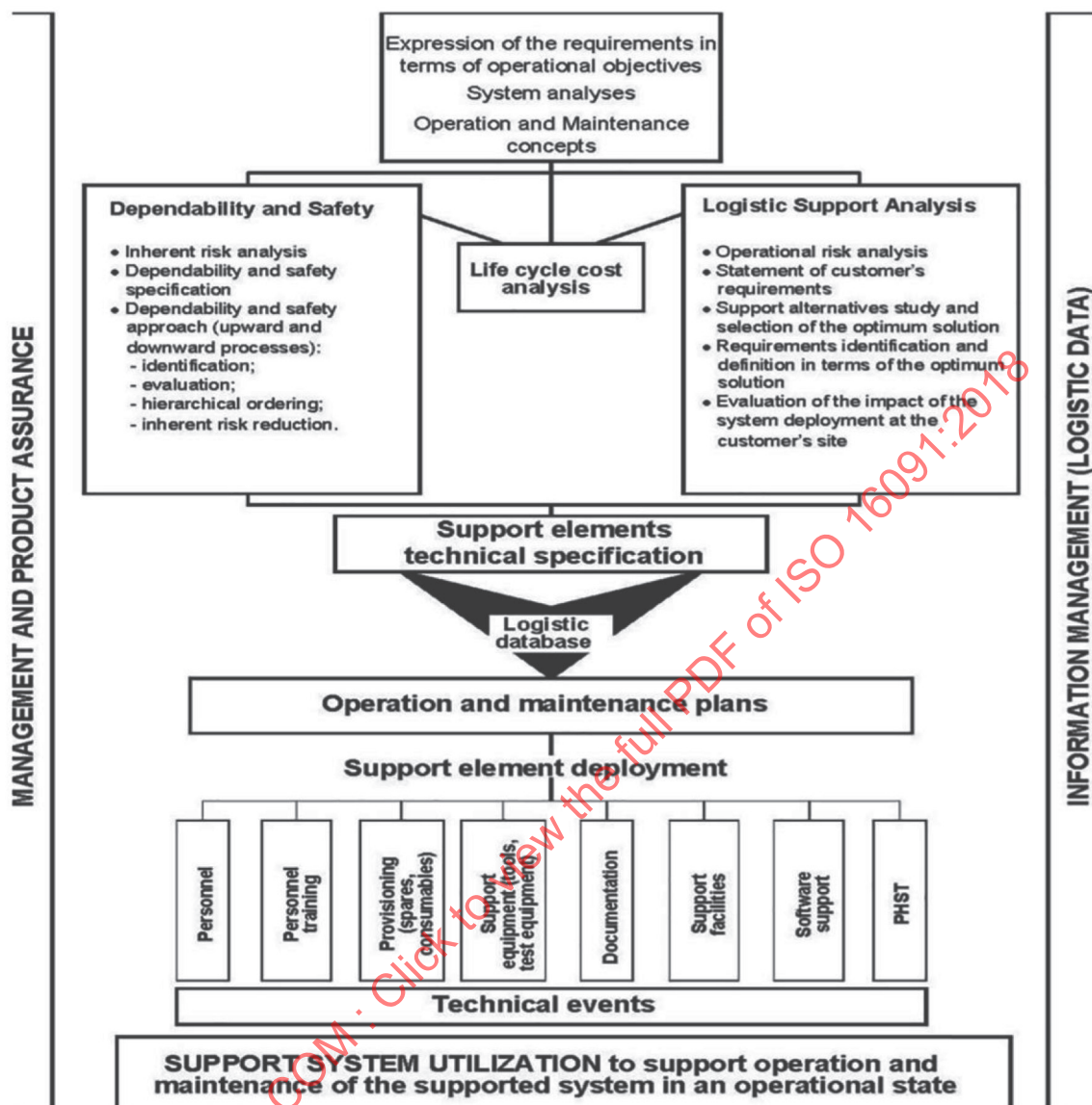


Figure 1 — Integrated logistic support overview

5 Management requirements for ILS

5.1 Control of logistic activities

5.1.1 Objectives and requirements

The overall project or programme requirements shall clearly state the objectives and requirements in terms of operational availability, life cycle cost and delivery of the system in its operational environment of use up to and including its disposal.

[GOAL] Ensure that all the operational environment requirements are identified.

[EXPECTED OUTPUT] Elements of the project requirements document covering operational availability, project life cycle cost, schedule and product operating environment.

