242A-WP-6-09

To: The GNSS Community

From: Joel Wichgers
(Co-chair of RTCA SC-159 WG 4)

Date: July 12, 2001

Subject: Request Feedback on the Proposed RTCA LAAS MOPS PVT Output Requirements

Request

The entire GNSS community is encouraged to review the change proposal to the RTCA SC-159 Local Area Augmentation System (LAAS) MOPS [DO-253] to ensure that it supports their needs.

The purpose of this communication is to highlight a rather significant change for the PVT output requirements in the draft RTCA LAAS MOPS (which is up for SC-159 approval in August). Feedback from the GNSS community including the ADS-B community (e.g., RTCA SC186 and EUROCAE Working Group 51) as well as other national and international groups interested in these requirements (e.g., GNSS Panel, operational concepts groups, and aircraft operators) is desired as soon as practical, but prior to August 22, 2001.

Please review the background information below and consider whether the proposed LAAS PVT output requirements support user needs (e.g., Separation Assurance and Surveillance Applications, FMS applications).

Background

RTCA SC-159 working group 4 (WG-4) has balloted for final review and comment the change proposal for the GPS LAAS airborne equipment Minimum Operation Performance Standards (MOPS) [DO-253]. Comments are due on August 22, and it is anticipated that this document will be SC-159 approved during the week of August 27, 2001. [For a copy of the LAAS MOPS change proposal, please contact either Hal Moses at hmoses@rtca.org or Joel Wichgers at jmwichge@rockwellcollins.com.]

Significant Change to the Draft LAAS MOPS PVT Output

RTCA SC-159 WG-4 has recently made a significant change to the draft Position/Velocity/Time (PVT) output requirements when the receiver is using LAAS differential corrections. Prior to May 2001, the proposed LAAS MOPS PVT output was required to be the LAAS differential PVT solution when the LAAS was selected and the receiver was receiving valid and usable LAAS differential corrections. However, the current draft LAAS MOPS PVT output was changed to allow it to be either: 1) LAAS differential PVT, or 2) in accordance with DO-229() -- the WAAS MOPS which is either WAAS corrected PVT or RAIM/FDE protected PVT, or 3) in accordance with DO-208 as amended by TSO-C129A (RAIM protected PVT) for TSO equipment classes B1 or C1. (See Section 2.3.1 Table on page 29 of the DO-253 change proposal as is reproduced in Attachment #1 below.)

Items to Note

1. *ICAO Ground Based Augmentation System (GBAS) Requirements: The International Civil Aviation Organization (ICAO) Global Navigation Satellite Systems Panel (GNSSP) has approved Standards and Recommended Practices (SARPs) for GBAS (i.e., international term for LAAS) that supports Category I precision approach, but does NOT support augmented PVT for area navigation. These standards have been adopted and will be published as part of ICAO Annex 10 in November 2001. When using such a GBAS station, the airborne receiver must NOT provide PVT based on the differential corrections (e.g., LAAS differential PVT). Note that there are optional (i.e., not minimum) GBAS requirements (in addition to the Category I requirements) being developed by the GNSSP for a differential positioning service which supports augmented PVT.*

2. *Even when the GBAS optional differential positioning service requirements are completed by the GNSSP, note that the current RTCA LAAS MOPS change proposal does NOT require the LAAS airborne receiver to output augmented PVT, even when operating with a ground station that supports augmented PVT in the terminal area. According to the current requirements, the LAAS MOPS receiver "may or may not" output augmented PVT (it is up to the manufacturer). This option to "opt out" of high accuracy PVT was recommended by some such that the GPS Landing System category I approach system could be introduced with "no change" to the TSO-C129A PVT output so as not to impact other systems on the aircraft. Will this approach negatively impact airspace development for any proposed user applications (e.g., Surveillance applications) to the "least capable" user?*

Feedback Requested

The GNSS community is encouraged to review the balloted final review and comment LAAS MOPS to ensure that RTCA SC-159 has a LAAS airborne requirements MOPS that supports their needs. Feedback is desired whether endorsing or suggesting changes to the current draft LAAS MOPS PVT requirements. Please provide specific rationale for the desired LAAS receiver PVT output.

Please respond prior to August 22, 2001 both to:

1. RTCA (i.e., Hal Moses) at hmoses@rtca.org (phone 1-202-833-9339) as a response to the final review and comment period for the LAAS MOPS change proposal, and
2. Joel Wichgers at jmwichge@rockwellcollins.com (phone 1-319-295-0068).

If any additional information or clarification is needed, please contact Joel Wichgers.

Attachment #1: LAAS PVT Output Requirements

(Excerpt from RTCA LAAS MOPS Change Proposal dated June 11, 2001)

From the Section 2.3.1, the LAAS Position and Navigation Function General Requirements

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When applying LAAS differential corrections, the PVT outputs of the airborne equipment shall [LAAS-068] meet the requirements of either: 1) Section 2.3.10, or 2) RTCA/DO-229() (any of the equipment classes), or 3) RTCA/DO-208 as modified by TSO-C129A Class B1 or TSO-C129A Class C1.

When not applying LAAS differential corrections, the LAAS airborne equipment shall [LAAS-069] meet the requirements of either: 1) RTCA/DO-229() (any of the equipment classes), or 2) RTCA/DO-208 as modified by TSO-C129A Class B1 or TSO-C129A Class C1.

Note: Only RTCA/DO-229() addresses the integration of precision approach with other area navigation functions. GNSS equipment that only meets the requirements of RTCA/DO-208 may be subject to operational restrictions due to the lack of compatibility with Required Navigation Performance (RNP) requirements.

This information is summarized in the table below:

LAAS Equipment Outputs	Applying LAAS Differential Corrections		Not Applying LAAS Differential Corrections
	Approach Selected (Note 1)	Approach Not Selected	
Precision Approach Guidance	defined in Section 2.3.11 (Note 2)	not applicable	In accordance with DO-229() if applicable
PVT	Either: 1. LAAS differential PVT as defined in Section 2.3.10, or 2. In accordance with DO-229(), or 3. In accordance with DO-208 as modified by TSO-C129A Class B1 or TSO-C129A Class C1	Either: 1. LAAS differential PVT as defined in Section 2.3.10, or 2. In accordance with DO-229(), or 3. In accordance with DO-208 as modified by TSO-C129A Class B1 or TSO-C129A Class C1	Either: 1. In accordance with DO-229(), or 2. In accordance with DO-208 as modified by TSO-C129A Class B1 or TSO-C129A Class C1

Note 1: Depending upon the architecture of the avionics and the aircraft integration, the function of selecting an approach may occur either within the equipment described in this MOPS or external to this equipment. See also Section 2.3.4.

Note 2: The precision approach guidance outputs for LAAS airborne equipment are conditional in that equipment Class A (defined in Section 1.4) is not required to meet the requirements of Section 2.3.11 when the GBAS signal-in-space does not support the differential positioning service.