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Safety, Performance and Interoperability Requirements Document for the In-Trail Procedure in Oceanic Airspace (ATSA-ITP) Application

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Prepared by RTCA, Inc.
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CHAPTER 1

INTRODUCTION

This document provides the minimum operational, safety, and performance requirements (SPR) and interoperability requirements (INTEROP) for the implementation of enhanced Airborne Traffic Situational Awareness (ATSA) for "In-Trail Procedure" (ITP). The ATSA-ITP application is fully defined in the Operational Services and Environment Definition (OSED) found in Annex A.

All material in this document was developed jointly by EUROCAE Working Group 51 and RTCA Special Committee 186, within the group commonly referred to as the "ADS-B Requirements Focus Group" (RFG).

This document was developed based on the criteria for SPR and INTEROP documents set forth in RTCA DO-264/EUROCAE ED-78A, "Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications." [18]. It provides the minimum ATSA-ITP requirements - and allocations thereof - based on the results of a coordinated requirements determination process.

The requirements contained in this document are necessary to provide adequate assurance that the appropriate aspects of the relevant Communication Navigation Surveillance and Air Traffic Management (CNS/ATM) system, when operating together, will perform their intended function in an acceptably safe manner for the operations defined in the OSED. The system here includes ground and airborne elements.

While all detailed SPR related assessments are found in Annexes to this document, Chapter 3 presents the outcome of the reconciliation process of all of these results into a single set of underlying safety and performance requirements. This process retains the most stringent requirement for those attributes or parameters commonly treated by both the safety and performance assessments. Traceability of those requirements is provided back to the corresponding assessment(s).

1.1 PURPOSE OF THIS DOCUMENT

This document defines and allocates the set of minimum requirements for the end-to-end operational, safety, performance and interoperability aspects for implementations of the ATSA-ITP application. Allocation of these requirements is done by this SPR/INTEROP to the necessary domains of the CNS/ATM system, i.e., at aircraft and ground domain level.

These requirements can be used for approval processes including aircraft type design approval, aircraft operator operational approval, and Air Traffic Services (ATS) provider operational approval.

In addition, this document also provides guidance to determine the levels of design assurance and performance that are needed for each element (aircraft, operator, and ANSP – Air Navigation Service Provider) to support the ATSA-ITP application.

The ATSA-ITP SPR and INTEROP are also envisaged to be used along with those from other surveillance applications, based on Automatic Dependent Surveillance Broadcast (ADS-B), to develop minimum standards for avionic systems to assure that all subsystems perform their intended functions adequately for these applications.

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1.1.1 ATSA-ITP

The objective of the In-Trail Procedure (ITP) is to enable aircraft that desire Flight Level changes in Procedural Airspace to achieve these changes on a more frequent basis, thus improving flight efficiency while maintaining safe seperation from other aircraft. ATSA-ITP achieves this objective by permitting a climb-through or descend-through maneuver past the Reference Aircraft, in compliance with an assumed distance-based longitudinal separation minimum (the ITP Separation Minimum) during the maneuver. This assumed separation standard is known as "LONGITUDINAL SEPARATION MINIMA BASED ON DISTANCE USING ADS-B IN-TRAIL PROCEDURE (ITP)". At the time of publication of this document, this assumed separation minimum has not been approved but is under review by the ICAO Separation and Airspace Safety Panel (SASP).

Note: *This document is based on the assumption that the separation standard has been approved and published. Any differences between the published standard and the proposed standard would need to be reflected in subsequent versions of this document.*

ATSA-ITP enables flight crew to use information derived on the aircraft to determine whether criteria can be met to enable a climb or descend maneuver with reduced separation in Procedural Airspace. The criteria are designed such that the spacing between the estimated positions of the ITP Aircraft and Reference Aircraft, throughout the maneuver, is never less than the ITP Separation Minimum (Refer to section 3.2 for definitions of terms used throughout this document).

The ATSA-ITP application does not change the responsibilities of either pilots or controllers. The flight crew continues to be responsible for the operation of the aircraft and conformance to its clearance, and the controller continues to be responsible for separation and the issuance of clearances throughout the ATSA-ITP application. Initial conditions, and the crew's compliance with the ITP procedure, are in place to ensure the safety of the Flight Level change.

The full OSED for ATSA-ITP on which all analysis in this SPR/INTEROP is based, is contained in Annex A of this document.

1.1.2 Use of Document for Approvals

This document is intended to support the approval of all elements of the CNS-ATM system that relate to the application of ATSA-ITP.

The corresponding safety, performance, and interoperability assessments are based on the detailed specification of the OSED. States or regions implementing an application different to that specified in the OSED must take into account those differences in the operations or environment in supporting analysis.

The assessments and specifications in this document are not intended to be a sole basis for operational and airworthiness approval. However, this material can be used as an important component for establishing minimum design and system performance standards for ANSP, aircraft operator, and aircraft certification approvals for the ATSA-ITP application.

Aircraft and avionics system designers should consider any additional specifications that may enhance the system supporting the ATSA-ITP application, in view of other future Airborne Surveillance Applications (ASA), so that systems designed for ATSA-ITP will easily accommodate more demanding ADS-B enabled operations in the future.

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1.2 SCOPE OF THE DOCUMENT

This document includes the definition of the services and the environmental conditions relevant to the implementation of the ATSA-ITP application, and the operational, safety, performance and interoperability requirements for using the application.

Note: *Requirements that provide for protection against intentional behaviour causing harm or sabotage are beyond the scope of this document.*

Note: *Requirements related to the recording of ADS-B data for accident or incident investigation purposes are beyond the scope of this document.*

1.2.1 ATSA-ITP Context

This document considers ATSA-ITP as an isolated application, however all Package 1 applications (see section 1.2.1.1 below) are envisioned to be implemented, and implementers must recognise this when considering the minimum requirements for both the air and ground.

ATSA-ITP is one of many envisioned ADS-B IN functions that relies on the participation of ADS-B OUT equipped aircraft. There is a strong expectation that ADS-B OUT will be implemented widely using, for example, the published and future SPR/INTEROP documents such as ADS-B NRA and ADS-B RAD. This document has therefore been developed in coordination with ADS-B NRA [30].

1.2.1.1 Package 1

ATSA-ITP is one of the applications originally defined as a first package of Ground and Airborne Surveillance Applications enabled by ADS-B and collectively called "Package 1"[1] [14]. All applications defined within Package 1 are enabled by a sufficient level of equipage of aircraft broadcasting ADS-B information and ground stations and/or other aircraft receiving and processing that same data.

The applications within Package 1 fall into two categories as follows:

ADS-B Package 1 Ground Surveillance Applications which are:

- ADS-B NRA Enhanced ATS in non-radar areas using ADS-B surveillance
- ADS-B RAD Enhanced ATS in radar areas using ADS-B surveillance
- ADS-B APT Airport surface surveillance
- ADS-B ADD Aircraft derived data for Air Traffic Control (ATC) tools

ADS-B Package 1 Airborne Surveillance Applications which are:

- ATSA VSA Enhanced visual separation on approach
- ATSA-ITP In-trail procedure in Procedural Airspace
- ATSA AIRB Enhanced traffic situational awareness during flight operations
- ATSA SURF Enhanced traffic situational awareness on the airport surface
- ASPA S&M Enhanced sequencing and merging operations

[1] Some of the original application acronyms have been modified in the course of the RFG work.

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