5.1.2 Control of risks

The requirement to control the operational risks related to the system or the system of systems shall be included in the overall project requirements.

[GOAL] Achieve a balance between the ILS risks and the overall project risks, and to ensure all ILS risks are assessed and mitigated at the highest level of their impact in the system or system of systems.

[EXPECTED OUTPUT] An overall approach to risk management.

5.1.3 Concurrent development

The support elements shall be developed concurrently with the system.

[GOAL] Define the support elements early enough, so that:

- a) the design and technical solutions selected for the support elements are consistent with the system definition (design integration concept);
- b) the various identified support elements are actually usable in the operational environment of use, and work together (support elements integration concept); and
- c) the customer gets the support elements when required (customer's requirement integration concept).

[EXPECTED OUTPUT] Timely availability of the support elements.

5.1.4 Validation

The support elements shall be validated as part of the overall project verification process.

This validation should be enhanced through use of feedback data (lessons learned).

[GOAL] Ensure early enough the ability of the system supportability characteristics to meet the logistic support requirements.

[EXPECTED OUTPUT] Validated support elements.

5.1.5 Customer participation

The supplier shall make allowances for the customer to participate in the definition and validation of the support elements.

[GOAL] Ensure that throughout the development phase the system and support elements design conforms to the customer's requirements in terms of logistic support.

[EXPECTED OUTPUT] Agreed support elements design.

5.1.6 Integration and synchronization

The logistic support activities, project management, project phasing and planning shall be synchronized.

[GOAL] Synchronized activities

[EXPECTED OUTPUT] Synchronized planning for the overall project.

5.1.7 Work breakdown structure

The logistic activities shall be associated with project work breakdown structure (WBS) and shall be clearly identifiable as indicated in ISO 14300-1.

[GOAL] To ensure or establish:

- a) a consistent and focused identification and management of ILS activities;
- b) roles, responsibilities and authority related to the logistic function;
- c) conditions enabling roles and responsibilities to be undertaken throughout the project and especially in early phases A, B and C (see ISO 14300-1); and
- d) close customer/supplier communication between the various levels of the project organization.

[EXPECTED OUTPUT] Project WBS containing ILS work packages.

5.1.8 Appropriate phasing

The logistic support activity management in the project shall develop and be implemented at a level commensurate with the project phase. The project phasing implies consideration of the logistic activities according to three management responsibility categories:

- a) the logistic support management from definition of requirements to acquisition phases (A, B, C, D), including:
 - i) ILS management (control of the logistic activities during the system acquisition);
 - ii) Logistic support analysis (LSA) management (control of the studies aimed at logistic support specification and validation); and
 - iii) support elements management (control of the acquisition of specified support elements).
- b) the operation and maintenance (O&M) logistic support management - phase E (control of the support elements use); c) the logistic information management (applicable throughout the project life cycle).

[GOAL] Consideration of the correct requirements at the appropriate phase of the project.

[EXPECTED OUTPUT] Balanced definition of ILS activities throughout the project phases.

5.2 Logistic support

5.2.1 Customer summary

- a) The customer shall summarize the logistic support requirements in the project requirements documents.
- b) The system or project requirements document should include:
 - i) a summary of the project objectives to be achieved;
 - ii) the delivery, operation and maintenance concepts;
 - iii) the requirement for integrating the logistic support into the project.

[GOAL] Identify any customer's logistic support requirement in the project requirements documents.

[EXPECTED OUTPUT] Corresponding elements in the project requirements documents.

5.2.2 Supplier response

- a) The supplier shall respond to the customer's logistic support requirements with appropriate elements of his implementation approach.
- b) These elements should include:
 - i) identification of the logistic activities, the organization and the resources implemented to perform the logistic activities, as reflected in the project work breakdown structures; and
 - ii) phasing and planning of the logistic activities.
- c) The supplier shall provide a description of the methods to be implemented and the links with the other plans, in particular, the support elements development plans, the configuration management plan, and the safety, dependability, and quality assurance plans.
- d) Depending on the project size, objectives and requirements, the response may be split into separate plans.

[GOAL] Appropriate response to the ILS requirements.

[EXPECTED OUTPUT] Elements of the implementation documents.

5.2.3 Strategy

- a) The supplier, in response to the project requirements documents, shall develop plans for ILS and logistic activities throughout all the phases of the project.
- b) All the development activities, including those conducted during phases A and B, shall address ILS, in particular the objectives and the functions to be performed by the system, in its initial operational and maintenance concepts. The operational concept addresses the operational environment in which the system is deployed and used. The maintenance concept addresses the repair policy and the maintenance organization levels.

