

## **ARINC Project Initiation/Modification (APIM)**

### **1.0 Name of Proposed Project APIM 16-013**

Prepare the following new standards:

- Supplement 6 to ARINC 743A, GNSS
- Supplement 1 to ARINC 743B, GLSSU
- New ARINC Project Paper 743C, GLSSU with VDB Receiver
- Supplement 5 to ARINC 755, MMR

### **1.1 Name of Originator and/or Organization**

CMC Electronics & Airbus

### **2.0 Subcommittee Assignment and Project Support**

#### **2.1 Suggested AEEC Group and Chairman**

Group: GNSS Working Group

Chairman: Julien Sanscartier (Esterline CMC Electronics Inc) and Francois Tranchet (Airbus)

#### **2.2 Support for the activity**

Airlines: United Airlines, others TBD

Airframe Manufacturers: Airbus, Boeing, and all that are interested

Suppliers: CMC Electronics, Rockwell Collins, Honeywell, Thales

#### **2.3 Commitment for Drafting and Meeting Participation**

Airlines: TBD, all that are interested

Airframe Manufacturers: Airbus, Boeing

Suppliers: CMC Electronics (Rockwell Collins, Honeywell, Thales)

#### **2.4 Recommended Coordination with other groups**

SAI Subcommittee

### **3.0 Project Scope**

#### **3.1 Description**

Aviation standards development committees such as RTCA, Eurocae, and to some extent ICAO, are in the process of extending functional capabilities in GPS navigation (integration of IMUs), SBAS (increasing number of SBAS PRNs), and GBAS updates (as per the current RTCA DO-253D MOPS in development & various ICAO working papers).

Standards development, and the expected TSOs, may/will cause an impact on the interface between GPS equipage and aircraft systems. It is recommended that aircraft GPS ARINC Characteristics describing unit-level form, fit, function, and system interfaces be opened to align these new functional or certification requirements with aircraft systems.

Standards development at the RTCA are in progress, The FAA is expected to issue corresponding TSO immediately thereafter. The schedule is approximately RTCA green covers by summer 2017 and TSOs by winter 2017. These will impact GPS/SBAS/GBAS receivers, and new data outputs are expected. To comply with new TSOs, the ARINC GPS/SBAS/GBAS Characteristics will have to be updated.

The specific items for consideration are as follows:

1. The current RTCA DO-229D MOPS specifies SBAS PRNs from 120 to 138.

The number of SBAS PRNs will be increasing. In actual fact, new SBAS PRNs are already deployed (satellites) and are in test mode. The SBAS service providers are seeking approval to go live safety-of-life with new PRNs from 139 to 158.

This situation has resulted in causing an update to the RTCA DO-229D MOPS and RTCA DO-229E is in progress. The new MOPS will increase the number of PRNs to cover the range from 120 to 158. There will be an impact on the ARINC 429 data interface.

Once RTCA DO-229E is approved, TSO updates are expected to follow immediately thereafter.

The current ARINC label set supports PRNs only from 120 to 138, so clearly this has to be updated to include the new PRNs.

2. GBAS standards development activity at both RTCA (a new RTCA DO-253D is in-the-works) and ICAO (new SARPs). Items for consideration are new alerting:
  - a. GAST-C or D annunciation (new data)
  - b. Authentication status annunciation (new data)
  - c. Differential correction magnitude check status annunciation (new data)
  - d. VHF Data Broadcast (VDB) receiver classification, potentially antenna considerations (TBD)
  - e. Starting with Supplement 1 to ARINC 743B, add VDB receiver to create ARINC Project Paper 743C, basically adding a VHF connector to the ARINC

743B form factor and adding VDB outputs (same labels as ARINC 755)

3. Considerations for usage of carrier-phase measurements for heading computation and integration with Inertial Measurement Units (IMUs) as being developed by RTCA SC-159 WG-2C which may require new label definitions.
4. And finally, cleanup of residual editorial errors in the current documents

The anticipated schedule to update the ARINC Characteristics should span no more than one year after go-ahead since the changes are well-defined by standards development (and certification).

New data definitions will be required to accommodate the requirements for annunciator.

### 3.2 Planned usage of the envisioned specification

New aircraft developments planned to use this specification      yes  no

Specify: New SBAS PRNs are being deployed, GBAS is deployed or is in the process of being deployed. These will affect aircraft certification.

Modification/retrofit requirement      yes  no

Specify: SBAS and GBAS are core to NextGen. It is expected that airlines will want to retrofit and take advantage of both SBAS and GBAS capability.

Needed for airframe manufacturer or airline project      yes  no

Specify: There will be near term impact on airframe manufacturers and their avionics suppliers, particularly from certification standpoint.

