



SLOVENSKI STANDARD

SIST EN 16603-70:2015

01-april-2015

Nadomešča:

SIST EN 14737-1:2004

SIST EN 14737-2:2004

Vesoljska tehnika - Zemeljski sistemi in delovanje

Space engineering - Ground systems and operations

Raumfahrttechnik - Bodensysteme und Bodenbetrieb

Ingénierie spatiale - Systèmes sol et opérations

ITEH STANDARD PREVIEW
(standards.iteh.ai)

Ta slovenski standard je istoveten z: EN 16603-70:2015

[SIST EN 16603-70:2015](https://standards.iteh.ai/catalog/standards/sist/en-16603-70-2015/18d3-ab8c-aa391c274862/sist-en-16603-70-2015)

<https://standards.iteh.ai/catalog/standards/sist/en-16603-70-2015/18d3-ab8c-aa391c274862/sist-en-16603-70-2015>

ICS:

49.140 Vesoljski sistemi in operacije Space systems and operations

SIST EN 16603-70:2015

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 16603-70:2015](https://standards.iteh.ai/catalog/standards/sist/e4b1dcbc-246b-48d3-ab8c-aa391c274862/sist-en-16603-70-2015)

<https://standards.iteh.ai/catalog/standards/sist/e4b1dcbc-246b-48d3-ab8c-aa391c274862/sist-en-16603-70-2015>

EUROPEAN STANDARD

EN 16603-70

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2015

ICS 49.140

Supersedes EN 14737-1:2004, EN 14737-2:2004

English version

Space engineering - Ground systems and operations

Ingénierie spatiale - Systèmes sol et opérations

Raumfahrtproduktsicherung - Bodensysteme und
Bodenbetrieb

This European Standard was approved by CEN on 23 November 2014.

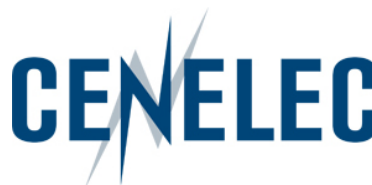
CEN and CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN and CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN and CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN and CENELEC members are the national standards bodies and national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

SIST EN 16603-70:2015

<https://standards.iteh.ai/catalog/standards/sist/e4b1dcbc-246b-48d3-ab8c-aa391c274862/sist-en-16603-70-2015>



**CEN-CENELEC Management Centre:
Avenue Marnix 17, B-1000 Brussels**

Table of contents

Foreword	9
Introduction	10
1 Scope	11
2 Normative references	12
3 Terms, definitions and abbreviated terms	13
3.1 Terms defined in other standards	13
3.2 Terms specific to the present standard	13
3.3 Abbreviated terms.....	15
4 Ground segment and operations domain	19
4.1 Overview	19
4.2 Operations organization.....	19
4.3 Ground systems.....	20
4.3.1 Introduction.....	20
4.3.2 Mission operations system.....	20
4.3.3 Payload operations and data system	21
4.3.4 Ground station system	22
4.3.5 Ground communications system	22
4.4 Engineering processes	22
4.5 Critical areas.....	23
5 Operations engineering	24
5.1 Overview	24
5.2 Requirements analysis and concept development	26
5.2.1 Inputs.....	26
5.2.2 Process description.....	27
5.2.3 Outputs	32
5.3 Mission operations data production	33
5.3.1 Inputs.....	33
5.3.2 Process description.....	33
5.3.3 Outputs	35

5.4	Mission operations data validation	35
5.4.1	Inputs	35
5.4.2	Process description	36
5.4.3	Outputs	36
5.5	Operations teams build-up and training	36
5.5.1	Inputs	36
5.5.2	Process description	37
5.5.3	Outputs	38
5.6	Operational validation	38
5.6.1	Inputs	38
5.6.2	Process description	39
5.6.3	Outputs	40
5.7	Operational configuration management	40
5.7.1	Inputs	40
5.7.2	Process description	41
5.7.3	Outputs	41
5.8	Operations execution	42
5.8.1	Inputs	42
5.8.2	Process description	42
5.8.3	Outputs	44
5.9	Space segment disposal operations	45
5.9.1	Inputs	45
5.9.2	Process description	46
5.9.3	Outputs	46
6	Ground segment engineering	47
6.1	Overview	47
6.2	Ground segment definition	49
6.2.1	Inputs	49
6.2.2	Process description	49
6.2.3	Outputs	53
6.3	Ground segment production	54
6.3.1	Inputs	54
6.3.2	Process description	54
6.3.3	Outputs	55
6.4	Ground segment AIT and verification	56
6.4.1	Inputs	56
6.4.2	Process description	57