[GOAL] Continuous evolution of the ILS strategy throughout the project life cycle.

[EXPECTED OUTPUT] ILS elements in the supplier implementation documents.

5.3 Reports

5.3.1 Overall project report

The supplier shall periodically report to the customer on the status of the logistic support tasks within the context of the overall project.

[GOAL] An integrated approach to project reporting.

[EXPECTED OUTPUT] Project progress reports that include ILS aspects.

5.3.2 Project review report

The supplier shall submit the status of the logistic support tasks during the project reviews.

[GOAL] An integrated approach to project review.

[EXPECTED OUTPUT] Project reviews that include ILS aspects.

5.3.3 Lessons learned report

The supplier shall include an element covering logistic support within the context of the overall project in the project lessons learned report.

[GOAL] An integrated view of the lessons learned during the project.

[EXPECTED OUTPUT] An element of the project lessons learned report covering logistic support.

6 Management requirements for logistic support analysis

6.1 Control of logistic analyses

The supplier shall define a plan for the implementation of logistic support analysis (LSA). The strategy can cover:

- a) management tasks for preparing, managing and coordinating the LSA activities;
- b) tasks for integrating the customer's requirements into the logistic support activities;
- c) tasks aimed at analysing the ability of the system design to be supported;
- d) tasks aimed at studying the support alternatives and selecting the optimum solution;
- e) tasks aimed at identifying and defining the requirements in terms of support elements; and
- f) validation tasks aimed at ensuring that the deployed support elements are conformant to the support requirements.

[GOAL] Tailor the logistic support analysis effort as early as possible in the project phasing to achieve the best method of meeting the requirements.

[EXPECTED OUTPUT] An implementation document element defining the strategy for LSA throughout the project. Its implementation is supported by means of LSA documentation.

6.2 Study and validation of support requirements

6.2.1 General

The following requirements relate to the identification of the logistic support requirements of the system mission and the comparative analyses of the required input data.

- a) The logistic support analysis activities (LSA) are aimed at defining the requirements in terms of logistic support, in order to identify all the data required for the development of the support elements.
- b) The LSA consists of a set of selected tasks iteratively implemented throughout the project, the main part being implemented during phases B, C and D.
- c) [Figure 2](#) illustrates the sequence of the groups of tasks for phases B and C. At the end of phase C, the LSA process leads to establishing the applicable operation and maintenance plan and the support elements technical specification.

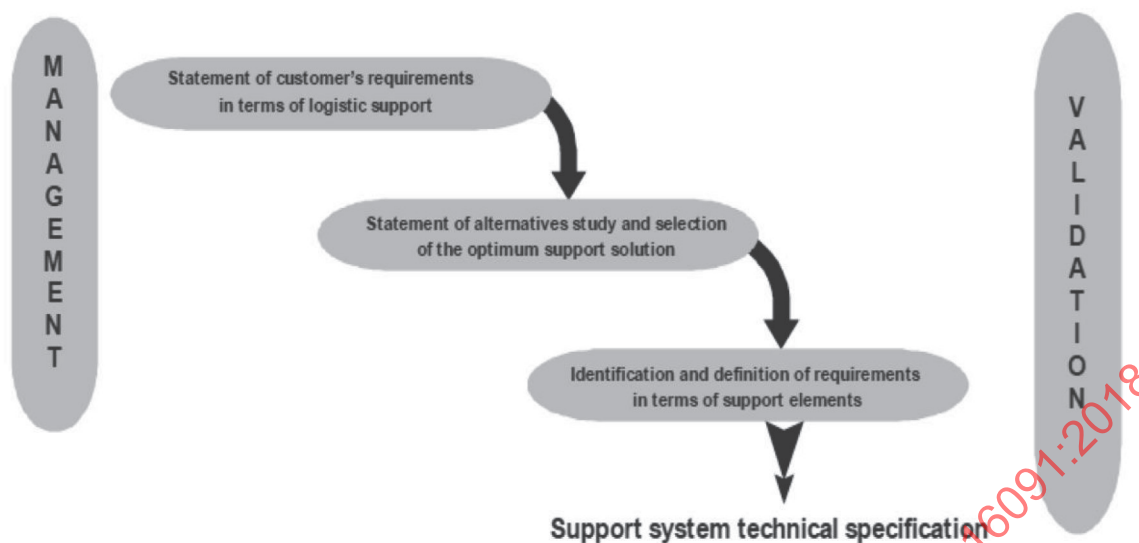


Figure 2 — Sequence of the groups of tasks during phases B and C

6.2.2 Identification of logistic support elements

- a) The supplier shall perform an analysis to identify the functional requirements in terms of logistic support related to the system mission (e.g. quality function deployment for logistic support).
- b) The supplier shall perform a detailed analysis of the mission and utilization profiles based on the mission analysis and system analyses, and identify and document:
 - i) the manner, location and time of utilization of the system;
 - ii) the logistic support functions, the logistic support ability criteria; and
 - iii) the levels of these criteria. For each criterion, the list of critical points or unacceptable risks from the operational viewpoint shall be established.

