

ARINC Project Initiation/Modification (APIM)

- 1.0 Name of Proposed Project** **APIM 17-002B**
Supplement 9 to ARINC Specification 631: VHF Digital Link (VDL) Mode 2 Implementation Provisions
Supplement 9 will add the definition of Connectionless VDL Mode 2
- 1.1 Name of Originator & Organization**
Mike Matyas, Boeing
- 2.0 Subcommittee Assignment and Project Support**
- 2.1 Suggested AEEC Group and Chairman**
Datalink (DLK) Systems Subcommittee
Chairman: Bob Slaughter, American Airlines
- 2.2 Support for the activity (to be confirmed)**
Airlines: American Airlines, Delta, Lufthansa, Southwest, TAP Portugal, UPS, United
Airframe Manufacturers: Airbus, Boeing
Suppliers: Honeywell, Collins Aerospace, Universal Avionics, Spectralux, Thales, Garmin (TBC)
Others: Collins Aerospace IMS, SITAOnAir, L3Harris Technologies, FAA
- 2.3 Commitment for Drafting and Meeting Participation**
Airlines: American Airlines, UPS
Airframe Manufacturers: Airbus, Boeing
Suppliers: Honeywell, Collins Aerospace
Others: Collins Aerospace IMS, SITAOnAir, L3Harris Technologies
- 2.4 Recommended Coordination with other groups**
DLK Users Forum, RTCA SC-214 VDLSG, EUROCAE WG-92, ICAO DCIWG, AEEC/RTCA/EUROCAE IPS Groups
- 3.0 Project Scope**
This project will create **Supplement 9** to ARINC Specification 631.
- 3.1 Description**
Initial VDL Mode 2 CPDLC operation in Europe (Data Link Services) and USA (Data Comm En Route Services) has highlighted air-ground interoperability issues and the need for enhanced Frequency Management.
Supplement 8 to ARINC Specification 631 includes ELSA Consortium recommendations, and Handoff guidance that are expected to improve VDL Mode 2 performance by

encouraging robustness in the avionics’ ground station selection algorithm.

Supplement 9 will include implementation provisions for connectionless VDL Mode 2 capability. It will add provisions for VDL subnetworks to support ATN/IPS. Security considerations required by the ICAO SARPS will be included.

These changes are intended to further improve VDL Mode 2 operation and performance beyond the changes made with Supplement 7.

Experience with implemented ATN/OSI B1 CPDLC in Europe has shown that VDL Mode 2 air-ground interoperability guidance is desirable. This will provide greater assurance that the VDL Mode 2 system will work as intended and allow early detection of potential interoperability issues.

Connectionless VDL Mode 2 will allow airplanes and ground stations to exchange messages without having to establish an explicit connection, similar to how POA (VDL Mode 0/A) works. It will exercise the previously unused connectionless message exchange capability already described in relevant standards, namely the Unnumbered Information (UI) frame defined in ISO 4335/7809 and ICAO Doc 9776 (the “VDL Tech Manual”). Connectionless VDL Mode 2 will be fully compatible with existing VDL Mode 2. Both variants will work on the same frequency at the same time and a particular airplane could use **either variant**.

Connectionless VDL Mode 2 is intended to further address the performance issues by providing greater efficiency and robustness. The greater efficiency of connectionless VDL Mode 2 will increase effective VDL Mode 2 capacity – the limits of which are a valid concern in both Europe and the US – and accordingly its sustainability. Additionally, connectionless VDL Mode 2 will leverage investments already made in VDL Mode 2 (as opposed to starting over with new technology) and be highly beneficial for existing ACARS and ATN/OSI network technology as well as for future ATN/IPS network technology. Boeing, Honeywell, SITA have already performed successful ground and flight trials of IPS over connectionless VDL Mode 2. **Supplement 9** will define connectionless VDL Mode 2 to carry ACARS messages (AOA packets), ATN/OSI messages (ISO 8208 packets), and ATN/IPS messages (IP packets).

Supplement 9 will define VDL Mode 2 operation to support ATN/IPS. This may include additional protocols (e.g., Orange Protocol) and security measures.

3.2 Planned usage of the envisioned specification

New aircraft developments planned to use this specification: yes no

Airbus: (aircraft & date)

Boeing: To be determined

Other: (manufacturer, aircraft & date)

Modification/retrofit requirement: yes no

Specify: **TBD - need Airbus and Boeing input**

Needed for airframe manufacturer or airline project: yes no

Specify: **TBD - need Airbus and Boeing input**

Mandate/regulatory requirement: yes no

Program and date: (program & date)

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

Specify ARINC 631 VDL Mode 2

When is the ARINC Standard required?

