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Space systems — Lessons learned — Principles and guidelines

Systèmes spatiaux — Retour d'expérience — Principes et lignes directrices

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Foreword

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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 document 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).

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

This third edition cancels and replaces the second edition (ISO 16192:2017), which has been technically revised.

The main changes are as follows:

— normative references have been added.

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

In order to improve the quality of products and to work efficiently, it is important to consider past experiences and how the knowledge of those experiences is transmitted. The aim is to decrease errors (in terms of both quantity and gravity), improve working methods and decrease risks of nonconformity to specified objectives (management, technical, quality, costs and schedules).

In the process of lessons learned, future space projects or programmes are intended to draw benefit from past experiences, by capturing and communicating knowledge from the past through recording, classifying and making the information available.

An efficient processing of lessons learned is considered essential for:

— ongoing efficiency and quality improvement inside any organization;

— successful project management.

Space systems — Experience gained in space projects (Lessons learned) — Principles and guidelines

1 Scope

This document specifies lessons learned principles and guidelines that are applicable in all space project activities (management, technical, quality, cost and schedule).

The application of this document is intended to be included in the supplier quality management system, but can be tailored in individual contracts as agreed by the customer and supplier, depending on:

— the content of each project (size, technological level and novelty, particular organization, participants, etc.);

— the interest and usefulness of the related information.

The lessons learned information can result from any situation which can be encountered in similar contexts for future projects, i.e.:

— undesirable experiences to be avoided;

— strategies, rules, principles of design, validation, tests and operations proved to be successful or necessary.

This document neither endorses nor recommends the transmission of company proprietary information to external entities as part of a lessons learned process.

Implementing a formal lessons learned process as outlined in this document makes it possible to capture and benefit from this information.

The lessons learned activity is an important contribution to the processing of the preventive and corrective actions specified in ISO 9001, ISO 17666, ISO 14620-1 and ISO 23460.

This document also provides lessons learned processes and suggested lessons learned forms.

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.

~~<std>ISO 10795, *Space systems — Programme management and quality — Vocabulary*</std>~~

~~<std>ISO 14620-1, *Space systems — Safety requirements — Part 1: System safety*</std>~~

~~<std>ISO 17666, *Space projects — Risk management*</std>~~

~~<std>ISO 23460, *Space projects — Programme management — Dependability assurance requirements*</std>~~

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

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ISO 14620-1, *Space systems — Safety requirements — Part 1: System safety*

ISO 17666, *Space projects — Risk management*

ISO 23460, *Space projects — Programme management — Dependability assurance requirements*

3 Terms and definitions

No terms and definitions are listed in this document. For the purposes of this document, the terms and definitions given in ISO 10795 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 The role of a lessons learned activity

4.1 Role

The role of a lessons learned activity is to ensure that projects benefit from the experiences – good and bad – of previous projects. The main activities involved in the process are:

a) to identify and collect relevant information;

b) to analyse information, classify lessons learned and issue recommendations;

c) to document the process;

d) to make information available.

The outputs of the activity are:

— root event background;

— lessons learned;

— recommendations.

The steps involved in the lessons learned process are described in detail in Clause 6.

To support risk management activities as described in ISO 17666, safety activities as required in ISO 14620-1, and dependability assurance activities as required in ISO 23460, lessons learned activity shall be organized to safeguard all safety and dependability knowledge through recording, classifying and making available the proper information for the benefit of future space projects.

4.2 Information availability

Information shall be made available, as necessary, by referring to a collection of data and by consulting a shared database. External provision of data should be in accordance with agreements between the customer and supplier. This database should include any information considered by the participants to be useful for ongoing or future project activities.

The database should be searchable by domain, type of project, period and type of anomaly.

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Information may also be made available by means of more “active” ways of knowledge transfer, such as a debriefing or presentation of lessons learned to interested personnel (e.g. within the company) or the presentation of lessons learned to relevant project teams (e.g. within the company).

5 Lessons learned management

5.1 The main applications of the lessons learned

Lessons learned should be systematically applied in the following situations:

a) before the start of a space project;

EXAMPLE 1 Information about costs and duration, technical performance and quality of previous projects are made available to a new project.

b) transition from one phase to another phase;

EXAMPLE 2 The lesson learned during phase B (definition phase) or phase C (development phase) is that a qualification of an advanced technology is followed by specific inspection during manufacturing.

c) when the results from one project could benefit another coexisting project;

EXAMPLE 3 The lessons learned from analysis of a component in a given project is directly beneficial to another project.

d) when the knowledge of one field can benefit another.

EXAMPLE 4 The lessons learned from analysis of defects or failures during integration and test results in improvement of the specifications of a contract.

5.2 Information sources for the lessons learned

The search for useful information is an essential step to developing lessons learned.

Sources of useful information should include the following:

— opinions of specialists and experts;

— documented conclusions of specialists and experts;

— technical reports, actions and recommendations resulting from reviews;

— non-conformity reports;

— failure analysis reports;

— assessments of success in meeting project objectives (at the end of a project);

— documented results of operation of models of space engineering, or results of space mission, or both;

— feedback from customers;

— alerts;

— accidents, mishaps, incidents and close calls;

— risk assessments.

6 The lessons learned process

6.1 General

The lessons learned process is depicted in Figure 1. It comprises three phases with related outputs:

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a) the background of the experience, in which the following are described in detail:

   — the report of the fact;

   — the analyses which comprise the identification of the causes (possible, probable and proven) and the consequences (immediate, future and potential);

   — the resulting actions;

b) lessons learned, which are lessons drawn from the experience;

c) recommendations, which are applicable to new projects (impact on documentation, impact on product).

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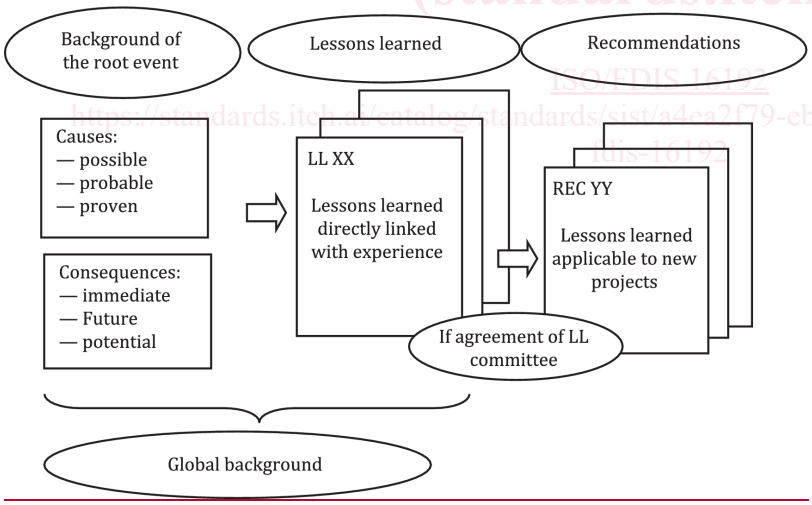

Figure 1 — Lessons learned process

6.2 Process steps

The lessons learned process is optimized by implementing a common methodology of definition, classification, description and registration.

