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Space systems — Guidelines to define the management framework for a space project

Systèmes spatiaux — Lignes directrices pour définir le cadre de management pour un projet spatial

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Foreword

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In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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ISO/TR 23462 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

Introduction

Many documents exist which address programme/project management, and elements of these are also addressed in ISO 14300-1 and ISO 14300-2. This Technical Report complements the aforementioned documents by providing an overall concise, single source approach for establishing the basis for managing a specific programme/project.

The aim of this Technical Report is to:

— help the programme/project manager to prepare the programme/project specific management framework, as an input to be used for developing detailed programme/project management plans;

— promote consistency and best practice in an organization;

— minimize planning omissions, thus reducing risks;

— be used as a top level document, in conjunction with the application of standards in space programme/project management;

— facilitate a harmonized approach to decision making in the field of space programme/project management.

This Technical Report supports the application of ISO 14300-1 and ISO 14300-2.

Space systems — Guidelines to define the management framework for a space project

1 Scope

This Technical Report provides a framework within which an organization can establish the basis for the development of programme/project management specifications and plans when undertaking the execution of a specific programme/project. It enables the programme/project manager to establish the criteria for programme/project success and to secure the organization's commitment to the programme/project manager's management approach for the overall programme/project and its constituent elements. It includes guidelines leading to the establishment of a programme/project management framework, and identification of practices to be applied. Following these guidelines also results in traceability of the considerations and decisions on why and how the programme/project is conducted according to its specific characteristics.

This Technical Report provides a holistic approach for programme/project managers to apply their organization's programme/project management practices when defining the management framework for programme/project planning. It is based on a systematic method of

— defining the programme/project objectives and success criteria,

— identifying and elaborating the specific characteristics of their programme/project,

— specifying the management elements needed,

— establishing and agreeing the management approaches to be implemented,

— compiling these into a programme/project management framework document.

The guidelines in this Technical Report are applicable to any organization undertaking the execution of space programmes/projects.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
management approaches
considerations developed for management elements

NOTE Management approaches are used in establishing the programme/project management framework.

2.2
programme/project management framework
collection of management approaches defined for programme/project management elements

NOTE The programme/project management framework is used as a reference basis upon which to establish programme/project management plans.

2.3
programme/project characteristic
description of an attribute, specific to a programme/project

NOTE Programme/project characteristics are considered when determining management approaches to the programme/project management elements.

2.4
programme/project management element
part of programme/project management, relevant to the setting-up, planning and associated processes, for which the management approaches are elaborated

3 Process to establish the programme/project management framework

The process and the steps involved in the preparation of the programme/project management framework are illustrated in the flowchart in Figure 1.

This flowchart guides the programme/project manager, the project team and other actors through the inter-disciplinary and iterative activities of defining objectives, characterization and planning for the performance of the functions relevant to each identified programme/project management element. The approaches incorporated into the programme/project management framework document, which are subject to agreement by the organization hierarchy, support actors and customers where applicable.

4 Process implementation guidelines

4.1 General guidelines

The guidelines in this section are numbered. Each numbered guideline is composed of the wording of the guidelines proper, and accompanied by an explanatory text attached to the general guideline (aim) and to the expected output.

4.2 Establishing the programme/project management framework document

4.2.1 General

The programme/project management framework document preparation should be performed in accordance with the seven-step process illustrated in Figure 1.

— Aim: to perform systematically the tasks required for the establishment of the programme/project management framework.

— Expected output: programme/project management framework document.

4.2.2 Step 1: Defining programme/project objectives and success criteria

The programme/project manager should define the mission objectives: overall technical, cost and schedule performance, and the related mission success criteria. This should include the assessment and comparative analysis of options, taking into account parameters for safety, reliability and quality, aiming at defining as many verifiable requirements at this stage of the project as possible.

— Aim: to ensure that all actors clearly understand the goals of the programme/project.

— Expected output: documented description of the overall programme/project objectives, tied to the mission success criteria.