This information is updated as necessary to address modifications of the system, the mission, the use environment, or the customer logistic support requirements.

[GOAL] Complete identification of all logistic support elements by phase B.

[EXPECTED OUTPUT] A report identifying all the logistic support elements.

6.2.3 Assessment of resources

The supplier shall assess the customer's existing logistic resources in order to identify which, if any of those existing logistic resources can be used to support the system being developed. The supplier shall make recommendations identifying which, if any of the existing logistic resources should be utilized to support the system being developed. By expressing the system design recommendations after an analysis of the customer's existing logistic resources, which can improve efficiency and cost, the use of specific elements that require adapted operation or maintenance are avoided as far as possible.

[GOAL] Take into account existing customer's resources that can have an impact on the logistic support solutions.

[EXPECTED OUTPUT] Optimized support elements, which maximizes the use of existing resources.

6.2.4 Technology impact

- a) The supplier shall identify and evaluate the impact of new technologies used for the system and support elements definition.
- b) The consequences of these new technologies on the system definition, in terms of potential improvements or new requirements on the various support elements, shall be identified. These consequences shall be analysed insofar as they affect the support elements cost or performances.

[GOAL] Reduce system risks deriving from the use of new technologies.

[EXPECTED OUTPUT] New technology impact evaluation document.

6.2.5 Evaluation of alternatives

For each design option of the system, the supplier shall define the potential logistic support alternatives, evaluate each alternative, then compare them (sensitivity analysis) and identify the most efficient solution to meet the operational requirements.

These tasks facilitate the identification of the best solution to be submitted in order to optimize the system: the solution to be selected is the one leading to the best trade-off between cost, support ability performances and schedule.

This evaluation can cover such aspects as:

- a) level of repair analysis;
- b) framework of reliability-centred maintenance; and
- c) management of safety, dependability, and quality assurance risks associated with supportability.

[GOAL] Selection of the optimum "system/logistic support option" association.

6.2.6 Test, evaluation and validation

System acceptance procedures shall include provisions for the logistic support acceptance. The acceptance can cover such aspects as:

- a) support elements efficiency;
- b) availability characteristics; and
- c) logistic support data quality.

[GOAL] Applying acceptance procedures to the logistic support provisions

[EXPECTED OUTPUT] An accepted system and accepted support elements.

6.3 Requirements for LSA reports

The requirements are identical with those in [5.3](#).

7 Management requirements for support elements

7.1 General

The objective of the following requirements is to determine the logistic resources required to perform the identified operation and maintenance tasks.

7.2 Control of support element activities

The support element activities shall be organized in a manner agreed by the customer and the supplier.

[GOAL] Consistent approach to management of all project disciplines.

[EXPECTED OUTPUT] Integrated approach to managing the project.

7.3 Support element definition and development

7.3.1 Operation and maintenance task identification

- a) The supplier shall define the support elements required to support the system in its environment of use. For each task, the following should be defined:
 - i) an overview and a reminder of: 1) nature and type of the task; 2) frequency (or periodicity); 3) allotted duration for the task;
 - ii) the quantified resources requirements, regarding the logistics in terms of: 1) support equipment (e.g. tools, test equipment); 2) packaging, handling, storage and transport (PHST); 3) personnel skills and manpower; 4) training; 5) software support; 6) support facilities; 7) provisioning of spares and consumables; 8) documentation material (operation, maintenance, re-provisioning data and procedures); 9) technical events data feedback.
- b) A synthesis of logistic requirements per support element shall then be performed. This synthesis should be presented as a part of the operation and maintenance plan.

[GOAL] All the identified operational and maintenance tasks are fully supported from a logistics standpoint.

[EXPECTED OUTPUT] Identification of the operation and maintenance tasks and the corresponding support elements.

