RTCA, Inc.
1150 18th St. NW Suite 910
Washington, D.C. 20036-5133 U.S.A.

Guidelines for Verification and Validation of Aerodrome Mapping Databases (AMDB) Aerodrome Surface Routing Networks (ASRN) for Routing Applications

RTCA DO-342
March 20, 2013

Prepared by: SC-217
©2013 RTCA, Inc.

Copies of this document may be obtained from

RTCA, Inc.
1150 18th Street, NW, Suite 910
Washington, DC 20036 USA

Telephone: 202-833-9339
Fax: 202-833-9434
Internet: www.rtca.org

Please call RTCA for price and ordering information.

FOREWORD

This report was prepared by RTCA Special Committee 217 (SC-217) and EUROCAE Working Group 44 (WG-44) and approved by the RTCA Program Management Committee (PMC) on March 20, 2013.

RTCA, Incorporated is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal advisory committee, and develops consensus-based recommendations on contemporary aviation issues. RTCA's objectives include but are not limited to:

- coalescing aviation system user and provider technical requirements in a manner that helps government and industry meet their mutual objectives and responsibilities;

- analyzing and recommending solutions to the system technical issues that aviation faces as it continues to pursue increased safety, system capacity and efficiency;

- developing consensus on the application of pertinent technology to fulfill user and provider requirements, including development of minimum operational performance standards for electronic systems and equipment that support aviation; and

- assisting in developing the appropriate technical material upon which positions for the International Civil Aviation Organization and the International Telecommunication Union and other appropriate international organizations can be based.

The organization's recommendations are often used as the basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration Technical Standard Orders and several advisory circulars.

Since RTCA is not an official agency of the United States Government, its recommendations may not be regarded as statements of official government policy unless so enunciated by the U.S. government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

This Page Intentionally Left Blank

EXECUTIVE SUMMARY

This is a guidance document on the concepts, methods, and criteria for verification and validation of an Aerodrome Surface Routing Network (ASRN). The ASRN of an Aerodrome Mapping Database (AMDB) is a connected network defined by node and edge features that support taxi routing functions (e.g. D-Taxi) and other applications (e.g. the ones developed within SESAR and NextGen). Such applications contribute to situational awareness as well as safety, capacity, and efficiency of operations.

The connected network introduced by the ASRN can support the intended applications of multiple users (both on the ground and onboard) in collaborative ways. In order to ensure the consistency of the ASRN for multiple users, it is necessary to provide guidance on verification and validation applied to the ASRN. This document has been written with the assumption that if all users are using verified and validated ASRNs, greater interoperability can be achieved, along with new functions, capabilities, and operational improvements.

The information contained in this document has been prepared to provide guidance related to the compliance of the ASRN with the rules defined in RTCA DO-272C/EUROCAE ED-99C and the compliance with specific application requirements (e.g. data quality or display requirements). The guidelines presented are not all-inclusive, but represent a framework for creating and using verification and validation processes applied to the ASRN. The intended users of this document include aerodrome operators, air navigation service providers, airframe manufacturers, Air Traffic Control (ATC), Air Traffic Management (ATM)/ground system manufacturers, avionics manufacturers, certification authorities, data suppliers, regulators, and Research and Development (R&D) organizations.

The document is organized as follows:

- Section 1 provides scope and background information with respect to the ASRN and the operational context, and lists the main stakeholders that may use the document in their processes
- Section 2 states general considerations about verification and validation
- Section 3 describes acceptance criteria for verification and validation
- Section 4 provides some methods for the verification and validation of ASRNs
- Section 5 lists the membership of the committee that developed this document
- Appendix A includes operational perspectives on ASRN verification and validation
- Appendix B presents an example of a potential operational implementation (D-Taxi application)
- Appendix C explains the use of some ASRN Key Performance Areas, Key Performance Indicators, and Metrics
- Appendix D is a glossary of relevant terms
- Appendix E lists abbreviations and acronyms

This Page Intentionally Left Blank

TABLE OF CONTENTS

1 INTRODUCTION AND SCOPE 1
1.1 Introduction 1
1.2 Scope 1
1.3 Background 1
1.4 Key ASRN Terminology 3
1.5 Operational considerations 3
1.6 Stakeholders 4
1.7 Reference documents 6

2 GENERAL CONSIDERATIONS FOR VERIFICATION AND VALIDATION 7
2.1 Roles and responsibilities 7
2.2 Objectives of verification and validation 7
2.3 Existing verification and validation methodologies 7
2.4 Error reporting and traceability 8
2.5 Timeliness 8
2.6 Verification and validation plan 9