EN 16603-70:2015 (E)

6.4.3	Outputs	60
6.5	Ground segment maintenance.....	61
6.5.1	Inputs.....	61
6.5.2	Process description.....	61
6.5.3	Outputs	63
6.6	Ground segment disposal	63
6.6.1	Inputs to ground segment disposal.....	63
6.6.2	Process description.....	63
6.6.3	Outputs	64
7	Ground segment and operations lifecycle	65
7.1	General.....	65
7.1.1	The lifecycle	65
7.1.2	General requirements	67
7.2	Phase A: Mission and operational analysis, feasibility studies and conceptual design.....	67
7.2.1	Purpose of phase A.....	67
7.2.2	Processes during phase A.....	67
7.2.3	Milestones and reviews of phase A.....	68
7.3	Phase B: Preliminary design.....	68
7.3.1	Purpose of phase B.....	68
7.3.2	Processes during phase B.....	69
7.3.3	Milestones and reviews of phase B.....	70
7.4	Phase C: Detailed design	70
7.4.1	Purpose of phase C	70
7.4.2	Processes during phase C	70
7.4.3	Milestones and reviews of phase C.....	71
7.5	Phase D: Production, AIT and verification.....	72
7.5.1	Purpose of phase D	72
7.5.2	Processes during phase D	72
7.5.3	Milestones and reviews of phase D.....	74
7.6	Phase E: Mission operations	75
7.6.1	Purpose of phase E.....	75
7.6.2	Processes during phase E	75
7.6.3	Milestones and reviews of phase E.....	77
7.7	Phase F: Disposal.....	77
7.7.1	Purpose of phase F.....	77
7.7.2	Processes during phase F.....	77

7.7.3	Milestones and reviews of phase F	78
7.8	Summary of key documents and reviews.....	78
Annex A (normative) Customer requirements document (CRD) - DRD		83
A.1	DRD identification.....	83
A.1.1	Requirement identification and source document.....	83
A.1.2	Purpose and objective.....	83
A.2	Expected response.....	83
A.2.1	Scope and content	83
A.2.2	Special remarks	85
Annex B (normative) Mission analysis report (MAR) - DRD		86
B.1	DRD identification.....	86
B.1.1	Requirement identification and source document.....	86
B.1.2	Purpose and objective.....	86
B.2	Expected response.....	86
B.2.1	Scope and content	86
B.2.2	Special remarks	88
Annex C (normative) Mission operations concept document (MOCD) - DRD		89
C.1	DRD identification.....	89
C.1.1	Requirement identification and source document.....	89
C.1.2	Purpose and objective.....	89
C.2	Expected response.....	89
C.2.1	Scope and content	89
C.2.2	Special remarks	93
Annex D (normative) Operations engineering plan (OEP) - DRD		94
D.1	DRD identification.....	94
D.1.1	Requirement identification and source document.....	94
D.1.2	Purpose and objective.....	94
D.2	Expected response.....	94
D.2.1	Scope and content	94
D.2.2	Special remarks	96
Annex E (normative) Space segment user manual (SSUM) - DRD		97
E.1	DRD identification.....	97
E.1.1	Requirement identification and source document.....	97
E.1.2	Purpose and objective.....	97
E.2	Expected response.....	97

EN 16603-70:2015 (E)