7.3.2 Customer defined location

The supplier shall assess the impact of deploying the system at the customer-defined location(s). The aim of the analysis is verification of the adequacy of available logistic resources selected for the support and establishing, when necessary, the modifications to be applied to these resources, so that they can be used effectively.

EXAMPLE PHST, support facilities, test equipment, personnel workload and availability.

[GOAL] Ensure a trouble-free delivery, installation and resupply of the logistic support elements at the defined location.

[EXPECTED OUTPUT] An impact assessment based upon the system customer defined location.

7.3.3 Prediction of consumption

- a) The supplier shall predict, for the system, the rate of consumption of spares, consumables and other support elements and shall make recommendations to ensure continuity of resupply. This task facilitates the availability of the required logistic resources throughout the system utilization phase and before the industrial production phases out.
- b) The customer shall provide the predicted system usage rate or operational requirement to the supplier as required information for the supplier's rate of consumption analysis.

[GOAL] Define the scope of logistic support.

[EXPECTED OUTPUT] Effective implementation of logistic support.

7.3.4 Support

The supplier shall establish the actions required to maintain the supportability performance in spite of the changes that affect the system, its support elements and their environment.

NOTE This task enables the taking of appropriate steps in accordance, for instance, with the customer's socio-economic changes, some industrial skill unavailability, product obsolescence and market fluctuations.

[GOAL] Contribute to operational risk management within support activities.

[EXPECTED OUTPUT] Logistic support contribution to risk management as part of project implementation documents.

7.3.5 Unexpected operational events

The supplier shall analyse all the unexpected operational events to determine their cause.

[GOAL] Improve resilience of the system.

[EXPECTED OUTPUT] Unexpected event analysis and proposal for improvement actions.

7.4 Management of the production of support elements

7.4.1 General

- a) The objective of the support elements production tasks is to achieve the delivery of hardware and software, services and data conforming to the support elements requirements.
- b) The purpose is to develop the specified support elements, insuring that they are available when they are required by the system. The coordinated delivery of the system and the associated support elements enables the global acceptance of the system in its as-built configuration.
- c) The delivery can be performed in several steps: an initial delivery composed of the required elements at the system deployment and a recurring delivery composed of replenishment of logistic resources, including human resources, to ensure the support continuity throughout the utilization phase.

- d) The production tasks are carried out under general management procedures.

EXAMPLE Statement of work, plans, acceptance or financial resources.

- e) In the following sub-clauses, requirements are detailed for appropriate planning activities resulting in named plans. The requirements are to action and document the planning; this may be individual plans, combined plans or a single document if all of the detailed requirements are addressed.

EXAMPLE Provision of one overall plan instead of one plan per logistic support element.

- f) Configuration management should be properly integrated into the logistic support activities. Strong attention shall be paid to the conformance of the logistic support element configuration to the "as-built" reference of the system.

7.4.2 Re-use of equipment

Prior to acquisition, the supplier shall assess the desirability and feasibility of having equipment capable of being used during both the development and utilization phases.

EXAMPLE Development tooling and test equipment.

[GOAL] Maximize the re-use of existing or development equipment.

[EXPECTED OUTPUT] All re-usable existing or development equipment identified.

7.4.3 Provisioning plan

a) The supplier shall establish a provisioning plan that identifies initial and recurring spares, repair parts and consumables.

b) The provisioning plan shall address:

i) the designation, including the original equipment manufacturer (OEM) identification and the OEM part number, and quantity of hardware items to stock for each maintenance level and use location; and

ii) the acquisition procedures;

EXAMPLE Orders, allotted time or quality survey.

iii) the production means.

[GOAL] Ensure reliable provisioning.

[EXPECTED OUTPUT] Provisioning plan as part of the implementation document.

7.4.4 Support equipment acquisition plan

a) The supplier shall establish a support equipment acquisition plan that shall include a recommended maintenance concept for the support equipment to be acquired.

b) The supplier shall specifically consider the built-in test equipment (BITE), the special support equipment developed for the system and the common support equipment.

[GOAL] Ensure timely acquisition of the support equipment.

[EXPECTED OUTPUT] Support equipment acquisition plan.

7.4.5 Support facilities plan

The supplier shall establish a development and construction plan for any support facilities required.

[GOAL] Ensure timely acquisition of support facilities.

[EXPECTED OUTPUT] Support facilities plan.

7.4.6 Packaging, handling, storage and transportation plan

a) The supplier shall establish a packaging, handling, storage and transportation plan (PHST plan).

b) The PHST plan shall take into account:

i) the hardware items to be manufactured;