ANSI/AIAA G-043A-2012
(Revision of G-043-1992)

Guide

American National Standard

Guide to the Preparation of Operational Concept Documents

Approved American National Standard
ANSI

AIAA

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Guide to the Preparation of Operational Concept Documents

Sponsored by

American Institute of Aeronautics and Astronautics

In cooperation with the International Council on Systems Engineering

Approved July 2012

American National Standards Institute

Abstract

A recognized systems engineering best practice is early development of operational concepts during system development and documentation of those operational concepts in one or more operational concept documents. Recognizing this best practice, U. S. Department of Defense (DoD) and NASA standard procedures have required that information relating to system operational concepts is prepared in support of the specification and development of systems. In the past, the DoD has published Data Item Descriptions (DIDs), and NASA has published Data Requirements Documents (DRDs), which describe the format and content of the information to be provided.

This AIAA Guide describes which types of information are most relevant, their purpose, and who should participate in the operational concept development effort. It also provides advice regarding effective procedures for generation of the information and how to document it.

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Published by
American Institute of Aeronautics and Astronautics
1801 Alexander Bell Drive, Reston, VA 20191

Printed in the United States of America

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Change History

Change Number	Change Date	Comments
1	14 December 2010	Ballot Draft 2
2	26 March 2011	Ballot Draft 3

Foreword

This *Guide for the Preparation of Operational Concept Documents* (OCD) has been sponsored by the American Institute of Aeronautics and Astronautics (AIAA) as a part of its Standards Program. It is an update and extension of the original ANSI/AIAA Guide (ANSI/AIAA G-043-1992), incorporating new insights, knowledge, and experience that have been recognized since the Guide's original publication. The original Guide was developed by the AIAA Software Systems Committee on Standards and formed a sound foundation for this updated version. This edition of the Guide has been prepared by the AIAA Systems Engineering Committee on Standards, the AIAA Software Engineering Technical Committee, and the Requirements Working Group of the International Council on Systems Engineering.

At the time that the original Guide was published, various government standards required the generation of operations concept information. The U.S. Department of Defense (DoD) had developed Data Item Descriptions (DIDs), but little information was provided describing the manner in which an Operational Concept Document should be used in support of a system development. No guidelines were provided regarding which information was most useful, how to develop that information, which developer and customer personnel should participate, or how to document it.

Subsequent to the publication of the original Guide, the DoD embarked on a substantial acquisition reform activity, which resulted in the cancellation of many standards that had guided the development of systems and software in favor of comparable commercial standards. In the same time period, guides to the preparation of Operational Concept Documents were published by the Institute of Electrical and Electronic Engineers (IEEE 1362) and by ISO (ISO 14711:2002 (E)). Lastly, many advances have been made in the last decade in methods used in systems and software development, not the least of which has been the expansion of object orientation and the development of the Unified Modeling Language (UML) and the Systems Modeling Language (SysML).

The original Guide, ANSI/AIAA G-043-1992, was subject to review and revision in 1997. At approximately that time, members of the International Council on Systems Engineering Requirements Working Group (INCOSE RWG) had recognized a need for such a Guide and had begun work on their own document. After discussion between both organizations, the INCOSE RWG and the AIAA Systems Engineering Committee on Standards (SE CoS) decided to work jointly on the revision of the ANSI Guide. In addition, the INCOSE Net-Centric Operations (NCO) Working Group has worked jointly with the AIAA SETC in reviewing the G-043 document. The NCO Working Group has concurred with the contents. Although the review and revision process was begun in 1997, it was not completed until 2011.

The current Guide for the Preparation of Operational Concept Documents, in addition to including new information, has been broadened to encompass the development of all system types, including software-intensive systems, and to reflect technological advances of the last decade. Development of the current Guide has benefited from the cooperative effort between the AIAA and INCOSE by providing a broad systems-level viewpoint and inclusion of international knowledge, information, and experience.

This publication is a Guide and contains no normative material. It is informative only.