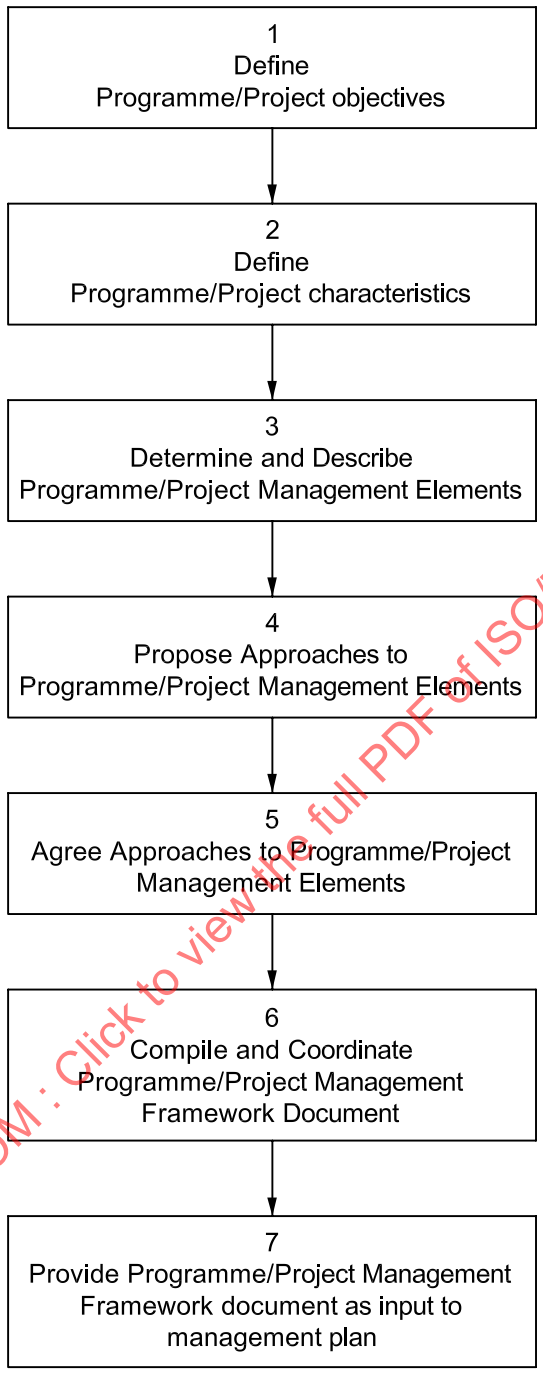

Figure 1 — Process to establish the programme/project management framework

4.2.3 Step 2: Defining programme/project characteristics

The programme/project manager should identify and describe the characteristics of the programme/project to be taken into account when developing the programme/project management framework document by completing the checklist provided in Table 1. This step should include the development of complex (theoretical and experimental) substantiation of the basic characteristics of the project, development in coordination with subcontractors the initial data for improvement of the project characteristics, generation of a block diagram of the project and identification of acceptable principles for the management of the project as a whole and its basic components.

— Aim: to facilitate analysis of the programme/project, enabling the selection of the most suitable management approaches to be applied.

— Expected output: list and descriptions of programme/project characteristics.

Table 1 — Example of a programme/project characteristics checklist

Programme/project characteristic	Summary description
Nature of the programme/project	
Mission type	
Product type	
Scope	
Technical risks	
Maturity of project	
Customer requirements and risk to the organization	
Payload types	
Launch site	
Launch vehicle	
Programmatic parameters	
Cost requirements/constraints	
Programme/project duration	
Schedule constraints/criticality	
Resource requirements/constraints	
Contracting approach and contract types	
Programmatic risks	
Programme/project phase	
Operational life	
Management software tools	
Programme/project organization	
External project framework	
Internal project framework	
Industrial complexity	
Other participants	
Political constraints	

Where additional characteristics are considered influential, these are added to the checklist.