E.2.1	Scope and content	97
E.2.2	Special remarks	104
Annex F (normative)	Operational validation plan (OVP) - DRD	105
F.1	DRD identification	105
F.1.1	Requirement identification and source document.....	105
F.1.2	Purpose and objective.....	105
F.2	Expected response	105
F.2.1	Scope and content	105
F.2.2	Special remarks	107
Annex G (normative)	Mission operations plan (MOP) - DRD	108
G.1	DRD identification	108
G.1.1	Requirement identification and source document.....	108
G.1.2	Purpose and objective.....	108
G.2	Expected response	108
G.2.1	Scope and content	108
G.2.2	Special remarks	110
Annex H (normative)	Operations anomaly report (OAR) - DRD.....	111
H.1	DRD identification	111
H.1.1	Requirement identification and source document.....	111
H.1.2	Purpose and objective.....	111
H.2	Expected response	111
H.2.1	Response identification	111
H.2.2	Scope and content	111
H.2.3	Special remarks	113
Annex I (normative)	Operations procedures - DRD	114
I.1	DRD identification	114
I.1.1	Requirement identification and source document.....	114
I.1.2	Purpose and objective.....	114
I.2	Expected response	114
I.2.1	Response identification	114
I.2.2	Scope and content	114
I.2.3	Special remarks	117
Annex J (normative)	Customer furnished items and services requirements document (CFISRD) - DRD.....	118
J.1	DRD identification.....	118
J.1.1	Requirement identification and source document.....	118

J.1.2	Purpose and objective.....	118
J.2	Expected response.....	118
J.2.1	Scope and content.....	118
J.2.2	Special remarks.....	122
Annex K (informative)	Commonality considerations	123
K.1	General.....	123
K.2	Software	123
K.3	Spacelink interfaces.....	124
K.4	Mission operations data.....	124
K.5	Commonality of software framework and hardware infrastructure.....	124
Annex L (informative)	ECSS-E-ST-70 level 3 standards.....	126
Bibliography.....		128
Figures		
Figure 4-1:	The ECSS-E-ST-70 domain	20
Figure 4-2:	Ground segment systems.....	21
Figure 5-1:	Schematic of operations engineering process.....	25
Figure 6-1:	Schematic of ground segment engineering processes	48
Figure 6-2:	Ground segment AIT and verification	58
Figure 7-1:	Ground segment and operations phases.....	66
Tables		
Table 5-1	Inputs to the requirements analysis and concept development process.....	27
Table 5-2:	Outputs of the requirements analysis and concept development process.....	32
Table 5-3:	Inputs to the mission operations data production process.....	33
Table 5-4:	Outputs of the mission operations data production process.....	35
Table 5-5:	Inputs to the mission operations data validation process	35
Table 5-6:	Outputs of the mission operations data validation process	36
Table 5-7:	Inputs to the operations teams build-up and training process	37
Table 5-8:	Outputs of the operations teams build-up and training process.....	38
Table 5-9:	Inputs to the operations validation process.....	38
Table 5-10:	the outputs of the operations validation process	40
Table 5-11:	Inputs to the operational configuration management process	40
Table 5-12:	Outputs of the operational configuration management process	41
Table 5-13:	Inputs to the operations execution process.....	42
Table 5-14:	Outputs of the operations execution process.....	45

EN 16603-70:2015 (E)

Table 5-15: Inputs to space segment disposal operations process.....	45
Table 5-16: Outputs of the space segment disposal operations process	46
Table 6-1: Inputs to the ground segment definition process.....	49
Table 6-2: Output of the ground segment definition process.....	53
Table 6-3 Inputs to the ground segment production process	54
Table 6-4: Outputs of the ground segment production process.....	56
Table 6-5: Inputs to the ground segment AIT and verification process.....	56
Table 6-6: Outputs of the ground segment AIT and verification process.....	60
Table 6-7: Inputs to the ground segment maintenance process.....	61
Table 6-8 Outputs of the maintenance process	63
Table 6-9: Input to the ground segment disposal process.....	63
Table 6-10: Outputs of the ground segment disposal process	64
Table 7-1: Processes and outputs of phase A	68
Table 7-2: Processes and outputs of phase B	69
Table 7-3: Processes and outputs of phase C	71
Table 7-4: Processes and outputs of phase D	73
Table 7-5: Processes and outputs of sub-phase E1	76
Table 7-6: Processes and outputs of sub-phase E2	76
Table 7-7: Processes and outputs of phase F	77
Table 7-8: Key ground segment and operations documents and reviews at which they are deliverable.....	79
Table 7-9: Ground segment and operations reviews	81

Foreword

This document (EN 16603-70:2015) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN.