Supplement 8: May 2020 (adopted)

Supplement 9: September 2022 (proposed)

What is driving this date?

This date is driven by the need for the benefits that VDL Mode 2 air-ground interoperability guidance and connectionless VDL Mode 2 will bring.

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

Are Patent(s) involved? yes no

If YES please describe, identify patent holder: _____

3.3 Issues to be worked

Define the best way to perform frequency management when using connectionless VDL Mode 2 and how connectionless VDL Mode 2 will carry **AOA, ATN/OSI and IPS** messages.

Compatibility with existing air to ground operations over VDL Mode 2.

Data security requirements for VDL subnetworks to support ATN/IPS will be addressed.

3.4 Security Scope

Is Cyber Security Impacted (if yes, check box(es) below) yes no

Aircraft Control Domain yes no

Airline Information Services Domain yes no

PAX Information and Entertainment Systems yes no

Other _____ yes no

For Supplement 9: Based on initial analysis, VDL Mode 2 security is required and will be dependent on IPS industry recommendations (ICAO Working Group I – Security Subgroup/ AEEC IPS SC/EUROCAE WG-108 / RTCA SC-223).

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. Is this an interchangeable interface definition? yes no

d. Is this an interchangeable function definition? yes no

If not fully interchangeable, please explain:

Air/Ground Interoperability

Is this a software interface and protocol standard? yes no

Specify: Air/Ground Interoperability

Is this product offered by more than one supplier? yes no

Universal Avionics, Spectralux, Garmin, Airbus, Honeywell, Collins
Aerospace, Collins Aerospace IMS, SITAOnAir

4.2 Specific Project Benefits

4.2.1 Benefits for Airlines

Benefits for airlines of connectionless VDL Mode 2 include more efficient and robust communication of AOC and ATS messages via VDL Mode 2. As demonstrated in Europe with implemented ATN/OSI B1 CPDLC, current connection-oriented VDL Mode 2 has proven to be less efficient and robust than desired.

For example, ELSA “peer loss of communication” (also known as “N2 events”) will be less likely to occur with connectionless VDL Mode 2 because of antenna diversity. In particular, an airplane will accept uplinks from any ground station of the selected service provider and all ground stations of the selected service provider will accept downlinks from an airplane.

4.2.2 Benefits for Airframe Manufacturers

Benefits for airframe manufacturers of VDL Mode 2 air-ground interoperability tests include greater assurance that VDL Mode 2 systems will perform as intended and early detection of potential interoperability issues. Benefits for airframe manufacturers of connectionless VDL Mode 2 include more efficient and robust communication via VDL Mode 2 that better satisfy the needs of their customers.

4.2.3 Benefits for Avionics Equipment Suppliers

Benefits for avionics equipment suppliers of VDL Mode 2 air-ground interoperability tests include greater assurance that VDL Mode 2 systems will perform as intended and early detection of potential interoperability issues. Benefits for avionics equipment suppliers of connectionless VDL Mode 2 include

more efficient and robust communication via VDL Mode 2 that better satisfy the needs of their customers.

4.2.4 Benefits for ATSPs/DSPs/CSPs

Benefits for the ground service providers of VDL Mode 2 air-ground interoperability include greater assurance that VDL Mode 2 systems will perform as intended and early detection of potential interoperability issues. Increased capability and reduction of RF congestion.

5.0 Documents to be Produced and Date of Expected Result

Supplement 8 to ARINC Specification 631, **May 2020 (adopted)**

Supplement 9 to ARINC Specification 631, September 2022 (proposed)

5.1 Meetings and Expected Document Completion

These meetings will be coordinated by the AEEC staff person assigned to this activity.

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
Supplement 8 to ARINC 631	TBD	24	June 2017	May 2020 Adopted
Supplement 9 to ARINC 631	TBD	17	May 2020	September 2022

Proposals for inclusion in **Supplement 9** to ARINC 631 will be coordinated through web conference meetings. Final document review will take place as part of the regularly scheduled DLK Systems Subcommittee meetings.

6.0 Comments

Regular web conferences are planned.

6.1 Expiration Date for the APIM

May **2023**

Completed forms should be submitted to the AEEC Executive Secretary and Program Director, Paul J. Prisaznuk (pjp@sae-itc.org)