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MINIMUM AVIATION SYSTEM PERFORMANCE STANDARDS FOR THE LOCAL AREA AUGMENTATION SYSTEM (LAAS)

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1. Purpose and Scope

1.1 Introduction

This document contains the Minimum Aviation System Performance Standards (MASPS) for the Local Area Augmentation System (LAAS), a system developed to support precision approach and landing operations and other navigation and surveillance applications within a local area including and surrounding an airport. These standards should be useful to equipment designers, installers, manufacturers, service providers and users for systems intended for operational use within the United States (US) National Airspace System (NAS). As the LAAS has global application as a Ground-Based Augmentation System (GBAS) to the Global Navigation Satellite System (GNSS), many of the standards in this document have been harmonized with those being developed by the International Civil Aviation Organization (ICAO) and The European Organization for Civil Aviation Equipment (EUROCAE). Additionally, the standards in the document have been developed to be consistent with ongoing worldwide harmonization of advisory circulars and regulatory documents pertinent to precision approach equipment and operations. The harmonization efforts are intended to continue as standards developed by these organizations mature, and this document will be updated as appropriate.

Within this document, the terms "LAAS" and "GBAS" are not synonymous. "LAAS" refers to the system being proposed for use and further development by RTCA to meet the operational objectives for the US NAS as documented in this MASPS and DO-253A. This system may also be suitable for implementation in other areas. "GBAS" refers to any system compliant with the existing ICAO standards (through and including Amendment 79 to Annex 10).

Use of the term "LAAS" instead of "GBAS" is intended to highlight two facts:

1. Within this document, certain options allowed by the existing ICAO GBAS standards have been chosen for LAAS implementation including, for example, the positioning service and the ephemeris error bound.
2. This document also contains proposed requirements that have not yet been standardized by ICAO. In many cases, these requirements have not yet been harmonized within the international community. Examples include the requirements to support Category II/III approach and landings such as the alert limits, navigation system accuracy requirements, and the spectral content of the positioning errors.

Expanding on item #1 above, LAAS implements both the GBAS CAT I approach service and the positioning service based on GPS and, optionally, visible SBAS/WAAS geostationary satellites. The GBAS approach service currently only supports approaches to Category I minima and has an optional broadcast of ephemeris error bound parameters. The GBAS positioning service requires the broadcast of the ephemeris error bound parameters. LAAS requires the broadcast of the additional ephemeris bound parameters to support the approach service as well as the positioning service.

Expanding on item #2 above, additional broadcast features have been added for LAAS that have been identified as beneficial by some operators but have not yet been harmonized or standardized internationally. Optional requirements for the broadcast of a subset of DO-236B-compatible terminal area path (TAP) data to provide additional support for terminal area operations have been added. The TAP broadcast development was intended to be compatible with the GBAS CAT I approach and positioning services and future CAT II/III services, but further development may be needed. RTCA has

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developed requirements to support approaches in CAT II/III minima. Requirements are also under development in EUROCAE and ICAO. These requirements have not yet been harmonized.

Finally, this document also uses the terminology "GBAS service levels" (GSL) for the approach service that distinguishes between various levels of performance. This concept is being discussed within international standards groups, but is still under development. GSL C is equivalent to GBAS CAT I. Although GSLs commensurate with ICAO's navigation system requirements to support approaches with vertical guidance (designated APV-I and APV-II in Annex 10) are included in the GSL concept herein (i.e., GSL A and B), the allocations and functional requirements to support these service levels are not complete. ICAO is expected to complete this work in conjunction with amendments to the GBAS standards to support ground-based regional augmentation systems.

The MASPS is not expected to be implemented by regulatory documents and/or advisory documents (e.g., certifications, authorizations, approvals, commissionings, advisory circulars, notices, etc.). Any regulatory application of this document is the sole responsibility of appropriate governmental agencies.

This MASPS is recommended as a tool for facilitating the system development of GBAS to support all categories of precision approach and landing as well as to further support terminal area services. This document is expected to assist States, industry, and other standards development bodies responsible for GBAS development and international harmonization of GBAS requirements by providing one complete package of both total system requirements and ground/airborne subsystem allocations. The proposed allocations in this document will serve as a basis for further development of both ground and airborne subsystem requirements. These and subsequent efforts will help mature and refine the requirements to a level suitable for international standardization. Continued maintenance of this document will also allow it to be a vehicle for the development of requirements for future applications (e.g., expansion of the positioning service to provide additional vertical positioning integrity for ADS-B applications) and for future envisioned enhancements to GNSS, including additional and modernized core satellite constellations.

The MASPS is also expected to be employed by the U.S. Department of Defense (DOD), with a small number of adaptations, for future use within the Joint Precision Approach and Landing System (JPALS) program for military aviation. The particular adaptations required for operations in various military environments and modes will be defined in the JPALS program documentation that implements portions of the MASPS. It seems likely that at least one JPALS operating mode (e.g., military aircraft landing at a civil airfield equipped with a LAAS ground subsystem) may need to implement the MASPS in its entirely. Other operating modes may require adaptations such as the use of P(Y)-code signals instead of C/A-code signals, using the L2 frequency signals in addition to the L1 frequency signals, and using different ground-to-air data broadcast subsystem that is more suited for hostile interference environments.

1.2 Document Overview

Section 1 of this document describes the LAAS and provides information needed to understand the rationale for system characteristics and requirements that are stated at the LAAS system and subsystem levels in the remaining sections. Section 1 describes typical applications and operational goals, as envisioned by members of RTCA Special Committee 159, and establishes the basis for the standards stated in Sections 2 through 4.

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