Mandate/regulatory requirement      yes  no

Program and date:

Is the activity defining/changing an infrastructure standard?      yes  no

Specify: None.

When is the ARINC Standard required?      2017

What is driving this date?

- SBAS PRN deployment.
- GBAS MOPS in 2017 followed by TSO update.

Are 18 months (min) available for standardization work?      yes  no

If NO, please specify solution: Not applicable

Are Patent(s) involved?      yes  no

If YES please describe, identify patent holder: Not applicable

### 3.3 Issues to be worked

No anticipated issues, just the above work items as described in section 3.1:

1. ARINC Label updates, including changes and corrections to labels 217, 056, 153, and 164

2. Possible introduction of new ARINC Labels
3. Bus review
4. Cleanup prior errata
5. Introduce and formalize GBAS to 743B
6. Introduce a new ARINC 743 form factor receiver (as an extension of ARINC 743B) to include a VDB receiver, it is proposed to introduce ARINC 743C (due to the fact that a new VHF connector will be added). ARINC 743C will be identical to ARINC 743B with the following two exceptions:
  1. adding a new VHF connector for the VDB receiver embedded inside the ARINC 743 form factor and
  2. adding VDB output (identical to ARINC 755).
 Remark: ARINC 743C will comprise two receivers in one form factor: a GPS/SBAS/GBAS receiver and a VDB receiver.

## 4.0 Benefits

### 4.1 Basic benefits

Operational enhancements? yes  no

For equipment standards:

- a. Is this a hardware characteristic? yes  no
- b. Is this a software characteristic? yes  no
- c. Interchangeable interface definition? yes  no
- d. Interchangeable function definition? yes  no

If not fully interchangeable, please explain: Not applicable

Is this a software interface and protocol standard? yes  no

Specify: None.

Product offered by more than one supplier yes  no

Identify: CMC Electronics, Rockwell Collins

## 4.2 Specific project benefits (Describe overall project benefits.)

### 4.2.1 Benefits for Airlines

Airline benefits are expected from usage of the GPS SBAS and GBAS in their operations. Further, many nations have invested in SBAS and will enable SBAS-enhanced operations such as LPV approaches.

Nations are expected to also invest in GBAS, especially where additional capability is required or where SBAS does not/cannot provide SBAS services.

ARINC Project Paper 743C is expected to define a form factor that delivers GPS/SBAS and GBAS in one unit. ARINC Project Paper 743C and ARINC 755

form factor are expected to focus on and provide all 3 GPS-based navigation and precision approach capabilities: GPS, SBAS, and GBAS (from CAT-I to CAT-III). ARINC 743C will be an alternative to ARINC 755 when only GPS, SBAS and GBAS services are required, particularly for retrofits.

**4.2.2 Benefits for Airframe Manufacturers**

All airframe manufacturers have invested in both SBAS and GBAS and will continue to do so, particularly as nations states further deploy SBAS and GBAS and their customers take advantages of the services provided by SBAS and GBAS.

**4.2.3 Benefits for Avionics Equipment Suppliers**

These standards are necessary for all GPS/SBAS/GBAS equipment manufacturers intending on serving aviation. Further, it allows all other avionics manufacturers to properly interface with GPS/SBAS/GBAS avionics in a clear, unambiguous, cost-effective manner that meets all certification/regulatory requirements.

**5.0 Documents to be Produced and Date of Expected Result**

Update of ARINC 743A-5 and ARINC 743B, add ARINC 743C. ARINC 743C will be defined as ARINC 743B with the addition of GBAS capability as described above.

**5.1 Meetings and Expected Document Completion**

The following table identifies the number of meetings and proposed meeting days needed to produce the documents described above. Meetings are expected to be held via teleconferences, potentially bi-weekly.

<b>Activity</b>	<b>Mtgs</b>	<b>Expected Start Date</b>	<b>Expected Completion Date</b>
Step 1: Organizational meeting, work plan, and kick-off	1	October 2016	---
Produce the following deliverables: <ul style="list-style-type: none"> <li>• Supp 6 to ARINC 743A</li> <li>• Supp 1 to ARINC 743B</li> <li>• New ARINC Project Paper 743C with VDB</li> <li>• Supp 5 to ARINC 755 MMR</li> </ul>	5	---	April 2017
Consensus and closure	2	April 2017	October 2017

**6.0 Comments**

**6.1 Authorization**

When approved, the APIM will authorize the activity defined in Section 3.1. This is required due to the fact that standards are in development and the corresponding TSOs are expected to follow.

**6.2 Expiration Date for the APIM**

Expect completion by October 2017 – coincide with standards development at RTCA