Examples of influential characteristics to be considered could include the following:

a) nature of the project:

— experimental or operational mission functions;

— number of spacecraft in-orbit at one time or for sequential launch;

- top-level technical elements of spacecraft, e.g. platform, instruments;
- top-level elements of ground segment; command and control facilities, ground stations, facilities for data processing and distribution;
- re-use of platform design or of certain subsystems;
- redundancy philosophy;
- re-use of existing ground segment facilities/infrastructure;
- use of specific launchers;
- requirements for operational or data compatibility with other spacecraft;
- objective to demonstrate new technology;
- immature technology to be proven during the development process;

b) programmatic parameters:

- schedule constraints, e.g. trajectory opportunities to astronomical objects, need to be first to market;
- phasing plan;
- funding constraints:
  - specific financing schemes and budgetary commitments;
  - policy to be taken on contingency funding;
- nominal mission lifetime, constraints on actual lifetime, potential for mission extension;
- principles of compliance to standards addressing issues such as parts quality, criteria for software re-use, verification and test approach, fracture mechanics;
- procurement approach:
  - direct negotiations;
  - competitive procurement;
  - intended price-type for the procurements;
  - specific contractual requirements;
- availability and reliability requirements, e.g. for operational missions;
- utilization of major facilities, including laboratories, test facilities, control rooms and ground station network, site infrastructure, data reception / processing facilities;
- new facilities investments required;

c) programme/project organization:

- internal programme/project framework; describe the internal organizational framework within which the project will be executed:

- where the lead role on the project lies at each phase;
- who is responsible for satisfying the customer interface during that phase;
- internal responsibilities for the project and responsibilities in the company organization;
- distinguishing between support and delegated tasks;

— external programme/project framework; describe the external organizational framework within which the programme/project will be executed:

- legal programmatic basis for the project;
- external approvals needed;
- constraints on procurement policy;
- major external deliverables;

— industrial complexity:

- describe the major procurements foreseen;
- technical and programmatic interfaces between each of the major procurements;
- major deliverables from one contract to another;
- potential impacts of schedule slippages;

— other participants:

- partnerships;
- external cooperation;
- constraining aspects of multilateral cooperation;
- externally delegated tasks;

d) political constraints:

- security aspects affecting the project;
- relevant laws and regulations covering technology exchange;
- any controlling agreements.

4.2.4 Step 3: Determining and describing programme/project management elements

The programme/project manager should describe the management elements of the programme/project relevant to the performance of programme/project management, by completing the checklist provided in Table 2.

— Aim: to identify the required set of management elements relevant to the programme/project.

— Expected output: list of management elements, with brief summaries.

Table 2 — Example of a programme/project management elements checklist

Programme/project management element	Summary description
Programme/project definition	
Phasing strategy	
Organization and decision processes	
Model philosophy	
Contracting	
Strategy for a choice of subcontractors and contracting	
Programme/project structures	
Schedule management	
Resources/cost management	
Document management	
Configuration management	
Change management	
Logistics and inventory management	
Performance management	
Risk management	
Lessons learned	
Quality management	
Human resources management	
NOTE Where additional management elements are considered influential on the basis of the programme/project characteristics, these are added to the checklist and described.	

4.2.5 Step 4: Proposing approaches to programme/project management elements

The programme/project manager should describe the proposed approach, and alternatives to be considered, to setting up, planning, executing, monitoring, reporting, and to any other aspects of the specific functions of each management element, by completing the template provided in Table 3.

— Aim: to provide a record of analysis and decisions for the identification of programme/project management approaches.

— Expected output: proposed management approaches and alternatives to be considered for each programme/project management element.

Table 3 — Example of a template for programme/project management approaches

Programme/project management element *(Name of management element)*	
Assumptions/requirements *(Consider all requirements related to the programme/project management element.)*	
Driving characteristics: *(Programme/project characteristics that drive the management element.)*	
Driving risks *(Identification of risks relevant to the management element)* *(Recorded in accordance with ISO 17666)*	
Proposed management approach *(Description of the approach to the programme/project management element and decisions, etc.)*	
Justification *(Justification of the proposed approach, taking into account the identified risks)*	
Alternative approaches *[Description of alternative approach(es)]*	
Preferred/agreed approach *(The desired solution)*	
Programme/project manager	**Date**
Support providers	**Date**
Hierarchy	**Date**

The management approaches are determined by considering each characteristic and management element to select the methods, processes and procedures needed to ensure that adequate and efficient management and control will be exercised. At the same time, it is ensured that risks are reduced to an acceptable level, while avoiding non-value added work. In this way, traceability back to the driving characteristics is provided. When the characteristics change, appropriate changes can be made to the management approaches in full knowledge of previous considerations and decisions.

The programme/project characteristics and management elements are considered in an integrated way, and not in isolation. Only an integrated approach can result in meaningful and consistent conclusions. A low price