

Aeronautical Telecommunication Network Panel

Working Group 2

Alexandria, 7-16 October 1996

Industry Concerns Regarding the ATN SARPs

Draft ATNP/2 WP

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Summary

Attached to this paper is a draft ATNP/2 Working Paper which identifies incompatibilities between ATN draft SARP applications and those which are already in operation in the FANS-1 environment. The paper proposes that corrections to the draft SARPs be incorporated to reduce these incompatibilities, which will increase the cost of implementation for both avionics and ground automation.

Proposal

WG3 is invited to note that this paper is being submitted to ATNP/2.

Aeronautical Telecommunication Network Panel
Second Meeting
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Agenda Item 3: Development of the ATN SARPs

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Summary

After review of the drafts of the CPDLC, ADS and CM SARPs, Boeing engineers have identified a number of issues which threaten to make the cost of implementing ATN greater than necessary. The message element and variable definitions specified in the draft SARPs should be made compatible with those defined in RTCA DO-219 (for CPDLC) and RTCA DO-212 and ARINC 745 (for ADS), with the goal of minimizing the economic impact of implementing ATN.

Discussion

Several of the Boeing engineers who will be responsible for implementation of CPDLC and ADS over the ATN have recently completed a review of the draft CPDLC, ADS, and CM (Context Management) SARPs proposed by the ATN Panel. With each successive iteration the draft CPDLC and ADS SARPs message sets are evolving further from those defined in RTCA DO-219, DO-212 and ARINC 745. Boeing and Honeywell designed the FANS 1 package with the intent that much of the CPDLC and ADS application software would be fully migratable to ATN. Boeing and Honeywell's goal is to have common software and a common human interface for the existing DO-219 and DO-212 / ARINC 745 message sets and much of the CPDLC and ADS applications. ATC Service Providers, who already provide FANS 1 services, have an equivalent need.

The airlines require that the avionics and airframe manufacturers build SARPs compliant ATN applications and many of them require that the avionics and ground stations support CPDLC and ADS over both the ACARS network and ATN. The evolution of the SARPs is forcing avionics and ground station manufacturers into a position of having to support two unique CPDLC and ADS applications in order to meet the airlines' requirements. If the avionics and ground station manufacturers are forced into developing and maintaining completely new CPDLC and ADS applications, the cost of the resulting package will be significantly more, causing the cost/benefit equation to be less attractive.

The SARPs should be written with the goal of backward compatibility with DO-219 and DO-212/ARINC 745 in order to avoid significant financial impact to the airline industry and ATS Service Providers. The existing draft SARPs do not achieve this goal and the DO-219 and ARINC 745 incompatibilities that have been introduced will not provide significant benefits to the industry. Changes which provide significant value can be justified. Changes which impart no value incur cost without benefit.

A description of the types of differences which exist between the DO-219 and draft CPDLC SARPs message sets is presented as Appendix A to this document. A description of the types of differences which exist between the DO-212/ARINC 745 and draft ADS SARPs message sets is presented as Appendix B to this document.

Recommendations

The ATN Panel is encouraged to consider the economic impact of compatibility between existing CPDLC and ADS functions and those functions described in the draft ATN SARPs. To that end, the Panel is encouraged to make the ATN SARPs backward compatible with DO-219 and DO-212/ARINC 745 to the maximum extent possible. This would minimize the impact on the message encoding and decoding within the airborne and ground applications supporting CPDLC and/or ADS over both ACARS and ATN, and would likely minimize the human interface differences between the two applications. Specifically:

- The DO-219 and ARINC 745 message sets should be used as baselines for CPDLC and ADS, respectively.

- Message elements currently defined in DO-219 and variables currently defined in DO-219 or ARINC 745 should not be redefined in the SARPs.
- Where CPDLC elements assigned to existing DO-219 message element numbers must be changed, the new element should be assigned a new element number.
- Where DO-219 or ARINC 745 variable definitions must be changed, the new definition should be assigned a new variable name.

Appendix A: Differences Between DO-219 and the CPDLC SARPs

The following describes the types of differences which exist between the DO-219 and draft CPDLC SARPs message set.

1. message elements associated with element numbers already in DO-219 have been redefined

Example: In DO-219, uplink element 73 is [predepartureclearance]. In the SARPs, element 73 is [departureclearance]. These elements have different definitions.

2. variables already in DO-219 have been redefined

Example: The [altitude] variable is used in several of the uplink and downlink message elements. In DO-219 the [altitude] variable is defined as:

```
Altitude ::= CHOICE
{
    altitudeqnh           [0]    Altitudeqnh,
    altitudeqnhmeters    [1]    Altitudeqnhmeters,
    altitudeqfe          [2]    Altitudeqfe
    altitudeqfemeters    [3]    Altitudeqfemeters,
    altitudegnssfeet     [4]    Altitudegnssfeet
    altitudegnssmeters   [5]    Altitudegnssmeters
    altitudeflightlevel  [6]    Altitudeflightlevel
    altitudeflightlevelmetric [7] Altitudeflightlevelmetric
}
```

In the SARPs the [altitude] variable is defined as:

```
Altitude ::= CHOICE
{
    noAltitude           [0]    NULL,
    singleAltitude       [1]    AltitudeType,
    blockAltitude        [2]    SEQUENCE SIZE (2) OF
AltitudeType
}
AltitudeType ::= CHOICE
{
    altitudeqnh           [0]    Altitudeqnh,
    altitudeqnhmeters    [1]    Altitudeqnhmeters,
    altitudeflightlevel  [2]    Altitudeflightlevel
    altitudeflightlevelmetric [3] Altitudeflightlevelmetric
}
```

3. variables already in DO-219 have been redefined with the net result being the same meaning as in DO-219

Example: DO-219 defines the variable [timestamp] as:

```
Timestamp::= SEQUENCE
{
    Timehours,
    Timeminutes,
    Timeseconds
}
```

The SARPs defines the equivalent variable [Timehhmmss] as:

```
Timehhmmss::=SEQUENCE
{
    hoursminutes,
    seconds
}
```

Appendix B: Differences Between DO-212/ARINC 745 and the ADS SARPs

The following describes the types of differences which exist between the DO-212/ARINC 745 and the draft ADS SARPs message sets.

In ARINC 745 the altitude variable is defined as:

```
Altitude          ::=INTEGER (-32768..32767)
-- MSB (sign bit) = 131072 feet, unit = 4 feet, invalid = -32768
-- valid range (-131068..131068)
```

In the ADS SARPS, the altitude variable is defined as:

```
Altitude          ::= INTEGER (-10..6640)
-- units = alt-units (see Note 1)
-- range = -10 alt-units to + 6640 alt-units
```

Note 1.— Different states have different requirements with respect to the units of measurement of some of the fields in the PDUs. The units described below have been defined to meet these differing requirements. Conversion to the units should be made in the transmitting application and conversion from the units should be made at the receiving application. The new units have been defined to be midway between the minimum resolution required by the two units used by different states.

Unit of altitude = 1 alt-unit = 3.02400 metres = 9.92126 feet (midway between 3 metres and 10 feet)

To convert from alt-unit to metres, multiply by 3.02400

To convert from alt-unit to feet, multiply by 9.92126

To convert from meters to alt-units, multiply by 0.33069

To convert from feet to alt-units, multiply by 0.10079

As far as the overall format and content of the draft SARPs is concerned, the requirements are hard to read and are overly abstract (e.g., the module abstractions for ADS). Simpler requirements would be more appropriate.