

---

---

**Space systems — Programme  
management — Requirements  
management**

*Systèmes spatiaux - Management de programme - Programme  
management - Management des Exigences*

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO 16404:2013](https://standards.iteh.ai/catalog/standards/sist/686fd329-1560-429c-bed7-94fc305c81eb/iso-16404-2013)

<https://standards.iteh.ai/catalog/standards/sist/686fd329-1560-429c-bed7-94fc305c81eb/iso-16404-2013>



**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO 16404:2013](https://standards.iteh.ai/catalog/standards/sist/686fd329-1560-429c-bed7-94fc305c81eb/iso-16404-2013)

<https://standards.iteh.ai/catalog/standards/sist/686fd329-1560-429c-bed7-94fc305c81eb/iso-16404-2013>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
<b>4 Abbreviated terms</b> .....	<b>4</b>
<b>5 Objective and scope of Requirements Management</b> .....	<b>4</b>
5.1 Objective of Requirements Management.....	4
5.2 Scope and interfaces.....	4
<b>6 Requirements Management overall process</b> .....	<b>7</b>
6.1 Capture needs and develop requirements.....	9
6.2 Allocation and flow down requirements.....	10
6.3 Validate requirements.....	10
6.4 Verify design against requirements.....	10
6.5 Verify product against requirements.....	10
6.6 Requirements change management.....	10
<b>7 Requirements Management plan</b> .....	<b>11</b>
7.1 General.....	11
7.2 Functional and technical specifications.....	11
<b>8 Rules for Requirements Management</b> .....	<b>12</b>
8.1 Rules for deployment of Requirements Management activities.....	12
8.2 Rules for Requirements Management.....	12
8.3 Key Performance Indicators.....	13
<b>Annex A (informative) Requirements Management plan template</b> .....	<b>15</b>
<b>Bibliography</b> .....	<b>16</b>

## 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. [www.iso.org/directives](http://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. [www.iso.org/patents](http://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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [http://www.iso.org/iso/home/standards\\_development/resources-for-technical-work/foreword.htm](http://www.iso.org/iso/home/standards_development/resources-for-technical-work/foreword.htm)

The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

[standards.iteh.ai](http://standards.iteh.ai/catalog/standards/sist/686fd329-1560-429c-bed7-94fc305c81eb/iso-16404-2013)  
<https://standards.iteh.ai/catalog/standards/sist/686fd329-1560-429c-bed7-94fc305c81eb/iso-16404-2013>

## Introduction

There is consensus that successful aerospace programmes/projects depend on meeting the needs and requirements of the stakeholders/customers. When the requirements are for a complex system or for a system that may take many years to be developed, a formal Requirements Management (RM) process is mandatory and justified.

Requirements Management concerns the collection, analysis, and validation of requirements with all the communications and negotiations inherent in working with people.

This International Standard will help to clarify and enhance current practices to improve Programme Management. It is intended to be used by space programmes when establishing, performing, or evaluating Requirements Management processes in the space sector.

This International Standard describes Requirements Management functions and principles and defines a common Requirements Management terminology for use with any product line.

Requirements Management is an integral element of any programme, but, in space, it is particularly important due to

- specific environmental conditions in space,
- a need for a high level of performance,
- a limited number of models,
- limited access to the product during operations,
- quasi-impossibility of repairing in the case of failure during flight,
- often high complexity of the organization, and
- associated high costs.

The deployment of this standardized common set of Requirements Management is intended to encourage and facilitate international space cooperation.

[Annex A](#) of this International Standard gives the general template for a Requirements Management plan.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 16404:2013

<https://standards.iteh.ai/catalog/standards/sist/686fd329-1560-429c-bed7-94fc305c81eb/iso-16404-2013>

# Space systems — Programme management — Requirements management

## 1 Scope

This International Standard presents the requirements for Requirements Management (RM) for space projects.

This International Standard addresses the space programme/project management requirements, applicable through a top-down approach in a contractual relationship between customers and suppliers.

