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Systèmes de transfert des informations et données spatiales — Messages de données d'attitude

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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 documents should be noted (see www.iso.org/directives).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 504.0-B-1 Cor.1, July 2015) and was adopted (without modifications) by Technical Committee ISO/TC 20, *Space vehicles,* Subcommittee SC 13, *Space data and information transfer systems*.

This second edition cancels and replaces the first edition (ISO 13541:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

— adds clarifying text to 1.3, Conventions and Definitions.

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.

CCSDS RECOMMENDED STANDARD FOR ATTITUDE DATA MESSAGES

CONTENTS

CONTENTS (continued)

CONTENTS (continued)

CCSDS RECOMMENDED STANDARD FOR ATTITUDE DATA MESSAGES

1 INTRODUCTION

1.1 PURPOSE

1.1.1 This Attitude Data Message (ADM) Recommended Standard specifies two standard message formats for use in transferring spacecraft attitude information between space agencies: the Attitude Parameter Message (APM) and the Attitude Ephemeris Message (AEM). Such exchanges are used for:

– preflight planning for tracking or attitude estimation support;

– scheduling attitude and data processing support;

– carrying out attitude operations;

– performing attitude comparisons;

– carrying out attitude propagations and/or sensor predictions;

– testing to initialize sub-system simulators (communications, power, etc.).

1.1.2 This Recommended Standard includes sets of requirements and criteria that the message formats have been designed to meet. For exchanges where these requirements do not capture the needs of the participating agencies, another mechanism may be selected.

1.2 SCOPE AND APPLICABILITY

1.2.1 This document contains two attitude data messages designed for applications involving data interchange in space data systems. The rationale behind the design of each message is described in annex B and may help the application engineer to select a suitable message. Definition of the attitude accuracy underlying a particular attitude message is outside of the scope of this Recommended Standard and should be specified via Interface Control Document (ICD) between data exchange participants. Applicability information specific to each Attitude Data Message format appears in sections 3 and 4, as well as in annex subsection B3.

1.2.2 This Recommended Standard is applicable only to the message format and content, but not to its transmission. The transmission of the message between agencies is outside the scope of this document and should be specified in an ICD or by following a CCSDS standard on transmission.

1.2.3 Description of the message formats based on the use of the eXtensible Markup Language (XML) will be available. An XML schema is defined by the CCSDS Recommended Standard titled 'XML Specification for Navigation Data Messages' (reference [5]). Agencies should specify, via ICD, the ASCII file format to be exchanged (Keyword Value Notation [KVN] or XML).

CCSDS RECOMMENDED STANDARD FOR ATTITUDE DATA MESSAGES

1.3 CONVENTIONS AND DEFINITIONS

The following conventions apply throughout this Recommended Standard:

a) the words 'shall' and 'must' imply a binding and verifiable specification;

b) the word 'should' implies an optional, but desirable, specification;

c) the word 'may' implies an optional specification; and

d) the words 'is', 'are', and 'will' imply statements of fact.

As in some attitude dynamics references, in this document the term 'nutation' is used to mean the motion of the spin axis of a body about an inertial axis. In many other references this motion is called 'precession'.

Cor. 1

1.4 STRUCTURE OF THIS DOCUMENT

1.4.1 Section 2 provides a brief overview of the CCSDS-recommended Attitude Data Message types, the Attitude Parameter Message (APM) and Attitude Ephemeris Message (AEM).

1.4.2 Section 3 provides details about the structure and content of the APM.

1.4.3 Section 4 provides details about the structure and content of the AEM.

1.4.4 Section 5 provides details regarding syntax of the APM and AEM messages.

1.4.5 Section 6 provides information regarding security concerns related to the access and transmission of the Attitude Data Messages.

1.4.6 Annex B provides a list of approved values for selected keywords in the ADM Metadata sections.

1.4.7 Annex B lists a set of requirements that were taken into consideration in the design of the APM and AEM, along with tables and discussion regarding the applicability of the two message types to various attitude estimation tasks and functions.

1.4.8 Annex C lists a number of items that should be covered in ICDs prior to exchanging ADMs on a regular basis. There are several statements throughout the document that refer to the desirability or necessity of such a document; this annex lists all the suggested ICD items in a single place in the document.

1.4.9 Annex D is a list of abbreviations and acronyms applicable to the ADM.

1.4.10 Annex E is a list of informative references.

1.5   REFERENCES

The following documents contain provisions which, through reference in this text, constitute provisions of this Recommended Standard. At the time of publication, the editions indicated were valid. All documents are subject to revision, and users of this Recommended Standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. The CCSDS Secretariat maintains a register of currently valid CCSDS Recommended Standards.

[1]   *Information Technology—8-Bit Single-Byte Coded Graphic Character Sets—Part 1: Latin Alphabet No. 1*. International Standard, ISO/IEC 8859-1:1998. Geneva: ISO, 1998.

[2]   *Spacewarn   Bulletin*.   Greenbelt,   MD,   USA: WDC-SI. <http://nssdc.gsfc.nasa.gov/spacewarn>

[3]   *JPL Solar System Dynamics*. Pasadena, CA, USA: JPL. <http://ssd.jpl.nasa.gov>

[4]   *Time Code Formats*. Recommendation for Space Data System Standards, CCSDS 301.0-B-3. Blue Book. Issue 3. Washington, D.C.: CCSDS, January 2002.

[5]   *XML Specification for Navigation Data Messages*. Draft Recommendation for Space Data System Standards, CCSDS 505.0-R-1. Red Book. Issue 1. Washington, D.C.: CCSDS, November 2005.

[6]   *IEEE Standard for Binary Floating-Point Arithmetic*. IEEE Std 754-1985. New York: IEEE, 1985.

[7]   *Orbit Data Messages*. Recommendation for Space Data System Standards, CCSDS 502.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, September 2004.

NOTE –   A list of informative references can be found in annex E.