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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.

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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.

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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/

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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 receives 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.

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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.

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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

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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

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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.

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