The objective of this International Standard is to state and establish a common reference framework for all the customers and suppliers in the space sector to deploy Requirements Management for all space products and projects.

This International Standard on Requirements Management includes

- a definition of the Requirements Management scope for the space sector,
- the standard processes for Requirements Management within the product lifecycle management, and
- a set of rules for Requirements Management activities to be implemented by the actors (customers and suppliers), including rules derived from best practices.

The primary target audience for this International Standard includes

- the Requirements Management/Systems Engineering process owners of the customers and suppliers,
- the Programme/Project Managers managing the space programmes, and
- the Chief Engineers and the Quality Managers.

The term programme is understood as a group of several projects. Both “programme” and “project” may be used in the same context throughout this International Standard.

ISO 21351 defines the requirements for the format and the content of the functional and technical specifications.

In addition, it allows customer/supplier flexibility in its implementation and tailoring.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9000:2005, *Quality management systems — Fundamentals and vocabulary*

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

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

ISO 21351, *Space systems — Functional and technical specification*

ISO/IEC/IEEE 29148 — *Systems and software engineering — Life cycle processes — Requirements engineering*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 9000:2005 and ISO 10795 and the following apply.

#### 3.1 design verification

evaluation of the implementation of the design (architecture, components) against the requirements to determine that they can be met

Note 1 to entry: This is compliant with ISO 9001 Verification.

#### 3.2 product lifecycle

description of all stages of the product throughout its life starting from the expression of its need until the disposal, whatever the form is

#### 3.3 product verification

evaluation of the implementation of the product against the requirements to determine that they have been met

Note 1 to entry: This is compliant with ISO 9001 Verification.

#### 3.4 qualification

act or conduct of the **supplier** to provide evidences to prove that the design and manufacturing (including manufacturing process) of hardware/software is adequate to fulfil all **requirements** under required environment conditions

Note 1 to entry: This may be implemented by analysis, test, inspection, or demonstration of a set of tasks that provide proofs, while basing on theoretical and experimental justifications that the defined product satisfies the specified need and can be produced.

Note 2 to entry: The qualification decision is the act by which the customer, at the origin of the technical specification, attests on the basis of theoretical and experimental justifications that the defined product, identified by the design data file, meets all the requirements of the technical specification and can be produced.

#### 3.5 requirement

formalized statement identifying a capability, a functionality, a physical characteristic, or a quality that must be met or possessed by a system or system component to satisfy a contract, a standard, a specification, or other formally imposed documents

Note 1 to entry: A requirement may be developed at any point in the product lifecycle by any number of stakeholders.

Note 2 to entry: A requirement is a need or expectation that is stated, generally implied, or obligatory.

[SOURCE: ISO 10795]

#### 3.6 requirements baseline

set of requirements that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that can be changed only through formal change control procedures

#### 3.7 Requirements Management RM

discipline that covers all the tasks that shall be performed to manage requirements, such as gathering, developing, organizing, tracing, analysing, reviewing, allocating, changing, and validating requirement objects, as well as managing documents and databases that contain them with the purpose of defining and delivering the right product or service



**3.8****Requirements Management plan  
RM plan**

management plan which describes all the activities related to Requirements Management for a specific project or programme that includes the requirement cascading activity and the Requirements Management interaction with Configuration Management and Functional Analysis

Note 1 to entry: This plan describes the activities that need to be performed to support the verification and validation activities in order that the design and product can be verified against requirements.

**3.9****requirement validation**

set of activities to ensure that requirements are correct and complete so that the product meets upper-level requirements and user needs

**3.10****stakeholders**

customers and/or users

**3.11****Systems Engineering**

interdisciplinary approach and means to enable the realization of successful systems, starting with the definition of customer needs, the identification of product functionality, and the intended validation very early in the lifecycle

Note 1 to entry: Systems Engineering considers both the business and the technical needs of all customers with the goal of providing a quality product that meets the user's needs.