3 ACCEPTANCE CRITERIA 11
3.1 Verification acceptance criteria 11
3.2 Validation acceptance criteria 11
3.2.1 General validation acceptance criteria 12
3.2.2 Geometric validation acceptance criteria 13
3.2.3 Functional validation acceptance criteria 13

4 POTENTIAL METHODS FOR ASRN VERIFICATION AND VALIDATION 15
4.1 Verification methods 15
4.2 Validation methods 15

5 MEMBERSHIP 17

APPENDIX A: ASRN OPERATIONAL CONSIDERATIONS A-1
1.OPERATIONAL PERSPECTIVES – VERIFICATION A-1
1.1 ATC operational perspective A-1
1.2 Aircraft operational perspective A-1
1.3 Integrated ATC and aircraft operational perspective A-1
2.OPERATIONAL PERSPECTIVES – VALIDATION A-1
2.1 ATC operational perspective A-1
2.2 Aircraft operational perspective A-2
2.3 Integrated ATC and aircraft operational perspective A-2

APPENDIX B: EXAMPLE OPERATIONAL IMPLEMENTATION OF AN ASRN B-1
1.OPERATIONAL SCENARIO B-1
2.GRAPHICAL DATA DESCRIPTION B-1
3 USE OF THE ASRN WITHIN A D-TAXI SERVICE B-1

APPENDIX C: ASRN KEY PERFORMANCE AREAS, INDICATORS AND METRICS C-1
1.KPAS, KPIS AND METRICS C-1
2.ASRN KEY PERFORMANCE AREAS (KPAS) C-1
3.ASRN KEY PERFORMANCE INDICATORS (KPIS) C-2
4.ASRN METRICS C-3

APPENDIX D: GLOSSARY D-1

APPENDIX E: ABBREVIATIONS AND ACRONYMS E-1

TABLE OF FIGURES

Figure 1-1 Extent of ASRN in maneuvering area 2
Figure 2-1 The roles of verification and validation in an overall process 7
Figure 3-1 Example of aerodrome without fully connected maneuvering area 12
Figure B-1 D-Taxi architecture for exchange of graphical routes B-2
Figure C-1 Hierarchical relationship of Strategic Performance Framework concepts C-1

TABLE OF TABLES

Table 1.6-1 Stakeholders and the Intended Uses of the Document 4

1 INTRODUCTION AND SCOPE

1.1 Introduction

This document provides guidelines for the verification and validation of Aerodrome Surface Routing Networks (ASRN) in Aerodrome Mapping Databases (AMDB) for routing applications and potentially other applications. Those who develop and/or use an AMDB may use this document to guide their verification and validation process for ASRN. This document does not supersede the existing documents describing processes related to Aeronautical Data, e.g. ED 76/DO200-A, FAA AC 20-153A, or EU 73/2010.

1.2 Scope

This document only covers the verification and validation of AMDB ASRN. The verification and validation of other portions of AMDB are covered in section 3.9 of RTCA DO-272C/EUROCAE ED-99C.

The verification and validation process described in this document addresses both the compliance of the ASRN with the rules defined in RTCA DO-272C/EUROCAE ED-99C (e.g. geometry, capture rules, and attribute constraints) and the compliance with the specific application requirements (e.g. data quality or display requirements). It covers general considerations, acceptance criteria, and potential methods.

This document applies to entities involved in the development, revision, and/or use of ASRNs. These entities may be any of the stakeholders (reference Table 1.6-1) involved in ground and onboard application development and use of ASRNs.

It is not the intent of this document to provide a verification and validation process, but rather a framework for creating and using such processes.

1.3 Background

The ASRN information can be an integral part of an AMDB. It uses aerodrome data to produce a connected routing network. The network facilitates graphical depiction of a route on the representation of the aerodrome surface to aid in taxi-in and taxi-out operations. The ASRN does not cover taxi operations navigational guidance.

The ASRN as defined in RTCA DO-272C/EUROCAE ED-99C provides connectivity up to the points where taxiways intersect with parking or apron areas but does not extend into those areas.

For example, the nodes in Figure 1-1 labeled 600D, 600L, etc. identify where the ASRN ends at the intersections of taxiway X and parking stands 600D, 600L, etc., but there are no nodes or edges in those parking areas. Similarly, there is a node identifying the transition point between taxiway X and “Maintenance Apron”, but no nodes or edges in the apron area.

Therefore, the ASRN supports identifying the point where a route can start or end in the maneuvering area given a particular parking area, but does not provide the geographical location of the parking area itself.

© 2013, RTCA, Inc