This standard (EN 16603-70:2015) originates from ECSS-E-ST-70C.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2015, and conflicting national standards shall be withdrawn at the latest by July 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document supersedes EN 14737-1:2004 and EN 14337-2:2004.

This document has been developed to cover specifically space systems and has therefore precedence over any EN covering the same scope but with a wider domain of applicability (e.g.: aerospace).

<https://standards.iteh.ai/catalog/standards/sist/e4b1dcbc-246b-48d3-ab8c->

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Ground systems and operations are key elements of a space system and play an essential role in achieving mission success. Mission success is defined here as the achievement of the target mission objectives as expressed in terms of the quantity, quality and availability of delivered mission products and services within a given cost envelope.

Mission success requires successful completion of a long and complex process covering the definition, design, production, verification, validation, post-launch operations and post operational activities, involving both ground segment and space segment elements. It involves technical activities, as well as human and financial resources, and encompasses the full range of space engineering disciplines. Moreover it necessitates a close link with the design of the space segment in order to ensure proper compatibility between these elements of the complete space system.

ITh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 16603-70:2015](https://standards.iteh.ai/catalog/standards/sist/e4b1dcbc-246b-48d3-ab8c-aa391c274862/sist-en-16603-70-2015)

<https://standards.iteh.ai/catalog/standards/sist/e4b1dcbc-246b-48d3-ab8c-aa391c274862/sist-en-16603-70-2015>

1

Scope

Within the framework of the overall engineering standards for space missions, this Standard contains the basic rules, principles and requirements applied to the engineering of the ground segment and mission operations, which form an integral part of the overall system implementing a space project.

This Standard also addresses the relationships between a customer and the ground segment supplier (GSS) and a customer and the operations supplier (OS).

The following topics are not considered:

- Ground systems (e.g. EGSE) and operations to support space segment verification which are covered within ECSS-E-ST-10-02.
- The launch segment and its operations.

This Standard has the following structure:

- definition of the ground segment and operations domain;
- requirements on ground segment engineering, i.e. the tasks required to design, implement and maintain a ground segment;
- requirements on operations engineering, i.e. the tasks required to prepare and carry out operations of a space project;
- identification of the relationships between the ground segment engineering and operations engineering processes and the space project lifecycle as defined in ECSS-M-ST-10.

This Standard may be tailored for the specific characteristics and constraints of a space project in conformance with ECSS-S-ST-00.

Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revision of any of these publications do not apply, However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the more recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system - Glossary of terms
EN 16603-10	ECSS-E-ST-10	Space engineering – System engineering general requirements
EN 16603-10-02	ECSS-E-ST-10-02	Space engineering – Verification
EN 16603-10-06	ECSS-E-ST-10-06	Space engineering - Technical specification
EN 16603-40	ECSS-E-ST-40	Space engineering – Software general requirements
EN 16601-40	ECSS-M-ST-40	Space project management – Configuration and information management
EN ISO 16091:2002	ECSS-M-ST-70	Space project management - Integrated logistic support
EN 16602-10-09	ECSS-Q-ST-10-09	Space product assurance - Nonconformance control system
EN 16602-80	ECSS-Q-ST-80	Space product assurance - Software product assurance

3

Terms, definitions and abbreviated terms

3.1 Terms defined in other standards

For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply.

For the purpose of this Standard, the following terms and definitions from ECSS-E-ST-10 apply:

system engineering

For the purpose of this Standard, the terms and definitions from ECSS-E-ST-10-02 apply:

inspection

test

STANDARD PREVIEW
(standards.iteh.ai)

3.2 Terms specific to the present standard

3.2.1 entity

combination of ground systems and the associated personnel or operations organization

3.2.2 ground segment operations

activities related to the operations planning, execution and evaluation of the ground segment (or subsets thereof)

3.2.3 ground segment

ground systems necessary for the preparation or execution of mission operations

3.2.4 ground segment customer

party responsible for the procurement of the ground segment

NOTE The ground segment customer interfaces with the ground segment supplier through a customer-supplier relationship.

3.2.5 ground segment supplier

party responsible for the supply of the ground segment