**3.12****traceability**

ability to identify the relationship between various artefacts of the development process

EXAMPLE Artefacts of the development process include the lineage of requirements, the relationship between a design decision and the affected requirements and design features, the assignments of requirements to design features, and the relationship of test results to the original source of the requirement.

Note 1 to entry: Bidirectional traceability is required to permit top-down impact analysis and down-top traceability analysis.

Note 2 to entry: Traceability is the ability to trace the history, application, or location of that which is under consideration.

[SOURCE: ISO 10795]

## 4 Abbreviated terms

The following abbreviated terms are used in this document.

CM	Configuration Management
KPI	Key Performance Indicators
PLM	Product Lifecycle Management
RM	Requirements Management
ROI	Return on Investment
SE	Systems Engineering
SMART	Specific, Measurable, Achievable, Relevant, and Traceable
TBC	to be confirmed
TBD	to be defined
V&V	Validation and Verification

## 5 Objective and scope of Requirements Management

### 5.1 Objective of Requirements Management

The objective of Requirements Management (RM) is to ensure that stakeholders' needs (customers, users, system's operating environment, trade and marketing, regulations, etc.) are understood, agreed upon, and realized (i.e. that the final design and the delivered products fulfil stakeholders' needs). The best opportunity for Requirements Management to influence a good outcome of the project is an early implementation. Greatest Return on Investment (ROI) of Requirements Management is if it is implemented early.

### 5.2 Scope and interfaces

#### 5.2.1 Requirements Management scope

- a) Requirements Management is a transversal activity that lasts for the whole product lifecycle. Requirements Management shall be started as early as possible and shall be sustained through all the phases of the project, including
  - 1) Concept and definition,
  - 2) Design and development,
  - 3) Production,
  - 4) Support, and
  - 5) Disposal.
- b) Requirements Management is a discipline that shall be applied to all engineering domains. Requirements Management shall, as a minimum, apply to technical requirements, although non-technical requirements may also be managed.

- c) Requirements Management covers the following high-level functional processes described in [Clause 6](#):
- 1) capture the needs and develop the requirements;
  - 2) allocate and flow down the requirements;
  - 3) validate the requirements;
  - 4) verify the design against the requirements;
  - 5) verify the product against the requirements;
  - 6) manage the requirement changes.
- d) Requirements Management is an essential part of Systems Engineering. Requirements Management does not cover the full Systems Engineering discipline, but it is strongly linked to all elements of Systems Engineering.
- e) The major objects managed by Requirements Management are
- 1) “Requirement” (object to be detailed with attributes such as stakeholder, source, rationale, identification, author, status, allocation to design, and statement of the verification method),
  - 2) “Links” (object to be detailed as the link between requirements, but also links from/to other objects enabling Requirements Management to reach its primary objective and ensuring that stakeholders’ needs are understood and realized),
  - 3) “Input documents” (source documents or data that contain the requirements),
  - 4) “Output documents” (reports, compliance matrix, verification matrix, traceability matrix, impact analysis, design documentation, and specification), and
  - 5) “Requirements baseline”.
- f) Requirements Management needs to use other types of objects, but is usually not a master of the following objects in order to ensure efficiency:
- 1) “Product Breakdown Structure”, “Configured Items”, and “Functions”, used to organize requirements and allocate them;
  - 2) “Analysis and Trade Items”, used to make decisions on the validation of requirements, for example objects “Risk”, “Issue”, “Decisions”, and “Discussions”, used to support Requirements Management processes;
  - 3) “Change Management Items”, such as “Change Request” and “Change Order”.

## 5.2.2 Interfaces and support for other disciplines

Requirements Management interface with the following disciplines is based on an iterative data exchange throughout the project lifecycle. As a transversal activity, Requirements Management supports these disciplines as described in the following sections.

### 5.2.2.1 Monitoring quality of requirements

Metrics or Key Performance Indicators (KPIs) shall be collected and analysed on a regular basis to measure quality of requirements and support the evaluation of the effectiveness of the Requirements Management process (see [8.3](#)).