At the time of approval, the members of the AIAA Systems Engineering Committee on Standards were as follows:

Satoshi Nagano, Chair	The Aerospace Corporation
James R. van Gaasbeek, Co-Chair	Northrop Grumman Corporation
Michelle Bailey	Defense Acquisition University South
Dexter Lee Blackstock	NASA Langley Research Center

Shirley Brandt	Jacobs Engineering
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Mahantesh Hiremath	Space Systems Loral
John C. Hsu	California State University, Long Beach
Stephen Jensen	NASA Dryden Flight Research Center
Rosemary Matty	Arnold Engineering Development Center
John C. Muehlbauer	Lockheed Martin Aeronautics Company
Eric E. Nichols	Orbital Sciences Corporation
Brian Selvy	Pratt and Whitney Rocketdyne
William W. Vaughan	University of Alabama, Huntsville
Tony Williams	Jacobs Engineering (NASA Johnson Space Center)

The following individuals made particular contributions to the preparation of the document:

Kurt Dittmer	Northrop Grumman Corporation
Andrew Gabb	Consultant
Alvaro Gracia	Northrop Grumman Corporation
Raymond Jorgensen	Rockwell Collins
Jérôme Loubersac	Integrate Systems Engineering
George Strengers	BAE Systems, Australia
John Tiehen	Northrop Grumman Corporation

The AIAA Systems Engineering Committee on Standards (Satoshi Nagano, Chairperson) approved this document for publication in February 2012.

The AIAA Standards Executive Council (Laura McGill, Chairperson) accepted this document for publication in June 2012.

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1 Introduction

1.1 Purpose

The purpose of this Guide is twofold. First, the Guide describes a time-tested process for operational concept development. Second, it is intended to recommend how to compile the information developed during operational concept development into one or more Operational Concept Documents (OCDs) encompassing the full range of the product lifecycle (Haskins, 2010): concept, development, production, utilization, support, and retirement stages.

1.2 System

The Operational Concept is prepared initially to support the concept and development stages of the *system* life cycle. The Operational Concept is then maintained throughout the Program to support the production, utilization, support, and retirement stages of the system life cycle. As the concept of "system" is central to the Operational Concept and its preparation and maintenance, for the purposes of this Guide, a s*ystem* is defined as:

> A combination of interacting elements organized to achieve one or more stated purposes. A system may be considered as a product or as the services it provides. In practice, the interpretation of its meaning is frequently clarified by the use of an associative noun (e.g., aircraft system). Alternatively, the word "system" may be substituted simply by a context-dependent synonym (e.g., aircraft), though this may then obscure the system principles perspective [after ISO, 2008].

Early in the system development activity, a system is conceptual in nature. As the development effort continues, the system becomes realized in hardware, software, materials, personnel, facilities, and processes.

A system may consist of several levels where each element at each lower level may by this definition itself be considered a *system* (i.e., a subsystem of a large system may itself possess all of the attributes of a system).

1.3 Operational Concept Document Versus Concept of Operations Document

The terms "operational concept" and "concept of operations," and the terms "operational concept document" and "concept of operations document," are often used interchangeably in system development. Although there are similarities between the two terms in each set, there are also significant differences. It is important to understand the term "concept of operations" and "operational concept" before trying to understand the terms describing the documents.

For the purposes of this Guide, a distinction shall be made between the terms "concept of operations" and "operational concept." Each has a separate purpose and is prepared and used to meet separate ends. It is imperative that the system and software engineering communities within a given Program agree on the usage of the two terms, and use this Guide in accordance with the Program-specific meanings. The terms "concept of operations" and "operational concept" will be used as defined below throughout this Guide.

1.3.1 Concept of Operations

A concept of operations is an abstract model created by an organization or enterprise[1] to describe how it intends to operate to achieve its goals and objectives. The concept of operations may be very high level and independent of the particular systems to be used in the organization or enterprise operations or it may be developed as part of the process for acquisition of a new, upgraded, or modified system. A

[1] See Section 5.2, Definitions, for the distinction between "organization" and "enterprise."